

# TopSURV

Integrated Controller Software



## Reference Manual





# **TopSURV Reference Manual**

Part Number 7010-0492

Rev L

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# Preface

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



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# Manual Conventions

This manual uses the following conventions:

Example	Explanation
<b>File ► Exit</b>	tap the File menu and tap 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.
<i>Topo</i>	Indicates the name of a dialog box or screen.



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



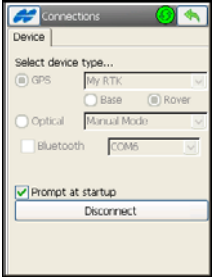


Supplementary information that can have an affect on system operation, system performance, measurements, personal safety.

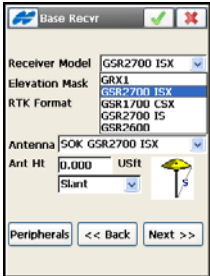
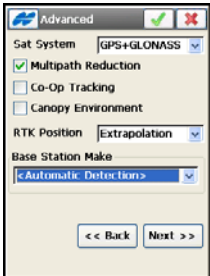
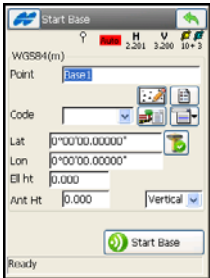
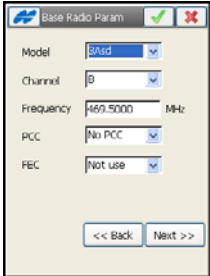
---



# What's New with TopSURV

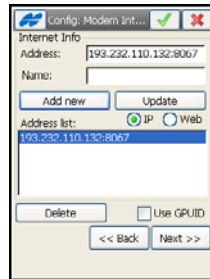
The chapter briefly describes new features and functions for version 8 of TopSURV.

<p><b>Connection Settings</b></p> <p>Connection settings are now available on selecting observation mode. For GPS mode you are able select the Base or Rover receiver to work.</p>	
<p><b>Default Code Library</b></p> <p>Default Code Library is now installed and set to the Global Code library.</p>	
<p><b>Moving Arrow on Map</b></p> <p>Moving arrow now denotes the current position on the map.</p>	

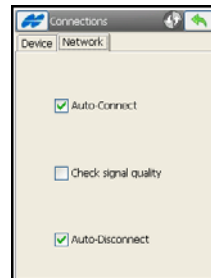
<p><b>Sokkia Equipment</b></p> <p>Sokkia equipment is now supported.</p>	
<p><b>Canopy Environment</b></p> <p>Setting the receiver in “forest” mode is now supported.</p>	
<p><b>Automatic Start UHF Radio</b></p> <p>Automatic start UHF radio is added to Start Base. Selecting frequency is now available on the status string.</p>	
<p><b>PCC mode</b></p> <p>Satel PCC mode is optional now.</p>	

**Web Address**

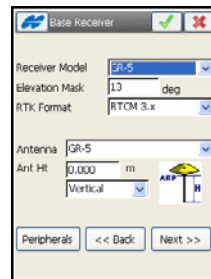
NTRIP connection can now be set up based on web address instead of IP address for controller-side Internet connection.

**Network Connections**

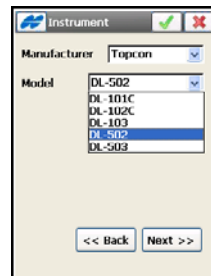
Auto-connection to Network is optional, and auto-disconnection from Mount Point on disconnecting from receiver is now added.

**GR-5 Receiver**

Topcon GR-5 receiver is now supported.

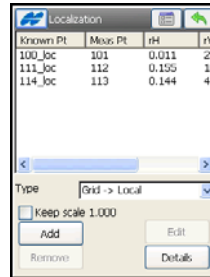
**DL-502/503 Digital Levels**

Topcon digital levels DL-502 and DL-503 are now supported.



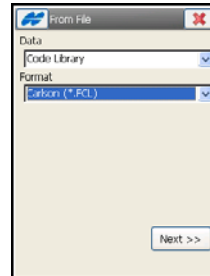
**Localization**

Localizations based on user-selected projection/datum are now supported.



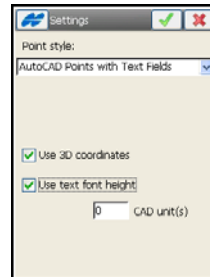
**SurvCE Code Library**

SurvCE code library is now supported for import/export.



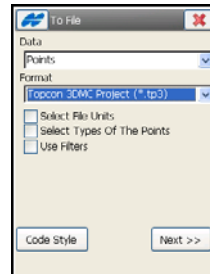
**Text Size in DXF/DWG**

Text size can now be manually/ automatically set in exported DXF/DWG files.



**TP3 Import/Export**

Topcon machine control project file is now supported for import/export.



### High/Low Positions

High/low positions can be computed now for the Grade and Station option in Vertical Alignment.

Stati...	T...	Elev...	Rad...
0+19...	High	13...	--
0+26...	Low	13...	5.000

### Named Segments

The segments are stored now as Named segment instead of a Code being created for each segment.

### String Sets and Working Corridor

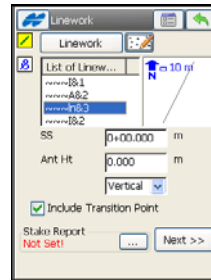
String Sets as an alternative method for defining a road surface, and Working corridor are now supported.

### Stake Reports

Stake reports are now supported to be set for stakeout.

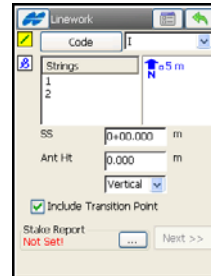
**Lineworks From Map**

Ability to stakeout Linework created from Map, and ability to stop at transition points are now supported.



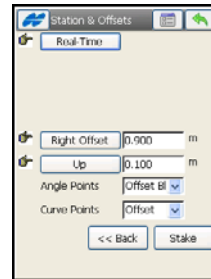
**Lineworks By Code Strings**

Selecting Lineworks for stakeout by either Line or Code/String is now supported.



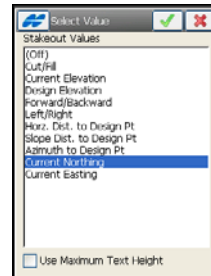
**Real-Time Stakeout of Lineworks**

Ability to do Station (interval) or Real-Time stakeout of a linework, and ability to add horizontal and vertical offsets are now supported.



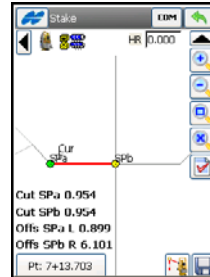
**User Definable Labels**

Editing any of four labels for showing any live value on all graphical views for stakeout is now supported. Just click on one of them to change.



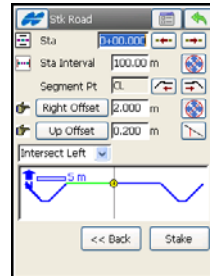
### Cross Section Segment Highlighted

The cross section segment at the rod position is highlighted, and cut/fill and offset to two segment points are reported.



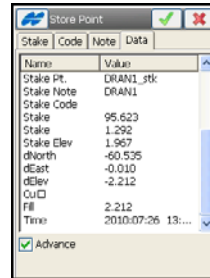
### Vertical/Perpendicular Offsets

Vertical or perpendicular offset can now be defined for Intersect Left/Right.



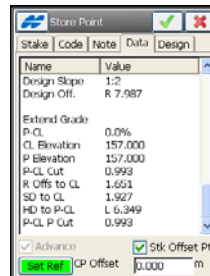
### Store Point Information

Store point information now include Stake, Code and Note for setting properties of the staked point to be stored, and Design for setting properties of the calculated design point, when applicable.



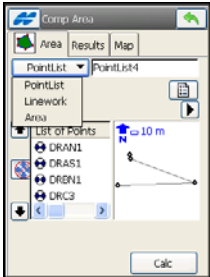
### Store Catch /Offset Point

When storing the Catch Point / Offset Point, an offset can be selected on the Data tab. Also references can be set for additional reporting options.



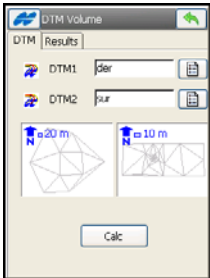
**Linework for COGO Area**

Selecting Linework/Area is now supported for computing Area task.



**Volumes**

Now two DTM files can be selected to get a volume report.





# Introduction

TopSURV is Topcon's survey software available for hand-held controllers and can be installed on a Topcon hand-held controller that runs the Windows® CE or Windows Mobile® operating system, such as Topcon's FC-200, FC-2200, FC-2500, FC-250, FC-Z, and the integrated controller of GMS-2, GMS-2 Pro and GRS-1.

TopSURV is used for:

- Field data collection with Topcon GPS receivers, Topcon, Sokkia, Nikon, and Leica total stations, and Topcon digital levels
- Stakeout and control work
- Data conversions
- Advanced COGO



Also, TopSURV 8 for Windows PC is available from the Topcon website. It will operate in 'demo' mode, allowing 25 points to be added to a job. To fully activate, a separate license must be purchased.

---

## Security

Upon initial startup, a **Security** screen displays (Figure 1-1 on page 1-2). TopSURV requires an access code to start. Contact a Topcon representative to acquire the necessary codes.

- *Key Value* – displays the default controller's number; given to a Topcon representative to receive activation IDs.
- *Activation IDs* – the fields in which to enter the security codes received from a Topcon representative to activate purchased different features in TopSURV: *Optical*, *Robotic*, *GPS+*, *GIS (RT DGPS and PP DGPS)*, *Roads*, and *mmGPS*.

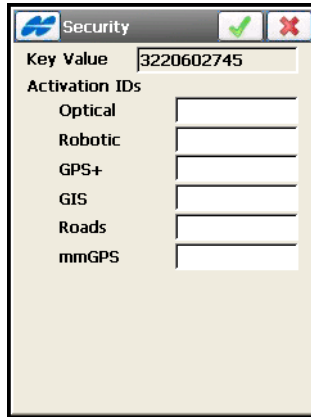



Figure 1-1. Security



Once entered, the access codes are stored in the *secstore* file in the hidden *tsv\_setup* folder in the internal storage of the controller where TPS folder resides.

Hitting the green tick ok icon  on the Security screen with blank fields for activation IDs (Figure 1-1) will run a demo version of TopSURV. A warning displays (Figure 1-2).

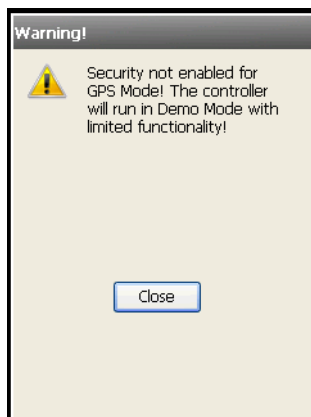


Figure 1-2. Run Demo Mode

# Open Job

Initially, TopSURV opens only a Default job created upon program installation (Figure 1-3). On the *Open Job* screen do the following:

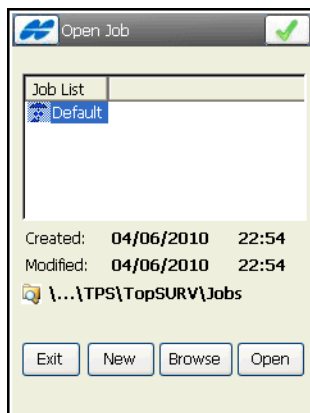



Figure 1-3. Open Job

- **Open** – press to create the Default (current) job and return to the main screen.
- **New** – press to create a new job.
- **Exit** – press to quit the program.
- **Browse** – press to browse directories to open a job from a remote directory. Highlight the file and press the ok  button.

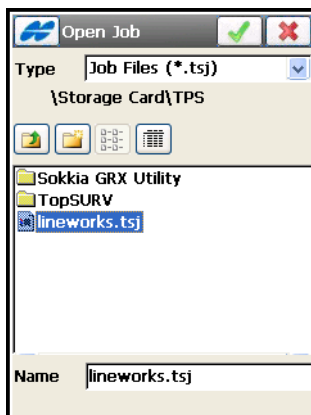


Figure 1-4. Open a New Job

## Opening Old Jobs

Starting from Version 7, TopSURV job files are made universal to be compatible on both controllers and personal computers. They have the *tsj* extension and need no conversion.

- To open a job created in a previous version of TopSURV, tap the icons **Job ▶ Open Job**, then tap the **Browse** button in the **Open Job** screen (Figure 1-3 on page 1-3). Select the *Ts6 Job Files* (\*.tsv) type and navigate to the desired TSV job.

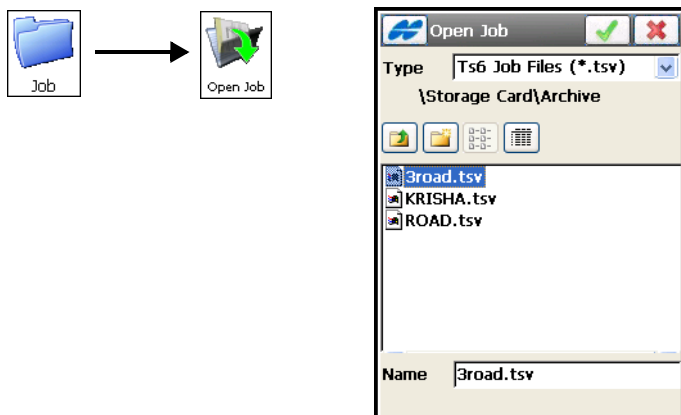


Figure 1-5. Open TSV Job Files

Pressing the tick  ok button starts upgrading the job.

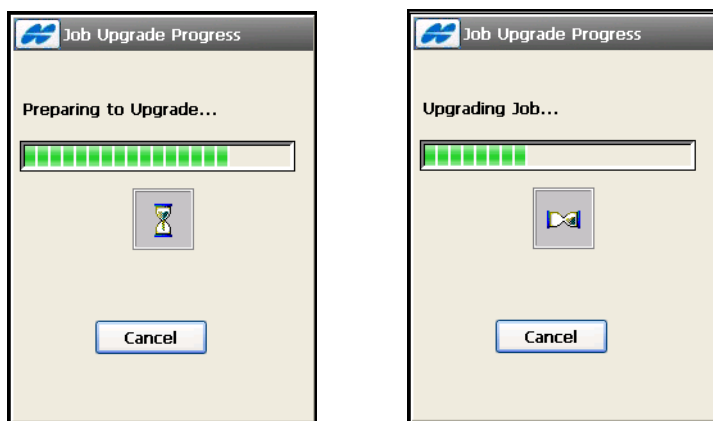


Figure 1-6. Job Upgrade Progression Bar

The progress bar shows the progression (Figure 1-6 on page 1-4).

**Cancel** aborts upgrading of the job.

When the process is complete and the version of the file is determined, a confirmation message will appear to make a current version of the file (Figure 1-7).

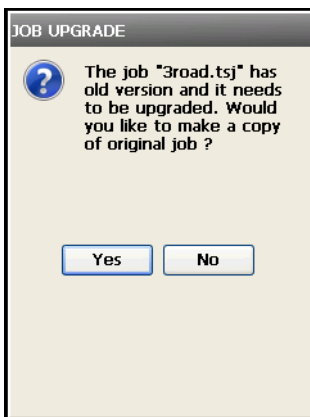


Figure 1-7. Make the Current Version of the Old File

After pressing the **Yes** button, the \*.tsv file is upgraded to \*.tsj file. A successful message will show the name of the created file (Figure 1-8).



Figure 1-8. Job Was Upgraded Successfully

The *Archive* folder is created in the directory where the \*.tsv file was located and where the \*.tsj file will be created. The *Archive* folder stores the .tsv jobs. If the job had a job history, a directory using the same name as the job, is also created to store the \*.xml file with the job history (Figure 1-9).

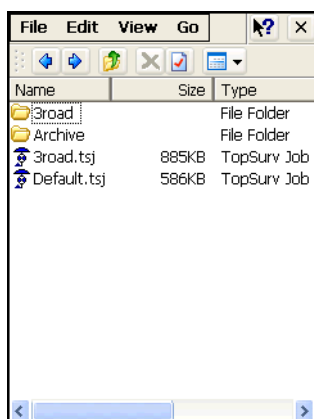


Figure 1-9. Upgraded Jobs

## Main Screen

The TopSURV main screen consists of a title bar and a main menu.








Figure 1-10. TopSURV Main Screen





TopSURV has two implementations of the graphical user interface: Icon-based and List-based. By default, TopSURV uses the Icon-based interface for fast and easy program operation.

The title bar of the main menu screen shows the name of the job that is open and the following icons (Table 1-1).

**Table 1-1. Title Bar Icons**

Icon	Description
	Topcon Logo Help Icon – opens a pop-up menu giving access to the help files (mandatory) and some options specific to the current open screen.
	Controller Power Status Icon – shows power status.
	Connection Icon – shows connection status (green stands for an established connection with the device). Pressing the icon opens the <b>Connections</b> dialog to reconnect (see “Connections” on page 2-12).
	Exit Icon – closes TopSURV. When in a submenu, it turns into the back  icon to return to the main menu.

Within a menu option, the title bar displays the Help Icon, the name of the open screen, and any system buttons (the green tick  ok button and the red x  cancel button) used to save settings or not (Figure 1-4 on page 1-3).

The TopSURV Icon Menu of the main screen contains the following icons to provide access to job configuration, setup, display, and other jobsite functions, and to control data (Table 1-2):

**Table 1-2. Main Menu Icons**














Icon	Description
	Job – opens a submenu to create, open, delete a job or get information about an active job. For details on the options, see “Working with a Job” on page 2-1.
	Configure – opens a submenu to create or change a configuration for a job. For details on the options, see “Configuring a Job” on page 3-1. The icon changes its appearance and reflects the instrument set for use in the current job.

Table 1-2. Main Menu Icons (Continued)

Icon	Description
 Import	Import – opens a submenu to import data from a job, controller or a file. For details on the options, see “Importing Data” on page 5-1.
 Export	Export – opens a submenu to export job data to a new job, controller or a file. For details on the options, see “Exporting Data” on page 4-1.
 Edit Job	Edit Job – opens a submenu to edit the job data. For details on the options, see “Editing Job Data” on page 6-1.
 Edit Roads	Edit Roads – opens a submenu to edit roads. Not available for a static survey. For details on the options, see “Editing Roads” on page 7-1.
 Setup	Setup – opens a submenu to set up surveying. For details on the options, see “Setting up GPS” on page 8-1 and “Setting up TS Survey” on page 10-1.
 Survey	Survey – opens a submenu to conduct a survey. Not available for static surveys. For details on the options, see “GPS Survey” on page 9-1, “Total Station Survey” on page 11-1 and “Digital Level Survey” on page 12-1.
 Stake	Stake – opens a submenu to stake out objects. For details on the options, see “Staking out” on page 13-1.
 COGO	COGO – opens a submenu to calculate cogo tasks. For details on the options, see “COGO Calculations” on page 14-1.
 Map	Map – opens the map for the current job. For details on the options, see “Viewing Map” on page 15-1.
 Connections	Connections – switches between GPS and Optical instruments and sets connections with the instrument for a survey. For details on the options, see “Switching Instruments” on page 16-1.



## Help Icon's Pop-up Menu

The Help Icon  opens a pop-up menu giving access to the help files, module activation codes, port data logging, changing menu interface, and information about TopSURV.

### Help

The *Help* option opens the *TopSURV Help* topics screen (Figure 1-11).

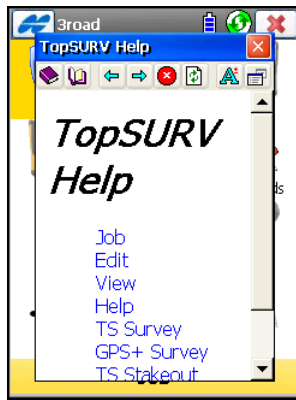



Figure 1-11. Help Topics

### Activate Modules

To view or to add the ID's for activating the main features in TopSURV, select the *Activate Modules* option.

The *Security* screen (Figure 1-12 on page 1-10) displays the device number and the IDs that have been entered.

- **Key Value** – the default key values of the controller.
- **Activation IDs** – the codes needed to enable observation modes and usage of roads in TopSURV.
- Pressing the ok  button saves the ID values, and if allowed, provides access to the observation modes and creating and using roads.

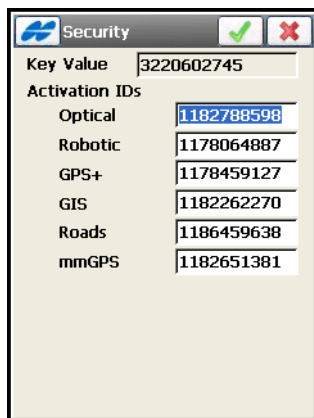


Figure 1-12. Security

## Port Data Logging

To view incoming and outgoing traffic information of a controller port connected to TopSURV and to save this data to a file, select the *Port Data Logging* option.

The **Port Logging** screen displays (Figure 1-13 on page 1-11).

The *Help* icon on this screen opens a pop-up menu that contains the following options:

- *Show incoming port data* – check mark to view incoming data.
- *Show outgoing port data* – check mark to view outgoing data.
- *Pause logging to screen* – check mark to freeze showing port traffic.
- *Help* – gives access to *Help* files.



Figure 1-13. Port Logging

- *Log to file* – check mark this box to save the data to a file. The **Save File** screen displays (Figure 1-14). Assign a name and select a desired directory in which to save the file on the controller. By default, the *comm.log.txt* file will be saved in the *TopSURV* folder.

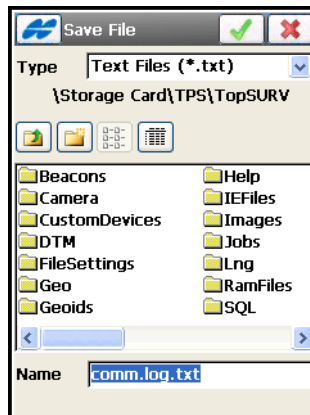



Figure 1-14. Save File

- Pressing the ok button  returns to the *Port Logging* screen to view the data being saved to file. The file name is also shown on the screen (Figure 1-15 on page 1-12).

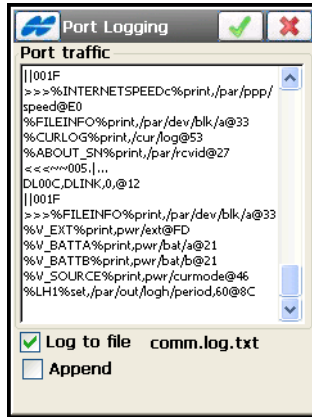



Figure 1-15. Logging to File

- *Append* – check mark this box to add new data to the existing file. Press the ok button  to confirm the operation.

## Switch Menus

TopSURV has two implementations of menu interface: the Icon Menu and the List Menu. TopSURV defaults to the Icon Menu interface.

Use the *Switch Menus* option to toggle between the Icon and List Menu interfaces. The main screen with the List Menu opens with the Map View on the top (Figure 1-16).

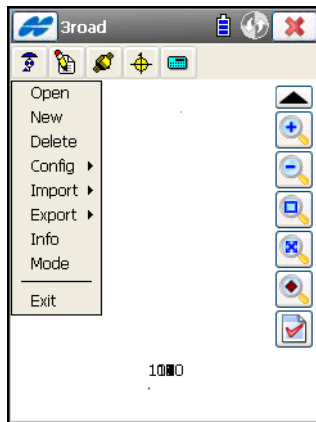


Figure 1-16. List Menu

## About

To view basic information about TopSURV, tap the *About* option. The *About TopSURV* screen (Figure 1-17) displays the software name, version, copyright, and build date.



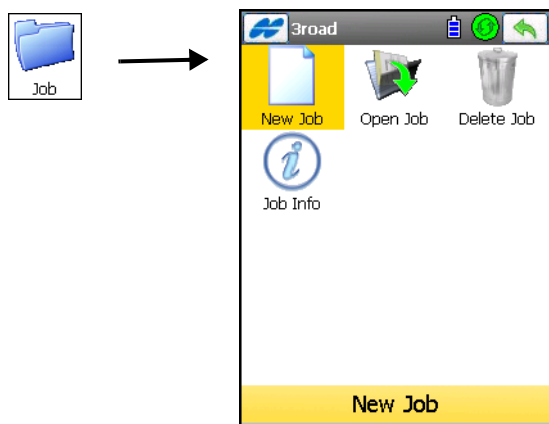
Figure 1-17. About TopSURV

## Notes:

[illegible]

# Working with a Job





To work with job files, tap the **Job** icon in the main menu (Figure 2-1).



**Figure 2-1. Job Menu**


The **Job** folder contains the following options (Table 2-1):

**Table 2-1. Job Menu Icons**

Icon	Description
 New Job	New Job – creates a new job. For details on this option, see “Creating a New Job” on page 2-2.
 Open Job	Open Job – makes a selected job active. For details on the option, see “Opening a Job” on page 2-11.
 Delete Job	Delete Job – deletes a selected job from the controller. For details on the option, see “Deleting a Job” on page 2-14.
 Job Info	Job Info – shows information from an active job. For details on the option, see “Viewing Job Information” on page 2-15.



If the menu options you need are not visible, tap **Configure/Menus** icons and enable these options in the *Config Menus* screen.

The *Help* Icon  opens a pop-up menu, giving access to the Help files, module activation codes, port data logging, changing menu interface, and information about the TopSURV used (for detail see “Help Icon’s Pop-up Menu” on page 1-9).

## Creating a New Job

To create a new job, tap the **New Job** icon.

The *New Job* screen (Figure 2-2) starts the new job creation process, which is performed with the help of a Wizard.

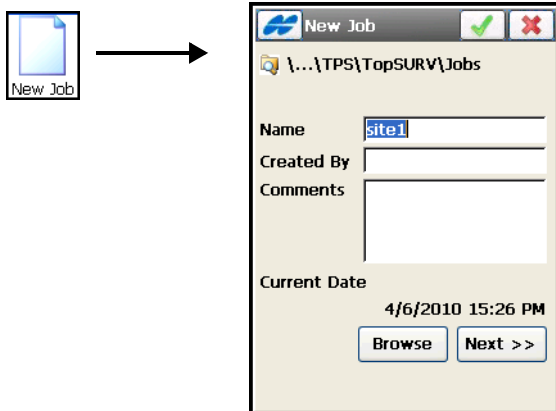


Figure 2-2. New Job

Fill in the fields on the *New Job* screen. On controllers with pop-up soft keyboards, place the cursor in the field to have the soft keyboard open on screen (Figure 2-3).



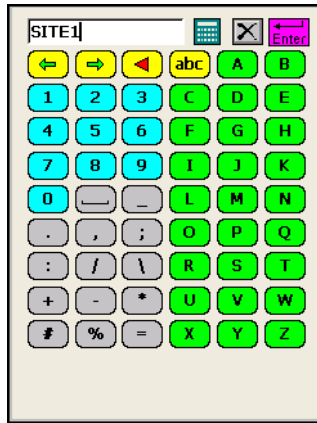


Figure 2-3. On-screen Soft Keyboard

- *Name* – a name of the new job. Only the Name is mandatory for filling in. If the field left unfilled or the job name is invalid, a warning message displays (Figure 2-4).





Figure 2-4. Failed Job Name



The job name is considered invalid if it contains:

- more than 63 characters
- any of symbols ! , ? % \* @ # \$ % ^ & ' " \ / | ~ ; [ ] { } ( ) < > ` + =

- *Created By* – the name or some other identifier of the surveyor.
- *Comments* – any additional information about the project, for example, the conditions of survey.
- *Current Date* – displays the current date and time when the job is getting created.
- **Browse** – changes the directory in which to look for a job. By default, job files are stored in the Jobs folder in the directory where the application was installed. The path  to the job file displays in the upper-part of the screen. The last specified file path is retained.
- **Next** – opens the *Survey Style* screen (Figure 2-5).
- Pressing the ok  green tick button saves the information and returns to the main screen. The new job becomes the current job.





The new job uses the settings from the last opened job, unless changed.

## Select Survey Configuration

On the *Survey Style* screen select a survey configuration for the new job (Figure 2-5).

Figure 2-5. Select Survey Configuration

TopSURV contains several default configurations: *My RTK*, *My Network RTK*, *My Network DGPS*, *My RT DGPS*, *My PP Static*, *My PP Kinematic* and *My PP DGPS* for GPS+ mode; *My Conventional*, *My Reflectorless*, *My Robotic* and *My Level* for Optical mode.

- *GPS+ Config* – shows the GPS+ receiver configuration for the current job. The drop-down list shows the configurations available for the GPS+ mode.
- *Optical Config* – shows the optical instrument configuration for the current job. The drop-down list shows the configurations available for the Optical mode.
-  – opens the **Configurations** screen to edit a configuration (see Figure 3-3 on page 3-4).
- **Back** – returns to the previous screen.
- **Next** – opens the **Coordinate Systems** screen (Figure 2-6 on page 2-6).
- Pressing the ok  green tick button saves the settings, and returns to the main screen.



The job settings of a survey configuration are applied only after opening a TopSURV screen which can perform and store measurements in the job file.

Parameters for the survey configuration do not depend on the job. One configuration can be used for several Jobs.

For more information on how to work with configurations, see “Configuring the Survey” on page 3-3.

## Coordinate System

The *Coordinate System* screen (Figure 2-6) contains coordinate system information for the new job.

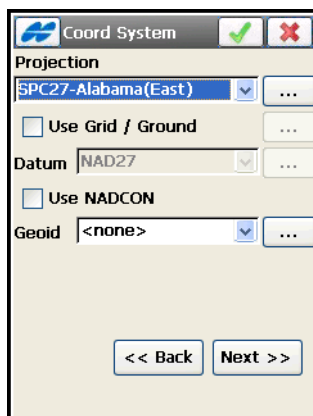


Figure 2-6. Coordinate System

- *Projection* – specifies the projection to be used. The button opens the *Projections* screen.
- *Use Grid/Ground* – only available if a grid projection is selected. If this box is check marked, the button is activated to open the *Grid/Ground Param* screen.
- *Datum* – shows the datum for the selected projection. The drop-down list of datums is available only when the current grid projection allows datum selection. The button opens the *Custom Datum* screen.
- *Use NADCON* – available only when SPC27 projection is used. When this box is selected, TopSURV makes the coordinates equal to the same from Corpscon.
- *Geoid Model* – shows the geoid selected (if any). The button opens the *Geoids List* screen (see “Geoid List” on page 3-92).
- Pressing the ok green tick button saves the settings and returns to the main screen.

- **Next** – opens the *Units* screen (Figure 2-7 on page 2-7).

For details see “Setting Coordinate System Parameters” on page 3-79.

## Units

On the *Units* screen, the default units that are used in the job display. You can set the following units (Figure 2-7).

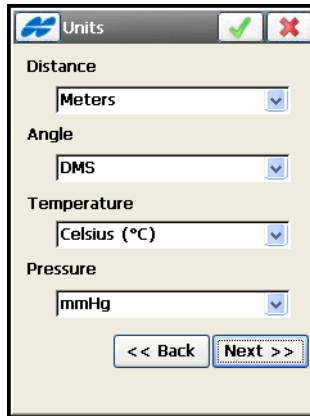


Figure 2-7. Units

- *Distance* – units of linear measurements; select either *Meters*, *IFeet* (International Feet, 1 Ifoot = 0.3048 Meters), *US Feet* (1 USFt = 1200/3937 Meters); *IFeet and Inches*, or *US Feet and inches* formula).



If the selected units are *US Feet*, linear values can be entered as meters, or international feet by appending “m” or “if” to the entered value.

If the selected units are in meters, then a linear value in *US Feet* or *International Feet* is entered by appending “f” or “if” to the end of the entered value.

If the selected units are in *International Feet*, enter linear values in meters or USfeet by appending “m” or “f” to the entered value. The appended characters “m”, “f”, or “if” are not case insensitive. You can also enter “M”, “F”, or “IF”.



If the selected units are US or International *Feet and Inches*, you can enter feet and inches in the following formats:

- feet.inches.fracNumerator.fracDenominator  
(displays as the next format)
- feet'inches"fracNumerator/fracDenominator  
(where the fracDenominator can be either 2, 4, 8, or 16)

- *Angle* – units of angle measurements and parameters; select either *DMS (degrees, minutes, seconds)*, *Grads (Gons)*, *Radians* (for Cogo use only), or *Mils* (for Cogo use only). (360 degrees = 400 grads =  $2\pi$  radians = 6400 mils.)





Angle entered as ddd.mmssssss displays as ddd° mm' ss.ssss; dms units taken out from the screen.

Bearing entered as NW45.4545 is interpreted as N45°45'45W.

Azimuth and distances can be entered as two points separated by “-”, “,” or “;”. Certain angles can be entered as three points separated by “-”, “,” or “;”.

For instance, a value of 100-101 indicates the Azimuth or Distance from Point 100 to Point 101.

- *Temperature* (for Optical mode only) – units of temperature, used only for the raw measurements; select either *Celsius (C)* or *Fahrenheit (F)*.
- *Pressure* (for Optical mode only) – units of atmosphere pressure, used only for the raw measurements: *mmHg*, *hPa*, *inHg*, or *bbar*.
- **Next** – opens the *Display* screen (Figure 2-8 on page 2-9).
- Pressing the ok  green tick button saves the settings, and returns to the main screen.
- Pressing the exit  red x button closes the screen without saving the settings.

## Display


The *Display* screen (Figure 2-8) customizes the software interface. You can set the following parameters.

The screenshot shows a 'Display' dialog box with the following settings:

- Coord Type:** Ground
- Coord Order:** Northing, Easting, Elevation
- Azimuth Origin:** North
- Disp Dir As:** Bearing
- Disp CL Pos As:** Station
- Full Station:** 100.000 m

Navigation buttons at the bottom: '<< Back' and 'Next >>'. There are also green and red buttons in the top right corner of the dialog box.

Figure 2-8. Display

- *Coord Type* – selects the coordinate type for the coordinate system selected.
- *Coord Order* – selects the *Northing/Easting* order and displays the height type for the coordinate system selected.
- *Azimuth Origin* – selects the reference direction of azimuth.
- *Disp Dir As* – selects whether to display the direction as *bearing* or *azimuth*.
- *Disp CL Pos As* – selects how to display the position on the center line; select either *station* or *chainage*.
- *Full Station* – available if *Station* is selected for *Disp CL Pos As*; sets the measurement units used for the full station value and is usually 100 units.
- **Back** – returns to the previous screen.
- **Next** – opens the *Alarms* screen (see Figure 2-9).
- Pressing the ok  green tick button saves the settings, and returns to the main screen.

## Alarms

The *Alarms* screen sets sound alerts for situations of low power, low memory, poor radio link, and loss of fixed/float solutions. These alarms may occur for the controller, GPS+ receiver, or Optical instrument.

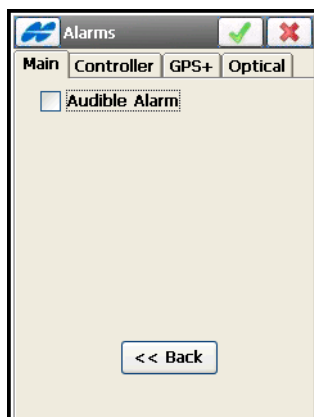




Figure 2-9. Alarms

- *Audible Alarm* – check mark this box to automatically sound an alert when an alert situation occurs.
- Check mark available boxes on the *Controller*, *GPS+* and *Optical* tabs to select alerts for various instruments and situations: low power, memory limited, losing/gaining radio link, or fixed solution with GPS receiver, or tracking with Robotic Total Station. They are checked by default.
- **Back** – returns to the previous screen.
- Pressing the ok  green tick button saves the settings and returns to the main screen.
- Pressing the exit  red x button closes the screen without saving the settings and returns to the main screen.



# Opening a Job

To open a job, tap the **Open Job** icon. The *Open Job* screen (Figure 2-10) displays. Select a job from the list.

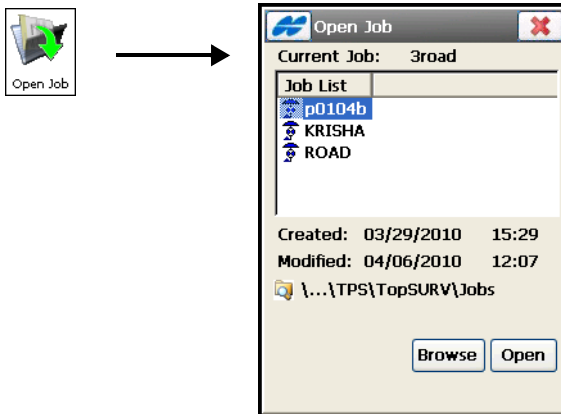



Figure 2-10. Open Job

The *Job List* field contains the names of all existing jobs created/opened using TopSURV. Initially, the *Job List* contains only a Default job created upon TopSURV installation. The icon  indicates a TopSURV job.


When a job is selected from the list, the *Created* and *Modified* fields shows the date that the job was created and when it was last modified.

The path below the Job List shows the directory where the selected job is located (Figure 2-11 on page 2-12). By default, all job files are stored in the Jobs folder of TopSURV directory.

- **Open** – opens a selected job and returns to the main screen. When opening a job after starting TopSURV, the Connection Prompt dialog will display by default (Figure 2-12 on page 2-13).



Select the appropriate Instrument Type to work with the opened job. Use the *Mode* Icon to switch if needed.

- **Browse** – displays the screen to browse directories to select a job to open. Use the standard navigation buttons to move up or down to the directory where the desired file resides. Highlight the file and press the ok  green tick button.

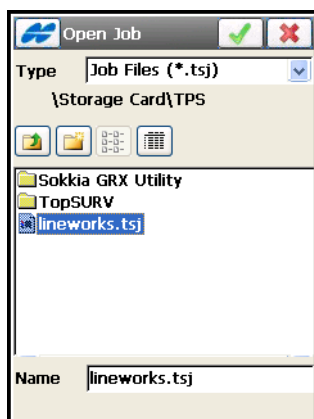



Figure 2-11. Browse Jobs

The job files created in TopSURV have the “.tsj” extension.



To see the old job files created in an earlier version of TopSURV, select the Ts6 Job Files (\*.tsv) or All Files (\*.\*) type.

## Connections

When opening a job, the **Connections** dialog displays by default (Figure 2-12 on page 2-13). Also pressing the Connection  icon on the title bar of the main menu screen opens this dialog.

### With Device

The **Device** tab of the **Connections** screen allows changing the device type to work in the opening job.

- **Select device type** – select either the *GPS* or *Optical* type of device and the job style to work at the site.

- *Base / Rover*– select when working with the base receiver or the rover receiver in RTK surveys, respectively.
- *Bluetooth* – check mark this box to enable Bluetooth connection with the device on the selected communication port.
- *Prompt at startup* – it is checked by default; uncheck the box if you want to enable auto connection with the device and not to display the **Connections** dialog again.
- **Connect** – press the button to establish the connection selected.

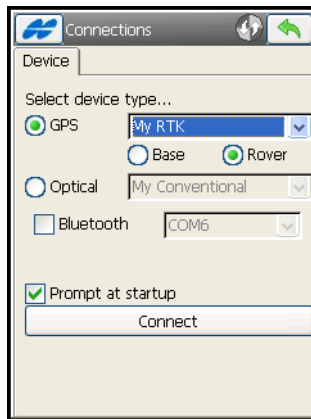


Figure 2-12. Prompt for Connection at Startup

## With Network

The *Network* tab of the **Connections** screen displays for Network job configurations to manage a connection with the modem(Figure 2-13 on page 2-14).

- *Auto-Connect* – check mark this box to enable automatic connection with the modem.
- *Check signal quality* – check mark this box to enable checking quality of the signal.
- *Auto-Disconnect* – check mark this box to enable disconnecting from the modem on exiting TopSURV.

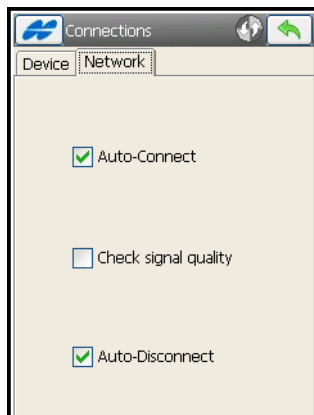



Figure 2-13. Network Connection

## Deleting a Job

To delete a job, tap the **Delete Job** icon. Once deleted from the Job List, the file is deleted from the controller (Figure 2-14 on page 2-15).

When a job is selected from the list, the *Created* and *Modified* fields reflect the date when the job was created and last modified.

- The path under the Job List displays the directory where the selected job was created.
- **Browse** – if a job is not listed in the job list, browse through the directories to select the job you want to delete.
- **Delete** – deletes the job.
- Pressing the back  button closes the screen without saving the settings and returns to the main screen.

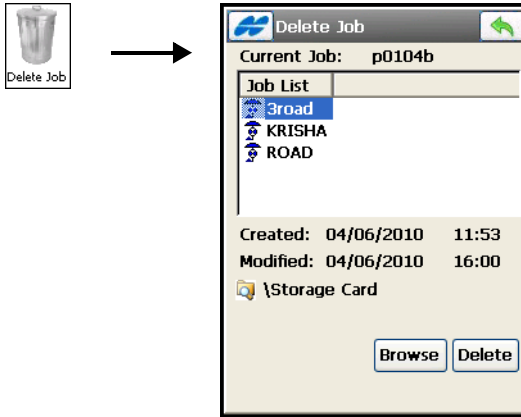


Figure 2-14. Delete Job



When a job is deleted, the job history file, images, etc., are also deleted.

## Viewing Job Information

To view job information, tap the **Job Info** icon. The **Job Info** screen contains information about the current job (Figure 2-15).

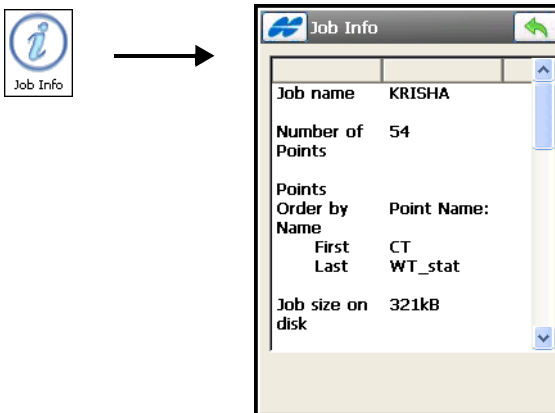
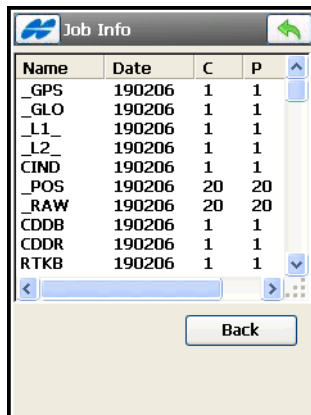


Figure 2-15. Job Information

- *Job name* – the name of the job.
- *Created by* – the name or some other identifier of the person who created the job.
- *Number of Points* – the amount of points stored in the job.
- *Points* – the names of the first point and the last point from the list of the points ordered by name.
- *Job size on disk* – the space that the job takes up on the disk.
- *Job created* – the time and date of job creation.
- *Job modified* – the time and date of job modification.
- *Survey Configurations* – the GPS and TS configurations set for the job.
- *Coordinate Systems, Datum, Geoid Model* – the coordinate system, datum, and geoid model defined for the job.
- *Units of Measurements* – the units set for the job.
- *Display Settings* – the customized interface settings for the job.
- *OAF expire on* – the date of OAF expiration for a given GPS receiver. Tap **Clk to expand** under the date to display the Current, Purchased, and Leased status for all OAF options (Figure 2-16).
- *Firmware version* – lists the number and build date of the firmware loaded into the GPS receiver connected.



Name	Date	C	P
_GPS	190206	1	1
_GLO	190206	1	1
_L1	190206	1	1
_L2	190206	1	1
CIND	190206	1	1
_POS	190206	20	20
_RAW	190206	20	20
CDDB	190206	1	1
CDDR	190206	1	1
RTKB	190206	1	1

Figure 2-16. Job Info – OAF

# Configuring a Job

To set up a job, tap the **Configure** icon in the main menu. The icon reflects the instrument to be used in survey. The **Configure** menu displays (Figure 3-1).

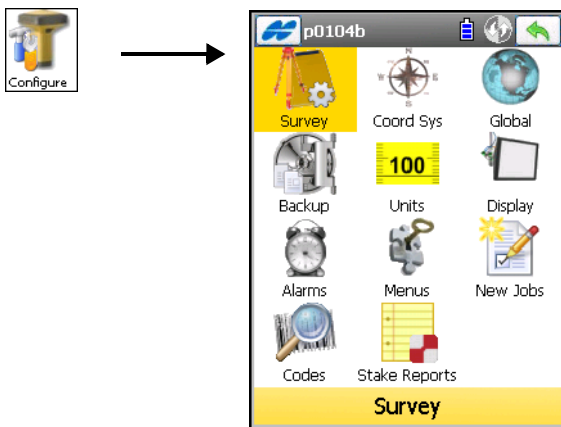













Figure 3-1. Configure Menu


The **Configure** folder contains the following options (Table 3-1):

Table 3-1. Job Menu Icons

Icon	Description
	Survey – creates or edit a survey configuration. For details on this option, see “Configuring the Survey” on page 3-3.
	Coord Sys – sets a coordinate system for a job. For details on the option, see “Setting Coordinate System Parameters” on page 3-79.
	Global – logs the job history to a file. For details on the option, see “Setting Global Parameters for Job” on page 3-94.

**Table 3-1. Job Menu Icons (Continued)**



Icon	Description
 Backup	Backup – selects some other (not default) directory to save job backups. For details on the option, see “Job Backups” on page 3-95.
 Units	Units – sets default units to be used in a job. For details on this option, see “Setting Units” on page 3-97.
 Display	Display – customizes the interface to display data in a job. For details on this option, see “Customizing Data Display” on page 3-98.
 Alarms	Alarms – sets alarm parameters. For details on this option, see “Setting Alarms” on page 3-98.
 Menus	Menus – shows / hides functions in the menus. For details on this option, see “Modifying Menus” on page 3-99.
 New Jobs	New Jobs – sets automatic use of localization from the previous job and use of global code library. For details on this option, see “New Jobs” on page 3-101.
 Codes	Codes – sets code global parameters. For details on this option, see “Codes” on page 3-102.
 Stake Reports	Stake Reports – creates reports on configurations. For details on this option, see “Stake Reports” on page 3-105.

The *Help* Icon  opens a pop-up menu giving access to the help files, module activation codes, port data logging, changing menu interface, and information about the TopSURV used (for details see “Help Icon’s Pop-up Menu” on page 1-9).



# Configuring the Survey

To configure a survey, tap the **Survey** icon or use the New Job Wizard (see “Creating a New Job” on page 2-2). The **Survey Style** screen displays (Figure 3-2).

- **GPS+ Config** – shows the GPS+ configuration for the current job. The following configurations for GPS+ mode are available from the drop-down list: *My RTK*, *My Network RTK*, *My Network DGPS*, *My RT DGPS*, *My PP Static*, *My PP Kinematic*, and *My PP DGPS*.
- **Optical Config** – shows the total station configuration for the current job. The following configurations for TS mode are available from the drop-down list: *My Conventional*, *My Reflectorless*, *My Robotic*, and *My Level*. In the Contractor Module, only *My Conventional* and *My Reflectorless* are available.
- The **List**  button – opens the **Configurations** screen to edit parameters for the each configuration.
- Pressing the ok  button sets the selected configuration for the current job and returns to the main screen.

Configurations are stored in a file called *Styles.tsstyles* in the TopSURV directory.



The job settings of a survey configuration are applied only after opening a TopSURV screen, which enables you to perform and store measurements in the job file.

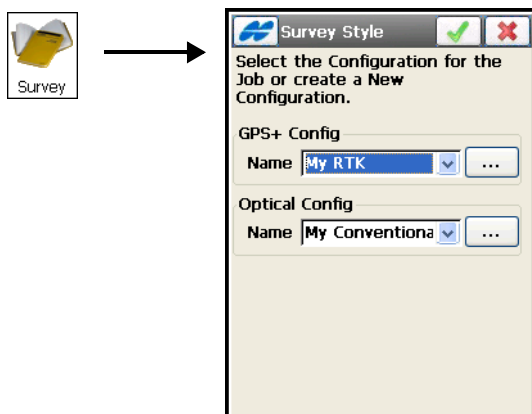


Figure 3-2. Survey Style

## GPS+ Configuration

To configure a GPS+ survey, press the **List** [...] button in the *GPS+ Config* field of the *Survey Style* screen (Figure 3-3).

The *Configurations* screen (Figure 3-3) displays a list of pre-defined configurations. Either edit an existing configuration or create a new configuration. A new configuration is performed with the help of a Wizard.

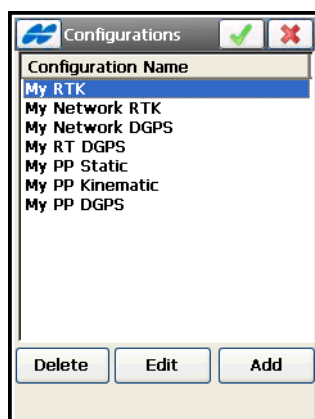



Figure 3-3. GPS+ Configurations

- **Delete** – deletes the highlighted configuration.
- **Edit** – opens the *Survey* screen to edit the configuration settings.
- **Add** – opens the *Survey* screen to create a new configuration.
- Pressing the tick  ok button saves configuration settings and returns to the *Survey Style* screen.

## Configuring the Survey

The *Survey Configuration* screen (Figure 3-4 on page 3-7) contains general settings for the configuration.

- *Name* – the name of the configuration that is displayed in the *Configurations* screen (Figure 3-3 on page 3-4).
- *Type* – the type of configuration; select either *RTK*, *Network RTK*, *Network DGPS*, *Real Time DGPS*, *PP Static*, *PP Kinematic*, or *PP DGPS*. (“PP” means Post-Processing.)
  - *RTK* (Real Time Kinematic): implies, first, a pair of receivers operating simultaneously and, secondly, a radio link has been established between the two receivers. From a functional point of view, the two receivers differ from each other. One of the receivers (usually referred to as the Base Receiver) is located at a fixed point with known coordinates. The Base receiver collects carrier measurements, generates RTK corrections, and sends this data to the other receiver (usually referred to as the Rover Receiver) via a radio link. To establish proper connection between the two receivers, specify necessary communication parameters first. The Rover processes this transmitted data with its own carrier phase observations to compute its relative position with centimeter accuracy.

A mmGPS aided RTK survey uses the usual RTK GPS+ survey system, but with a wireless PZS-1 sensor at the Rover to pick up the signal from the PZL-1 transmitter for (millimeter) accurate elevations.

  - *Network RTK* (Network Real Time Kinematic): implies that the Rover uses RTK correction data received from operating reference station networks to compute its position.

- Real Time DGPS (Real Time Differential GPS): implies that the Rover uses differential pseudorange correction data transmitted from DGPS services.
- Network DGPS (Network Differential GPS): implies the usage of pseudorange corrections received from operating differential GPS reference station networks.
- PP Static (Static Post Processing): implies two receivers that collect data at stationary locations during a long period of time. In the office, the software operator processes the GPS data collected in the field (usually “differential processing”), and calculates the relative position of the receivers. Differential processing takes place when data from two or more receivers are processed together in order to compute the ‘receivers’ relative position. If the coordinates of one receiver are known, then the coordinates of the other can be calculated.
- PP Kinematic (Kinematic Post Processing): implies two receivers. One is fixed, the other is moving along some trajectory. The processing of the collected data is performed later, the same as it is for the PP Static type.
- PP DGPS (Post Processing Differential GPS): implies that the raw observations made by the Rover and the Base receiver has to be written to files for further processing.
- *Post Processing* – check mark this box for additional screens to become available for post processing options in *RTK*, *Network RTK*, *RT DGPS*, and *Network DGPS* (see Figure 3-10 on page 3-12, Figure 3-27 on page 3-28, and on page 3-46).
- *Corrections* – available only in a Network RTK (select either *VRS*, *MAC*, *FKP*, *Single Base* or *External Config*), Network DGPS, or Real Time DGPS configuration (select the service to receive differential correction data (either a *User Base*, *Beacon*, *SBAS*, *CDGPS*, *OmniSTAR-VBS*, or *OmniSTAR-HP* (Figure 3-4 on page 3-7)).

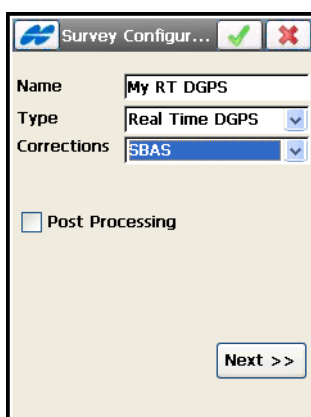


Figure 3-4. Survey - Real Time DGPS



To use the differential corrections receiver BR-1, select the Beacon differential service.

The *Help* Icon on the upper-left corner of the *Survey Configuration* screen (Figure 3-5) displays a pop-up menu that always contains the *Help* item to access the Help files. This menu can also contain options specific to the currently open dialog.

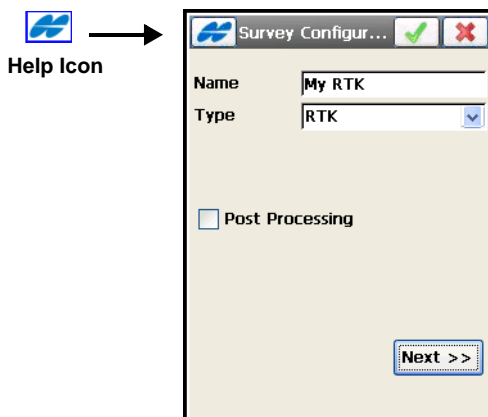


Figure 3-5. Survey – RTK Parameters

- **Next** – opens the *Receiver Make* screen (Figure 3-6 on page 3-8).

## Receiver Make

The **Receiver Make** screen (Figure 3-6) contains general settings for the rover and base receivers.

- *Simulation mode* – check mark this box to run TopSURV GPS mode in a GPS simulation mode. When the mode is selected, the *Set Simulator* icon appears on the Edit Job menu (see “Simulation Setup” on page 6-50).
- *Rover and Base Manufactures* – fields to select manufactures for the rover and base receivers; either Topcon or Sokkia. Depending on the job style configured, there can be the both fields available for selection, or only one of them. When *Simulation Mode* is selected, the fields will show *Simulation*.

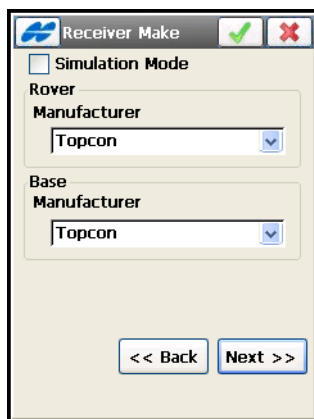


Figure 3-6. Receiver Make

- **Next** – opens the **Base Receiver** screen (Figure 3-7 on page 3-9).

For *Network RTK*, *Network DGPS*, and *Real Time DGPS* (except User Base mode) without the post processing option, the **Rover Receiver** screen displays (see Figure 3-23 on page 3-23).

For *Real Time DGPS* with the Beacon correction type selected, the **Config: Beacon** screen displays (Figure 3-41 on page 3-41).

If a PP Static survey type is selected, the **Static Receiver** screen opens (see Figure 3-9 on page 3-11).

## Base Receiver

The *Base Receiver* screen contains Base settings.

For RTK and RT DGPS (with a User Base) surveys, the *Base Recvr* screen contains the following parameters for configuring a Base receiver and antenna (Figure 3-7).

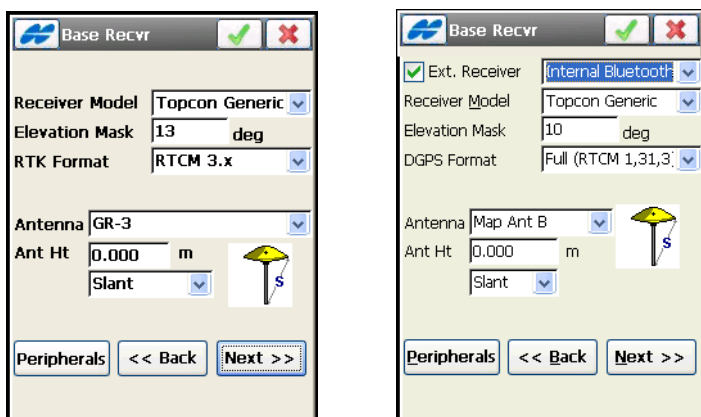


Figure 3-7. Base Receiver



TopSURV on GMS-2, GMS-2 Pro and GRS-1 allows selection of an external receiver with connection mode: cable, external, or internal Bluetooth Module (Figure 3-7).

- *Receiver Model* – the model of the receiver being used for survey. For Topcon manufacturer (see Figure 3-6 on page 3-8), select *Hiper II*, *GR-3*, *GR-5*, *GMS-2/GMS-2 Pro*, *GRS-1*, *NET G3*, or *Topcon Generic*. For Sokkia manufacturer, *GRX-1*, *GSR2700 ISX*, *GSR1700 CSX*, *GSR2700 IS*, *GSR2600* and *Radian IS* receivers are available for use.
- *Elevation Mask* – data from satellites below this elevation are not used.
- *RTK Format / DGPS Format* – the format of the Base receiver corrections transmitted to the Rover: CMR, CMR+, RTCM 2.1, RTCM 2.2, RTCM 2.3, RTCM 3.x / Full (RTCM 1, 31, 3) or Partial (RTCM 9, 34, 3).

- **Ant Type** – the type of the Topcon antenna being used for survey. Select either *CR-3*, *CR-3 with Cone*, *CR-3 with SCIGN*, *CR-4*, *CR-4 RD*, *CR-4 with cone*, *CR-G3*, *CR-G3 (TPSH)*, *G3-A1*, *G3-A1 with ground plane*, *G3-A1 with ground plane RD*, *GR-3*, *GRS/GMS Series*, *GRX-1*, *HiPer Ga/Gb*, *HiPer GD/GGD*, *HiPer II*, *HiPer Lite/Lite+*, *HiPer Pro*, *HiPer XT*, *HiPer+*, *Legant 2*, *Legant E*, *Legant L1*, *Legant3 with UHF*, *Map Ant B*, *MG-A1*, *MG-A2*, *MG-A5*, *MG-B5*, *Odyssey*, *PG-A1*, *PG-A1 with ground plane*, *PG-A1 with ground plane RD*, *PG-A1 with GP*, *PG-A2*, *PG-A5*, *Regant-DD*, *Regant-SD*, *Regency-DD*, *Regency-SD*, *SOK 600*, *SOK 702*, *SOK GSR1700 CSX*, *SOK GSR2700 IS*, *SOK GSR2700 ISX* or *Unknown*.
- **Ant Ht** – the height of the antenna, and the type of antenna height measurement; either *Vertical* (measured to *ARP*, antenna reference point) or *Slant* (measured to the edge of the antenna). The screen also illustrates the measurement type.
- **Peripherals** – if needed, check and enable the *Multiple Ports* option to configure the Base to transmit data from different ports used for peripherals (Figure 3-8).

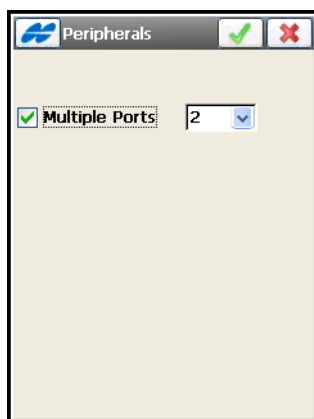



Figure 3-8. Peripherals

- **Back** – returns to the previous screen.
- **Next** – opens the **Base Radio** screen (Figure 3-11 on page 3-14). For PP enabled RTK survey the Next button opens the **Base PP Setup** screen (Figure 3-10 on page 3-12).



- Pressing the ok  green tick button saves the changes and returns to the **Survey Style** screen.

The **Help** Icon in the upper-left corner of the **Base Receiver** screen displays the pop-up menu that contains two options:

- Receiver Setting** – check mark the box on the **Receiver Settings** screen appear to turn the charger mode off.
- Use relative calibrations** – select the option if needed to use Relative antenna model at the base station that transmits CMR+ data. By default, TopSURV uses Absolute calibration offsets for antennas. Also, you can select this option when editing the base.

For **PP Static**, or **PP Kinematic**, and **PP DGPS** surveys, the **Static / Base Recvr** screen (Figure 3-9) contains the same parameter fields as for **RTK** survey type, except for the **RTK Format** field (for details refer to “Base Receiver” on page 3-9).

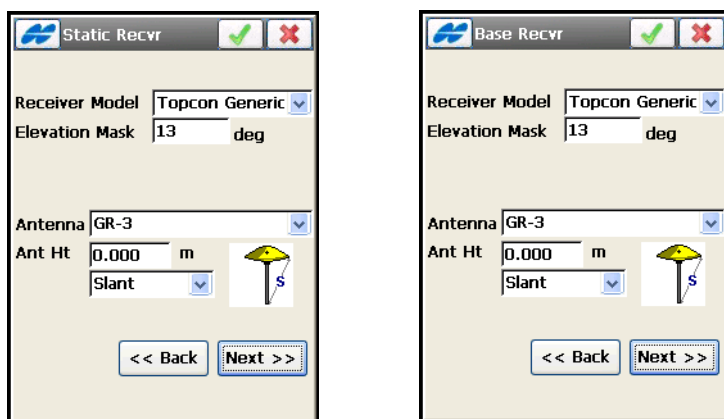


Figure 3-9. Static (Base) Receiver Settings

- Next** – opens the **Base PP Setup** screen.

The **Help** Icon in the upper-left corner of the **Static (Base) Recvr** screen displays a pop-up menu containing an option:

- Receiver Setting** – check mark the box on the **Receiver Settings** screen to turn the charger mode off.

## Base PP Setup

On the **Base PP Setup** screen raw data logging parameters for the base are set up (Figure 3-10).

- *Raw Data Logging* – set raw data logging parameters:
  - File Name: select either *Default* to automatically set a file name or *User Defined* (the corresponding dialog box is displayed at the logging start).
  - Log To: currently only logging to *Receiver* is available.



Raw data is always recorded into the Receiver memory.

TopSURV allows logging data to the Controller (TopSRV/Raw Data directory) in PP DGPS survey mode only.



- Logging Rate: enter a data logging interval.
- **Next** – opens the *Base Radio* screen (Figure 3-11 on page 3-14).
- Pressing the ok  green tick button saves the settings and returns to the *Survey Style* screen (Figure 3-2 on page 3-4).

Figure 3-10. Base PP Setup

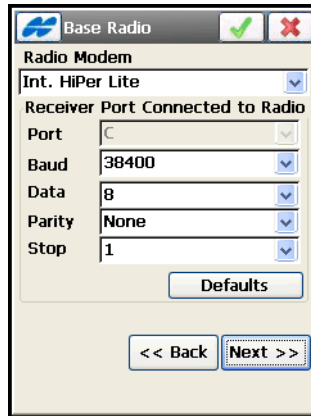
## Base Radio

The **Base Radio** screen (Figure 3-11 on page 3-14) contains the settings for configuring the radio modem connected to the Base receiver for RTK and RT DGPS (user base) surveys.

- **Radio Modem** – select a modem type from the list of pre-defined modem types; the list contents will vary, depending upon the job configuration selected. The list of modems for GRS-1 includes the modems on the RH-1 holder: *RH-1 Digital UHF*, *RH-1 FH915Plus*, and *RH-1 Satel*.
- **Receiver Port Connected to Radio** – contains parameters for the connection port (i.e., *Port*, *Parity*, *Data*, *Baud*, *Stop*), which are specific to the connected modem. For example, Siemens cell phones need a 19200 baud rate.  
*Internal GR-3 FH915+*, *Internal HiPer Lite*, and *Internal HiPer Lite+ FH915+* modems require a 57600 baud rate.
- **Defaults** – returns all the values in the *Receiver Port Connected to Radio* fields to the default value.
- **Next** – opens the **Base Radio** screen to set parameters for the chosen modem (Figure 3-11 and Figure 3-12 on page 3-14).  
*AirLink GPRS*, *AirLink CDMA*, *AirLink CDPD*<sup>1</sup>, *CDMA2000*, *Generic*, *Sierra Wireless MP200 CDPD* radios do not require additional settings.
- Pressing the ok  green tick button saves the changes and returns to the **Survey Style** screen (Figure 3-2 on page 3-4).  
All settings are transmitted only when using the configuration.

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1. CDPD stands for “Cellular Digital Packet Data”. CDPD is an open packet data service, defined as an autonomous overlay network, specified for the cellular TDMA network.

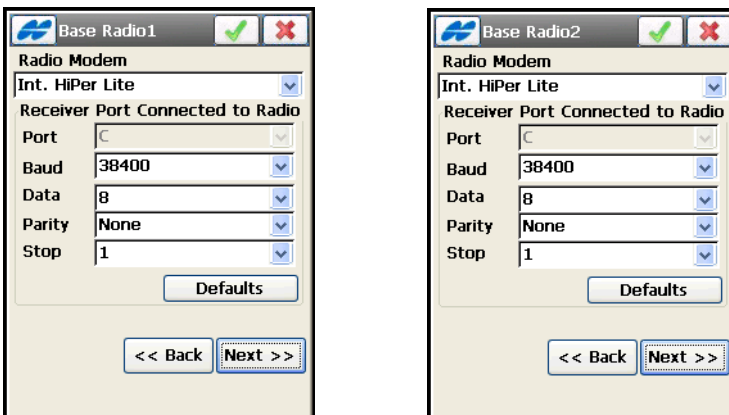


The 'Base Radio' dialog box features a title bar with a blue icon, the text 'Base Radio', and green and red status icons. The main area is divided into sections: 'Radio Modem' with a dropdown set to 'Int. HiPer Lite', and 'Receiver Port Connected to Radio' with fields for 'Port' (C), 'Baud' (38400), 'Data' (8), 'Parity' (None), and 'Stop' (1). Each field has a dropdown arrow. At the bottom are three buttons: 'Defaults', '<< Back', and 'Next >>'.

Figure 3-11. Base Radio Parameters



If Multiple Ports are set for peripherals (Figure 3-5 on page 3-7), several **Base Radio** screens display to configure the radio for data output, depending on the job configuration (Figure 3-12 on page 3-14).



Two side-by-side dialog boxes, 'Base Radio1' and 'Base Radio2', both featuring the same layout as Figure 3-11. They include a title bar, a 'Radio Modem' dropdown set to 'Int. HiPer Lite', a 'Receiver Port Connected to Radio' section with fields for 'Port' (C), 'Baud' (38400), 'Data' (8), 'Parity' (None), and 'Stop' (1), and buttons for 'Defaults', '<< Back', and 'Next >>'.

Figure 3-12. Base Radio Output

## Base Radio Parameters

Pressing the **Next** button on the **Base Radio** screen (Figure 3-11 on page 3-14) opens the **Base Radio Parameters** screen to configure parameters of the radio modem selected.

**For the cell phones** (*External GSM Modem, Internal HiPerXT (GSM), Internal HiPer (GSM), Internal GSM, Internal Digital UHF (GSM), Internal FH915Plus (GSM), Internal Satel (GSM), Internal GRS-1 GSM, Motorola V60 Cell Phone, Motorola V710 Cell Phone, MultiTech GSM/GPRS Modem, Siemens TC35 Modem, Siemens M20 Modem, Nextel i58sr Cell Phone, Nokia Cell Phone and Wavecom Fastrack GSM*) the screen contains the following parameters (Figure 3-13):


- **Base PIN** – a PIN number for a base cell phone.
- **Next** – opens the **Rover Receiver** screen (if the selected modem type does not require additional settings).
- Pressing the ok  green tick button saves the change and returns to the **Base Radio** screen.



Figure 3-13. Base Cell Phone Parameters

**For a Digital UHF Modem:** *Internal GR-3 Digital UHF, Internal HiPer Digital UHF, TRL-2/TRL-35 External Digital UHF, and RH-1 Digital UHF* the screen contains the following parameters (Figure 3-14 on page 3-16):

- **Protocol** – sets the following protocol for data transmission:
  - Simplex: ArWest’s proprietary protocol. Only works with other ArWest (Digital UHF) radios.
  - TRMB: works with Trimble Trim Talk and Trim Mark Radios.
  - PDL: works with existing PDL radios and Hiper XTs set in PDL mode.
- **Modulation** – selects a modulation type for the base radio-modem; select either *DBPSK (Differential Binary Phase Shift Keying)* if using the Simplex protocol or *GMSK (Gaussian Minimum Shift Keying)* if using Trimble or PDL.
- **Spacing** – sets the channel step: either 6.25, 12.5, 20, 25 or *Do not set*.
- **Next** – opens the **Rover Receiver** screen (if the selected modem type does not require additional settings).

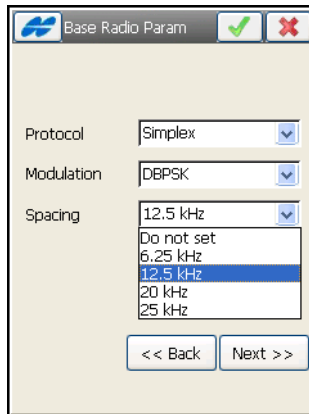
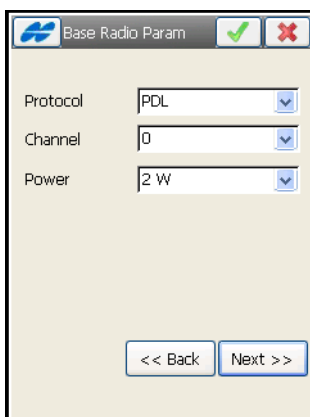


Figure 3-14. Parameters for Digital UHF Modems

**For UHF Modems:** the *Internal HiPerXT (UHF)* the screen contains the following parameters (Figure 3-15 on page 3-17):

- **Protocol** – selects the protocol for data transmission: either *TPS*, or *PDL* to communicate with the Rover PDK radio.
- **Channel** – selects a dedicated channel for the PDL protocol.

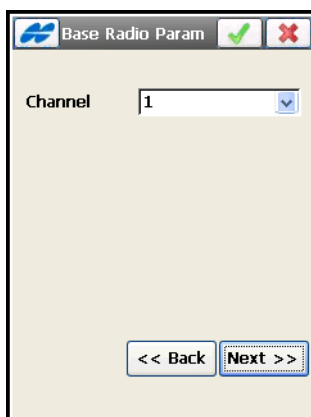
- *Power* – selects the level of power for RF transmissions: either 1W or 2W.



The screenshot shows a dialog box titled "Base Radio Param" with a blue icon on the left and green checkmark and red X buttons on the right. Inside the dialog, there are three dropdown menus: "Protocol" set to "PDL", "Channel" set to "0", and "Power" set to "2 W". At the bottom, there are two buttons: "<< Back" and "Next >>".

Figure 3-15. UHF Modem

**For the FH915 Modem:** *Internal HiPer Lite* the screen sets the operating channel for the modem (Figure 3-16).

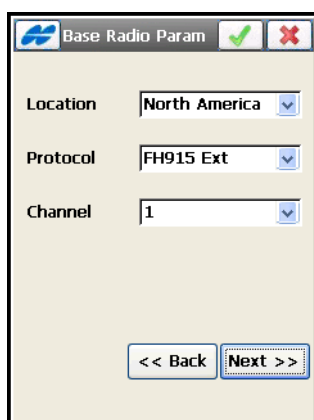


The screenshot shows a dialog box titled "Base Radio Param" with a blue icon on the left and green checkmark and red X buttons on the right. Inside the dialog, there is one dropdown menu: "Channel" set to "1". At the bottom, there are two buttons: "<< Back" and "Next >>".

Figure 3-16. Parameters for the FH915 Modem

**For FH 915Plus Modems:** *the Internal HiPer Lite+ FH915Plus, the Internal GR-3 FH915Plus, RE-S1, and RH-1 FH915Plus radios* the screen contains the following parameters (Figure 3-17 on page 3-18):

- *Location* – selects the territory (North America, Australia, or New Zealand) to adjust the frequency range and RF power level for the modem.
- *Protocol* – selects the operation protocol: either FH915 Ext, recommended if all receivers on the jobsite are equipped with FH915Plus radios only, or FH915: recommended if there is a mixture of receivers with FH915 and FH915Plus radios on the jobsite.
- *Channel* – selects the operating channel.



Base Radio Param

Location: North America

Protocol: FH915 Ext

Channel: 1

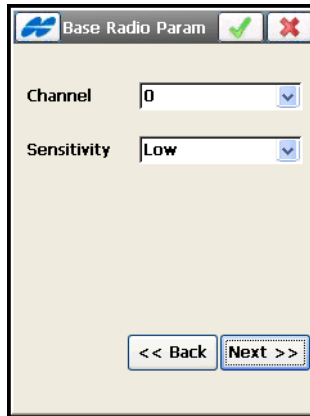
<< Back   Next >>

Figure 3-17. Parameters for FH915+ Modems



**For Pacific Crest and Internal HiPer (Pac Crest) Radio Modem**

the screen selects the operating channel and the sensitivity level for the radio modem; either *low*, *moderate*, *high*, or *off* (Figure 3-18):



**Figure 3-18. Pacific Crest Radio Parameters**

**For external Satel radio modem** the screen contains the following parameters (Figure 3-19 on page 3-20):

- *Model* – select the model of the radio.
- *Channel* – select the channel of the radio.
- *Frequency* – shows the frequency of the radio.
- *PCC* – (Pacific Crest Corporation) allows setting PCC 4-FSK, PCC GMSK protocols.
- *FEC* – (Forward Error Correction) use to maximize data communication. The rover radio modem has the capability to check and correct transmission errors (if any) in an incoming data stream.

**Figure 3-19. Satel Radio Parameters**

**For internal Satel modem (Internal HiPer Pro, Internal GR-3 Satel, and RH-1 Satel)** the screen contains the following parameter (Figure 3-20 on page 3-20):

- *Enable Free Channel Scan* – if this option is selected, the base radio in an FCS system will do all of the channel hopping.

**Figure 3-20. Internal Satel Parameters**

**For Airlink Multicast CDMA (Multicast UDP) modem** the screen contains the following parameters (Figure 3-21):

- *Address to Add* – the field for IP address input.

- *IP Addresses list* – displays all available IP addresses.

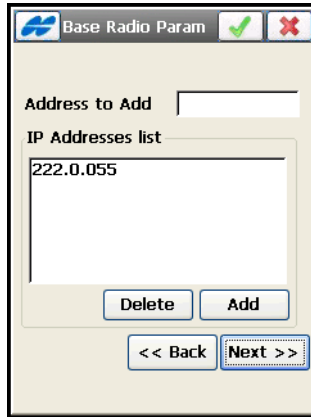


Figure 3-21. Base Multicast Parameters

- **Delete** – deletes the highlighted IP address.
- **Add** – adds a new address from the *Address to Add* field to the list of IP addresses below.

For **Internal CDMA modem** the *Config: Modem Dialup* screen contains parameters to set up the modem.

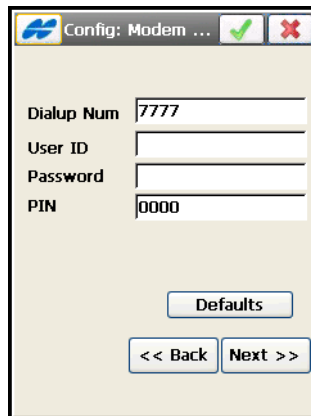



Figure 3-22. Config: Modem

- **Defaults** – sets default values for a dialup number and PIN code.
- **Next** – opens the *Rover Receiver* screen (Figure 3-23 on page 3-23). For PP enabled surveys, the *Rover PP Setup* screen

displays first (Figure 3-27 on page 3-28). In the PP Static case, the **Occupation Times** screen is opened (Figure 3-47 on page 3-46).

- Pressing the ok  green tick button saves the changes and returns to the **Survey Style** screen (Figure 3-2 on page 3-4). Settings are transmitted only when the configuration is used.

## Rover Receiver

The **Rover Recvr** screen contains Rover settings (Figure 3-23 on page 3-23).

**For RTK surveys**, the screen contains the following parameters (Figure 3-23 on page 3-23) for configuring a Rover receiver and antenna.

- Receiver Model** – the model of the receiver being used for survey. For Topcon manufacturer (Figure 3-6 on page 3-8), select either *Hiper II*, *GR-3*, *GR-5*, *GMS-2/GMS-2 Pro*, *GRS-1*, *NET G3*, or *Topcon Generic* for any other Topcon receiver. For Sokkia, *GRX-1*, *GSR2700 ISX*, *GSR1700 CSX*, *GSR2700 IS*, *GSR2600* and *Radian IS*.
- Elevation Mask** – data from satellites below this elevation are not used.
- RTK Format** – the format of the corrections received from the Base.
- Ant Type** – the type of the Topcon antenna being used for survey. Select either *CR-3*, *CR-3 with Cone*, *CR-3 with SCIGN*, *CR-4*, *CR-4 RD*, *CR-4 with cone*, *CR-G3*, *CR-G3 (TPSH)*, *G3-A1*, *G3-A1 with ground plane*, *G3-A1 with ground plane RD*, *GR-3*, *GRS/GMS Series*, *GRX1*, *HiPer Ga/Gb*, *HiPer GD/GGD*, *Hiper II*, *HiPer Lite/Lite+*, *HiPer Pro*, *HiPer XT*, *HiPer+*, *Legant 2*, *Legant E*, *Legant L1*, *Legant3 with UHF*, *Map Ant B*, *MG-A1*, *MG-A2*, *MG-A5*, *MG-B5*, *Odyssey*, *PG-A1*, *PG-A1 with ground plane*, *PG-A1 with ground plane RD*, *PG-A1\_6 with GP*, *PG-A2*, *PG-A5*, *Regant-DD*, *Regant-SD*, *Regency-DD*, *Regency-SD*, *SOK 600*, *SOK 702*, *SOK GSR1700 GSX*, *SOK GSR2700 IS*, *SOK GSR2700 ISX* or *Unknown*.

- *Ant Ht* – the height of the antenna, and the type of antenna height measurement; either *Vertical* (measured to *ARP*, antenna reference point) or *Slant* (measured to the edge of the antenna). The screen also illustrates the measurement type.

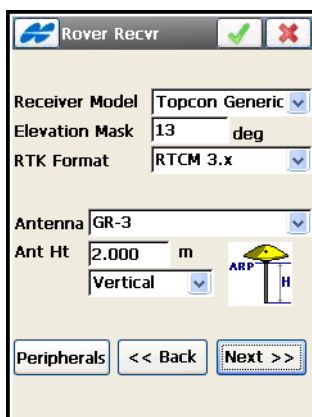



Figure 3-23. Rover Receiver


- **Next** – opens the *Rover Radio* screen (see “Rover Radio” on page 3-31). For PP enabled RTK survey the **Next** button opens the *Rover PP Setup* screen (Figure 3-27 on page 3-28).
- Pressing the ok  green tick button saves the changes and returns to the *Survey Style* screen (Figure 3-2 on page 3-4). Settings are transmitted only when the configuration is used.
- **Peripherals** – opens the *Peripherals* screen with four options to select *NMEA Ports*, *Multiple Port*, *mmGPS+* or/and *External Laser* (Figure 3-26 on page 3-26).

The Help Icon in the upper-left corner of the *Rover Receiver* screen displays the pop-up menu containing the options:

- *Receiver Setting* – check mark the box on the *Receiver Settings* screen appear to turn the charger mode off.
- *Relative calibrations on Base* – (only for RTK surveys) select the option if needed to use Relative antenna model at the base station that transmits correction data. By default, TopSURV uses Absolute calibration offsets for antennas. Also, you can select this option when editing the base.


- **RTK Protocol** – adds the *RTK Protocol* field to the **Rover Receiver** screen to set the *CSD Data* protocol through a cellular phone used as modem.

**For Real Time DGPS survey type** the screen allows a selection of DGPS correction format.

- **DGPS Format** – the format of the differential corrections received either from the user base (Full (*RTCM 1,31,3*) and Partial (*RTCM 9,34,3*) or from a Beacon station (*RTCM 2.1, 2.2, or 2.3* can be selected). This field disappears when any other differential service is chosen on the **Survey** screen.
- **Next** – depending on the differential service selected on the **Survey** screen (Figure 3-4 on page 3-7), this button opens one of the following screens:
  - **Config: Rover Radio** (Figure 3-31 on page 3-31),
  - **Config: SBAS** (Figure 3-44 on page 3-43),
  - **CDGPS Radio** (Figure 3-45 on page 3-44),
  - **Config: OmniSTAR** screen (Figure 3-46 on page 3-45).
- Pressing the ok  green tick button saves the changes and returns to the **Survey Style** screen. Settings are transmitted only when the configuration is used.
- **Peripherals** – opens the **Peripherals** screen with two options to select *NMEA Ports*, or/and *External Laser* (for a description, refer to “Peripherals” on page 3-26).

**For Network RTK and Network DGPS surveys** the screen displays the following parameter fields (see Figure 3-25 on page 3-26). For a description of these parameters, refer to “For RTK surveys,” on page 3-22. In addition, the *Protocol* field is turned on by default (Figure 3-24).

- **Protocol** – selects the protocol to receive the corrections:
  - *NTRIP*: from a NTRIP Caster
  - *TCP/IP*: through the Internet
  - *CSD Data*: through a cellular phone used as a modem

- **Peripherals** – opens the *Peripherals* screen with two options to select *NMEA Ports*, or/and *External Laser* (for a description, refer to “Peripherals” on page 3-26).
- **Next** – opens the *Config: Modem Connect* screen (Figure 3-28 on page 3-28).
- Pressing the ok  green tick button saves the changes and returns to the *Survey Style* screen (Figure 3-2 on page 3-4).

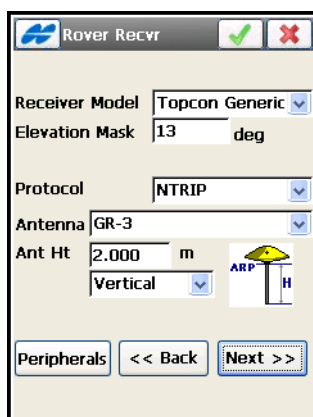


Figure 3-24. Rover Receiver Options for Network RTK and Network DGPS

**For PP Kinematic and PP DGPS surveys**, the screen displays the following parameter fields (see Figure 3-25 on page 3-26). For a description of these parameters, refer to “For RTK surveys,” on page 3-22.

The Help Icon in the upper-left corner of the *Rover Receiver* screen displays the *Receiver Setting* option to turn the charger mode off.

The **Next** button opens the *Rover PP Setup* screen.

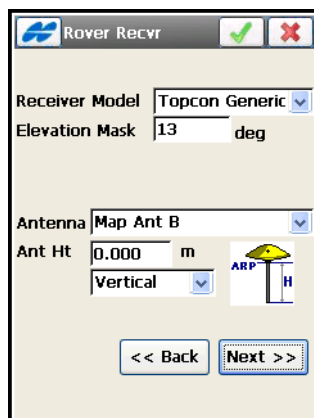


Figure 3-25. Rover Receiver Options for PP Kinematic and PP DGPS

## Peripherals

The *Peripherals* screen enables using peripheral devices connected to the rover receiver.

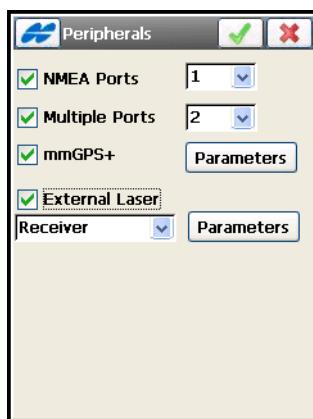


Figure 3-26. Rover Receiver Options


- *NMEA Ports*: check mark this box to set the number of ports available to output NMEA messages.
- *Multiple Ports*: check mark this box to set the number of ports to input data from peripherals.



- *mmGPS+* – available only in a RTK configuration, check mark this box to enable a mmGPS aided RTK survey. The **Parameters** button opens the *mmGPS+ Parameters* screen to set the rover port and general parameters for the mmGPS+ unit (see Figure 3-29 on page 3-29).
- *External Laser*: check mark this box to use an external laser. When selected, the *Laser Connect* field displays to set the device the laser is connected to: either *Receiver* or *Controller*. The **Parameters** button opens the *Laser Config* screen to configure the laser device (Figure 3-30 on page 3-31).

## Rover PP Setup

The screen contains parameters for logging rover raw data.

- *Raw Data Logging* – the set of logging parameters; log to the receiver, set the logging rate, and select if the name of the receiver file is automatically set or user-defined. In the latter case, the corresponding dialog box displays at the logging start.  
The *Start Log* option selects whether to start logging manually or automatically as data are being collected. This option is absent for PP Kinematic and PP DGPS surveys, the selection of manual start of logging is not allowed.
- **Next** – opens the *Init Times* screen (Figure 3-47 on page 3-46).
- Pressing the ok  green tick button saves the changes and returns to the *Survey Style* screen (Figure 3-2 on page 3-4).



Raw data always records into the Receiver memory. TopSURV allows logging data to the Controller (TopSRV/Raw Data) when in PP DGPS survey mode only.

On GMS-2, GMS-2 Pro and GRS-1 systems with integrated controllers, *Log To Receiver* is a single selection. Raw data files for post-processing are always stored in the TopSURV/Raw Data folder.

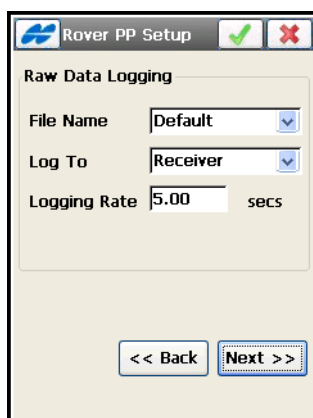


Figure 3-27. Rover PP Setup

## Modem Connection

The *Config: Modem Connect* screen (Figure 3-28) displays for the Rover receiver configuration in Network RTK or Network DGPS surveys.

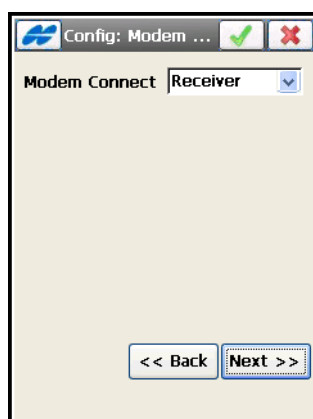


Figure 3-28. Config: Modem Connect

- *Modem Connect* – select either *Receiver* or *Controller* to which to connect the modem.
- **Next** – opens the *Rover Radio* screen (Figure 3-31 on page 3-31).



Refer to the *TopSURV User's Manual* for details on configuring modems for a Network RTK survey.

## mmGPS+ Parameters

For mmGPS aided RTK survey types (see Figure 3-5 on page 3-7), the configuration screens are the same as for the standard RTK survey types. A mmGPS survey (RTK or Network RTK) uses the usual RTK GPS+ survey system, but with a wireless PZS-1 sensor at the Rover to pick up the Lazer Zone signal from the PZL-1 transmitter for accurate (millimeter) elevations.



When measuring the height of the Rover antenna, include the height of the PZS-1 sensor with 5/8 inch plug.

The **mmGPS+ Parameters** screen adds a millimeter GPS+ selection to the RTK survey (Figure 3-29):

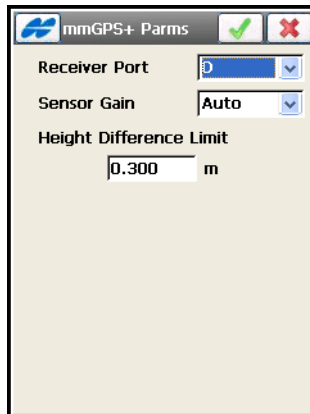



Figure 3-29. mmGPS+ Parameters

- *Receiver port* – selects the port used for communication between the receiver and PZS-1 sensor (typically port D).

- *Sensor Gain* – select Auto to automatically control the mmGPS receiver’s detection level of the transmitter’s signal.
- *Height Difference Limit* – sets the threshold for the difference between GPS and mmGPS+ height measurements.
- Pressing the ok  green tick button saves the changes and returns to the **Survey Style** screen. All the settings will be transmitted only when the configuration is used.

## Laser Config

The **Config: Laser** screen contains typical laser parameters and settings (Figure 3-30 on page 3-31).


- *Manufacturer* – the manufacturer for the laser device.
- *Model* – the model of the laser device.
- *Type* – the type of laser measurement system.
- *Laser Port Setting* – the settings (*port, parity, data, baud rate*, the number of *stop bits*) for the laser device’s connection port to output raw and calculated data to the peripheral device.
- Pressing the ok  button saves the changes and returns to the **Survey Style** screen. Settings are transmitted only when the configuration is used.

Table 3-2 lists supported manufacturers and models of laser devices.

**Table 3-2. Laser Device Manufacturer and Model**

Manufacturer	Model	Type of Laser measurement system
MDL	LaserAce 300	Range Finder Only Range Finder with Encoder
Laser Technology, Inc.	Impulse 200	Impulse Only Impulse with Compass
Laser Technology, Inc.	TruPulse 200	TruPulse Only TruPulse with Encoder
Laser Technology, Inc.	TruPulse 360	TruPulse Only TruPulse with Compass

Figure 3-30. Laser Configuration

## Rover Radio


The *Rover Radio* screen contains parameters for configuring a rover receiver port used for radio connection. (Figure 3-31).

Figure 3-31. Rover Radio

- *Radio Modem* – the type of modem. The Radio Modem list includes the types of radio to select depending on a survey style used.

For RTK and Real Time DGPS (User Base) survey types, the modem list is identical with the list of base radios plus the *Internal Map-HP(UHF)* modem (see “Base Radio” on page 3-13).

For Network RTK and Network DGPS survey types, the modem list includes *External AirLink Modem SW*, *External CDMA Modem FW*, *External GPRS Modem FW*, *Internal CDMA*, *Internal GPRS* and *Generic* modems for selection.

- **Receiver Port Connected to Radio** – contains the parameters of the connection port.
- **Defaults** – returns all the values to defaults in the *Receiver Port Connected to Radio* fields.
- **Back** – returns to the previous screen.
- **Next:** – displays the parameters for the chosen modem (see “Rover Radio Parameters” on page 3-33). Opens the ***Survey Parameters*** screen if the selected modem type does not require additional settings.
- Pressing the ok  button saves the changes and returns to the ***Survey Style*** screen.

All settings are transmitted only when the configuration is used.

The Help Icon in the upper-left corner of the ***Rover Radio*** screen displays the pop-up menu that contains an option:

- **Config RE-S1 Repeater** – enables using the RE-S1 radio as repeater (see “RE-S1 FH915 Repeater” on page 3-36).

## Rover Radio Input

If Multiple Ports mode is selected, depending on the number of ports selected (Figure 3-26 on page 3-26), there can be two **Rover Radio** screens to configure radios for data input (Figure 3-32).

Figure 3-32. Rover Radio Input



Use only one radio to receive corrections from the Base.

## Rover Radio Parameters

Modem parameters for the Rover receiver are generally the same as for the Base receiver (for details, see “Base Radio Parameters” on page 3-15).

**For Internal HiPer XT UHF** modem, set the following parameters:.

- *Protocol* – selects the protocol for data transmission: either *TPS*, or *PDL* to communicate with the PDL radio.
- *Channel* – selects a dedicated channel for the PDL protocol.

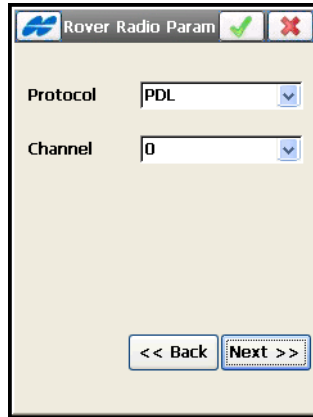



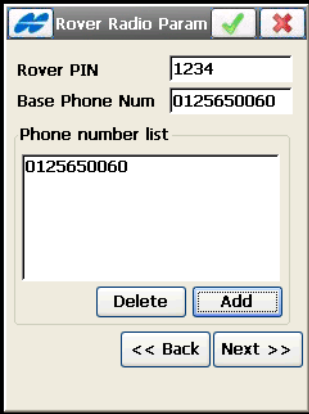
Figure 3-33. Rover UHF Modem Parameters

**For GSM cell phones** (Figure 3-34 on page 3-35), set the following parameters:

- *Rover PIN* – a personal identification number of the Rover phone for GSM networks.
- *Base Phone Number* – the phone number for the Base.
- **Add** – adds it to the *Phone number list*.
- **Back** – returns to the previous screen.
- **Next** – opens the *Survey Parameters* screen.
- Pressing the ok  button saves the changes and returns to the *Survey Style* screen (Figure 3-2 on page 3-4).

All settings are transmitted only when the configuration is used,






The dialog box titled "Rover Radio Param" has a green checkmark icon and a red X icon in the top right corner. It contains the following fields and controls:

- Rover PIN**: A text box containing the value "1234".
- Base Phone Num**: A text box containing the value "0125650060".
- Phone number list**: A list box containing the value "0125650060".
- Buttons**: "Delete" and "Add" buttons are located below the list box. At the bottom of the dialog are "<< Back" and "Next >>" buttons.

Figure 3-34. Rover Cell Phone Parameters

**For AirLink Cellular Digital Modems** (Figure 3-35), set the following parameters:

- **Base Address** – an internet address assigned by your service provider for the *GPRS / CDMA / CDPD* networks.
- **Add** – adds it to the *IP Address list*.
- **Delete** – erases the IP address from the *IP Address list*.



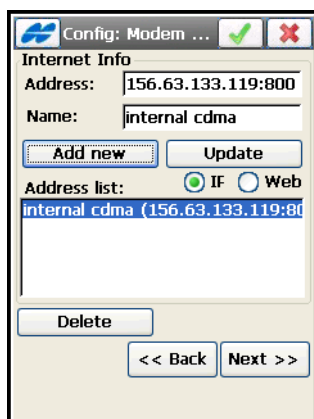
The dialog box titled "Rover Radio Param" has a green checkmark icon and a red X icon in the top right corner. It contains the following fields and controls:

- Base GPRS Address**: A text box.
- IP Addresses list**: An empty list box.
- Buttons**: "Delete" and "Add" buttons are located below the list box. At the bottom of the dialog are "<< Back" and "Next >>" buttons.

Figure 3-35. AirLink Modem Parameters

**For Internal CDMA Modem** (Figure 3-36), set the following parameters:

- **IP Address** – an internet address assigned by your service provider for the *CDMA* network.
- **Name** – allows setting a name for the IP address which displays in the *IP Address list*.
- **Add new** – adds the IP address to the *IP Address list*.
- **Update** – updates the entry in the *IP Address list*



The screenshot shows a dialog box titled "Config: Modem ..." with a green checkmark icon and a red X icon in the title bar. The "Internet Info" section contains the following fields and controls:

- Address:** A text field containing "156.63.133.119:800".
- Name:** A text field containing "internal cdma".
- Buttons:** "Add new" and "Update" buttons.
- Address list:** A section with two radio buttons, "IF" (selected) and "Web". Below them is a list box containing the entry "internal cdma (156.63.133.119:800)".
- Buttons:** "Delete", "<< Back", and "Next >>" buttons.

Figure 3-36. Internal CDMA Parameters




The same Internet information is required when configuring external and internal CDMA / GPRS modems connected to the rover receiver in Network RTK and Network DGPS surveys.

## RE-S1 FH915 Repeater

The RE-S1 is a transmit/receive/repeat FH915+ spread spectrum radio modem.

The **RE-S1 FH915 Repeater** screen configures the RE-S1 modem as a stand-alone repeater to increase the range between a Base and Rover in spread spectrum systems such as with the GR-3 or HiPer Lite+ GPS systems (Figure 3-37 on page 3-37).

This screen opens by selecting the *Config RE-S1 Repeater* option from the pop-up menu on the *Rover Radio* screen.

- *Enable RE-S1 Repeater Configuration* – enables using the RE-S1 as repeater.
- *Connect Type* – selects the connection of the modem either to the receiver or the controller to setup the modem.
- *Connect Port Setup* – sets the properties of the connection port.
- **Defaults** – sets the port properties to the default values.
- Pressing the ok  button returns to the *Rover Radio* screen (Figure 3-31 on page 3-31).

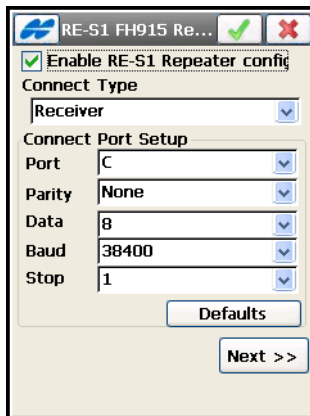


Figure 3-37. Using RE-S1 as Repeater

- **Next** – opens the next *RE-S1 FH915 Repeater* screen to choose the location, protocol and operating channel for the FH915 radio modem (Figure 3-38 on page 3-38).

After enabling the usage of the RE-S1 as a repeater, the *Config RE-S1* option becomes available for selection from the Help Icon menu in the *Status*, *Start Base* and *Topo* screens (“RE-S1 FH915 Repeater” on page 3-36).



Figure 3-38. Configure RE-S1 FH915 Repeater

## Output Radio

If NMEA Ports mode is selected (see Figure 3-24 on page 3-25), depending on the number of output ports set, there can be several *Output Radio* screens to configure radios for NMEA data output (Figure 3-39).

The **Output Radio** screen contains parameters for the radio modem connected to the Rover (Figure 3-39). For details, see “Rover Radio” on page 3-31.

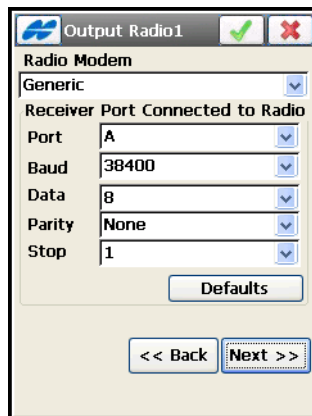


Figure 3-39. Output Radio

- **Next:** opens the *Config: Output NMEA* screen. If needed the *Rover Radio Param* screen displays first.

## Config: Output NMEA

The *Config: Output NMEA* screen (Figure 3-40 on page 3-40) contains a list of NMEA messages. Select the types of messages to issue via the specified receiver port at the interval set in seconds (up to 0.1 sec).

- *GSA* – outputs the operation mode of the GNSS receiver, the satellite used for positioning, and DOP.
- *GLL* – outputs data on the current latitude/longitude and positioning mode.
- *VTG* – outputs the traveling direction and velocity.
- *GRS* – outputs the residual error of distance for each satellite, is used to support RAIM.
- *ZDA* – outputs UTC, day, month, year, and local time zone.
- *GST* – outputs the statistics of position errors.
- *GNS* – outputs data on time, position, and positioning of GPS+GLONASS (GNSS).
- *GGA* – outputs data on time, position and positioning.
- *GSV* – outputs the number of satellites, satellite number, elevation angle, azimuthal angle, and SNR.
- *HDT* – outputs the direction (heading).
- *P\_ATT* – outputs attitude parameters.
- *RMC* – outputs time, date, position, course and speed data provided by a GNSS navigation receiver.
- *ROT* – outputs rate of turn.
- *GMP* – outputs GNSS map projection fix data.
- *Set GP as Receiver Talker ID* – instructs the receiver to use "GP" as Talker ID in appropriate NMEA sentences generated. Check mark and enable to support Google Maps that cannot recognize default "GN" or "GL" as Talker IDs in these messages.

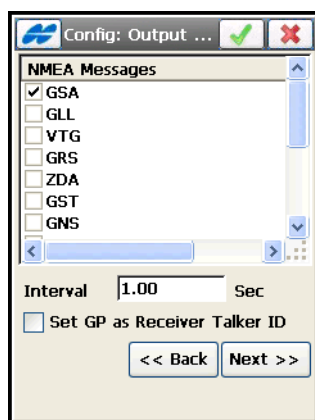



Figure 3-40. Config: Output NMEA

## Config: Beacon

The **Config: Beacon** screen (Figure 3-41 on page 3-41) contains settings for a radio-beacon source of differential GPS corrections.

- **Country** – the country where the radio-beacon differential service is located.
- **Station** – the station that provides broadcasting differential corrections for the Rover.
- **Beacon Corrections from BR-1** – check mark this box to enable the BR-1 receiver as a source of differential corrections for the rover. If selected, makes the *Automatic Scan Mode* available (Figure 3-41).
- **Automatic Scan Mode** – when set to Automatic Scan mode, a manual selection of the beacon station becomes not available. The BR-1 automatically scans broadcasting frequencies to get the Beacon Signal and output RTCM corrections from the best signal.
- **Back** – returns to the previous screen.
- **Next** – opens the **Rover Receiver** screen, on which the **Next** button opens the **Config: BR1** screen when using the BR-1 receiver is enabled by checking the box *Beacon Corrections from BR-1*.

- Pressing the ok  button saves the changes and returns to the **Survey Style** screen. All settings are transmitted only when the configuration is used.

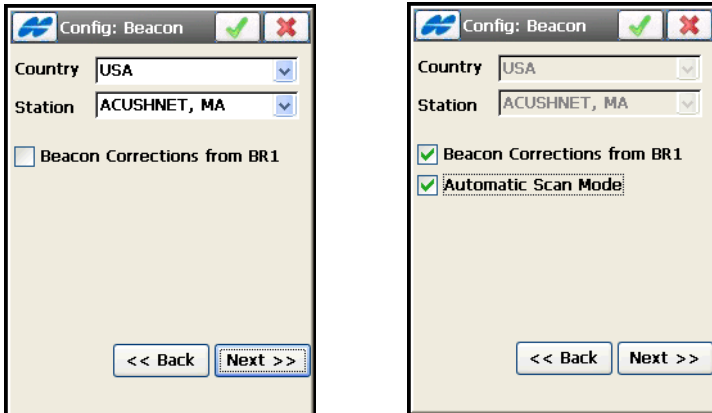



Figure 3-41. Config: Beacon

## Config: BR1

The **Config: BR1** screen (Figure 3-42 on page 3-42) contains settings for the connection with the BR-1.

- Connected to** – selects the device to which the BR1 is connected: either *Receiver* or *Controller*.
- Port connected to BR1** – sets the parameters of the connection port.
- Back** – returns to the previous screen.
- Next** – opens the **Survey Parameters** screen. In case of Controller connection, the **Config: BR-1 Receiver Info** displays first (Figure 3-43).
- Pressing the ok  button saves the changes and returns to the **Survey Style** screen. All settings are transmitted only when the configuration is used.

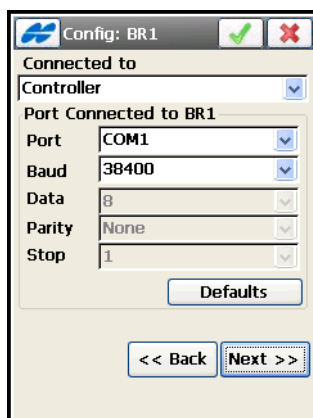


Figure 3-42. Config: BR-1

- *Virtual Radio Port* – sets the receiver port on which the receiver receives the RTCM messages from the controller. This port on the receiver is used in addition to the receiver port that is connected to the controller (see Figure 3-43).

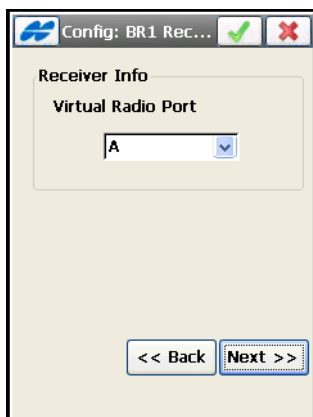


Figure 3-43. BR-1 Virtual Radio Port



## SBAS Setup

The **SBAS Setup** screen (Figure 3-44) selects satellites of a satellite-based augmentation system (WAAS/EGNOS/MSAS) to use to improve accuracy of DGPS solutions.

To select satellites, check the boxes near the PRN numbers of the satellites. All satellites can be selected. The most available satellite from the selected ones will be used in Code DGPS solution.

- *PRN* and *Name* – the SBAS satellite’s PRN number and name.
- *GPS #* – the GPS satellite’s PRN number, which is associated with the SBAS PRN number.
- *Iono corr* – enable/disable the use of ionospheric corrections from the SBAS satellite when computing positions:
  - *None*: ionospheric corrections are not used
  - *Apply if avail*: use ionospheric corrections if available
  - *Use sat only if avail*: use only the satellites for which ionospheric corrections are available.




For GMS-2, SBAS PRN# and Ionospheric corrections are available.

PRN	Name	GPS#
<input checked="" type="checkbox"/> 120	AOR-E	2
<input type="checkbox"/> 121		
<input checked="" type="checkbox"/> 122	AOR-W	4
<input type="checkbox"/> 123		
<input type="checkbox"/> 124	Artemis	
<input type="checkbox"/> 125		

Iono Corr

<< Back    Next >>

Figure 3-44. SBAS Setup

- **Back** – returns to the previous screen.
- **Next** – opens the *Survey Parameters* screen.
- Pressing the ok  button saves the changes and returns to the *Survey Style* screen (Figure 3-2 on page 3-4).

## CDGPS Radio

The *CDGPS Radio* screen (Figure 3-45) contains settings for the receiver port connected to the CDGPS radio.

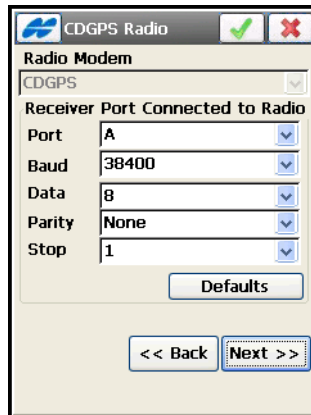




Figure 3-45. CDGPS Radio

- *Receiver Port Connected to Radio* – contains parameters for the connection port: port, parity, number of data bits, baud rate, and the number of stop bits.
- **Next** – opens the *Survey Parameters* screen.
- Pressing the ok  button saves the changes and returns to the *Survey Style* screen.

## Config: OmniSTAR

The *Config: OmniSTAR* screen (Figure 3-46 on page 3-45) contains settings for an OmniSTAR source of differential correction data.

- *Satellite* – the satellite that delivers differential GPS corrections.
- **Next** – opens the *Survey Parameters* screen.

- Pressing the ok  button saves the changes and returns to the *Survey Style* screen. Settings are transmitted only when the configuration is used.

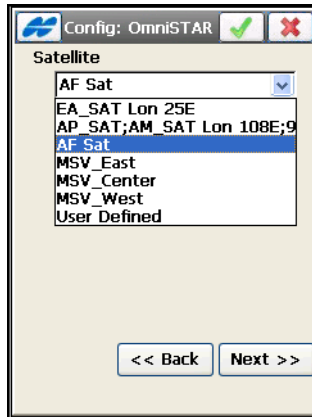




Figure 3-46. Config: OmniSTAR



## Initialization (Occupation) Times

The *Init Times/Occupation Times* screens (Figure 3-47 on page 3-46) contains timing settings for receiver loggings, used in automatic mode during a PP Static Survey, and depends upon the number of satellites available and the number of frequencies used.

- Initialization (Occupation) Time in minutes* – these are time values, dependent upon numbers of satellites and frequencies. For example, the default for six GPS/GLONASS (6+) dual frequency satellites is ten minutes. This means that for PP enabled RTK and PP Kinematic surveys, the complete Rover file should be at least this long. Individual occupations can be different. For Static surveys, this means that each station (Occupation) should be occupied for at least ten minutes.
- Back** – returns to the previous screen.
- Next** – proceeds to the next screen (for PP Static, *Stakeout Parameters*; for PP enabled RTK and PP Kinematic, *Survey Parameters*).

- Pressing the ok  button saves the changes and returns to the **Survey Style** screen. Settings are transmitted only when the configuration is used.



Init Times






Occupation times in minutes:

Num SVs	Single Freq	Dual Freq
4	60	20
5	40	15
6+	20	10

<< Back
Next >>


Occup Times


Initialization time in minutes:

Num SVs	Single Freq	Dual Freq
4	60	20
5	40	15
6+	20	10

<< Back
Next >>


Figure 3-47. Initialization / Occupation Times

## Survey Parameters

The **Survey Parameters** screen (Figure 3-48 on page 3-48) sets the parameters used by default during the survey. These parameters can be changed with the help of the settings  button from any **Survey** screen in GPS+ mode.

- Solution Type** – sets the solution type for each epoch. Depending on the survey type chosen, select either “Fixed mmGPS+”, “Fixed Only”, “Fixed and Float mmGPS+”, “Fixed and Float”, “Fixed, Float, DGPS”, “DGPS”, “DGPS, Auto”, or “All”.
  - **Fixed mmGPS+**: positions are computed by the RTK engine using the carrier phase measurements from the Base receiver and mmGPS aided Rover receiver. Integer ambiguities are fixed.
  - **Fixed**: positions are computed by the RTK engine using the carrier phase measurements from Base and Rover receivers. Integer ambiguities are fixed.

- *Float*: positions are computed by the RTK engine using the carrier phase measurements from Base and Rover receivers. Integer ambiguities, however, are NOT fixed (use float estimates instead).
- *DGPS*: positions are determined using only the pseudo-range measurements or carrier-phase pseudo-ranges.
- *All*: positions are computed using all epochs accepted, including autonomous solutions.
- *Auto*: autonomous positions when differential corrections are not available.
- The *Auto Accept* field sets the following parameters for automatic acceptance during a stationary survey.
  - *Num Meas to Avg*: sets the number of measurements used for averaging, as needed.
  - *Precision (m) Hz*: sets Horizontal and Vertical precision values, if taken into account. If both the *Precision* and *Num Meas To Avg* boxes are checked, both these conditions must be satisfied before the coordinates are accepted.
- The *Auto Topo* field sets the following parameters for kinematic surveys.
  - *Method*: defines the method for measuring the interval between the received epochs; by time, by horizontal distance, or by slope distance.
  - *Interval*: sets the value of this interval.
- The Help Icon in the upper-left corner of the screen opens the pop-up menu that contains an option:
  - *Point Properties*: opens the ***Point Properties*** screen to define the point increment value for Survey points (Figure 3-50 on page 3-49).
- **Back** – returns to the previous screen.
- **Next** – opens the ***Stake Parameters*** screen.

- Pressing the ok  button saves the changes and returns to the **Survey Style** screen. Settings are transmitted only when the configuration is used.

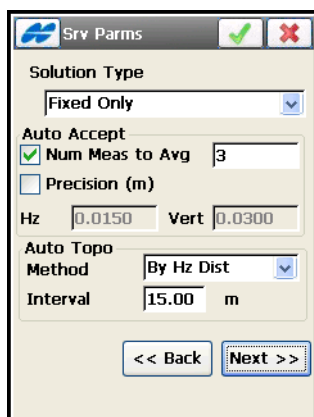
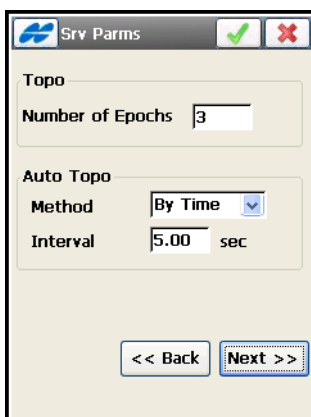


Figure 3-48. Survey Parameters

When configuring PP Kinematic or PP DGPS survey, the **Survey Parameters** screen sets the following parameters (Figure 3-49).

- Topo* – enter the number of epochs to log on each location (for stop-and-go survey).

- *Auto Topo* – as the only method currently available, sets the time interval between locations (for continuous kinematic survey).

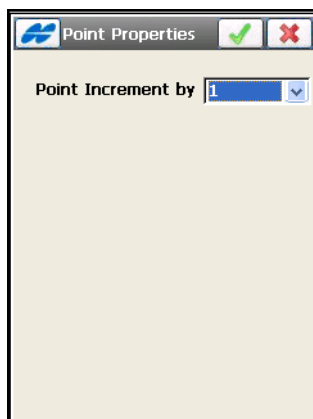


The screenshot shows a window titled "Srv Params" with a blue icon on the left and green checkmark and red X buttons on the right. The window is divided into two main sections. The top section, labeled "Topo", contains a text box for "Number of Epochs" with the value "3". The bottom section, labeled "Auto Topo", contains a "Method" dropdown menu set to "By Time" and an "Interval" text box with the value "5.00" followed by the unit "sec". At the bottom of the window are two buttons: "<< Back" and "Next >>".

Figure 3-49. Survey Parameters for PP Kinematic and PP DGPS

## Point Numbering


The *Point Properties* screen sets a user-defined value to increment/decrement the survey point number (Figure 3-50).



The screenshot shows a window titled "Point Properties" with a blue icon on the left and green checkmark and red X buttons on the right. The window contains a single text box labeled "Point Increment by" with a dropdown menu set to the value "1".

Figure 3-50. Point Numbering

## Stake Parameters

The *Stake Parameters* screen (Figure 3-51) sets parameters that are used by a job during a stakeout. These parameters can be changed with the help of the settings  button from any Stakeout screen in GPS+ mode.

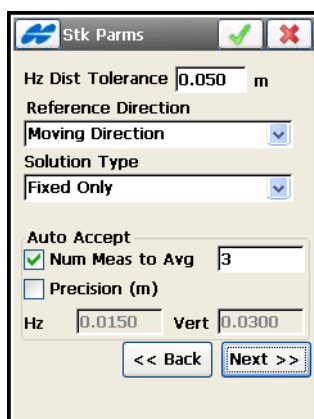



Figure 3-51. Stake Parameters

- *Hz Dist Tolerance* – sets when the graph switches to a bull's eye in Stakeout.
- *Reference Direction* – sets the reference direction for stakeout. The reference direction can be North, moving direction, moving direction +North, the direction to the reference point, or a reference azimuth. Moving Direction +North is similar to the Moving Direction option, but displays the North direction when the user is within three meters of the design point.
- *Solution Type* (for real time surveys only) – defines the type of position solutions that should be used for the stakeout: *Fixed Only*; *Fixed and Float*; *Fixed*, *Float*, *DGPS*; *DGPS*, *Auto*; or *All*.
- The *Auto Accept* field sets the parameters for automatic acceptance during a stakeout.
  - *Num Meas to Avg*: sets the number of measurements used for averaging, as needed.



- *Precision (m) Hz*: sets Horizontal and Vertical precision values, if taken into account.

If both the *Precision* and *Num Meas To Avg* boxes are checked, both these conditions must be satisfied before the coordinates are accepted.

- **Next** – opens the next *Stake Parameters* screen (see Figure 3-51 on page 3-50).
- Pressing the ok  button saves the changes and returns to the *Survey Style* screen.
- The Help Icon in the upper-left corner contains the option:
  - *Display*: opens the *Staked Point Icon* screen (Figure 3-53 on page 3-53) to set an icon for the staked point.

The next *Stake Parameters* screen sets the rule for naming staked points (Figure 3-52 on page 3-52).

- The *Store Staked Point As* field defines:
  - *Point*: sets the rule for defining names for the staked-out points; either design point name, next point name, design point with a pre-defined prefix (that is, *stk\_01*, where “*stk\_*” is the prefix), or design point with a pre-defined suffix. The choice of the prefix or suffix appears only when the corresponding item is chosen from the drop-down menu. Also, a specified numerical constant can be added to automatically generate the staked point name.  
  
For instance, if the constant specified is 1000, and the design point is 100, the staked point would be named 1100 (that is, 100+1000). If the design point is alphanumeric, the constant is appended to the name. For example, for the design point ALPHA, the corresponding staked out point is named ALPHA1000.
  - *Note*: sets the rule for setting Notes for the staked out points; either design point name, design point with a prefix, or design point with a suffix. Also, it can be Station & Offset information.

If the Station & Offset option is activated, an edit box for entering alphanumeric prefix appears. For the United States, this prefix is “Sta”, for the international markets the prefix is “Cha”, and for the Korean/Japanese markets the prefix is “No”. With this option activated, depending on the choice for the prefix, TopSURV automatically generates one note for each stakeout point: *Sta5+5.5R5.0*, *Cha505.5R5.0*, or *No.5+5.5R5.0* respectively.

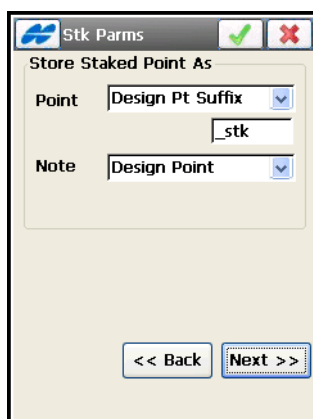



Figure 3-52. Design Point Name + Constant

- **Next** – opens the *Advanced* screen.
- Pressing the ok  button saves the changes and returns to the *Survey Style* screen.

## Staked Point Icon

The *Staked Point Icon* screen selects options to display the icon for the staked point on the map (Figure 3-53).

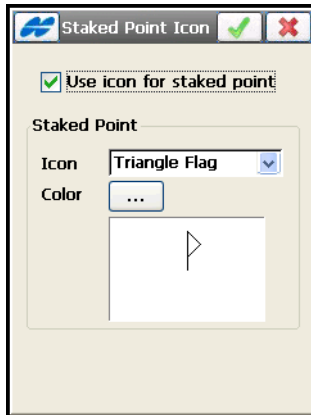


Figure 3-53. Staked Point Icon

- *Use icon for staked point* – displays the icon for the staked point on the map.
- *Staked point* – specifies a colored icon for the staked point.
- The list  button opens a screen to set a desired color for the icon.
- Pressing the ok ☒ button saves the changes and returns to the *Stakeout Parameters* screen.

## Select Color

The *Select Color* screen sets a desired color for the icon of staked points (Figure 3-54 on page 3-54).

Select the color and click the ok ☒ button to save the setting and to return to the *Staked Point Icon* screen.

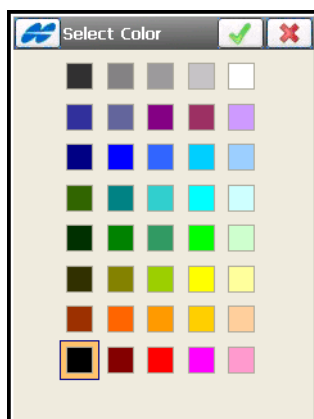


Figure 3-54. Select Color for Staked Point Icon

## Advanced

The *Advanced* screen sets several additional parameters for the GPS+ mode (Figure 3-55).

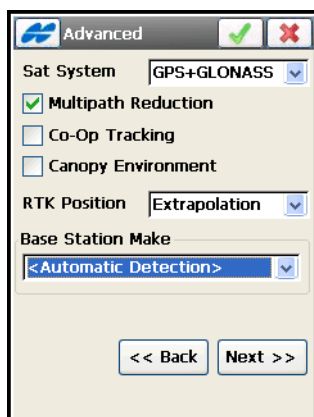



Figure 3-55. Advanced

- The *Multipath reduction* (Code) – enable when a signal received includes multiple reflections from nearby objects. Check mark the box to use this mode during a standard RTK survey or GIS data collection in standalone or DGPS mode.

- *Co-Op tracking* – enable to involve additional resources for acquisition of the signal, phase-lock, and delay-lock loops.
- *Canopy Environment* – enable to set less rigid thresholds for the RTK engine to filter out measurement outliers. This mode is recommended when working under tree canopy and in other cases of high multipath.
- *Satellite System* – selects the system of satellites to use: either *GPS* or *GPS+GLONASS*.
- *RTK Position* (only for real time surveys) – selects the method of RTK corrections definition; either *Extrapolation* or *Matched Epoch* (sometimes described as asynchronous or synchronous, respectively).
- *Base Station Make* – available only when the GPS+GLONASS satellite system is selected for the rover. This selects a manufacture of the Base receiver to accommodate differences in processing GLONASS by different companies. You can select from *Topcon Positioning Systems*, *Sokkia*, *Ashtech*, *Javad*, *Leica*, *Magellan*, *Novatel*, *Septentrio*, *Trimble*, *Other* (for the base receiver of other class included in the IGS list) or *Unknown* (for the base receiver's class not included in the IGS list). By default, *<Automatic Detection>* is set.
- **Next** – opens the *Miscellaneous* screen (Figure 3-57 on page 3-57).
- Pressing the ok  button saves the changes and returns to the *Survey Style* screen. Settings are transmitted only when the configuration is used.
- The Help Icon in the upper-left corner of the dialog for real time surveys contains an option:
  - *RTK Settings*: opens the *RTK Settings* screen (Figure 3-56 on page 3-56) to set ambiguity resolution parameters for RTK engine.

## RTK Settings

The *RTK Settings* screen (Figure 3-56 on page 3-56) sets parameters to govern the RTK engine.

- *Ambiguity Level*: select Low, Medium or High. The higher the specified level, the longer the ambiguity search time.
- *Resolution Period*: defines the period at which the ambiguities estimation is performed.
- *Expected Correction*: sets differential correction update interval for base station, effective only in the RTK Matched Epoch mode. The value should be set to the exact rate at which the base station transmits its differential correction data. This parameter will instruct the rover receiver to output the RTK position at the same rate at which differential corrections are updated.

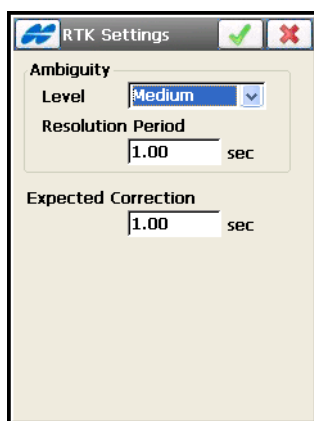


Figure 3-56. RTK Settings

## Miscellaneous

The *Miscellaneous* screen (Figure 3-57) is used to customize the user interface using the following options:

- *Display Coordinates after Measurement* – if enabled, the *Store Point* screen automatically displays computed coordinates after a GPS measurement is performed and the point information before the point coordinates are stored into the database.

- *Prompt for antenna height* – if enabled, the *Antenna Setup* screen appears to set the antenna parameters.
- *Beep on Storing Points* – if enabled, makes a sound every time a point is stored.

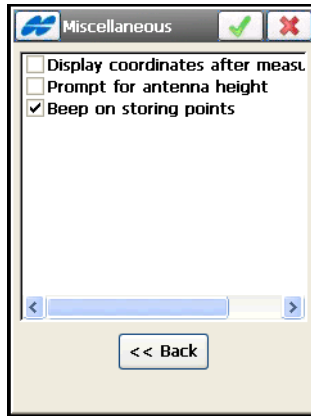


Figure 3-57. Miscellaneous

## Optical Configuration

On the *Survey Style* screen (Figure 3-58 on page 3-58), select an Optical configuration from the drop-down list; *My Conventional*, *My Reflectorless*, *My Robotic*, or *My Level* for Level configuration. To simulate a real survey, select Manual Mode. In this mode, no measurements are performed, all the data is entered manually.

The *Configurations* screen displays (Figure 3-58).

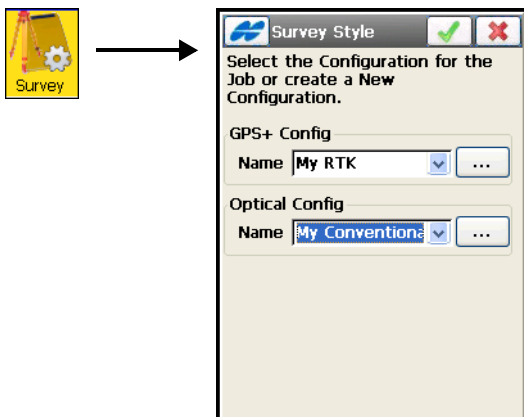



Figure 3-58. Survey Style

- – opens the *Configurations* screen for editing parameters for the configurations.
- Pressing the ok  button sets the selected configuration for the current job and returns to the main screen.

The *Configurations* screen shows the list of available configurations.

- **Delete** – deletes the configuration.
- **Edit** – changes the configuration settings.
- **Add** – adds a new configuration.



- Pressing the ok  button returns to the *Survey Style* screen (Figure 3-58 on page 3-58).

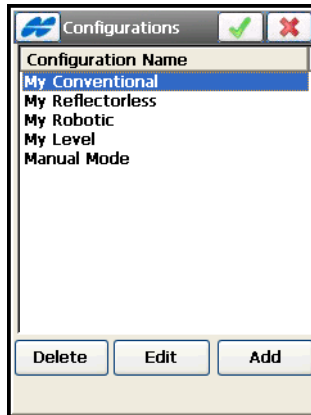


Figure 3-59. TS Configurations

## Configuring the Survey

The *Survey Configuration* screen selects a survey type (Figure 3-60).

- *Name* – the name of the configuration that is displayed in the *Configurations* screen.
- *Type* – the type of the Configuration; either *Conventional*, *Reflectorless*, *Robotic*, or *Level*.
- **Next** – opens the *Instrument* screen.

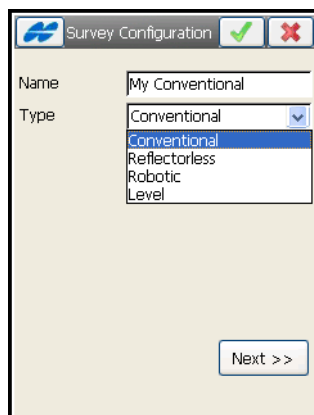



Figure 3-60. Survey Configuration Screen

- Pressing the ok  button saves the changes and returns to the Survey Style screen. Settings are transmitted only when the configuration is used.

## Instrument

The *Instrument* screen (Figure 3-61) sets a total station being used in survey.

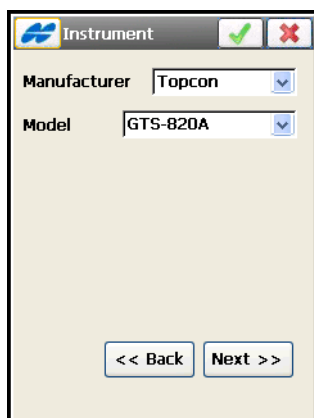


Figure 3-61. Instrument Screen


- **Manufacturer** – defines if a Topcon or Sokkia instrument is used. For Conventional surveys Nikon and Leica instruments can be also defined. Leica instruments are supported in the Reflectorless survey type as well. For survey emulation (except Robotic survey), Manual Mode can be used.
- **Model** – sets the model of the instrument, taking into account the type of the configuration. For Robotic types, only motorized models are displayed in the drop-down menu.
- **Back** – returns to the previous screen.
- **Next** – opens the **Connection Mode** screen for Total Stations and the **Cable** screen for Levels.
- Pressing the ok  button saves the changes and returns to the **Survey Style** screen. Settings are transmitted only when the configuration is used.

Table 3-3 gives Topcon instrument models and their available functionality.

**Table 3-3. Instrument Model and Functionality**

<b>Topcon Instrument Models:</b>	
GTS Series – Conventional	GRT 2000 – Conventional/Robotic
GTS-100N – Conventional	GPT 1000 – Reflectorless
GTS-220 – Conventional	GPT 2000 – Reflectorless
GTS-230/230W – Conventional	GPT 3100W – Reflectorless
(Bluetooth)	GPT 6000 – Reflectorless
GTS-600 – Conventional	GPT 3000/3000W/3000L – Reflectorless
GTS-720/720W – Conventional	GPT 7000/7000W/7000L – Reflectorless
GTS-750 – Conventional	GPT 7500 – Reflectorless
GTS-800/810 – Conventional	GPT 8000 – Reflectorless
GTS-800A/810A – Conventional and	GPT 8200 – Reflectorless
Robotic	GPT 9000 – Reflectorless
GTS-820A – Conventional/Robotic	GPT 8000A/8200A/9000A –
GTS-900 – Conventional	Reflectorless/Robotic
GTS-900A – Conventional/Robotic	IS Robot – Reflectorless/Robotic
GTS 3000 – Reflectorless	IS Robot (Live Video) – Robotic
AP-L1A – Conventional/Robotic	DL-101C/102C – Level
AP-L1 – Conventional/Robotic	DL-103 – Level
GMT100 – Conventional	DL-502– Level
GTS 1/GTS 3 – Conventional	DL-503– Level

Table 3-3. Instrument Model and Functionality

<b>Sokkia</b> Conventional instrument models are: SET, Series 10/10K/20/20K, SCT6; Reflectorless: Series 30R/30RK/130R, SETX, SRX (this model is also Robotic); Level: SDL 1X, SDL 30, SDL 50.
<b>Nikon</b> instrument model in Conventional mode is: DTM (SET)
<b>Leica</b> instrument models in Conventional and Reflectorless modes are: TCR400 or TCR700

In Robotic mode, the Help Icon in the upper-left corner of the screen opens a pop-up menu with the *Monitor* option to set a Monitor survey.

## Monitor Options

Selecting the *Monitor* item opens the *Monitor Options* screen (Figure 3-62) to set the parameters for data output in the Monitor survey. Available options vary, depending on whether a File or a COM / Bluetooth port is selected for data output.

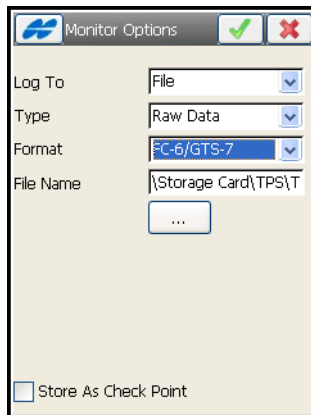


Figure 3-62. Monitor Option – File Selected

- *Log To* – sets whether the data is output to a File, COM1 port, Bluetooth, Bluetooth2, or None.
- *Output Type* – sets either *Raw Data* or *Coordinates* to output.
- *Output Format* – sets the format in which to output the data:
  - for raw data: *FC-5*, *FC-6/GTS-7* or *GTS-6*
  - for coordinates: *GGA*

- *File Name* – sets the file name.
- – browses for the destination of the file and sets the default file extension (Figure 3-63).

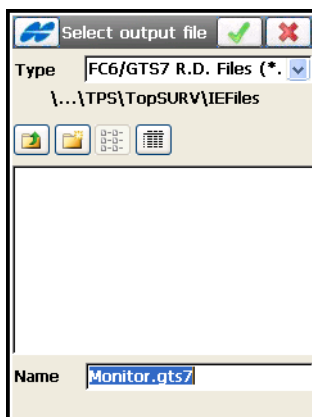


Figure 3-63. Select Output File

- *Comm Settings* – sets the communication parameters for the port: the baud rate, parity, number of the data bits and number of the stop bits (Figure 3-64).
- Pressing the ok ☒ button saves the settings and returns to the *Instrument* screen (Figure 3-61 on page 3-60).

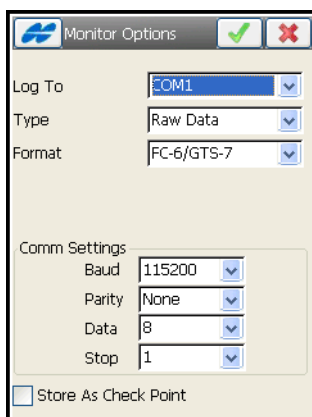



Figure 3-64. Monitor Options - COM1 Port selected

## Connection Mode

On the **Conn Mode** screen (Figure 3-65 on page 3-64), select the connection mode to manage communication between the Total Station and the data controller.

- **Initial TS Connection** – selects a communication course between the total station and the data controller depending on the optional device used. Depending upon the type of the instrument, select one of the following optional devices:
  - **Cable:** for connection using the RS-232 cable
  - **Radios:** for radio communication
  - **RC2 Only** or **RC3 Only:** for optical communication using the remote controller RC-2 or RC-3.
  - **Bluetooth TS:** for establishing a Bluetooth connection
- **Optical** – selects the connection course (either *RC2 Cable*, *RC3 Cable*, *RC2 Bluetooth*, *RC3 Bluetooth*, or *None*) between the field controller and the remote controller RC-2 or RC-3 in the case of carrying out optical communication with the Total Station.
- **Next** – opens the **Cable** screen.
- Pressing the ok  button saves the changes and returns to the Survey Style screen. Settings are transmitted only when the configuration is used.

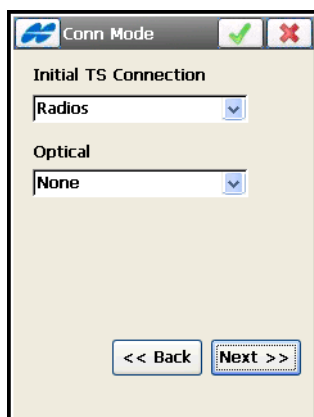



Figure 3-65. Connection Mode

## Cable

The **Cable** screen contains the parameters of the cable connection (see Figure 3-66).

- **Cable Comm Settings** – the parameters for the cable connection: *Baud* (baud rate), *Parity*, *Data* (number of the data bits), and *Stop* (number of the stop bits).
- **Default** – restores settings to default values if they have been modified.
- **Next** – opens the **Radio** screen (for Robotic surveys), the **Mode** screen (for motorized Conventional or Reflectorless surveys), or the **Survey Parameters** screen (for *Conventional*, *Reflectorless*, or *Level* surveys).
- Pressing the ok  button saves the changes and returns to the **Survey Style** screen (Figure 3-58 on page 3-58). Settings are transmitted only when the configuration is used.

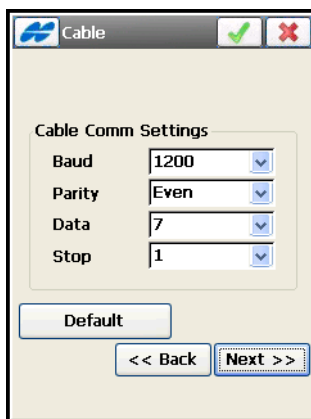



Figure 3-66. Cable

## Radio

The **Radio** screen sets the parameters of the modem connected to the total station (see Figure 3-67 on page 3-66).

- **Type** – the type of modem; either *SS Wireless*, *Satel*, *Pacific Crest* or *Generic*.
- **Radio Comm Settings** – sets radio communication parameters: parity, number of data bits, baud rate, and the number of stop bits.
- **Configure Radio** – opens the **Radio Parameters** screen to set channel and other parameters for a SS Wireless, Satel or Pacific Crest radio (Figure 3-16 on page 3-17, Figure 3-18 on page 3-19 and Figure 3-19 on page 3-20, respectively).
- **Next** – opens the **Search/Track** screen (see “Search/Track” on page 3-68).
- Pressing the ok  button saves the changes and returns to the **Select Survey Config** screen. Settings are transmitted only when the configuration is used.

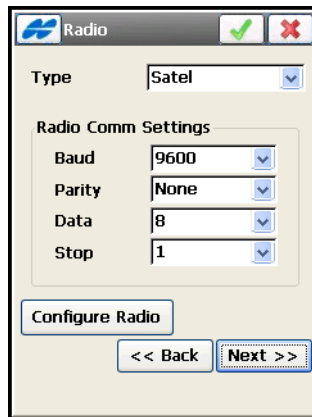


Figure 3-67. TS Radio



## Mode


The **Mode** screen contains the parameters defining the turning ability of conventional total stations. This mode is available only for motorized instruments in Conventional and Reflectorless modes of operation (Figure 3-68 on page 3-68).

Table 3-4 lists Motorized total stations that support Auto Tracking and Auto Aiming mode.

**Table 3-4. Motorized Total Stations**

GTS-800/810/900 – Motorized GTS-800A/810A/820A/900A – Motorized and Auto Tracking/Aiming GPT-8000 – Motorized GPT-8000A/8200A – Motorized and Auto Tracking/Aiming	AP-L1 – Motorized and Auto Tracking AP-L1A – Motorized and Auto Tracking GRT-2000 – Motorized and Auto Tracking GMT-100 – Motorized
---	---

- *Enable Motor Turning* – sets the motor to active mode if enabled.
- *Auto Tracking* – if motor turning is enabled, sets the motorized total station into remote control, or a fully automatic mode of operation. Select one of the following modes of auto tracking:
  - *Auto Tracking*: causes the total station to track the reflector as the surveyor moves from point to point.
  - *Auto Tracking/Auto Aiming*: causes the instrument to find the prism in a pre-defined region.
  - *No Aiming/No Tracking*: disables the total station operation program.

- Pressing the ok  button saves the changes and returns to the *Survey Style* screen (Figure 3-2 on page 3-4). Settings are transmitted only when the configuration is used.

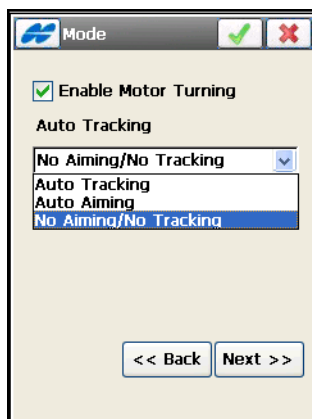


Figure 3-68. Mode

## Search/Track

The *Search/Track* screen (Figure 3-69 on page 3-69) contains parameters for signal tracking for motorized total stations. Parameter values and accessibility depend on the selected total station model.

- Turning Speed* – sets the turn speed of a total station in revolutions per minute.
- Start Search After* – sets the delay between signal loss and the start of searching.
- Pattern* – sets the program for tracking and searching.
  - Normal* (for AP-L1A and GRT-2000) or *Pattern 1* mode: searches for the prism at the point where the prism was lost. The instrument gradually searches in up and down directions, and continues until the prism is found.
  - High* (for AP-L1A and GRT-2000) or *Pattern 2* mode: searches for the prism for a set amount of time. The instrument searches from up to down and continues until the prism is found, or after a maximum of six attempts.

Auto tracking mode changes to manual mode when the prism cannot be found within six attempts, and returns to the point where the prism was lost.<sup>1</sup>


- *Trk Speed* – sets the speed for tracking; either *slow*, *medium*, or *fast*. For TS models with *Auto Tracking*, sets the speed mode according to the purpose of measurement: *Survey* (for fixed point observation), *Machine Control 1, 2* (to control construction machinery), or real time surveying of various traveling objects.
- *Sensitivity* – sets the detection sensitivity of the accepted signal; either *low*, *medium*, or *high*.
- *Track Light* – enables/disables the light on the line of sight.

Figure 3-69. Search/Track Parameters

- *Scan Range* – sets the width of the tracking signal; either narrow, middle, or wide. Available only in the AP-L1A and GRT-2000 total stations.
- *Search Area (dms)* – sets the area of searching or tracking, in degrees, for vertical and horizontal planes.
- **Back** – returns to the previous screen.

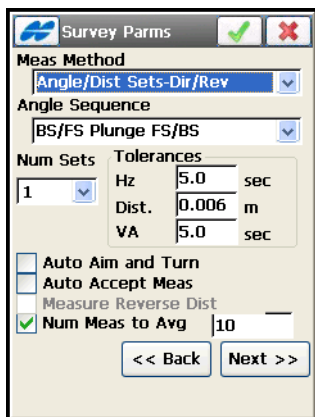
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1. For details, refer to the “Automatic Tracking Total Stations. GTS-800A Series” Instruction Manual.

- **Next** – opens the *SurveyParms* screen (Figure 3-70).
- Pressing the ok  button saves the changes and returns to the *Select Survey Config* screen. Settings are transmitted only when the configuration is used.

## Survey Parameters


The *Survey Parameters* screen (Figure 3-70 on page 3-70) contains the default parameters that are used during the survey. They can be changed with the help of the **Settings** button from any *Survey* screen.



Survey Params		
Meas Method		
Angle/Dist Sets-Dir/Rev		
Angle Sequence		
BS/FS Plunge FS/BS		
Num Sets	Tolerances	
1	Hz	5.0 sec
	Dist.	0.006 m
	VA	5.0 sec
<input type="checkbox"/> Auto Aim and Turn <input type="checkbox"/> Auto Accept Meas <input type="checkbox"/> Measure Reverse Dist <input checked="" type="checkbox"/> Num Meas to Avg 10		
<< Back      Next >>		


Figure 3-70. Survey Parameters – First Screen


- *Meas Method* – sets the mode of side-shot measurements; either *Sideshot-Direct*, *Sideshot Direct/Reverse*, or *Angle/Dist Sets-Dir/Rev*. See “Topo” on page 11-2 for a description of these methods.
- *Angle Sequence* – sets the sequence of measured angles. (Available in the *Angle/Dist Sets-Dir/Rev* mode.) Here, *BS* is backsight point (the previous occupation point), *FS* is foresight point (the next occupation point), and *Plunge* stands for flipping and rotating the total station telescope by 180 degrees. These are used for the reduction of the angle errors. Possible sequences are *BS/FS Plunge BS/FS*; *BS/FS Plunge FS/BS*; *FS/BS Plunge BS/FS*; *FS/BS Plunge FS/BS*; *BS Plunge BS/FS Plunge FS*; and *FS Plunge FS/BS Plunge BS*.

- *Num Sets* – the number of measurement sets participating in the average. Here, the Num Sets defaults to 1 and cannot be changed if *Sideshot-Direct* or *Sideshot Direct/Reverse* is selected in the *Meas Method* field. Selecting *Angle/Dist Sets-Dir/Rev* in the *Meas Method* field allows NumSets to be greater than 1.
- *Tolerances* – the admissible deviation values of the horizontal and zenith angles and the distance.
- *Auto Aim and Turn* – sets the Automatic Repetition of the measurements to active mode, the survey automatically advances to the next set. Enabled only for motorized surveys and only if a *Meas Method* of Angle/Dist Sets-Dir/Rev is selected.
- *Auto Accept Meas* – activates the review of automatic repetition needed to accept each measurement. Enabled only for Robotic, non-RC2 surveys and only when a *Meas Method* of Angle/Dist Sets-Dir/Rev is selected.
- *Measure Reverse Dist* – reverse distance measurements (if enabled). These are used for the reduction of the distance measurement errors.
- *Num Meas to Avg* – defines how many measurements is averaged, if enabled.
- **Next** – opens the second (additional) *Survey Parameters* screen (Figure 3-71 on page 3-73).
- Pressing the ok  button saves the changes and returns to the Survey Style screen.

The second (additional) *Survey Parameters* screen contains the following survey parameters (Figure 3-71 on page 3-73).

- *Meas Type* – sets the order and the type of the measurements in one set. There are five types:
  - *HA*: horizontal angle
  - *VA*: vertical angle
  - *SD*: slope distance
  - *HD*: horizontal distance
  - *VD*: vertical distance

- **EDM Mode** – sets distance measuring mode, either *fine* or *coarse*, that determines the sensitivity of the distance measurements. Select **Fine** for a normal mode or **Coarse** mode to measure in a shorter time. For a Sokkia instrument the *Coarse* setting changes to **Rapid**.
- **Backsight/Foresight P.C. (Prism Constant)** – select a backsight and foresight prism from the drop-down list. Prism Constant is the parameter of the prism, characterizing the difference between the reflection plane and the center of the prism.
- **List**  Button – opens the **Edit Prisms** screen to add a new prism or change a prism existing in the list (Figure 3-72 on page 3-74).
- **Point Guide** – check and enable to operate the tracking lights. Select the appropriate prism mode: either *Prism* or *Non-Prism*. For a Sokkia instrument, you can select from *Prism*, *360 Prism*, *Sheet* and *Non-Prism*.
- **AutoTopo** (only for robotic total stations) – the parameters of the automatic survey.
  - *Method*: select a method for taking auto measurements; either by *time*, or by *horizontal* or *slope distance*.
  - *Interval*: enter the interval for taking auto measurements.
- **Next** – opens the **Stakeout Parameters** screen.

- Pressing the ok  button saves the changes and returns to the **Survey Style** screen. Settings are transmitted only when the configuration is used.

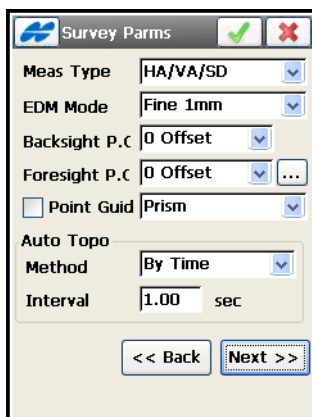


Figure 3-71. Survey Parameters – Second Screen

- The *Help* Icon in the upper-left corner of the screen opens the pop-up menu that contains the following option:
  - *Point Properties*: opens the **Point Properties** screen to define the point increment value for Survey points (“Point Numbering” on page 3-49).

## Edit Prisms

The **Edit Prisms** screen (Figure 3-72) allows the user to change the prism constant selected in the list.

- Prism* – list of prisms.
- Prism Info* – displays editable information on the prism selected.
  - Name: enter a name for the prism.
  - Constant: enter a constant value for the prism.
- Delete** – removes the prism from the list.

- **Update** – updates for new information on the prism.




Figure 3-72. Edit Prisms

## Stakeout Parameters

The *Stkt Parm*s screen sets the default stakeout parameters. These parameters can be changed using the **Settings** button from any *Stakeout* screen in TS mode (Figure 3-73 on page 3-75).

- *Hz Dist Tolerance* – enter a time to set for when the graph switches to a bull's eye in Stakeout.
- *Reference Direction* – sets the direction assumed to be the referenced direction during the stakeout. The reference direction can be Instrument Reference, North, moving direction, moving direction +North, the direction to the reference point, or a reference azimuth. Moving Direction +North is similar to the Moving Direction option, but displays the North direction when the user is within three meters of the design point. If Reference Point/Azimuth is set, an additional field or dialog appears to set the point/azimuth during stakeout.
- *Turn TS to Design Pt* – controls the way the total station turns toward the design point.
- *Search After Turn* – causes the instrument (only for motorized surveys) to search for the prism after turning to the design point (when enabled).



- *Num Meas to Avg* – defines how many measurements is averaged, if enabled (only for robotic surveys).
- **Next** – opens another *Stk Params* screen (Figure 3-74 on page 3-76).
- Pressing the ok  button saves the changes and returns to the *Survey Style* screen (Figure 3-58 on page 3-58). Settings are transmitted only when the configuration is used.

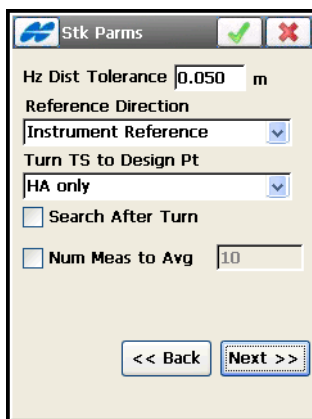


Figure 3-73. Stakeout Parameters - First Screen

The *Help* Icon in the upper-left corner displays the pop-up menu containing an option:

- *Display* – opens the *Staked Point Icon* screen to set an icon for the staked point as in GPS configurations (see “Staked Point Icon” on page 3-53).

The second (additional) *Stk Params* screen (Figure 3-74 on page 3-76) sets parameters to save staked points.

- *Store Staked Point As* – sets the rules for naming staked points. The only field needed for a Level survey.
  - *Point*: sets the rule for defining names for the staked-out points; either *design point name*, *next point name*, *Design Pt Suffix*, *design point with a pre-defined prefix* (that is, *stk\_01*, where “*stk\_*” is the prefix), *design point with a pre-defined suffix*, or *design point with a specified numerical constant*

*added automatically* (for details on staked point name generation, see page 3-51).

- *Note*: sets the rule for defining Notes for the staked-out points; either *Design Point*, *Design PT Prefix*, *Design PT Suffix*, or *Station & Offset* (for details, see page 3-51).

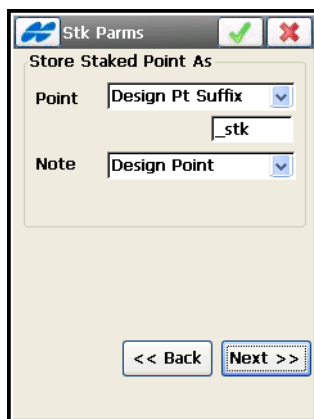


Figure 3-74. Stakeout Parameters - Second Screen


- **Next** – opens the *Miscellaneous* screen (Figure 3-75 on page 3-78).

## Miscellaneous

The *Miscellaneous* screen is used to customize the user interface (Figure 3-75 on page 3-78):

- *Display Coordinates after Measurement* – if enabled, automatically displays computed coordinates after a total station measurement is performed and before the point coordinates are stored into the database.
- *Apply Earth Curvature and Refraction* – if enabled, corrects the computed heights for the Earth's Curvature (Vertical Distance) and slope distances and vertical angles for atmospheric refraction.
- *Prompt for Rod Height* – if enabled, prompts you for a height of a Rod (Target) before a point is stored.
- *Stakeout Sound* – if enabled, makes a sound each time a point is staked-out.

- *Manual Stakeout Update (Robotic Only)* – the **Meas** button on a **Stakeout** screen must be pressed to make a measurement to the Robotic Total Station. If this option is disabled, the measurements are recorded continuously. This applies to **Stakeout** screens only.
- *Beep on Storing Points* – if enabled, beeps each time a point is stored.
- *VA Zero at Level* – if enabled, vertical angle measurements are oriented to be zero at the Horizontal (“Level”) direction. If this option is disabled, vertical angle measurements are oriented to be zero at the vertical (“Zenith”) direction (default). Only certain Total Stations allow TopSURV to set this value. For this reason, ensure that this option is set to the same value in the total station as that set in TopSURV.
- *Use Horizontal Angle Left* – if enabled, the horizontal angle measurements are shown in a counter-clockwise (“Left”) direction. If this option is disabled, the horizontal angle measurements are shown in a clockwise (“Right”) direction (default). TopSURV automatically sets the Total Station to “HR” or “HL” depending on the selection.
- *Automatically display BS Setup screen* – if enabled, the **Backsight Setup** screen displays automatically when attempting to access any of the screens involving total station observations.
- *Hold Offset Measurement* – if enabled, the screen to measure an offset point with the help of the selected offset tool displays automatically after each measurement (see *Prompt for Rod Height*).
- *Remember Occ/BS if set* – if checked, then, when attempting to access any of the screens involving total station and level observations, the user will not have to keep setting the BS if it has already been set.

- Pressing the ok  button saves the changes and returns to the **Survey Style** screen (Figure 3-2 on page 3-4). Settings are transmitted only when the configuration is used.

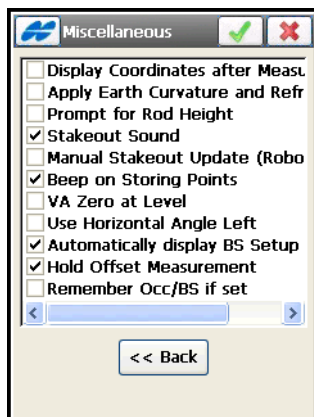



Figure 3-75. Miscellaneous

## Miscellaneous (Level Survey)

For the Level survey type, the *Miscellaneous* screen contains the following specific user interface parameters (Figure 3-76 on page 3-79).

- Display Coordinates after Measurement* – if enabled, automatically displays computed coordinates after a level measurement is performed and before the point coordinates are stored into the database.
- Apply Earth Curvature and Refraction* – if enabled, corrects the computed heights for the Earth's Curvature (Vertical Distance) and slope distances and vertical angles for atmospheric refraction.
- Stakeout Sound* – if enabled, makes a sound each time a point is staked-out.
- Beep on Storing Points* – if enabled, makes a sound each time a point is stored.
- Hold Vertical Offset* – if enabled, the vertical offset is added automatically to each measurement. Available only for the digital level.

- Pressing the ok  button saves the changes and returns to the **Survey Style** screen (Figure 3-2 on page 3-4). Settings are transmitted only when the configuration is used.

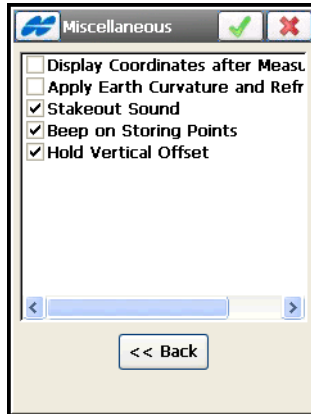





Figure 3-76. Miscellaneous – Level

## Setting Coordinate System Parameters

To configure coordinate system details for the job, tap the *Coordinate System* icon. The **Coordinate System** screen displays coordinate system information for the job (Figure 3-77 on page 3-81).

- Projection** – specifies the projection used. The **List**  button opens the **Projections** screen (see Figure 3-78 on page 3-82) where active projections can be manipulated (added from a list of pre-defined projections, deleted).
- Use Grid/Ground** – when a grid projection is selected, this box is available. If enabled, the **List**  button is activated to open the **Grid / Ground Parameters** screen where transformation parameters are set to place grid coordinates to a near ground reference surface and vice versa.
- Datum** – shows the datum for the selected projection. The drop-down list of datums is available only when the current grid

projection allows appropriate datum selection. The List  button (activated in case of a wide list of available datums) opens the **Custom Datums** screen to add/edit user-defined datums.

The NAD83 datum has three independent realizations in TopSURV with respect to the WGS84 datum: *NAD83*, *NAD83(ITRF96)* and *NAD83\_NO\_TRANS* to reflect the updates to these datums.

The original intent was for WGS 84 and NAD 83 to be identical. The mathematical definition of the ellipsoids (WGS 84 and GRS 80) differs slightly due to the choice of defining constants and number of significant figures. The maximum discrepancy between a Cartesian X,Y,Z coordinate projected onto both ellipsoids is 0.1 mm at 45 degrees latitude. So, for all intents and purposes, consider the ellipsoids to be identical.

The confusion arises when we start to talk about the realization of the WGS 84 and NAD 83 datums. When NAD 83 was first realized in 1986, it used the same control stations as WGS 84, some of which were Doppler stations, which were accurate to about one meter. Consider the datums to be identical.



Since this time, there have been several realizations of WGS 84, the latest being WGS 84 (G1150), which was performed using data from IGS tracking stations collected during GPS Week 1150. Recent studies have shown that WGS 84 (G1150) is essentially identical to the International Terrestrial Reference Frame of 2000 (ITRF00). Also, during this time there have been no new realizations of NAD 83.

What this means is that WGS 84 and NAD 83 can no longer be considered identical and are in fact different by more than one meter. This is because the WGS 84 datum has been updated over time, using GPS while the NAD 83 datum has remained constant since 1986. However, most software manufacturers still consider WGS 84 to be identical with NAD 83.

To be compatible with other manufacturers, Topcon provides transformation parameters from WGS 84 to NAD 83 where all the parameters are zero. This means WGS 84 equals NAD 83. This set of datum transformation parameters is called NAD 83 No\_Trans.

Topcon also provides another set of datum transformation parameters called NAD 83 which reflects the updates to WGS 84. These parameters are taken from the National Geodetic Survey.

Topcon only uses the first seven parameters, three translations, three rotations, and scale.

- *Use NADCON* – available only when SPC27 projection is used. When selected, TopSURV makes the coordinates equal to the same from Corpscon.
- *Geoid Model* – shows the geoid selected (if any). The List  button opens the **Geoids List** screen where geoids can be added, deleted, or their properties viewed. See “Geoid List” on page 3-92 for more information.
- Pressing the ok  button saves the settings and returns to the main screen.

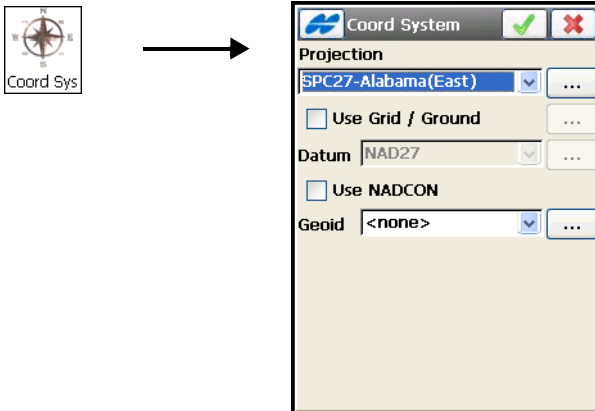


Figure 3-77. Coordinate System

# Projections

The *Projections* screen contains a list of cataloged projections to select for the job (Figure 3-78 on page 3-82).




- *Pre-Defined* – contains a tree of available projections divided by regions.
- **Custom** – opens the *Custom Projections* screen to add/edit user-defined projections (Figure 3-79 on page 3-83).
- *Active* – contains a list of selected projections (corresponds to the drop-down list in the *Projections* field of the *Coordinate System* screen). The first time the screen is opened, it is empty (Figure 3-78 on page 3-82).
-  – selects the chosen projection in the *Pre-Defined* panel and inserts it into the *Active* panel.
-  – deletes the highlighted projection from the *Active* panel.
- Pressing the ok  button saves the changes and returns to the *Coord System* screen (Figure 3-77).



Figure 3-78. Projections



## Custom Projections

The *Custom Projections* screen (Figure 3-79) contains a list of custom projections (grid systems). Initially, this list is empty.

- **Delete** – press to delete the selected custom grid systems.
- **Edit** – opens the *Custom Projection* screen (Figure 3-80 on page 3-84) to edit parameters of the selected custom grid system.
- **Add** – opens the *Custom Projection* screen (Figure 3-80 on page 3-84) to enter parameters for the new custom grid system.

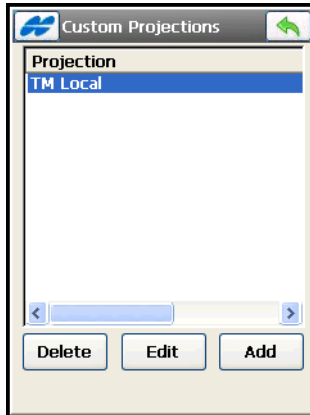


Figure 3-79. Custom Projections – Add New Custom Grid System

On the *Custom Projection* screen, enter or select the following parameters for the custom grid (Figure 3-80).

- *Name* – enter the name of the new projection.
- *Type* – select a sample projection to construct a custom projection from the following list of available types:
  - *Albers Equal Area* (orthembadic): conic projection.
  - *Cassini-Soldner*: cylindrical projection.
  - *Double Stereographic*: conformal azimuthal projection.
  - *Lambert*: conformal conic projection.
  - *Oblique Mercator*: conformal cylindrical projection.
  - *Stereographic*: conformal azimuthal projection.

- *Transverse Mercator*: conformal cylindrical projection (see Figure 3-81 on page 3-85 for more information).
- *Datum* – select the datum for the projection from the list of available types. The **List** [...] button opens the *Custom Datums* screen to add/edit user-defined datums.
- *Region* – displays the region.
- *Note* – enter any additional information about the projection, if preferred.

**Figure 3-80. Custom Projections – Add New Custom Grid System**

- **Next** – opens another *Custom Projection* screen to enter the new projection specifications depending on the selected sample projection.
- Pressing the ok button saves the changes, closes the screen, and returns to the *Custom Projections* screen.

If the *Transverse Mercator* projection is the selected type for constructing a custom projection, the *Custom Projection* screen displays the following fields (Figure 3-81):

- *Central (Meridian)* – sets the longitude of the central meridian of a zone. The central meridian is a line of constant longitude (zero eastings) at the center of a graticule of a zone of custom projection. The central meridian is usually used as a base for constructing the other lines of the graticule.

- *Scale* – sets a constant scale factor along the central meridian. By this number, a distance along the central meridian of custom projection is multiplied to obtain the actual distance on the datum of the projection.
- *Lat0* – latitude of a point chosen as the origin on the central meridian of the zone grid.

Central	30°00.00000	
Scale	1.000015000	
Lat0	40°07'00.000	
East0	10000.000	m
North0	10000.000	m

<< Back


Figure 3-81. New Projection Specifications

- *East0*, *North0* – false Easting and Northing of the origin. These constant values are added to all negative eastings and northings so that only positive values of easting and northing are recorded.



Latitudes are entered as positive numbers in the Northern Hemisphere, and as negative numbers in the Southern Hemisphere.

Longitudes are positive for Eastern directions and negative for Western directions from the GMT line.

- **Back** – returns to the previous screen.
- Pressing the ok  button creates the custom projection and returns to the *Custom Projection* screen with the new projection added.

## Grid / Ground Transformation

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

TopSURV has three modes to set up grid/ground parameters. Select a desired one of these modes from the *Parameters* field on the **Grid / Ground Parameters** screen(Figure 3-82 on page 3-86):


- *Scale Factor*
- *Average Job Height*
- *Origin Point*

**For Scale Factor**, the **Grid / Ground Parameters** screen (Figure 3-82) sets the *Combined Scale Factor* for *Grid to Ground* or *Ground to Grid* coordinate transformation.

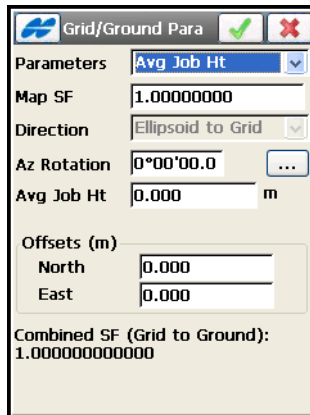
The screenshot shows a dialog box titled "Grid/Ground Para" with a blue icon on the left and green checkmark and red X icons on the right. The "Parameters" dropdown menu is set to "Scale Factor". Below this, the "Combined SF" field contains the value "1.000000000000". The "Direction" dropdown menu is set to "Grid to Ground". The "Az Rotation" field contains "0°00'00.0" with a blue ellipsis button to its right. A section titled "Offsets (m)" contains two input fields: "North" with "0.000" and "East" with "0.000". At the bottom, it displays "Combined SF (Grid to Ground): 1.000000000000".

Figure 3-82. Grid to/from Ground - Scale Factor

- *Combined SF* – sets the combined scale factor. This value has to be known for the user.
- *Direction* – switches between the *Grid to Ground* and *Ground to Grid* combined scale factor transformation directions.

- *Az Rotation* – sets the angle between the North directions of the grid and the ground coordinate systems. This angle defines the reference direction for ground azimuths. This value either has to be known for the user or computed using the  button. For details on this computation, see “Compute Rotation” on page 3-89.
- *Offsets* – shows editable offset values of the grid origin along the North and East axes to reduce ground coordinates to manageable values. The offsets will be subtracted from (or added to) the original coordinates values, in order to more easily differentiate the grid coordinates from the ground coordinates.
- The additional reference information at the bottom of the screen goes about the scale factor and the direction of transformation set and used.

**For Average Job Height**, the *Grid / Ground Parameters* screen sets the *Average Height* of the job points for *Grid-to-Ground* coordinate transformation (Figure 3-83).



Grid/Ground Para	
Parameters	Avg Job Ht
Map SF	1.00000000
Direction	Ellipsoid to Grid
Az Rotation	0°00'00.0 ...
Avg Job Ht	0.000 m
Offsets (m)	
North	0.000
East	0.000
Combined SF (Grid to Ground): 1.000000000000	

**Figure 3-83. Grid to Ground - Average Job Height**

- *Avg Job Ht* – sets a height that is typical of the job site. This value will be used to compute the elevation scale factor. An elevation factor is determined by using a constant value for the mean radius of the earth. An approximation of the earth's radius used in TopSURV is 6,371,000 meters.

- *Map SF* – sets the value of the map scale factor (how many *Grid* distance units correspond to one distance unit on the *Ellipsoid*). This value has to be known for the user.
- *Direction* – shows the *Ellipsoid to Grid* transformation direction.
- *Az Rotation* – sets the angle between the axes of the grid and the ground coordinate systems. This angle defines the reference direction for ground azimuths. This value either has to be known for the user or computed using the  button. For details on this computation, see “Compute Rotation” on page 3-89.
- *Offsets* – enter offset values of the origin along the North and East axes to reduce ground coordinates to manageable values.
- The reference information at the bottom of the dialog goes about the combined scale factor computed using the map scale factor and elevation factor (computed using the average job height).

For **Origin Point**, the *Grid to Ground Params* screen displays the parameters to set the origin of the ground coordinates (Figure 3-84).

Figure 3-84. Grid to Ground - Origin Point

- *Combined SF* – shows the combined scale factor. The scale factor for this mode is a calculated value. The value (not equal to “1”) depends on the height of the origin point.
- *Direction* – always shows the *Grid to Ground* transformation.


- *Az Rotation* – sets the angle between the axes of the grid and the ground coordinate systems. This angle defines the reference direction for ground azimuths. This value either has to be known for the user or computed using the  button. For details on this computation, see “Compute Rotation” on page 3-89.
- *Origin Point* – sets a desired grid point from the job as a ground origin; can be selected from a map, a list, or entered manually.
- *Ground Pt* – sets the ground coordinates for the origin point.
- The additional reference information at the bottom of the dialog goes about the combined scale factor computed and the direction of distance transformation.
- Pressing the ok ☒ button performs transformation and returns to the *Coordinate System* screen.

## Compute Rotation

The *Compute Rotation* screen (Figure 3-85) computes azimuth rotation using ground and grid azimuths.


Figure 3-85. Compute Rotation

- *Azimuth* – sets the azimuths in the ground and grid systems.
- **Compute** – opens the *Compute Azimuth* screen to compute azimuths in the ground and grid systems, respectively.
- *Rotation* – shows the azimuth rotation.

- Pressing the ok  button saves the results and returns to the *Grid to Ground Parameters* screen.

## Compute Azimuth

The *Compute Azimuth* screen (Figure 3-86 on page 3-90) computes the azimuth of the direction using two points in the job.

- From* – sets the start point for the direction.
- To* – sets the end point for the direction.
- Add to* – adds an additional value to the azimuth.
- Azimuth* – displays the result.
- Pressing the ok  button saves the results and returns to the *Compute Rotation* screen with the rotation angle shown (Figure 3-85).

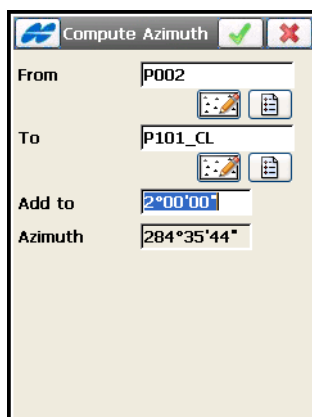


Figure 3-86. Compute Azimuth



## Custom Datums

The *Custom Datums* screen (Figure 3-87) contains a list of custom datums. Initially, the list is empty.

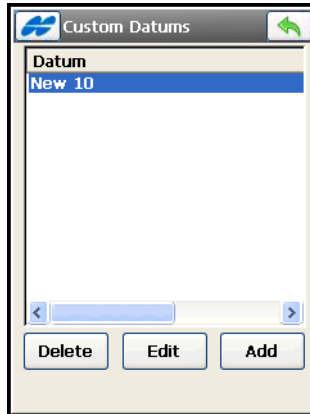



Figure 3-87. Custom Datums

- **Add** – opens the *Custom Datum* screen to enter parameters for a new custom datum (Figure 3-88 on page 3-92).
- **Edit** – opens the *Custom Datum* screen to edit parameters of the selected custom datum.
- **Delete** – deletes the selected custom datum.

The *Custom Datum* screen (Figure 3-88) displays to enter or select parameters for a new custom datum.

- **Name** – sets the name of the new datum.
- **Ellipsoid** – selects the ellipsoid for the datum from the list of available types.
- **Note** – any additional information about the datum.
- **Next** – opens another *Custom Datum* (Figure 3-88) screen to set offsets, rotations, and scale for the new datum
- **Back** – returns to the previous *Custom Datum* screen.

- Pressing the ok  button creates the custom datum and returns to the **Custom Datums** screen with the new datum added.

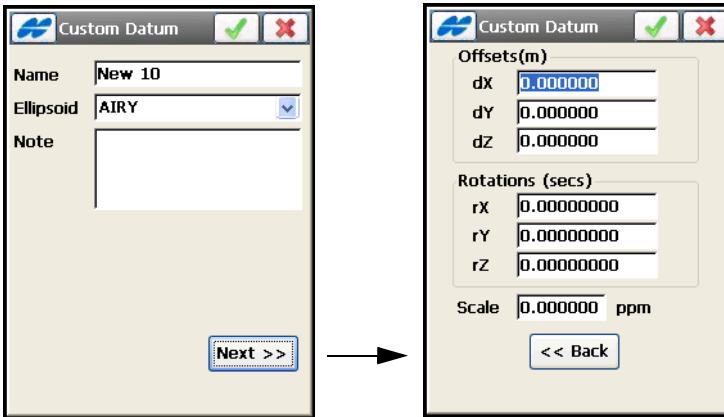



Figure 3-88. Custom Datum

## Geoid List

Geoid is a physical reference surface. Its shape reflects the distribution of mass inside the earth. Geoid undulations are important for converting GPS-derived ellipsoidal height differences to orthometric height differences.

The **Geoids List** screen (Figure 3-89) contains a list of active *Geoids* available for selection.

- Remove** – deletes the geoid from the list.
- Edit** – opens the **Add Geoid** screen (Figure 3-90 on page 3-94) to change the geoid.
- Add** – opens the **Add Geoid** screen (Figure 3-90 on page 3-94) to add a geoid file to the list. Install the geoid file on the controller prior to adding it to the list. Some geoid files can be installed on the controller during TopSURV installation. They are provided to the user with the TopSURV installation program as ‘.gff’ files.

- Pressing the ok  button the job refers to the selected geoid file when performing calculations.

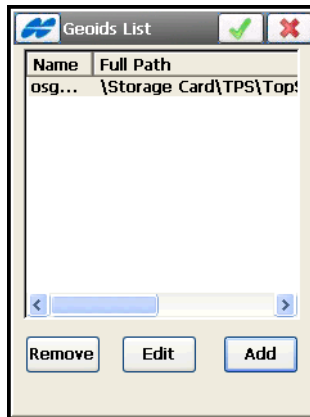





Figure 3-89. Geoid List

## Add a Geoid File

On the **Add Geoid** screen (Figure 3-90 on page 3-94), select a Geoid file from the controller to view the boundaries of the geoid application.

- **Geoid Format** – the format of the geoid; either *Geoid 99/2003/2009, Australian, Canadian 2000, Canadian 95, Geoid File Format, Mexico 97, Sweden, Denmark, Dutch2004 Files, or Norwegian*.
-  – displays the directory where the geoid file is stored in the controller. Usually, the geoid files are stored in the Geoids folder in the directory where the application was installed.
- **Browse** – opens the **Select geoid** screen to navigate to the geoid file previously downloaded to the controller.
- **Geoid Boundary** – displays the boundary of the geoid application after pressing the ok  button on the **Select geoid** screen.

 (Lat/Lon): the longitude and latitude of the point that sets the north-west boundary of the geoid.

└ (Lat/Lon): the longitude and latitude of the point that sets the south-east boundary of the geoid.

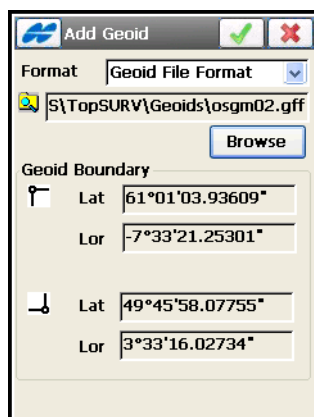




Figure 3-90. Geoid Parameters

- Pressing the ok  button returns to the *Geoid List* screen (Figure 3-89 on page 3-93).

## Setting Global Parameters for Job

To set global parameters in TopSURV, tap the **Global** icon. The *Global Settings* screen (Figure 3-91 on page 3-95) sets the mode for collecting data.

- *Use Bold Font* – if enabled, creates bold fonts on the controller display.
- *Enable Job History* – if enabled, saves the job history of every surveyor's operation on the job.
- *Prompt for Connection* – if enabled, the Connection Prompt dialog will displays every time on opening a job to set / change the job style and connection.

- Pressing the ok  button saves the changes and returns to the main screen.

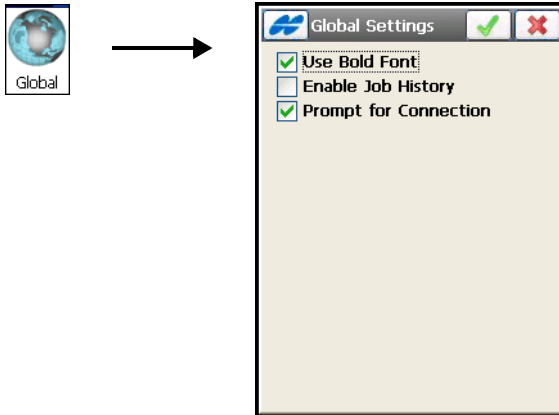


Figure 3-91. Global Settings

## Job Backups

To increase the reliability of work with jobs in TopSURV, a backup copy is automatically created for the current job when the job is modified. This automatic renewal occurs about every ten minutes.

If backing up a job extends for more than 3 seconds, the corresponding message appears (see Figure 3-92 on page 3-96). And it is safely stored with a new name, i.e., *file\_name!YYY-MM-DD!.tsj.bak* in a folder where the original \*.tsj file is located.

TopSURV will create a separate \*.bak file for the current job every time the user opens the \*.tsj file during the day with another date, but there cannot be more than three such files. If the \*.tsj file is opened in

subsequent days, the \*.bak files previously formed will be overwritten to the ones with the newer dates.

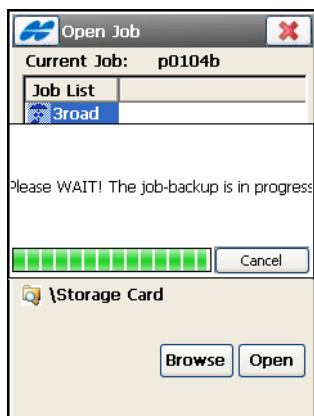


Figure 3-92. Job Backup in Progress

To change the folder for saving backup copies, tap the **Backup** icon. The **Backup Config** screen displays.

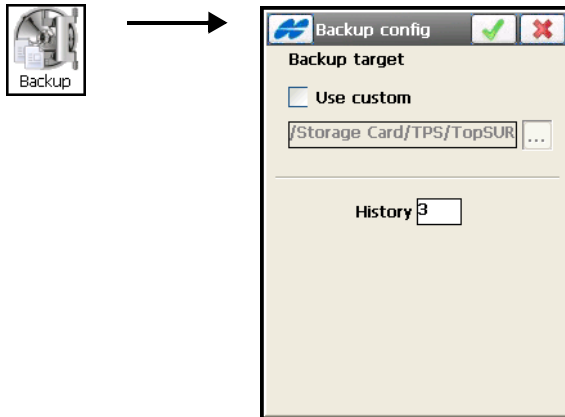



Figure 3-93. Job Backups

- *Use custom* – if selected, activates a field below either to type in a backup target folder or to select it.
- *History* – shows how many last copies will be daily created (three copies by default).

Use the List  button to open the *Open Directory* screen to select a destination directory to save backups.

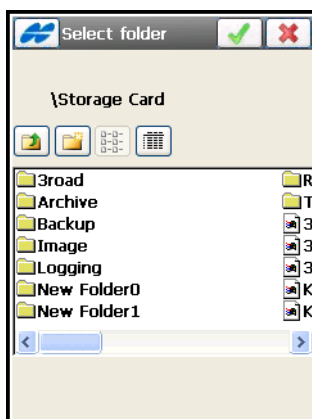


Figure 3-94. Open Directory

## Setting Units

Tap the **Units** icon, to set default units for a job. The *Units* screen (Figure 3-95) displays. For details, see “Units” on page 2-7.

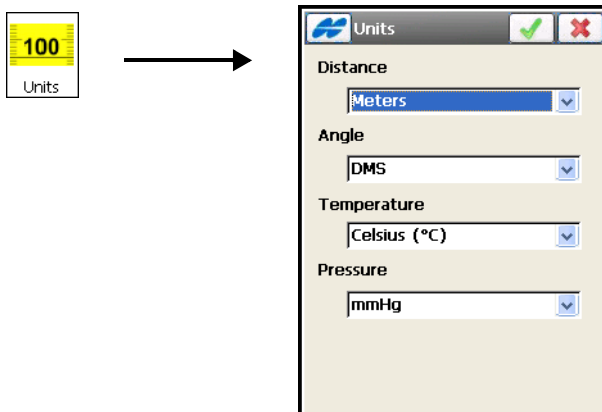


Figure 3-95. Units Screen

# Customizing Data Display

The **Display** icon opens the *Display* screen (Figure 3-96) to customize the software interface. For details on this screen, see “Display” on page 2-9.

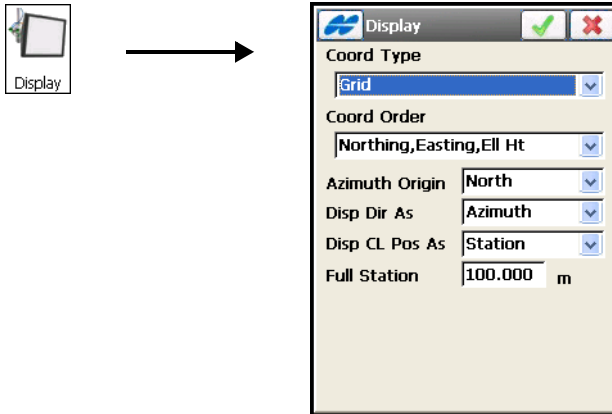


Figure 3-96. Display

# Setting Alarms

The **Alarms** icon opens the *Alarms* screen (Figure 3-97). For detail on setting alarms, see section “Alarms” on page 2-10.

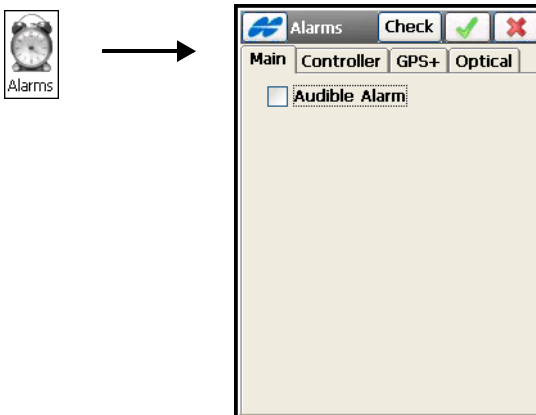


Figure 3-97. Alarms



- **Check** – pressing this button checks the status of selected situations for the instruments being used (Figure 3-98).

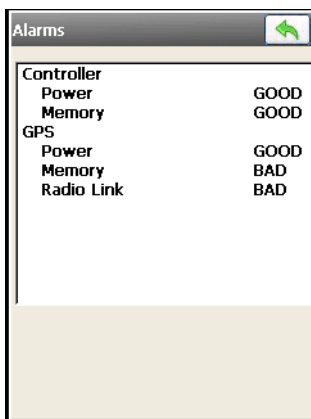



Figure 3-98. Checking Status

## Modifying Menus

Tap the **Menu** icon to modify the appearance of the menus. Some rarely used functions are not displayed. If the menu options you need are not visible (available), enable these options in the corresponding menu in the **Config Menu** screen (Figure 3-99).

The **Config Menu** screen displays a list of menus and submenus for each special submenu for the current job configuration (Figure 3-99).

- **Menu** – shows the list of available menus.
- **Sub Menu to Display** – shows the list of the selected menu items available for display. Place a check mark next to the item you want to display in the menu.

- Pressing the ok  button saves the settings made and return to the main screen.

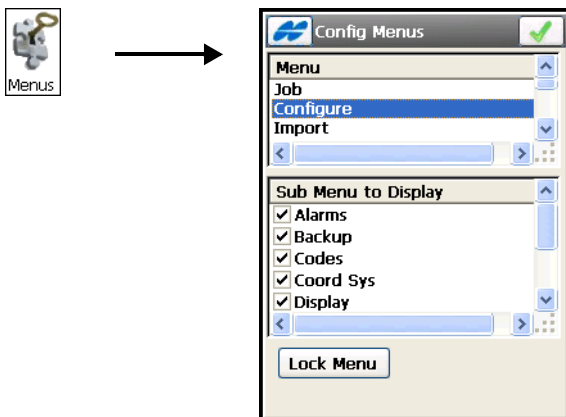


Figure 3-99. Config Menu Options

- Lock Menu** – press to set a password to protect the selected menus from changing (see Figure 3-100 on page 3-100).

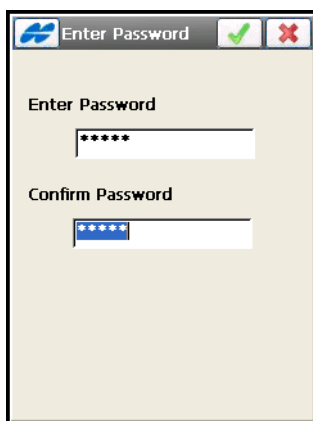


Figure 3-100. Enter Password

When TopSURV is in the List menu mode (For details on switching to the List Menu, see “Switch Menus” on page 1-12), the *Use Icons* check box appears on the Config Menu screen. Check and enable

this box to use the icon main menu instead of the list of names (Figure 3-101 on page 3-101).

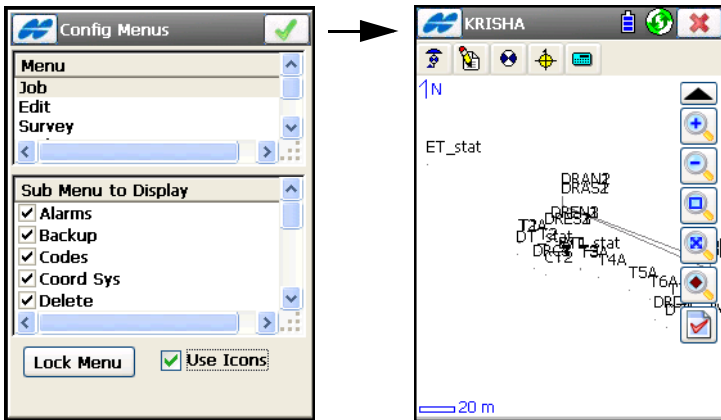


Figure 3-101. List Menu Icons

## New Jobs

Tap the **New Jobs** icon to set parameters for automatic import of Localization from the previous job and Global code library. The *New Jobs* screen displays (Figure 3-102).

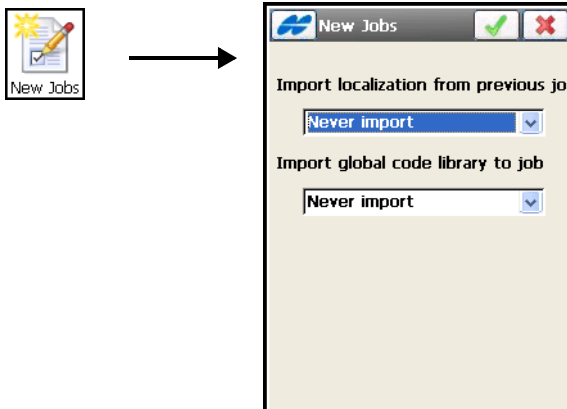


Figure 3-102. New Jobs Import Options

- *Import localization from previous job*— you can select from *Never import* localization data from the previous job, *Always import*, and *Prompt to import*.
- *Import global code library to job* – you can select from *Never import* global code library to job, *Always import*, and *Prompt to import*.

## Codes

Tap the **Codes** icon to set global parameters and prompts for codes.

The *Global Code Options* screen displays that includes two tabs: *Code Settings* and *Code Prompts*.

## Code Settings

The *Code Settings* tab sets global parameters for codes and control codes (see Figure 3-104 on page 3-104).

For Codes:

- *Default New Type* – select *Prompt* to receive a prompt for creating a new code upon saving points, or select a code entity type *Point*, *Line*, or *Area* to be shown for a new code.
- *Data Entry* – select either *Codes* or *Notes* to enter in the field during survey in the main Topo dialog (Figure 9-2 on page 9-2).
- *Code File* – sets a Code File to use the file's codes and layers with the currently selected job. When using a Code File, the codes immediately become available for selection from the Code drop-down list. The layers from the Code File display in the Layer list

of the current job only as points are saved with the file's codes selected.



Default code library is installed automatically on TopSURV installation and can be set to the Global Code Library.

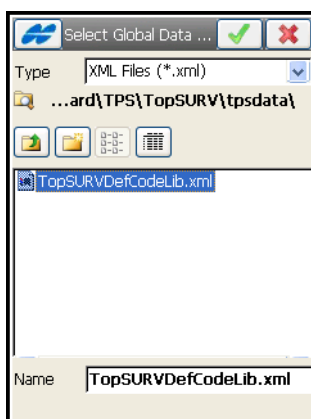


Figure 3-103. Default Code Library File

- **Browse** – tap to select an XML file to use for the Code File above (Figure 3-103).
- *Code with Description* – if this box is check marked, the drop-down menu for Code selection displays descriptions along with code names to select during survey.

For Control Codes:

- *Allow Custom* – if this box is check marked, TopSURV will not use it's linework package. In this case, the user can enter any string to mark it as a control code. TopSURV will not interpret these control codes.
- *Allow Persistent* – if this box is check marked, the control codes will be persistent between recorded points and not cleared when surveying. This option available, only if the *Allow Custom Control Code* option is turned on above.

- *Delimiter* – when surveying, if the selected mode is either *Line* or *Area*, then this option selects a delimiter for entering control codes, along with codes in a single field, separated by the delimiter.

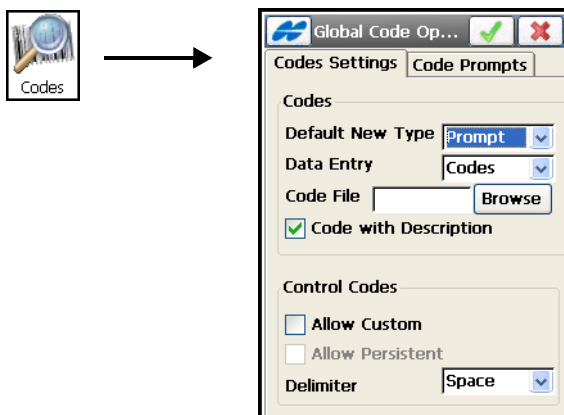


Figure 3-104. Global Code Options

## Code Prompts

The *Code Prompts* tab allows setting global prompts for code when performing Total Station and GPS Surveys, Stakeout and COGO tasks.

Check mark corresponding boxes to enable prompts for codes (see Figure 3-105 on page 3-105).

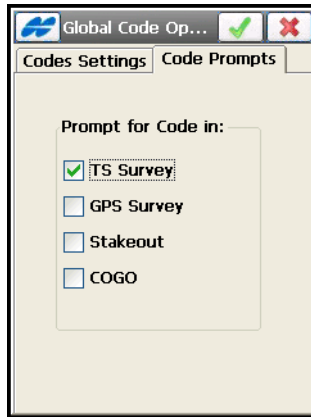


Figure 3-105. Code Prompts

## Stake Reports

Tap the **Stake Reports** icon to configure reports for staking. The *Stake Report Configurations* screen displays (Figure 3-106).

The *Stake Report Configurations* screen contains a list of default styles of reports. You can edit a default configuration or create a new one.

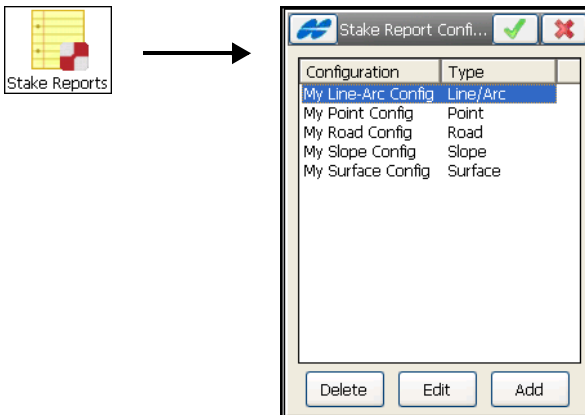

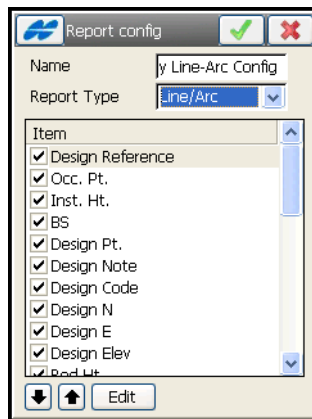


Figure 3-106. Stake Report Configuration


- **Delete** – deletes the highlighted report configuration.
- **Edit** – opens the **Report Configuration** screen to edit the configuration settings (Figure 3-107 on page 3-106).
- **Add** – opens the **Report Configuration** screen to create a new report configuration.
- Pressing the ok  button saves configuration settings and returns to the main menu.

## Report Configuration

The **Report Configuration** screen allows editing default reports and creating new reports on staking lines, points, roads, slopes, and surfaces (Figure 3-107 on page 3-106).



**Figure 3-107. Edit Stake Report**

- **Name** – the editable name of the report configuration.
- **Report Type** – selects the report type.
- **Item** – list of items of information the report reflects. Check the appropriate boxes to define if the items are shown in the reports.
- **Edit** – allows editing the name of the highlighted item. Tap the **Edit** button or just tap the item to open the editable field (see Figure 3-108 on page 3-107).
-  – allows moving items up and down.



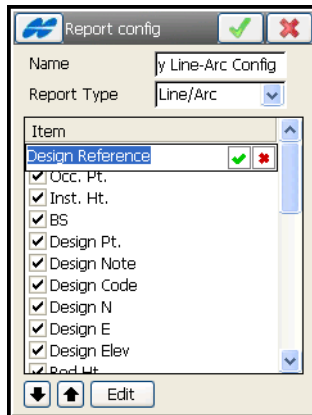
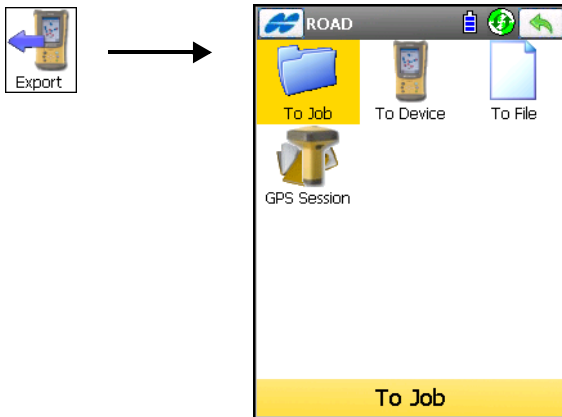


Figure 3-108. Edit Item of Stake Report



# Exporting Data





To export data, tap the **Export** icon in the main menu (Figure 4-1).




**Figure 4-1. Export Menu**

The **Export** folder contains the following options (Table 4-1):

**Table 4-1. Export Menu Icons**

Icon	Description
	To Job – exports data from an active job to a new job. For details on this option, see “Exporting To a Job” on page 4-2.
	To Device – exports job data to another controller. For details on the option, see “Exporting to Device” on page 4-11.
	To File – exports data to a file. For details on the option, see “Exporting to File” on page 4-13.
	GPS Session – exports GPS session settings to the receiver. For details on the option, see “Exporting GPS Session” on page 4-60.

The Export function is used to save points, codes and attributes, code libraries, roads, cross section templates, point lists, localization data, road survey, and raw data in another job, controller, or file.



Tap the Help Icon  to open a pop-up menu, giving access to the help files, module activation codes, port data logging, changing menu interface, and information about TopSURV (for details see “Help Icon’s Pop-up Menu” on page 1-9).

## Exporting To a Job

To export data to a job, tap the **To Job** icon.

### Select a Job

The **Select Job** screen (Figure 4-2) selects the destination job to export to.

- *Job List* – a list of jobs to open.
- *Created/Modified* – shows the date the file was created and when it was last modified.
- **Browse** – tap to select a job from the disk. if there is no job in the Job List that you want.
- Pressing the **Select** or ok  button starts the export process wizard.  
Follow the wizard’s **Next** button until the ok  button is available.
- **New** – tap to create a new job to which to export data from the current job.
- **Exit** – returns to the main icon menu.

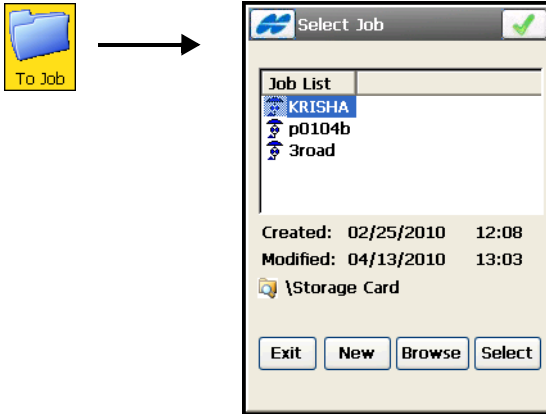


Figure 4-2. Select Job

## Export To the Job

On the *To <Job name>* screen (Figure 4-3), select the data that you want to have exported along with the point data.

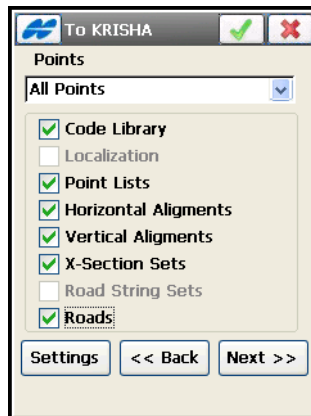




Figure 4-3. Export To Job

- *Points* – select the points to import from the drop-down list; either *All Points*, *By Type*, *By Range and Code*, *By Type, Range and Code*, or *None*.

- Check mark the data to be imported along with the points; either *Code Library*, *Localization*, *Point Lists*, *Horizontal Alignments*, *Vertical Alignments*, *X-Section Sets* or *Roads*.
- **Settings** – opens a dialog to select to export points as either *Design* or *Control* (see Figure 5-4 on page 5-4).
  - *Design Points*: points used as targets for stakeout.
  - *Control Points*: points with coordinates, known from the catalog; used for localization.
- **Back** – returns to the previous screen.
- **Next** – depending on data selections, opens an appropriate screen to select either *Point Types Point*, *Point List*, *Horizontal Alignments*, *Vertical Alignments*, *X-Section Sets* or *Roads* to export.
- Pressing the exit  red x button closes the dialog without saving the settings and returns to the previous dialog.
- Pressing the **Select** or ok  button starts the export process only if *Code Library* and/or *Localization* items are chosen and *All Points* is selected. Otherwise, the option becomes available after all data are selected by the **Next** button.

## Select Point Types To Export

The *Point Type(s) To Export* screen (Figure 4-4) selects the types of points to export if points filter by type has been enabled in the *Export* screen. Place check marks near the desired point types.

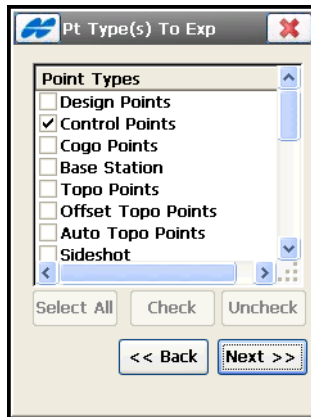



Figure 4-4. Select Point Type(s) to Export

- *Point Types* – the point types available for import: either *Design Points*, *Control Points*, *Cogo Points*, *Base Station*, *Topo Points*, *Offset Topo Points*, *Auto Topo Points*, *Sideshot*, *Offset*, *Remote*, *Reflectorless*, *BackSight*, *Stake Points*, *Stake Line*, *Check Points*, *Manually Typed*, or *Tape Dimension*.
- **Check** – marks the highlighted entries.
- **Uncheck** – removes the mark from the highlighted code.
- **Back** – returns to the previous screen.
- **Next** – if available, opens the next screen to select objects; once the button becomes grayed out, tap the **Finish** button to start the export process.
- Pressing the exit  red x button closes the dialog without saving the settings and returns to the previous dialog.

## Select Points to Export

The *Points to Export* screen (Figure 4-5) filters the exported points.

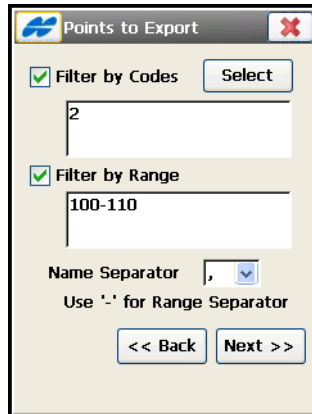




Figure 4-5. Points to Export

- *Filter by Codes* – export all points with the selected codes.
- **Select** – opens the *Code* screen (Figure 4-6 on page 4-7).
- *Filter by Range* – selects a range of points to export. These can be set by range or by enumeration.
- *Name Separator* – selects a parameter to use as a name separator,
- *Use '-' for Range Separator* – shows the separator used as a range separator.
- **Back** – returns to the previous screen.
- **Next** – opens the next screen to select data. The button is available until all data of chosen types is selected. After the Next button becomes greyed out, the ok  button appears to open the *Export Status* screen and start the export process.
- Pressing the exit  red x button closes the dialog without saving the settings and returns to the previous dialog.



## Select Code

The *Code* screen (Figure 4-6) contains a list of available codes. All codes that have been check marked are imported.

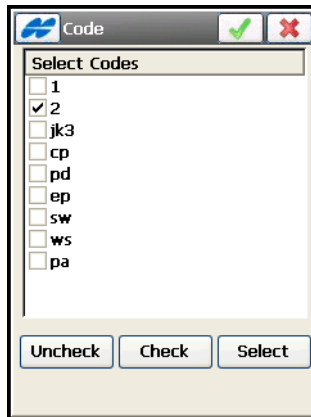




Figure 4-6. Select Code

- **Uncheck** – removes the mark from the highlighted code.
- **Check** – marks the highlighted codes.
- Pressing the **Select** or ok  button returns to the *Points to Export* screen with the codes selected.
- Pressing the exit  red x button closes the dialog without saving the settings and returns to the previous dialog.

## Select Point List to Export

The *Pt List To Export* screen (Figure 4-7) selects the point lists to export only points from the point list(s) selected along with other data chosen.

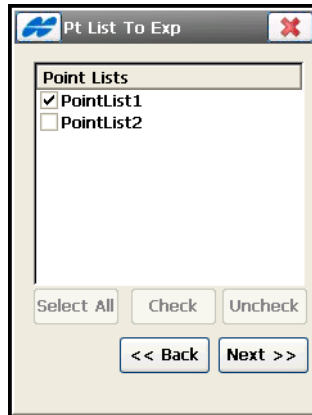




Figure 4-7. Select Point List to Export

- *Point Lists* – the list of available point lists in the job.
- **Select All** – highlight all the lists at a time.
- **Check** – marks the highlighted entries.
- **Uncheck** – removes the mark from the highlighted entries.
- **Back** – returns to the previous screen.
- **Next** – available if other data is chosen to export on the *To Job* screen (Figure 4-3 on page 4-3). Opens the next screen to select other objects (horizontal alignments, vertical alignments, roads or x-section sets) which are similar to the *Point List to Export* screen.
- Once the ok  button becomes available, tap this button to open the *Export Status* screen and start the export process.
- Pressing the exit  button closes the screen without saving the settings.



The screens are identical for all other possible objects to export: horizontal and vertical alignments, x-section sets and roads.

## Export Status

The *Export Status* screen (Figure 4-8) reflects the export process and contains a progress bar and a comments window. The progress bar displays the percentage of the data being exported.

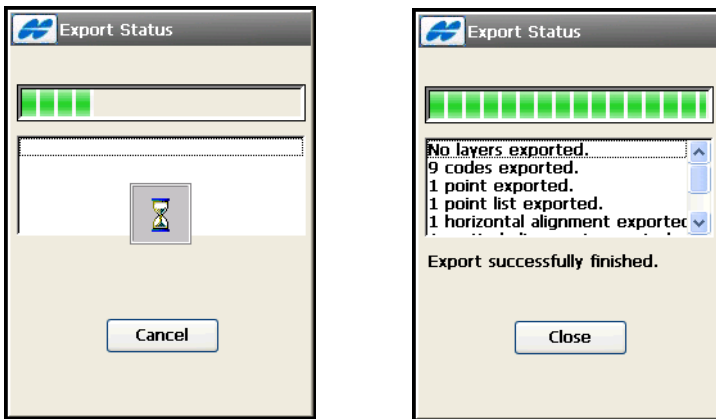


Figure 4-8. Export Status

- **Cancel** – cancels the export process.
- **Close** – returns to the main screen.

## Duplicate Objects

If the existing job contains objects with the same names as the job that the objects are exported to, the *Duplicate <Objects>* screen displays a warning that the object already exists (Figure 4-9 on page 4-10).

The *Duplicate <Objects>* screen issues a warning that prevents the loss of points, roads, or point lists when names of these exported objects coincide with existing ones. Select from the following options:

- *Overwrite* – the exported object overwrites the existing one.

- *Rename* – the imported object is renamed. The new name should be noted in the corresponding field (*Start Name*).
- *Prefix/Suffix* – the imported object differs from the existing object by prefix or suffix. The prefix/suffix should be noted in the corresponding field.

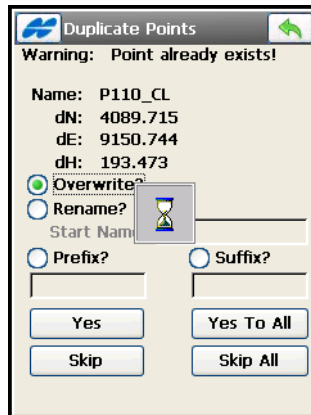



Figure 4-9. Duplicate <Objects>

- **Yes** – press to accept the decision.
- **Yes To All** – press to accept the same decision for all similar cases.
- **Skip** – press to skip the object without exporting.
- **Skip All** – press to skip all the objects with names that coincide with the names of existing objects, without exporting.
- The back  button disables the export process and opens the *Export Status* screen to remove all the objects already exported.

# Exporting to Device

To export a file to a controller, tap the **To Device** icon.

## Selecting Port

On the *Settings* screen (Figure 4-10) you can select the port for data transfer with another controller.

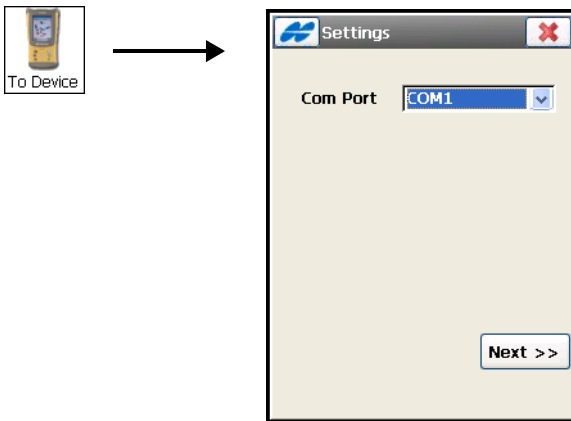


Figure 4-10. Select Port

- *Com Port* – selects the Communication port; select either *COM1*, *COM2*, *Ethernet* or *Bluetooth*.
- **Next** – opens the *Select File* screen (Figure 4-11 on page 4-12).

## Select File To Export

On the *Select File* screen, you can navigate to any file to export after selecting *All Files* in the *Type* field (Figure 4-11).

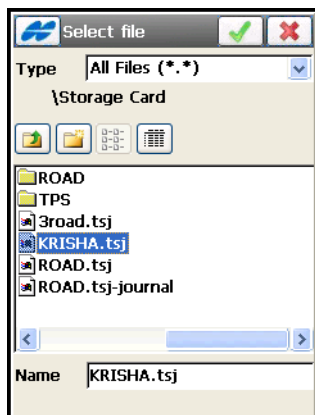




Figure 4-11. Select File to Export

- The ok  button – opens the *Export File* screen reflecting the status of exporting the selected file (Figure 4-12), then returns to the main screen if successful.
- The exit  button – closes the screen and returns to the *Settings* screen.

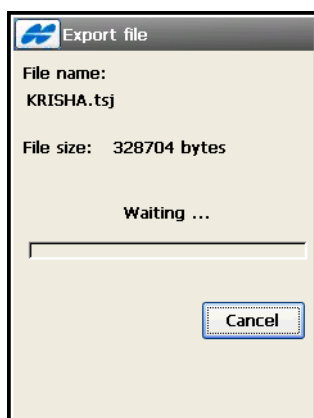
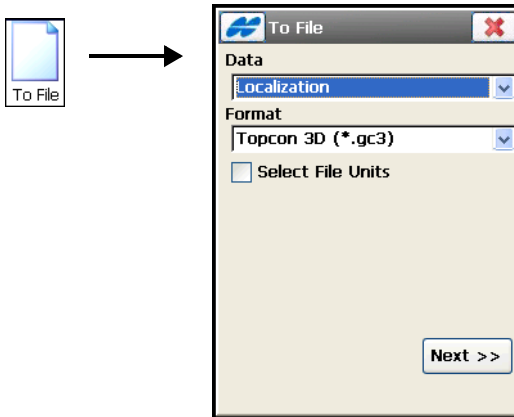


Figure 4-12. Export File

# Exporting to File

To export data to a file, tap the **To File** icon.

The **To File** screen selects data type from the current job to export to files of either pre-defined or custom formats. For a description of these formats, see Appendix A (Figure 4-13).



**Figure 4-13. Export To File**

- **Data** – select the data type to export: either *Points*, *Lines*, *Areas*, *Point Lists*, *Code Library*, *Raw Data*, *Horizontal Alignments*, *Vertical Alignments*, *X-Section Sets*, *Roads*, *X-Section Templates*, *Localization*, *Scanning Data*, *Roads Survey*, *Job History*, *TINs*, *Layer States*, or *Multiple*.
- **Format** – select the file type to which to export data.
- **Select File Units** – when this checkbox is selected, the **Next** button opens the **File Units** screen that allows selecting units for the data exported (Figure 4-14 on page 4-14).



This option is available for all data types and formats containing distance/angular values. Depending on the data and format selected, you can set only distance, or distance and angle units if they are available for setting.

- **Next** – opens the *To < name of Format >* screen to specify the file name and the directory where the file will be saved.

Follow up the export process with the help of the export wizard.

## File Units

The *File Units* dialog is used to select units for the data exported. Selections available depend on data and format being exported.

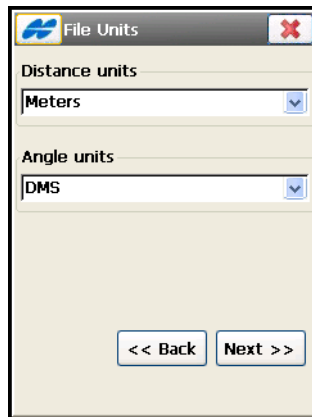


Figure 4-14. File Units

- *Distance Units* – if available for selection, you can choose from *Defined in the File*, *Meters*, *IFeet*, *US Feet*, *IFeet and Inches*, *US Feet and Inches*. The list changes depending on the file format selected.
- *Angle Units* – if available for selection, you can choose from *DMS*, *Grads (Gons)*, *Radians*, *Mils*, *Decimal Degrees*, *Defined in the file*.
- **Back** – returns to *To File* the screen without saving the settings.
- **Next** – opens the *To < name of Format >* screen.



## Points

For Point data, the following exports are allowed for the formats:

*Topcon Text Custom (\*.txt), Text Custom Report (\*.txt), Topcon Text Custom QC (\*.txt), Topcon FC-4 (\*.fc4), Topcon FC-5 (\*.fc5), Topcon GTS210/310/10 (\*.xyz), Topcon GTS-6 (\*.gts6), Topcon FC-6/GTS-7 (\*.pnt), Topcon GTS-7 with strings (\*.txt), Topcon GT (\*.pnt), Topcon GT Finland (\*.gt), Topcon 3DMC (\*.pt3), Topcon 3DMC Project (\*.tp3), AutoCAD DXF (\*.dxf), AutoCAD 2000 Drawing (\*.dwg), ESRI Shape (\*.shp), TDS (\*.cr5), LandXML (\*.xml), MOSS GENIO (\*.mgn), Cut Sheet Standard (\*.txt), Cut Sheet User Defined (\*.txt), Check Sheet (\*.txt), PTL Sheet (\*.txt), NEZ (\*.csv), NEZ with strings (\*.csv), CMM (\*.cor), MMH360 (\*.360), MML-ETRS (\*.mml), KOF (\*.kof), MMH360\_Z000 (\*.360), Microstation 95/ISFF (\*.dgn), SBG Pxy (\*.PXY), SBG Geo (\*.Geo), and Sokkia SDR33 (\*.sdr).*

For Points for most formats the **To File** screen (Figure 4-15 on page 4-16) has the following options.

- **Select File Units** – check mark this option to select units for the data exported (Figure 4-14 on page 4-14). Depending on the data and format selected, you can set only distance, or distance and angle units if they are available for setting.
- **Select Types Of The Points** – check mark this field if not all types of points should be exported. In this case the **Point Types to Export** screen first displays (see Figure 4-4 on page 4-5).
- **Use Filters** – check mark this field if filters (by code and by range) should be used for exported points.

In this case, the **Points to Export** screen first displays (see Figure 4-5 on page 4-6).

- **Next** – opens the **To <name of Format>** screen to set the destination file.

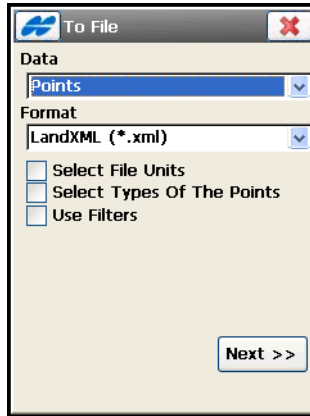


Figure 4-15. Points to File

The options, which are available on the *To File* screen, depend on the format selected. Refer to the following sections for detail.

## Topcon Text Custom

If the *Text Custom* format is selected, the *To File* screen (Figure 4-16) shows the *ASCII File Properties* field.

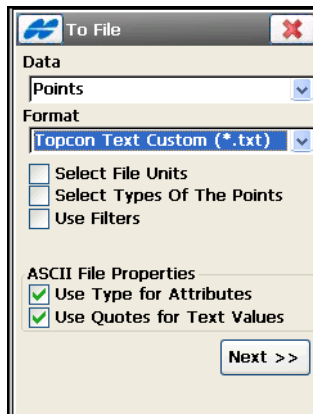


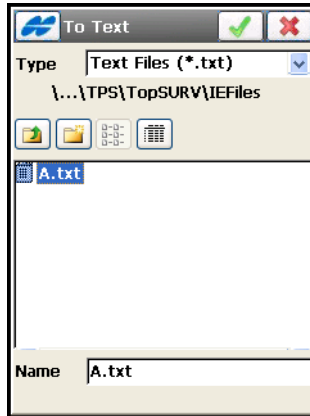
Figure 4-16. Points to Text File

- *ASCII File Properties* – defines the conditions of the exported file interpretation.


Check and enable *Use Type for Attributes* and *Use Quotes for Text Values* (one or both). These conditions use the same type for the attributes and quotes for the text values.

- **Next** – opens the *To Text* screen (Figure 4-17).

**On the To Text** screen (Figure 4-17), select a destination directory and the name of the created file.



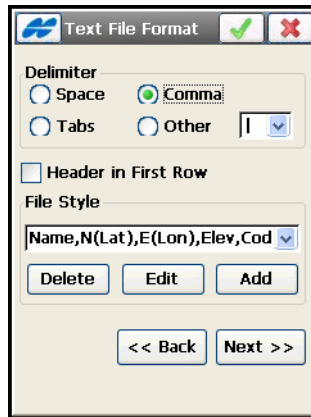
**Figure 4-17. Select the File**

- *Type* – specifies the file extension (file type).
- *Name* – the name of the created file.
- The ok  button – opens the *Text File Format* screen.


**On Text File Format** screen (Figure 4-18), select a desired text format.

- *Delimiter* – enables the delimiting symbol between the data in the exported file; either *space*, *comma*, *tabs* or *Other* delimiter selected from the list.
- *Header in First Row* – enable to output a header in the file.
- *File Style* – selects the order of fields in the exported file.
- **Delete** – deletes an existing file format.
- **Edit (Format)** – edits an existing file format. The *Custom Style* screen displays (Figure 4-19 on page 4-19).


- **Add (Format)** – adds a new file format. The *Custom Style* screen (Figure 4-19 on page 4-19) displays.



**Figure 4-18. Text File Format**

- **Back** – returns to the previous screen.
- **Next** – opens the *Coordinate System* screen (Figure 4-20 on page 4-19).
- The ok  button – press to start the export process (Figure 4-22 on page 4-21).

**On the Custom Style** screen (Figure 4-19 on page 4-19), using the arrows, move items at the bottom of the *Available* column to the *Order* column and arrange in the preferred order with the *Up* and *Down* arrows to the right of the *Order* column.

- **Save** – saves the custom file format and returns to the *Text File Format* screen. A new entry appears in the *File Style* drop-down menu.
- The back  button returns to the previous screen without changes being made.

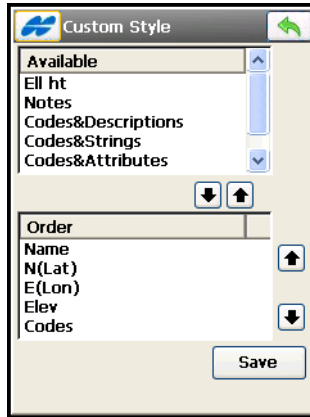


Figure 4-19. Custom Style

On the **Coord System** screen (Figure 4-20 on page 4-19) select the coordinate type for the data in the file exported. This screen first displays information about the coordinate system in the job whose data is exported.

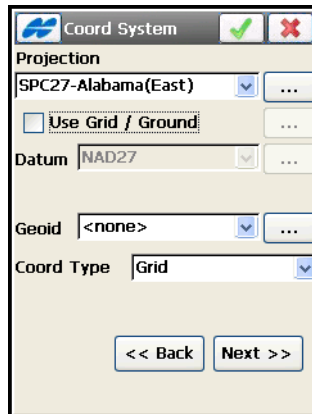




Figure 4-20. Coordinate System

- *Coord Type* – select either WGS84 (Lat/Lon/Ht), Datum (Lat/Lon/Ht), Grid, or Ground.
- **Back** – returns to the previous screen.

- **Next** – opens the *Units Format* screen (see Figure 4-21 on page 4-20).
- The ok  button opens the *Export Status* screen and starts the export process. (See Figure 4-22 on page 4-21.)

**On the Units Format** screen (Figure 4-21 on page 4-20), select from the drop-down list the format for coordinates you want to represent in the data exported.

- *Format (Lat/Lon)* – select the format for degrees in Latitude and Longitude. It can be *ddd. (decimal)*, *ddd.mmsssssss*, *ddd mm ss.sssss*, or *dddmmss.sssss*
- *Plane coordinates precision* – select fractal length (precision) for plane coordinates from *0.0* to *0.00000000*.
- *Elevation precision* – select fractal length (precision) for height from *0.0* to *0.00000000*.
- **Back** – returns to the previous screen.
- The ok  button opens the *Export Status* screen and starts the Export process (see Figure 4-22.)

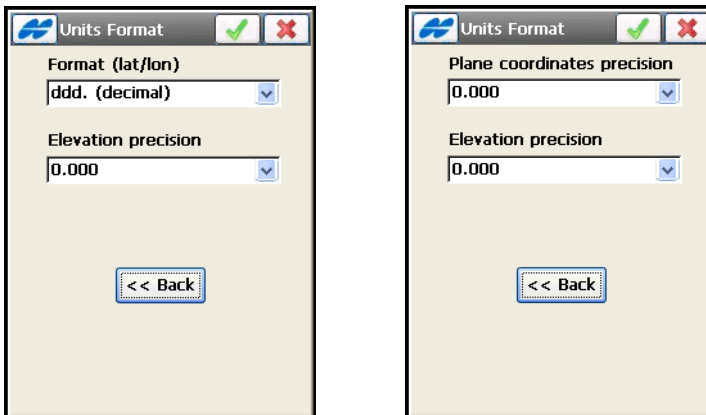


Figure 4-21. Units Format

On the **Export Status** screen (Figure 4-22), tap the **Close** button to return to main screen.

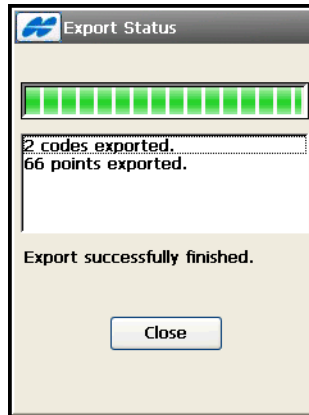


Figure 4-22. Export Status

## Text Custom Report, Sokkia SDR33 and Topcon 3DMC Project

Note that text custom report files cannot be imported back to TopSURV. If one of these formats is selected, the *To File* screen contains the **Code Style** button (Figure 4-23).

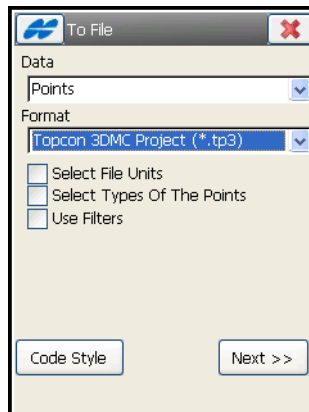



Figure 4-23. To Text Custom Report

- **Code Style** – opens the *Code Style* screen to set a format for point properties (codes, control codes, strings and notes) to export to the file (Figure 4-24).
- **Next** – with the help of the export wizard, follow next screens which are similar to those for the Topcon Text Custom format.

**On the Code Style** screen (Figure 4-24), select or create a desired format for information on every point to arrange it on one line in the exported file.

- **Style** – selects a defined format style. The pre-defined styles are: *Topcon*, *Carlson*, *GeoPAK* and *Eagle Point*.
- Using the arrows, move items from the *Available* column to the *Order* column and arrange in the preferred order.
- **Separators** – opens the *Separators* screen to edit separators for a selected style (Figure 4-25 on page 4-23).
- **Control Codes** – opens the *Control Codes* screen to edit control codes for a selected style.
- The back  button returns to the previous screen without changes made.
- **Delete** – deletes the selected style from the list.
- **Save** – saves the custom report format and a new entry appears in the *Style* drop-down menu.

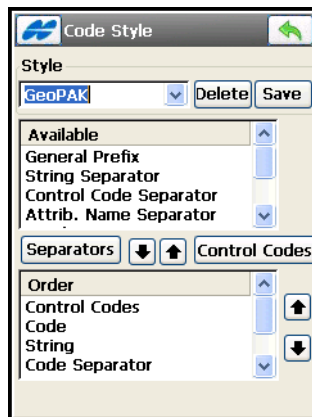
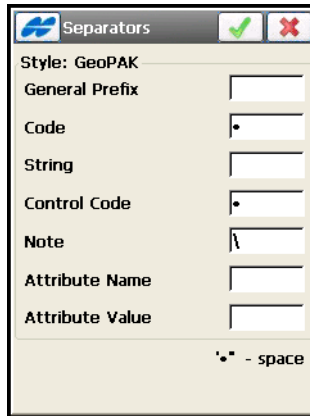


Figure 4-24. Code Style



On the **Separators** screen (Figure 4-25), you can edit separators for *Code*, *String*, *Control Code*, *Note* and *Attributes* for a selected code style.

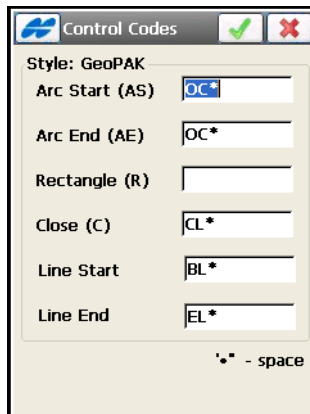
The image shows a dialog box titled "Separators" with a blue icon on the left and green and red checkmark buttons on the right. The "Style" is set to "GeoPAK". Below this, there are seven rows, each with a label and a text input field: "General Prefix", "Code", "String", "Control Code", "Note", "Attribute Name", and "Attribute Value". The "Code" and "Control Code" fields contain a space character followed by an asterisk. The "Note" field contains a backslash followed by an asterisk. At the bottom right, there is a legend: ".\* - space".

Label	Value
Style	GeoPAK
General Prefix	
Code	.*
String	
Control Code	.*
Note	\.*
Attribute Name	
Attribute Value	

.\* - space

Figure 4-25. Separators

On the **Control Codes** screen (Figure 4-26), you can edit control codes in the package of the selected code style.

The image shows a dialog box titled "Control Codes" with a blue icon on the left and green and red checkmark buttons on the right. The "Style" is set to "GeoPAK". Below this, there are seven rows, each with a label and a text input field: "Arc Start (AS)", "Arc End (AE)", "Rectangle (R)", "Close (C)", "Line Start", and "Line End". The "Arc Start (AS)" field contains "OC\*", "Arc End (AE)" contains "OC\*", "Close (C)" contains "CL\*", "Line Start" contains "BL\*", and "Line End" contains "EL\*". At the bottom right, there is a legend: ".\* - space".

Label	Value
Style	GeoPAK
Arc Start (AS)	OC*
Arc End (AE)	OC*
Rectangle (R)	
Close (C)	CL*
Line Start	BL*
Line End	EL*

.\* - space

Figure 4-26. Control Codes

## Topcon Text Custom QC

The procedure of exporting points and point lists to the Topcon Text Custom QC format is the same as for the Topcon Text Custom format. For details, see “Topcon Text Custom” on page 4-16. The only difference is that this format allows for parameters of Quality Control in the *Custom Style* screen: (Figure 4-27).

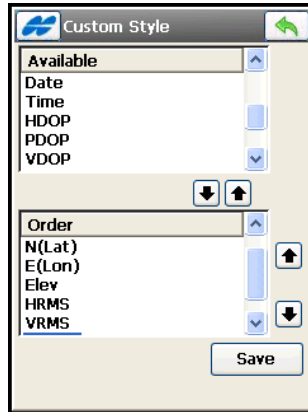


Figure 4-27. Custom Style with QC

## AutoCAD DXF and AutoCAD 2000 Drawing

If the *AutoCAD DXF* or *AutoCAD Drawing* format is selected, the *To File* screen has the following options for point export.

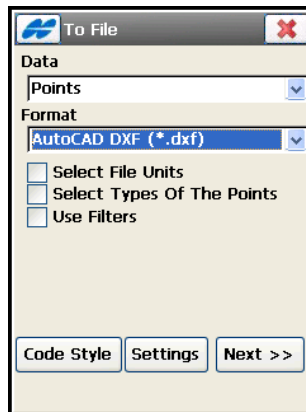

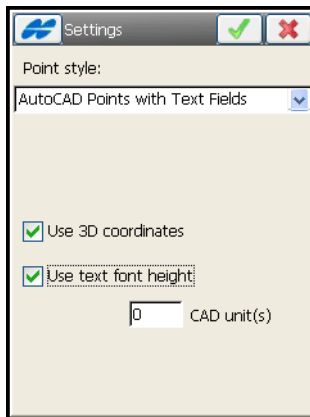


Figure 4-28. To AutoCAD DXF


- **Code Style** – opens the *Code Style* screen to set a format for point properties (codes, control codes, strings and notes) to export to the file. For details, refer to “On the Code Style” on page 4-22.
- **Settings** – opens the *Settings* screen to select point styles.
- **Next** – with the help of the export wizard, follow next screens to export points.
- The exit  button closes the screen without saving the settings.

**On the Settings** screen, you select desired drawing styles to represent points.



**Figure 4-29. Settings**

- **Point Style** – selects the drawing style to represent points in AutoCAD:
  - *AutoCAD Points* – displays points as positions without icons and descriptions such as names, elevations, codes and attributes.
  - *AutoCAD Points with Text Fields* – displays points with descriptions such as names, elevations, codes and attributes. Each description is given in text format and on a separate layer. For this point style AutoCAD does not decode descriptions for points, it only provides text fields for them.

- *Carlson Point Blocks* – displays points and descriptions for them as block references.
- *TopSURV Point Blocks* – displays points with the names as block references.
- *Use 3D coordinates* – check mark this box to use 3D coordinates.
- *Use text font height* – check mark this box to open a field to manually/automatically set the height of text fonts to show the text (in CAD units).
- The ok  button saves the settings and returns to the previous screen.

## ESRI Shape

If the *ESRI Shape* format type is selected, the **To File** screen has the *Store Description as Attribute* option to save code descriptions as attributes in the file (see Figure 4-30).

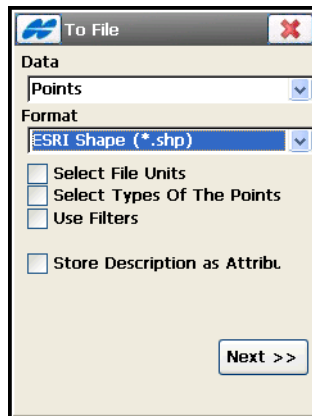


Figure 4-30. ESRI Shape

Shapefiles spatially describe geometries: points, lines, and areas. A shapefile is actually a set of several files: mandatory four files (\*.shp, \*.shx, \*.dbf, \*.clf) and some optional files. A set is created for forms lying on one layer and having the same code.

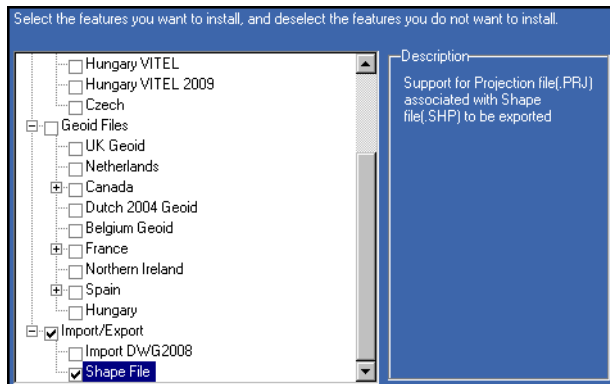
While exporting, TopSURV creates a set of four mandatory files for every code and named by the given code in the same selected

directory. Also in this directory, a folder that contains all photo notes exported with the points is created.

Having projection data, TopSURV additionally creates a \*.prj file associated with the shapefile (\*.shp) being exported. If this file is required, select the corresponding option while installing TopSURV.



The SHP support libraries are optional installation files, available for selection during install. They require 4MB of storage and should not be used where memory is limited. The additional support files will be installed as a separate process after the initial install of the program is completed.



**Figure 4-31. Support for Shape File Export**

- **Next** – the export wizard follows next screens to export points.

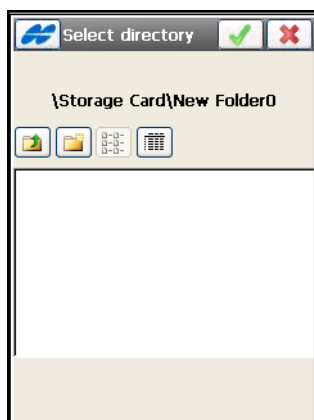


Figure 4-32. Select Directory

## TDS

If the *TDS* format is selected, the *To File* screen has an option to rename points with alphanumeric names on export.

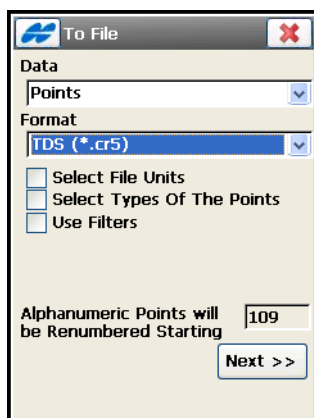


Figure 4-33. To TDS

- *Alphanumeric Points will be Renumbered Starting* – the field displays a number at which TopSURV will start renaming points with alphanumeric names as the TDS format demands points have only numerical names. TopSURV will continue numbering from the last previous number of the job point.

## Lines

For Lines data, the export is allowed for the formats: *Topcon Text Custom (\*.txt)*, *Topcon 3DMC (\*.ln3)*, *Topcon 3DMC Project (\*.tp3)*, *AutoCAD DXF (\*.dxf)*, *AutoCAD 2000 Drawing (\*.dwg)*, *ESRI Shape (\*.shp)*, *LandXML (\*.xml)*, *KOF (\*.kof)*, *Topcon 3D Linework (\*.ln3)*, *Microstation 95/ISFF (\*.dgn)*, *MX GENIO (\*.txt)*, *SBG Pxy (\*.PXY)* or *SBG Geo (\*.Geo)*.

For Lines data and for most formats the **To File** screen (Figure 4-34) has the following options.

- **Select File Units** – check mark this option to select units for the data exported (Figure 4-14 on page 4-14).  
Depending on the data and format selected, you can set only distance, or distance and angle units if they are available for setting.
- **Export Areas as Lines** – check mark this field if areas should be exported as lines.

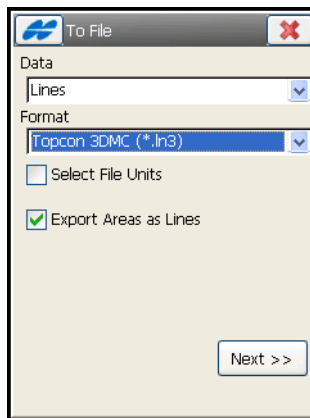



Figure 4-34. Lines to File

- **Next** – opens the **To < name of Format >** screen to set the destination file.
- The exit  button closes the screen without saving the settings.

The options on the *To File* screen depend on the format selected for export of lines from the current job. These options are much similar to those available for export of Points data. For example, refer to “Topcon Text Custom” on page 4-16 for details on exporting to the Topcon Text Custom format.

### AutoCAD DXF and AutoCAD 2000 Drawing

If the *AutoCAD DXF* or *AutoCAD Drawing* format is selected, the *To File* screen has the following options for line export (Figure 4-35).

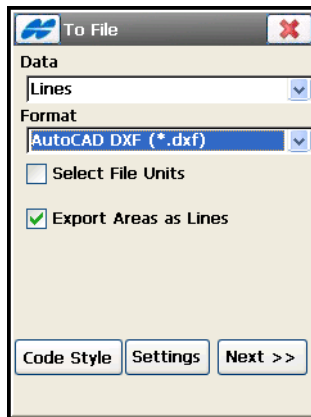




Figure 4-35. To AutoCAD DXF

- *Select File Units* – check mark this option to select units for the data exported (Figure 4-14 on page 4-14).
- *Export Areas as Lines* – check mark this field if areas should be exported as lines.
- **Next** – opens the *To < name of Format >* screen to set the destination file.
- **Code Style** – opens the *Code Style* screen to set a format for line properties (codes, control codes, strings and notes) to export to the file. For details, refer to “On the Code Style” on page 4-22.
- **Settings** – opens the *Settings* screen to select line styles.



On the **Settings** screen, you can select desired drawing styles to represent lines.

- *Line Style* – selects the drawing style to represent lines:
  - *AutoCAD Lines* – displays lines without names.
  - *AutoCAD Lines with Text Fields* – displays lines, lines names, and vertex elevations.
  - *TopSURV Line Blocks* – displays lines with the lines names as block references.
- *Use 3D coordinates* – check mark this box to use 3D coordinates.
- *Use text font height* – check mark this box to open a field to manually/automatically set the height of text fonts to show the text (in CAD units).
-  – saves the settings and returns to the previous screen.
-  – closes the screen without saving the settings.

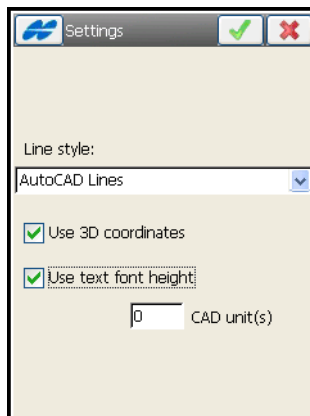


Figure 4-36. Settings

## ESRI Shape

Shapefiles spatially describe geometries: points, lines, and areas. A shapefile is actually a set of several files: mandatory three files (\*.shp, \*.shx, \*.dbf) and some optional files. A set is created for forms lying on one layer and having the same code.

If the *ESRI Shape* format type is selected, the **To File** screen has the *Store Description as Attribute* option to save code descriptions as attributes in the file (see Figure 4-37 on page 4-33).

While exporting, TopSURV creates a set of four mandatory files for every code and named by the given code in the same selected directory. Also in this directory, a folder that contains all photo notes exported with the points is created.

Having projection data, TopSURV additionally creates a \*.prj file associated with the shapefile (\*.shp) being exported. If this file is required, select the corresponding option while installing TopSURV (see Figure 4-31 on page 4-27).



The SHP support libraries are optional installation files, available for selection during install. They require 4MB of storage and should not be used where memory is limited. The additional support files will be installed as a separate process after the initial install of the program is completed.

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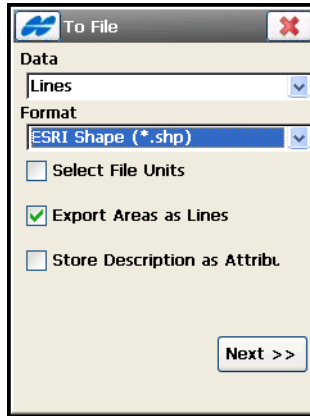


Figure 4-37. ESRI Shape

## Areas

For *Area* data, you can export data from *ESRI Shape (\*.shp)* files. The options are similar to those available for export of *Lines* data (see “ESRI Shape” on page 4-32). The only difference is absence of the *Export Areas as Lines* option.

## Point Lists

For *Point Lists* data, you can export points that included into point lists from the formats which are the same as for export of *Points* data (see “Points” on page 4-15). Also, the options for point types selection are similar to those available for export of *Points* data.

After selecting point types (if needed), the *Point List To Export* screen will display to choose desired point lists to export.

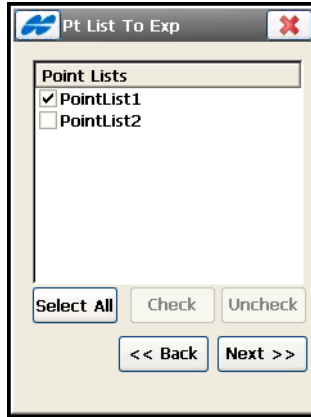


Figure 4-38. Point List To Export

- *Point Lists* – the list of available point lists in the job.
- **Select All** – highlight all the lists at a time.
- **Check** – marks the highlighted entries.
- **Uncheck** – removes the mark from the highlighted entries.
- **Next** – opens a screen to set the destination file.

## Code Library

For Code Library data, the export is allowed for the formats: *Topcon XML (\*.xml)*, *DBF (\*.dbf)*, *Topcon Text Custom (\*.txt)*, or *Carlson (\*.FCL)*.

Code Library is a set of codes with attributes used in the job.

## Raw Data

For Raw Data, the following formats are available on the *To File* screen:

*LandXML (\*.xml)*, *Topcon FC-5 (\*.fc5)*, *Topcon GTS210/310/10 (\*.raw)*, *Topcon GTS-6 (\*.gts6)*, *Topcon FC-6/GTS-7 (\*.gts7)*, *Topcon GTS-7 + (\*.gts7)*, *SurvCE (\*.RW5)*, *TDS (\*.RAW)*, *MOSS Survey*

(*\*.txt*), *Field Book* (*\*.fbk*), *TVF* (*\*.tyf*), *TVF with Code Style* (*\*.tyf*), *KOF* (*\*.kof*), *Berlin GNSS-Messprotocoll* (*\*.txt*), *Berlin GNSS-Mittelwerte* (*\*.txt*), *Sokkia SDR33* (*\*.sdr*).

When using *LandXML*, *Topcon FC-6/GTS-7*, *Topcon GTS-7 +*, *SurvCE*, *TDS Raw Data*, *Field Book*, *KOF* or *Sokkia SDR33* format, you are able to choose the type of raw data to export: TS and/or GPS.

The formats *Topcon FC-5*, *Topcon GTS210/310/10*, *Topcon GTS-6*, and *MOSS Survey* are allowed for only TS raw data export.

The formats *TVF*, *TVF with Code Style*, *Berlin GNSS-Messprotocoll* or *Berlin GNSS- Mittelwerte* provide the export of only GPS data.

## To LandXML and KOF

When the *LandXML* (or *KOF*) format is selected to which to export the current job's raw data, the following options are available for selection on the **To File** screen (Figure 4-39 on page 4-36):

- *Select File Units* – if this box is marked with a tick, pressing the **Next** button opens a dialog to select units for the data exported (Figure 4-14 on page 4-14).
- *Export TS Raw Data* – check mark this option to enable export of TS data.
- *Export GPS Raw Data* – check mark this option to enable export of GPS data.
- **Next** – opens the **To < name of Format >** screen to set the destination file.

The above options are present on the *To File* screen for every format selected to export raw data.

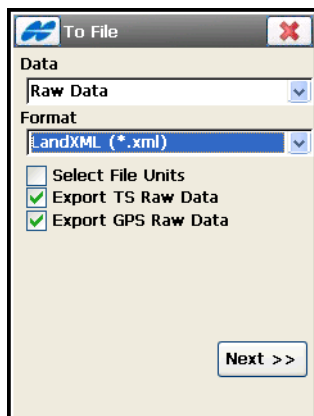


Figure 4-39. Raw Data To LandXML



Code, Attributes, String, Note, Control Code, Photo Name and Control flag are also exported with GPS and TS raw data into LandXML.

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## To Topcon FC-5, GTS210/310/10, GTS-6 and MOSS Survey

These formats are allowed only for TS Raw Data export (see Figure 4-40).

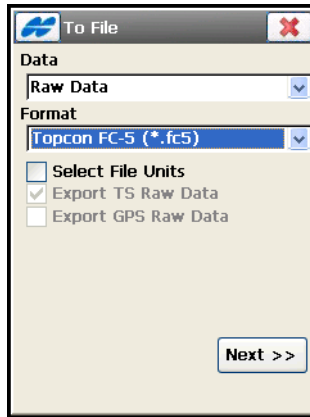


Figure 4-40. To Topcon FC-5

## To Topcon FC-6/GTS-7 and GTS-7+

When using *Topcon FC-6/GTS-7 (\*.gts7)*, *Topcon GTS-7 + (\*.gts7)* format, you are able to choose TS and/or GPS raw data to export, and to automatically replace all alphanumeric names with numeric ones during GPS Raw data export.

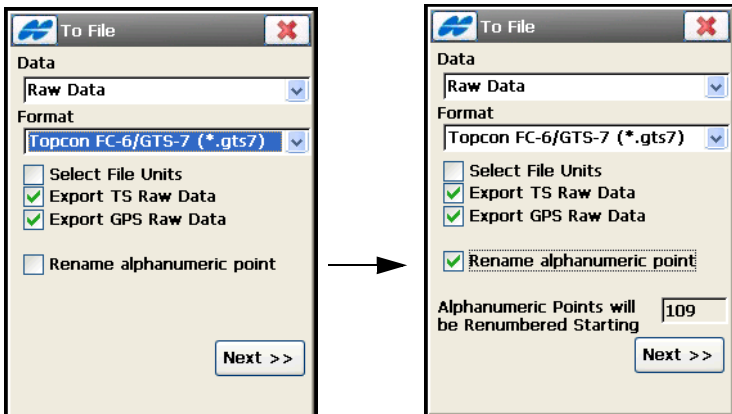


Figure 4-41. To Topcon FC-6/GTS-7

- *Rename alphanumeric point* – check mark this option to enable renaming points with alphanumeric names for numeric ones.

Putting a tick in this box will show the *Alphanumeric Points will be Renumbered Starting* field with a starting figure for numbering (see Figure 4-41 on page 4-37).

## To SurvCE

When using *SurvCE* (\*.RW5) format, you are able to choose TS and/or GPS raw data to export, and file units (Figure 4-42 on page 4-38). Two additional options allows you to:

- *Select Additional Point Types* – check mark this box to select additional point types to export: Design, Control, COGO and/or Manually entered points (Figure 4-43 on page 4-39).
- *Export GPS points as SP points* – check mark this box to save GPS points as manually entered points (Store Points in the Carlson SurvCE RW5 format).

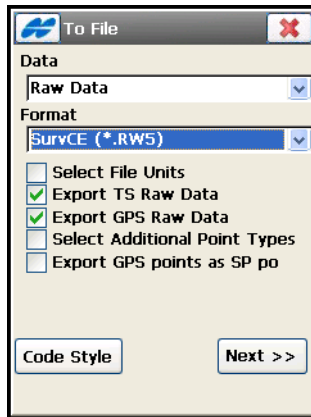


Figure 4-42. To SurvCE

**On the Points Types To Export** screen, you can additionally select point types (*Design, Control, Cogo, Manually Typed*) to store during export of raw data (Figure 4-43 on page 4-39).



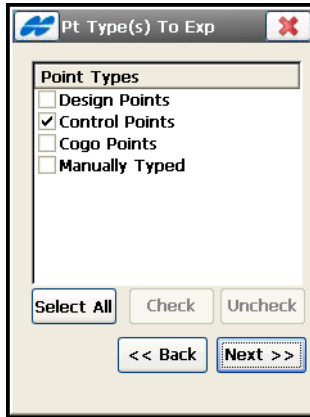


Figure 4-43. Points Types To Export

## To TDS

When using *TDS (\*.RAW)* format, you are able to choose TS and/or GPS raw data to export, and file units (Figure 4-42 on page 4-38).

The options available on the screen are as follows:

- *Select Additional Point Types* – check mark this box to select additional point types to export (Figure 4-43 on page 4-39).
- **Code Style** – pressing this button opens the *Code Style* screen to set a format for points information (codes, control codes, strings and notes) to export to the file. For details, refer to “On the Code Style” on page 4-22.
- *Control Codes as Notes* – check mark this box to export Control codes as notes. The *FBK Compatible* option becomes available for selection, and the Code Style button becomes inactive (see Figure 4-45 on page 4-40).
- *FBK Compatible* – when selected, the option demands points have only numeric names. The *Alphanumeric Points will be renumbered starting* field will appear (see Figure 4-45 on page 4-40).

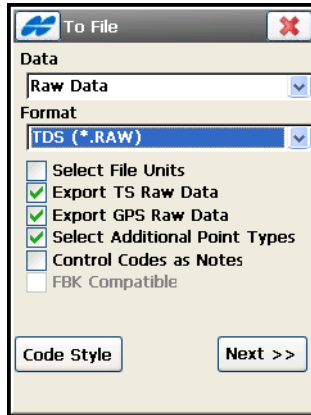


Figure 4-44. Export Raw Data To TDS

- *Alphanumeric Points will be renumbered starting* – the field displays a number at which TopSURV will start renaming points with alphanumeric names by numeric ones.

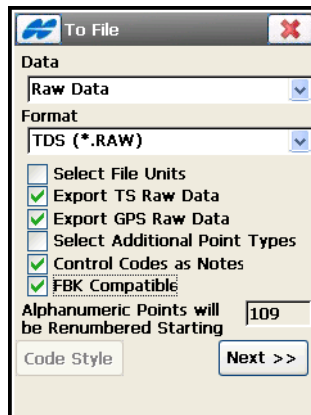


Figure 4-45. To TDS compatible with FBK

## To Field Book

When using *Field Book* (\*.fbk) format, you are able to choose TS and/or GPS raw data to export, and file units (see Figure 4-42 on page 4-38). Also the user can export points as manually entered:

- *Select Additional Point Types* – check mark this box to select additional point types to export (Figure 4-43 on page 4-39).

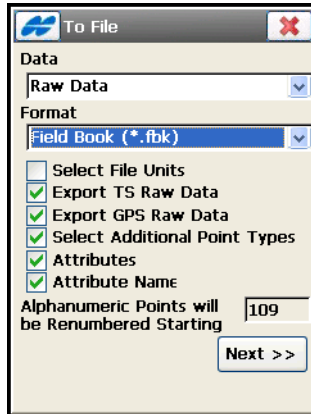


Figure 4-46. To Field Book

The FBK format demands points have only numeric names.

- *Alphanumeric Points will be renumbered starting* – this shows the next number after the last existing one at which TopSURV will start numbering alphanumeric points.
- *Attributes* – check mark to export attributes for the selected point types.
- *Attribute Name* – check mark to export the names of attributes.

## To Sokkia SDR33

When using *Sokkia SDR33* (\*.sdr) format, you are able to choose TS and DL data, and/or GPS raw data to export (Figure 4-47). You can set file units and export points as manually entered:

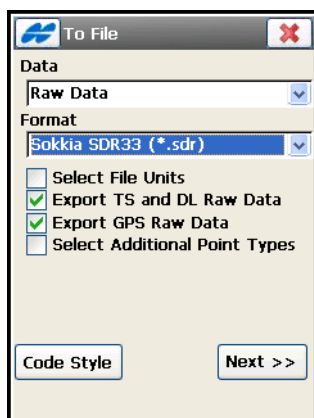


Figure 4-47. To Sokkia SDR33

Resection, Stakeout and Topography data are exported to this format.

## Horizontal Alignments

For Horizontal Alignments data, you can export to the following formats: *SSS* (\*.hal), *TopSURV* (\*.thl), *CLIP* (\*.PLT), or *ISPOL* (\*.ALI) from the *Format* drop-down list (Figure 4-48).

- *Select File Units* – if this box is marked with a tick, pressing the **Next** button opens a dialog to select units for the data exported (Figure 4-14 on page 4-14).

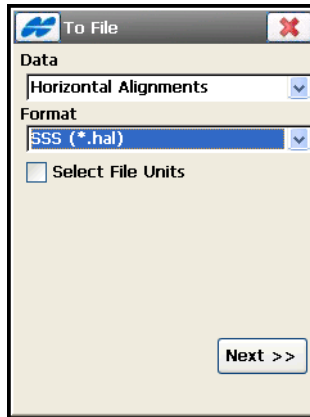


Figure 4-48. Horizontal Alignments

- **Next** – opens the *H.Alignments to Exp* screen to select alignments (see Figure 4-49 on page 4-43).

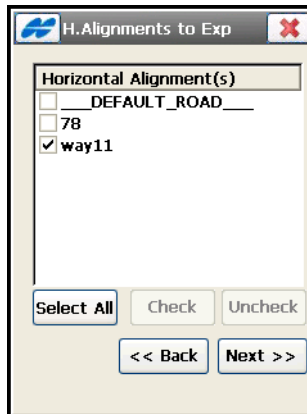


Figure 4-49. Select Horizontal Alignments

- *Horizontal Alignment(s)* – lists the available horizontal alignments in the job.
- **Select All** – highlight all the alignments at a time.
- **Check** – selects the highlighted entries.
- **Uncheck** – deselects the highlighted alignment.

- **Back** – returns to the previous screen.
- **Next** – opens the *Select directory* screen (Figure 4-50) to select the directory to save the file. The file will have the same name of the exported alignment.



Figure 4-50. Select Directory

-  – opens the *Export Status* screen and starts the export process.



For other road objects (vertical alignments, roads, x-section sets or x-sections templates), TopSURV opens similar screens when exporting them to files.

## Vertical Alignments

For Vertical Alignments data, you can export to the following formats: *SSS* (\*.val), *TopSURV* (\*.tvl), *CLIP* (\*.ALZ), or *ISPOL* (\*.RAS).

The steps to be taken are similar to those for export of horizontal alignments (see “Horizontal Alignments” on page 4-42).

## X-Section Sets

For X-Section Sets data, you can export to the following formats: *SSS (\*.rd)*, *TopSURV (\*.trd)*, *CLIP (\*.TRV)*, *ISPOL (\*.SC1)*, or *Custom (\*.cxs)*.

The steps to be taken are similar to those for export of horizontal alignments (see “Horizontal Alignments” on page 4-42).

## Roads

For Roads data, you can export to the following formats: *Topcon 3DMC (\*.rd3)*, *Topcon 3DMC Project (\*.tp3)*, *Land XML (\*.xml)*, *SSS (\*.hal; \*.val; \*.rd)*, *TDS (\*.rd5)*, *TopSURV (\*.thl; \*.tvl; \*.trd)*, *CLIP (\*.PLT; \*.ALZ; \*.TRV)*, *ISPOL (\*.ALI; \*.RAS; \*.SC1)*, *Tekla (\*.vgp)*, *MX GENIO (\*.txt)*, or *SBG (\*.LIN)*.

### To LandXML

For LandXML file, the To File screen has an additional option - *Use Zone elements for x-sections* (Figure 4-51).

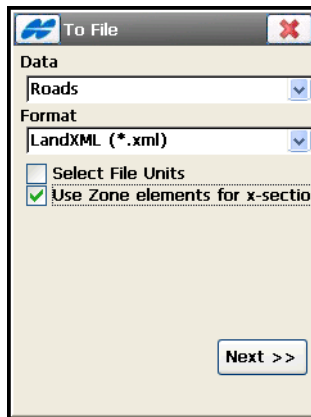


Figure 4-51. Roads to LandXML

- *Use Zone elements for x-sections* – if this box is check marked, X-Sections are stored as Zones.

- **Next** – opens the *Roads To Export* screen to select roads and then the *To <Format>* screen to set the file.



When exporting a job road data to LandXML, the road string sets are also included.

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## X-Section Templates

For X-Section Templates data, you can export to the following formats: *SSS (\*.xtl)*, *TDS (\*.tp5)*, or *TopSURV (\*.xst)*.

## Localization

For *Localization* data, you can export to the following formats: *Topcon 3DMC (\*.gc3)*, *Topcon 3DMC Project (\*.tp3)*, *TDS (\*.RAW)* and *Carlson (\*.loc)*.



Export File formats allow only *WGS84 -> Local* type of localization (for details, see “Localization” on page 8-9).

Control Points are exported together with Localization data.

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## Scanning Data

For *Scanning Data*, you can export all scanning data to *DI-3000 Project (\*.fsc)* (Figure 4-52).

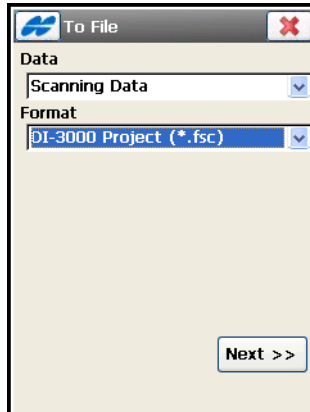


Figure 4-52. Scanning Data to File

## Roads Survey

You can export *Roads Survey* data to the following formats: *TopSURV X-Section Survey (\*.xss)* or *Find Chainage/Station Report (\*.txt)*.

## Job History

For Job History data, you can export to the following formats: *CSV (Comma delimited) (\*.csv)*, and *Text report (\*.txt)*.

The CSV file contains information on all operations performed in the job and the Text Report contains data about total station points and resection.

The Job History file is formed if the *Enable Job History* box is checked marked on the **Global Settings** screen (see “Setting Global Parameters for Job” on page 3-94).

## TINs Data

For *TINs* data, you can export to the following formats: *AutoCAD DXF* (\*.dxf), *AutoCAD Drawing* (\*.dwg), or *LandXML* (\*.xml).

TopSURV stores surfaces in TN3 files in the DTM directory. Select a desired TN3 file to export in the *Select TN3* screen (Figure 4-53).

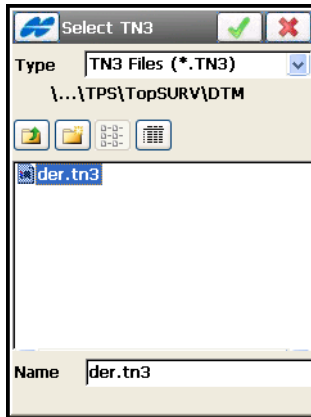



Figure 4-53. Select TN3

The  icon opens the *To <Format>* screen to select a destination directory and the name of the created file.

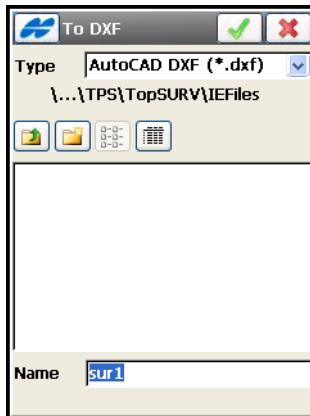


Figure 4-54. Export To DXF File

## Layer States

For *Layers* data, you can export to the following formats:  
*Topcon XML (\*.xml)*, *Autodesk (\*.las)*.

## Stakeout Reports

Stakeout reports can be exported to *CSV Report (\*.csv)* files.

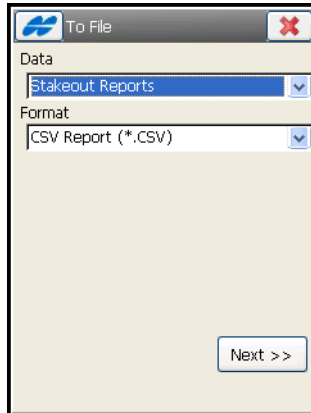


Figure 4-55. Export Stakeout Reports

- **Next** – opens the *Select Type To Export* screen to select the stakeout report type. Highlight the type and tap **Next**.

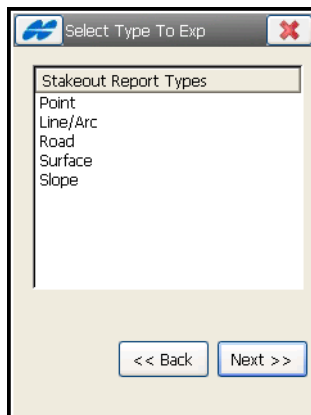


Figure 4-56. Select Report Type

- **Next** – opens the *Select Report To Export* screen to select the stakeout report. Highlight the report and tap **Next**.

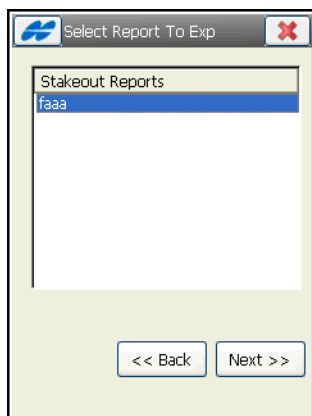


Figure 4-57. Select Report

- **Next** – opens the *Select Report To Export* screen to name the \*.CSV file to be saved on the disk.

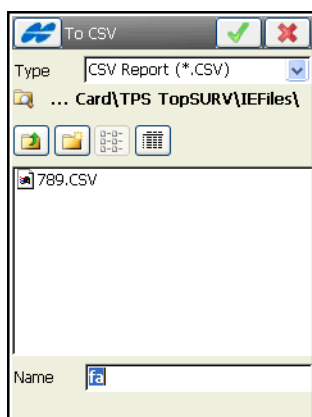



Figure 4-58. Save CSV File

Pressing the ok  button opens the Export Status screen that displays a successful message.

## Multiple Data

For *Multiple* data, you can export to the following formats:

*Topcon Text Custom (\*.txt)*, *AutoCAD DXF (\*.dxf)*, *AutoCAD Drawing (\*.dwg)*, *ESRI Shape (\*.shp)*, *LandXML (\*.xml)*, *KOF (\*.kof)*, *Microstation 95/ISFF (\*.dgn)*, *MX GENIO (\*.txt)*, *SBG Pxy (\*.PXY)*, or *SBG Geo (\*.Geo)*.

Each format is intended for storing a certain data group. Options specific for every data type in this group will be presented for Multiple data on the **To File** screen. The following options are common for all Multiple Data export screens:

- *Select File Units* – check mark this option to select units for the data exported (Figure 4-14 on page 4-14). This option is available on all export screens. Depending on the data selected, you can set only distance, or distance and angle units if they are available for setting.
- *Export Areas as Lines* – check mark this field if areas should be exported as lines.

### To Topcon Text Custom

This format can store points, codes, and lines data. The **To File** screen for Topcon Text Custom format displays (Figure 4-59 on page 4-52):

- *ASCII File Properties* – defines the conditions of the exported file interpretation.  
Check and enable *Use Type for Attributes* and *Use Quotes for Text Values* (one or both). These conditions use the same type for the attributes and quotes for the text values.

- **Next** – opens the *Data selection* screen to select data in the job to export (Figure 4-60 on page 4-52).

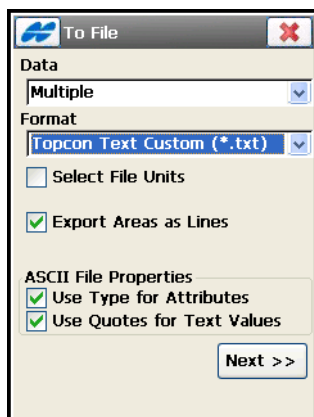


Figure 4-59. Multiple to Topcon Text

**On the Data Selection** screen, select a specific data group in the job available to export to Topcon Text Custom format. For this format Points, Codes, and Lines are available for selection.

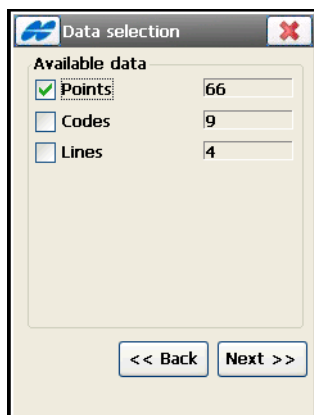


Figure 4-60. Data Selection for Topcon Text

- **Next** – opens the *Points selection* screen to select filters (by code and by range) which will be used for exported points.

On the **Point Selection** screen (Figure 4-61), select a filter to choose desired points on export by type, by range and code, by type, range and code.

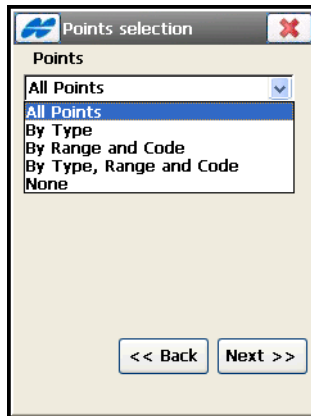


Figure 4-61. Points Selection

- **Next** – depending on the filter selected, can open first the *Point Types to Export* screen (see Figure 4-4 on page 4-5) and/or the *Points to Export* screen (see Figure 4-5 on page 4-6). And finally opens the *Point List To Export* screen (Figure 4-7 on page 4-8).

For the rest of steps, see “Points” on page 4-15.

## To AutoCAD DXF and Drawing

This format can store points, codes, lines, and surfaces data.

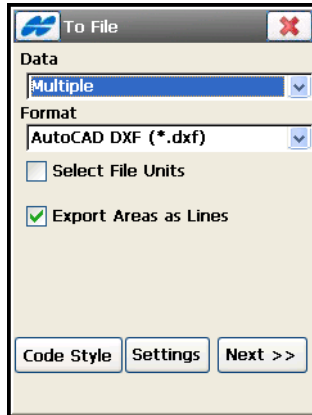


Figure 4-62. Multiple To DXF

TopSURV exports layers to DWG/DXF files, along with the appropriate data types.



TopSURV only exports to AutoCAD 2000 format DWG files.

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The **To File** screen for AutoCAD DXF and Drawing formats displays (Figure 4-62 on page 4-54):

- **Code Style** – opens the *Code Style* screen to set a format for data properties (codes, control codes, strings and notes) to export to the file. For details, refer to “On the Code Style” on page 4-22.
- **Settings** – opens the *Settings* screen to select line styles. For details, refer to “On the Settings” on page 4-25.
- **Next** – opens the *Data Selection* screen (Figure 4-63).



On the **Data Selection** screen, select a specific data group in the job available to export. For AutoCAD DXF and Drawing formats Points, Codes, Lines and Surfaces can be available for selection.

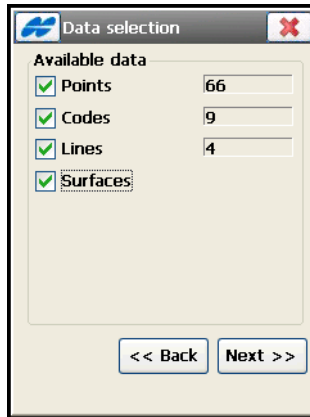


Figure 4-63. Data Selection for AutoCAD DXF

- **Next** – depending on the data selected, can open:
  - For *Points*: depending on the filter selected, first open the ***Point Types to Export*** screen (see Figure 4-4 on page 4-5) and/or the ***Points to Export*** screen (Figure 4-5 on page 4-6). Then opens the ***Point List To Export*** screen (Figure 4-7 on page 4-8).
  - For *Surfaces*: opens the ***Select TN3*** screen to select a desired TN3 file to export (see Figure 4-53 on page 4-48). TopSURV stores surfaces in TN3 files in the DTM directory.
  - Finally the ***To <Format>*** screen displays to set the destination file.

## To ESRI Shape

This format can store points, codes, lines, and surfaces data. For details on export data to ESRI Shape format, see “ESRI Shape” on page 4-26.

The *To File* screen for ESRI Shape format displays:

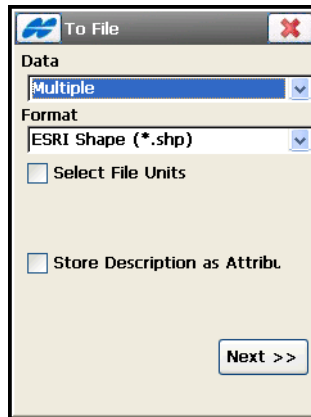


Figure 4-64. Multiple To ESRI Shape

- *Store Description as Attribute* – check mark this field to save code descriptions as attributes in the file.
- **Next** – opens the *Data Selection* screen.

**On the Data Selection** screen, select a specific data group in the job available to export. For ESRI Shape format Points, Codes, Lines and Areas can be available for selection (Figure 4-65).

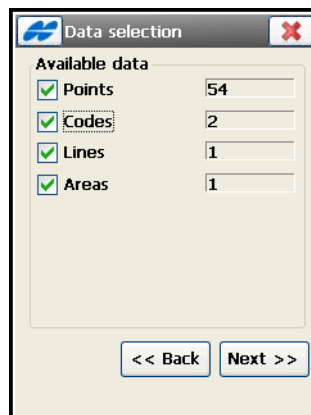


Figure 4-65. Data Selection for ESRI Shape

- **Next** – depending on the data selected, can open:
  - For *Points*: depending on the filter selected, first open the **Point Types to Export** screen (see Figure 4-4 on page 4-5) and/or the **Points to Export** screen (Figure 4-5 on page 4-6). Then opens the **Point List To Export** screen (Figure 4-7 on page 4-8).
- The **Select Directory** screen displays to set the destination directory (see Figure 4-50 on page 4-44). Clicking OK opens the Coordinate System screen.
- The **Coordinate System** screen allows setting coordinate system for exported data (see Figure 4-20 on page 4-19). Clicking the ☒ button starts the export.

## LandXML

This format can store points, codes, lines, and surfaces data. The **To File** screen for LandXML format displays (Figure 4-66):

- *Use Zone elements for x-sections* – check mark this field to save code descriptions as attributes in the file.

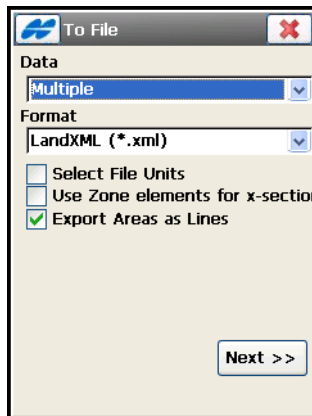


Figure 4-66. Multiple Data To LandXML

- **Next** – opens the **Data Selection** screen.

On the **Data Selection** screen, select a specific data group in the job available to export. For LandXML format Points, Codes, Lines, Alignments, X-Sections, Surfaces and TS/GPS Raw Objects can be available for selection.

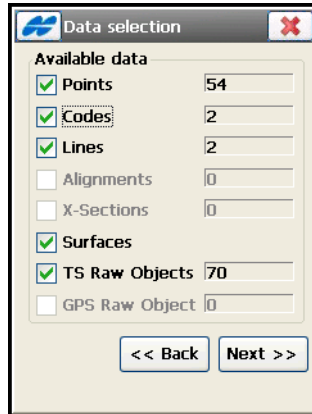


Figure 4-67. Data Selection for LandXML

- **Next** – depending on the data selected, can open:
  - For *Points*: depending on the filter selected, first open the **Point Types to Export** screen (see Figure 4-4 on page 4-5) and/or the **Points to Export** screen (Figure 4-5 on page 4-6). Then opens the **Point List To Export** screen (Figure 4-7 on page 4-8).
  - For *Alignments*: opens the **Roads To Export** screen to select roads.
  - For *Surfaces*: opens the **Select TN3** screen to select a desired TN3 file to export (see Figure 4-53 on page 4-48). TopSURV stores surfaces in TN3 files in the DTM directory.
  - Finally the **To <Format>** screen displays to set the destination file.

## MX GENIO

This format can store lines, alignments and x-sections data. The *To File* screen for MX GENIO format displays usual export options:

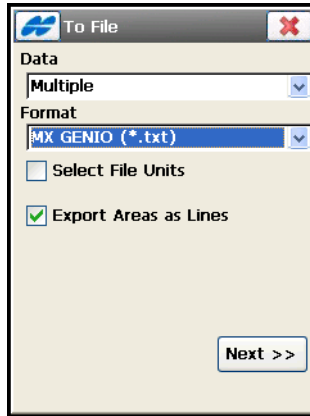


Figure 4-68. Multiple Data To MX GENIO

- **Next** – opens the *Data Selection* screen.

**On the Data Selection** screen (Figure 4-69), select a specific data group in the job available to export. For the MX GENIO, Lines, Alignments, and X-sections are available for selection.

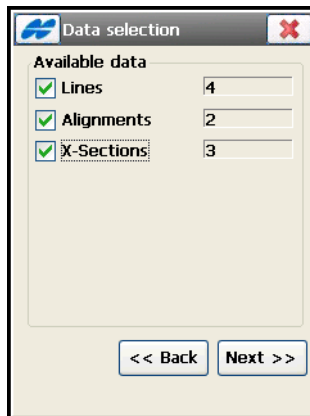


Figure 4-69. Data Selection for MX GENIO

- **Next** – depending on the data selected for export, opens different screens:
  - **Roads to Export** for Alignments (see Figure 4-49 on page 4-43 which is similar to this one).
  - **X-Sections to Export** for X-Sections (see Figure 4-49 on page 4-43 which is similar to this one).
  - **To <Format>** screen (Figure 4-17 on page 4-17).

## Exporting GPS Session

To export a session settings to the receiver, tap the **GPS Session** icon.

In the **Sessions** screen, the **Receivers** panel contains a tree of the available receivers and their session plans. The **Active Sessions** panel contains a list of sessions to export (Figure 4-70).

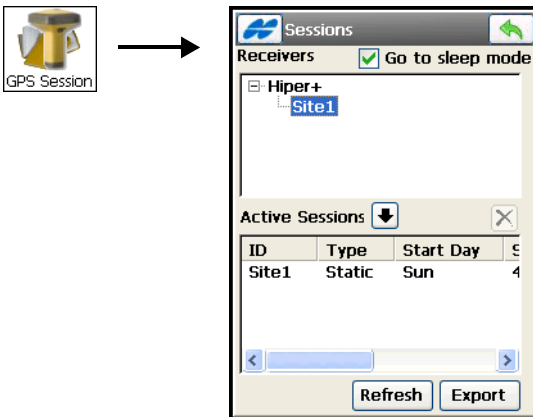



Figure 4-70. Job Sessions

- – selects the highlighted session to export.
- – deletes the session from the export list.
- **Go to sleep mode** – puts the receiver into sleep mode (if the box is check marked).
- **Refresh** – refreshes the export list.
- **Export** – starts the connection with the receiver.

- The back  button returns to the previous screen without performing export.

The Help Icon in the upper left corner of the screen opens the pop-up menu that consists of two items:

- *Edit Session* – opens the **Sessions** screen to edit the sessions. For details see “Sessions” on page 6-48.
- *Help* – accesses the Help files.





# Importing Data

To import data, tap the **Import** icon (Figure 5-1).

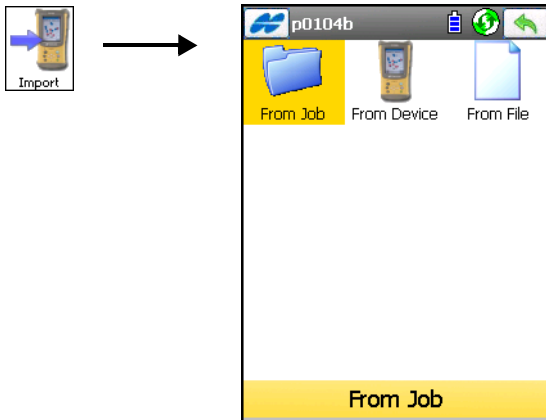






Figure 5-1. Import Menu

The **Import** folder contains the following options (Table 5-1):

Table 5-1. Export Menu Icons

Icon	Description
	From Job –imports data to the current job from another job. For details on this option, see “Importing From Job” on page 5-2.
	From Device – imports job data from another controller. For details on the option, see “Importing From Device” on page 5-11.
	From File – imports data from a file. For details on the option, see “Importing From a File” on page 5-13.


The Import function is used to add points, codes and attributes, Code Libraries, Roads, Cross Section Templates, Point Lists and Localization from another job, controller, or file.

The *Help* Icon  opens a pop-up menu, giving access to help files, module activation codes, port data logging, changing menu interface, and information about the TopSURV used (for detail see “Help Icon’s Pop-up Menu” on page 1-9).

## Importing From Job

To import data from a job, tap the **From Job** icon. The *Select Job* screen (Figure 5-2) displays.

### Select a Job

The *Select Job* screen (Figure 5-2) selects the job for import through a wizard-based import process. The wizard guides you through the import process by tapping the **Next** button. At the final stage, press the ok  button to complete the process.



- **Current Job** – shows the name of the job selected from the job list.
- **Created** – shows the date the selected job was created.
- **Modified** – shows the last date the selected job was modified.
-  – displays the directory where the job file is stored in the controller.
- **Browse** – opens the browse screen for choosing the job file from files previously downloaded to the controller.
- **Select** – selects the job file highlighted in the job list.
- The back  button disables the selection and returns to the previous screen.



Figure 5-2. Select Job

## Import From the Job

On the *From <name of Job>* screen, select the data to import and, if necessary, filter the imported points (see Figure 5-3).

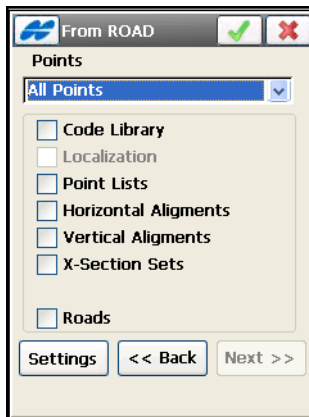



Figure 5-3. Import From Job

- *Points* – select the points to import from the drop-down list; either *All Points*, *By Type*, *By Range and Code*, *By Type, Range and Code*, or *None*.

- Check mark the data to be imported along with the points; either *Code Library*, *Localizaiton*, *Point Lists*, *Horizontal Alignments*, *Vertical Alignments*, *X-Section Sets*, or *Roads*.
- **Back** – returns to the previous screen.
- **Next** – if available, depending on the data selection, opens the screens for further selection:
  - **Point Type(s) To Import** if the points are filtered *By Type* (see Figure 5-5 on page 5-5)
  - **Points To Import** if the points are filtered *By Range and Code* (see Figure 5-6 on page 5-6)
  - **Point List(s) To Import and/or Horizontal Alignments, Vertical Alignments, X-Section Sets, Roads To Import** if the corresponding data are check marked in the *From Job* screen
- Pressing the ok  button starts the import process. The option becomes available when the Next button becomes grayed out, that is after all data are selected by the **Next** button.
- **Settings** – opens a dialog to select to import points as either *Design* or *Control* (see Figure 5-4).
  - *Design Points*: points used as targets for stakeout.
  - *Control Points*: points with coordinates, known from the catalog; used for localization.

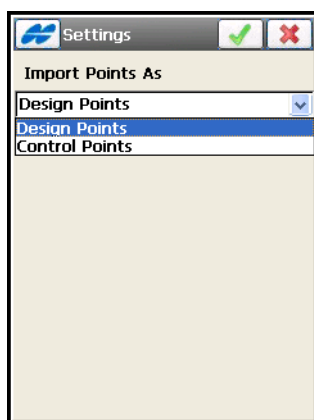


Figure 5-4. Settings

## Select Point Types To Import

On the **Pt Type(s) To Import** (Figure 5-5), select the types of points to be imported; only if the *Code Library*, *Localization*, or *Roads* box is check marked and if the points filter *By Type* has been enabled in the **From <Job>** screen. Place a check mark next to the point type that you want (Figure 5-3 on page 5-3).

- **Point Types** – select the point types for import; either *Design Points*, *Control Points*, *Cogo Points*, *Base Station*, *Topo Points*, *Offset Topo Points*, *Auto Topo Points*, *Sideshot*, *Offset*, *Remote*, *Reflectorless*, *BackSight*, *Stake Points*, *Stake Line*, *Check Points*, *Manually Typed*, *Tape Dimension*, *Scanned Points*, *Edge Extraction*, *Design Elevation Points*, *Topo mmGPS Points*, or *Auto Topo mmGPS Points*.
- **Select All** – selects all types of points from the list.
- **Check / Uncheck** – toggles the highlighted item(s) on or off, depending on the button being pressed.

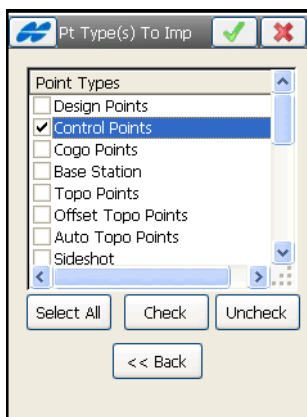





Figure 5-5. Select Point Type(s) to Import

- **Next** – if available opens the next screen to select objects.
- After the Next button becomes greyed out, the ok  button becomes available; pressing it opens the **Import Status** screen and starts the import process.
- Pressing the exit  button closes the screen.

## Select Points to Import

The *Points to Import* screen filters imported points (Figure 5-6 on page 5-6).

- *Filter by Codes* – if enabled, all points with the selected codes are imported.
- **Select** – opens the *Code* screen (see Figure 5-7 on page 5-7) for code selection.
- *Filter by Range* – select the points to import. These can be set by range or by enumeration.
  - *Name Separator*: selects a delimiter to use for enumeration of point names. It can be either “.”, or “;” or “,”.
  - *Use ‘-’ for Range Separator*: shows that only “-” can be used as a range separator.
- **Back** – returns to the previous screen.
- The exit  button closes the screen without saving the settings.

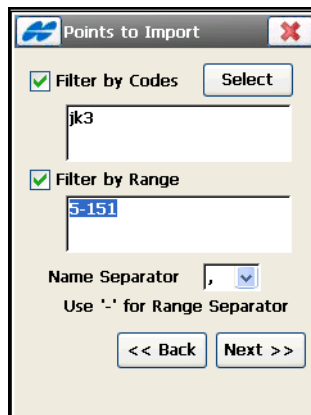




Figure 5-6. Points to Import

- **Next** – if available, opens the next screen to select objects.
- After the Next button becomes greyed out, the ok  button becomes available; tap the button to open the *Import Status* screen and start the import process.

## Code

The *Code* screen contains a list of available codes. All points with codes selected here are imported (Figure 5-7 on page 5-7).

- **Uncheck** – deselects the highlighted code.
- **Check** – check marks the highlighted entries.
- **Select** and the ok  button – returns to the *Points to Import* screen with the selected codes.

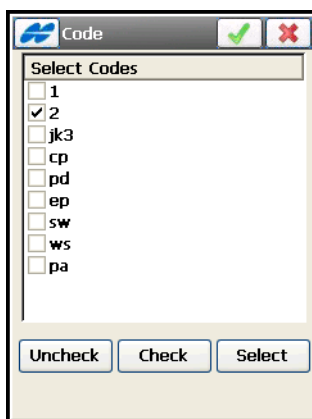



Figure 5-7. Code

## Select Point List to Import

The *Point List To Import* screen (see Figure 5-8 on page 5-8) selects the point list to import. Place a check mark next to the point list you want to import from the list of Point Lists.

- *Point Lists* – the list of available point lists in the selected job.
- **Select All** – highlight all the lists at a time.
- **Uncheck** – deselects the highlighted point list.
- **Check** – selects the highlighted entries.
- **Back** – returns to the previous screen.
- **Next** – available if other data is chosen to import in the *From Job* screen. Opens the next screen to select other objects (horizontal alignments, vertical alignments, roads or x-section sets) which

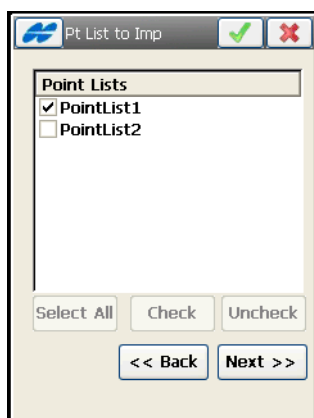
are similar to the ***Point List to Import*** screen. Once the button becomes grayed out, tap the ok  button.

- The ok  button – opens the ***Import Status*** screen and starts the import process.



Only points from the point lists selected will be imported.

---



**Figure 5-8. Select Point List to Import**



The screens are identical for all other possible objects to import: horizontal and vertical alignments, x-section sets and roads. See Figure 5-9 as an example of horizontal alignments to import highlighted by the **Select All** button.

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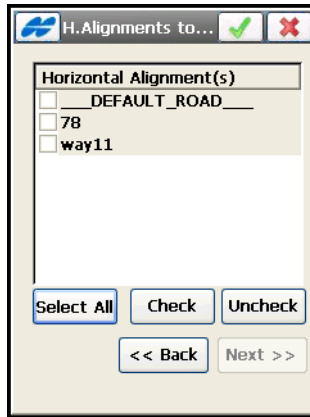


Figure 5-9. Horizontal Alignments to Import

## Import Status

The *Import Status* screen (Figure 5-10) reflects the import process and contains a progress bar and a comments window. The progress bar displays the percentage of the data being imported. Tap **Close** to return to the main screen.

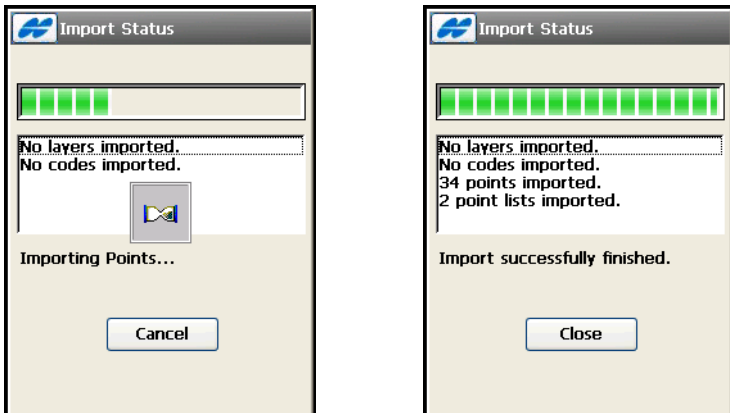


Figure 5-10. Import Status

## Duplicate Objects

If the existing job contains objects with the same names as the job they are imported from, the *Duplicate <Objects>* screen displays (Figure 5-11).

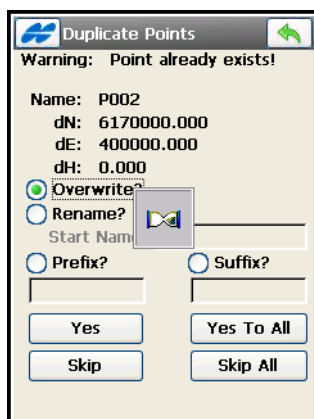



Figure 5-11. Duplicate <Objects>

The *Duplicate Objects* screen issues a warning that prevents the loss of points, roads, or point lists when names of these imported objects coincide with existing ones. Select from the following options:

- *Overwrite* – the imported object overwrites the existing one.
- *Rename* – the imported object is renamed. The new name should be noted in the corresponding field.
- *Prefix/Suffix* – the imported object differs from the existing object by prefix or suffix. The prefix/suffix should be noted in the corresponding field.
- **Yes** – accepts the decision.
- **Yes To All** – accepts the same decision for all similar cases.
- **Skip** – skips the object without importing.
- **Skip All** – skips all the objects with names that coincide with the names of existing objects, without importing.

- The back  button disables the import process and opens the **Import Status** screen to remove all the objects already imported (Figure 5-12).

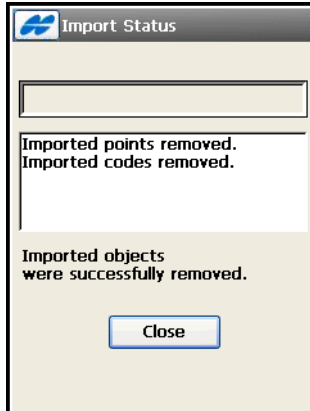


Figure 5-12. Import Status for Removed Objects



The import process cannot skip duplicate templates. These objects must be renamed.

## Importing From Device

To import a job (or any other file) from a controller device connected with the current controller, tap the **From Device** icon (Figure 5-13 on page 5-12).

### Selecting Port

The **Settings** screen (Figure 5-13 on page 5-12), selects the communication port for file interchange with another controller.

- **Com Port** – select the communication port; either *COM1*, *COM2*, *Bluetooth*, or *Ethernet*.
- **Next** – opens the **Select Directory** screen (Figure 5-14 on page 5-12).

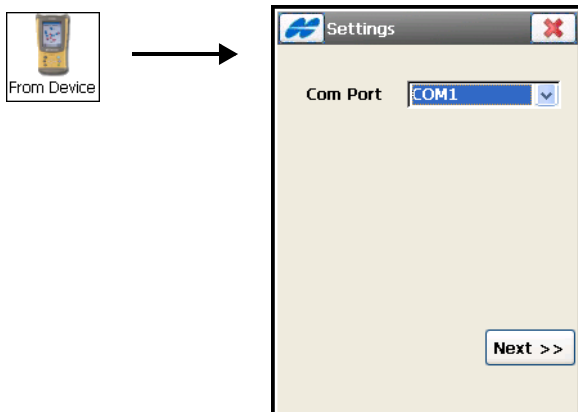


Figure 5-13. Select Port

- *Com Port* – select the communication port; either *COM1*, *COM2*, or *Ethernet*.
- **Next** – opens the *Select Directory* screen (Figure 5-14 on page 5-12).

## File Import Directory

On the *Select Directory* screen (Figure 5-14), select the destination directory for data import.

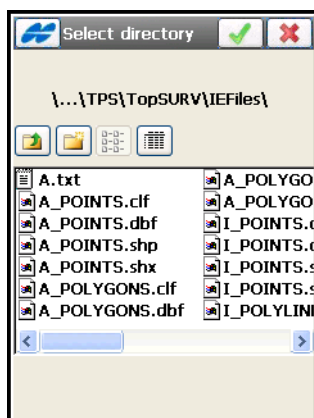



Figure 5-14. Select Directory

- The ok  button opens the **Import File** screen reflecting import status to the selected directory (Figure 5-15)

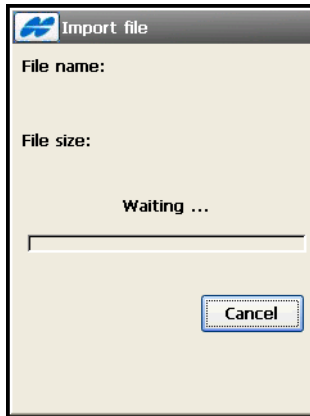


Figure 5-15. Import File

A successful completion of the import returns to the main screen.

## Importing From a File

To import data from a file, tap the *From File* icon (Figure 5-16). On the **From File** screen (Figure 5-16) you can import data of various types from files of either pre-defined or custom formats. For a description of these formats, see Appendix A.

- *Data* – select the data type to import from the file; either *Points*, *Lines*, *Areas*, *Point Lists*, *Code Library*, *Horizontal Alignments*, *Vertical Alignments*, *X-Section Sets*, *Roads*, *Parcels*, *X-Sect Templates*, *Localization*, *Scanning Data*, *TINs*, *Layer States*, or *Multiple*.
- *Format* – select the type of file being imported.
- *Select File Units* – this option is available for all data types and formats containing distance/angular values. When this checkbox is selected, the **Next** button opens the **File Units** screen that allows selecting units for the data imported (Figure 5-17 on page 5-15). Depending on the data and format selected, you can set only distance, or distance and angle units if available.

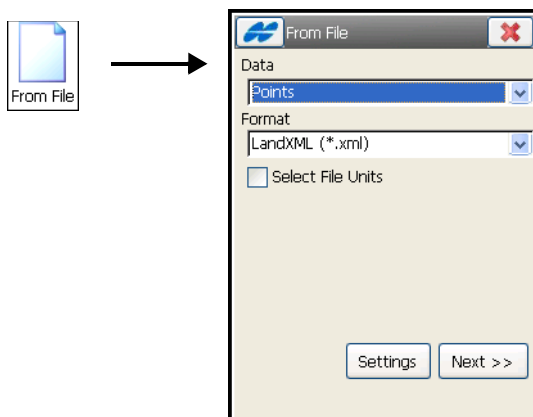


Figure 5-16. Import From File

- **Settings** – opens a dialog to select desired styles to represent points and lines presented in the file being imported (see Figure 5-18 on page 5-15).
- **Next** – opens the *From < name of Format >* screen to navigate to the directory where the file is located.

Follow up the import process with the help of the import wizard.

## File Units

The *File Units* dialog is used to select units for the data imported. Selections available depend on data and format being imported.

- *Distance Units* – if available for selection, you can choose from *Defined in the File*, *Meters*, *IFeet*, *US Feet*, *IFeet and Inches*, *US Feet and Inches*. The list changes depending on the file format selected.
- *Angle Units* – if available for selection, you can choose from *DMS*, *Grads (Gons)*, *Radians*, *Mils*, *Decimal Degrees*, *Defined in the file*.
- **Back** – returns to *From File* the screen without saving the settings.
- **Next** – opens the *From < name of Format >* screen.

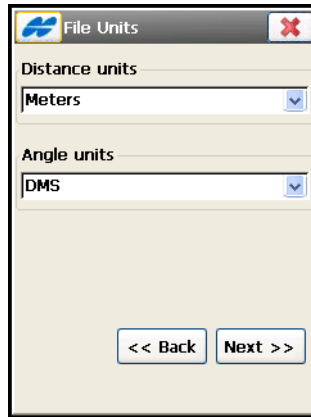


Figure 5-17. File Units

## Settings

The *Settings* dialog is used to select desired styles to represent points and lines. Options available depend on data and format being imported.

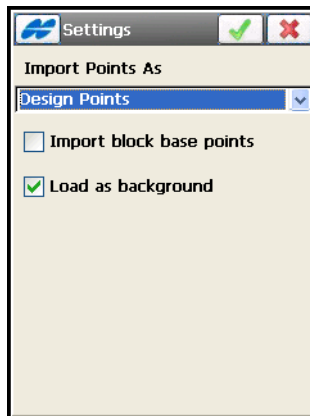



Figure 5-18. Settings

- *Import Points As* – select to import points as either *Design* or *Control*:
  - *Design Points*: points used as targets for stakeout.

- *Control Points*: points with coordinates, known from the catalog; used for localization.
- *Import block base points* – enable to import central points in blocks as points. Available only for AutoCAD files.
- *Load as background* – enable to load data as background. Available only for AutoCAD files.
- The ok  button saves the settings and returns to the **From File** screen (Figure 5-16 on page 5-14).

## Points and Point Lists

On the **From File** screen (Figure 5-16 on page 5-14) for *Points* and *Point Lists* data, you can import the following formats: *Topcon Text Custom (\*.txt)*, *Topcon FC-4 (\*.fc4)*, *Topcon FC-5 (\*.fc5)*, *Topcon GTS210/310/10 (\*.xyz)*, *Topcon GTS-6 (\*.gts6)*, *Topcon FC-6/GTS-7 (\*.pnt)*, *Topcon GTS-7 with strings (\*.txt)*, *Topcon GT (\*.pnt)*, *Topcon GT Finland (\*.gt)*, *Topcon 3DMC (\*.pt3)*, *Topcon 3DMC Project (\*.tp3)*, *AutoCAD DXF (\*.dxf)*, *AutoCAD 2000 Drawing (\*.dwg)*, *ESRI Shape (\*.shp)*, *TDS (\*.cr5)*, *LandXML (\*.xml)*, *MOSS GENIO (\*.mgn)*, *NEZ (\*.csv)*, *NEZ with strings (\*.csv)*, *CMM (\*.cor)*, *MMH360 (\*.360)*, *KOF (\*.kof)*, *MMH360\_Z000 (\*.360)*, *Microstation 95/ISFF (\*.dgn)*, *MicroStation V8 (\*.dgn)*, *SBG Pxy (\*.PXY)*, *SBG Geo (\*.Geo)*, or *Sokkia SDR33 (\*.sdr)*.

- *Select File Units* – when this checkbox is selected, the **Next** button opens a dialog to select a type of distance units for the points imported (see Figure 5-17 on page 5-15). Depending on the Format, you can select from *Defined in the File*, *Meters*, *IFeet*, *US Feet*, *IFeet and Inches*, *US Feet and Inches*.
- **Settings** – pressing this button opens a dialog to select desired styles to represent points and lines (Figure 5-18 on page 5-15).
- **Next** – opens the **From < name of Format >** screen.

The options available on the **From File** screen depend on the format selected. Refer to the following sections for details.



## Topcon Text Custom

If the *Text Custom* format is selected, the **From File** screen has an *ASCII File Properties* field (Figure 5-19 on page 5-17).

- *Select File Units* – if the box is check marked, the **Next** button opens a screen to select a type of distance units for the points imported from *Meters*, *IFeet*, *US Feet*, *IFeet and Inches*, *US Feet and Inches* (see Figure 5-17 on page 5-15).
- *ASCII File Properties* – defines the condition of the imported file interpretation. Check and enable *Use Type for Attributes* and *Use Quotes for Text Values* (one or both). These conditions use the same type for the attributes and quotes for the text values.

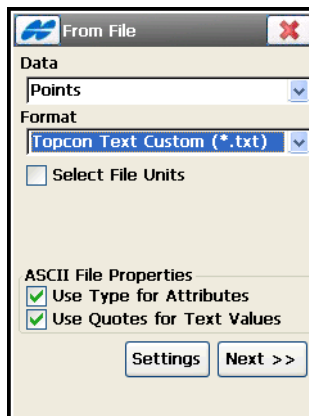


Figure 5-19. Import From Text File

- **Settings** – selects to import points as either *Design* or *Control* (see Figure 5-4 on page 5-4).
- **Next**: opens the **From Text** screen (Figure 5-20 on page 5-18).

The **From Text** screen browses directories from which to select the file to import data (Figure 5-20).

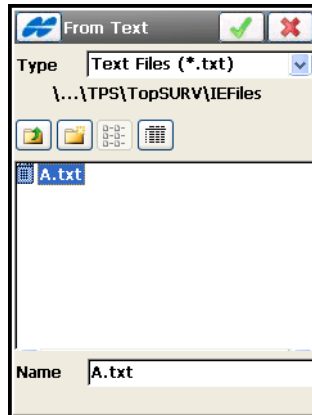



Figure 5-20. Import From Format

- *Type* – specifies the .txt extension for the filename.
- *Name* – the name of the selected file from which you want to import points.
- The ok  button approves the selection and opens the **Text File Format** screen.

The **Text File Format** screen (Figure 5-21 on page 5-19) imports a file of arbitrary text format.

- *Delimiter* – sets the separator symbol between data in the import file; either a *space*, a *comma*, *tabs* or other (select from the list).
- *Header in First Row* – enable if the text file has a header.
- *File Style* – sets the order of fields in the selected file.
- **Delete** – deletes the selected file format.
- **Edit (Format)** – changes the selected file style with the help of the **Custom Style** screen (see Figure 5-22 on page 5-20).
- **Add (Format)** – creates a new file style with the help of the same **Custom Style** screen.

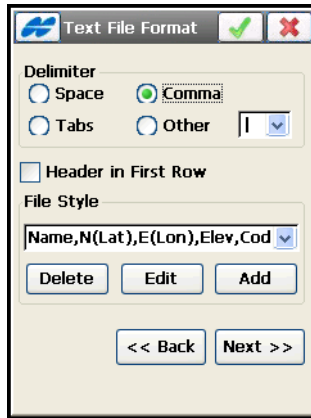




Figure 5-21. Text File Format

- **Back** – returns to the previous screen.
- **Next** – opens the *Coordinate System* screen (see Figure 5-23 on page 5-20).
- The ok  button opens the *Import Status* screen and starts the import process (see “Import Status” on page 5-9).

**On the Custom Style** screen (Figure 5-22), change the file style according to data fields in the file imported. Use the arrows to move the parameters you want from the top (*Available* panel) to the bottom (*Order* panel) of the screen. Use the arrows (up and down) to move the parameters in ascending or descending order in the *Order* panel.

- **Save** – saves the File Style created and returns to the *Text File Format* screen. A new string appears in the Select File Format drop-down menu.
- The back  button returns to the previous screen.

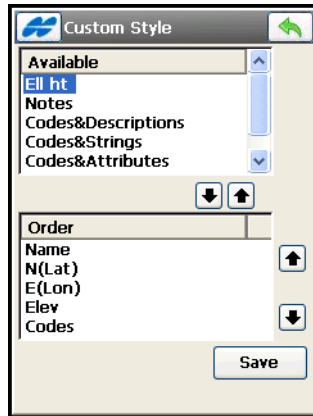


Figure 5-22. Custom Style

On the **Coord System** screen (Figure 5-23) select the coordinate type for the data in the file imported. This screen also displays information about the coordinate system in the job.

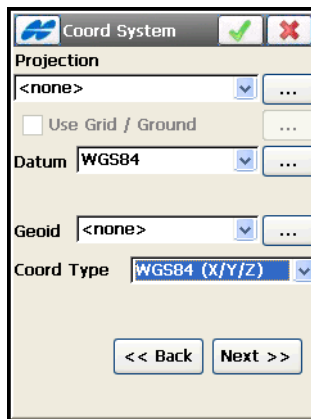



Figure 5-23. Coordinate System

- *Coordinate Type* – select either *WGS84*, *Datum*, *Grid*, or *Ground*.
- **Next** – opens the *Units Format* screen if a type of geodetic coordinate is selected (Figure 5-24 on page 5-21).
- The ok  button opens the *Import Status* screen and starts the import process. See “Import Status” on page 5-9.

**On the Units Format** screen (Figure 5-24), select the format you want to represent the degrees of Latitude and Longitude in the imported data from the drop-down list.

- *Format (Lat/Lon)* – select the format for degrees in Latitude and Longitude. It can be *ddd. (decimal)*, *ddd.mmsssssss*, *ddd mm ss.sssss*, *dddmmss.sssss*, or *dddmmss.sssss*

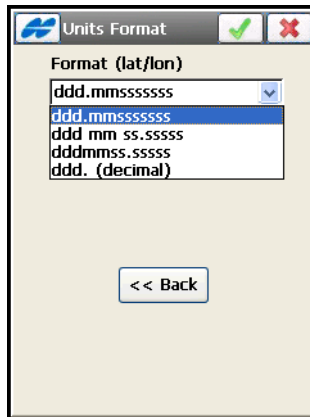


Figure 5-24. Units Format

**On the Import Status** screen (Figure 5-25), tap the **Close** button to return to the main screen.

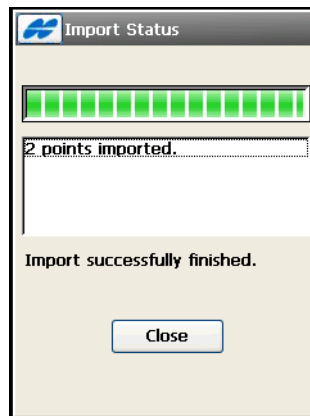


Figure 5-25. Import Status

## AutoCAD DXF and AutoCAD 2000 Drawing

If the *AutoCAD DXF* or *AutoCAD 2000 Drawing* format is selected for point import, the **From File** screen has the following options (Figure 5-26).

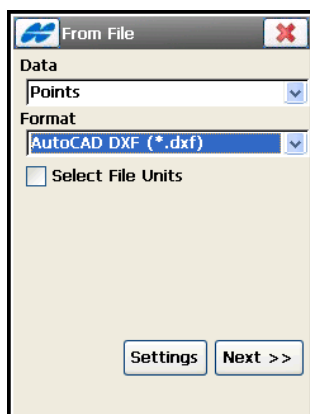



Figure 5-26. AutoCAD DXF

- **Settings** – opens the *Settings* screen to select point and line styles (see Figure 5-18 on page 5-15).
- **Next** – with the help of the import wizard, follow next screens to import points.
- The exit  button closes the screen without saving the settings.

TopSURV imports layers from DWG/DXF files, along with the appropriate data types. All distance units are detected on import.

## ESRI Shape

Shapefiles spatially describe geometries: points, polylines, and polygons. A shapefile is actually a set of several files: mandatory four files (\*.shp, \*.shx, \*.dbf, \*.clf) and some optional files. A set is created for forms lying on one layer and having the same code.

If the *ESRI Shape* format is selected for points import, TopSURV will prompt to select only the file with “.shp” extension, other files are picked up automatically.



When importing shapefiles you need to repeat the import process for every desired code.

In addition TopSURV can optionally import a \*.prj file associated with the shapefile (\*.shp) being imported.



The SHP support libraries are optional installation files, available for selection during install. They require 4MB of storage and should not be used where memory is limited. The additional support files will be installed as a separate process after the initial install of the program is completed.

## TDS

If the *TDS* format (or any other coordinate file format) is selected to import points, the **Settings** button on the *From File* screen allows choosing to import points as either *Design* or *Control*.

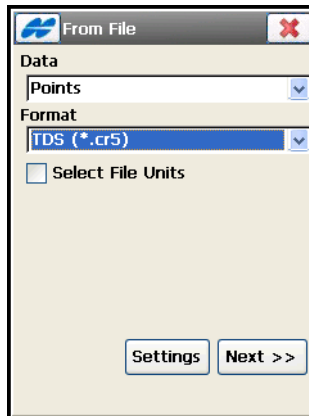


Figure 5-27. From TDS

- **Next** – follow next screens with the help of the import wizard.

## Lines

For *Lines* data, you can import the following formats:

*Topcon Text Custom (\*.txt)*, *Topcon 3DMC (\*.ln3)*, *Topcon 3DMC Project (\*.tp3)*, *AutoCAD DXF (\*.dxf)*, *AutoCAD 2000 Drawing (\*.dwg)*, *ESRI Shape (\*.shp)*, *LandXML (\*.xml)*, *KOF (\*.kof)*, *Microstation 95/ISFF (\*.dgn)*, *MicroStation V8 (\*.dgn)*, *MX GENIO (\*.txt)*, *SBG Pxy (\*.PXY)* or *SBG Geo (\*.Geo)*.

TopSURV linework consists of lines and points, whereas the imported linework contains no points. It includes positions only. In this case the **Edit Line** screen lists line points with question marks (see Figure 5-28 on page 5-24).

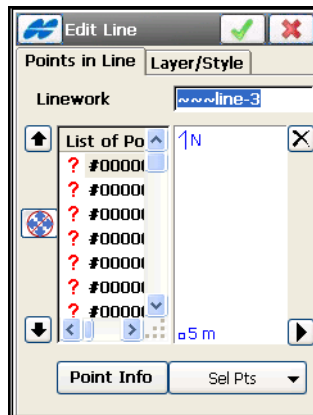


Figure 5-28. Edit Imported Linework

If the *AutoCAD DXF* or *AutoCAD 2000 Drawing* format is selected for lines import, the **Settings** button on the **From File** screen allows choosing styles to represent points and lines.

- *Import block base points* – enable to import central points in blocks as points.
- *Load as background* – enabled by default to load lines as background.



## Areas

For *Area* data, you can import data from *ESRI Shape (\*.shp)*.



Line and Area shape files are imported into the Line and Area layers.

---

## Code Library

For *Code Library* data, you can import the following formats: *Topcon XML (\*.xml)*, *Topcon Text (\*.tdd)*, *DBF (\*.dbf)*, *Topcon Text Custom (\*.txt)*, or *Carlson (\*.FCL)*. Code Library is a set of codes with attributes used in the job.

All layers are automatically imported whether they are with codes or not.

*Topcon Text Custom* format allows importing code library from a comma delimited file.

## Horizontal Alignments

For *Horizontal Alignments* data, you can import the following formats: *SSS (\*.hal)*, *TopSURV (\*.thl)*, *CLIP (\*.PLT)*, or *ISPOL (\*.ALI)*.

## Vertical Alignments

For *Vertical Alignments* data, you can import the following formats: *SSS (\*.val)*, *TopSURV (\*.tvI)*, *CLIP (\*.ALZ)*, or *ISPOL (\*.RAS)*.

## X-Section Sets

For *X-Section Sets* data, you can import the following formats: *SSS (\*.rd)*, *TopSURV (\*.trd)*, *CLIP (\*.TRV)*, *ISPOL (\*.SCI)*, or *Custom (\*.cxs)*.

## Roads

For *Roads* data, you can import the following formats:

*Land XML* (\*.xml), *SSS* (\*.hal; \*.val; \*.rd), *TDS* (\*.rd5), *Topcon 3D* (\*.rd3), *TopSURV* (\*.thl; \*.tvl; \*.trd), *CLIP* (\*.PLT; \*.ALZ; \*.TRV), *ISPOL* (\*.ALI; \*.RAS; \*.SCI), *Tekla* (\*.vgp), *MX GENIO* (\*.txt), or *SBG* (\*.LIN).

The header record of the TopSURV road format stores distance/angle units and the starting azimuth if the Road is not a straight line.

## Parcels

For *Parcels*, data can be imported from *Land XML* (\*.xml) files.

## X-Section Templates

For *X-Section Templates* data, you can import the following formats:

*SSS* (\*.xtl), *TDS* (\*.tp5), or *TopSURV* (\*.xst).

## Localization

For *Localization* data, you can import the following formats:

*Topcon 3D* (\*.gc3), *TDS* (\*.RAW), *Trimble DC* (\*.dc) and *Carlson* (\*.loc), which contain coordinates of control points in two coordinate systems. Control Points are imported together with Localization data.

## Scanning Data

For *Scanning* Data, all scanning data can be imported from

*DI-3000* (\*.cmr; \*.imc \*.csv).

## TINs


For *TINs* data, you can import the following formats: *AutoCAD DXF*

(\*.dxf), *AutoCAD Drawing* (\*.dwg), or *LandXML* (\*.xml).

When importing from an AutoCAD DXF or Drawing file, tap the **Settings** button to select desired drawing styles to represent points and lines (for detail, see “Settings” on page 5-15).



TopSURV only imports AutoCAD 2000 format DWG files. Support of DWG 2008 is optional and selected during TopSURV installation.

The ok  button on the **From <Format>** screen opens the **Import Status** screen and starts the import process to save results into TN3 files. The TN3 files will have the same name of the file imported, and will be saved in the DTM directory.

## Layer States

For *Layer States* data, you can import the following formats: *Autodesk (\*.las)*, *Topcon XML (\*.xml)*.


## Multiple Data

For Multiple data, you can import the following formats: *Topcon Text Custom (\*.txt)*, *AutoCAD DXF (\*.dxf)*, *AutoCAD Drawing (\*.dwg)*, *ESRI Shape (\*.shp)*, *LandXML (\*.xml)*, *KOF (\*.kof)*, *Microstation 95/ISFF (\*.dgn)*, *MicroStation V8 (\*.dgn)*, *MX GENIO (\*.txt)*, *SBG Pxy (\*.PXY)*, or *SBG Geo (\*.Geo)*.



TopSURV only imports AutoCAD 2000 format DWG files. Support of DWG 2008 is optional and selected during TopSURV installation.

TopSURV imports layers from files, along with the appropriate data types.

**For Land XML** file as an example, select the file from which you want to import data on the **From <Format>** screen and tap the ok  button. The **Coordinate System** screen displays.

On the **Coordinate System** screen (Figure 5-29 on page 5-28) select the coordinate type for the data imported. This screen first displays information about the coordinate system in the job.

- *Coord Type* – select either *WGS84 (Lat/Lon/Ht)*, *Datum (Lat/Lon/Ht)*, *Grid*, or *Ground*.

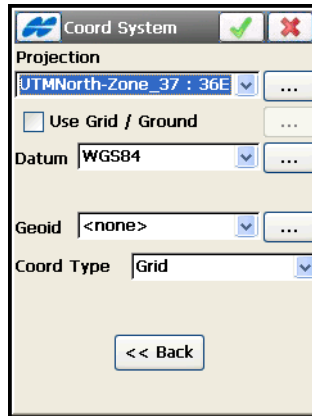



Figure 5-29. Coordinate System

- The ok  button opens the *Import Status* screen for a while to retrieve information on the file contents (Figure 5-30).

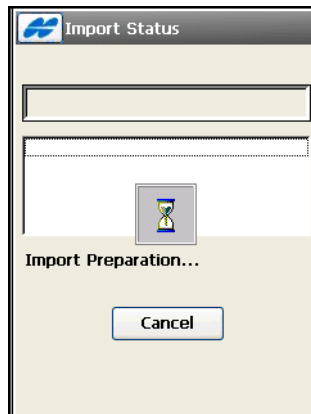


Figure 5-30. Import Preparation

The *Data Selection* screen displays to select desired data types (Figure 5-31).

## Data Selection

On the Data selection screen (Figure 5-31), select the specific data group from the file to be imported. For *LandXML* as an example, you can select *Point Lists*, *Lines*, *Alignments*, *Codes*, *Surfaces*, *X-Sections* and *Parcels*.

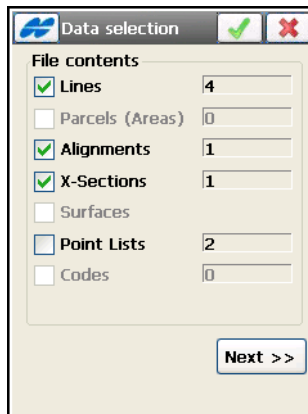




Figure 5-31. Data Selection

- **Next** – if available opens the *Select Data For Import* screen (Figure 5-32 on page 5-30).




The **Next** button becomes active after selection of a data group from the file contents which needs further selection from the list (Point Lists, Alignments, Surfaces and X-Sections).

- The ok  button starts the import process. This button is not available until the data, not demanding further selection, is chosen and the **Next** button becomes inactive.
- The exit  button closes the screen without saving the settings.

## Select Data for Import

On the Select Data For Import screen (Figure 5-32 on page 5-30), select objects from the list to import. Follow the **Next** button until the **Finish** button appears on the screen.

- **Check** – check marks the highlighted entries.

- **Uncheck** – deselects the highlighted entries in the list.
- **Back** – returns to the previous screen.
- **Next** – tap until the ok  button displays on screen.
- The ok  button opens the *Import Status* screen and starts the import process.
- The exit  button closes the screen and cancels the import process.

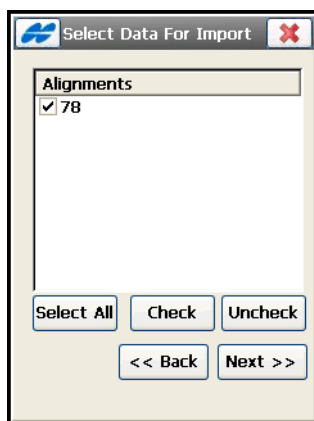
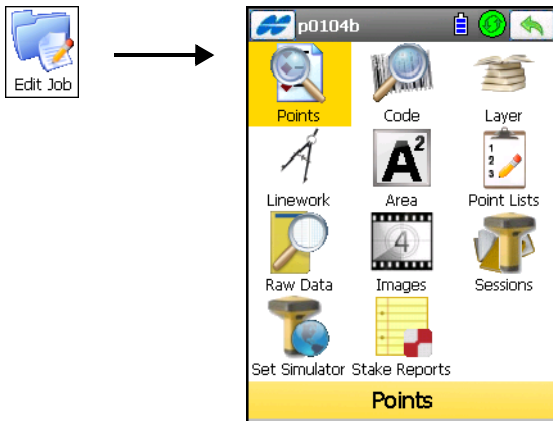


Figure 5-32. Select Data For Import

# Editing Job Data

To edit data in a job, tap the **Edit Job** icon in the main menu.



**Figure 6-1. Edit Job**

The **Edit job** folder contains the following options (Table 6-1):

**Table 6-1. Edit Job Menu Icons**












Icon	Description
	Points – use to edit properties of existing points and to add new points manually. For details on this option, see “Points” on page 6-3.
	Codes – use to edit code properties and to add new codes. For details on the option, see “Codes” on page 6-17.
	Layers – use to edit layer properties and to add new layers manually. For details on the option, see “Edit Layers” on page 6-24.
	Linework – use to edit linework properties and to create new lineworks manually. For details on the option, see “Linework” on page 6-28.


Table 6-1. Edit Job Menu Icons (Continued)

Icon	Description
	Area – use to edit areas. For details on this option, see “Area” on page 6-32.
 Point Lists	Point Lists – used to edit point lists. For details on this option, see “Point Lists” on page 6-36.
 Raw Data	Raw Data – use to edit raw data and to recompute coordinates. For details on this option, see “Raw Data” on page 6-41.
 Images	Images – use to delete/add background images. For details on this option, see “Background Images” on page 6-45.
 Sessions	Sessions – use to edit/add observation sessions for GNSS receivers. For details on this option, see “Sessions” on page 6-48.
 Set Simulator	Set Simulator – use to set a simulated base station. For details on this option, see “Simulation Setup” on page 6-50.
 Stake Reports	Stake Reports – use to edit stake reports. For details on this option, see “Stake Reports” on page 6-50.

The **Edit Job** menu (Figure 6-1 on page 6-1) includes options to edit the following data in the current job: Points, Codes, Layers, Linework, Area, Point Lists, Raw Data, Images, and Sessions (for GPS+ post processing modes only). Also, you can edit starting coordinates for GPS Simulation mode if used.



If the menu option you need is not visible, tap the **Configure/Menus** icons to enable these options in the *Config Menus* screen.

The Help Icon  opens a pop-up menu, giving access to the help files, module activation codes, port data logging, changing menu interface, and information about TopSURV (for details see “Help Icon’s Pop-up Menu” on page 1-9).





To edit any object properties, either double-click on the object or select the object and tap the Edit button.

## Points

To edit points, tap the **Points** icon. The *Points: <Coord Type>* screen contains the list of stored points with coordinates of the job's coordinate type and codes, and a set of tools for database operation (Figure 6-2).

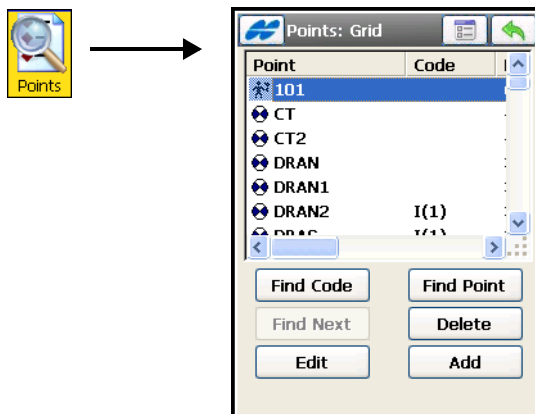









Figure 6-2. Points

In the Point column, an icon displays the point type (Table 6-2):

Table 6-2. Points Icons

Point Icon	Point Type
	GPS stationary (topo)
	offset topo point
	GPS kinematic (auto topo)
	RTK base


Table 6-2. Points Icons (Continued)

Point Icon	Point Type
	TS observed
	control
	design or imported
	staked out
	TS scanned point
	cogo
	manually entered


- **Find Code** – opens the *Find by Code* screen to enter a code for searching for a point.
- **Find Point** – opens the *Find by Point* screen to enter a point name (or a part of the name) to perform a search.
- **Find Next** – finds next point that satisfies the same conditions as the previously found point.
- **Delete** – deletes the point from the list.
- **Edit** – opens the *Edit Point* screen to edit the point parameters: *name*, *code*, *coordinates* and/or other parameters stored with the point.
- **Add** – opens the *Add Point* screen to create a new point.

The *Help* Icon in the upper-left corner of the screen displays the pop-up menu that always contains the *Help* item to access the Help files. This menu can also contain a few options specific to the currently open dialog. For the *Points* screen they are:

- *PTL Mode* – switches on the PTL (Point-To-Line) Mode. (The screen changes its appearance on **PTL Points**). For details, see “PTL Point” on page 6-14.
- *Show Scan Points* – switches on the scan points displaying function.

- *Show AutoTopo Points* – switches on the AutoTopo points displaying function.
- *Recompute* – recomputes the point coordinates after editing the point's raw data (if the recomputation was not performed in Raw Data).
- The settings  button – opens the *Display* screen.

## Display Settings

On the *Display* screen (Figure 6-3) select the display parameters to customize the software interface, then press the ok  button to save the settings and return to the *Points* screen.

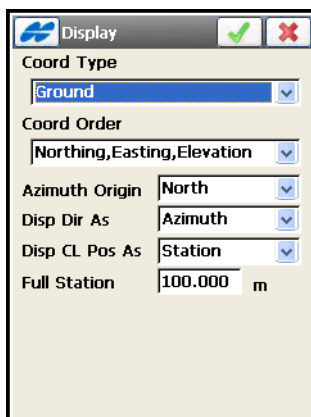


Figure 6-3. Display

For details on the display settings, see “Display” on page 2-9.

## Finding Point by Name

The *Find by Point* screen (Figure 6-4 on page 6-6) contains settings for searching for a point by it's name.

- *Point* – the name of a point or a part of the name.
- *Match entire name* – set if the whole name was entered in the *Point Name* field.

- *Match partial name* – set if a part of the searched name was entered in the *Point* field.
- **Search** – starts the search process and returns to the *Points* screen, highlighting the point found.

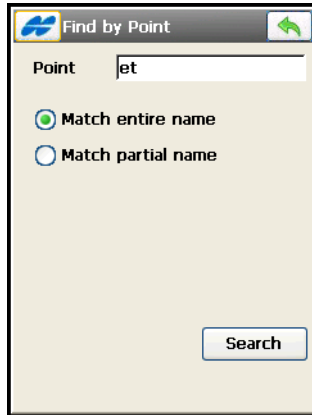


Figure 6-4. Find by Point Name

## Finding Point by Code

The *Find by Code* screen (Figure 6-5) searches for point information by its code.

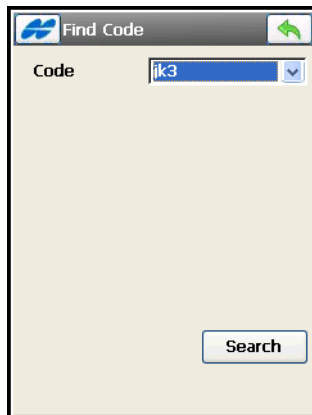


Figure 6-5. Find by Code

- *Code* – select a code from the drop-down list.

- **Search** – starts the search process and returns to the *Points* screen, highlighting the first point with the code selected.

## Editing a Point

The *Edit Point* screen (Figure 6-6) shows the properties of a point to edit. The screen will auto-hide and show the string input box based on the code type. All line and area codes will display the string field while all point codes will hide the string field.

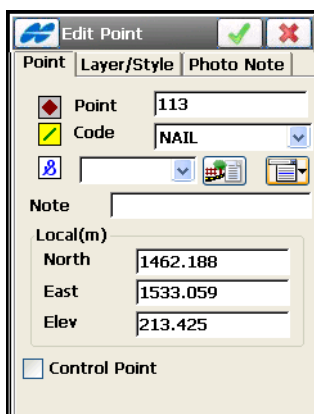









Figure 6-6. Add/Edit Point

## Edit Point Information

On the *Point* tab of the *Edit Point* screen (Figure 6-6) you can edit the following point data:

- *Point* – enter the name of the point.
- *Code* with a symbol that show the code entity type (  Point,  Line, or  Area) – select a code from the drop-down list or enter a new code. *Default New Type* for the code entity type can be set in the Global Code Options (see Chapter 3 on page 3-102). Code needs to be defined at the time it is entered (see “Edit Code” on page 6-19) if it is not a code that exists in the codes dialog, or the *Prompt* for new code creating is disabled in the Global Code Options (see Chapter 3 on page 3-102).

- The lower field, marked by the  sign, is displayed only for a Code Type of Line or Area and intended for entering a string.
-  – the *Attributes List* icon, opens the **Point Attributes** screen to set the code and attributes available for the code chosen, layer and photo notes (Figure 6-7 on page 6-9).
- The  icon next to the *Attributes List* icon displays the pop-up menu of the following items:
  - *Add to End/Start*: for Line and Area codes.
  - *Insert*: for Line and Area codes. This allows the user to insert a point to a line out of sequence.
  - *Layer*: opens the **Select Layer** screen (see “The Topo Menu” on page 9-3).
  - *Note*: opens the **Note** screen to enter any additional information on the point. For details, see “The Topo Menu” on page 9-3.
- *Local (m)* – the field for the (measured) coordinates of the point in the current coordinate system (the field name changes with the coordinate type selection).
- *Note* – saves any additional information about the point (if preferred)
- *Control Point* – check mark this box to save the point as control.
- The ok  button – saves the changes and returns to the **Points** screen.

Points that have no codes, or have codes, but no strings associated with the codes, are simply stored as points.

## Edit Point Attributes

On the *Point Attributes* screen (Figure 6-7), you can set a code, control code, string (displayed only for a Code Type of Line or Area) and attributes' values for the point.

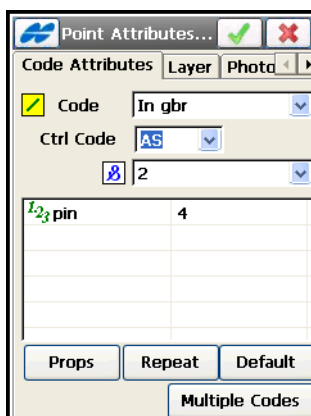


Figure 6-7. Point Attributes



- *Code* – select a code from the drop-down list. Code needs to be defined at the time it is entered if it is not a code that exists in the codes dialog.

By default, the lower panel shows the control code list available for a Code Type of Line or Area.

The Control Code is a special type of code that is used by the graphic tool for the interpretation of survey results.

The supported control codes (*AS*, *AE*, *C*, *R*) control line behavior when creating arcs, closure of lines, and rectangles respectively. The *AS* control code indicates the start of an arc, and the *AE* control code indicates the end of the arc. *Arc* parameters are determined using additional points in the line.

TopSURV will not use this linework package if the *Allow Custom Control Code* box on the *Global* screen is check marked. In this case, the user can enter any string to mark it as a control code. TopSURV will not interpret these control codes.

- The field, marked by the  sign is intended for entering a string to generate a line for a Code Type of Line or Area. Code Type is set when editing the code.
- The lower panel shows the available attributes. Tap on the attribute to display a field to enter its value.
- **Properties** – opens the *Attrib Ranges* screen (Figure 6-9 on page 6-11) to view the ranges for the attributes.
- **Repeat** – erases the entered values.
- **Default** – sets default values.
- **Multiple Codes** – opens the *Point Attributes* screen with multiple codes to edit (Figure 6-10 on page 6-11).
- The ok  button – saves the changes and returns to the *Edit (Add) Point* screen. The program displays a message prompt if the attribute value is not within the range specified.

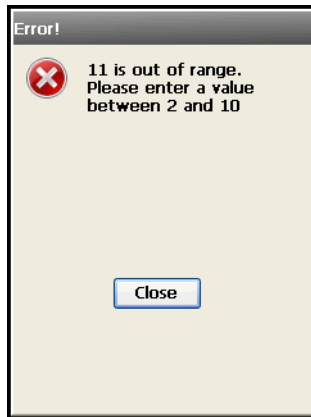


Figure 6-8. Attribute Range Error

The *Help* icon in the upper-left corner of the screen displays the pop-up menu:

- *Show Second Control Code*: switches on the field to enter another control code.



On the **Attribute Ranges** screen (Figure 6-9), you can view the ranges for the attributes.

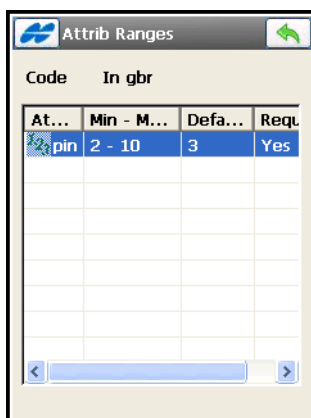


Figure 6-9. Attribute Range

Attributes can only be added on the *Code-Attributes* screen (Figure 6-19 on page 6-17).

On the **Multi-Code** tab (Figure 6-10), you can edit multiple codes and strings. Multiple codes and strings associated with a point make the point a part of numerous lines.

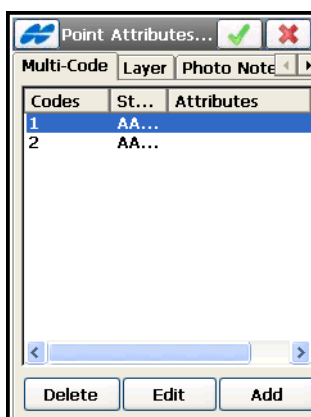



Figure 6-10. Multiple Code-Attributes

- **Delete** – deletes the code from the list.

- **Edit** – opens the *Codes-Attributes* screen to edit the selected code.
- **Add** – creates a new code through the *Code-Attributes* screen.
- The ok  button – saves the settings and returns to the *Edit Point* screen.

## Layer and Style

On the *Edit Point* screen, you can change the layer and graphic properties of the point (Figure 6-11):

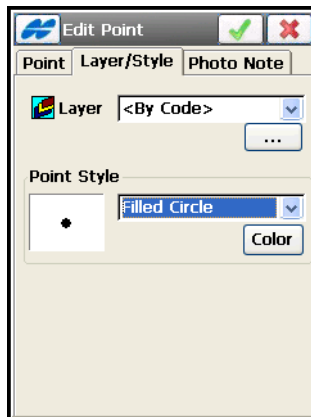




Figure 6-11. Add/Edit Point – Layer/Style Tab

Open the *Layer/Style* tab to change the layer and graphic properties of the point:

- **Layer** – selects the layer to locate the point.
- The List  button opens the *Layers* screen to edit layers. (For details on editing layers, see “Edit Layers” on page 6-24.)
- **Point Style** – select a point style from the drop-down list. The box to the left shows the style to designate the point on the map.
- **Color** – opens the *Select Color* screen (see “On the Select Color” on page 6-13) to edit the color you desire.
- The ok  button – saves the changes and returns to the *Points* screen.

On the **Select Color** screen (Figure 6-12), set the color of the point mark to show on the map.



Figure 6-12. Select Color

Tap on the color you want. You can select the color of the point for either the *Layer* or the *Code* by highlighting the *Layer* or *Code* node on the screen (Figure 6-12).

## Cut Sheet

If the point has some stake points, there will be an additional **Cut Sheet** tab on the **Edit Point** screen. On the **Cut Sheet** tab, you can view information on the stake points (Figure 6-13):

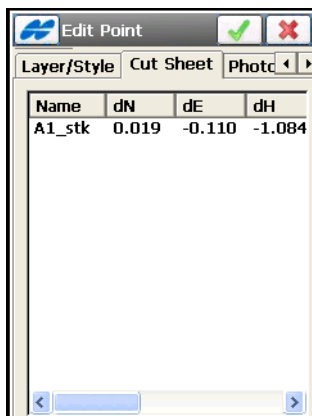


Figure 6-13. Edit Point – Cut Sheet Tab


## PTL Point

In PTL Mode, the *PTL* tab displays on the **Edit Point** screen with the following parameters (Figure 6-14 on page 6-14).

- *Start Ref Pt, End Ref Pt* – selects reference points, either from the map, from the list, or when entered manually.
- *PTL Offsets* – the offsets from the reference line formed by the reference points:
  - *Line*: the distance from the start of the reference point along the reference line, where the perpendicular to this line passes through the target.
  - *Offset*: the horizontal distance from the target.
- *Ell ht* – the height of the target.

The screenshot shows the 'Edit Point' dialog box with the 'PTL' tab selected. The 'Start Ref Pt' field contains '100' and the 'End Ref Pt' field contains '101'. Below these, the 'PTL Offsets(m)' section has 'Line' set to '10.000' and 'Offset' set to '10.000'. At the bottom, the 'Ell ht' field is set to '137.000'. The dialog includes a green checkmark button and a red X button at the top right.

Figure 6-14. Edit Point (PTL)

- The ok  button – saves the changes and returns to the **Points** screen.

## Photo Note

The *Photo Note* tab on the **Add Point** screen displays a photo note—a picture of the situation at the point—if a picture has been taken and added (using the **Add** button) (Figure 6-15).

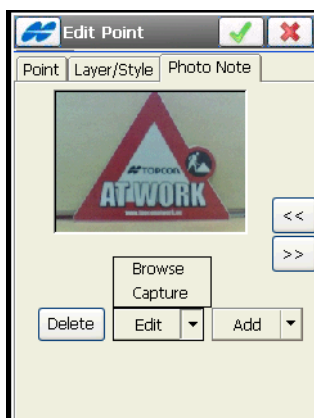


Figure 6-15. Add/Edit Point – Photo Note Tab

- **Delete** – erases the picture for the point.
- **Edit** – selects a new picture to attach (or can use the camera on GMS-2, GMS-2 Pro or GRS-1 to capture a new picture).
- **Add** – opens the **Select Image File** screen to browse for the picture to attach (or can use the camera on GMS-2, GMS-2 Pro or GRS-1 to capture a new picture).
- The forward and back arrows opens the next and previous images respectively.

## Check Points

The *Check Points* tab appears on the **Edit Point** screen if the point has duplicate points and these points are saved as check points (Figure 6-16).

The *Check Points* tab displays the check points coordinates and the deviations from the original coordinate points.

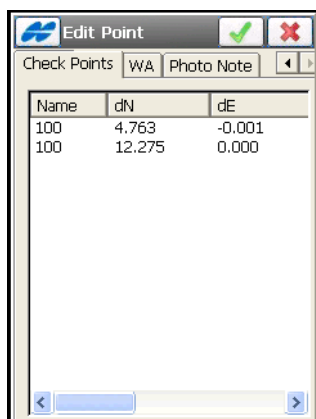


Figure 6-16. Edit Point – Check Points

## Weighted Average

The *WA (Weighted Average)* tab appears on the **Edit Point** screen only for GPS points if the point has check points which are used in a weighted average (Figure 6-17 on page 6-16). The *Weighted Average* tab displays coordinate residuals of the check points used in a weighted average.

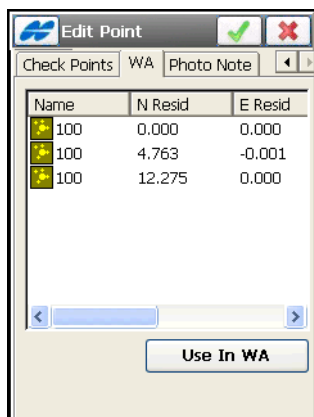


Figure 6-17. Edit Point – Weighted Average

To exclude a station from a weighted average, highlight the station. Tap the **Exclude from WA / Use in WA** button to delete/include the highlighted station in averaging (Figure 6-18).

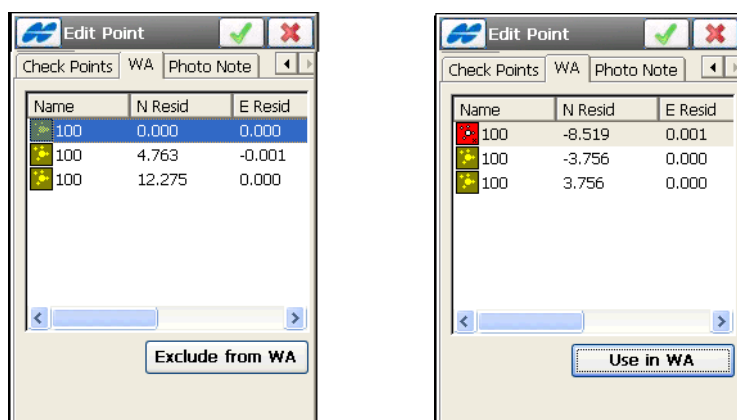


Figure 6-18. Exclude Station from Weighted Average

## Codes

To edit codes and attributes, tap the **Code** icon. The *Code-Attributes* screen displays (Figure 6-19).

The *Code-Attributes* screen (Figure 6-19) contains a list of codes used for a survey, the list of attributes for each code, and a set of tools for editing the codes and attributes. Codes already in use cannot be edited or deleted.

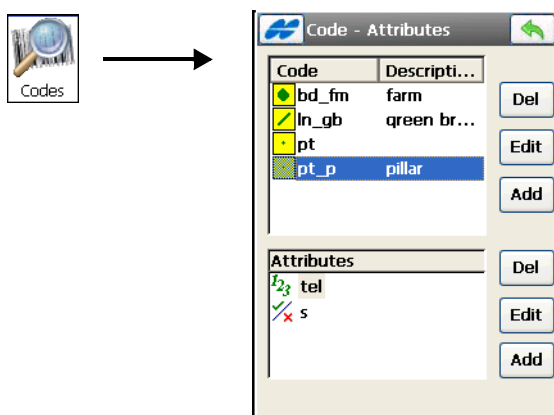


Figure 6-19. Code – Attributes

- *Codes* – contain a list of codes with their associated icons for Code type:
  - Point, ■ Line, or ■ Area.
- *Attributes* – contains a list of attributes for the selected code.
- **Delete** – deletes the highlighted entry.
- **Edit** – opens the applicable *Code* (Figure 6-21 on page 6-19) or *Attribute* (Figure 6-24 on page 6-21) screen with the properties of the highlighted entry.
- **Add** – opens the applicable blank *Code* or the *Attribute* screen. A new attribute can be added if at least one code exists and is highlighted.
- The *Help* Icon in the upper-left corner of the screen opens the pop-up menu containing the *Export To File* option. The *To File* screen (Figure 6-20) displays to export the code library to the selected file format.

**On the To File** screen (Figure 6-20) select the file format to which to export codes of the current job. The **Next** button runs the export process.

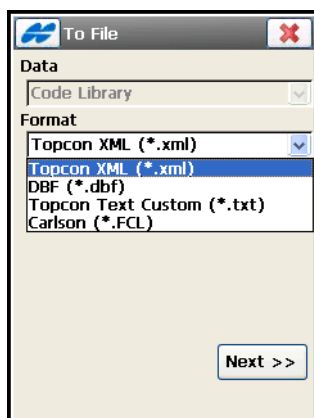


Figure 6-20. Export to Code Library



## Edit Code

On the **Code** screen (Figure 6-21 on page 6-19), set the following code parameters:

- *Name* – the name of the code.
- *Desc* – the description for the code.
- *Type* – the type of objects the code describes: *Point*, *Line* or *Area*.  
A Code Style of Point, Line, or Area can be edited. Each style has an associated plotting attributes and colors.
  - *Point*: when *Point* is selected in the *Type* field, color and symbol attributes for the point displays (Figure 6-21 on page 6-19). The **Color** button opens the **Color** screen (see “On the Select Color” on page 6-13).
  - *Line*: when *Line* is selected in the *Type* field, color, symbol for node, style, and thickness for line attributes display (Figure 6-22 on page 6-20).
  - *Area*: when *Area* is selected in the *Type* field, color, symbol for node, style and thickness for boundary, fill color, fill style and transparency attributes display on the *Area* tab (Figure 6-23 on page 6-20).

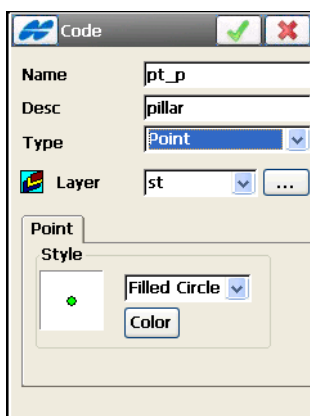


Figure 6-21. Edit Code - Point Type

- *Layer* – the name of the layer in which the code resides.

- The **List**  button opens the **Layers** screen to edit layers. (For details on editing layers, see “Edit Layers” on page 6-24.)

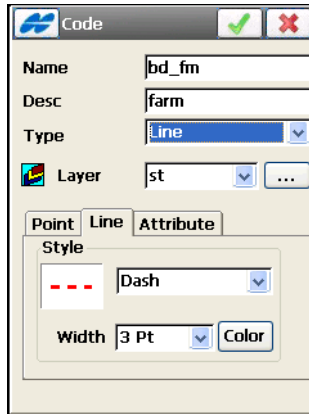



Figure 6-22. Edit Code - Line Type

- *Attribute* – for Line and Area Code type; the radio buttons selected on this tab determine whether the prompt for code should be at the beginning of a line/area (*Start*) or at every point along the line/area (*Each Node*).
- The ok  button – saves the changes, closes the screen, and returns to the **Code-Attributes** screen.

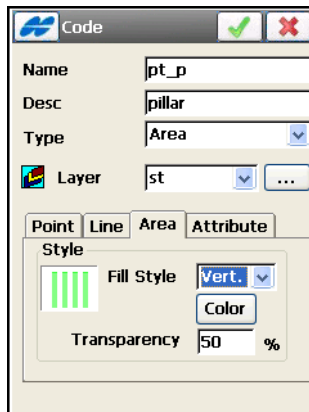



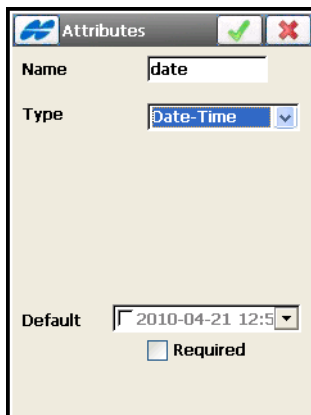
Figure 6-23. Edit Code - Area Type

## Edit Attributes

On the *Attributes* screen, you can set attributes for the code selected on the *Code-Attributes* screen (Figure 6-19 on page 6-17). This screen sets different parameters depending on the attribute type chosen from the *Type* drop-down menu: *Bool* (*boolean* with default *True* or *False*), *Date-Time*, *Integer*, *Menu*, *Real Number* or *Text*.

**For Date-Time** type, use the default (current date) and time for the code attribute or set the date and time from the drop-down list (Figure 6-24 on page 6-21).

- *Attribute Name* – the name of the code attribute.
- *Required* – if the box is checked, a prompt to enter the attribute value will appear every time when using the corresponding code. If the box is not selected, the default value will be always used for the code attribute automatically.
- The ok  button – saves the changes, closes the screen and returns to the *Code-Attributes* screen.



The screenshot shows a dialog box titled "Attributes" with a blue header bar containing a logo and two buttons: a green checkmark (OK) and a red X (Cancel). The dialog has a light beige background. It contains the following fields:

- Name:** A text input field containing the word "date".
- Type:** A dropdown menu with "Date-Time" selected and a blue arrow pointing down.
- Default:** A date and time picker showing "2010-04-21 12:5" with a dropdown arrow.
- Required:** A checkbox that is currently unchecked.

Figure 6-24. Date-Time Attribute

**For Integer** type, the attribute value is an integer. Enter the minimum and maximum values of the attribute (Figure 6-25).

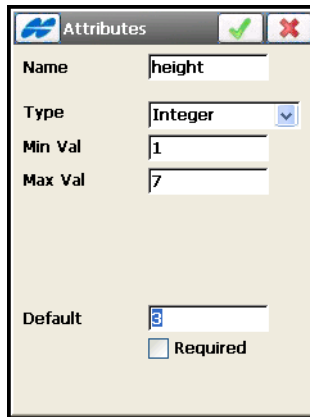
The screenshot shows a dialog box titled 'Attributes' with a blue icon on the left and green checkmark and red X icons on the right. The dialog has several fields: 'Name' with the text 'height', 'Type' with a dropdown menu set to 'Integer', 'Min Val' with the text '1', and 'Max Val' with the text '7'. At the bottom, there is a 'Default' section with a dropdown menu set to '3' and a checkbox labeled 'Required' which is currently unchecked.

Figure 6-25. Integer Attribute

**For Menu** type, the attribute value is selected only from a list of available values (Figure 6-26).

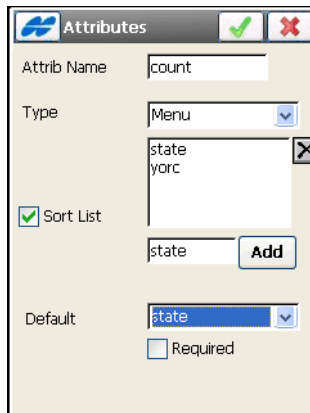

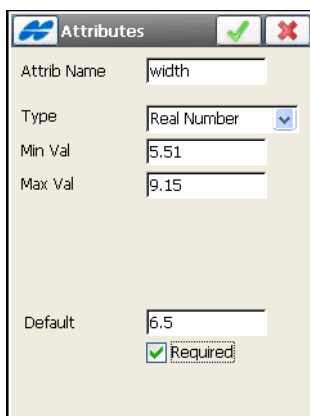
The screenshot shows a dialog box titled 'Attributes' with a blue icon on the left and green checkmark and red X icons on the right. The dialog has several fields: 'Attrib Name' with the text 'count', 'Type' with a dropdown menu set to 'Menu', and a list box containing 'state' and 'yorc'. To the left of the list box is a checked checkbox labeled 'Sort List'. Below the list box is a text field with the text 'state' and an 'Add' button. At the bottom, there is a 'Default' section with a dropdown menu set to 'state' and a checkbox labeled 'Required' which is currently unchecked.

Figure 6-26. Menu Attribute

- **Add** – adds admissible values entered in the *Add* entry field.
- *Sort List* – enable to arrange the list in alphabetical order.
- **Delete**  – deletes the selected entry from the menu.

**For Real Number** type, the attribute value is a real number. Enter the minimum and maximum values of the attribute (Figure 6-27).

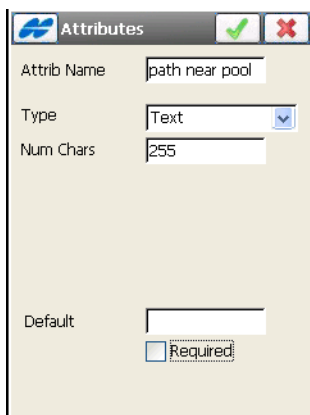


The 'Attributes' dialog box shows the configuration for a 'Real Number' attribute. The 'Attrib Name' is 'width'. The 'Type' is set to 'Real Number'. The 'Min Val' is '5.51' and the 'Max Val' is '9.15'. The 'Default' value is '6.5'. The 'Required' checkbox is checked.

Attrib Name	width
Type	Real Number
Min Val	5.51
Max Val	9.15
Default	6.5
Required	<input checked="" type="checkbox"/>

**Figure 6-27. Real Number Attribute**

**For Text** type, the attribute value is an alpha-numeric string. Enter the number of characters available for the text value (Figure 6-28).



The 'Attributes' dialog box shows the configuration for a 'Text' attribute. The 'Attrib Name' is 'path near pool'. The 'Type' is set to 'Text'. The 'Num Chars' is '255'. The 'Default' value is empty. The 'Required' checkbox is unchecked.

Attrib Name	path near pool
Type	Text
Num Chars	255
Default	
Required	<input type="checkbox"/>

**Figure 6-28. Text Attribute**

# Edit Layers

To edit layers, tap the **Layers** icon.

The **Layers** screen (Figure 6-29) displays the list of all existing layers in the current job and the layer status of each.

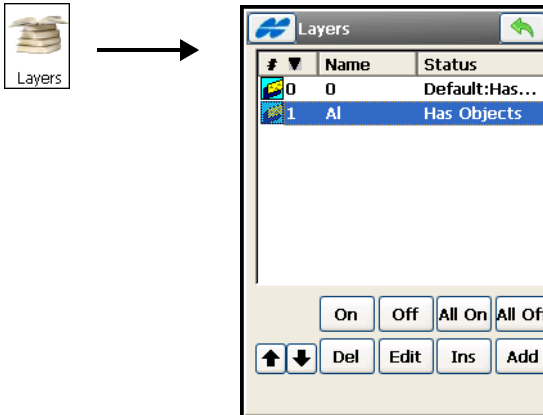







Figure 6-29. Layers

- Each layer has an icon to show whether the layer is unhidden  or hidden  and a running number. To turn on/off the visibility of selected or all Layers, tap on the corresponding button **On/Off** or **All On/All Off**.
- The order  icon – tap on the icon to list the layers in ascending or descending running order. After tapping in the *Name* header of the table, the icon will toggle to the Name column to set the layers in ascending or descending order of names.
- *Name* – the name of the layer
- *Status* – shows whether the layer is empty or contains objects.
-  – moves the highlighted layer up or down.
- **Delete** – deletes the highlighted layer.
- **Edit** – opens the applicable **Edit Layer** screen to display the properties of the highlighted layer (Figure 6-30 on page 6-25).


- **Insert** – opens the *Add Layer* screen to insert a new layer below the selected layer.
- **Add** – opens the *Add Layer* screen to add a new layer.
- The ok  button – closes the screen and returns to main menu.

## View Objects on the Layer

The *Edit Layer* screen (Figure 6-30 on page 6-25) is similar to the *Add Layer* screen but has the additional *Objects* tab to view objects on the layer.

### Layer Name

The *Layer* tab contains general settings. You can edit the following to set new parameters for the layer:

- *Layer Name* – shows the name of the layer.
- *Visible* – hides/shows the layer objects on the map.
- *Note* – enter any additional information on the layer (if preferred).
- The ok  button – saves the settings and returns to the *Layers* screen.

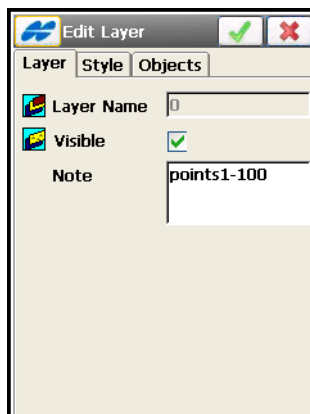


Figure 6-30. Edit Layer Name

## Style Tab

The *Style* tab plots parameters for lines and points on the layer. Do the following to set parameters for the lines and points on the layer (Figure 6-31).

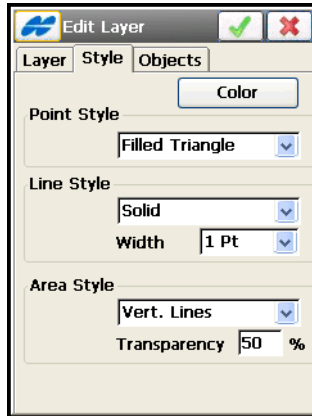


Figure 6-31. Edit Layer Style

- *Point Style* – selects a symbol for the Point.
- *Line Style* – selects a style, and thickness for the Line.
- *Area Style* – selects a fill style and transparency for the Area.
- **Color** – opens the *Select Color* screen to set the color for the layer (see Figure 6-12 on page 6-13).

## Objects Tab

If the layer has objects, the *Objects* tab on the *Edit Layer* screen appears that displays points and other objects of the current layer (Figure 6-32 on page 6-27).





Figure 6-32. Edit Layer Objects

## Edit Multiple Layers

To turn on/off the visibility of multiple layers at a time, select the layers you want using the **Ctrl** or **Shift** buttons on the controller's keyboard and tap on the *Layer Name* column (Figure 6-33).

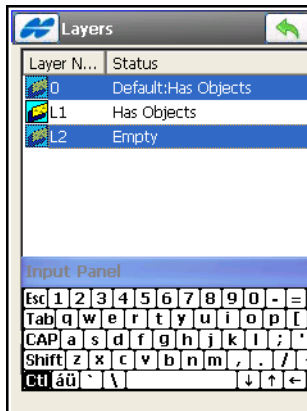



Figure 6-33. Edit Multiple Layers

- The *Status* column shows the status of the layer.
- The back  button – returns to the main menu.

# Linework

Linework is a group of points connected with a line. Points defined by the same code-string combination automatically form a linework.

To edit a linework, tap the **Linework** icon. The **Linework** screen contains a list of existing Lineworks on the left side of the screen, and the two windows on the right side that represent the view of the selected linework in the horizontal and vertical planes (Figure 6-34).

- **Delete** – press to delete the Linework from the list.
- **Edit** – opens the applicable **Edit Line** screen (Figure 6-35 on page 6-29).
- **Add** – opens a blank **Add Line** screen to create a new linework. The Linework can be created in four ways: by either selecting the points with the desired codes and strings, by tapping the points on the map, or by selecting the points from the list.

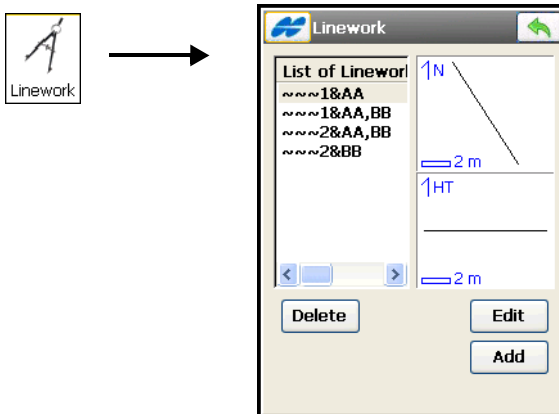



Figure 6-34. Linework

- The back  button – returns to the main menu.

The **Help** Icon in the upper-left corner displays the pop-up menu:

- **Edit Points** – displays the **Points** screen. For details, see “Points” on page 6-3.

## Edit Line

On the *Edit Line* screen (Figure 6-35), you can edit the points and the layer of the selected linework.

### Points in Line

The *Point in Line* tab displays a list of existing points or positions (with the question marks in the case of imported lineworks) in the selected Linework on the left side of the screen, and the general view of the linework on the right side (Figure 6-35).

The yellow circle symbol on the plot indicates the point highlighted in the list of points. To view the current selected linework on a large map, tap on the map plot.

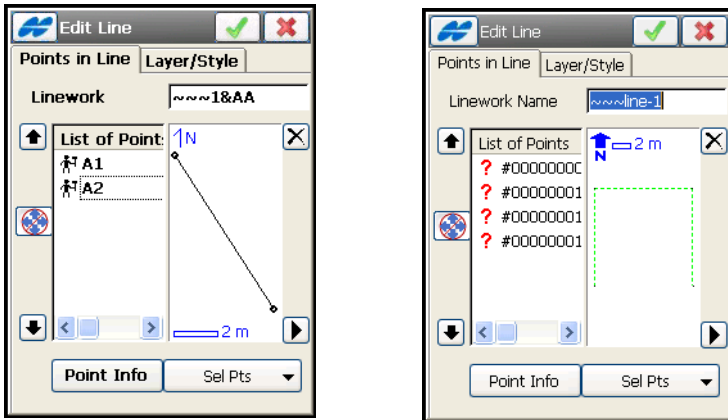





Figure 6-35. Edit Points in Line

- *Linework* – the name of the Linework.
- *List of Points* – points or positions in the selected linework.
- The up and down arrows to the left of List of Points move the highlighted point up or down in the order of the points in the linework.
-  – toggles on/off the keyboard arrow keys that duplicate the arrows on the screen.
-  – deletes the highlighted point from the linework.

-  – closes the plot of the point list. Only the list of points table will be available.
- **Point Info** – displays information on the selected point.
- **Select Points** – displays the five methods of adding points to the beginning of the line: *By Code*, *By Code String*, *From Map*, and *From List*.

**By Code:** select the codes with which the points are added to the line. The *Select Points by Code* screen displays (Figure 6-42).

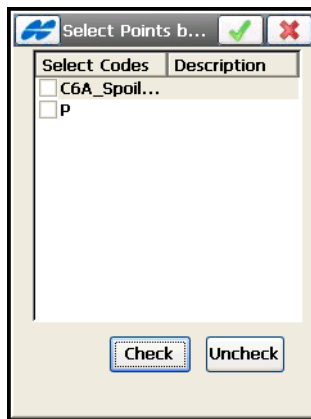


Figure 6-36. Select Points by Code

The **Check** and **Uncheck** button selects and deselects a highlighted code.

**By Code String:** select the codes and strings with which the points are added to the line. The *Code Strings* screen displays (Figure 6-37 on page 6-31).

First select the code that has strings then a string list will be available for selection.

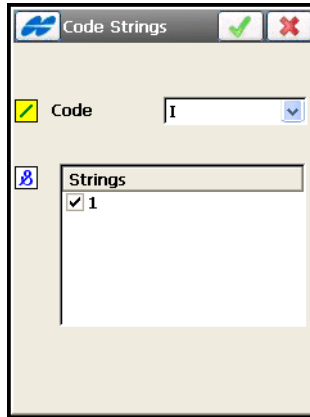


Figure 6-37. Select Points by Code String

**From Map:** select the points by tapping them on the map; points that are sequentially tapped are connected with a line.

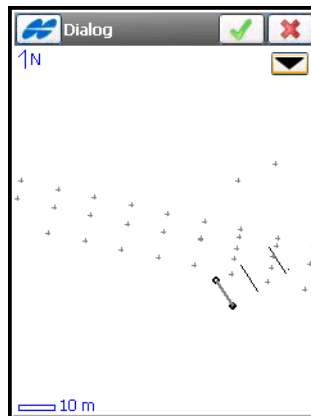



Figure 6-38. Select Points from Map

The tool bar  button opens the map tools (for description, see Table 15-1 on page 15-2).

**From List:** select the points from the list of points. The *Points* screen displays (for details, see Figure 6-2 on page 6-3).

## Layer/Style

On the *Edit Line* screen (Figure 6-39), tap the *Layer/Style* tab to set a type and a color to display the line in the selected Linework on the map.

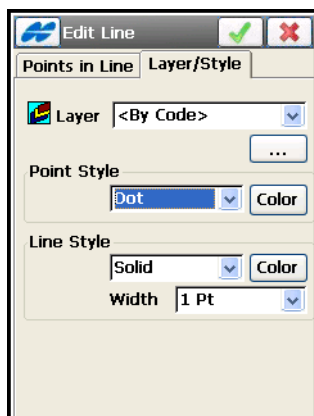



Figure 6-39. Edit Line Layer

- *Layer* – selects the layer for the line from the drop-down list.
- *Line Style* – selects the form and width of the line from the drop-down lists and shows the result.
- **Color** – opens the *Select Color* screen (see “On the Select Color” on page 6-13) to choose the color for the line.
- The **List**  icon opens the *Layers* screen to edit layers. (For details on editing layers, see “Edit Layers” on page 6-24.)

## Area

Area is bound with a closed line. Line nodes (points) have the same code of area type to form an area boundary.

To edit an area, tap the **Area** icon. The *Area* screen (Figure 6-40) contains a list of existing areas on the left side of the screen, and the two windows on the right side that represent the view of the selected area in the horizontal and vertical planes.

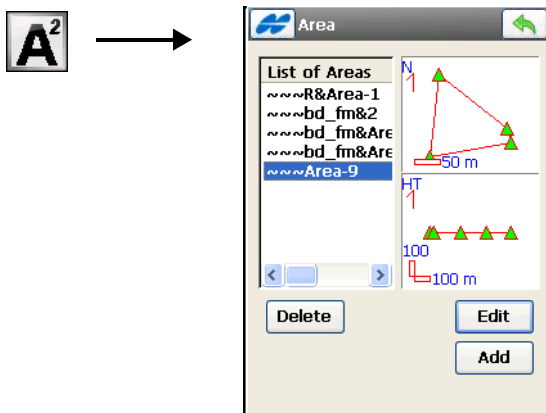


Figure 6-40. Area Screen

- **Delete** – press to delete the highlighted Area from the list.
- **Edit** – opens the applicable *Edit Area* screen (Figure 6-41 on page 6-34).
- **Add** – opens a blank *Add Area* screen to create a new area (Figure 6-41 on page 6-34).

The *Help* Icon in the upper-left corner displays the pop-up menu:

- *Edit Points* – displays the *Points* screen. For details, see “Points” on page 6-3.

## Edit Area

On the *Edit Area* screen (Figure 6-41 on page 6-34), you can edit the name, the points, and the layer of the selected area.

## Points in Area

The *Points in Area* tab displays a list of existing points (*Area Name*) in the selected Area on the left side of the screen (Figure 6-41), and the general view of the area lines on the right side.

The point highlighted in the list of points will be marked with a yellow circle.

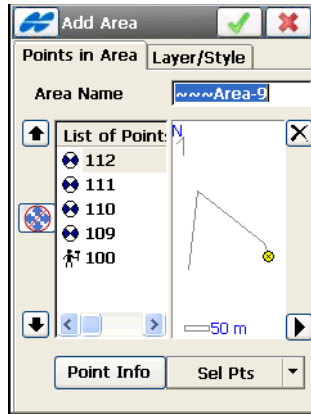





Figure 6-41. Edit Points in Area

- *Area Name* – the name of the Area.
- *List of Points* – the list of currently selected points.
- The up and down arrows to the left of List of Points move the highlighted point up or down in the order of the points in the area.
-  – toggles on/off the keyboard arrow keys that duplicate the arrows on the screen.
- **Point Info** – shows the point information of the currently selected single point.
-  – deletes the highlighted point from the area.
-  – closes the plot of the area. Only the list of points table is available.
- **Select Points** – displays the five methods of adding points to the beginning of the line: *By Code*, *By Code String*, *From Map*, and *From List*.

**By Code:** select the codes with which the points are added to the area. The *Select Points by Code* screen displays (Figure 6-36 on page 6-30).



**By Code String:** select the codes and strings with which the points are added to the line. The *Code Strings* screen displays (Figure 6-37 on page 6-31).

**From Map:** select the points by tapping them on the map; points that are sequentially tapped are connected with a line to arrange an area (Figure 6-38 on page 6-31).

**From List:** select the points from the list of points. The *Points* screen displays (for details, see Figure 6-2 on page 6-3).

**From Line:** select all points from the line. The *Points* screen displays (Figure 6-42).

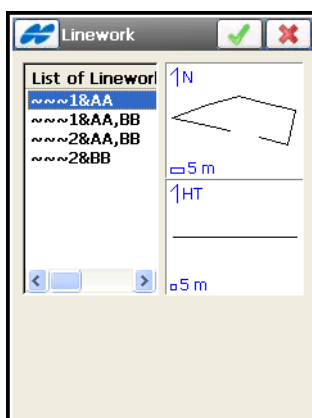




Figure 6-42. Select Points from Line

Pressing the ok  button adds all points in the selected line to the area.

## Edit a Layer/Style

On the *Edit Area* screen, tap the *Layer/Style* tab to edit a style and color to display the points, lines and area in the selected Area on the map (Figure 6-43 on page 6-36).

- *Layer* – selects the layer for the line from the drop-down list.
- The **List**  icon opens the *Layers* screen to edit layers. (For details on editing layers, see “Edit Layers” on page 6-24.)

- *Point Style* – selects the color and the symbol for the Point.  
**Color** opens the *Select Color* screen (see “On the Select Color” on page 6-13) to choose the fill color for the point.
- *Line Style* – selects color, style and thickness for Line.
- *Area Style* – selects fill color, fill style and transparency for Area.

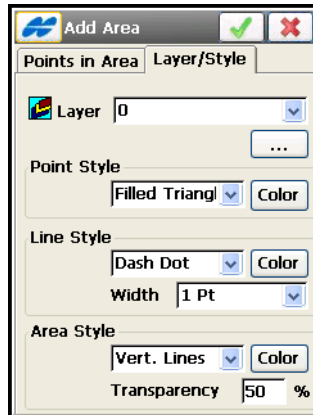


Figure 6-43. Edit Area Layer/Style

## Point Lists

The Point List is a group of points that can be simultaneously processed and is tightly intergrated throughout TopSURV. Depending on the context, the points may or may not be connected with a line. A Point List with its points connected forms a polyline.

To use the Point Lists, tap the **Point Lists** icon. The *List of Point Lists* screen displays (Figure 6-44).

## List of Point Lists

The *List of Pt Lists* screen (Figure 6-44 on page 6-37) contains a list of existing Point Lists on the left side of the screen, and the two windows on the right side, that displays a general view of the selected list in the horizontal and vertical planes. To view the current selected point list on a larger map, double-click one of the map plots.

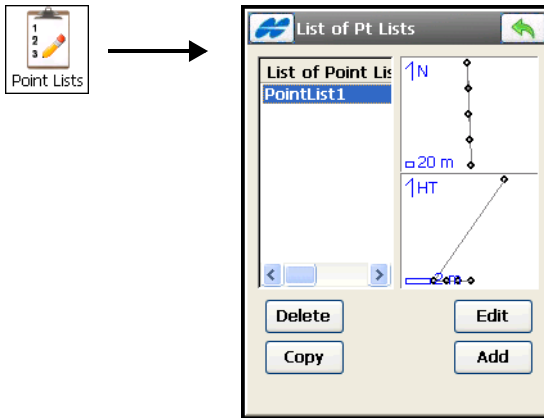



Figure 6-44. List of Point Lists

- **Delete** – deletes the Point List from the list.
- **Copy** – creates a copy of the selected List.
- **Edit** – edits the properties of the selected List. The *Edit Point List* screen displays (Figure 6-45 on page 6-38).
- **Add** – creates a new point List. The *Add Point List* screen displays.
- The back  button returns to the main menu.
- The Help Icon in the upper-left corner of the screen displays the pop-up menu:
  - *Edit Points*: displays the *Points* screen. For details, see “Points” on page 6-3.

## Edit Point List

The *Edit Point List* screen (Figure 6-45 on page 6-38) is similar to the *Add Point List* screen. The screen displays the points included in the list to edit and the plot interpretation.

- *Point List Name* – the name of the Point List.
- *List of Points* – the list of currently selected points.
- The up and down arrows to the left of List of Points move the highlighted point up or down in the order of the points in the list.

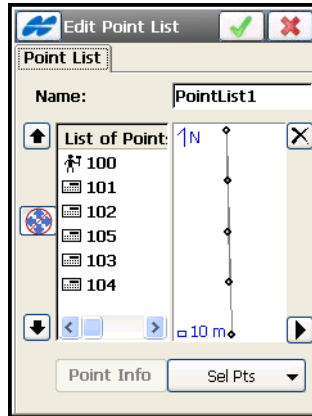





Figure 6-45. Edit Point List

-  – toggles on/off the keyboard arrow keys that duplicate the arrows on the screen.
- **Point Info** – shows the point information of the currently selected single point.
-  – deletes the highlighted point from the list.
-  – closes the plot of the point list. Only the list of points table is available.
- **Select Points:** displays the seven methods of adding points: select either *By Range*, *By Code*, *By CodeString*, *By Radius*, *From Map*, *From List* or *From Layer*. Enter in this sequence: set the range, check the codes, set the center point and the radius of the area, then select the points from the map or use the list or the layer.

**By Code:** select the codes with which the points are added to the list. The *Select Points by Code* screen displays (see Figure 6-42 on page 6-35).

**By Code String:** select the codes and strings with which the points are added to the line. The *Code Strings* screen displays (Figure 6-37 on page 6-31).

**From Map:** select the points by tapping them on the map; points that are sequentially tapped are connected with a line (Figure 6-38 on page 6-31).

**From List:** select the points from the list of points. The *Points* screen displays (for details, see Figure 6-2 on page 6-3).

**By Range:** select the points in the range. The *By Range* screen displays (Figure 6-46).

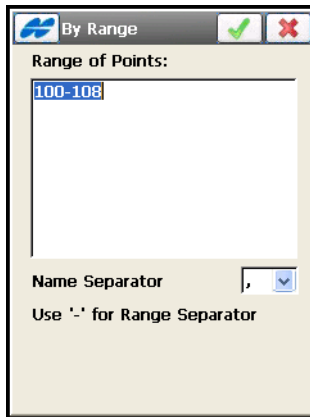






Figure 6-46. Select Points by Range

Type in the names of the first and the last points of the point list separated by the hyphen and press the ok  button.

**By Radius:** select the points included in the circle of the radius set from the selected point. The *By Radius* screen displays (Figure 6-47 on page 6-40).

Select the desired center point from the list of points  or from the map . Type in the value of the radius and press the ok  button to add all points covered by the defined circle to the point list.

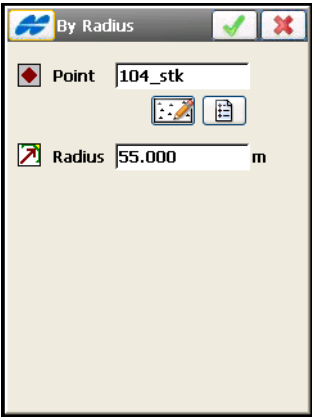


Figure 6-47. Select Points by Radius

**From Layer:** select the points from the objects which lie on the selected layer. The *Layers* screen displays (Figure 6-48).

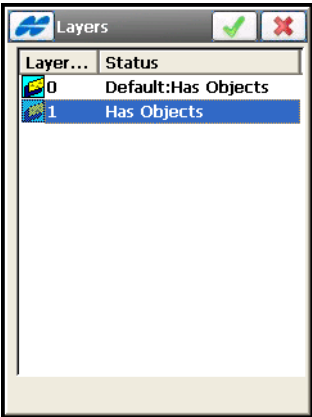



Figure 6-48. Select Points from Layer

Select the layer and press the ok  button to add all points on the selected layer to the point list.

# Raw Data

To edit raw data, tap the **Raw Data** icon.

The **Raw Data** screen has the following columns for raw data (see Figure 6-49 on page 6-42).

- *Name* – point name and the icon displaying the type of measurement
- *Type* – the type of measurement
- *Codes* – codes for the point
- *HI* – for TS mode, the height of the instrument; for a Level survey, the elevation of the line of sight of the levelled instrument above the datum.
- *Ant Ht* – for GPS+ mode, the antenna height (S-stands for the slope measurement of the antenna height).
- *Coordinates* – the coordinates of the point (TS and GPS+ modes).
- *Mid Wire* – the reading on the middle wire for Level survey.
- *Distance* – the horizontal distance between the Level and the rod for Level survey.
- *Ctrl Code* – control code for the point.
- *Notes* – additional information on the point.
- *Local Time* – the local time when the point is collected.

To navigate to a desired point, you can use the buttons in the lower part of the screen:

- **First** and **Last** – moves the cursor to the first or last point.
- **Edit** – opens the **Edit Raw Data** screen to edit user-entered raw data.
- **Find Point** – finds a point by its name or a part of its name.
- **Find Code** – finds a point by its code or by a part of the code.
- **Find Next** – finds the next point that satisfies the same conditions as the previous found point.

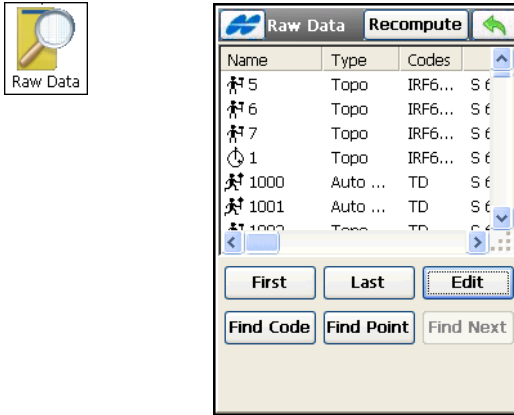



Figure 6-49. Raw Data - GPS

- **Recompute** – recomputes the point coordinates after editing the point’s raw data.
- The back  button returns to the main menu.

The *Help* Icon in the upper-left corner of the screen enables the menu of items:

- *Job Info*: displays the **Job Info** screen (For details, see “Viewing Job Information” on page 2-15).
- *Show Raw GPS+/TS*: toggles between displaying GPS+ raw data and TS raw data.

## Edit Raw Data

The **Edit Raw Data** screen (Figure 6-50 on page 6-43) is used to edit the name and code of the surveyed point, and the antenna/instrument height at this point. Also, you can edit the antenna type for GPS measurements and backsight azimuth for TS measurements.

The first tab is named by the measurement type and contains editable data for the point being edited:

- *Topo* or *Auto Topo* for GPS data.
- *BS*, *Occ Pt.* and *Side Shot* for Total Station data.



- *Side Shot* for Digital Level data.

Figure 6-50. Edit Raw Data

The *Data* tab (Figure 6-51) displays information on measurements:

- Vector components for GPS data (Figure 6-51).
- Angle and distance measurements for Total Station data.
- Horizontal distance, rod height and vertical offset for Digital Level data.

Type	Topo
dN	1.747 m
dE	0.262 m
dU	0.136 m
Local Time	2009:05:12::03:4
PDOP	1.818
HRMS	0.011
VRMS	0.010
GPS Sats	7
GNSS Sats	5

Figure 6-51. Edit Raw Data – Data Tab

For the Base Station started in the job, the **Edit** button displays the Base coordinates on the *Mark Coords* screen (Figure 6-52).

The screenshot shows the 'Mark Coords' screen with the following fields and values:

- Point:** base3
- Code:** (empty)
- Grid:** SK1942-Zone\_7 : ... (m)
- North:** 6185614.153
- East:** 419208.896
- Ell ht:** 137.352
- Ant Type:** GR-3
- Relative cal.:** ☐
- Ant Ht:** 2.000 m, **Slant:** (dropdown menu)

Figure 6-52. Base Station Coordinates

- *Relative cal* – enable to use relative parameters at the base with correction data transmission if necessary.

In addition, the *Edit Raw Data* screen for DL measurements contains a *Measurements* tab to adjust vertical offsets (Figure 6-53).

The screenshot shows the 'Edit Raw Data' screen with the 'Meas' tab selected. The fields and values are:

- Rod Ht.:** 0.8275 m
- Distance:** 2.575 m
- V. Offset:** 0.0000 m

Figure 6-53. Edit DL Raw Data – Measurements Tab

# Background Images

To edit background images in the current job, tap the **Images** icon.

Any raster image with a TIF, JPG, or BMP extension is supported. To be positioned correctly under all observed data on the map screen, the images must have geo-referenced data. GeoTIFF images already include geo-referenced data, while the others use a separate file that references the geographic location of the image. This file is called a **World File**. The World File contains information about the size of the corresponding image and the coordinates of the geo-reference point (the upper left corner of the image) in the coordinate system of the job.

The World File must have the same filename extension associated with the image format (TFW, JGW or BPW) and should be located in the same directory as the image file.

The **Background Images** screen (Figure 6-54) displays a list of available image files. Initially, the list is empty.

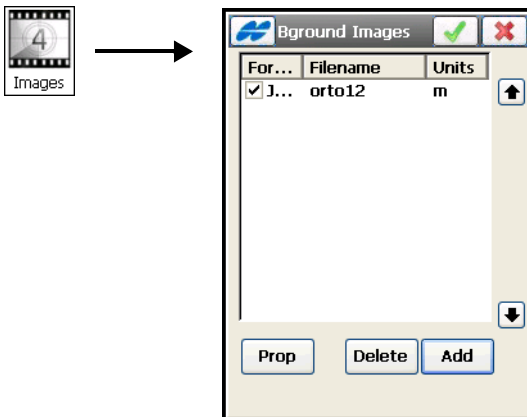



Figure 6-54. Select Image to Open

- **Properties** – opens the *Properties* screen for the highlighted file.
- **Delete** – deletes the currently selected file from the list.
- **Add** – opens the *Add Image* screen (Figure 6-55 on page 6-46) to browse the controller's directories for the desired file.

- **Up/Down** arrows – moves the selected images up or down in the list.
- The ok  button – opens the selected file. If no World File exists for the background image file selected, a warning displays, and the **Background Images** screen appears again to select another file. Multiple background images can be selected, but is limited by the amount of free space in the controller memory.

## Add Image

The **Add Image** screen (Figure 6-55) selects an image file to add to the *Background Images* list.

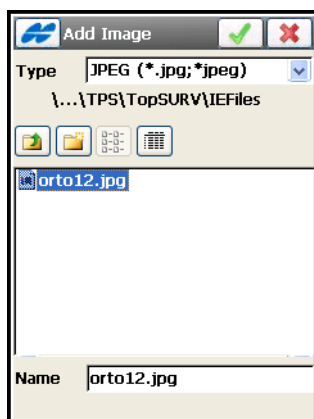



Figure 6-55. Add Image

- **Type** – selects the type of the image to be added, either GeoTIFF, TIFF, JPEG, or BITMAP.
- **Name** – displays the name of the selected file.
- The ok  button – opens the **Properties** screen (Figure 6-56 on page 6-47) for the selected file.

## Properties

If the selected image uses a **World File**, select the projection in which the coordinates in the World File are given: either *Current* job projection or *UTM*.

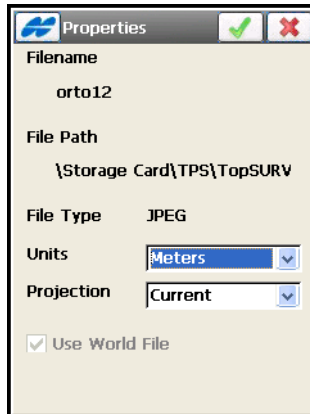



Figure 6-56. Properties of Background Image

- The ok  button – returns to the **Background Images** screen (Figure 6-54 on page 6-45) with the file added to the list. To use a file once it is added, make sure the file is selected in the list.



To map a Background Image correctly, the image (it's geo-reference point) should be in the job's current coordinate system or at least in a very similar one (for example, in a corresponding UTM zone).

# Sessions

To create or edit GPS sessions of the automatic survey for post-processing, tap the **Sessions** icon. The **Sessions** (Figure 6-57) screen displays.

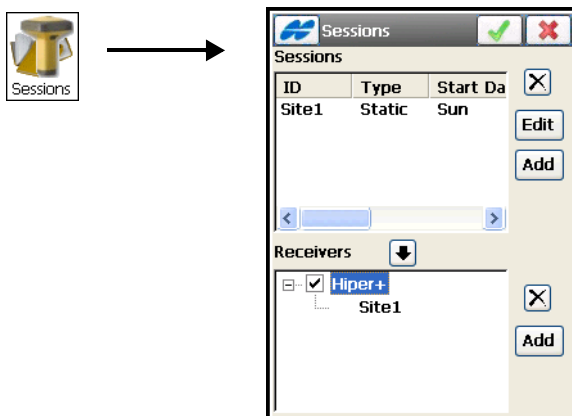


Figure 6-57. Sessions


- **Sessions** – on this panel, enter an ID name, survey type, the day and time the survey began, and the day, time, and date the survey ended.
- **Edit** – press to edit the existing session. The **Session Setup** screen opens (Figure 6-58 on page 6-49).
- **Add** – press to create a new session. The **Session Setup** screen opens (Figure 6-58 on page 6-49).
- **Receivers** – on this panel, is the list of the available receivers and their session plans. To hide/display the session plans of the receiver, tap on the “-/+” sign located near the receiver name.
- **Add** – press to add a receiver. The **Receiver Name** screen displays.
- – press to put a session to the session plan of the receiver. On the **Sessions** screen, highlight the preferred session in the **Sessions** panel and highlight the necessary receiver in the **Receivers** panel. Press this button.
- – press to delete the session from the sessions list or receiver.

- The ok  button – saves the changes and closes the screen.

## Session Setup

The *Session Setup* (Figure 6-58) screen contains the parameters of the session.

Figure 6-58. Session Setup

- *Site Name* – the name of the occupation point.
- *Type* – sets the type of session survey, either *static* or *kinematic*.
- *Start Time*, *End Time* – sets the start and end time of the survey
- *Interval* – sets the interval between measurements,
- *Min SVs* – sets the minimum satellites available for the survey
- *Ant Type* – sets the type of antenna.
- *Ant Ht* – sets the value and type of the antenna height.
- The ok  button– saves the changes and returns to the *Sessions* screen (Figure 6-57 on page 6-48).



The antenna type specified in this screen does not display in the receiver file. But the antenna height recorded in the file includes offsets for the specified antenna type.

# Simulation Setup

Simulation Setup becomes available in the **Edit Job** menu when GPS Simulation mode is enabled (see Figure 3-7 on page 3-9).

To setup the simulation mode, tap the **Set Simulator** icon.

The **Simulation Setup** screen (Figure 6-59) sets a reference position for GPS simulation. Set the reference position by selecting the point, either from the map or from the list, or enter manually.

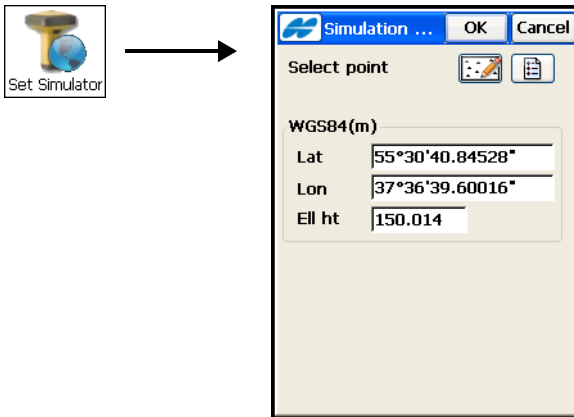


Figure 6-59. Simulation Setup



The Latitudes are considered to be positive in the Northern Hemisphere and negative in the Southern one. The Longitudes are positive for the Eastern direction and negative for the Western direction, relative to the GMT line.

# Stake Reports

To edit an existing report or create a new one, tap the **Stake Reports** icon. The **Stake Reports List** screen will display a list of existing reports in the job (see Figure 6-60 on page 6-51).

The red asterisk \* icon near the report name means that the report is set as current for this type.



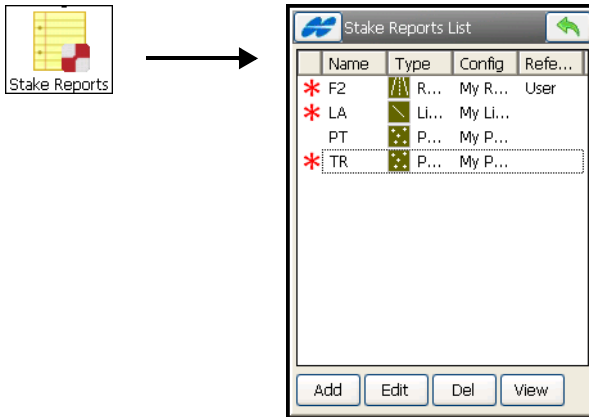


Figure 6-60. Stake Reports List

- **Edit** – press to edit the existing report in the *Stake Report* screen (Figure 6-61).
- **Add** – press to create a new report. The *Stake Report* screen opens (Figure 6-61).

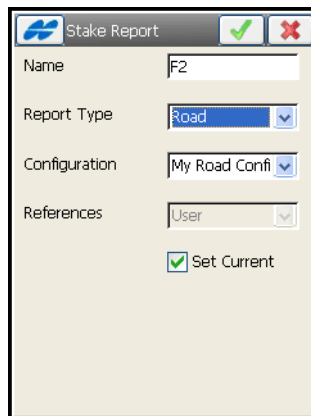
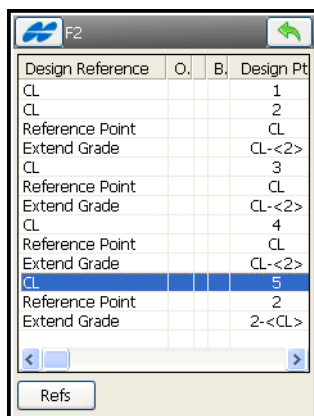


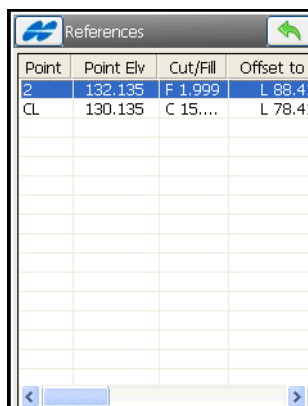
Figure 6-61. Stake Report

- **Del** – deletes the report. The user will have twice to confirm deletion before the report data is deleted.
- **View** – shows the full report selected (Figure 6-62 on page 6-52).



**Figure 6-62. Report View**

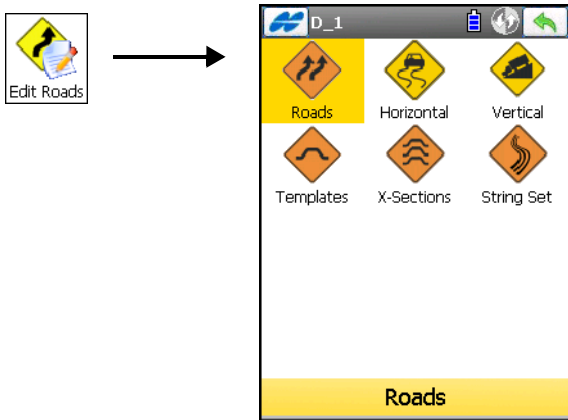
- **Refs** – this button appears only if there are set references, and is available for design points with references; displays the *References* data for the highlighted design point.



### Figure 6-63. References

# Editing Roads

To edit road data in a job, tap the **Edit Roads** icon in the main menu (Figure 7-1).



**Figure 7-1. Edit Roads Menu**

The **Edit Roads** folder contains the following options (Table 7-1):

**Table 7-1. Export Menu Icons**








Icon	Description
 Roads	Roads – use to edit properties of existing roads and to add new roads. For details on this option, see “Roads” on page 7-2.
 Horizontal	Horizontal – use to edit code properties and to add new codes. For details on the option, see “Horizontal Alignment” on page 7-7.
 Vertical	Vertical – use to edit layer properties and to add new layers manually. For details on the option, see “Vertical Alignments” on page 7-16.
 Templates	Templates – use to edit linework properties and to create new lineworks manually. For details on the option, see “Cross Section Templates” on page 7-26.

Table 7-1. Export Menu Icons (Continued)

Icon	Description
 X-Sections	X-Sections – use to edit linework properties and to create new lineworks manually. For details on the option, see “Cross Section Sets” on page 7-29.
 String Set	String Set – use to edit linework properties and to create new lineworks manually. For details on the option, see “String Set” on page 7-32.

The **Edit Roads** menu opens, which includes options to edit road data in the current job: Roads, Horizontal Alignments, Vertical Alignments, Templates, X-Sections and String Set.

The **Help Icon**  opens a pop-up menu, giving access to the help files, module activation codes, port data logging, changing menu interface, and information about TopSURV (for details see “Help Icon’s Pop-up Menu” on page 1-9).



To edit object properties, double-click on the object or select the object and tap the Edit button.

## Roads

The road as an object is described through the main alignment, called *Centerline*, and the surface of the road.

There are two definitions of the road in TopSURV where:

1. The road surface is described with *Cross Section Set*, and the main alignment is the center line of this surface. *Cross Section Set* is grouped together polylines (cross sections) lying on the road surface in the plane perpendicular to the centerline.
2. The road surface is described with *String Set*, and the main alignment may not be the centerline of the physical road surface but a center line marking the center of a road construction project. *String Set* is a set of road *Strings*, made up of paired horizontal and vertical alignments.

The alignment can be divided into sections, each described with the help of algebraic functions. The horizontal alignment can be described through *lines*, *spirals*, *arcs* and *intersection points*. *Intersection point* is defined as the intersection of the two lines tangential to the 'incoming' and 'exiting' spirals, or to the central curve at the PC and PT points, if spirals are not specified. The vertical alignment can be described through *vertical grades* and *parabolas* or *circular arcs*, or *long sections*.

To edit a road as a whole, tap the **Roads** icon.

The **Roads** screen (Figure 7-2) displays a list of the created roads, and plots of the horizontal and vertical alignments for each road.

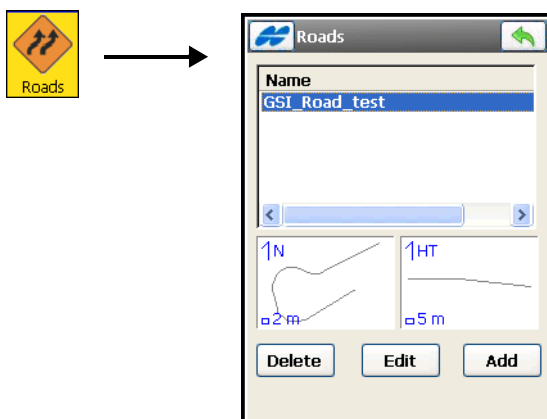


Figure 7-2. Select Road

The upper part of the screen displays the list of created roads. The lower part displays the corresponding alignment plots.

- **Edit** – opens the **Edit Road** screen (Figure 7-3 on page 7-4), displaying the parameters of the selected road.
- **Add** – opens the **Add Road** screen blank parameter fields to set a new road.



Double-tapping a plot on any edit screen opens a greater map.

The *Help* Icon in the upper-left corner of the screen displays a pop-up menu of options:

- *Import Road(s) From Job* – starts the import of roads from the job selected (“Importing From Job” on page 5-2).
- *Import Road(s) From File* – starts the import of roads from the file of the selected format (“Importing From a File” on page 5-13).
- *Export Road(s) To Job* – starts the export of roads to the job selected (“Exporting To a Job” on page 4-2).
- *Export Road(s) To File* – starts the export of roads to the file of the selected format (“Exporting to File” on page 4-13).

## Edit Road

The *Edit Road* screen (Figure 7-3) displays the general properties of the road.

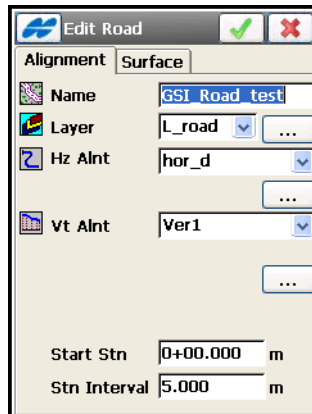



Figure 7-3. Edit Road Alignment


## Road Alignment

The *Alignment* tab displays the alignment properties:


- *Name* – enter a name for the road.
- *Layer* – selects the layer on which the road is located.

The **List**  button opens the **Layers** screen to edit layers (for details see “Edit Layers” on page 6-24).

- *H<sub>z</sub> Alnt* – selects a pre-defined horizontal alignment to use in designing the road. This Horizontal Alignment defines the stationing for the road and must be set for either way of creating a road: with *Cross Section Set* or *String Set*.

The **List**  button opens the **Horizontal Alignment** screen to edit horizontal alignments (for details see “Horizontal Alignment” on page 7-7).

- *Vt Alnt* – selects a pre-defined vertical alignment to use in designing the road. This Vertical Alignment defines the vertical center alignment for the road only if *Cross Section Set* is being used.


The **List**  button opens the **Vertical Alignment** screen to edit vertical alignments (for details see “Vertical Alignments” on page 7-16).

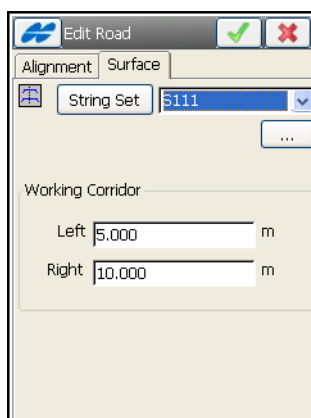
- *Start Stn/Start Chn* – the starting station number with distance to the station, or the starting chain distance, depending on a selection made in the **Display** screen (for details see “Display” on page 2-9).
- *Stn Interval/Chain Interval* – the interval between the points where road related computations are made.

## Road Surface

The *Surface* tab displays the properties of the road surface (Figure 7-4 on page 7-6):

- **X-Sec Set / String Set** – selects a way of describing the road surface: with a set of cross sections or a set of strings. Select a set from the drop-down menu to use in designing the road.

- The List  button opens the corresponding dialog:
  - either the ***X-Section Set*** screen to edit cross section sets (for details see “Cross Section Sets” on page 7-29).
  - or the ***String Set*** screen to edit string sets (for details see “String Set” on page 7-32).
- ***Working Corridor*** – limits along the road for the width of a cross section, to only include those strings inside the working corridor. A working corridor is defined by two offsets from the centerline: offsets to the *Left* (near to the centerline) and *Right* (far from the centerline) sides of the corridor.



**Figure 7-4. Edit Road Surface**



If the value entered in the *Left* field is more than one entered in the *Right* field, a warning displays:

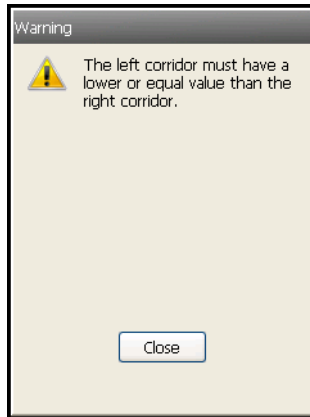


Figure 7-5. Wrong Offsets Values

After the Road is created, you can calculate the road points. The *Help* icon in the upper-left corner of the screen displays a pop-up menu that contains an option:

- *Calculate Road Points* – opens the *Calculate Road Points* screen (see “Calculate Road Points” on page 7-37).

## Horizontal Alignment

To edit a horizontal alignment, tap the **Horizontal** icon. The *H<sub>z</sub> Alnt* screen (Figure 7-6) displays a list of the horizontal alignments, and the map area displaying the plot of the highlighted horizontal alignment.

- **Delete** – deletes the horizontal alignment from the job.
- **Edit** – opens the *Edit H<sub>z</sub> Alnt* screen, displaying the parameters of the selected horizontal alignment.

- **Add** – opens the *Add Hz Alnt* screen with empty parameter fields to set a new horizontal alignment (see Figure 7-7 on page 7-9).

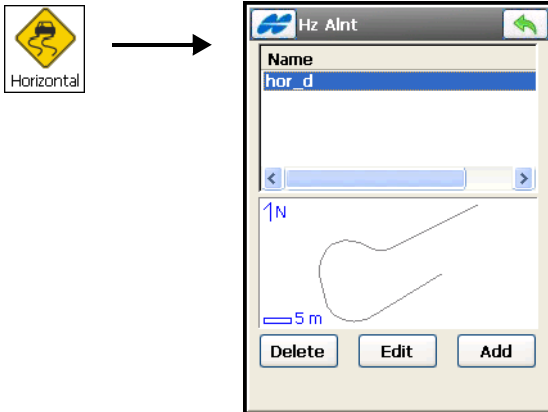



Figure 7-6. Horizontal Alignment



- The back  button – returns to the main menu.

## Edit the Horizontal Alignment

The *Edit Hz Alnt* screen (Figure 7-7 on page 7-9) contains the features of the horizontal alignment.

### Start Point

The *Start Point* tab displays the starting point of the horizontal alignment parameters.

- *Alnt Name* – the horizontal alignment name.
- *Start Pt* – the start point name. Enter the start point name, either manually, from the map  icon, or from the list  icon.
- *Code* – shows the point code and its type.
- *North, East* – the local coordinates of the point.
- *Start Sta/Start Chn* – the starting station number with distance to the station, or the starting chain distance, depending on a

selection made in the Display screen (for details see “Display” on page 2-9).

Figure 7-7. Edit Horizontal Alignment

The *Help* Icon in the upper-left corner of the screen displays a pop-up menu that contains an option:

- *Edit Points* – opens the **Points** screen to edit points (see “Points” on page 6-3).

## Horizontal

The *Horizontal* tab displays a list of horizontal alignment elements, the horizontal alignment plot, and the ending station (or chainage) of each element. The selected horizontal alignment element is highlighted in the plot displayed on the right (see Figure 7-8 on page 7-10).

On the *Hz* tab, the element list has the following columns:

- *Element* – the icon and the name of the element; either *line*, *spiral*, *curve*, or *intersection point*.
- *Length* – the length of the element.
- *Azimuth* – the azimuth at the beginning of the element.
- *Radius* – the radius of the curve, spiral, or intersection point (the radius of the spiral is the radius at the end of the ‘incoming’ spiral

or at the beginning of the ‘exiting’ spiral; the radius of the intersection point is the radius of the corresponding curve).

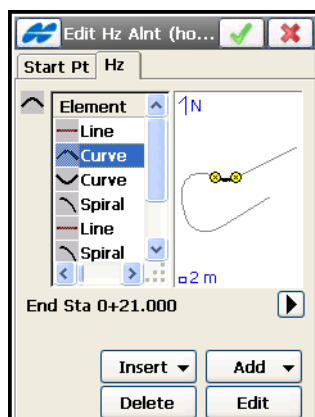


Figure 7-8. Edit Horizontal Alignment Elements

- **Delete** – deletes the element from the road.
- **Edit** – opens a screen with properties of the selected element.
- **Insert** – inserts elements selected from a floating menu (*Line*, *Curve*, *Spiral*, or *Intersection Point*) at the selected location in the list.
- **Add** – adds elements selected from the floating menu to the end of the list:
  - *Line*: for more information, see “Add a Line” on page 7-11.
  - *Curve*: for more information, see “Add a Curve” on page 7-12.
  - *Spiral*: for more information, see “Add a Spiral” on page 7-14.
  - *Intersection Point*: for more information, see “Intersection Point” on page 7-15.

Select a horizontal alignment element, then tap the *Station* information under the element list to display the start and end stations

(or chainages) information for the selected alignment element (Figure 7-9).

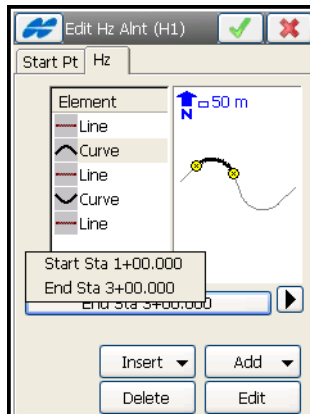


Figure 7-9. Alignment Element Information

## Add a Line

To add a line, select the *Line* option from the **Insert** or **Add** floating menu on the *Horizontal* tab of the *Edit Horizontal Alignment* screen. The *Line* screen displays (Figure 7-10).

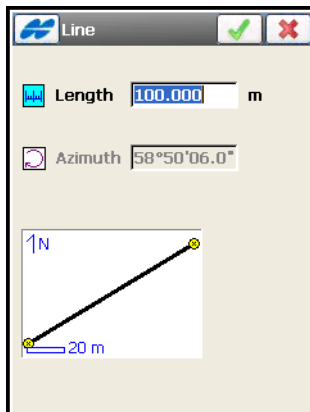


Figure 7-10. Line

The plot illustration at the bottom-left corner of the *Line* screen shows the element's appearance (Figure 7-10).

- *Length* – the length of the line element.

- *Azimuth* – by default, the azimuth is set tangent to the previous element. This field is editable only for the starting element of the road. To change the azimuth of all other elements, remove the check mark from the *Tangent to Previous Item* box on the Help Icon in the upper-left corner of the screen.



Caution should be exercised when setting the azimuth, since road elements are usually tangential to each other.

- The ok button – saves the element to the road and returns to the **Add Horizontal Alignment** screen.
- The exit button – closes the screen without saving the settings.

## Add a Curve

To add a curve, select the *Curve* option from the **Insert** or **Add** floating menu on the *Horizontal* tab of the **Edit Horizontal Alignment** screen. The *Curve* screen displays (Figure 7-11).

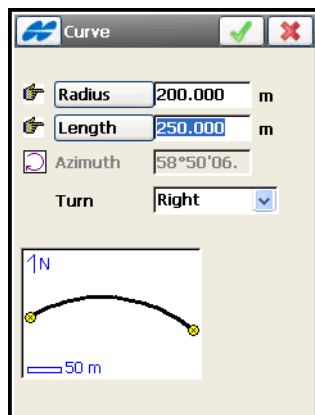


Figure 7-11. Curve

The plot illustration at the bottom of the *Curve* screen shows the element's appearance.

- **Radius/ Deg Chord/ Deg Curve** – the radius of the curve, or one of the two parameters unambiguously defining the radius: *degree of chord*, or *degree of curve*.

Using the degree of chord (DCH) or degree of curve (DCV) parameters, the radius can be calculated.


- **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 tangent), or *delta* (the angle between the radii corresponding to the curve).
- *Azimuth* – by default, the azimuth is set tangent to the previous element. This field is editable only for the starting element of the road.

To change the azimuth of all other elements, remove the check mark from the *Tangent to Previous Item* menu on the bitmap icon in the upper-left corner of the screen.



Caution should be exercised when setting the azimuth, since road elements are usually tangential to each other.

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- *Turn* – the direction of turn. Select either the *Right* value (clockwise direction) or the *Left* value (counter-clockwise direction).
- The ok  button – saves the element to the road and returns to the **Add Horizontal Alignment** screen.

## Add a Spiral

To add a spiral, select the *Spiral* option from the **Insert** or **Add** floating menu on the *Horizontal* tab of the **Edit Horizontal Alignment** screen. The *Spiral* screen displays (Figure 7-12).

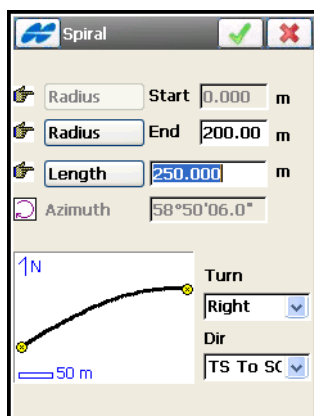


Figure 7-12. Spiral


The plot at the bottom of the screen displays the element's appearance.

- **Radius/ Deg Chord/ Deg Curve** – the *radius* of the curve, or one of two parameters unambiguously defining the radius: the *degree of chord*, or the *degree of curve* (see “Add a Curve” on page 7-12).
- **Length/Sp Const** – the parameter is the square root of the product of the length and the radius of the spiral, as defined above. Consequently, the spiral constant has the units of length.
- **Azimuth** – by default, the azimuth is set tangent to the previous element. This field is editable only for the starting element of the road. To change the azimuth of all other elements, remove the check mark from the *Tangent to Previous Item* box on the bitmap in the upper-left corner of the screen.



Caution should be exercised when setting the azimuth, since road elements are usually tangential to each other.



- *Turn* – the direction of turn. Select either the *Right* value (clockwise direction) or the *Left* value (counter-clockwise direction).
- *Dir* – the direction of movement along the spiral, *TS* to *SC* (entering the turn), or *CS* to *ST* (exiting the turn)<sup>1</sup>.
- The ok  button – saves the element to the road and returns to the *Add Horizontal Alignment* screen.

## Intersection Point

To add an intersection point, select the *Intersection Point* option from the **Insert** or **Add** floating menu on the *Horizontal* tab of the *Edit Horizontal Alignment* screen. The *Intersection Pt* screen (Figure 7-13 on page 7-15) displays.

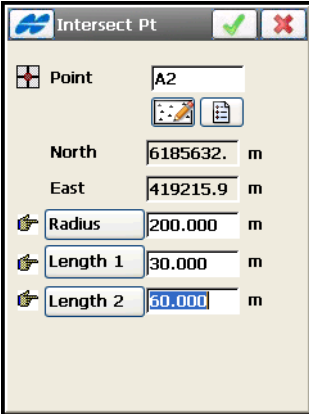



Figure 7-13. Intersection Point

- *Point* – the name of the intersection point. Either enter the name manually (with the coordinates specified in the *North* and *East* fields and a height of zero) or select it from the map or the list.

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1. The traverse points on the turn have the following markers:  
TS-traverse-spiral; SC-spiral-circle; CS-circle-spiral; and ST-spiral traverse.

- *North, East* – the local coordinates of the intersection point; cannot be changed for an existing point.
- **Radius/ Deg Chord/ Deg Curve** – the radius of the corresponding curve, or the parameter, unambiguously defining the radius, degree of chord, or degree of curve. See “Add a Curve” on page 7-12.
- **Length1/Sp Const 1, Length2/Sp Const 2** – the length of the corresponding spiral elements, or the spirals constants. The spiral constants are defined. See “Add a Spiral” on page 7-14.
- The ok  button – saves the element to the road and returns to the *Add Horizontal Alignment* screen.

## Vertical Alignments

To edit a vertical alignment, tap the **Vertical** icon. The *Vert Alnt* screen (Figure 7-14) displays a list of the created vertical alignments and the map area to show the plot of the highlighted vertical alignment.

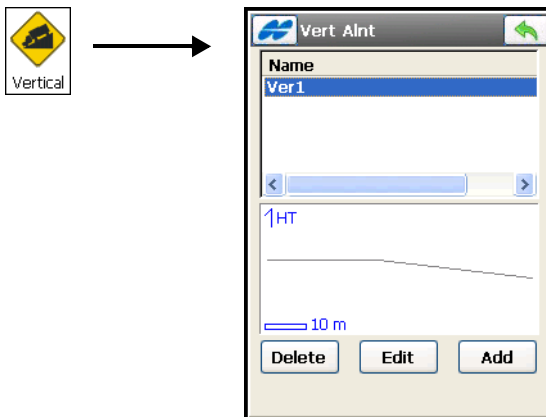



Figure 7-14. Vertical Alignment

- **Delete** – deletes the vertical alignment from the job.
- **Edit** – opens the *Edit Vt Alnt* screen (Figure 7-16 on page 7-18), to edit a vertical alignment highlighted in the list.

- **Add** – opens the *Add Vt Alnt* screen (Figure 7-15 on page 7-17) to add a new vertical alignment.
- The back  button returns to the main menu.

## Add Vertical Alignments

Tap the **Add** button on the *Vertical Alignment* screen (Figure 7-15). The *Add Vt Alnt* screen selects a method of creating this alignment and sets the name of the new vertical alignment.

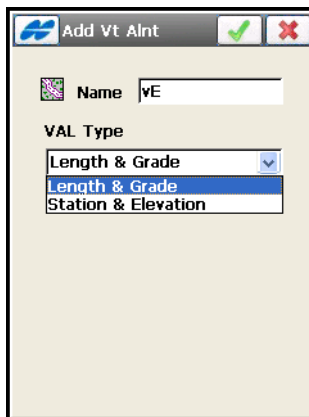



Figure 7-15. Add Vertical Alignment

- **Name** – enter a name for the new vertical alignment.
- **VAL Type** – the method of creating the vertical alignment, which include:
  - *Length & Grade*: select to create the vertical alignment by sections of graded lines. The vertical alignment is presented as a set of sections between the stations where the heights are known (usually these are the extremes of the vertical alignment line), and the interval around the station where the vertical alignment line has a parabolic shape.
  - *Station & Elevation*: select to create the vertical alignment by elements, starting and finishing at any station where you want and starting again.

- The ok  button – opens the next *Add Vt Alnt* screens similar to those for editing vertical alignments.

## Edit Vertical Alignments

Select the alignment and tap the **Edit** button on the *Vertical Alignment* screen.

### Editing Length & Grade

For *Length & Grade* vertical alignment types, the *Start Pt* tab on the *Edit Vt Alnt* screen (Figure 7-16) sets the parameters of the point starting the vertical alignment.

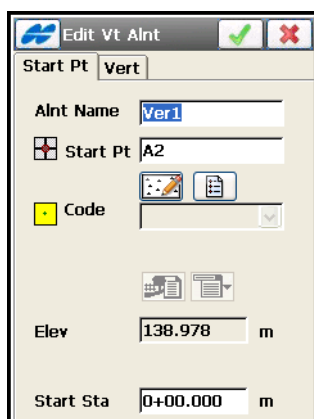


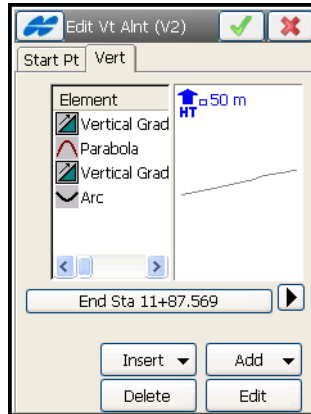


Figure 7-16. Edit Vertical Alignment

- *Alnt Name* – the vertical alignment name.
- *Start Pt* – the start point name. Enter manually (if a new point name is entered, the point is created with the height entered in the *Elev ht* field) or in one of two other ways:
  - : select from the map
  - : select from the point name list
- *Code* – shows the point code.
- *Elev ht* – the point height.

- *Start Sta/Start Chn* – the starting station number with distance to the station, or the starting chain distance, depending on a selection made in the Display screen (for details see “Display” on page 2-9).

The *Vert* tab on the **Edit Vt Alnt** screen (Figure 7-17) displays a list of vertical alignment elements, the vertical alignment plot, and the ending station (or chainage) of each element.



**Figure 7-17. Edit Vertical Alignment Elements**

The element list has the following columns for the vertical alignment elements:

- *Element* – the icon and name of the element: either *vertical grade*, *parabola*, or *arc*.
- *Length/Arc Radius* – depending upon the selection: either the length of the element or the radius of the circular arc.
- *Start Grade, End Grade* – the grades of the element, in percentage, at the starting and ending points. For a *Vertical grade* element, values are the same.
- **Insert** – inserts elements selected from a floating menu (*Vertical Grade* and *Curve*) at the selected location in the list.
- **Add** – displays a menu of two elements: select to add either *Vertical Grade* or *Curve*.

The *Help* Icon in the upper-left corner of the screen displays a pop-up menu that contains an option:

- *Edit Points* – opens the **Points** screen to edit points (see “Points” on page 6-3).
- *High/Low Positions* – opens the **High/Low Positions** screen (see “The High/Low Positions” on page 7-24)

Select a vertical alignment element, then tap the *Station* information under the element list to briefly display information (Figure 7-18) on the start and end stations (or chainages) for the selected element.

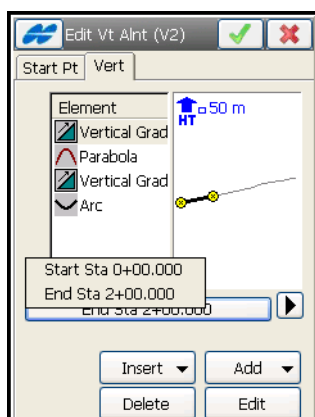


Figure 7-18. Alignment Element Information

**Vertical Grade:** To add a vertical grade, select the *Vertical Grade* option from the **Insert** or **Add** floating menu on the *Vertical* tab of the

*Edit Vertical Alignment* screen. The *Vertical Grade* screen (Figure 7-19) displays.

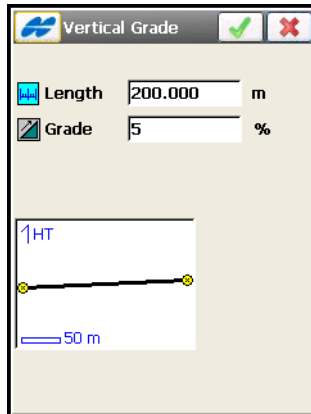

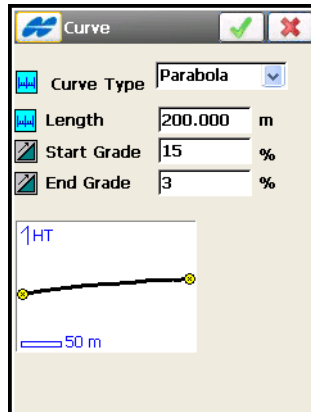


Figure 7-19. Edit Vertical Grade


The plot at the bottom of the screen shows the element's appearance.

- *Length* – the length of the vertical grade element.
- *Grade* – the grade percentage of the element. If the grade is falling, the value should be set to negative.
- The ok  button – saves the element to the road and returns to the *Add Vertical Alignment* screen.

**Edit a Curve:** To edit a curve, select the *Curve* option from the **Insert** or **Add** floating menu on the *Vertical* tab of the **Edit Vertical Alignment** screen. The *Curve* screen (Figure 7-20) displays.



**Figure 7-20. Edit Vertical Curve**

- *Curve Type* – selects the type of curve to add, either *Circular Arc* or *Parabola*. The plot in the bottom of the screen shows the element appearance.
- *Length/Arc Radius* – the radius of the arc or the length of the parabola element, depending on the type of curve selected.
- *End Grade/Start Grade* – the percentage of the starting and ending grades of the element. If the grade is falling, use a negative value.
- The ok  button – saves the element to the road and returns to the **Add Vertical Alignment** screen.



## Station & Elevation

For Station & Elevation vertical alignment types (Figure 7-21), the *Start Pt* tab displays only the vertical alignment name.

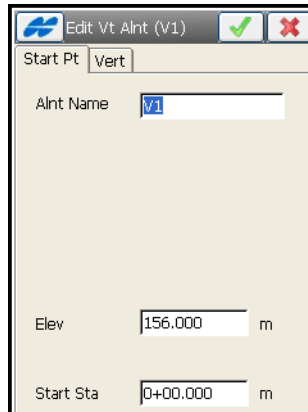


Figure 7-21. Edit Vertical Alignment Name

The *Vert* tab on the *Edit Vt Alnt* screen (Figure 7-22) displays the list of vertical long sections, the vertical alignment plot, and the ending station (or chainage) at each section.

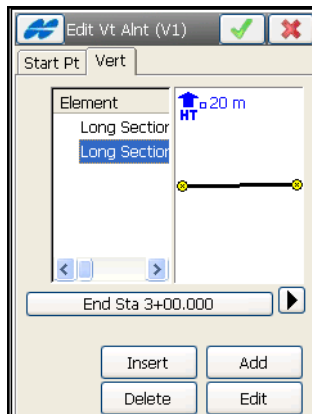


Figure 7-22. Edit Vertical Alignment Long Sections

The Element list has the following columns for vertical long sections:

- *Long Section* – the name of the element.

- *Station* – the station distance.
- *Elevation* – the elevation value on the station.
- *VC Length* – the vertical curve length is the length of the interval near the station, where the alignment has a parabolic shape.
- **Insert** – opens a blank **Long Section** screen in which to insert a section at the selected location in the list (Figure 7-24).
- **Add** – opens a blank **Long Section** screen for adding a section to the end of the list (Figure 7-24).
- **Delete** – deletes the element from the road.
- **Edit** – opens a screen with properties of the selected long section.

The *Help* Icon in the upper-left corner of the screen displays a pop-up menu that contains options:

- *Edit Points* – opens the **Points** screen to edit points (see “Points” on page 6-3).
- *High/Low Positions* – opens the **High/Low Positions** screen.

The **High/Low Positions** screen (Figure 7-24) shows the stations of the highest and low positions in the vertical alignment.

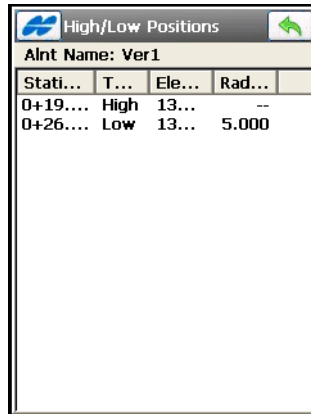



Figure 7-23. High/Low Positions

The **Long Sections** screen (Figure 7-24) adds a new long section to the vertical alignment.

Figure 7-24. Long Section

- *Station* – the station distance from the beginning of the road.
- *Elevation* – the height at the station.
- *Curve Type* – selects the type of curve to add, either *Parabola* or *Circular Arc*. The plot at the bottom of the screen shows the element appearance.
- *VC Length* or *Arc Radius* – the length of the parabola at the station (assuming that the station is located in the middle of the interval), or the radius of the arc, depending on the type of curve selected.
- The ok  button – saves the element to the road and returns to the **Add Vertical Alignment** screen.

# Cross Section Templates

A cross-section template is a template for the creation of a complex cross-section view of the road. The cross-section template consists of several sets of *segments*, *cut slopes*, and *fill slopes*.

To create a template for a cross-section view of the road, tap the **Templates** icon.

The *X-Sect Templates* screen (Figure 7-25) displays a list of the existing templates in the upper part of the screen and a plot of the highlighted template in the lower part.

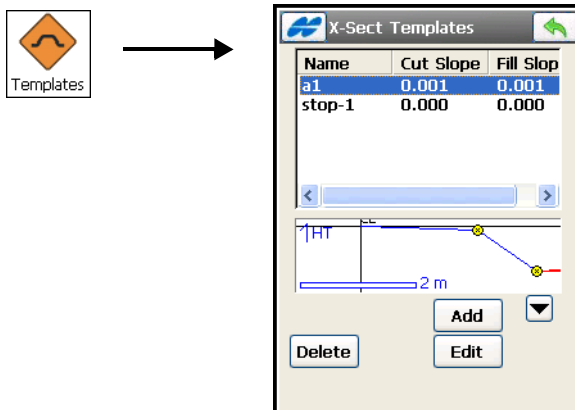



Figure 7-25. X-Sect Templates

- The list contains three columns – *Name* (the name of the template), *Cut Slope*, and *Fill Slope* values.
- **Delete** – deletes the template from the list.
- **Edit** – opens the properties of the selected template in the next *X-Sect Templates* screen (Figure 7-26).
- **Add** – opens the blank *X-Sect Templates* screen to enter the properties for a new template.
- The back  button – returns to the main menu.

## Edit X-Section Template

To edit an existing template, highlight it and tap the **Edit** button in the *X-Sect Templates* screen (Figure 7-25 on page 7-26).

The *X-Sect Template* screen (Figure 7-26 on page 7-27) displays the parameters of the highlighted template to edit.

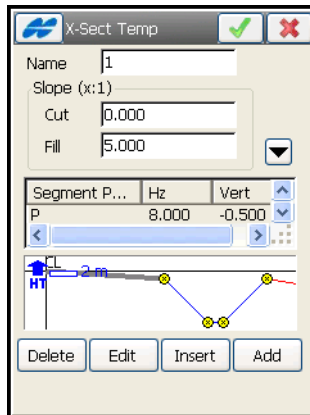



Figure 7-26. Edit X-Sect Template

- *Name* – the name of the template.
- *Slope* – the cut and fill parameter values (ratio of run values for cut and fill for a unit rise). These values represent the horizontal increment of the slope for a unit vertical increment.
  - *Cut*: the cut slope is used when the road surface is below the terrain.
  - *Fill*: the fill slope is used when the road surface is above the terrain.



The *X-Sect Template* screen (Figure 7-26) also contains a list of segment points comprising the template and a plot of the template. A list of segments consists of three columns: *Segment Point* (the name of points), *Hz* (the horizontal offset), *Vert* (the vertical offset).

- **Edit** – opens the *Segment* screen (Figure 7-27 on page 7-28) with the parameters of the highlighted segment.

- **Insert** – opens a blank *Segment* screen. The inserted segment is inserted in the list above the currently highlighted segment.
- **Add** – opens a blank *Segment* screen. The added segment is attached after the last segment in the list.
- **Delete** – deletes the segment from the template.
- The ok  button – saves the changes and returns to the *X-Sect Templates* screen (Figure 7-25 on page 7-26).

## Edit Cross Section Segments

The *Segment* screen (Figure 7-27 on page 7-28) contains the parameters of the highlighted segment.

- *Segment Point*– the name of the ending segment point.
- *Offset* – horizontal and vertical offsets. Press the **Down/Up/Grade** button to select the type and value of the vertical offset. The “hand” symbol means the function is selectable. Although the value is input as **Grade** (in percents), the vertical offset is recalculated to meters (or another selected unit) after pressing the ok  button.
- The ok  button – saves the changes and closes the screen.

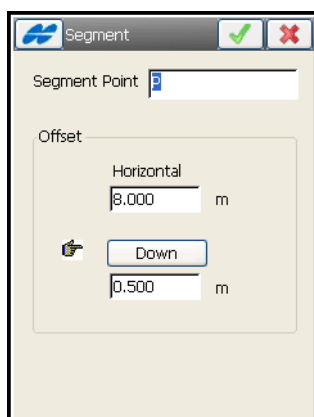


Figure 7-27. Segment Screen

# Cross Section Sets

To edit cross-section sets in the current job, tap the **X-Sections** icon.

The *X-Sect Set* screen contains a list of cross -section sets and a general scaled view of the highlighted cross section set.

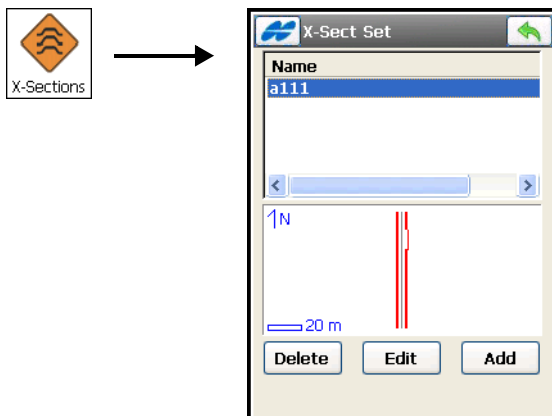



Figure 7-28. Cross Section Set

- **Delete** – deletes the cross section set from the list.
- **Edit** – opens the *Edit X-Sect Set* screen, displaying properties of the selected cross section set (Figure 7-29).
- **Add** – opens a blank *Add X-Sect Set* screen to create a new set of cross sections.
- The back  button returns to the main menu.

## Edit Cross Section Set

The *Edit X-Sect Set* screen (Figure 7-29) contains a list of stations where cross sections are applied, and a scaled plot of a cross section at the highlighted station.

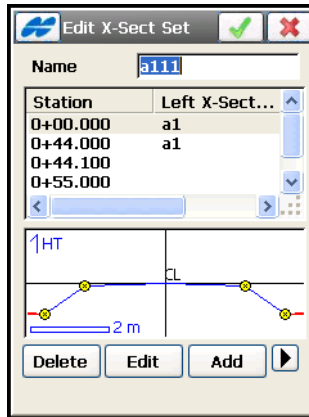


Figure 7-29. Edit X-Section Set Parameters

- *Name* – the name of the cross-section set.
- The list of stations contains the following columns:
  - *Station*: the station where the cross-section is applied.
  - *Left X-Section/Right X-Section*: the names of the cross-section templates for the left and right side of the road cross section relative to the center line. The left and right side cross sections can be different.



If two or more cross sections are defined, the intermediate cross sections are calculated using interpolation.

- **Delete** – deletes the station with the road cross-section from the list.
- **Edit** – opens the *X-Section* screen (Figure 7-30 on page 7-31) to edit the selected cross section.
- **Add** – opens a blank *X-Section* screen.



## Cross-Section

The *X-Section* screen (Figure 7-30) contains parameters of the road cross-section at a given distance and a plot of the cross-section.

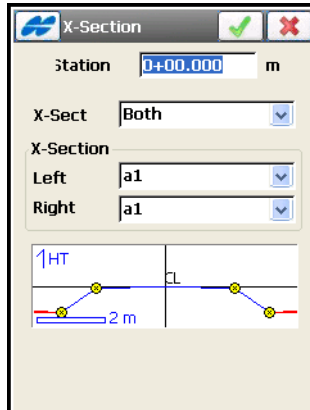



Figure 7-30. Cross Section Parameters

- *Station/Chainage* – the station where the cross-section is applied, or the distance to this station.
- *X-Sections* – selects whether the cross-section is created for both parts of the road or only for the left or right side of the road. The screen display changes, depending on the selection.
- *Left X-Section/Right X-Section* – the cross-section templates for the left and right side of the road cross-section. These can be selected only from the existing cross-section templates.
- The ok  button – saves the cross-section in the list and returns to the **Add Road** screen.

The *Help* Icon in the upper-left corner of the screen displays the pop-up menu that contains an option:

- *Edit X-Sect Templates* – opens the *X-Sect Templates* screen to edit cross section templates (see “Edit X-Section Template” on page 7-27).

# String Set

String Set is a combination of strings that represents the three dimensional surface of the road or a desired part of it.

To edit string sets in the current job, tap the **String Set** icon.

The **String Set** screen contains a list of string sets used for the road and a general scaled view of the highlighted string set.

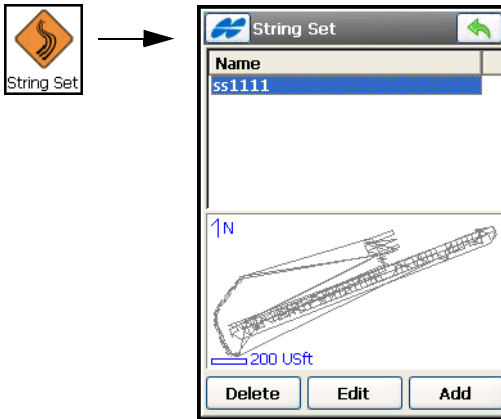



Figure 7-31. String Set

- **Delete** – deletes the string set from the list.
- **Edit** – opens the **Edit String Set** screen, displaying properties of the selected string set (Figure 7-32 on page 7-33).
- **Add** – opens a blank **String Set** screen to create a new set of strings.
- The back  button returns to the main menu.

## Edit String Set

The *Edit String Set* screen (Figure 7-32 on page 7-33) contains a list of strings that belong to the set, and a scaled plot of a highlighted string.

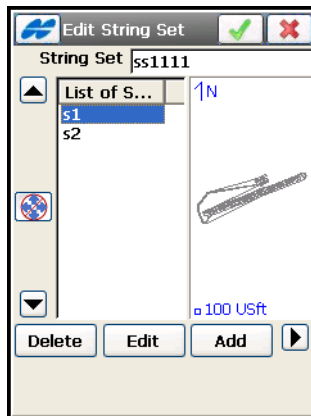



Figure 7-32. Edit String Set


- **Delete** – deletes the string from the list.
- **Edit** – opens the *Edit Road String* screen to edit the selected string (Figure 7-33 on page 7-34).
- **Add** – opens a blank *Add Road String* screen to create a new string.
- The ok  button saves the changes made and returns to the String Set screen.

## Edit Road String

A single string is defined by one or many pairs of the horizontal and vertical alignments (Figure 7-33 on page 7-34).

The *Edit Road String* screen displays a list of alignment pairs in the string, and scaled plots of a highlighted pair of the horizontal and vertical alignments.

- **Delete** – deletes the alignment pair from the list.

- **Edit** – opens the *Edit Alignment* screen to edit the selected pair of alignments (Figure 7-34 on page 7-35).
- **Add** – opens a blank *Add Alignment* screen to create a new pair of alignments.
- The ok  button saves the changes made and returns to the Edit String Set screen.

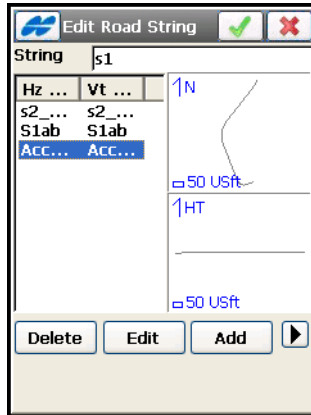


Figure 7-33. Edit Road String

## Edit Alignment

The *Edit Alignment* screen allows editing the selected pair of horizontal and vertical alignments (Figure 7-34).

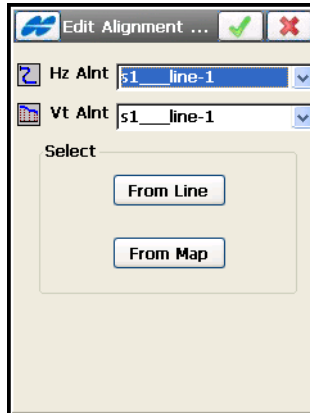


Figure 7-34. Edit String Alignments

- *Hz Alnt* – selects a horizontal alignment from the drop-down list of existing ones.
- *Vt Alnt* – selects a vertical alignment from the drop-down list of existing ones.
- *Select* – allows creating alignments from a linework selected:

- **From Line:** opens the *Linework* screen to select the linework from the list (Figure 7-35).

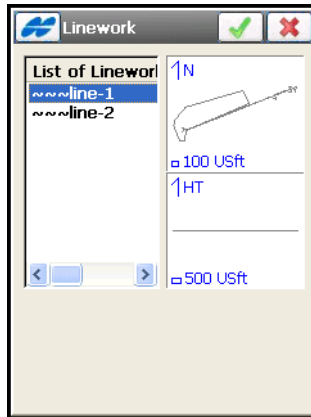


Figure 7-35. Select Linework from List

- **From Map:** opens the *Select Linework* screen (Figure 7-36). Double-tap the desired line to highlight the linework on the map.

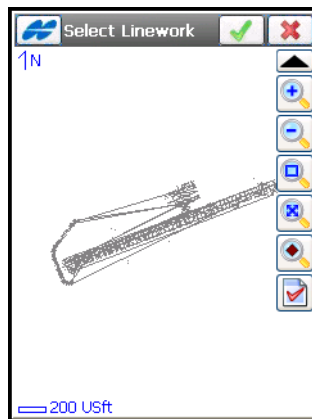



Figure 7-36. Select Linework from Map

- The ok  button opens a dialog to name the paired alignments for the string (Figure 7-37).

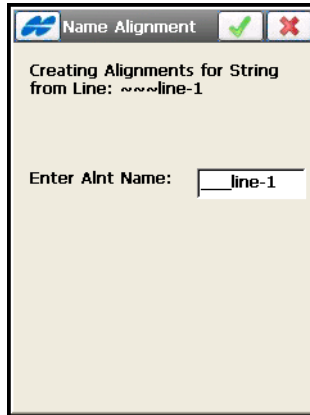



Figure 7-37. Enter Alignment Name

The ok  button on the *Name Alignment* screen returns to the *Edit Road String* screen with the created alignments.

## Calculate Road Points

To calculate road points, select the *Calculate Road Points* option from the Help pop-up menu on the *Edit Road* screen (Figure 7-3 on page 7-4).

The *Calculate Road Points* screen (Figure 7-38) generates points along to the right and to the left of the center line of the road, along the entire length.

- *Points to Generate* – defines the points to generate, either *center line* points, the points to the *right of the center line*, and/or the points to the *left of the center line*. Also, if you want to include transition points, place a check mark in the corresponding fields, and select a prefix/suffix for them, if necessary, in the *Prefix/Suffix field* drop-down list below the *Points to Generate* section.
- *Station Interval/Chainage Interv* – sets the interval between the generated points. By default, it is the Station (or Chain) Interval set in the *Start Pt* tab on the *Roads* screen.

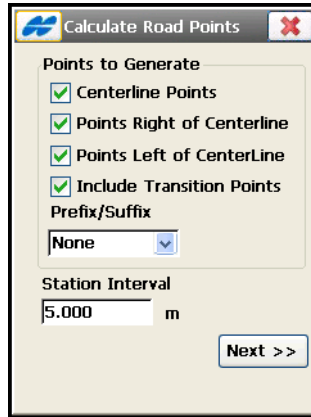



Figure 7-38. Calculate Road Points

- **Next** – opens the appropriate screen, depending on the selection made in the *Points to Generate* panel. The last screen contains the ok  button to calculate the road points along the line.

## Centerline Points Parameters

The *Centerline Points Params* screen (Figure 7-39) displays the parameters of points to be computed along the center line.

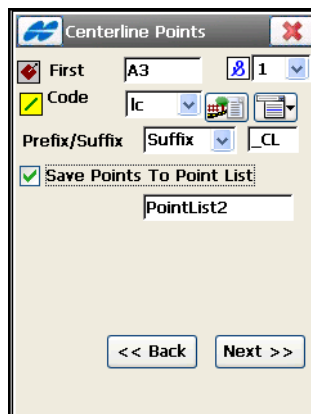








Figure 7-39. Centerline Points Parameters



- *First Point* – the name of the first point.
- *Code* with a symbol that show the code entity type ( Point,  Line, or  Area) – select a code from the drop-down list or enter a new code. Code needs to be defined at the time it is entered (see “Edit Code” on page 6-19) if it is not a code that exists in the codes dialog.
- The field, marked by the  sign, is displayed only for a Code Type of Line or Area and intended for entering a string.
-  – the *Attributes List* icon, opens the **Point-Attribute** screen to set the code and attributes available for the code chosen, layer and photo notes (Figure 6-7 on page 6-9).
- The  icon next to the *Attributes List* icon displays the pop-up menu that may include the following items:
  - *Add to End/Start*: for Line and Area codes.
  - *Insert*: for Line and Area codes. This allows the user to insert a point to a line out of sequence.
  - *Layer*: opens the **Select Layer** screen (see “The Topo Menu” on page 9-3).
  - *Note*: opens the **Note** screen to enter any additional information on the point. For details, see “The Topo Menu” on page 9-3.
- *Prefix/Suffix* – when selected, sets the prefix or suffix to be added to the generated point name.
- *Save points to Point List* – enable if you want to save the generated points to a separate points list. If it is selected, a field appears where the name for the list can be set.
- *Back* – returns to the previous screen.
- *Next* – opens the **Right Offset Points Params** screen.

## Right Offset Points Parameters

The *Right Offset Points Params* screen (Figure 7-40) displays the parameters of points to be computed to the right of the center line.

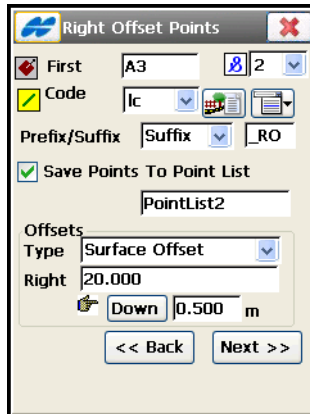








Figure 7-40. Right Offset Points Parameters

- *First Point* – the name of the first point.
- *Code* with a symbol that show the code entity type (  Point,  Line, or  Area) – select a code from the drop-down list or enter a new code. Code needs to be defined at the time it is entered (see “Edit Code” on page 6-19) if it is not a code that exists in the codes dialog.
- The field, marked by the  sign, is displayed only for a Code Type of Line or Area and intended for entering a string.
-  – the *Attributes List* icon, opens the *Point-Attribute* screen to set the code and attributes available for the code chosen, layer and photo notes (Figure 6-7 on page 6-9).
- The  icon next to the *Attributes List* icon displays the pop-up menu of the following items:
  - *Layer*: opens the *Select Layer* screen (see “The Topo Menu” on page 9-3).


- *Note*: opens the **Note** screen to enter any additional information on the point. For details, see “The Topo Menu” on page 9-3.
- *Prefix/Suffix* – when selected, sets the prefix or suffix to be added to the generated point name.
- *Save points to Point List* – enable (if necessary) to save the generated points to a separate points list. When check marked, a field appears where the name for the list can be set.
- *Offsets* – set the offset of the point from the center line along two dimensions: horizontal (the *Right* field) and vertical (the *Up/Down* field) relative to the surface (*Surface Offset* type) or to the horizontal line (*Flat Offset* type).
- **Back** – returns to the previous screen.
- **Next** – opens the *Left Offset Points Params* screen (Figure 7-41 on page 7-41).

## Left Offset Point Parameters

The *Left Offset Points Params* screen (Figure 7-41) is similar to the *Right Offset Points Params* screen, except for the direction of offsets.

The screenshot shows the 'Left Offset Points' dialog box. At the top, there's a title bar with a blue icon, the text 'Left Offset Points', a green checkmark, and a red X. Below the title bar, there are several input fields: 'First' with the value 'A3', 'Code' with 'Ic', 'Prefix/Suffix' with 'Suffix', and 'Save Points To Point List' which is checked and has 'PointList2' entered. Under the 'Offsets' section, 'Type' is set to 'Surface Offset', 'Left' is '20.000', and 'Down' is '0.500 m'. At the bottom, there is a '<< Back' button.

Figure 7-41. Left Offset Points Parameters

Pressing the ok  button starts calculating the points and stores them to the data set.

## Notes:

[illegible]

# Setting up GPS

To set up a GPS survey, tap the **Setup GPS** icon in the main menu. The **Setup GPS** menu (Figure 8-1) includes options to:

1. Start a base station or static occupation
2. Perform a localization of the current job
3. View current status information on positioning
4. Perform an initialization at a known point
5. Perform an initialization of mmGPS (only for mmGPS+ aided RTK)

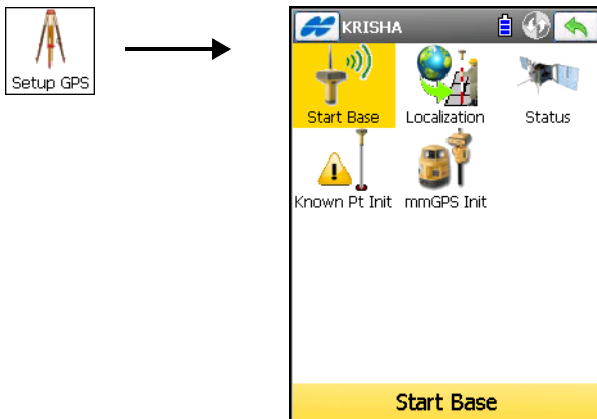



Figure 8-1. Setup GPS Menu

The **Help**  icon opens a pop-up menu giving access to the help files, module activation codes, port data logging, changing menu interface, and information about the TopSURV used (for details see “Help Icon’s Pop-up Menu” on page 1-9).

## Starting the Base

To start a Base, tap the **Start Base** icon.

The **Start Base** screen contains information about the Base receiver and can be used for the Base Receiver setting in an RTK survey.

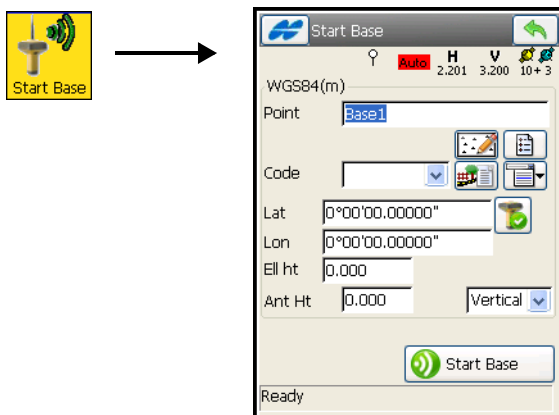











Figure 8-2. Start Base

- **Point** – select the name of the point of the Base receiver location from a *map*  or *list*  icon, or enter manually.
- **Code** – select a code from the drop-down list or enter a new code. Code needs to be defined at the time it is entered (see “Edit Code” on page 6-19) if it is not a code that exists in the codes dialog.
- The field, marked by the  sign, is displayed only for a Code Type of Line or Area and intended for entering a string.
-  – the *Attributes List* icon, opens the **Point-Attribute** screen to set the code and attributes available for the code chosen, layer and photo notes (Figure 6-7 on page 6-9).
- The  icon next to the *Attributes List* icon displays the pop-up menu of the following items:
  - **Layer**: opens the **Select Layer** screen (see Figure 6-7 on page 6-9).

- *Note*: opens the **Note** screen to enter any additional information on the point. For details, see “The Topo Menu” on page 9-3.
- *Ant Ht* – enter the antenna height and type of measurement; select either *vertical* or *slant*).
- *Local (m)* – for RTK mode, the field for the coordinates of the antenna in the selected coordinate system. Changes its name based on the chosen value on the **Coord System** screen; that is, *WGS84* or *Local* (see “Coordinate System” on page 2-6), the **Display** screen (see “Display” on page 2-9), and the selected distance units (see “Units” on page 2-7).
- Pressing the auto position  icon (for RTK mode) – measures the position of the current point. Once pressed, the icon becomes a stop  icon; press to stop getting position. After the base is started up, the auto position  icon will be greyed out.
- *Duration* and *Remaining Time* (for PP Kinematic mode) – displays the time passed and the time that remains since the beginning of the survey.
-  **Start Base** – sets the receiver as a Base, transmitting data.



For external Digital UHF and Satel UHF radios, performs quick start of the base. Pressing this button queries a frequency list from the radio and shows it in the status bar in the bottom of the screen. After getting the frequency list, select an appropriate frequency from the drop-down menu, and tap the near OK to setup the radio.

The *Help* icon at the upper-left corner displays the pop-up menu the the pop-up menu the depends on the survey type and configuration:

- *Status* – opens the **Status** screen (see “GPS+ Survey Status” on page 8-15).
- *Base Antenna Setup* – opens the **Antenna Setup** screen to set the antenna for the current survey.

- *Config Radio* (for RTK mode) – opens the **Configure Radio** screen. For details, see “Configure Radio” on page 8-30.
- *Config RE-S1 Repeater* – opens the **Configure Radio** screen to setup the RE-S1 radio as a repeater (see “Configure RE-S1 Repeater” on page 8-35).
- *Multi Base* – available for RTK with CMR+ format of correction data; opens the **Multi Base** screen (Figure 8-4 on page 8-6) to set the multi base mode. This mode allows the base station to use a single frequency for transmitting data. Setting a transmission delay for each station prevents signals from colliding.
- *Grid to Ground* – available if starting the base in a grid coordinate system; opens the **Grid to Ground Params** screen (see “Grid to Ground” on page 8-6).

## Correct the Base

If the Base starts in autonomous mode, and an observed Topo point has known coordinates stored in the job, you can correct the base position. Use the **Duplicate Points** screen in this case (Figure 8-3).

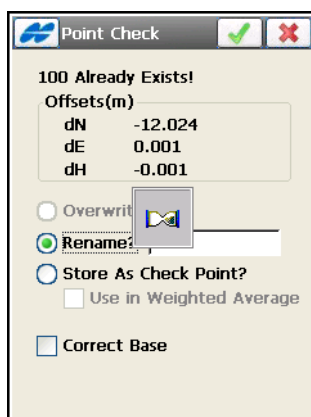



Figure 8-3. Duplicate Point

- *Overwrite* – overwrites the existing point.
- *Rename* – if enabled, the point is renamed. The new name is noted in the field and is the point with observed coordinates.



- *Store As Check Point?* – if enabled, the observed point is stored as a check point of the existing point.
- *Use in Weighted Average* – available if the *Store As Check Point* radio button is selected. The ok  button opens the **Weighted Average** screen (see “Weighted Average” on page 6-16).
- *Correct Base* – if enabled, the existing coordinates of the observed point are not replaced by the coordinates of the observed point. Instead, the known coordinates of this point are used to correct the Base coordinates. After either closing the **Topo** screen or moving to another tab, recomputations are performed and the coordinates of all points are updated using the new Base coordinates. For the *Correct Base* option to work properly, the coordinate type selected in *Display* (see “Customizing Data Display” on page 3-98) must be the same as for the known coordinates of the observed Topo point.

## Multi Base

The Multi Base function in TopSURV is implemented using Time Division Multiple Access (TDMA) mode of transmission. This means that one Base can transmit at the beginning of the second and another Base can transmit a half second later on the same frequency. The Rover can recognize the two separate data streams.



All transmitters (Base receivers) must be configured to transmit at the same frequency and must transmit CMR+ format corrections. The Rover receiver must be configured to receive only CMR+ messages.

The **Multi Base** screen (Figure 8-4 on page 8-6) sets parameters for Base Stations.

- *Base Station ID* – the ID of the current Base Station.
- *Transmit Delay* – a signal transmission delay for the current Base.
- *Use Multi Base* – when check marked, enables multi base mode for surveying. On the **Status** screen on the Rover side, the Multi-Base tab appears to select the Base.

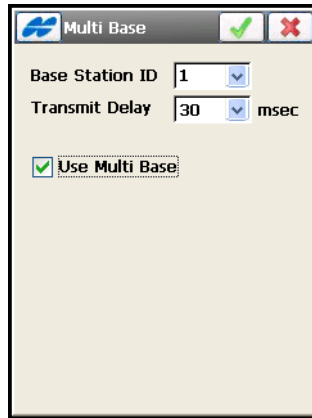


Figure 8-4. Multi Base

## Grid to Ground

The *Grid to Ground Params* screen (Figure 8-5) displays the Grid to Ground (GG) system (in the defined coordinate system) for the *Origin Point* option. This screen, available on the *Start Base* screen, provides a faster method for setting the calculated value of the *Scale Factor* that will be applied to the job.

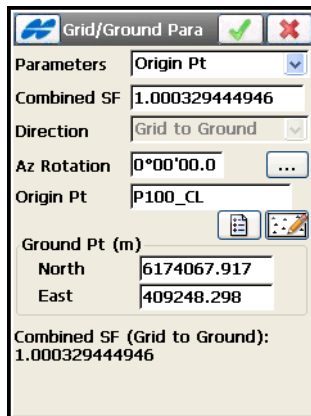










Figure 8-5. Grid to Ground from Start Base

For details, see “Grid / Ground Transformation” on page 3-86.

# Starting Static Occupation

To start a Static Occupation, tap the **Static Occupation** icon.

The **Static Occupation** screen contains information about the point occupied for static observations and starts logging data in PP Static survey (Figure 8-6 on page 8-8).

- **Point** – selects the name of the point of the Static receiver location from a *map*  or *list*  icon, or entered manually.
- **Code** – select a code from the drop-down list or enter a new code. Code needs to be defined at the time it is entered (see “Edit Code” on page 6-19) if it is not a code that exists in the codes dialog.
- The field, marked by the  sign, is displayed only for a Code Type of Line or Area and intended for entering a string.
-  – the *Attributes List* icon, opens the **Point-Attribute** screen to set the code and attributes available for the code chosen, layer and photo notes (Figure 6-7 on page 6-9).
- The  icon next to the *Attributes List* icon displays the pop-up menu of the following items:
  - **Layer**: opens the **Select Layer** screen (see “The Topo Menu” on page 9-3).
  - **Note**: opens the **Note** screen to enter any additional information on the point. For details, see “The Topo Menu” on page 9-3.
- **Ant Ht** – the antenna height and type of measurement (vertical or slant).
- **Duration** – displays the time passed since the starting of the occupation.
- **Start Occ/Stop Occ** – starts a new static occupation. When pressed, it changes to **Stop Occ**. The  icon displays the status of the log file. If the file is opened, the icon changes to .
- The settings  icon – opens the **Base Receiver** screen to set logging parameters (see “Base Receiver” on page 3-9.)

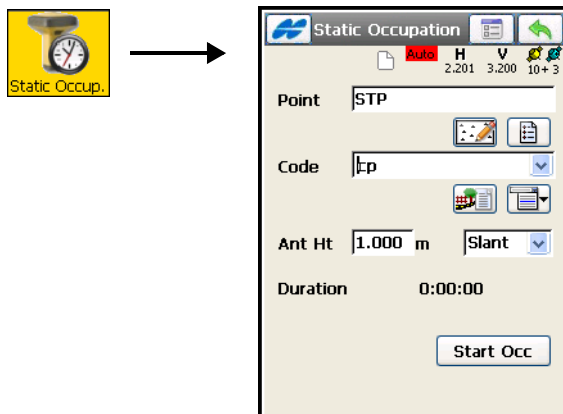


Figure 8-6. Static Occupation

The *Help* icon at the upper-left corner displays the pop-up menu containing the following items, depending on the survey type and configuration chosen:

- *Status* – opens the **Status** screen (see “GPS+ Survey Status” on page 8-15).
- *Base Antenna Setup* – opens the **Antenna Setup** screen to set the antenna for the current survey.

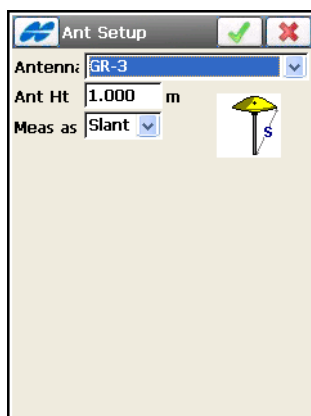


Figure 8-7. Antenna Setup

# Localization

Localization is calculating localization parameters of mathematical coordinate transformation between an original coordinate system (WGS84, or any datum selected, or any grid selected), in which the job points are **measured** or given, and a local coordinate system, in which control points are **known**.



Under *Local* (known) coordinates TopSURV understands coordinates of *Ground* type. Therefore, always enter or import local coordinates as ground.

The basic approach is to provide pairs of coordinates for the same point on the surface of the earth to use for localization in the job.



Generally, the more localization points are used, the more precise the localization is.

But the accuracy of control points and their location at the site directly affects the quality of localization. Use the control points located as evenly as possible around the perimeter of the site or grading area.

To set up a survey with localization, tap the **Localization** button.

The **Localization** screen (Figure 8-8) contains a list of points used for localization, called control points. Their coordinates are known in both systems: original and local. Each point has a level of reliability specified with the values of the residuals along the horizontal and the vertical axes and the Control parameters, that shows the status of the point. The horizontal and vertical use of any control point can be changed by selecting the line and then tapping on the header of the H Control or V Control. This toggles the display between “yes” and “no”. Double-tapping on the selecting line opens the Add Point screen that also allows changing the horizontal and vertical use (see Figure 8-10 on page 8-12).

- *Type* – allows selecting one of the following three ways for localization depending on the original coordinate system:

- *WGS84 -> Local*: using the oblique stereographic map projection on WGS84 as intermediate to calculate localization parameters of transformation of WGS84 coordinates to local coordinates.
- *Datum -> Local*: using the oblique stereographic map projection on any datum (selected in the Coordinate System dialog of the current job before localization) as intermediate to calculate localization parameters of transformation of coordinates on the datum to local coordinates.
- *Grid -> Local*: using any projection selected in the Coordinate System dialog of the current job to calculate localization parameters. Selecting the projection, which suits the job location better than the oblique stereographic map projection, allows greater distances between control points without loss in localization precision.

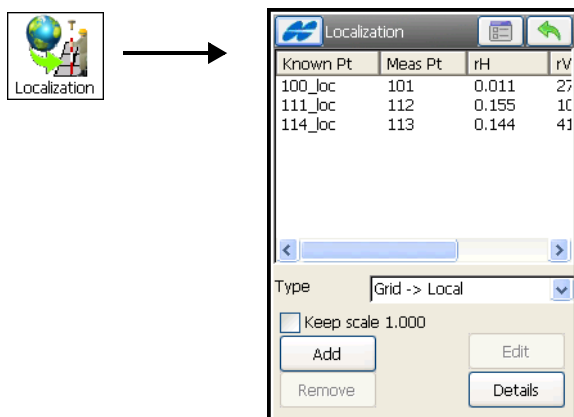


Figure 8-8. Localization



Set *Ground* coordinate type when importing/entering local coordinates, even if they are known as Grid coordinates from catalogs etc. To enable selection of *Ground* coordinate type in the *Grid -> Local* localization, either set *Projection* to <none> and *Coord Type* to Ground or select *Grid/Ground* box in the *Coord System* screen.

- **Keep scale 1.000** – preserves localization from a scale transformation (if enabled).
- **Details** – opens the **Localization Results** screen to view parameters of localization.
- **Remove** – removes the highlighted points.
- **Edit** – opens the **Edit H/V Controls** screen to use the point pair in horizontal and vertical localization independently.
- **Add** – opens the **Add Point** screen (Figure 8-10 on page 8-12) to add a point pair to use in localization. The localization is updated (recomputed) every time a new pair is added to the localization.
- The **Help** icon at the upper-left corner displays a pop-up menu that contains the following options:
  - **Config Radio** (for RTK mode): opens the **Configure Radio** screen. For details, see “Configure Radio” on page 8-30.
  - **Edit Points**: opens the **Points <Coord Type>** screen to edit points in the job. For details, see “Points” on page 6-3.
  - **Export To File**: opens the **To File** screen to export localization data. For details, see “Exporting to File” on page 4-13.



Export File formats allow only *WGS84 -> Local* type of localization.

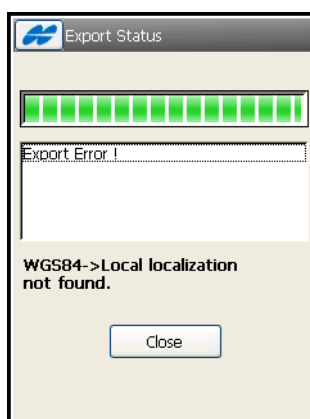


Figure 8-9. Export Error

## Add Localization Point

The *Add Point* screen (Figure 8-10) contains the coordinates of the control points.

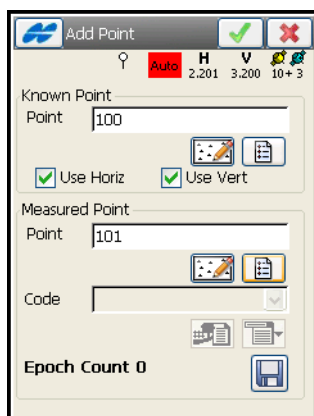










Figure 8-10. Add Localization Point

- The *Known Point* panel contains information on the point known in the local coordinate system.
  - *Point*: sets the name of the control point; either enter a point name manually, select a point from the map using the  icon, or from the list using the .
  - *Use Horizontal*: check and enable if the point should be used for horizontal localization.
  - *Use Vertical*: check and enable if the point should be used for vertical localization.
- The *Measured Point* panel contains information on the point measured or given in the current original coordinate system.
  - *Point*: sets the name of the control point; either enter a point name manually, select a point from the map, or from the list.
  - *Code*: sets the code of the control point. Can be entered manually or chosen from the drop-down list. Code needs to be defined at the time it is entered (see “Edit Code” on page 6-19) if it is not a code that exists in the codes dialog.



The field, marked by the  sign, is displayed only for a Code Type of Line or Area and intended for entering a string.

- Pressing the start measuring  icon (for RTK mode) measures global WGS84 coordinates for the original point and sets the original point to the current location in the job's coordinate system. The *Epoch Count* field shows the number of the accepted epochs. The parameters of the logging are set through the ***Survey Parameters*** screen. If the point name already exists, the ***Point Check*** notification screen displays, which prompts you to overwrite, rename, or store the point as a check point. Once pressed, the icon becomes a stop  icon; press the icon to stop getting position.
-  – the *Attributes List* icon, opens the ***Point-Attribute*** screen to set the code and attributes available for the code chosen, layer and photo notes (Figure 6-7 on page 6-9).
- The  icon next to the *Attributes List* icon displays the pop-up menu of the following items:
  - *Layer*: opens the ***Select Layer*** screen (see “The Topo Menu” on page 9-3).
  - *Note*: opens the ***Note*** screen to enter any additional information on the point. For details, see “The Topo Menu” on page 9-3.
- The ok  button – saves the point and opens the ***Localization*** screen to display a new point.

## Localization Details

The *Localization Details* screen (Figure 8-11 on page 8-14) contains the *Results* and *Map* tabs.

- The *Results* tab (Figure 8-11 on page 8-14) displays calculated parameters of the localization: global coordinates, corresponding local coordinates, scale parameter, the azimuth, and plane slope angles (deflections) corresponding to north and east directions.

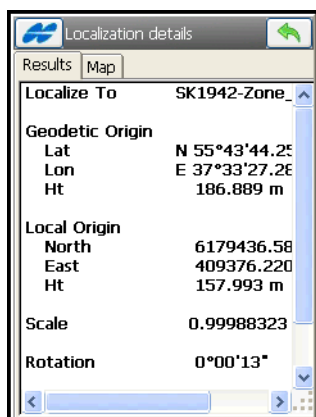


Figure 8-11. Localization Results

- The *Map* tab (Figure 8-12) displays the job graphically with the localization points marked by blue triangles.

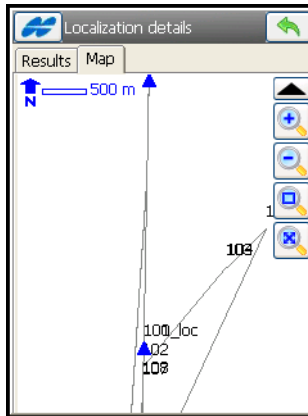



Figure 8-12. Localization Map


## GPS+ Survey Status

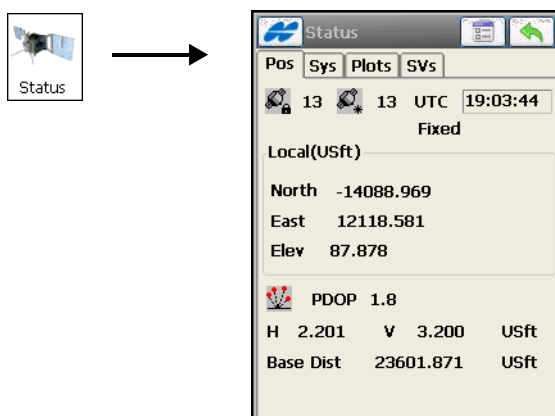
To check the status of a GPS+ survey, tap the **Status** icon. The *Status* screen displays (Figure 8-13 on page 8-16). The *Status* screen contains information about the current position of the receiver, RTK status, and the satellite constellation.

### Position


The *Position* tab displays the following information:

- Total number of available satellites. The *lock* icon signifies the number of the satellites tracked, the *star* icon shows the number of satellites used in position determination.
- For mmGPS, the *Position* tab displays a mmGPS icon . This icon displays when the receiver calculates mmGPS heights.
- *UTC* – the current UTC time.
- The type of the position calculation method – Autonomous, Fixed, Float, Code Differential.

- *WGS84* – the coordinates of the antenna (*Local(m)*) in the selected coordinate system; this field changes its name based on the chosen value in the Coordinate System screen (see “Coordinate System” on page 2-6), Display screen (see “Display” on page 2-9), and the selected distance units (see “Units” on page 2-7).
-  *PDOP* – the PDOP value. A factor depending solely on satellite geometry describing how the uncertainty in the coordinates depends on the measurement errors. PDOP is proportional to the estimated position uncertainty.




**Figure 8-13. Status – Position Tab**

- (*H*) *HRMS* and (*V*) *VRMS* – the  $\text{RMS}^1$  values of the horizontal and vertical coordinates for the last epoch of observation, respectively.
- *Base Dist* – slope distance to base antenna. The field is empty if no differential corrections are received.
- The settings  icon – opens the *Settings* screen (Figure 8-14).

---

1. RMS (Root Mean Square) – a factor that characterizes the precision of the collected coordinates.

- The back  button – returns to the main menu.

## Settings

The *Settings* screen (Figure 8-14) generally sets the value for the minimum threshold of elevation mask; data from satellites below this elevation angle are not used. Other settings depend on the current style selected in the job configuration.

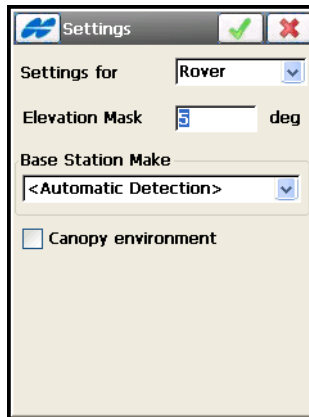


Figure 8-14. Elevation Mask

- *Settings for* – sets either the base or the rover of elevation mask application.
- *Elevation Mask* – the value of the elevation mask.
- *Base Station Make* – designates Base Make (IGS Class) used by the rover receiver to account for GLONASS biases. This allows overriding Base Make automatically detected by the rover receiver if this information is transmitted by the base. You can select from *Topcon Positioning Systems*, *Sokkia*, *Ashtech*, *Javad*, *Leica*, *Magellan*, *Novatel*, *Septentrio*, *Trimble*, *Other* (for the base receiver of other class included in the IGS list) or *Unknown* (for the base receiver's class not included in the IGS list).

- *Canopy environment* – enable to set less rigid thresholds for the RTK engine to filter out measurement outliers when working under tree canopy and in other cases of high multipath.
- Pressing the ok ☒ button – sends the current elevation mask to the base or rover receiver as selected above.

## System

The *System* tab (Figure 8-15) displays the information about the current state of RTK measurements.

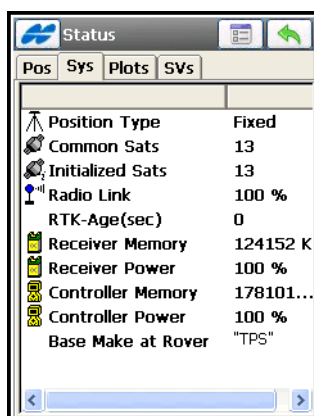


Figure 8-15. Status – System

- *Position Type* – the type of the position calculation method: *Autonomous*, *Fixed*, *Float*, or *Code Differential*.
- *Common Sats* – the number of satellites common to the Base and Rover used in RTK solution.
- *Initialized Sats* – the number of satellites contributing to the solution.
- *Radio Link* – a check sum reading from the radio as the Base generates packets. 100% means all packets have been received.
- *RTK-Age(sec)* – how much delay is seen between the marker of the last RTK message received from the Base and the epoch being solved at the Rover.
- *Receiver Memory* – the remaining memory of the receiver.

- *Receiver Power* – the current receiver power value.
- *Controller Memory* – the available memory in the controller.
- *Controller Power* – the current controller power value.
- *Base Make at Rover* – Base Make (IGS Class) automatically detected by the rover.

## Log History

For Post Processing surveys, when file logging starts, the *Status* screen (Figure 8-16) also displays the *Log History* tab.

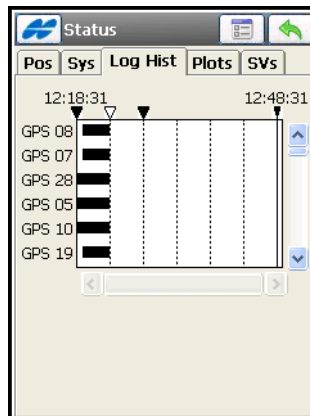


Figure 8-16. Status – Log History

The *Log History* tab graphically displays the usage of satellites over time. The field is divided into 5-minute portions along dotted lines with the starting time and each new hour marked.

# Multi Base

If the Rover receives CMR+ corrections from more than one Base, an additional tab called *Multi Base* appears in the *Status* screen on the Rover side. Muti Base mode is set in the *Start Base* screen (Figure 8-4 on page 8-6).

The *Multi Base* tab (Figure 8-17 on page 8-20) displays a list of the Base Stations with their parameters (age, link quality, type, and so forth). Check mark the desired Base to use its corrections.



Currently, TopSURV supports processing RTK baselines from one base at a time. If the receiver switches base stations when recording data, TopSURV warns the user.

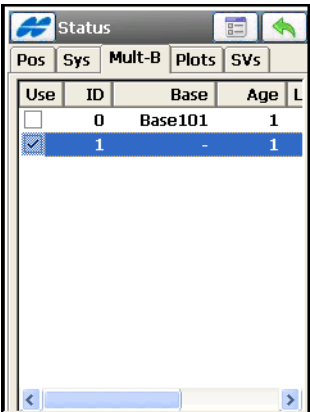


Figure 8-17. Status – Multi Base Tab



## Position Plots

The *Plots* tab (Figure 8-18) displays the current receiver position.

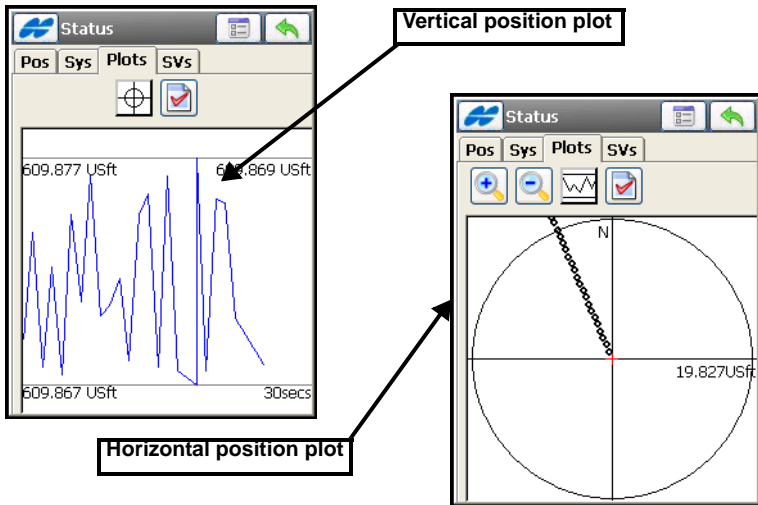







Figure 8-18. Status – Scatter Plots

Table 8-1 lists and describes the plot icons for the current position receiver.

Table 8-1. Plot Icons/Current Receiver Position

Plot Icons	Receiver Position Description
	Zooms the plot inward.
	Zooms the plot outward.
	Switches the vertical position plot to the horizontal one.
	Switches the horizontal position plot to the vertical one.
	Opens the <i>Properties</i> screen (Figure 8-19) from which to set graphical features for the scatter plots.

## Properties

On the *Properties* screen, you can set graphical features for scatter plots (Figure 8-19).

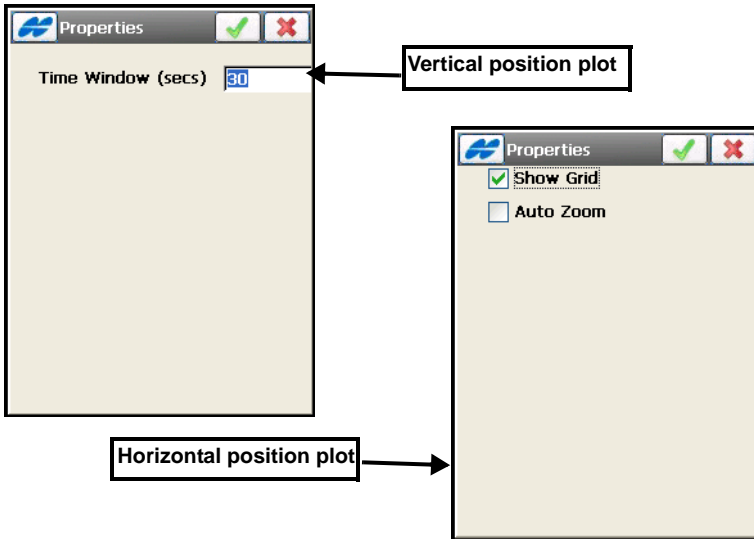


Figure 8-19. Scatter Plot Properties

On the *Properties* screen (Figure 8-19 on page 8-22) for the vertical position plot, enter the duration in seconds for the time axis. (*Time Window (secs)*).

On the *Properties* screen (Figure 8-19 on page 8-22) for the horizontal position plot, enter the following parameters:

- *Show Grid* – if enabled, displays the local coordinate axes.
- *Auto Zoom* – if enabled, automatically scales the horizontal position plot to fit into the screen.

## Satellites

The *SVs* tab of the *Status* screen (Figure 8-20) displays the graphical position of the satellites on the sky.

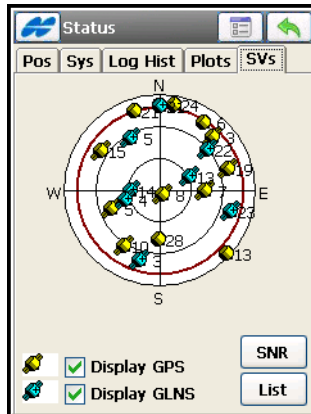


Figure 8-20. Status – SVs Plot

- *Display GPS* – shows/hides the GPS satellites images.
- *Display GLNS* – shows/hides the GLONASS satellite images. GLONASS satellites are marked with a “+” sign.



The absence of “wings” on the satellite image means that for some reason, the signal from this satellite is not used in the positioning (for example, below elevation cutoff).

- **SNR** – toggles the appearance of the screen to a table displaying the signal-to-noise ratio of each of the satellites (Figure 8-21).

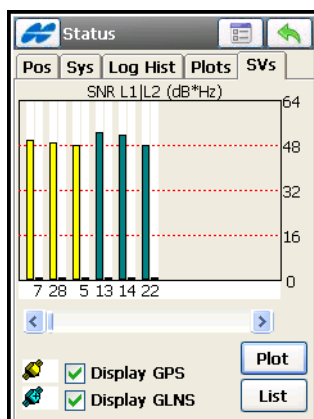


Figure 8-21. Status – SVs SNR

- **List** – toggles to the table (Figure 8-22) that displays the satellite parameters.

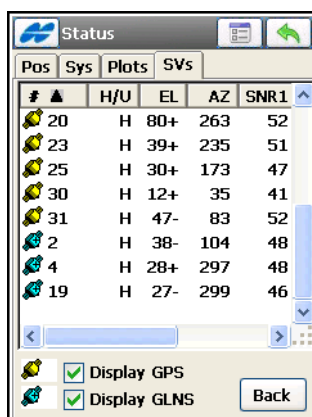





Figure 8-22. Status – SVs List

-  : toggles between ascending and descending order of the numbers of satellites (PRNs for GPS and slot numbers for GLONASS).
- *H/U*: shows whether signal is healthy or unhealthy.
- *EL*: shows the elevation angle of the satellite.

- *AZ*: shows the azimuth of the satellite.
- *SNR1*: shows the L1 signal to noise ratio.
- *SNR2*: shows the L2 signal to noise ratio.
- *L2C*: shows the L2C signal to noise ratio.
- *USED*: shows whether a satellite is used in position computation. The user can select whether a satellite should be used or not by selecting the corresponding row for the satellite in the list and clicking on the USED column header. This will toggle the use of the satellite.
- **Back** – return to the sky plot view (Figure 8-21 on page 8-24).
- The back  button – returns to the main menu.

## Help Icon Options

The *Help* icon  in the upper-left corner of the *Status* screen displays a pop-up menu which varies depending on the configuration type used:

- *Rover Antenna Setup* – opens the **Antenna Setup** Screen to set the antenna for the survey.
- *Config OmniSTAR* – available if OmniStar is configured; opens the **OmniSTAR** screen to setup the OmniSTAR service (see “Configure OmniSTAR” on page 8-26).
- *Config Beacon* – available if Beacon is configured; opens the **Beacon** screen to setup the Beacon service (see “Configure Beacon” on page 8-28).
- *Config Radio* – opens the **Configure Radio** screen to setup the radio (see “Configure Radio” on page 8-30). The option varies depending on the radio selected for the rover (see “Configure Radio” on page 8-30). It can be: *Config Radio*, *Config CDMA*, *Config CDPD*, *Config GSM* or *Config UHF*.
- *Config RE-S1 Repeater* – available if RE-S1 is configured as a repeater; opens the **Configure Radio** screen to setup the RE-S1 repeater (see “Configure RE-S1 Repeater” on page 8-35).

- *Reset RTK* or *Reset DGPS* – reinitializes the receiver.
- *mmGPS+ Options* – opens the ***mmGPS+ Options*** screen (see “mmGPS+ Options” on page 8-36).
- *Clear NVRAM* – resets the receiver parameters to factory default values (such as active antenna input, elevation mask and recording interval, and information about the receiver’s internal file system). This command will not delete any files from the receiver memory. After clearing the NVRAM, the receiver will require some time to collect new ephemerides and almanacs (around 15 minutes).

## Configure OmniSTAR

TopSURV references two OmniSTAR services: either *Virtual Base Station* (VBS) or *High Performance* (HP). To access OmniSTAR configuration options, select *Config OmniSTAR* from the *Help* Icon menu in the upper-left corner of the ***Status*** screen.



The same option is accessible from the ***Topo*** and ***Auto Topo*** screens.

If the job is configured to use the OmniSTAR VBS service with GPS receivers that allow using only VBS, the ***OmniSTAR*** screen (Figure 8-23), opens to select the satellite.



Figure 8-23. OmniSTAR information

- *Satellite* – selects the satellite that the receiver subscribes to.
- OmniSTAR SN – shows the OmniSTAR serial number.
- Subscription – shows the OmniSTAR subscription number.
- **Status** – opens the OmniSTAR screen to view information on the OmniSTAR link and the receiver OmniSTAR board (Figure 8-24 on page 8-27).

If the job is configured to use the OmniSTAR service with MAP-HP receivers, the **OmniSTAR** screen begins to display the status of OmniSTAR service directly after selecting the Config OmniSTAR option. Wait for some time to get the information shown.

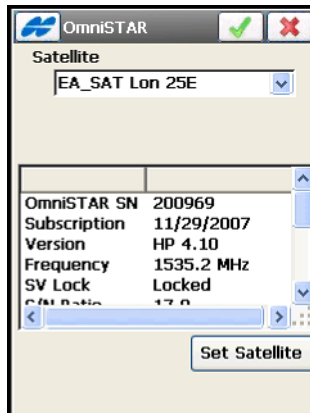


Figure 8-24. OmniSTAR HP Status

- Satellite – select an OmniSTAR satellite.
- **Set Satellite** connects to the selected satellite and begins logging data from this satellite.

The *System* tab will display (Figure 8-25) first DGPS VBS position type and then, HP DGPS solution.

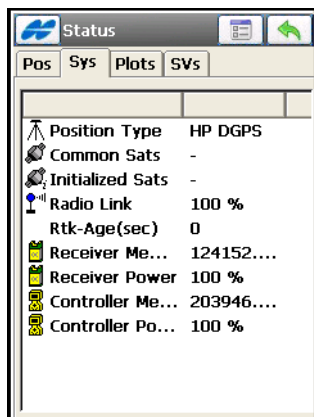


Figure 8-25. HP DGPS

## Configure Beacon

To access Beacon configuration options, select *Config Beacon* from the *Help Icon* menu in the upper-left corner of the *Status* screen. The *Beacon* screen (Figure 8-26) displays.



Figure 8-26. Beacon

- *Country* – the country where the radio-beacon is located.
- *Station* – the station that provides broadcasting differential corrections for the Rover.



- **Status** – opens the *Beacon Status* screen (Figure 8-27) to view information on the beacon link and the receiver beacon board.



Figure 8-27. Beacon Status

## BR-1 Configuration

When a survey is configured to use the differential corrections receiver BR-1 (see “Config: Beacon” on page 3-40), the *Beacon* screen (Figure 8-28) displays to set up the BR-1 radio.

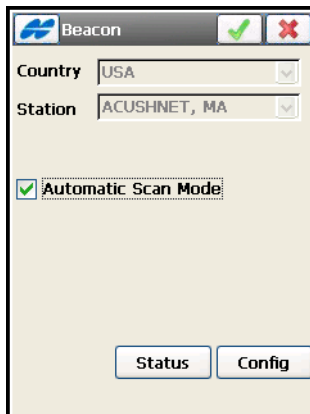


Figure 8-28. Beacon BR-1 Setup

- **Status** – queries BR-1 about the beacon status, and opens the *Beacon Status* screen (Figure 8-27) to view information on the the beacon link and the receiver beacon board.

- **Config** – sends the appropriate configuration commands for BR-1 radio channels (Figure 8-29):
  - When Automatic Scan mode is on, all four channels of the BR-1 automatically scans frequencies until one of the channels find the available Beacon Signal. After the signal is found, the channel maintains this frequency.

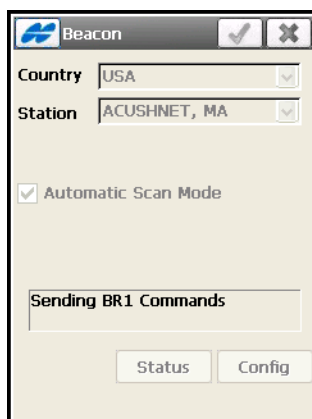


Figure 8-29. BR-1 Configuration

- When Automatic Scan mode is off, the frequency and data transfer rate of the known Station selected is set only to channel 'a' of the BR-1 receiver. The other channels do not work.

## Configure Radio

The *Config Radio* screen sets up the parameters for the rover/base/repeater radio modem. This screen displays the parameters which were set in the job configuration (see "Base Radio" on page 3-13 and "Rover Radio" on page 3-31).

The set of the parameters depends upon the type of the radio selected. For detailed description of the radio parameters see "Base Radio Parameters" on page 3-15.

**For a Digital UHF Modem: Internal GR-3 Digital UHF, Internal HiPer Digital UHF, TRL-2 and TRL-35 External Digital UHF** the *Config Radio* screen (Figure 8-30 on page 8-31), after querying the radio for the frequency, sets the radio channel to the frequency on which to receive or transmit correctional data.



Script file with Frequency list (Pac Crest Channels.ccx) must be loaded (using the Modem TPS software) before any frequencies will be displayed in TopSURV. Please do this **BEFORE** configuring the radio.

- *Radio Connected to* – selects the modem from the configured ones to setup.
  - Rover: selects the modem connected with the Rover receiver.
  - Base: selects the modem connected with the Base receiver.
- *Channel* – selects the frequency that the radio broadcasts and/or listens to.

**Figure 8-30. Config Internal GR-3 Digital UHF**

When using the GR-3 Digital UHF as the Base radio or when using a repeater, set the signal strength that the Base transmits (Figure 8-31). Select either *100 mW*, *250 mW*, *500 mW*, or *1W* power.

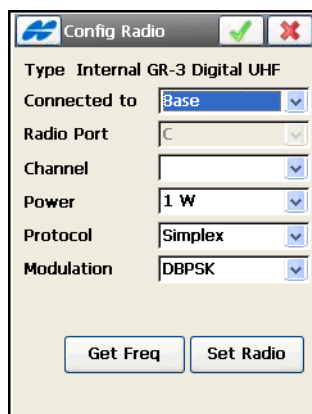



Figure 8-31. Config Base GR-3 Digital UHF Radio

For UHF Modems: the Internal HiPerXT (UHF) and Internal Map-HP (UHF) the *Config Radio* screen (Figure 8-32) sets the following parameters:



Figure 8-32. Config Internal HiPerXT (UHF)

- **Connect** – opens a daisy chain and sends commands to setup the UHF radio and get correctional data for the rover. For the base radio this button changes into **Set Radio**. A confirmation message displays if the modem was setup successfully.
- **Disconnect** – turns off the UHF modem.
- The ok  button– returns to the *Status* screen.

**For the FH915 Modem: Internal HiPer Lite** set the operating channel for the modem on the *Config Radio* screen (Figure 8-33).

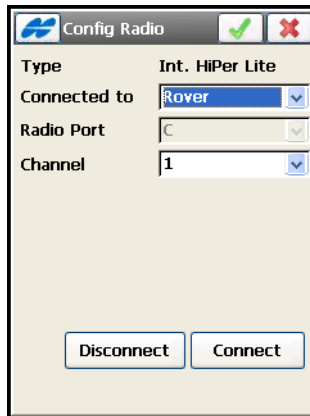


Figure 8-33. Config Internal HiPer Lite

**For FH 915Plus Modems: the Internal GR-3 FH915Plus, the Internal Hiper Lite+ FH915Plus and RE-S1 radios** the *Config Radio* screen (Figure 8-34) contains the following parameters.

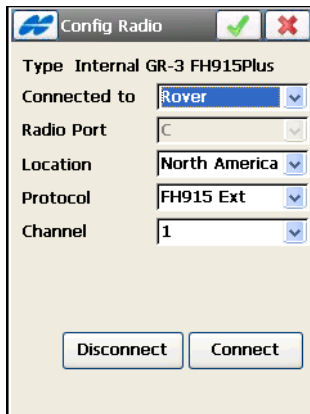


Figure 8-34. Config Internal GR3 FH915Plus

The RE-S1 is a 1W radio extension system using FH915 Plus spread spectrum radio. It can be used as a repeater with the GR-3 or HiPer Lite+ GPS receivers, or as a transmit/receive external FH915 Plus radio for the GB or Legacy GPS receivers. For the RE-S1 radio used as a repeater, see “Configure RE-S1 Repeater” on page 8-35.

For **Satel modems** the *Config Radio* screen (Figure 8-35) displays the model, channel and frequency to set for the radio.

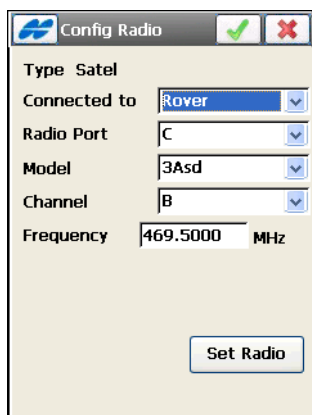
The image shows a software window titled "Config Radio" with a blue icon and green/red status buttons. It contains several configuration fields: "Type" is set to "Satel"; "Connected to" is a dropdown menu showing "Rover"; "Radio Port" is a dropdown menu showing "C"; "Model" is a dropdown menu showing "3Asd"; "Channel" is a dropdown menu showing "B"; and "Frequency" is a text field showing "469.5000" followed by "MHz". A "Set Radio" button is located at the bottom right.

Figure 8-35. Config Satel

For the **Internal GR3 Satel radios** the *Config Radio* screen (Figure 8-36) allows to get the frequency from the radio or to turn Free Channel Scan mode.

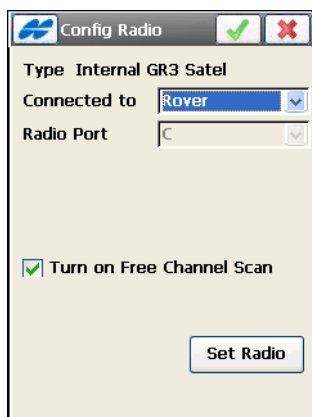

The image shows a software window titled "Config Radio" with a blue icon and green/red status buttons. It contains several configuration fields: "Type" is set to "Internal GR3 Satel"; "Connected to" is a dropdown menu showing "Rover"; "Radio Port" is a dropdown menu showing "C". Below these fields is a checkbox labeled "Turn on Free Channel Scan" which is checked. A "Set Radio" button is located at the bottom right.

Figure 8-36. Config Internal GR3 Satel

When using the Internal GR-3 Satel as the Base radio, set the signal strength that the Base transmits. Select either *100 mW*, *250 mW*, *500 mW*, or *1W* power.

## Configure RE-S1 Repeater

To setup the RE-S1 as a stand-alone repeater, during the survey configuration, first enable the usage of the RE-S1 radio modem as a repeater (see “RE-S1 FH915 Repeater” on page 3-36). Then the *Config RE-S1 Repeater* option appears in the pop-up menu of the *Status*, *Start Base* and *Topo* screens. This option opens the **Config Radio** screen to set RE-S1 as a repeater (Figure 8-37 on page 8-35).

- **Radio Port** – selects the radio port that connects with the receiver or controller.
- **Location** – selects the territory (North America, Australia or New Zealand) where the RE-S1 is used.
- **Protocol** – shows the compatibility protocol.
- **Channel** – sets the operating frequency channel.
- **Disconnect** – turns off the RE-S1 modem.
- **Connect** – opens a daisy chain and sends commands to setup the RE-S1 radio as a repeater. A confirmation message displays if the modem was setup successfully.
- The ok  button – saves and returns to previous screen.

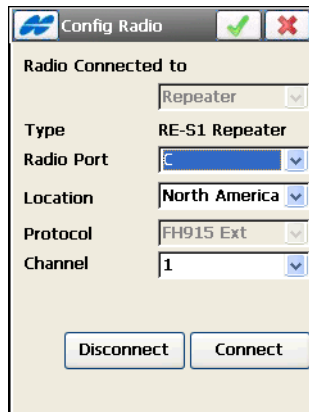


Figure 8-37. RE-S1 Repeater Configuration

## mmGPS+ Options

The *mmGPS+ Options* screen (Figure 8-38) displays the status of mmGPS+ in RTK survey mode. To open this screen, select the *mmGPS+ Options* item from the Help Icon menu in the upper-left corner of the *Status* screen.

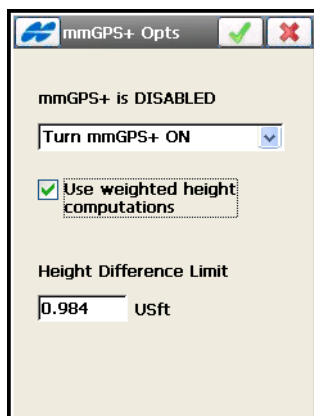


Figure 8-38. mmGPS+ Options

- Select “Turn mmGPS+ ON” to enable mmGPS+ height computation.
- *Use weighted height computations* – check and enable to combine mmGPS elevations and GPS elevations. When selected, this option forces the receiver/sensor to always consider the angle and distance when determining the elevation, then combines the two elevations accordingly. This option works well at large (300m) distances and steep angles.
- *Height Difference Limit* – sets the threshold for the difference between GPS and mmGPS+ height measurements.



# Known Point Initialization

To set up a survey with known points, tap the **Known Point Init** icon.

The **Known Point Init** screen (Figure 8-39) initializes the receiver using known coordinates for the Rover station. This screen is used with single frequency receivers and for quality control on dual frequency receivers.

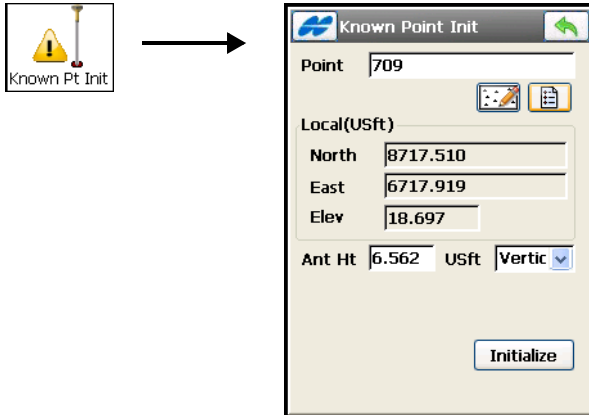




Figure 8-39. Known Point Rover

- **Point** – sets the name of the point; select from either the list  icon or from the map  icon.
- Coordinates of the point in the current coordinate system. (Use the **Configure** ► **Coord System** and **Display** icons selection to change the system and the name of the field. Its contents also change.)
- **Ant Ht** – the height of the antenna reference point (ARP) above the mark, and the type of height measurement (vertical or slant).
- **Initialize** – sends the information to the Rover receiver. After the initialization is carried out, the **KPI Position** screen will display results (Figure 8-40 on page 8-38).
- The Help Icon in the upper-left corner of the **Known Point Init** screen displays the pop-up menu containing four items:
  - **Status**: opens the **Status** screen (see “GPS+ Survey Status” on page 8-15).

- *Rover Antenna Setup*: opens the **Antenna Setup** Screen to set the antenna for the current survey.
- *Config Radio* – opens the **Configure Radio** screen (see “Configure Radio” on page 8-30). The option varies depending on the radio selected for the rover (see “Configure Radio” on page 8-30). It can be: *Config Radio*, *Config CDMA*, *Config CDPD*, *Config GSM* or *Config UHF*.

## KPI Position

The **KPI Position** screen will display results of known point initialization: the solution status, position residuals, precision data, and status of initialization of the rover receiver (Figure 8-40).

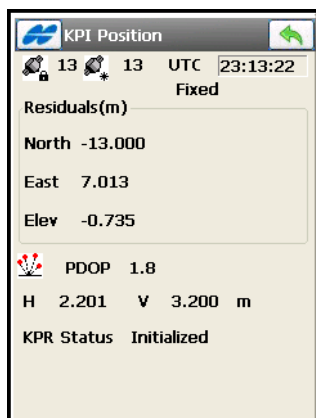


Figure 8-40. Known Point Initialization Position

## Initialize mmGPS+


To setup mmGPS+ system for RTK surveying, tap the **Init mmGPS** icon. The **Init mmGPS+** screen contains information about the calibration of the laser transmitter and initialization of the sensor (Figure 8-41 on page 8-40).

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing three options:

- *Field Calibration* – opens the **Calibration** screen (see Figure 8-50 on page 8-47) to set the transmitter to calibrate (that is, to fix errors in incline in the self-leveling mechanism of the transmitter).
- *Known Point Offset* – opens the **Known Point** screen (Figure 8-44 on page 8-42).
- *Advanced Sensor Options* – opens the **Advanced Sensor Options** screen (see).

## Transmitter Data

The *Data* tab (Figure 8-41 on page 8-40) calibrates the transmitter with the correct channel and communication port:

- *Name* – the name of the transmitter.
- *ID* – the ID that corresponds to the channel of the transmitter.
- *Data* – the status of calibration data.
- **Add** – opens the **Transmitter** screen (Figure 8-42 on page 8-41) to get the transmitter data.
- **Edit** – opens the **Transmitter** screen (Figure 8-42 on page 8-41) to change the information on the transmitter.
- **Delete** – removes the transmitter from the list.
- The ok  button – saves settings and returns to the previous screen.

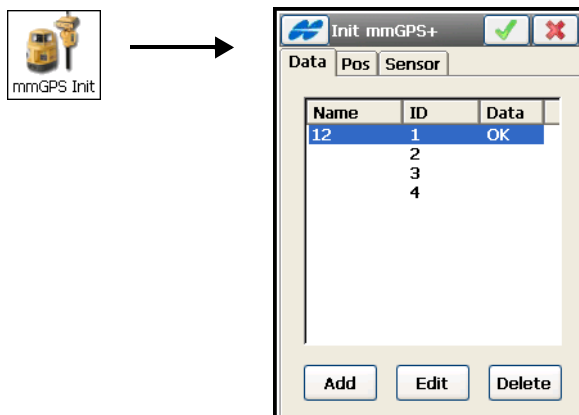



Figure 8-41. Initialize mmGPS – Data Tab

## Transmitter

On the *Transmitter* screen (Figure 8-42 on page 8-41), set the following parameters:

- *Name* – the name of the transmitter.
- *Com Port* – the communication port of the transmitter.
- *ID* – the channel of the transmitter.
- *Calibration Data* – the status of calibration data.
- **Clear Data** – clears the ID and Calibration Data fields.
- **Get Data** – retrieves the transmitter's data.
- The ok  button – returns to the *Init mmGPS+* screen (Figure 8-43 on page 8-41) showing the calibration data.

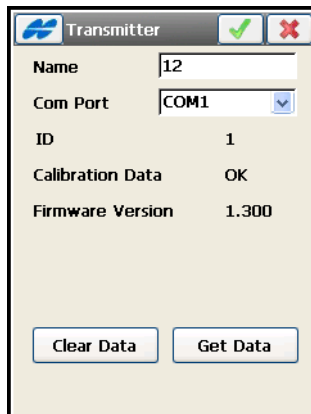


Figure 8-42. Transmitter

## Transmitter Position

The *Position* tab (Figure 8-43) sets up the transmitter's height and location at the jobsite.

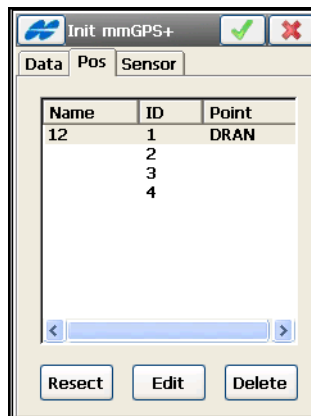


Figure 8-43. Initialize mmGPS – Position Tab

- *Name* – the name of the transmitter.
- *ID* – the channel of the transmitter.
- *Point* – the point over which the transmitter is setup.

- **Resect** – opens the *Resect mmGPS+* screen to perform a resection for an unknown transmitter location.
- **Edit** – opens the *Known Point* screen to select the point over which the transmitter is setup.
- **Delete** – removes the transmitter from the list.

## Known Point

On the *Known Point* screen (Figure 8-44) select the known point over which the transmitter is setup and enter the transmitter height.

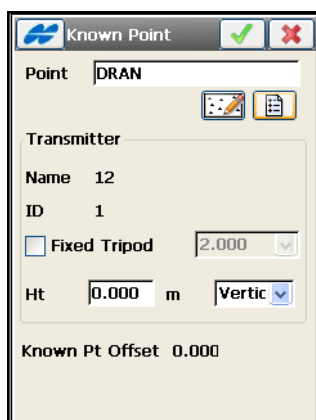



Figure 8-44. Known Point

- *Point* – the point over which to set up the transmitter; select using either the map or list icons next to the Point entry box.
- *Transmitter* – enter transmitter parameters:
  - *Name*: displays the name of the transmitter.
  - *ID*: displays the transmitter channel.
  - *Ht* and *m*: sets the height of the transmitter from the ground to the mark on the transmitter's side and the method of height measurement.
  - *2m Fixed Tripod*: check mark this box if using a 2 meter fixed tripod.

- The ok  button – uploads the transmitter calibration information to the sensor.

## Resection

On the **Resect mmGPS+** screen (Figure 8-45), measure an unknown transmitter location using the Rover and three or more points.

The **Sensor** tab (Figure 8-45) is identical to the title tab on the **Init mmGPS+** screen and is used to set up the sensor.

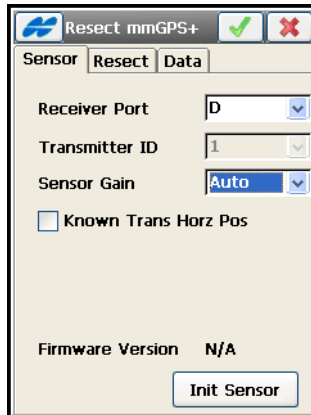


Figure 8-45. Resection – Sensor Tab

- *Receiver Port* – sets the receiver port that connects the receiver to the sensor.
- *Transmitter ID* – displays the channel of the transmitter.
- *Sensor Gain* – select Auto to automatically control the mmGPS receiver's detection level of the transmitter's signal.
- **Init Sensor** – starts the initialization of the sensor.
- *Known Trans Horz Pos* – if enabled, then after pressing the **Init Sensor** button, the **Known Point** screen (Figure 8-44 on page 8-42) displays. Select the point over which the transmitter is setup.

The **Resect** tab (Figure 8-46) is used to calculate the resection calculation from the Rover point to the point over which the transmitter is set up.

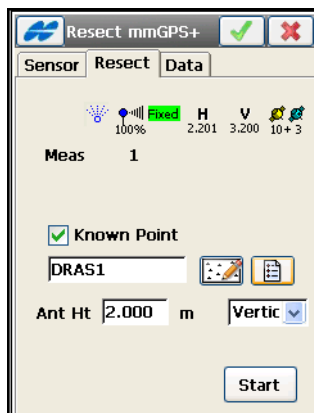







Figure 8-46. Resection – Resect Tab

The icons on the status bar of the screen displays information about the current state of measurement:

-  – the mmGPS icon displays the sensor receives the transmitter's beam.
-  – the quality of the radio link.
-  – the type of the position calculation method.
-  – the RMS errors for horizontal and vertical coordinates, respectively.
-  – the number of satellites tracked and used in position calculation, respectively.
- *Meas* – the number of the measurement.
- *Known Point* – check mark this box when occupying a known point, and select a point to occupy using the map and list icons.
- *Ht* and *m* – the antenna's height and method of height measurement.



- **Start** – starts the measurement process. After pressing, the button toggles to **Stop**, and the counter of the epochs collected appears.
- **Logging** – displays the number of GPS epochs used in the resection calculation during the measurement.

**Data** tab (Figure 8-47) is used to view the results of resection measurements. Data displays only after three or more points have been measured.

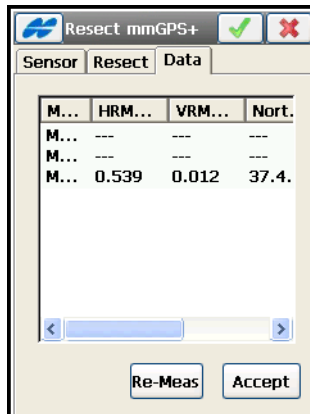


Figure 8-47. Resection – Data Tab

- **Re-Meas** – clears all data measurements and restarts the resection process.
- **Accept** – opens the **Add Point** screen (Figure 8-48 on page 8-46) to view the point information for the transmitter.

The **Add Point** screen (Figure 8-48 on page 8-46) is used to view and save the transmitter location.

**Add Point**

**Point Info**

Point: Transmitter21

Code: [dropdown]

Note: Transmitter

Local(USft)

North: 10385.773

East: 9280.436

Elev: 13.269

☐ Control Point

Figure 8-48. Add Point

## Sensor

The *Sensor* tab of the *Init mmGPS+* screen (Figure 8-49) uploads transmitter calibration information to the sensor and sets up the sensor for receiving the transmitter's laser beam.

**Init mmGPS+**

**Sensor**

Receiver Port: D [dropdown]

Transmitter ID: ANY [dropdown]

Sensor Gain: Auto [dropdown]

Firmware Version: S1V1.40

Init Sensor

Figure 8-49. Initialize mmGPS – Sensor Tab

- *Receiver Port* – connects the receiver and sensor.

- *Transmitter ID* – the transmitter’s channel. The ANY selection allows the sensor to independently select the transmitter with the smallest error rate.
- *Sensor Gain* – sets the sensitivity of the sensor to the transmitter’s laser beam.
- *Firmware version* – shows the firmware version for the sensor.
- **Init Sensor** – starts the initialization process with opening daisy chain and sending sensor commands, then close a message about successful sensor setup.

## Field Calibration

The *Calibration* screen (Figure 8-50) selects the transmitter for field calibration.

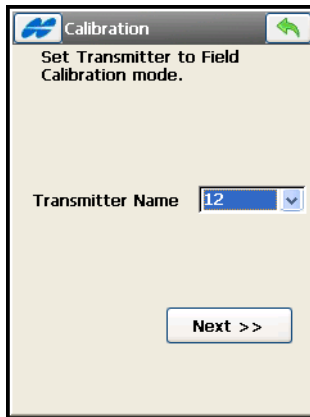


Figure 8-50. Calibration

- *Transmitter Name* – the name of the transmitter to calibrate
- **Next** – starts the process of auto-leveling (Figure 8-51 on page 8-48).

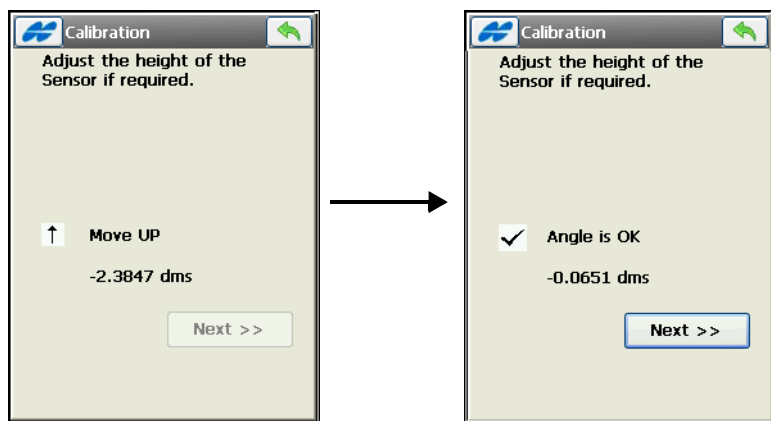


Figure 8-51. Check Angle of Sensor

- **Next** – opens the *Calibrate* screen with instructions to follow (Figure 8-52).

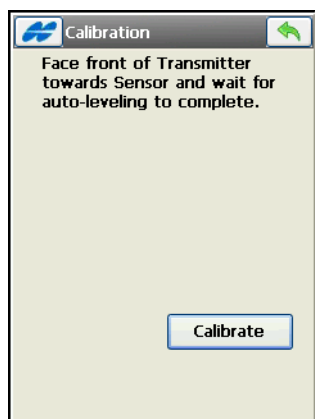






Figure 8-52. Calibrate

- **Calibrate** – press to collect calibration data after the auto-leveling process completes.

## Known Point Offset

The *Known Point Offset* screen (Figure 8-53) computes the height difference between the rover position and any known point.

- *Transmitter Name*: displays the name of the transmitter used.
- *Point*: sets the point from which to compute the offset; select the point from the map using the  icon, or from the list using the  icon.
- *Num Epochs*: sets the number of measurements to average on the rover location.
- Pressing the  icon (for RTK mode) measures position of the current location in the job's coordinate system. The *Epoch Count* field shows the number of the accepted epochs. Once pressed, the icon becomes a stop  icon; press the icon to stop getting position and display the height difference in the *Height Offset* field.

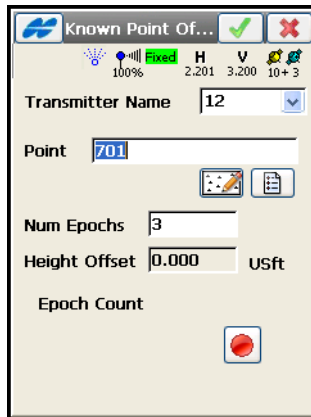


Figure 8-53. Known Point Offset

## Advanced Sensor Options

The *Advanced Sensor Options* screen (Figure 8-54) contains two advanced mmGPS+ options:

- *Init Time Improvement* – check mark to improve the RTK fix time for the GPS receiver. This option is useful to decrease the initialization time when satellite visibility is limited (for example, tracking only four or five satellites).
- *Weighted Height* – when selected, this option will force the receiver/sensor to always consider the angle and distance when determining the elevation, then combine the two elevations accordingly. This option works well at large (300 m) distances and steep angles.

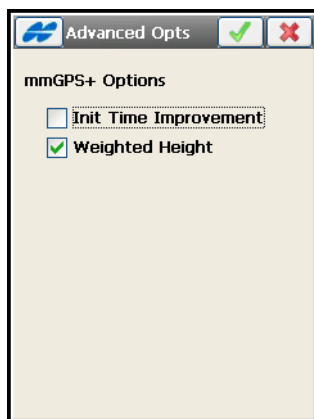


Figure 8-54. Advanced Sensor Options

# GPS Survey

To perform a survey with GPS receivers, tap the **Survey** icon in the main menu. The **GPS Survey** menu (Figure 9-1) includes options to set up the following surveys:

1. Topo
2. Auto Topo
3. X-Section
4. Find Station
5. Tape Dimension

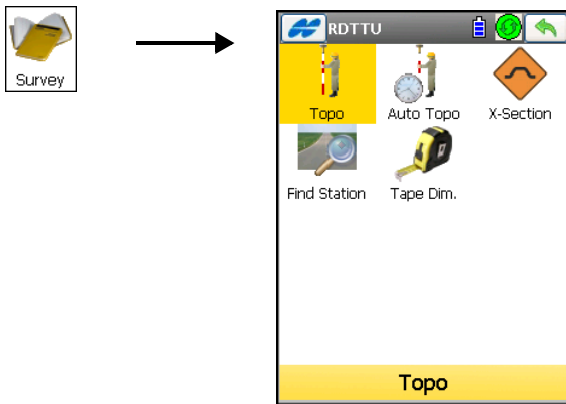



Figure 9-1. GPS Survey Menu

The Help Icon  opens a pop-up menu giving access to the help files, module activation codes, port data logging, changing menu interface, and information about the TopSURV used (for details see “Help Icon’s Pop-up Menu” on page 1-9).

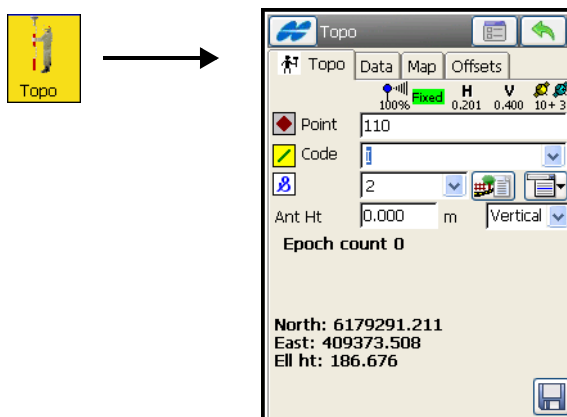


If there is no choice for some needed menu options, tap **Configure/Menus** icons and enable these options in the *Config Menus* screen.

# Topo Survey

To set up a survey with topo points, tap the **Topo** icon.

The **Topo** screen (Figure 9-2) records stop and go survey.



**Figure 9-2. Topo Points Survey**

The Help Icon in the upper-left corner of the screen displays the pop-up menu that always contains the *Help* item to access the Help files. This menu also contains a few options that varies, depending on survey mode used:

- *Status* – opens the **Status** screen (see “GPS+ Survey Status” on page 8-15).
- *Rover Antenna Setup* – opens the **Antenna Setup** screen to set the antenna for the current survey.
- *Config Radio* – opens the **Configure Radio** screen. For details, see “Configure Radio” on page 8-30.
- *Config RE-S1 Repeater* – opens the **Configure Radio** screen to setup the RE-S1 radio as a repeater (see “Configure RE-S1 Repeater” on page 8-35).
- *Config OmniSTAR* – opens the **OmniSTAR** screen to start the OmniSTAR service. For details, see “Configure OmniSTAR” on page 8-26.








- *Reset RTK* – resets the ambiguities and sets the receiver in the Rover RTK mode. The settings being used are based on the selections in the survey configuration.
- *Reset DGPS* – sets the receiver in the Rover DGPS mode. The settings being used are based on the selections in the survey configuration.
- *mm GPS+ Options* – opens the mmGPS+ Options screen in RTK survey (see “mmGPS+ Options” on page 8-36).
- *Note* – opens the **Note** screen (Figure 9-6 on page 9-6).
- *Edit Points* – opens the **Points** screen to edit points (see “Points” on page 6-3).
- *Inverse* – opens the *Two-Point Inverse* COGO task screen. For details see “Inverse” on page 14-2.
- *PTL Mode* – switches on the PTL (Point-To-Line) Mode. (The screen changes its appearance to **Topo (PTL)**.) For details see “PTL Point” on page 6-14.
- *Grid Setup* – opens the **Grid Setup** screen to set a grid to be displayed with the Map (see “Grid Setup” on page 9-19).

## The Topo Menu

The *Topo* tab on the Topo screen (Figure 9-6 on page 9-6) contains the initial data for the survey and displays the progress of data collection (Figure 9-2 on page 9-2).

Also, data collection includes considerations for the code type. The upper-right corner of the screen displays the status of information on the **Status** screen. For details, see “GPS+ Survey Status” on page 8-15.

- *Point* – displays the current point name.
- *Code* – displays the current point code with a symbol that shows the code entity type ( Point,  Line, or  Area); select a code from the drop-down list or enter a new code. Code needs to be defined at the time it is entered if it is not a code that exists in the codes dialog.

- The Topo screen will auto-hide and show the string input field based on the code type. The field is marked by the  sign. All line and area codes will display the string field while all point codes will hide the string field.
-  – tap on this icon to open the **Point Attributes** screen to set the code and attributes for the selected code, layer and to enter a photo note for the point (for details, see “On the Point Attributes screen (Figure 6-7), you can set a code, control code, string (displayed only for a Code Type of Line or Area) and attributes’ values for the point.” on page 6-9).

TopSURV on GMS-2, GMS-2 Pro or GRS-1 has an option to capture a picture for the point’s photo note using a camera integrated into these devices (Figure 9-3).

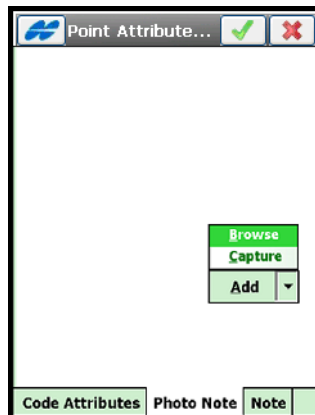




Figure 9-3. Photo Note by Camera

- The  icon next to the *Attributes List* bitmap displays the pop-up menu of the following items:
  - *Add to End/Start*: for Line and Area codes.
  - *Insert*: for Line and Area codes. This allows the user to insert a point to a line out of sequence.
  - *Layer*: opens the **Select Layer** screen to select the layer in which to locate the point. The List  button opens the **Layers** screen to edit layers. (For details on editing layers, see “Edit Layers” on page 6-24.)

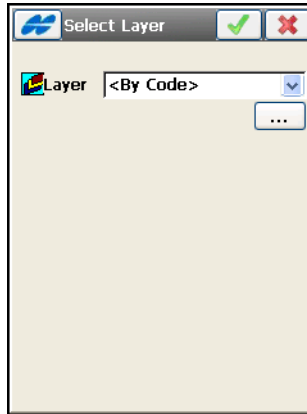



Figure 9-4. Select Layer

- *Note*: opens the **Note** screen (Figure 9-5). The **Note** screen is used for additional information. When exporting raw data (for example, to a TDS Raw Data file), this information is in the *Point Description* field. The note should be entered in the *Note* field. Press the ok  button to store the Note.

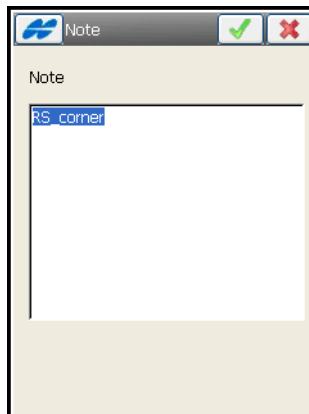




Figure 9-5. Note

- *Ant Ht* – sets the antenna height and its type (slant or vertical).



When using mmGPS+, the height of the Rover antenna includes the height of the PZS-1 sensor with 5/8 inch plug.

- *Epoch count* – shows the number of accepted epochs.
- *Rem Time* – shows remaining time to stop logging when in *PP Kinematic* or *PP DGPS* mode.
-  – starts the measurement process. After pressing this button, a new cancel button  appears along with the counter of the epochs collected (Figure 9-6).

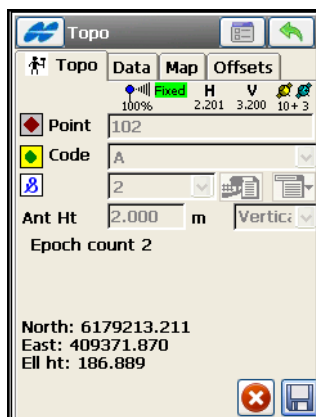








Figure 9-6. Topo – Accept

- A mmGPS icon  displays on the **Topo** screen when the receiver calculates mmGPS heights.
-  – opens the **Survey Parameters** screen. See “Survey Parameters” on page 3-46. If you set precision constraints for a Topo survey, TopSURV accepts some averaged point coordinates which are the first to meet the precision requirements.

-  (for PP enabled RTK, PP Kinematic, and PP DGPS) – starts logging file in the receiver. When pressed, the button toggles to  (Figure 9-7 on page 9-7).

Instead of an icon displaying the RTK solution, the symbol  displays, showing the status of the log file. If the file is opened, it changes its appearance to .

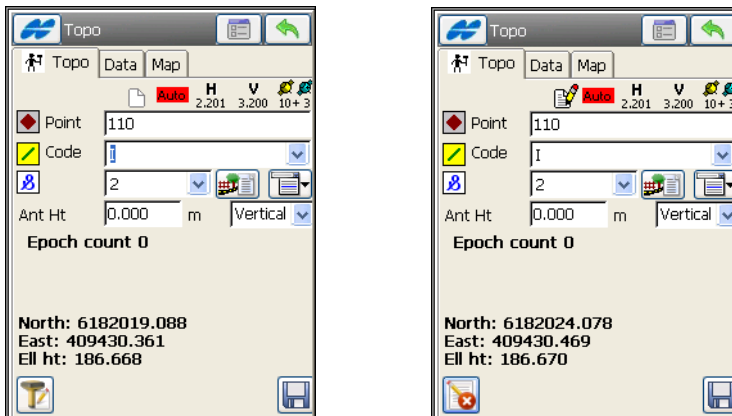




Figure 9-7. Topo for PP Kinematic

When file logging starts, the **Status** screen also displays the *Log History* tab (see “Log History” on page 8-19).

If an observed Topo point has a name existing in the job, the **Point Check** screen (Figure 9-8) displays.

- *Overwrite* – overwrites the existing point.
- *Rename* – the point is renamed. The new name is noted in the field and is the point with observed coordinates.
- *Store As Check Point?* – if enabled, the observed point is stored as a check point of the existing point.
- *Use in Weighted Average* – available if the *Store As Check Point* radio button is selected. The ok  button opens the **Weighted Average** screen (see “Weighted Average” on page 6-16 for details).

- *Correct Base* – in RTK surveys, if enabled, the existing coordinates of the observed point are not replaced by the coordinates of the observed point. Instead, the known coordinates of this point are used to correct the Base coordinates.

After pressing the ok  button, a warning message displays that recomputations are being performed. Then the coordinates of all points are updated using the new Base coordinates.

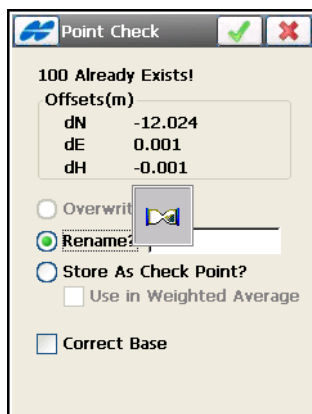


Figure 9-8. Duplicate Point

The *Weighted Average* screen (Figure 9-9 on page 9-9) displays coordinate residuals of the check point.

- The WA tab lists the names of the coordinate residuals

- **Use In WA/Exclude In WA** – uses or does not use the check points in weighted averaging positions.

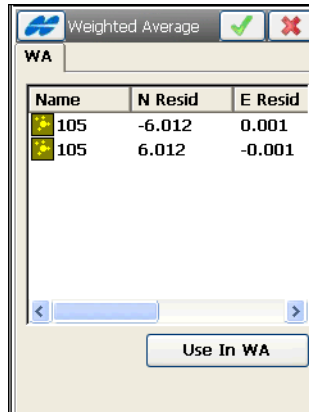


Figure 9-9. Weighted Average

## Data

The *Data* tab on the *Topo* screen (Figure 9-10) shows the results.

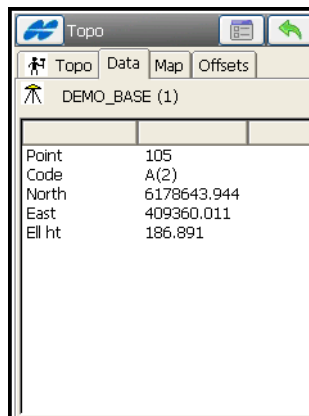


Figure 9-10. Topo – Data

The *Map* tab on the *Topo* screen (Figure 9-11) shows the stored point graphically.

# Map


On the *Map* tab (Figure 9-11), just like on the *Topo* tab, you can collect topo points using the start  button.



Figure 9-11. Topo – Map









-  – shows/hides the status bar for measurement.
-  – shows/hides the map tool bar.
- **Sim/Sim Off** – turns on/off Simulation mode.

Table 9-1 describes the stored point icons that display on the *Map* tab.

Table 9-1. Stored Point Descriptions

Icon	Description
	the name of a point code; shows the code type, it can be  Point,  Line, or  Area
	sets attributes for the code, layer and photonotes
	displayed only for a Code Type of Line or Area and shows a string

For a detailed description of the Map view see “Viewing Map” on page 15-1.



## Offsets

The *Offsets* tab (Figure 9-12) sets the offset point for the measurement.

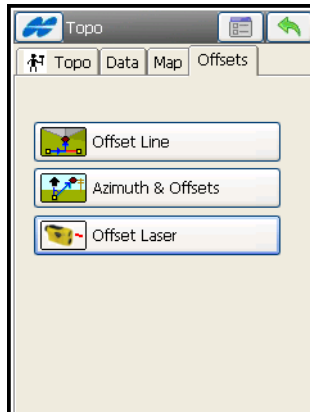





Figure 9-12. Topo – Offsets

-  **Offset Line** – opens the *Line* screen to define a point, set by the offset from a line. See Figure 9-13 on page 9-12.
-  **Azimuth & Offsets** – opens the *Azimuth-Distance-Height* screen to define a point specified by the offset from a point. See Figure 9-14 on page 9-14.
-  **Offset Laser** – available either if an external laser device has been added in the Config Survey or in TopSURV on GMS-2 Pro with an integrated laser; opens either the *Config Laser* screen (see “Laser Configuration” on page 9-15) or the *Laser BS Meas* screen to define a point specified through a backsight (see “For the Laser with an Encoder” on page 9-17).

## Offset Line

The **Line** screen (Figure 9-13) is used to enter the parameters defining a point that are not available physically, relative to some reference line.

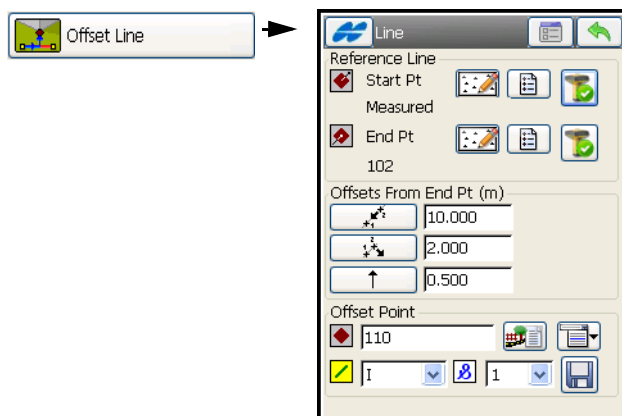













Figure 9-13. Line Screen

- **Reference Line** – a line specified by two known or measured points: select either from the map, from the list, or measure directly.
-  – tapping this measure button starts measuring the current location point.
- **Offset point** – sets the parameters of the offset point:
  - the name of a point (changed after the current offset point is stored).
  - the code of a point with a symbol that shows the code entity type (  Point,  Line, or  Area) – enter a code from the drop-down list. Code needs to be defined at the time it is entered if it is not a code that exists in the codes dialog. The lower field, marked by the  sign, is displayed only for a Code Type of Line or Area and intended for entering a string.
  - the attributes of the code (can be entered through the *Attributes List* icon, see “On the Point Attributes screen (Figure 6-7), you can set a code, control code, string

(displayed only for a Code Type of Line or Area) and attributes' values for the point." on page 6-11 for details).

-  – the *Attributes List* icon, opens the **Point-Attribute** screen to set the code and attributes available for the code chosen, layer and photo notes (Figure 6-7 on page 6-9).
- The  icon next to the *Attributes List* icon displays the pop-up menu of the following items:
  - *Add to End/Start*: for Line and Area codes.
  - *Insert*: for Line and Area codes. This allows the user to insert a point to a line out of sequence.
  - *Layer*: opens the **Select Layer** screen to select the layer in which to locate the point (see “The Topo Menu” on page 9-3).
  - *Note*: opens the **Note** screen (see “Topo Survey” on page 9-2).
- *Offsets From End Pt (m)* – the offset values include (Figure 9-13 on page 9-12):
  -  : the distance from Point 2 to the projection of the target point along the Line of Sight.
  -  : the distance from the target point to the line of sight, either to the Right or to the Left of the line.
  -  : the height difference from the target point, either Up or Down.
-  – calculates the coordinates of the offset point and saves the point to the database.
- The Help Icon on the upper-left corner displays the pop-up menu containing an option:
  - *Antenna Setup*: opens the **Antenna Setup** screen to set the antenna for the current survey.

## Azimuth & Offsets

The *Azimuth-Distance-Height* screen (Figure 9-14) defines an offset point using the current point as a reference.

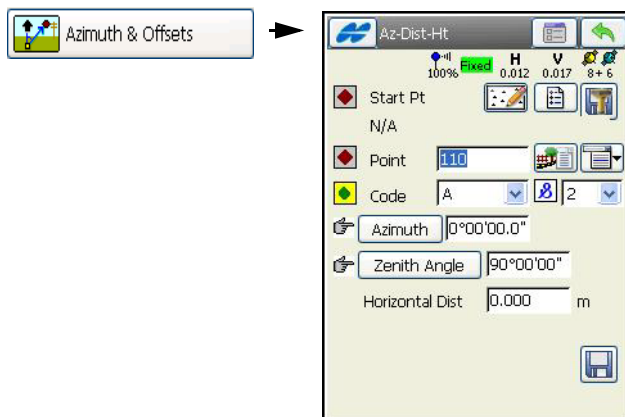






Figure 9-14. Azimuth-Distance-Height

- *Start Pt* – the starting point of the offset measurement. Can be selected either from the map or from the list of points, or measured as the current position by tapping the measure  button.
- *Point* – the name of the new point.
- *Code* with a symbol that show the code entity type (Point, Line or Area) – enter a code from the drop-down list. Code needs to be defined at the time it is entered if it is not a code that exists in the codes dialog.

The lower field, marked by the  sign, is displayed only for a Code Type of Line or Area and intended for entering a string.

-  – the *Attributes List* icon, opens the *Point-Attribute* screen to set the code and attributes available for the code chosen, layer and photo notes (Figure 6-7 on page 6-9).
- The  icon next to the *Attributes List* icon displays the pop-up menu of the following items:
  - *Add to End/Start*: for Line and Area codes.

- *Insert*: for Line and Area codes. This allows the user to insert a point to a line out of sequence.
- *Layer*: opens the **Select Layer** screen (see “The Topo Menu” on page 9-3).
- *Note*: opens the **Note** screen to enter any additional information on the point. For details, see “The Topo Menu” on page 9-3.
- **Azimuth/Az to Pt** – sets the azimuth to the target point by value or by point.
- *Zenith Angle/Elev Ang/Vert Dist* – sets the zenith angle (zenith distance) to the target point or vertical distance.
- *Horizontal Dist* – sets the horizontal distance between the current and the target point.
- **Store** – calculates and stores the point. The next screen shows the parameters of the current point, the PDOP value, the Sigma values, and the epochs logged counter.
- The Help Icon on the upper-left corner displays the pop-up menu containing an option:
  - *Antenna Setup*: opens the **Antenna Setup** screen to set the antenna for the current survey.

## Laser Configuration

Laser configuration depends on whether the laser selected in the job configuration has an Encoder or not.

**For the Laser without an Encoder** the *Config Laser* screen (Figure 9-15 on page 9-16) defines an occupation point and backsight azimuth or point, and defines the laser height and point information.

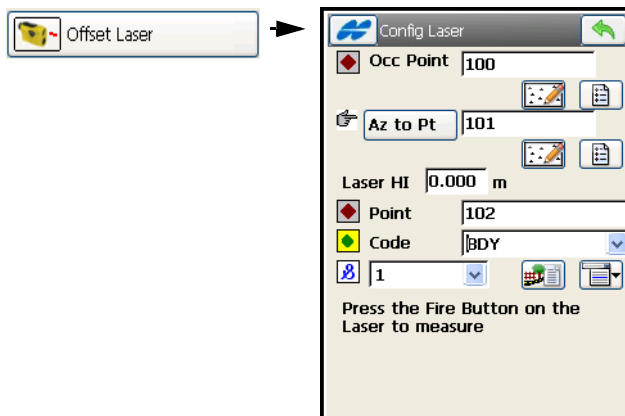






Figure 9-15. Config Laser

- *Occ Point* – enter an occupation or select an occupation using the map or list buttons.
- (*Az to Pt*) **BS Azimuth / BS Point** – enter either a BS azimuth value or select a BS point using the map or list buttons.
- *Laser HI* – enter the height of the device above the occupation point.
- *Point* – enter the name of the point being measured.
- *Code* with a symbol that show the code entity type (Point, Line or Area) – enter a code from the drop-down list. Code needs to be defined at the time it is entered if it is not a code that exists in the codes dialog. The lower field, marked by the  sign, is displayed only for a Code Type of Line or Area and intended for entering a string.
-  – the *Attributes List* icon, opens the *Point-Attribute* screen to set the code and attributes available for the code chosen, layer and photo notes (Figure 6-7 on page 6-9).
- The  icon next to the *Attributes List* icon displays the pop-up menu of the following items:

- *Add to End/Start*: for Line and Area codes.
- *Insert*: for Line and Area codes. This allows the user to insert a point to a line out of sequence.
- *Layer*: opens the **Select Layer** screen to select the layer in which to locate the point. See “The Topo Menu” on page 9-3.
- *Note*: opens the **Note** screen. For details, see “Topo Survey” on page 9-2.

**For the Laser with an Encoder** the **Laser BS Meas** screen (Figure 9-16 on page 9-17) first defines an occupation point and backsight azimuth or point to perform backsight measurements.

- *Occ Point* – enter an occupation or select an occupation using the map or list buttons.
- **BS Azimuth / BS Point** – enter either a BS azimuth value or select a BS point using the map or list buttons.
- The ok  button – after pressing the Fire button on the Laser (or on the screen for GMS-2 Pro) and performing backsight measurements, opens the **Config Laser** screen to perform measurements for the offset point.

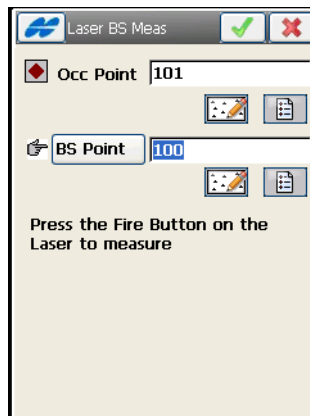


Figure 9-16. Laser BS Meas



For GMS-2 Pro the **Fire** button is present on the dialog screen.

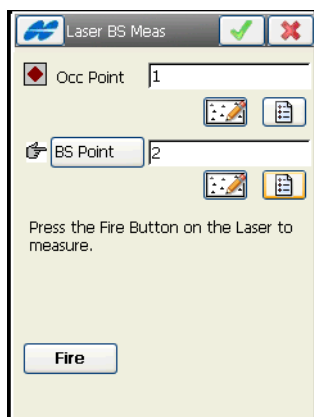


Figure 9-17. Laser BS Meas for GMS-2 Pro

The *Config Laser* screen (Figure 9-18) defines the laser height and information for the point to be measured.

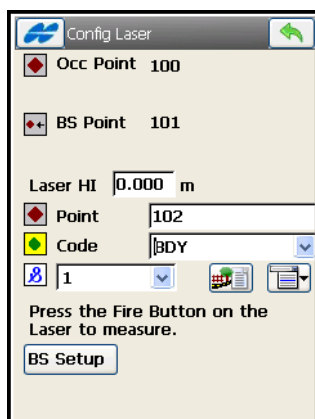



Figure 9-18. Config Laser

- *Occ Point* – shows the occupation point.
- *BS Azimuth / BS Point* – shows the BS azimuth value or the BS point.



- *Laser HI* – enter the height of the device above the occupation point.
- *Point* – enter the name of the point being measured.
- *Code* with a symbol that show the code entity type (Point, Line or Area) – enter a code from the drop-down list. Code needs to be defined at the time it is entered if it is not a code that exists in the codes dialog.

The lower field, marked by the  sign, is displayed only for a Code Type of Line or Area and intended for entering a string.

- **BS Setup** – returns to the *Laser BS Meas* screen to set up a new BS.
- For GMS-2 Pro the **Fire** button is present on the dialog screen.

## Grid Setup

Tap the *Help Icon* in the upper-left corner of the *Topo* screen. Select the *Grid Setup* option from the pop-up menu. The *Grid Setup* screen (Figure 9-19) displays. The *Grid Setup* screen sets up a grid for the Map to help while collecting data.

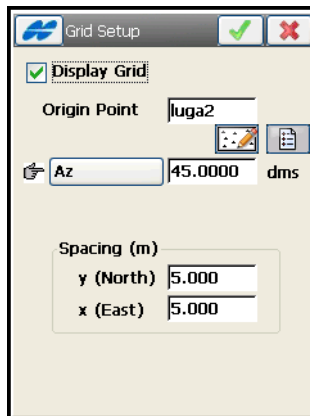



Figure 9-19. Grid Setup

- *Display Grid* – check mark this box to display a grid on the Map tab.

- *Origin Point* – specifies the origin point for the grid.
- *Azimuth(Bearing)/Azimuth(Bearing) To Point* – sets the corresponding value to the direction of the grid lines.
- *Spacing (m)* – specifies the intervals between the grid lines along the y(North) and x(East) axes.
- The ok  button – displays the grid on the *Map* tab (Figure 9-20) with the specified settings.

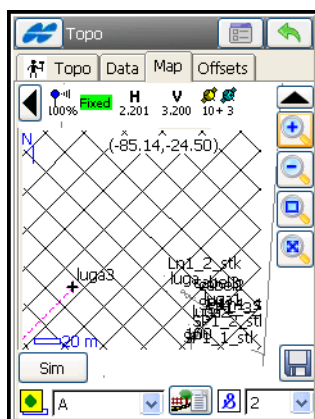


Figure 9-20. Grid in Map

If a grid is set up, the *Topo* screen (Figure 9-21) displays an offset of the current position from the grid origin point.

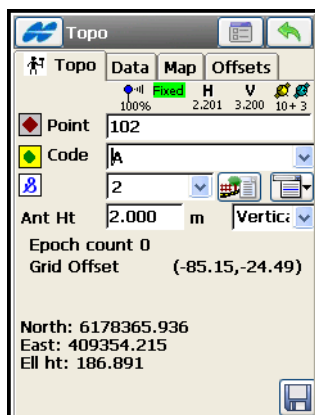


Figure 9-21. Grid Offset

# Auto Topo Survey

To set up a survey with automatic topo points, tap the **Auto Topo** icon. The **Auto Topo** screen (Figure 9-22) initiates a kinematic survey.

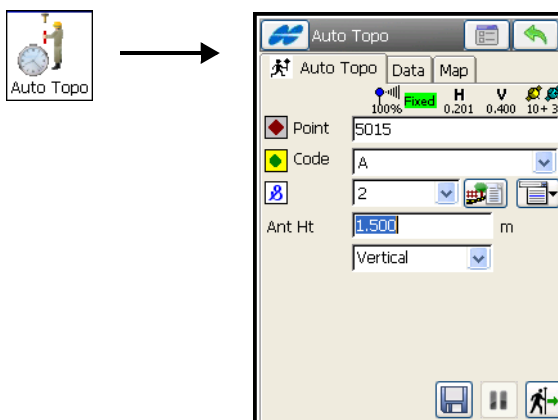


Figure 9-22. Auto Topo

The Help Icon in the upper-left corner of the screen displays the following pop-up menu items:

- *Status* – opens the **Status** screen. See “GPS+ Survey Status” on page 8-15.
- *Topo* – opens the Topo screen. See “Topo Survey” on page 9-2.
- *Rover Antenna Setup* – opens the **Antenna Setup** screen to set the antenna for the current survey.
- *Config Radio* – opens the **Configure Radio** screen. See “Configure Radio” on page 8-30.
- *Config OmniSTAR* – opens the **OmniSTAR** screen to start the OmniSTAR service. See “Configure OmniSTAR” on page 8-26.
- *Reset RTK* – resets the ambiguities and sets the receiver in the Rover RTK mode.
- *Reset DGPS* – sets the receiver in the Rover DGPS mode.
- *mm GPS+ Options* – opens the **mmGPS+ Options** screen in RTK survey. See “mmGPS+ Options” on page 8-36.

- *Note* – opens the **Notes** screen (“Note” on page 9-5).
- *Edit Points* – opens the Points screen. See “Points” on page 6-3.



To display points in the list of points, ensure that the Show Auto Topo Point option is selected in the Help Icon menu in the upper-left corner of the Points screen.


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- *PTL Mode* – switches on the PTL (Point-To-Line) Mode. (The screen changes its appearance to **Topo (PTL)**). For details see “PTL Point” on page 6-14.

## Auto Topo

The *Auto Topo* tab contains the initial data for the survey and displays the progress of the survey (Figure 9-22). The upper-right corner of the screen displays the status of information on the **Status** screen. For details see “GPS+ Survey Status” on page 8-15.

- *Point* – displays the current point name.
- *Code* with a symbol that show the code entity type (Point, Line or Area) – enter a code from the drop-down list. Code needs to be defined at the time it is entered if it is not a code that exists in the codes dialog.







The lower field, marked by the  sign, is displayed only for a Code Type of Line or Area and intended for entering a string.

-  – the *Attributes List* icon, opens the **Point-Attribute** screen to set the code and attributes available for the code chosen, layer and photo notes (Figure 6-7 on page 6-9).
- The  icon next to the *Attributes List* icon displays the pop-up menu of the following items:
  - *Add to End/Start*: for Line and Area codes.
  - *Insert*: for Line and Area codes. This allows the user to insert a point to a line out of sequence.

- *Layer*: opens the **Select Layer** screen to select the layer in which to locate the point.  
See “The Topo Menu” on page 9-3).
- *Note*: opens the **Note** screen. See “Note” on page 9-5.
- *Ant Ht* – sets the antenna height and its type (slant or vertical).



When using mmGPS+, the height of the rover antenna includes the height of the PZS-1 sensor with a 5/8 inch plug.

-  – immediately stores the current position of the receiver antenna.
- The measure  button – starts the survey process. After pressing, the button changes to stop  button; the pause  button activates.
- The measure  button – interrupts the survey. After pressing, the button changes to the resume  button. Press again to continue surveying.

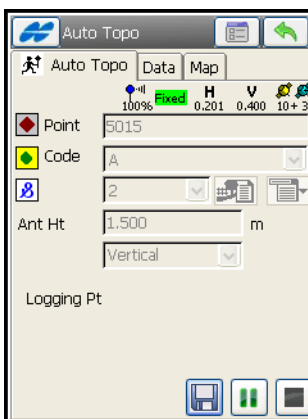




Figure 9-23. Auto Topo – Start

A mmGPS icon  displays on the status bar of the *Auto Topo* screen to calculate mmGPS heights for the receiver.

-  – opens the *Survey Parameters* screen. See “Survey Parameters” on page 3-46.

## Data

The *Data* tab (Figure 9-24) shows the properties of the last stored point: the Point name and its coordinates.

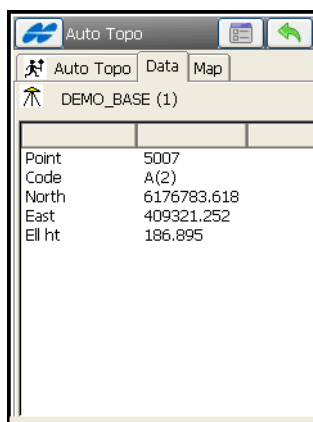



Figure 9-24. Auto Topo – Data

## Map

The *Map* tab (Figure 9-25 on page 9-25) shows the stored points graphically. All survey processes can be done through this page, and the *Auto Topo* tab, as all the controls are duplicated.

For a description of the Map view, see “Viewing Map” on page 15-1.

# X-Section

To perform X-Section function, tap the **X-Section** icon .

The X-Section function is similar to that of the Total Station mode, except for the measurement screens, which are the corresponding GPS+ measurement screens. For details, see “Edit Cross Section Set” on page 7-30 and “Topo Survey” on page 9-2.

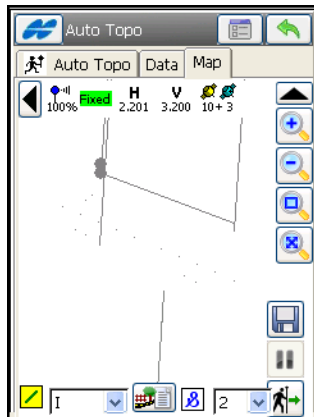



Figure 9-25. Auto Topo – Map

# Find Station

To perform Find Station function, tap the **Find Station** icon .

The Find Station function is similar to that of the Total Station mode, except for the measurement screens, which are the corresponding GPS+ measurement screens. For details, see “Find Station” on page 11-29 and “Topo Survey” on page 9-2.

## Tape Dimension

To perform Tape Dimension function, tap the **Tape Dimension** icon



The Tape Dimension function is similar to that of the Total Station mode, except for the measurement screens, which are the corresponding GPS+ measurement screens. For details, see “Tape Dimension” on page 11-31 and “Topo Survey” on page 9-2.



# Setting up TS Survey

To set up a TS survey, tap the **Setup** icon in the main menu when in TS mode. The **Setup** menu (Figure 10-1) includes options to:

1. Start a backsight survey (Backsight).
2. Calculate a resection task (Resection).
3. Calculate a point's elevation from remote benchmarks (Remote BM).
4. Remote Control (for Robotic mode).

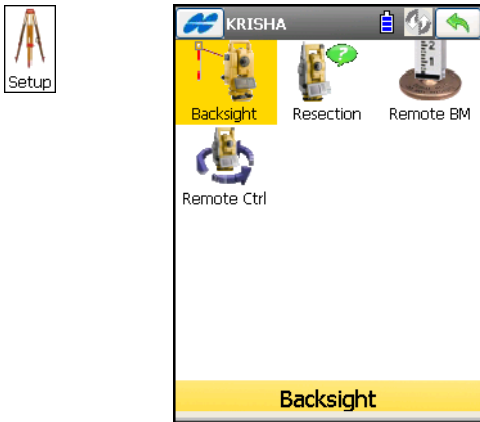



Figure 10-1. Setup GPS Menu

The Help Icon  opens a pop-up menu giving access to the help files, module activation codes, port data logging, changing menu interface, and information about the TopSURV used (for details see “Help Icon’s Pop-up Menu” on page 1-9).

# Backsight Survey

To set up a Total Station survey with localization, tap the **Backsight** icon. The **BS Survey** screen (Figure 10-2) displays.

## Setup

On the **BS Survey** screen (Figure 10-2), the *Setup* tab contains the following *Backsight* parameters.

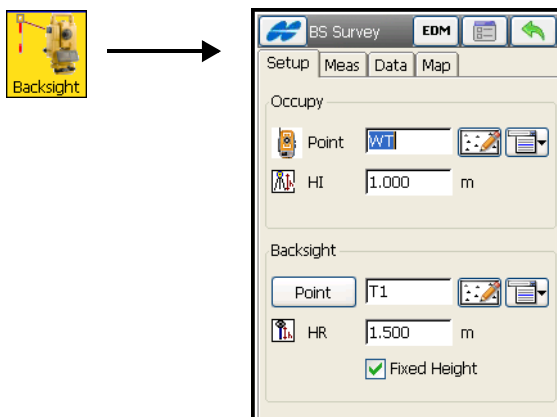










Figure 10-2. Backsight Setup

1. *Occupy* – involves properties of the point where the total station is located.
  -  *Point* – the name of the occupied point. The point can be defined using the map or a pop-up menu options:
    - tap the map  icon to open the map for choosing the occupation point.
    - tap the menu  icon to open the pop-up menu containing five items:
      - *From List*: opens a list to choose the occupation point.
      - *Station Offset*: opens the **Station and Offset** screen to add an arbitrary occupation point near a road.

- *Properties*: opens the **Add/Edit Point** screen that displays the properties of the current point, or you can create a new point if no point is selected yet.
- *Resection*: opens the **Resection** screen to determine the occupation point coordinates by solving the resection task, using the known point's coordinates (for details, see “Resection” on page 10-14.)
- *Elevation*: opens the **Remote BM** screen (for details, see “Remote Benchmarks” on page 10-22).
-  (*HI*) – sets the height of the instrument above or below the mark (the HR value can be negative, so points above the prism, such as those on a bridge, can be measured from below).
- 2. *Backsight* – involves properties of a reference point used for backsight
- *Point*– the name of the backsight point. The point can be defined using the map or a pop-up menu options:
  - tap the map  icon to open the map for choosing the occupation point.
  - tap the menu  icon to display the pop-up menu containing four items:
    - *From List*: opens a list to select the point.
    - *Station Offset*: opens the **Station and Offset** screen to add an arbitrary occupation point near a road (see “Station and Offset” on page 10-11).
    - *Properties*: opens the **Add/Edit Point** screen that displays the properties of the current point, or creates a new point if no point is chosen yet (see “Points” on page 6-3).
    - *Multiple BS*: opens the **Multi-Point BS** screen, to involve several Backsight points for performing a survey (see “Multi-Point Backsight” on page 10-8).
-  (*HR*) – sets the height of the target above the mark.

- *Fixed Height* – if enabled, sets the height of the backsight point fixed for the whole set of measurements. This is useful when one target is mounted at the BS for the duration of an occupation and another is used for the sideshots measured in mode *Ang/Dist Sets-Dir/Rev*.
-  – opens the **Mode** screen (see “Set Measurement Mode” on page 10-12).
- **EDM** – opens a menu to select the distance measurement mode. It depends on the instrument type in use, and can be *Coarse* or *Fine*, and *Prism* or *Non-Prism*, or as for robots:

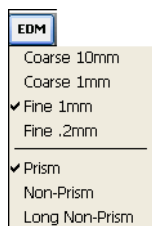

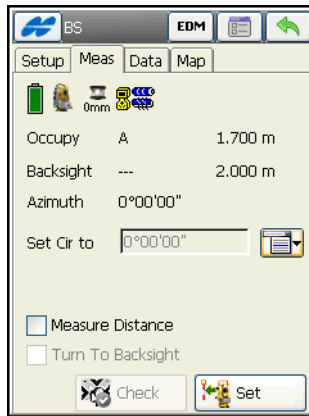


Figure 10-3. EDM for Robotic





- The Help Icon  in the upper-left corner displays the pop-up menu that always contains the *Help* item to access the Help files. This menu also contains a few options that varies, depending on survey mode used:
  - *Edit Points*: opens the **Points** screen (“Points” on page 6-3).
  - *Edit Raw*: opens the **Raw Data** screen (see “Raw Data” on page 6-41).
  - *Remote Control* (for Robotic mode only): opens the **Remote Control** screen, which controls the total station through the radio (see Figure 10-27 on page 10-25).
  - *Config Link* (only for the Robotic mode): opens the **Configure Link** screen (“Configure Link” on page 13-11).
  - *Inverse*: opens the **Inverse** COGO screen (see “Inverse” on page 14-2).
  - *Intersection*: opens the **Intersection** COGO screen (see “Compute the Intersection Point” on page 14-12).



# Measurement

The *Measurement* tab sets backsight parameters in the instrument.



**Figure 10-4. Backsight Measurement**

- *Occupancy* – the occupied point name and the height of the instrument.
- *Backsight* – the backsight point name and the height of the target.
- **Azimuth** – shows the direction to the backsight point location.
- *Set Cir to* – displays the horizontal circle reading when pointing to the backsight point.
- The menu  icon next to the *Set Cir to* field displays the pop-up menu that sets the circle reading value to zero, azimuth, input value, obtains the value from the instrument, or changes the value by +/- 90 or 180 degrees.
- *Turn To Backsight* (available only for Robotic mode) – select to turn the total station to the Backsight Point.
- *Measure Distance* – set if the distance to backsight point should be measured.
-  /  – shows the status of connection with the total station for measurement, whether it has been started or not yet.
-  – shows battery and memory status for the controller.

-  – shows battery status for the total station in Robotic mode.
-  – displays the current prism offset in use (survey parameters *Foresight P. C.*, and *Backsight P. C.* set for measurement mode *Ang/Dist Sets-Dir/Rev.*)
- **Check** – opens the *Data* tab of the **BS Survey** screen to check the backsight settings (see “Check Backsight” on page 10-10).
- **Set** – sets the horizontal circle as defined in the *Set Cir to* field, and opens the *Data* tab.

## Data

The *Data* tab on the **BS Survey** screen (Figure 10-5) displays the available values of the backsight point parameters: *HR* (Height of Rod/target), *HA* (Horizontal Angle), *VA* (Vertical Angle), and *SD* (Slope Distance).

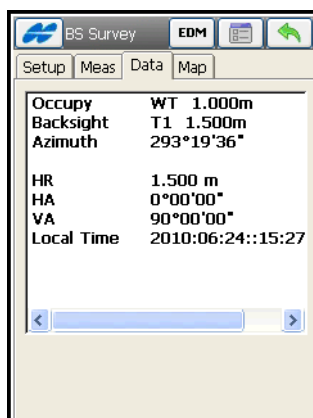


Figure 10-5. Backsight – Data

## Map

The *Map* tab allows backsight survey in a graphic mode (Figure 10-6 on page 10-7). Press and hold the stylus on the map area to display the *Map Properties* menu. For details on map properties and customizing, see “Viewing Map” on page 15-1.

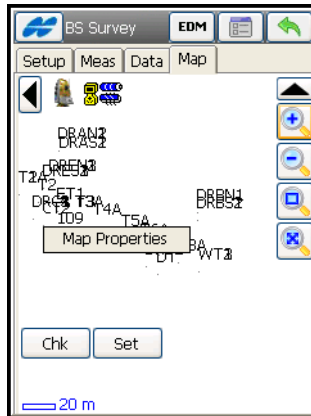


Figure 10-6. Backsight – Map

## Video

If the IS Robot (Live Video) instrument is used for surveying, an additional *Video* tab appears on the setup dialogs (see Figure 10-7).



Figure 10-7. Live Video for Backsight





WiFi and Ad-hoc network connection can be established between IS Robot and FC-2200, FC-2500, FC-200, FC-25 or GRS-1.

For details on using the video, see “Video” on page 11-11.

## Multi-Point Backsight

To access the *Multi-Pnt BS* screen (Figure 10-8), press the menu icon next to the *Map* icon in the *BS Point* field and select the *Multiple BS* item. Multiple backsight points can generate more precise measurements.

On the *Meas* tab, edit the following parameters:

- *Point* – the known point name. Can be selected from the map  or from the list .
- *Code* – the known point code.



- *HR* – the height of the rod (target).

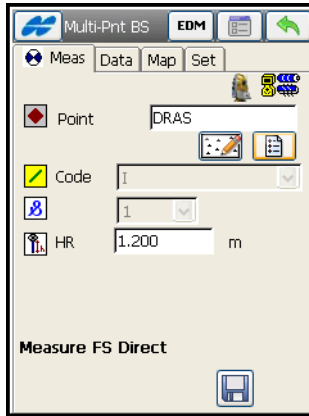



Figure 10-8. Multi-Point BS

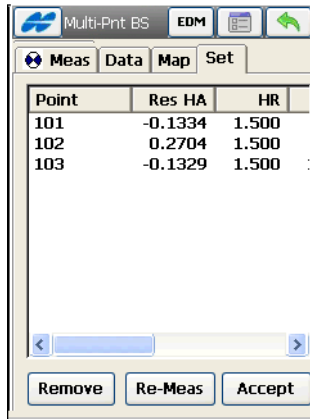
- **Measure FS Direct** – press the  button to take the sideshot of the point.
- The Help Icon on the upper-left corner of the **Multi-Pnt BS** screen displays a pop-up menu of options:
  - *Edit Points*: opens the **Points** list (see “Points” on page 6-3).
  - *Inverse*: opens the **Inverse** COGO screen (see “Inverse” on page 14-2).
  - *Notes*: opens the **Notes** screen.
  - *PTL Mode*: opens the **PTL Mode** screen (see “PTL Point” on page 6-14).
  - *Display Coord*: if selected, the coordinates of the previous point measured displays below HR data.

The **Data** tab (Figure 10-9) on the **Multi-Pnt BS** screen shows the results of the current measurement, the scale factor, and standard deviations of the coordinates.

The **Map** tab shows all points in graphic mode. For details on map properties and customizing, see “Viewing Map” on page 15-1.

The **Set** tab on the **Multi-Pnt BS** screen (Figure 10-9) displays measurement results of the sideshots being done during one set: the

*Res HA* (residuals of the horizontal angles) and the measured and initial parameters (*HR*, *HA*, and so forth)



Point	Res HA	HR
101	-0.1334	1.500
102	0.2704	1.500
103	-0.1329	1.500

Figure 10-9. Multi Point BS – Meas Set Tab

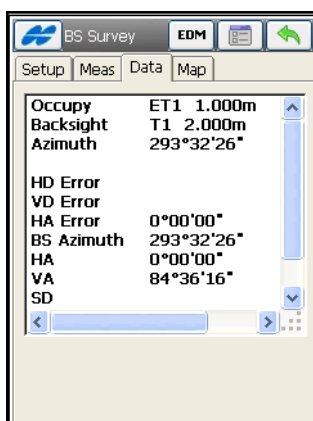
- **Remove** – deletes the highlighted measurement from the set.
- **Re-Meas** – replaces the current measurement with a new measurement.
- **Accept** – stores the new coordinates in the database.

## Check Backsight

The *Data* tab of the **BS Survey** screen (Figure 10-10) shows information about the backsight point errors.



HD and VD does not display if only an azimuth (direction) has been entered for the backsight.




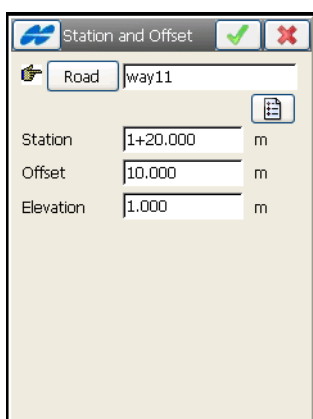
Item	Value
Occupancy	ET1 1.000m
Backsight	T1 2.000m
Azimuth	293°32'26"
HD Error	
VD Error	
HA Error	0°00'00"
BS Azimuth	293°32'26"
HA	0°00'00"
VA	84°36'16"
SD	

Figure 10-10. Check Backsight

## Station and Offset


The *Station and Offset* screen (Figure 10-11 on page 10-11) calculates a point defined by the number of stations on the road or horizontal alignment and an offset from this station.

Select the **Road / H Alnt** from the list, opened by tapping the  button, and enter the desired *Station*, *Offset* and *Elevation*.




Field	Value	Unit
Road	way11	
Station	1+20.000	m
Offset	10.000	m
Elevation	1.000	m

Figure 10-11. Station and Offset

Press the ok  button to open the **Add Point** screen on which to add the calculated point to the list of points. The **Backsight Survey** screen opens with this occupation point.

## Set Measurement Mode

To toggle between sideshot modes, press the settings  button on any **Survey** screen. The **Mode** screen (Figure 10-12 on page 10-13) displays. Select one of three measurement methods, *Sideshot Dir*, *Sideshot-Dir/Rev*, or *Ang/Dist Sets-Dir/Rev*.

- *Sideshot-Direct* – defines the measurement to a single point, taken using the Direct position of the Total Station.
- *Sideshot-Direct/Reverse* – defines that the measurement to a single point is taken using the Direct Position and the Reverse Position of the Total Station (that is, Plunge – Flip and Rotate the Total station by 180 degrees to get the reverse measurement). This measurement method is known as *Multiple*, in which case the *Set* tab appears in the **SS-Dir/Rev** screen. One set consists of one direct and one reverse measurement. These measurements are used to eliminate the Vertical and Horizontal circle centering errors.
- *Ang/Dist Sets-Dir/Rev* – during the measurement, defines the instrument that uses the specified Angle sequence to perform repeated measurements. In this case the **SS-Dir/Rev** screen also has the *Set* tab. The sequence of four measurements constitutes one set. One measurement is the backsight in *Direct* face or the Foresight in *Reverse* face in two positions of the Total Station.

These measurements are used to eliminate the Vertical and Horizontal circle centering errors.

Figure 10-12. Mode - Measurement Method

- **Next** – opens the next *Mode* screen to set the order and the type of the measurements in one set (Figure 10-13).

Figure 10-13. Mode - Type of Measurements

For a description of other parameters on these screens, see “Survey Parameters” on page 3-70.

# Resection

The method of resection computes the coordinates of an occupation point, where the instrument is set up, using measurements to two (or more) points with known coordinates.

To access the **Resection** option, tap the **Resection** icon. The **Resection** screen displays to set the occupation point (Figure 10-14).

To perform resection for the occupation point selected in the **BS Survey** screen, press the menu icon next to the **Map** icon in the **Occ. Point** field of this screen and select the **Resection** item (Figure 10-2 on page 10-2).

The **Resection** screen sets the name of the point, the heights of the instrument and the target (Figure 10-14).

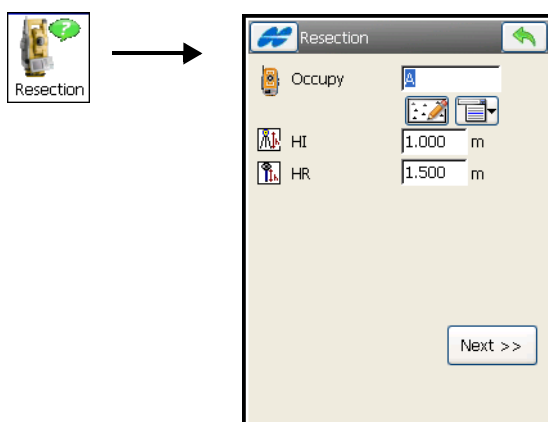


Figure 10-14. Occupation Point

- **Next** – opens the **Resection 3D** screen to take measurements to known points.

## Resection 3D

The **Resection 3D** screen calculates a three dimensional resection of the occupied point (Figure 10-15).

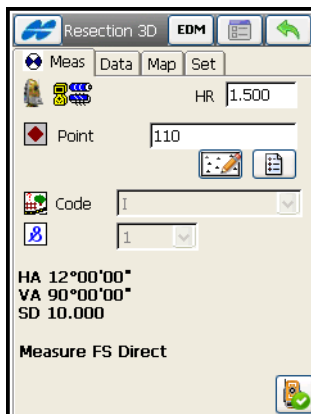



Figure 10-15. Resection 3D

The *Measurement* tab takes the measurements to known points.

- *Point* – the known point name; select from either the map or from the list.
- *Code* – the known point code.
- *HR* – the height of the rod (target). Saves settings from the **Resection** screen.
- The measurement  button – takes the sideshot to the point and displays the measurements of the point.
- The Help Icon in the upper-left corner displays the pop-up menu of the following options:
  - *Edit Points*: opens the **Points** list (see “Points” on page 6-3).
  - *Inverse*: opens the **Inverse** COGO screen (see “Inverse” on page 14-2).
  - *Notes*: opens the **Note** screen for to add notes to the measurement session (if preferred).

- *PTL Mode*: switches on the PTL (Point-To-Line) Mode. (The screen changes to **Points (PTL)**.) For details, see “PTL Mode” on page 11-8.
- *Remote Settings* (for Robotic mode only): opens the **Search/Track Parameters** screen (see “Staked Point Icon” on page 3-53).
- *Config Link* (only for the Robotic mode): opens the **Configure Link** screen (see “Configure Link” on page 13-11).
- *Options*: opens the **Resection Options** screen (see “Resection Options” on page 10-21) to use either a two or three dimensional resection.

## Resection 3D from GPS Points

In Robotic mode, the user can use GPS positions instead of pre-defined control points for calculating the resection task. This is only available if the user has defined a project using grid to ground or localization.

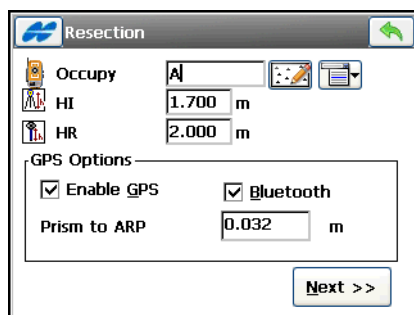


Figure 10-16. Enable GPS

- *GPS Options* – exist only in Robotic mode.
  - *Enable GPS*: check mark this box to use GPS positions for resection.
  - *Bluetooth*: check mark this box to use Bluetooth connection.
  - *Prism to ARP*: set the offset from the prism to GPS Antenna Reference Point (ARP).



If GPS is enabled for calculation of resection, the Meas GPS box will appear on the screen (see Figure 10-17 on page 10-17).

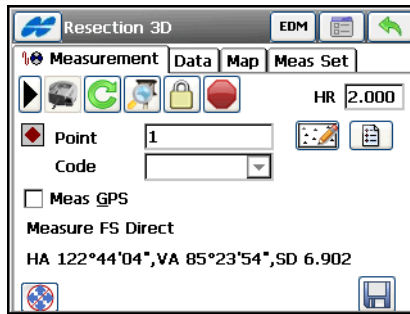


Figure 10-17. GPS Enabled

- *Point* – the name of the point to be GPS measured.
- *Meas GPS* – check mark the box to perform GPS measurements of the points with GPS antenna attached to the prism rod.

After selecting the *Meas GPS* option, the status bar will show information about GPS solution.

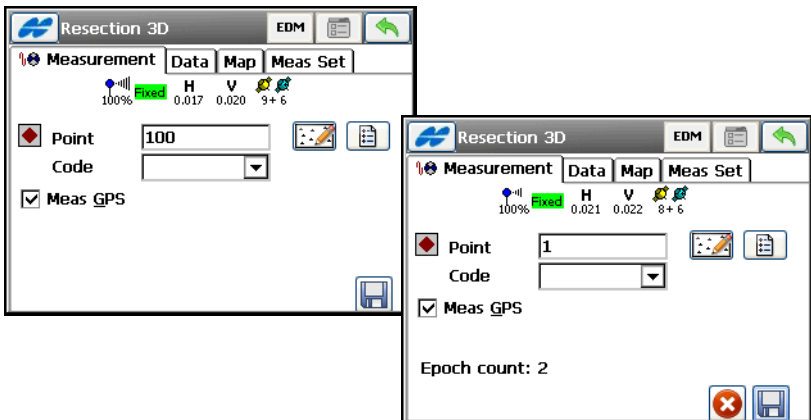


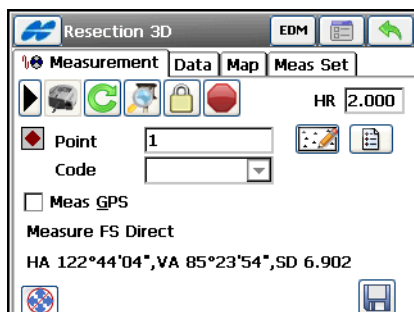


Figure 10-18. Measure GPS

-  – tapping this button saves the current location (Figure 10-18).
-  – the cancel button that appears along with the counter of the epochs collected.




After the point is logged, clear the *Measure GPS* box and take TS measurements as usual with a robotic total station for other point (Figure 10-19).






**Figure 10-19. Resection 3D in Robotic Mode**

The screen provides a set of tools for control. The arrow button toggles between the total station status icons and search icons.

For a Robotic survey, there are two additional icons beside the usual ones (see “Backsight Survey” on page 10-2) on the status bar:



-  – displays the current prism offset in use.
-  /  – switches on/off the arrow keys on the keypad to adjust the rotation up, down, left, or right.

The search icons are as follows:

-  – will trigger the RC-2/RC-3<sup>1</sup> to perform the “Quicklock” or “Turn Around” command.
-  – causes the instrument to perform a standard search for the prism.
-  – will lock onto the prism that is in the field of view or “track” it without searching.

---

1. RC-2/RC-3 is the Remote Control System 2 or 3 for optical communications. For instructions of how to operate the RC-2/RC-3 device, consult the instruction manual for RC-2/RC-3.

-  – opens the **Rotate** dialog (Figure 10-28 on page 10-27), which allows the Total station to turn to various angles or points.
-  – interrupts the total station and stop it from searching the prism and turning; the instrument will go into “Standby” mode.

The **Data** tab shows the current measurement data.

The **Map** tab shows all points in a graphic mode and allows selection of a point for measurement, and performing measurements.

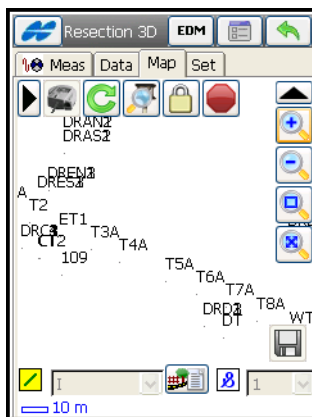


Figure 10-20. Resection 3D - Map Tab

For details on map properties and customizing, see “Viewing Map” on page 15-1.

The **Set** tab displays the result of the sideshots being done (Figure 10-21 on page 10-20).

- **Sd N, Sd E, Sd H** – displays Standard deviations for North, East and Height, respectively.
- **Ground to Grid scale** – displays the calculated scale factor.
- **Accept** – opens the **Store Point** screen (Figure 10-22 on page 10-20) to save the new point.
- **Re-Meas** – replaces the current measurement with a new measurement.
- **Remove** – deletes the selected measurement.

- **Use Ctrl** – toggles through specific measurements in the resection, for example the horizontal angle, but not the vertical, or vice versa. The used measurements are listed in the Use column. For example, *HVSD* indicates that the *H*orizontal angle, *V*ertical angle and the *S*lope *D*istance were used.

Point	Res HA	Res VA
1	0.0001	0.0000
2	-0.0000	-0.0000
3	-0.0000	0.0000

Sd N 0.0007  
Sd E 0.0009  
Sd H 0.0044  
Ground to Grid scale 0.9999985

Buttons: Accept, Re-Meas, Remove, Use Ctrl

Figure 10-21. Resection – Meas Set Tab

## Store Point

The *Store Point* screen (Figure 10-22) saves the resection point.

Point Info Layer/Style Photo

Point 5 occpt  
Code

Note

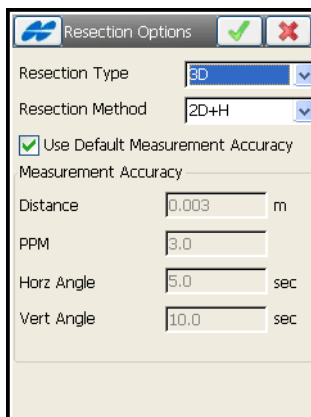
Local(m)  
North 1000.000  
East 999.999  
Elev 101.003

Figure 10-22. Store Point

This is a standard screen adding a new point. For details on this screen see “Editing a Point” on page 6-7.

## Resection Options

The *Resection Options* screen sets the resection type.



**Figure 10-23. Resection Options**

- *Resection Type* – selects the type of resection: using only horizontal coordinates (2D) or also heights (3D).



The 2D/3D option is retained between sessions. When doing a resection the next time, the resection will start up with the previous used setting.

- *Resection Method* – selects the method of calculation of 3D resection using horizontal coordinates and heights: either separately or jointly (2D+H or 3D Combined, respectively).
- *Use Default Measurement Accuracy* – uncheck this box to set your own values of accuracy for distance and angle measurements.

## Remote Benchmarks

The method of Remote Benchmarks computes the elevation of an occupation point, where the instrument is set up, using measurements to two (or more) points with known elevations.

To access the **Remote BM** option, tap the **Remote BM** icon (Figure 10-2). The **Elevation** screen displays first to set the occupation point for which the elevation will be calculated (Figure 10-14 on page 10-14).

To perform Remote BM for the occupation point selected in the *BS Survey* screen, press the menu icon next to the *Map* icon in the *Occ. Point* field of this screen and select the *Elevation* option (Figure 10-2 on page 10-2).

Computation or estimation of elevation (vertical coordinate) typically uses measurements from two or more points with known coordinates.

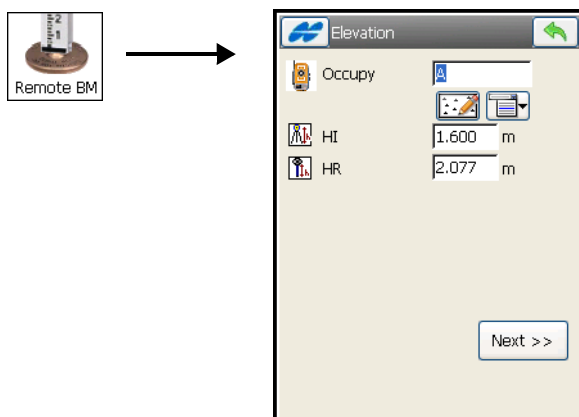


Figure 10-24. Elevation

- **Point:** the occupation point name (select either from the map or from the list).
- **HI** – the height of the instrument.
- **HR** – the height of the rod (target).
- **Next** – opens the **Known Elevation** screen to take measurements to known points.

## Known Elevation

The *Known Elevation* screen is used to take measurements to known points (Figure 10-25 on page 10-23).

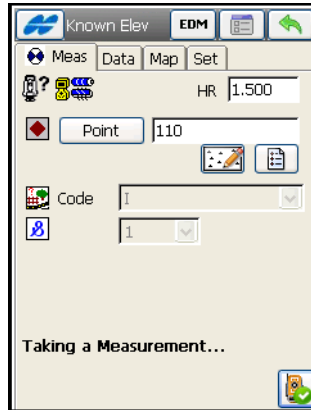



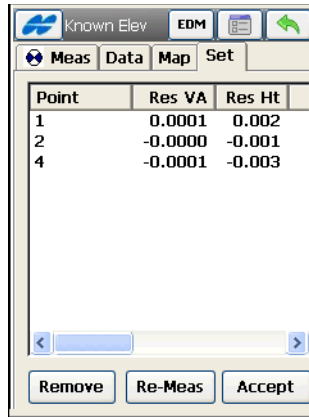
Figure 10-25. Known Elevation

- *Point / Elevation*: the known point name (select either from the map or from the list) / the known elevation.
- *Code* – the known point code.
- *HR* – the height of the rod (target).
-  – takes the sideshot to the point.
- The Help Icon on the upper-left corner displays the same pop-up menu as for the Resection task, except the *Options* item.

The *Data* tab shows the results of the current measurement and the scale factor and standard deviations of the coordinates.

The *Map* tab shows all points in a graphic mode. For details on map properties and customizing, see “Viewing Map” on page 15-1.

The *Set* tab displays the results of the sideshots being done during one set, the same as for the *Resection* task (Figure 10-26 on page 10-24).



Point	Res VA	Res Ht
1	0.0001	0.002
2	-0.0000	-0.001
4	-0.0001	-0.003

Figure 10-26. Measurement Set

The table represents the result list of the measurements being made: the residuals of the vertical and horizontal angles, the measured and initial parameters (*HR*, *HA*, *VA*, and so forth). The *Ht Diff* column represents the difference between the calculated height and the height of that measurement.

- **Remove** – deletes highlighted measurements in the elevation.
- **Re-Meas** – replaces the current measurement with a new measurement.
- **Accept** – stores the new coordinates in the database.

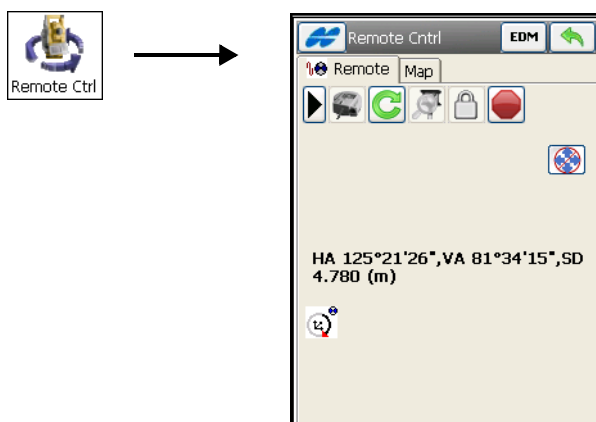
## Remote Control

To set up a survey with remote control, tap the **Remote Control** icon.

If one person performs the survey process with a motorized instrument, the remote control transmits commands from the controller to the total station. Either the radio modems need to be set and connected to the controller and the instrument or the devices can be connected via Bluetooth.









The *Remote Ctrl* screen (Figure 10-27) controls the total station through the radio.




**Figure 10-27. Remote Control of the Total Station**

The *Remote* tab shows the current values of the total station measurements and provides a set of tools for control:






-  – shows the battery status for the total station.
-  – shows the status of communication between the controller and total station.
-  – shows battery and memory status for the controller.
-  – displays the current prism offset in use.
-  /  – switches on/off the arrow keys on the keypad to adjust the rotation up, down, left, or right.

Also, there are five search icons on the bottom of the dialogs:

-  – will trigger the RC-2/RC-3<sup>1</sup> to perform the “Quicklock” or “Turn Around” command.

---

1. RC-2/RC-3 is the Remote Control System 2 or 3 for optical communications. For instructions of how to operate the RC-2/RC-3 device, consult the instruction manual for RC-2/RC-3.

-  – causes the instrument to perform a standard search for the prism.
-  – will lock onto the prism that is in the field of view or “track” it without searching.
-  – opens the **Rotate** dialog (Figure 10-28 on page 10-27), which allows the Total station to turn to various angles or points.
-  – interrupts the total station and stop it from searching the prism and turning; the instrument will go into “Standby” mode.
- The Data Indicator above the  button shows the current status of the total station. There are four status types: no data, querying status, turning, and receiving data.
- All the observations can be done in remote mode as well if the instrument chosen is robotic.
- The Help Icon in the upper-left corner of the screen displays the pop-up menu containing the following options:
  - *Edit Points*: opens the **Points** list.
  - *Inverse*: opens the **Inverse** COGO screen.
  - *Notes*: opens the **Notes** screen (see “The Topo Menu” on page 9-3).
  - *PTL Mode*: opens the **PTL Mode** screen (see “PTL Mode” on page 11-8).
  - *Remote Settings*: opens the **Search/Track** screen.
  - *Config Link*: opens the **Configure Link** screen (for details, see “Configure Link” on page 13-11).
  - *Display Coord*: if selected, the coordinates of the previous point measured displays below the HR data.

The *Map* tab shows all points in a graphic mode. For details, on map properties and customizing, see “Viewing Map” on page 15-1.

## Rotate

The **Rotate** screen (Figure 10-28) contains settings for rotation of the remote total station.

- **Rotation Angles** – sets the values of the horizontal and vertical rotation angles by adding or subtracting 90 or 180 degrees (use the menu) to / from shown values.
- **Turn** – sends the data to the total station. The corresponding icon shows the rotation process.
- **Rotate to Point** – selects a point by typing its name, selecting it from the map or a list, or inserting the HR value (height of rod or target). Press the **Turn** button.
- **Plunge TS** – press to plunge the instrument (rotate the telescope and the body by 180 degrees).

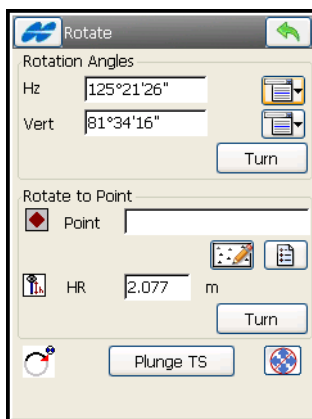


Figure 10-28. Rotate the Remote Total Station



# Total Station Survey

The Survey menu (Figure 11-1) for Total Station surveys opens by the **Survey** icon in the main menu and allows to perform the surveys:

- Topo
- Auto Topo (for Robotic mode)
- X-Section
- Find Station
- Tape Dimension
- Missing Line
- Scanning (for Robotic mode)
- Monitor (for Robotic mode)

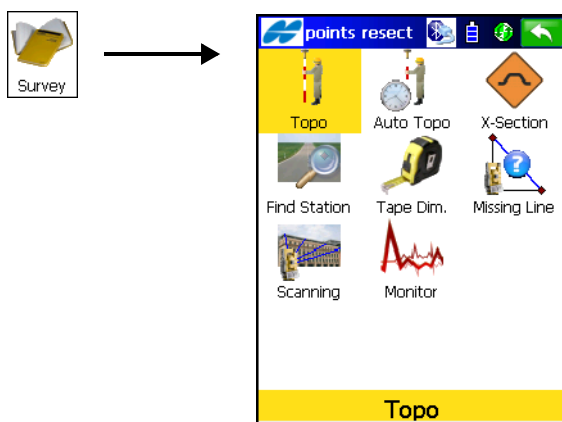



Figure 11-1. TS Survey



If needed menu options are not visible, tap **Configure/Menus** icons to enable these options in the *Config Menus* screen.

The Help Icon  opens a pop-up menu giving access to the help files, module activation codes, port data logging, changing menu interface, and information about the TopSURV used (for detail see “Help Icon’s Pop-up Menu” on page 1-9).

## Topo

The **Topo** icon activates one of three sideshot modes:

- *Sideshot-Direct* – defines that the measurement to a single point is taken using the Direct position of the Total Station (Figure 11-2 on page 11-3).
- *Sideshot-Direct/Reverse* – defines the measurement to a single point that is taken using the Direct Position and the Reverse Position of the Total Station (that is, Plunge – Flip and Rotate the Total station by 180 degrees to get the reverse measurement). This measurement method is known as *Multiple*, in which case the *Set* tab displays in the **SS-Dir/Rev** screen. One set consists of one direct and one reverse measurement. These measurements are used to eliminate the *Vertical* and *Horizontal* circle centering errors.
- *Angle/Distance Sets-Direct/Reverse* – defines that during the measurement, the instrument uses the specified Angle sequence to perform repeated measurements. In this case the **SS-Dir/Rev** screen also has the *Set* tab. The sequence of four measurements constitutes one set. One measurement is the backsight in Direct face or the Foresight in Reverse face in two positions of the Total Station. These measurements are used to eliminate the Vertical and Horizontal circle centering errors.

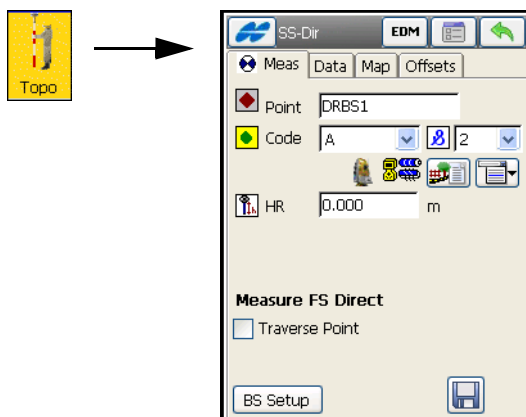



Figure 11-2. Sideshot-Direct – Measurement Tab

To toggle between sideshot modes, press the  button on any Survey screen. Select one of three measurement methods from the *Meas Method* drop-down list: *Sideshot Dir*, *Sideshot-Dir/Rev*, or *Ang/ Dist Sets-Dir/Rev*. For a description of other parameters on this screen, see “Survey Parameters” on page 3-46 for more information).

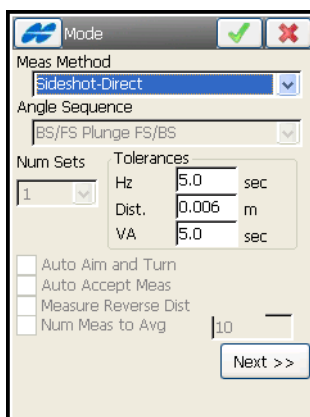


Figure 11-3. Mode

- **Next** – opens the next *Mode* screen to set the order and the type of the measurements in one set. For a description of other parameters on the *Mode* screens, see “Survey Parameters” on page 3-70 for more information).

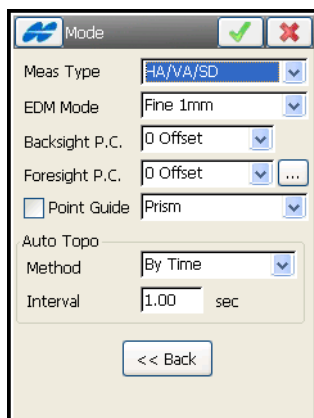








Figure 11-4. Mode - Type of Measurements

## Measurement

The *Meas* tab (see Figure 11-2 on page 11-3) contains the initial data for performing single sideshots and performs measurements.

- *Point* – sets the current point name. During the survey, the numerical part of the name increments automatically by one.
- *Code* with a symbol that show the code entity type (  Point,  Line, or  Area) – enter a code from the drop-down list. Code needs to be defined at the time it is entered if it is not a code that exists in the codes dialog.
- The lower field, marked by the  sign, is displayed only for a Code Type of Line or Area and intended for entering a string.
-  – the *Attributes List* icon, opens the ***Point-Attribute*** screen to set the code and attributes available for the code chosen, layer and photo notes (Figure 6-7 on page 6-9).
- The  icon next to the *Attributes List* icon displays the pop-up menu of the following items:
  - *Add to End/Start*: for Line and Area codes.



- *Insert*: for Line and Area codes. This allows the user to insert a point to a line out of sequence.
- *Layer*: opens the **Select Layer** screen (see “The Topo Menu” on page 9-3).
- *Note*: opens the **Note** screen to enter any additional information on the point. For details, see “The Topo Menu” on page 9-3.
- *HR* – sets the rod height of the target above the mark.
- **EDM** – opens a menu to select the distance measurement mode. It depends on the instrument type in use, and can be *Coarse* or *Fine*, *Prism* or *Non-Prism*, or as for robots:

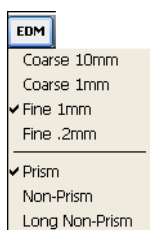








Figure 11-5. EDM for Robotic

- The status bar includes the following icons (Table 11-1):

Table 11-1. Status Icons

Icon	Description
	shows battery status for the robotic total station
	shows the status of measurements with the total station
	displays the current prism offset in use (Robotic mode)
	shows battery and memory status for the controller
	switches on/off the arrow keys on the keypad to adjust the rotation up, down, left, or right (Robotic mode)

- *Traverse Point* – tags the measured point as Traverse Point.
- **BS Setup** – opens the **BS Setup** dialog to set backsight (see Figure 10-2 on page 10-2).
- For a Robotic survey, the icon  toggles between the status bar and the tools bar (see Figure 11-6 on page 11-6).

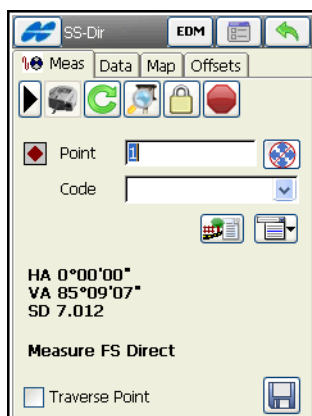


Figure 11-6. Sideshot-Direct – Robotic

Refer to Table 11-2 for descriptions of the tools icons.

Table 11-2. Search Icons

Icon	Description
	will trigger the RC-2/RC-3 <sup>a</sup> to perform the “Quicklock” or “Turn Around” command
	causes the instrument to perform a standard search for the prism
	will lock onto the prism that is in the field of view or “track” it without searching
	opens the <i>Rotate</i> dialog (Figure 10-28 on page 10-27), which allows the Total station to turn to various angles or points
	interrupts the total station and stop it from searching the prism and turning; the instrument will go into “Standby” mode


- a. RC-2/RC-3 is the Remote Control System 2 or 3 for optical communications. For instructions of how to operate the RC-2/RC-3 device, consult the instruction manual for RC-2/RC-3.

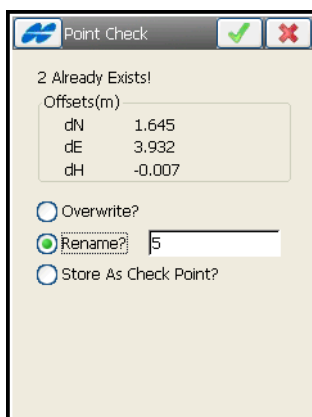
- – saves the sideshot to the point. The results and the next measurement step display in the information window.

If an observed Topo point has a name existing in the job, the **Point Check** screen displays (Figure 11-7 on page 11-7).

This screen shows coordinate offsets of the observed point from the existing one and allows the user to:

- *Overwrite* the existing point,
- *Rename* the observed point (the new name is noted in the near field), or
- *Store as a check point* of the existing point,


Select the corresponding radio button to choose the desired option and press the ok  button.



**Figure 11-7. Check Point**

- The Help Icon in the upper-left corner of the screen displays a pop-up menu containing the following options:
  - *Adv*: opens the **Backsight Survey** screen for setting the next traverse point as the next occupation point. The current occupation point becomes the next backsight point.



If more than two points have been tagged as Traverse Points, the *Advance* option displays a list box with all tagged Traverse points from which to select the next occupation point. Tap  to display the Backsight screen, which automatically updates, as is the case when one TP point is available.

- *Edit Points*: opens the **Points** list.
- *Inverse*: opens the **Inverse** COGO screen.
- *Notes*: opens the **Notes** screen.
- *PTL Mode*: opens the **PTL Mode** screen (see “PTL Mode” on page 11-8).
- *Robotic*: allows setting remote parameters and configuring link in Robotic mode.
- *BS Setup*: available in Robotic mode, opens the **BS Setup** dialog to set backsight (see Figure 10-2 on page 10-2).
- *Display Coord*: the coordinates of the previous point measured displays below the HR (Figure 11-2 on page 11-3).
- *Mirror Image*: if chosen, a reflected duplication of live video in reverse is displayed on the Video tab (Figure 11-12 on page 11-11).

## PTL Mode

On the **PTL** (Point-To-Line) **Mode** screen, the coordinates are defined through two reference points (Figure 11-8). The line traced through these points is set as one axis and is as perpendicular as another.

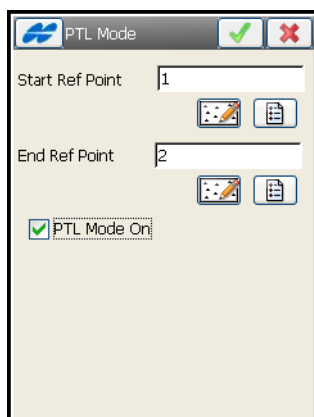



Figure 11-8. PTL Mode

- *Start Ref Point/End Ref Point* – the start and end reference points: select from either the map or from the list of points.

- *PTL Mode On* – enables the PTL mode.
-  – saves the settings and returns to the previous screen.

## Data

The *Data* tab (Figure 11-9) contains the results of the measurements, along with the initial data.

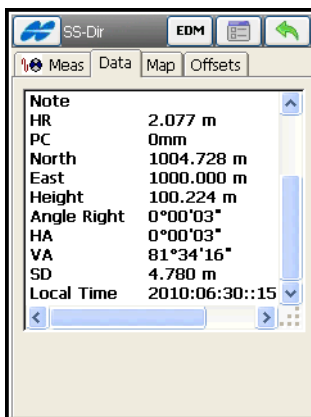


Figure 11-9. Sideshot-Direct – Data Tab

## Map

The *Map* tab (Figure 11-10) performs sideshots in the graphic mode.

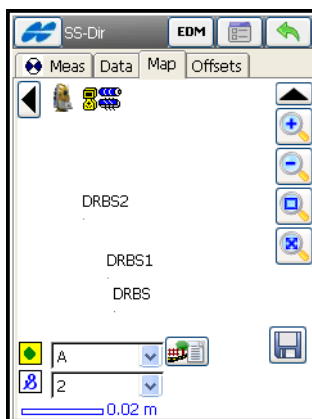


Figure 11-10. Sideshot-Direct – Map Tab

To set properties for the map view, tap and hold the stylus on the map until the Map Properties menu appears. For details on map properties and customizing, see “Viewing Map” on page 15-1.

## Set

The *Set* tab displays in the *Sideshot Sets-Dir/Rev* and *Ang/dist Sets-Dir/Rev* mode (Figure 11-11 on page 11-10).

The *Set* tab (Figure 11-11) contains the data collected during the measurements, grouped by sets: the set for Multiple mode contains two measurements; the set of the Repeat mode contains four measurements).

Point	Res HA	Res VA
4	-0°01'28"	0°00'38"
4	0°01'28"	-0°00'38"

Figure 11-11. Ang/dist Sets-Dir/Rev – Meas Set Tab

- The columns on the *Set* tab displays the following parameters:
  - *Point*: the name of the point.
  - *Res HA*: Difference of each HA measurement within the set from the average of all the HAs in the set.
  - *Res VA*: Difference of each VA measurement within the set from the average of all the VAs in the set.
  - *Res SD*: Difference of each SD measurement within the set from the average of all the SDs in the set.
  - *HR*: the height of the rod (target).

- *HA*: Horizontal Angle measurement in the corresponding set.
- *VA*: Vertical Angle measurement in the corresponding set.
- *SD*: Slope Distance measurement in the corresponding set.
- **Remove** – deletes all measurements from the set.
- **Re-Meas** – displays the sideshot page to measure a new angle set.
- **Accept** – pressing this button after angle sets are complete opens the *Store Point* dialog to save the calculated point.

## Video

If the IS Robot (Live Video) instrument with WiFi connection to the controller is used for surveying, an additional *Video* tab appears on the dialogs.









WiFi and Ad-hoc network connection can be established between IS Robot and FC-2200, FC-2500, FC-25 or GRS-1.


The *Video* tab shows the live video of the instrument view with graphic overlay that allows the user to touch the screen and have the instrument drive to that location.



**Figure 11-12. Live Video**

A set of icons located under the image provides image control:

-  and  – zoom the image inwards and outwards.
-  and  – get more or less contrast image.
-  – sets the instrument cross of reticle on the live image.
-  – opens the *Image Capture* screen to save the image in JPG format and optionally the Camera file.

Pressing the  button toggles from the search buttons of the robotic instrument (see Table 11-2 on page 11-6) to the status icons (see Table 11-1 on page 11-5).

## Offsets

The *Offsets* tab (Figure 11-13) on the *SideShot-Direct* screen contains a set of tools to define the offsets.



Figure 11-13. Offsets

- *Hz Angle* – defines a point using the horizontal angle from one point and the distance to another (see “Horizontal Angle Offset” on page 11-13).
- *Hz-Vt Angle* – defines a point using horizontal and vertical angles (see “Horizontal/Vertical Angle” on page 11-15).



- *Dist. Offset* – defines a point giving the ability to add or subtract distances, horizontally and vertically (see “Distance Offset” on page 11-16).
- *Hidden Point* – defines a point on the ground surface, with a slanted rod touching the ground point (see page 11-18).
- *2 Line ISection* – determines a point by the intersection of the two lines. Each line is defined by two points or two measurements (see “Two Line Intersection” on page 11-19).
- *Line & Corner* – determines a point on the corner using one line defined by two points and a horizontal angle measurement.
- *Line & Offset* – determines a point distant from a line defined by two points.
- *Plane & Corner* – determines a point (Corner) by a plane defined by three points and horizontal/vertical angle measurements.

## Horizontal Angle Offset

The *Measurement* tab of the *HorAng Ofst* screen (Figure 11-14) contains data for definition of a point using the horizontal angle from one point and the distance to another.

- *Point* – name for the offset point to be stored.

A comment appears on the screen to *Take measurements in any order.*

- **Side** – press the button for *HA*, *VA*, and distance measurements to the side point of a round object (i.e. tree or column).
- **Center** – press the button to take horizontal and vertical angle measurements to the center of the round object.

With these two sets of measurements, the computation is made for a point at the center of a tree/column. The computation assumes the offset point to be on the perpendicular to the line of sight at the Side point, and to have the same height as the Side point.

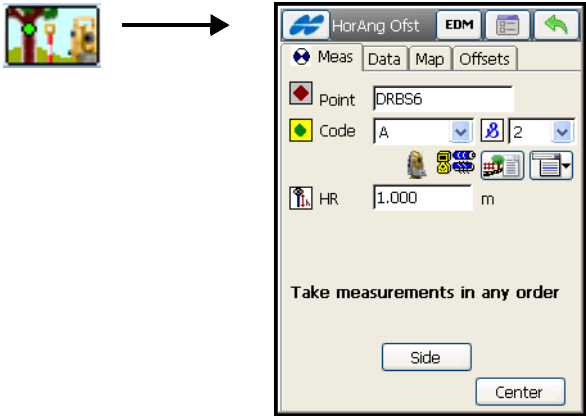


Figure 11-14. Horizontal Angle Offset – Measurement Tab



The other fields and icons on the screen are common for all topo screens. For details, see section “Measurement” on page 11-4.

The following three tabs are similar for every *Offset* option:

- The *Data* tab (Figure 11-15) on the *Horizontal Angle Offset* screen contains the data collected during the offset measurement.

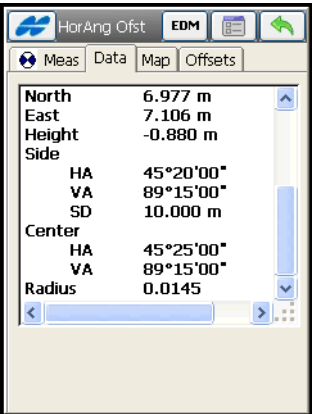


Figure 11-15. Horizontal Angle Offset – Data Tab

- The *Map* tab (see Figure 11-16 on page 11-15) on the **Horizontal Angle Offset** screen contains the graphic view and duplicated controls from the *Measurement* tab. For the details on viewing and customizing properties, see “Viewing Map” on page 15-1.
- The *Offsets* tab toggles to another offset option.



Figure 11-16. Horizontal Angle Offset – Map Tab

## Horizontal/Vertical Angle

The *Measurement* tab (Figure 11-17) on the **H/VAng** screen contains data for definition of a point using horizontal and vertical angles.

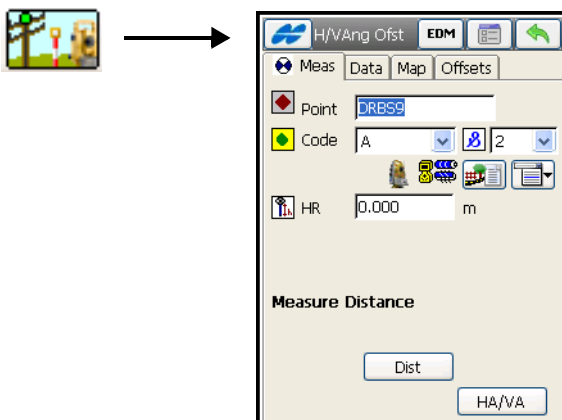


Figure 11-17. Horizontal/Vertical Angle – Measurement Tab

A comment appears on the screen to first *Measure Distance*.

- **Dist** – stores horizontal distance, and horizontal and vertical angle measurements to the prism.

Then the comment will tell to *Make Angle Observation*.

- **HA/VA** – combines horizontal angle and zenith angle measurements with horizontal distance logged in Prism step to determine point location.

With these two sets of measurements, the computation is made for a point at some height from the Prism point. The computation assumes the offset point to be on the perpendicular to the line of sight at the prism point.



The other fields and icons on the screen are common for all topo screens. For details, see section “Measurement” on page 11-4.

See the *Horizontal Angle Offset* measurement for other tabs.

## Distance Offset

The *Measurement* tab (Figure 11-18) on the *Dist Ofst* screen contains the parameters for definition of a point. You can add or subtract distances, horizontally and vertically.

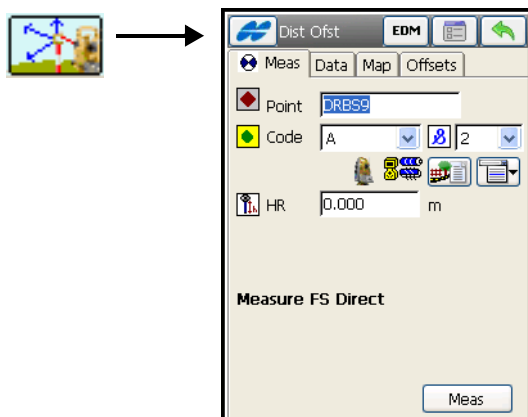


Figure 11-18. Distance Offset – Measurement Tab

- *Point* – name for the offset point to be stored.

A comment appears on the screen to *Measure FS Direct*.

- **Meas** – takes the sideshot to the current point.



The other fields and icons on the screen are common for all topo screens. For details, see section “Measurement” on page 11-4.

After the sideshot is taken, the **Enter Distance Offsets** screen (Figure 11-19 on page 11-17) displays to enter three distance offsets:

- **Away/(Toward)**: sets the distance between the current point and the projection of the offset point on the line of sight.
- **Right/(Left)**: sets the distance between the offset point and its projection, taking into consideration the location relative to the line of sight.
- **Up/(Down)**: sets the height of the offset point, relative to the current position.

Figure 11-19. Distance Offset Screen

The *Data*, *Map* and *Offsets* tabs are similar to those in the **Horizontal Angle Offset** measurement.

## Hidden Point

The *Measurement* tab (Figure 11-20) of the **Hidden Pt** screen defines an unseen point, with a slanted rod touching the point. The rod has two prisms.

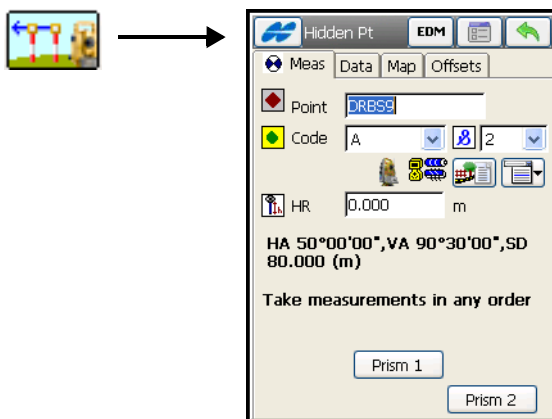


Figure 11-20. Hidden Point – Measurement Tab

- *Point* – name for the offset point to be stored.
- *HR* – the distance between the hidden point and Prism 2.

A comment appears on the screen to *Take measurements in any order*.

- **Prism1**: stores horizontal distance, and horizontal and vertical angle measurements to the first target on the rod.
- **Prism2**: stores horizontal distance, and horizontal and vertical angle measurements to the second target on the rod.

With these two sets of measurements, the computation is made for a point hidden for the instrument sight. The computation takes into account the offset distance HR.



The other fields and icons on the screen are common for all topo screens. For details, see section “Measurement” on page 11-4.

See the **Horizontal Angle Offset** measurement for other tabs.

## Two Line Intersection

The *Measurement* tab (Figure 11-21) on the **2Line Intersection** screen contains data for determination of a point by the intersection of two lines. Each line is defined by two points or by two measurements.

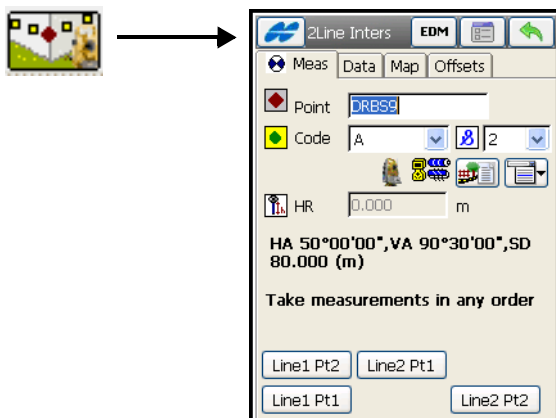


Figure 11-21. Two Line Intersection – Measurement Tab

- *Point* – name for the offset point to be stored.
- *HR* – the height of the Prism; the same for all point, and set in the Backsight dialog.

A comment appears on the screen to *Take measurements in any order*.

- **Line 1 Pt1** and **Line 1 Pt2** – obtains measurements to determine the first and second points defining the first line.
- **Line 2 Pt 1** and **Line 2 Pt 2** – obtains measurements to determine the first and second points defining the second line.

With these four sets of measurements, the computation is made for an offset point at intersection of the lines. The height of the offset point is calculated as the mean of the heights of both lines for this point.



The other fields and icons on the screen are common for all topo screens. For details, see section “Measurement” on page 11-4.

See the *Horizontal Angle Offset* measurement for other tabs.

## Line and Corner

The *Meas* tab (Figure 11-22) on the **Line&Corner** screen contains data for determination of a point on the corner using one line defined by two points.

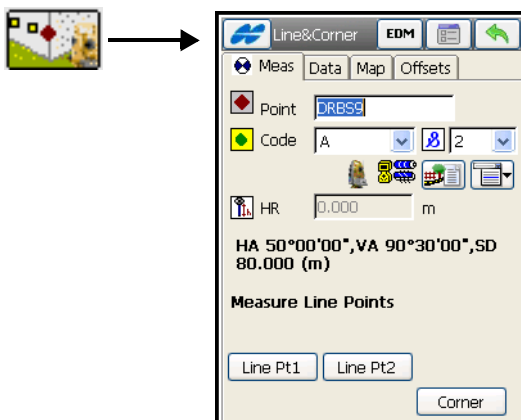


Figure 11-22. Line and Corner – Measurement Tab

- **Point** – name for the offset point to be stored.
- **HR** – the height of the Prism; the same for all point, and set in the Backsight dialog.

A comment first appears on the screen to *Measure Line Points*.

- **Line Pt1** – obtain measurements to determine the first point defining a line.
- **Line Pt2** – obtain measurements to determine the second point defining a line.

Then a comment appears on the screen to *Measure Corner Observation*.

- **Corner** – obtain the horizontal angle to locate a point on the line at the corner.



The other fields and icons on the screen are common for all topo screens. For details, see section “Measurement” on page 11-4.



## Line and Offset

The *Measurement* tab (Figure 11-23) on the **Line&Ofst** screen contains data for determination of a point distant from a line defined by two points.

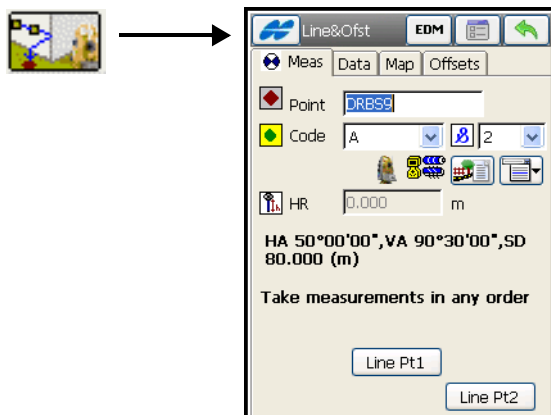


Figure 11-23. Line and Offset – Measurement Tab

- **Point** – name for the offset point to be stored.
- **HR** – the height of the Prism; the same for all point, and set in the Backsight dialog.

A comment first appears on the screen to *Take Measurements in any order*.

- **Line Pt1** – obtain measurements to determine the first point defining a line.
- **Line Pt2** – obtain measurements to determine the second point defining a line.



The other fields and icons on the screen are common for all topo screens. For details, see section “Measurement” on page 11-4.

After the line points are measured, the **Enter Distance Offsets** screen displays to enter offsets (see Figure 11-19 on page 11-17):

- **Forward/Backward** – sets the distance between the current point and the projection of the offset point on the line.

- **Up/Down** – sets the height of the point relatively to the current position.
- **Right/Left** – sets the distance between the offset point and its projection, taking into consideration its location relative to the line.

The *Data*, *Map* and *Offsets* tabs are similar to that of the **Horizontal Angle Offset** measurement.

## Plane and Corner

The *Measurement* tab (see Figure 11-24 on page 11-22) on the **Pln&Corner** screen helps determine a point (Corner), using a plane defined with three points and an angle measurement.



The three points defining a plane must not be colinear (all on the same line).



Pln&Corner EDM

Meas Data Map Offsets

Point DRBS9

Code A

HR 0.000 m

HA 50°00'00\", VA 90°30'00\", SD 80.000 (m)

Measure Plane Points

Plane 2 Plane 3

Plane 1 Corner

Figure 11-24. Plane (Point) and Corner – Measurement Tab

- *Point* – name for the offset point to be stored.
- *HR* – the height of the Prism; the same for all point, and set in the Backsight dialog.

A comment first appears on the screen to *Measure Plane Points*.

- **Plane 1** – obtains measurements to determine the first point in the plane.
- **Plane 2** – obtains measurements to determine the second point in the plane.
- **Plane 3** – obtains measurements to determine the third point in the plane.

Then a comment appears on the screen to *Measure Corner Observation*.

- **Cnr** – obtains horizontal and vertical angle measurements to determine the corner point in the plane.



The other fields and icons on the screen are common for all topo screens. For details, see section “Measurement” on page 11-4.

See the *Horizontal Angle Offset* measurement for other tabs.

## Auto Topo

This function is activated only with Robotic instruments, and collects points by Time and Distance. To open the *Auto Topo* screen (Figure 11-27), select the **Auto Topo** icon in the Robotic mode.

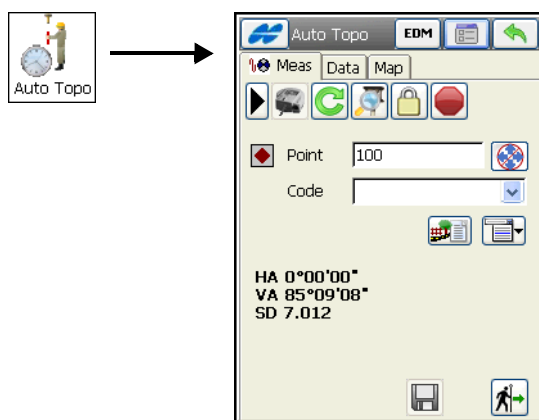



Figure 11-25. Auto Topo



The Help Icon in the upper-left corner of the screen displays a pop-up menu containing nine items:





- *Edit Points* – opens the **Points** list.
- *Inverse* – opens the **Inverse** COGO screen.
- *Notes* – opens the **Notes** screen.
- *PTL Mode* – opens the **PTL Mode** screen (see “PTL Mode” on page 11-8).
- *Remote settings* – opens the **Search/Track Parameters** screen (see “Stake Parameters” on page 3-50).
- *Config Link* – opens the **Configure Link** screen (see “Configure Link” on page 13-11).
- *BS Setup* – opens the **Backsight Survey** screen (see “Backsight Survey” on page 10-2).
- *Display Coord* – if selected, the coordinates of the previous point measured displays below the HR data (see Figure 11-2 on page 11-3).
- *Help* – accesses the Help files.

The **Measurement** tab on the **Auto Topo** screen (Figure 11-25 on page 11-23) contains the initial data for the survey:

- *Point* – displays the current point name.
- *Code* – displays the current point code. A symbol shows the code entity type (Point, Line or Area). Enter a code from the drop-down list. Code needs to be defined at the time it is entered if it is not a code that exists in the codes dialog.

The lower field, marked by the  sign, is displayed only for a Code Type of Line or Area and intended for entering a string.

-  – the **Attributes List** icon, opens the **Point-Attribute** screen to set the code and attributes available for the code chosen, layer and photo notes (Figure 6-7 on page 6-9).
- The  icon next to the **Attributes List** icon displays the pop-up menu of the following items:
  - *Add to End/Start:* for Line and Area codes.

- *Insert*: for Line and Area codes. This allows the user to insert a point to a line out of sequence.
- *Layer*: opens the **Select Layer** screen (see “The Topo Menu” on page 9-3).
- *Note*: opens the **Note** screen. For details, see “The Topo Menu” on page 9-3.
- *HR* – the height of the rod (target).
-  – immediately stores the current position.
- The start  button – starts the survey process. After pressing, the button changes (toggles) to the stop  button. Press again to stop the survey process.
-  – toggles between the status bar and search bar.  
For a description of the status icons, see Table 11-1 on page 11-5.  
For a description of the search buttons, see Table 11-2 on page 11-6.
- **EDM** – opens a menu to select the distance measurement mode. It can be as follows:

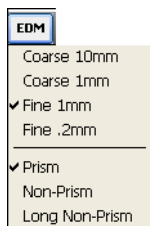




Figure 11-26. EDM for Robotic

- Pressing  – opens the **Mode** screen (see Figure 11-3 on page 11-3). Press **Next** to access the Auto Topo settings (Figure 11-27 on page 11-26):
  - Method: sets the method of data collection; either *By Time*, *By Horizontal Distance*, or *By Slope Distance*.
  - Interval: the time interval for the data collection.

For a description of other parameters on these screens, see “Survey Parameters” on page 3-70.

- The ok  button – saves the changes and returns to the **Auto Topo** screen.

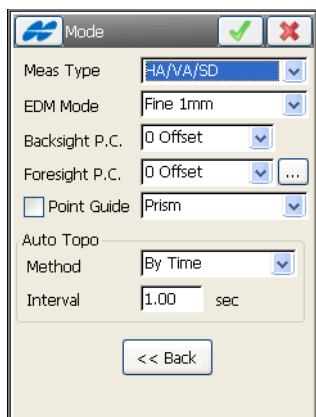


Figure 11-27. Mode Screen – Auto Topo Settings

The *Data* tab displays the data being surveyed.


The *Map* tab shows the surveyed data graphically and duplicates the controls from the *Measurement* tab to perform the survey to work in map mode.

## Cross-Section

To perform a cross-section survey of the selected road, select the **X-Section** icon. The **Cross Section** screen displays.

The **Cross Section** screen contains station settings for a selected road, where the cross section survey is to be performed.

- **Road** – select the road from the **Roads** list. Manually enter a road or either select one from the drop-down list.
- **Code** – the code of the center line points. A symbol shows the code entity type (Point, Line or Area). Enter a code from the drop-down list. Code needs to be defined at the time it is entered if it is not a code that exists in the codes dialog.

The lower field, marked by the  sign, is displayed only for a Code Type of Line or Area and intended for entering a string.

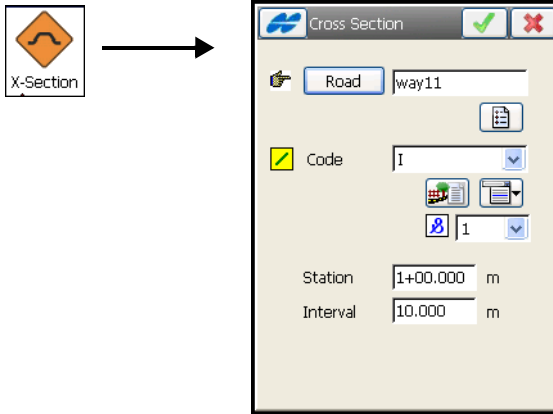






Figure 11-28. Cross Section

-  – the *Attributes List* icon, opens the **Point-Attribute** screen to set the code and attributes available for the code chosen, layer and photo notes (Figure 6-7 on page 6-9).
- The  icon next to the *Attributes List* icon displays the pop-up menu of the following items:
  - *Add to End/Start*: for Line and Area codes.
  - *Insert*: for Line and Area codes. This allows the user to insert a point to a line out of sequence.
  - *Layer*: opens the **Select Layer** screen (see “The Topo Menu” on page 9-3).
  - *Note*: opens the **Note** screen. For details, see “The Topo Menu” on page 9-3.
- *Station/Chainage*: sets the station/distance where the cross section is surveyed.
- *Interval* – the increment of distance towards the next station.



The Station/Chainage and Interval fields display ONLY if the road is selected.

- The Help Icon in the upper-left corner of the screen displays a pop-up menu containing an option:
  - *Edit Roads*: enables the **Roads** screen. See “Roads” on page 7-2.
- The ok  button – saves the changes and opens a screen to perform sideshot measurements. Toggling between the sideshot modes is performed from the *Measurement Method* field in the two **Mode** screens opened by the  button in the **XSect-Dir** (**XSect-Dir/Rev**) screen.

## XSection - Direct

The **XSect-Dir** screen (Figure 11-29) performs the usual observation work, relative to the cross-section.

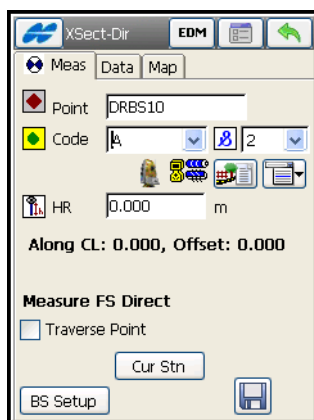




Figure 11-29. Cross Section - Direct

The survey is performed from one side of the road to another in a plane perpendicular to the center line. If the road has not been set, define the plane. On the first station, the survey is performed so that the next point has a different code, for example *A, B, C, cl, D, E, F*. Press the  button to automatically change the station number. The application suggests that the survey on the next station uses the same codes in the opposite order: *F, E, D, cl, C, B, A*. The line is created along the points with the “cl” code.

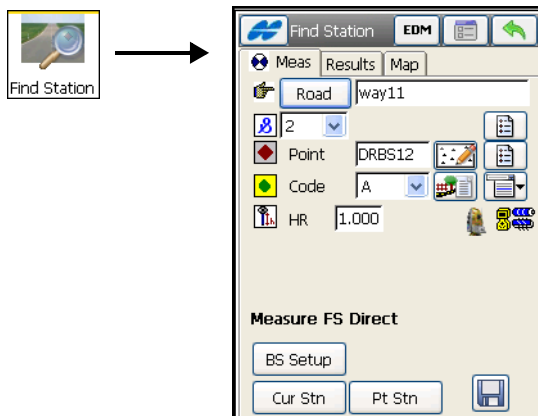


For a detailed description of the survey process, see “Topo” on page 11-2. The only difference lies in the presence of the **Cur Stn/ Cur Chn** button. Similar to the  button, it makes the measurement, but does not store the point to the data set.

## Find Station


To start this survey, select the **Find Station** icon.





The *Meas* tab (Figure 11-30) on the **Find Station** screen identifies the station by computing the distance from the beginning of the road to the projection of the station to the road, and the offset of the station from the center line of the road.



**Figure 11-30. Find Station – Measurement Tab**

- *Road* – enter the name of the road or select it from the list.
- *Point* – select the name of the point from the map or the list.
- *Code* – the code of the point. A symbol shows the code entity type (Point, Line or Area). Enter a code from the drop-down list. Code needs to be defined at the time it is entered if it is not a code that exists in the codes dialog.

A field marked by the  sign is displayed only for a Code Type of Line or Area and intended for entering a string.

-  – the *Attributes List* icon, opens the **Point-Attribute** screen to set the code and attributes available for the code chosen, layer and photo notes (Figure 6-7 on page 6-9).
-  – shows the battery and memory status for the controller.
- The menu icon next to the *Attributes List* icon displays the pop-up menu containing two items:
  - *Layer*: opens the **Select Layer** screen (see “The Topo Menu” on page 9-3).
  - *Note*: opens the **Note** screen.
- **HR** – sets the target height above the mark (rod height).
- **BS (Setup)** – opens the **Backsight Survey** screen to set the backsight point. The information displayed is the same as has been entered.
- **PStn** – computes the result of the point station.
- **CStn** – computes the result of the current station, takes the sideshot to the point, and stores the point to the data set.
-  – computes the result and takes the sideshot to the point. The result is reflected on the *Results* tab (Figure 11-30 on page 11-29).
-  – opens the **Mode** screen to set the sideshot mode.
- The Help Icon in the upper-left corner of the screen displays a pop-up menu of options:
  - *Edit Points*: opens the *Points* list.
  - *Inverse*: opens the **Inverse** COGO screen.
  - *Notes*: opens the **Notes** screen.
  - *PTL Mode*: opens the **PTL Mode** screen (see “PTL Mode” on page 11-8).
  - *Display Coord*: if selected, the coordinates of the previous point measured displays below the HR data (see Figure 11-2 on page 11-3).

The *Result* tab shows the results of the computation.

The *Map* tab shows all points in a graphic mode and duplicates the button controls from the first tab.

The *Set* tab (if available) displays the result of the sideshots being done during one set.

## Tape Dimension

To start working, select the **Tape Dimension** icon. The *Tape Dimension* screen displays.

The *Tape Dimension* screen calculates the periphery of structures such as buildings that have features perpendicular to each other. This is done using tape measurements, relative to the two known points that belong to one side of the structure (wall of the building), forming a so called *reference line*.

## Reference Line

The *Ref Line* tab contains information about the two points comprising the reference line.

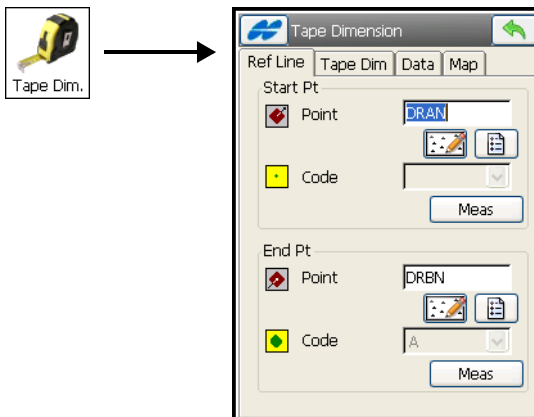


Figure 11-31. Tape Dimension - Ref Line Tab

- *Start Point/End Point* – contains properties of the starting and ending point: the name (can be entered manually or selected from the map or list) and code. Also, the point can be measured by pressing the **Meas** button.

## Tape Dimension Points

The *Tape Dim* tab contains the following settings for performing the survey.

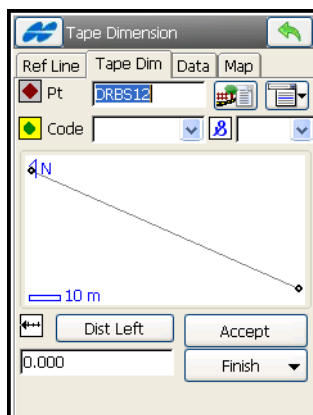



Figure 11-32. Tape Dimension – Tape Dim Tab

- *Point* – the name of the next point in the survey.
- *Code* – the code of the point: either enter manually or select from the drop-down list.
-  – the *Attributes List* icon, opens the list of available attributes (see “On the Point Attributes screen (Figure 6-7), you can set a code, control code, string (displayed only for a Code Type of Line or Area) and attributes’ values for the point.” on page 6-9 for more details).
- The menu icon next to the *Attributes List* icon contains the *String*, *Layer*, and *Note* items.
- **Dist Left** – toggles between *Dist Left* and *Dist Right* values. These set the direction of the next movement, relative to the previous direction. The field below sets the distance to move.
- **Accept** – applies the taped distance to the perimeter line.
- **Finish** – opens the floating menu of two items:
  - *Close Polygon*: connects the first and the last two points with a line.

- *Calc Closure*: calculates the difference between the last and the first points.
- The icon in the lower-left corner of the screen shows the plot of the already taped perimeter.

The *Data* tab shows the initial data and current results of the measurements.

The *Map* tab displays the plot of the already made measurements.

## Missing Line

To start working, select the **Missing Line** icon. The *Missing Line* screen displays (Figure 11-33).

The *Missing Line* screen emulates the total station measurement from one point to another and stores the result to the Raw Data database.

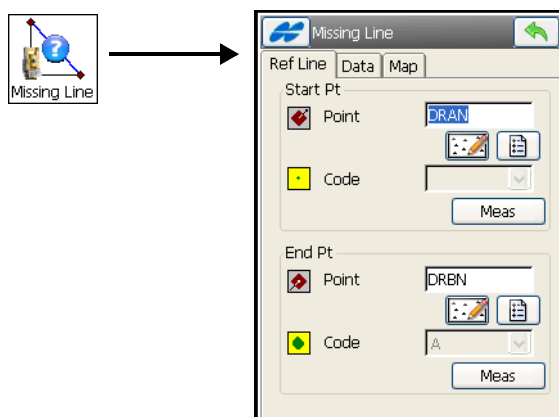


Figure 11-33. Missing Line – Ref Line Tab

- The *Start* and *End Points* can be entered manually, chosen from the map or from the list, or measured through the **Meas** button.

The *Data* tab displays the results of the measurements.

The same results are reflected in the *Raw Data* screen.

The *Map* tab shows the relative position of the points and the measured line.

# Scanning

This function is activated only with robotic/reflectorless and motorized/reflectorless total stations. Make sure that the *Show Scan Point* option is selected in the Help Icon menu in the upper-left corner of the **Points** screen (see “Points” on page 6-3).

To open the **Scanning** screen, select the **Scanning** icon in the Robotic mode. On the **Scanning** screen (Figure 11-47) select either, *Scan w/o Image* or *Scan with Image* mode.

## Scanning with an Image

To scanning with an image, tap **Next** to follow a scan wizard.

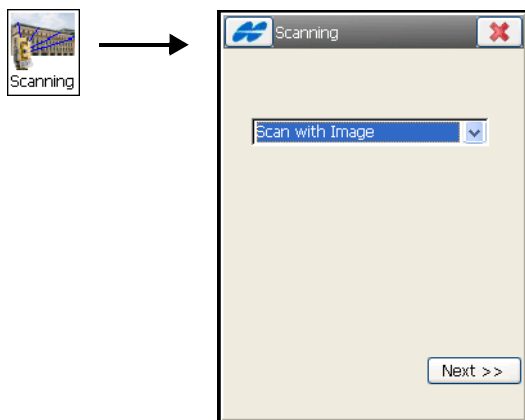


Figure 11-34. Scan with Image

Enter the following parameters on the **Select Scan** screen (Figure 11-35 on page 11-35).

- *Session* – sets a name for the session.
- *Image* – sets an Image file. Select a previous Image or browse for a new one (Images are stored as a JPEG file with the \*.jpg file extension).
- *Camera* – sets the Camera parameters. If the Image exists in the Job, the Camera data is selected automatically. Otherwise, select a previous Camera or browse for a new one (Cameras are stored as text files with the \*.cmr extension).

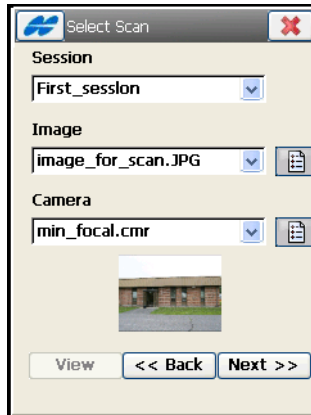


Figure 11-35. Enter Scan Session Information

- **View** – when available, opens the *View Scan* screen.
- **Back** – returns to the previous screen.
- **Next** – click to open the *Orient* screen (Figure 11-37 on page 11-36) to complete.

## View Scan

The *View Scan* screen (when available) displays the image, along with orientation and scanned points for completed scan sessions.

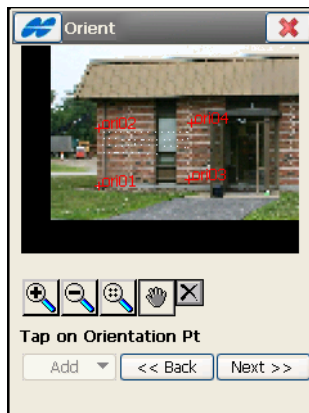


Figure 11-36. View Scan

## Orientation

The ***Orient*** screen (Figure 11-37) associates a position on the image (x,y) with known NEZ coordinates.



Figure 11-37. Orientation

- – zooms in the image
- – zooms out the image
- – displays the whole image
- / – enables/disables a pan drag control of the image. When the **Pan** button is disabled, tap on the image to choose the orientation point. The image zooms to this point and displays a crosshair. The position of the crosshair can be adjusted (see Figure 11-38).
- / – switches on/off the arrow keys on the keypad to adjust the crosshair position. When the **Arrow** button is enabled, the arrow keys on the keypad can move the crosshair up, down, left, or right.
- – attempts to move the crosshair to the center of a circular object on the image. First, tap somewhere inside the circular object. The object should be a well-defined circle with high contrast between the inside and outside of the circle.



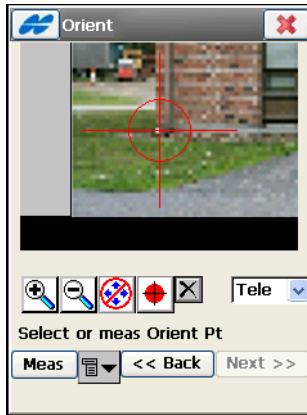


Figure 11-38. Select Orientation Point

- The drop-down list in the bottom-left corner of the screen (next to the **Meas** button) contains two options to view the image (Figure 11-39 on page 11-37):
  - *Tele* (telescope): the default zoomed-in view of the crosshair.
  - *Wide View*: zooms out and shows the area of the image which contains the orientation point.

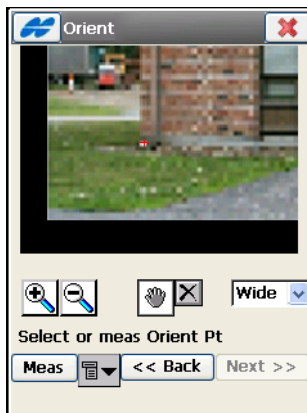



Figure 11-39. Select Orientation Point – Wide View

- **Meas** – measures the orientation point. The bitmap menu options (*Meas, From Map, From List*) are used to take a measurement or to select an existing point from a map or list (Figure 11-40).
-  – opens the **Orientation Res** screen (Figure 11-40 on page 11-38) to delete the selected orientation points.

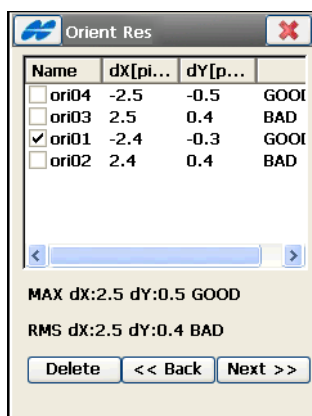


Figure 11-40. Delete Orientation Points

- **Next** – when four or more orientation points have been established, click to display the orientation results (Figure 11-42 on page 11-39).

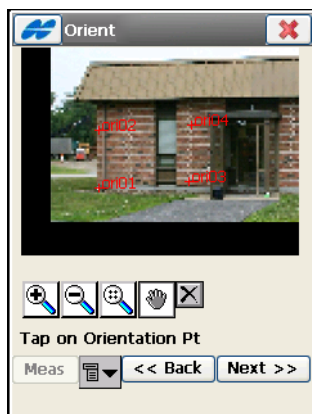


Figure 11-41. Calculate Image Orientation

## Orientation Results

The *Orientation Results* screen displays the results of the image orientation (Figure 11-42). The results for each orientation point is displayed as  $dX$  and  $dY$  in image pixels.

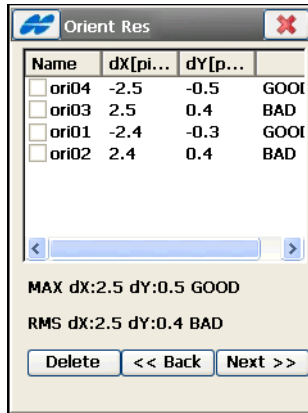


Figure 11-42. Orientation Results

- **Delete** – removes the selected point to adjust the orientation calculation. If four points still remain, the new results are displayed. If less than four orientation points display, the *Orientation Results* screen closes automatically to continue the orientation procedure.
- **Back** – continues to the *Scan* screen (Figure 11-43) to select areas for scanning.

## Selecting Scan Area



Use one of the following methods to select one or more areas for scanning:

**Select Area Method 1.** Draw a rectangle by pressing the stylus on the screen for the start point and dragging to the end point. When the stylus is lifted, the area is set (Figure 11-43).

**Select Area Method 2.** Draw a polygon by pressing the stylus down at each vertex. Lines will be drawn connecting each vertex to the previous one. Press the stylus near the first vertex to close the area.



Figure 11-43. Select Scan Area

- **Next** – press to begin the scan when the areas are set; the *Interval* screen (Figure 11-44 on page 11-41) opens first to set the scanning settings.
- **Clear** – erases all drawn areas.
-  – opens the *Mode* screen (for a description of parameters on this screen, see “Survey Parameters” on page 3-70). This is the same screen that opens if you press the  button in the *Observation and Occ/BS Setup* screens. The main objective is to set the instrument to “Non-Prism” mode, which is required for scanning and also, to change the measurement mode (*Fine*, or *Coarse*).

## Interval

The *Interval* screen (Figure 11-44) sets the starting point and the horizontal and vertical intervals for scanning.


The screenshot shows a software window titled "Interval" with a close button (X) in the top right corner. The window contains the following fields and controls:

- Start Pt:** A text input field containing "DRBS12".
- Scan Mode:** A dropdown menu currently set to "Fine".
- Meas Mode:** A dropdown menu currently set to "Normal NP".
- Interval:** A dropdown menu currently set to "Distance".
- H Dist:** A text input field containing "0.50000" followed by a unit "m".
- V Dist:** A text input field containing "0.50000" followed by a unit "m".
- Navigation:** Two buttons at the bottom: "<< Back" and "Next >>".

Figure 11-44. Scanning Interval

- *Start Pt* – enter a name for starting point the scanned points.
- *Scan Mode* – select the scanning mode: either *Fine* or *Coarse*.
- *Meas Mode* – select the measuring mode:
  - *Normal NP*: normal Non-Prism measurements.
  - *Long NP*: long distance Non-Prism measurements (200-300 meters away); only available for GPT-8200 and GPT-7000 Total Stations.
  - *Normal/Long NP*: attempts to take a normal NP measurement. If unsuccessful, the instrument automatically switches to long NP mode for the measurement; only available for GPT-8200 and GPT-7000 Total Stations.
- *Interval* – select the scanning intervals either as *Distance* or *Angle values* or *Numbers of points*.
- *H Dst/HA/Num H* – enter the interval in the horizontal direction.
- *V Dst/VA/Num V* – enter the interval in the vertical direction.
- **Next** – saves the settings and opens the *Estimate Time* screen (Figure 11-45).

# Time Estimate

Before scanning begins, the *Estimate Time* screen (Figure 11-45) displays the scanning information, including the total number of points to be scanned and an estimate of the time it takes to complete the scan. If the estimated time is too long, click the close  button and enter larger intervals.

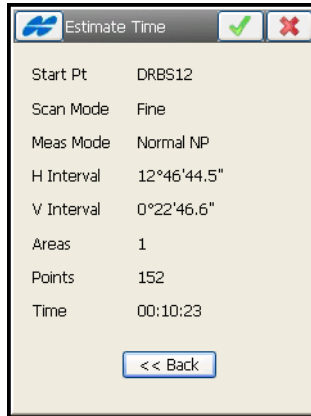


Figure 11-45. Estimate Time

- Pressing the ok  button – begins scanning points.

As the total station measures points within a predefined area, each point displays on the image.

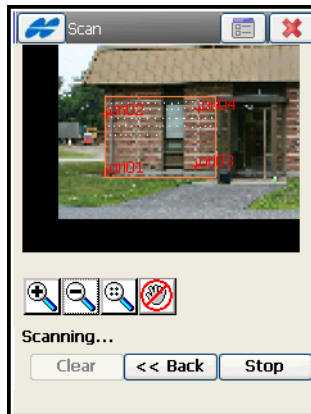


Figure 11-46. Scanning in Progress

## Scanning without an Image

To start working, select the *Scanning* icon. The *Scanning* screen displays (Figure 11-47).

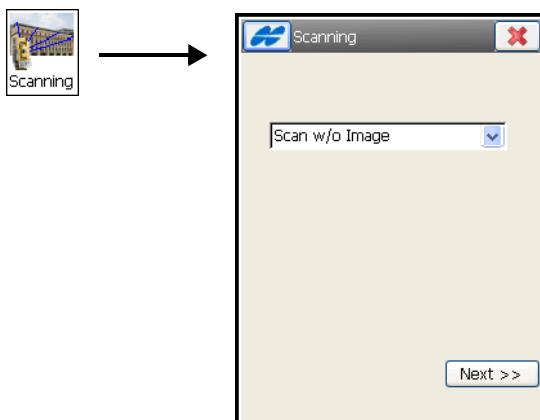


Figure 11-47. Scan without Image

- **Next** – opens the *Area* screen (Figure 11-48 on page 11-43).

## Area

The *Area* screen (Figure 11-48) selects the top-left, bottom-left and bottom-right corners to determine an area to scan.

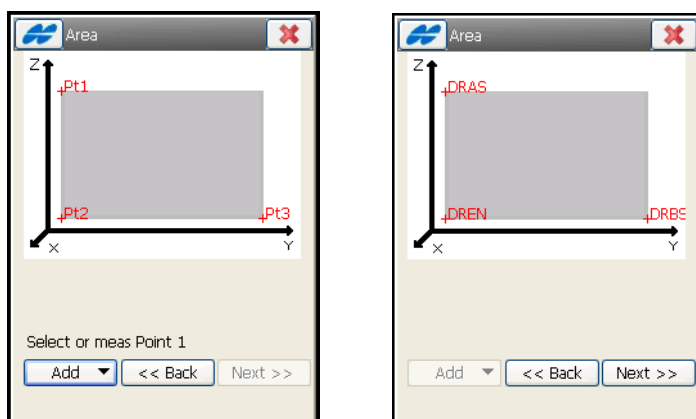



Figure 11-48. Select Area

- **Add** – opens the menu options (*Meas, From Map, From List*) used to take a measurement or to select an existing point from a map or list.
- **Next** – available after the points are specified and displays the same *Interval* and *Estimate Time* screens as for Scanning with Image mode (Figure 11-49).

Figure 11-49. Interval and Estimate Time

Pressing the ok  button on the *Estimate Time* screen start scanning.

For description on these screens, see “Interval” on page 11-41 and “Time Estimate” on page 11-42.



## Scan

As the total station measures points within the predefined area, each point displays on the screen (Figure 11-50).

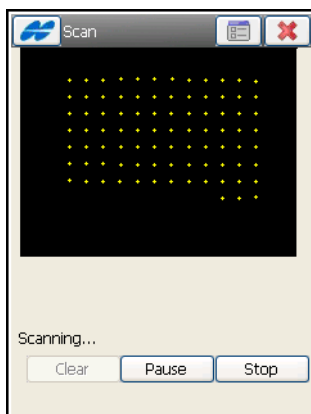



Figure 11-50. Scanning in Progress

- **Stop** – immediately stops the scan and returns to the *Area* screen.
- **Pause** – it stops temporarily. It is possible to restart.

After scanning is completed, the screen returns to the Area screen to set a new area for scanning. The *points*  icon denotes the scanned points in the list of points (Figure 11-51).

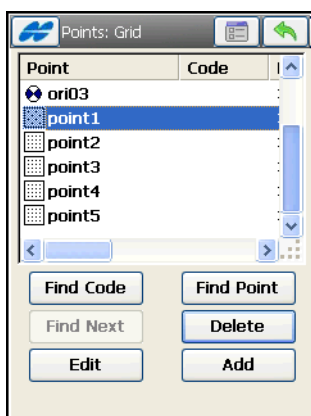


Figure 11-51. Scanned Points

# Monitor

This function is activated only with robotic total stations. To enable the monitor survey, select the **Monitor** icon in the Robotic mode. The *Monitor Pointlist* screen displays (Figure 11-52 on page 11-46).

## Monitor Point List

The points to be measured are added to a point list which is then loaded using the *Monitor Pointlist* screen displays (Figure 11-52).

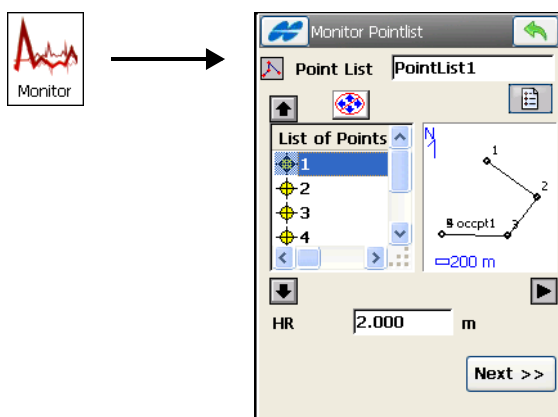


Figure 11-52. Monitor Point List

After the point list is selected, the **Next** button opens the *Monitor* screen.

## Monitor

The Monitor function measures one or more prisms repeatedly and uses the measurements to detect changes in the position of the prisms. The measurements are recorded into the raw data file.

Optionally, the raw measurements or the computed points can be output to a file or communication port in either an FC-6 or GTS-7 format. The output format and destination is accessed from the *Monitor Options* screen when configuring the total station (see “Monitor Options” on page 3-62).

The **Monitor** screen controls the monitor survey (Figure 11-53).

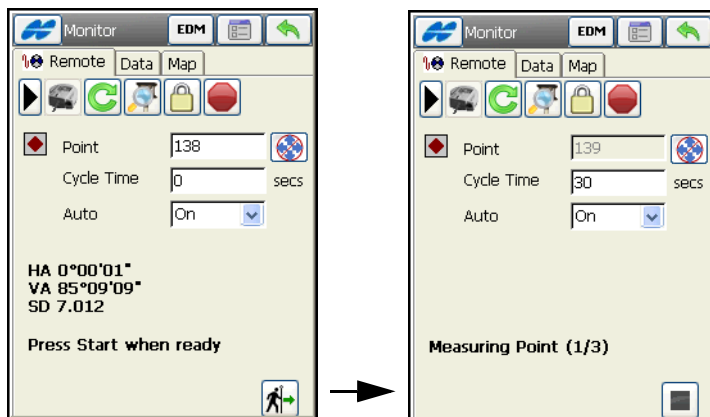



Figure 11-53. Monitor

- *Points* – the point name.
- *Interval* – interval listed as the Cycle Time. If a prism cannot be found after a period of 15 seconds, the total station rotates to the next point in the sequence.
- *Auto* – If the Auto combo box is set to ON, the total station automatically rotates to the next point in the sequence and records a measurement. If it is set to OFF, the total station rotates to the point, but allows the user to verify or correct the centering to the prism prior to taking a measurement. The monitor function always completes the entire sequence, even if the measurements take longer than cycle time.
-  – initiates the sequence of measurements, which repeats at the interval you want.

Refer to Table 11-2 for descriptions of the search icons for Robotic.

The *Data* tab lists the differences between the coordinates of the reference point and the measured point.

The *Map* tab shows all points in graphic mode. For details, on map properties and customizing, see “Viewing Map” on page 15-1.

## Notes:

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# Digital Level Survey

The Survey menu (Figure 12-1) for Level survey opens by the **Survey** icon in the main menu and allows to perform:

- Level Run
- Two Peg Test

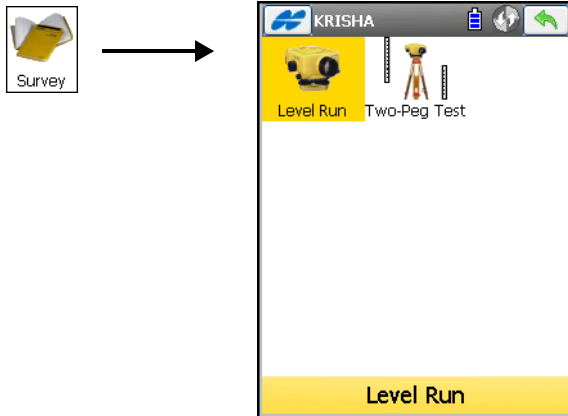



Figure 12-1. Level Survey Menu

The Help Icon  opens a pop-up menu giving access to the help files, module activation codes, port data logging, changing menu interface, and information about the TopSURV used (for detail see “Help Icon’s Pop-up Menu” on page 1-9).

# Level Run

To set up a Level survey in running mode, tap the **Level Run** icon.

The *Level Run* screen (Figure 12-2) creates a new level run.

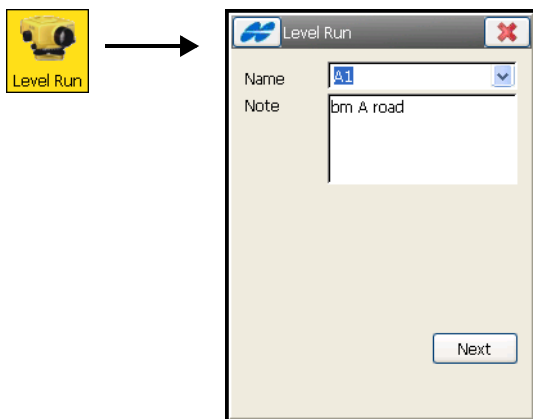


Figure 12-2. New Level Run

- *Name* – sets a name for the new level run.
- *Note* – adds optional information on the level run.
- **Next** – opens the screen to make leveling measurements (see Figure 12-3 on page 12-3).

## DL Level Run

The *DL* tab on the *Level Run <run name>* screen (Figure 12-3) displays all leveling data in progress and contains tools to conduct leveling.

- **BS** – usually sighting back along the leveling line, the Level takes a rod reading on a point of known elevation.
- **SS** – the Level takes a sideshot to the point.
- **FS** – the Level takes a rod reading on a point of unknown elevation.

The fields above the tools are for entering the point for rod reading the code for the measured point.

You can select the point from the map or the list of points. The icon next to the code field opens the **Code-Attributes** screen to set a new code. For details, see “Codes” on page 6-17.

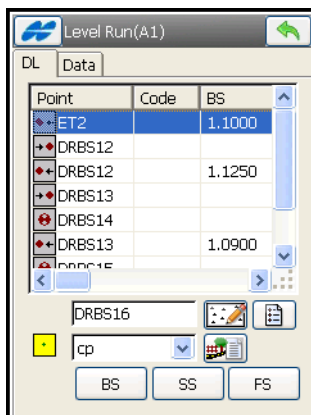






Figure 12-3. DL Level Run

- The fieldbook displays the following information:
  - *Point*: point name and icon displaying point type. Icons can be:
    -  – backsight point
    -  – sideshot point
    -  – foresight point
    -  – closure
  - *Code*: the code of the point.
  - *BS*: a rod reading taken on the backsight point.
  - *HI*: the height of the leveled instrument; the elevation of the line of sight of the telescope above the datum.
  - *FS*: a rod reading taken on the foresight point.
  - *Elev*: elevation of the point.
  - *BS Dist*: the horizontal distance from the level to the rod on a backsight point.
  - *FS Dist*: the horizontal distance from the level to the rod on a foresight point.
  - *Sum BS Dist*: the sum of backsight distances.

- *Sum FS Dist*: the sum of foresight distances.
  - *SumBS-SumFS*: the difference between the sums of BS and FS measurements.
  - *Accumulated Ht*: the difference between the sum of the backsights and the sum of the foresights.
  - *Notes*: any additional information on the point.
- 



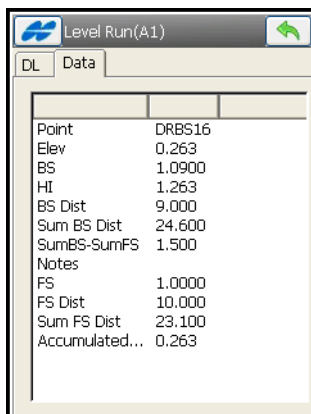
All columns except PT Name can be selected to display (see “Display Settings” on page 12-5).

---

- The Help Icon in the upper-left corner of the screen displays a pop-up menu of options:
  - *Stake Point*: opens the ***Stake Point*** screen to stake out a point.
  - *Stake Point List*: opens the ***Stake Point List*** screen to stake out points from the list (see “DL Stakeout” on page 13-17).
  - *Stake Elev*: opens the ***Stake Elev*** screen to stake out at a rod point (see “DL Stakeout of Elevations” on page 13-45).
  - *Vertical Offset*: opens the ***Vertical Offset*** screen to set the vertical offset to apply at the point.
  - *Display Settings*: opens the ***Settings*** screen to select the columns and the order of the columns to display.
  - *Show SumBS-SumFS*: displays SumBS-SumFS measurement.
  - *Inverse*: opens the ***Two-Point Inverse*** COGO screen (see “Inverse” on page 14-2).



The *Data* tab on the **Level Run** <run name> screen (Figure 12-4) displays information related to the current measurement.



The screenshot shows a window titled "Level Run(A1)" with a "Data" tab selected. The window contains a table with the following data:

Point	DRBS16
Elev	0.263
BS	1.0900
HI	1.263
BS Dist	9.000
Sum BS Dist	24.600
SumBS-SumFS	1.500
Notes	
FS	1.0000
FS Dist	10.000
Sum FS Dist	23.100
Accumulated...	0.263

Figure 12-4. Level Run - Data

## Display Settings

The *Settings* screen (Figure 12-5) selects the columns to display. The Up/Down arrows are used to change the order of the selected column.

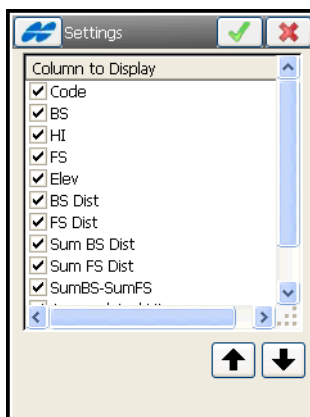



Figure 12-5. Display Settings

## Two Peg Test

The Two Peg Test is performed to check if the line of sight of the level telescope is horizontal when the instrument is leveled.

To perform the Two Peg Test, tap the **Two Peg Test** icon .

The *Two Peg Test* screen (Figure 12-6 on page 12-6) guides you through a series of measurements to help determine any errors. First, it prompts you to take shots to the first point, assuming the level is fairly centered between the two points. Then the instrument should be moved to one of the pegs and the shots are taken again to Pegs1 and 2.

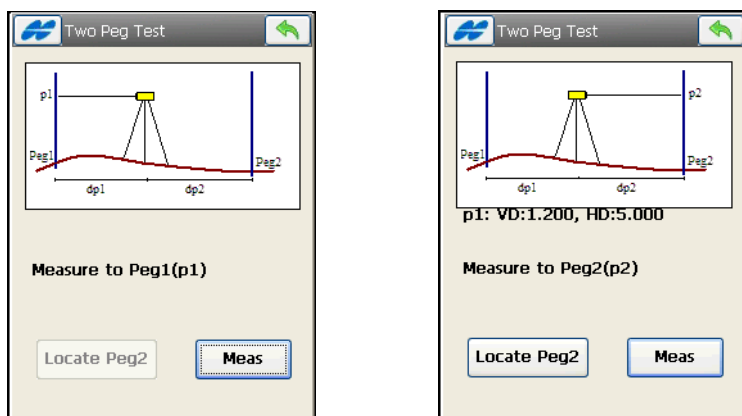
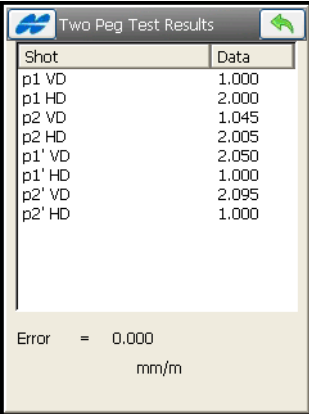


Figure 12-6. Two Peg Test

- **Locate Peg2** – measures the horizontal distance to Peg2 and compares it with the Peg1 measurement previously taken. This measurement is not used in the error computations.
- **Meas** – takes measurements for the displayed prompted Peg. The results display on the *Two Peg Test Results* screen (Figure 12-7 on page 12-7).

## Two Peg Test Results

The *Two Peg Test Results* screen (Figure 12-7) displays the results of the test after all measurements are taken.



The screenshot shows a software window titled "Two Peg Test Results". Inside, there is a table with two columns: "Shot" and "Data". The table contains eight rows of data. Below the table, the "Error" is displayed as "0.000 mm/m".

Shot	Data
p1 VD	1.000
p1 HD	2.000
p2 VD	1.045
p2 HD	2.005
p1' VD	2.050
p1' HD	1.000
p2' VD	2.095
p2' HD	1.000

Error = 0.000  
mm/m

**Figure 12-7. Two Peg Test Results**

- The table displays all the shots taken.
- *Error* – computed error means inclination of the actual line of sight from true horizontal. This error is proportional to the distance from the level to the rod.

## Notes:

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# Staking out

To stake out points, tap the **Stake** icon in the main menu.

The Stake function is used to stake out Points, Lines, Offsets, DTM, Point in Direction, Point List, Curve, Road, Real Time Road, Slope and Lineworks (Figure 13-1).

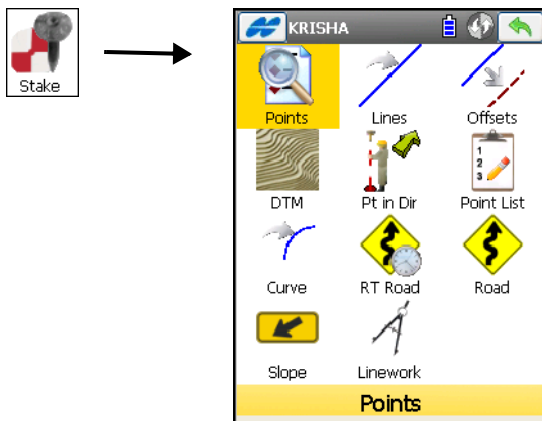



Figure 13-1. Stake Menu



If you need menu options that are not visible, tap **Configure/Menus** icons and enable these options in the *Config Menu* screen.

For stake out with digital levels, the menu options include Points, Point List and Elevation.

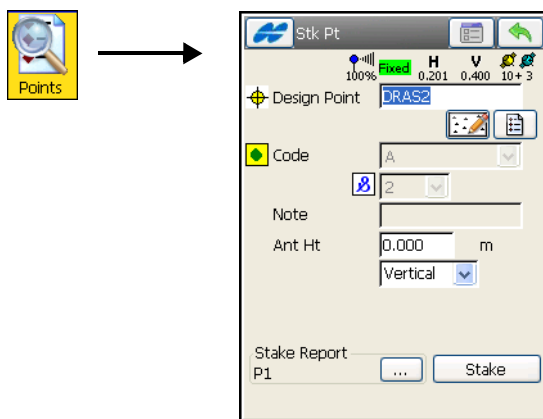
The Help Icon  opens a pop-up menu giving access to the help files, module activation codes, port data logging, changing menu interface, and information about the TopSURV used (for details see “Help Icon’s Pop-up Menu” on page 1-9).

# Points

To stakeout a point, tap the **Points** icon. The *Stake Pt* screen (Figure 13-2) displays.

## Stakeout Point

The *Stake Point* screen (Figure 13-2) contains initial data for the stakeout point.




**Figure 13-2. Stakeout Point**

- *Design Point* – sets the identifier of the design point: enter either manually or select from the map or from the list.
- *Antenna Ht* (for GPS mode) – sets the height of the antenna reference point (ARP) above the mark and specifies the measurement type for the height, either *slant* or *vertical*.
- *HR* (for TS mode) – the height of the rod (target).
- *Stake Report*– displays the current stake report. To select a stake report from a predefined list, tap the [...] button.  
For details on stake report configuration, see “Report Configuration” on page 3-106.



Stake Reports are available for setting in all stake routines.

-  – opens the *Stake Parameters* screen (see “Stake Parameters” on page 3-50).
- **Stake** – opens the *Stake* screen.

For GPS stakeouts, the Help Icon in the upper-left corner of the screen displays a pop-up menu with the following options:

- *Status* – opens the *Status* screen (see “GPS+ Survey Status” on page 8-15).
- *Rover Antenna Setup* – opens the *Antenna Setup* screen to set the antenna for the current survey.
- *Config Radio* – opens the *Configure Radio* screen (see “Configure Radio” on page 8-30).
- *Edit Points* – opens the *Points* screen (see “Points” on page 13-2).
- *PTL Mode* – switches on the PTL (Point-To-Line) Mode. (The screen changes its appearance to *Stake Point (PTL)*.) For details, see “PTL Mode” on page 11-8.
- *Inverse* – opens the *Two-Point Inverse COGO* task screen. For details, see “Inverse” on page 14-2.
- *View Report* – if available, opens an applicable stake report.

For Total Station stakeouts, the options are as follows:

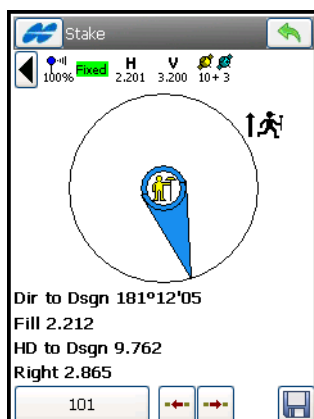
- *BS Setup* – opens the *BS Setup* screen (see “Backsight Survey” on page 10-2).
- *Config Link* (for Robotic mode only) – opens the *Configure Link* screen (see “Configure Link” on page 13-11).
- *Remote Control* (for Robotic mode only) – opens the *Remote Control* screen (see “Remote Control” on page 10-24).
- *Edit Points* – opens the *Points* screen (see “Points” on page 6-3).

- *PTL Mode* – switches on the PTL (Point-To-Line) Mode. (The screen changes its appearance to **Stake Point (PTL)**.) For details, see “PTL Mode” on page 11-8.
- *Inverse* – opens the *Two-Point Inverse COGO* task screen. For details see “Inverse” on page 14-2.
- *View Report* – if available, opens an applicable stake report.

## GPS+ Stakeout

The **Stake** screen (Figure 13-3) assists in the stakeout process.




The arrow icon in the upper-right corner of the screen hides/shows the status of information on the **Status** screen. For details, see “GPS+ Survey Status” on page 8-15.



**Figure 13-3. GPS Stakeout**

The graphic shows the north direction, the reference direction, and the target point, if the distance to the target is less than the horizontal distance tolerance. When the target is closer than the *Horizon Distance Tolerance* value, the graphic shows a bull’s-eye red target point on the screen (Figure 13-4 on page 13-6). If the distance is greater than three meters, the blue arrow points to the target, showing the direction of movement. The screen displays the live parameters of the target.






-  – saves the location. Check the parameters of the stored point in the **Store Point** screen (see Figure 13-14 on page 13-14).
-  – moves to the next (increment to the next point in the data set) point in the data set or return to the previous one.
-  – closes the screen and returns to the **Stake Point** screen.
- The Help Icon in the upper-left corner of the screen displays a pop-up menu with the following options:
  - *View Panel*: opens the context menu to have different representation of stakeout process (see “View Panel” on page 13-8).
  - *Status*: opens the **Status** screen (see “GPS+ Survey Status” on page 8-15).
  - *Rover Antenna Setup*: opens the **Antenna Setup** screen to set the antenna for the current survey.
  - *Topo*: opens the **Topo** screen to perform topo survey (see “Topo Survey” on page 9-2).
  - *Config Radio*: opens the **Configure Radio** screen (see “Configure Radio” on page 8-30).
  - *mmGPS+ Options*: if mmGPS is used, opens the **mmGPS+ Options** screen (see “mmGPS+ Options” on page 8-36).
  - *Design Offsets*: opens the **Design Elevation** screen, allowing you to change the design point elevation height, road offsets, and DTM offsets (see “Design Offsets” on page 13-12).
  - *Store Design Pt/Layer*: opens the **Design Pt/Layer** screen to select options to store the points (see “Store Design Point / Layer” on page 13-13).
  - *Edit Points*: opens the **Points** screen (see “Points” on page 6-3).
  - *Inverse*: opens the **Two-Point Inverse COGO** task screen. For details, see “Inverse” on page 14-2.
  - *View Report*: if available, opens an applicable stake report.

## TS Stakeout

The *Stake* screen reflects the status of the stakeout. On the *Stake* out screen (Figure 13-4 on page 13-6), shows the current design point name (in the bottom-left corner of the screen), the layout of the target, and the current position, the direction, and the values of the distances to the target display.

The top-left corner of the screen displays the status information. For details on the icon meaning, see Table 11-1 on page 11-5.

- **EDM** – selects the distance measurement mode that depends on the instrument type used.
-  – these buttons switch to the previous or next point (decrement/increment to the previous/next point in the data set).
-  – causes a measurement to be taken, computes the directions to the design point and coordinates to be stored to a staked point.
-  – opens the *Store Point* screen to store the current position as a point (see “Store Point” on page 13-13).

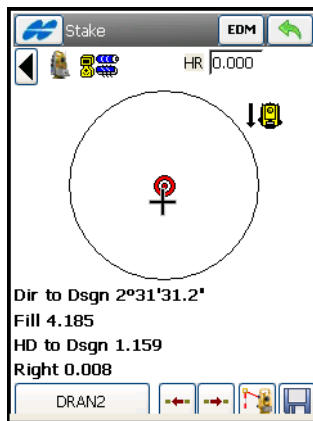


Figure 13-4. TS Stakeout

- Tapping the current design point name shows information on this point (Figure 13-5 on page 13-7).

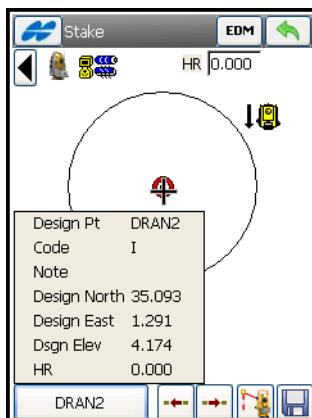



Figure 13-5. Information on Design Point

- The Help Icon displays a pop-up menu with the following options:
  - *View Panel*: opens the context menu to have different representation of stakeout process (see “View Panel” on page 13-8).
  - *Rod Height*: opens the **Enter Rod Height** screen to change the rod height during stakeout.
  - *Robotic*: contains two options: *Remote Control* and *Config Link* which open the **Remote Control** screen (see “Remote Control” on page 10-24) and the **Configure Link** screen (see “Configure Link” on page 13-11), respectively.
  - *Design Offsets*: opens the **Design Elevation** screen, allowing you to change the design point elevation height, road offsets, and DTM offsets (see “Design Offsets” on page 13-12).
  - *Store Design Pt/Layer*: opens the **Design Pt/Layer** screen to select options to store the points (see “Store Design Point / Layer” on page 13-13).
  - *Edit Points*: opens the **Points** screen (see “Points” on page 6-3).

- *Inverse*: opens the *Two-Point Inverse COGO* task screen. For details, see “Inverse” on page 14-2.
- *View Report*: if available, opens an applicable stake report.
- For Robotic total stations, there are search icons on the screen available to control autotracking (Figure 13-6 on page 13-8). For description of the search icons, see Table 11-2 on page 11-6.



Figure 13-6. Stakeout with Robotic

- If the IS Robot (Live Video) instrument with WiFi connection to the controller is used for staking, first click on the  button opens the map. The second click opens the live video of the layout of the target and the current position shown graphically. Touch the screen and have the instrument drive to that location.

## View Panel

This option from the pop-up menu opened by the Help icon displays the context menu to switch views of stakeout process.



The same context menu can be accessed by holding the stylus in the map area on the *Stake* screen. The last view mode is recalled between sessions.

The optional view modes are as follows:

- Data View

- Normal View
- Overhead View (available only for staking points)
- Map View

**Data View:** the screen displays all possible data of staking (see Figure 13-7).



Stake	
100%	Fixed
H	2.201
V	3.200
10 + 3	
Fill	2.214
Ell ht	184.676
Dsgn Ell ht	186.889
Back	23.851
Right	11.026
HD to Dsgn	26.276
SD to Dsgn	26.369
Dir to Dsgn	181°12'18.3"
North	6179462.748
East	409377.079

Figure 13-7. Stakeout Data View

**Normal View:** the default screen that shows graphic and text live values of stakeout (Figure 13-3 on page 13-4).

**Overhead View:** opens the graphical view of the layout of the target and current position (see Figure 13-8 on page 13-9).

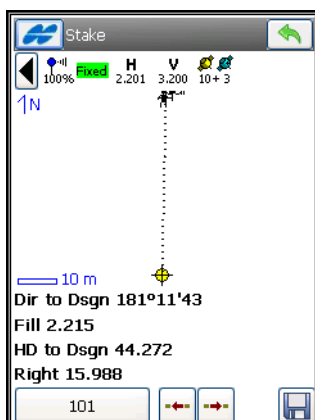


Figure 13-8. Stakeout Overhead View

**Map View:** opens the full screen graphical view of the whole job with the highlighted design point and current position (Figure 13-9).

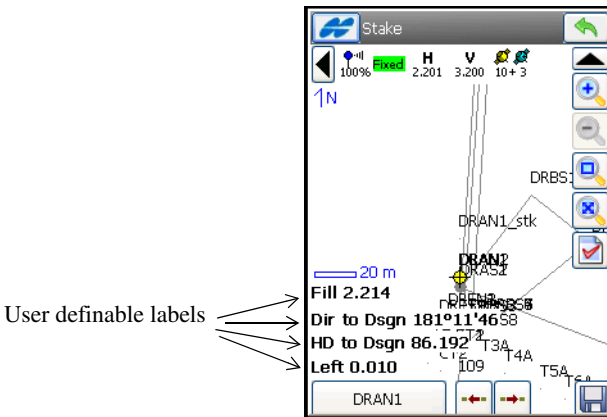


Figure 13-9. Stakeout Map View

## Select Stakeout Value

All graphical views contain four user definable labels for showing any live value. You can tap on one of them to change. The *Select Value* screen displays (Figure 13-10 on page 13-10).

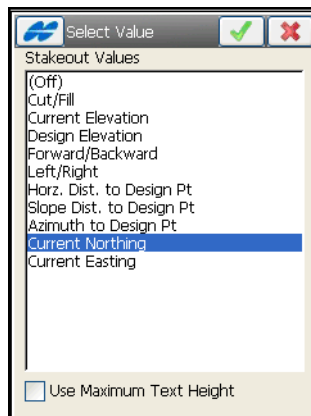



Figure 13-10. Select Value

- Highlight a desired value and press the ok  button to display instead of that you clicked.

- **Use Maximum Text Height** – if enabled, shows the text in larger font if space allows.

## Configure Link

The **Configure Radio** screen (Figure 13-11) manages communication between the Robotic Total Station and the data controller.

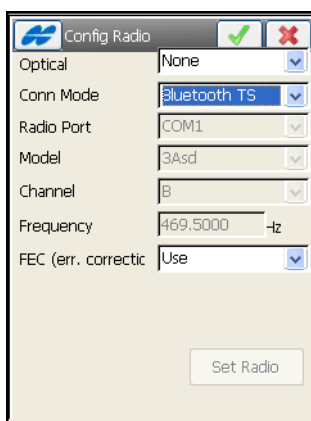


Figure 13-11. Configure Link

- **Optical** – selects the connection course (either *RC3/RC4 Cable*, *RC3/RC4 Bluetooth*, or *None*) between the field controller and the remote controller RC in case carrying out optical communication with the Total Station.
- **Conn Mode** – selects a communication course between the total station and the data controller depending on the optional device used. Depending upon the type of the instrument, select one of the following optional devices:
  - *Cable*: for connection using the RS-232 cable
  - *Radios*: for radio communication
  - *RC3 Only*: for optical communication using the remote controller RC-3.
  - *RC4 Only (SS Wireless)*: for optical communication using the remote controller RC-4.
  - *Bluetooth TS*: for establishing a Bluetooth connection

- *Model* – shows the current modem type set for the current survey configuration. To change the modem, from the Survey menu, tap the **Configure** icon in the main menu.
- *Radio Port, Channel, Frequency* – parameters for the radio connection.
- *FEC* – (Forward Error Correction) You can set either *Use* to maximize data communication or *Don't use*.

## Design Offsets

The *Design Elev* screen (Figure 13-10) sets an offset to add to the elevation of the point when staking points, roads, or DTM's.

Initially, the point height is shown. To set the elevation offset, check mark the appropriate box and enter the offset you want. Click the ok



button to save the setting and close the dialog.

**Figure 13-12. Design Elevation**



## Store Design Point / Layer

The *Store Des Pt* screen (Figure 13-13) is for setting routine when storing points.


- *Display Store Pt Info* – check mark this box to display the *Store Point* screen to view point data before storing.
- *Layer* – selects a layer from the drop-down list, on which points will be stored. The button [...] opens the *Layers* screen to edit layers (see “Edit Layers” on page 6-24).

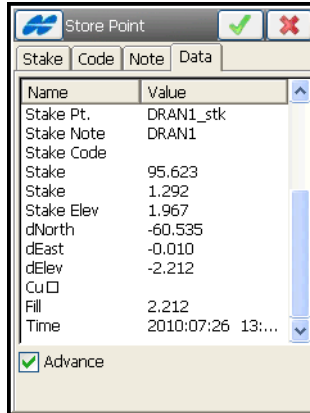


Figure 13-13. Design Pt/Layer

## Store Point

The *Store Point* screen (Figure 13-14) allows editing point properties before the point is stored.

**Data tab** on the *Store Point* screen displays all information about staking the point. Pressing the ok  button saves the point.



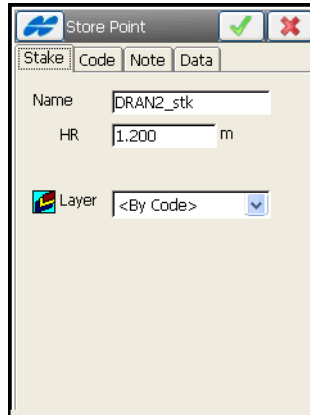
Name	Value
Stake Pt.	DRAN1_stk
Stake Note	DRAN1
Stake Code	
Stake	95.623
Stake	1.292
Stake Elev	1.967
dNorth	-60.535
dEast	-0.010
dElev	-2.212
Cu <input type="checkbox"/>	
Fill	2.212
Time	2010:07:26 13:...

☒ Advance

Figure 13-14. Store Point Information

- *Advance* – if check marked (enabled), after storing a staked point, the *Stake* screen will automatically open for the next point.

**Stake tab** on the *Store Point* screen is for editing the point properties (Figure 13-15):



Name

HR  m





 Layer

Figure 13-15. Staked Point Information

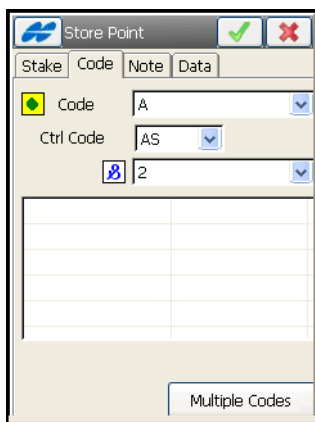
- *Name* – set the name of the staked point.

- *HR* – set the height of the target.
- *Layer* – select the layer for the staked point from the drop-down list.

**Code tab** on the *Store Point* screen is for entering code information (Figure 13-16):

- *Code* with a symbol that show the code entity type (  Point,  Line, or  Area) – enter a code from the drop-down list. Code needs to be defined at the time it is entered if it is not a code that exists in the codes dialog. For a Code Type of Line or Area there will be a field intended for entering a string.

For details on code settings, see “Edit Point Attributes” on page 6-9.



**Figure 13-16. Store Point Code**

**Note tab** on the *Store Point* screen adds text and photo notes to the stakeout point (see Figure 13-17 on page 13-16).

Initially the screen is empty, type in the desired text and add a photo of situation on the point by selecting the corresponding image file on the disk.

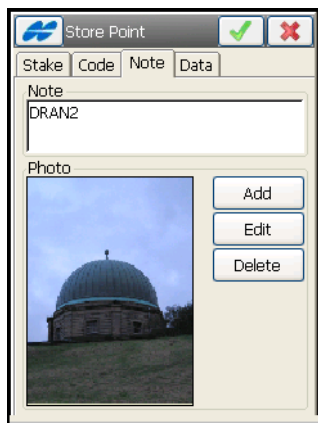


Figure 13-17. Store Point Note

- **Add/Edit** – opens the **Select Image File** screen to browse for the necessary file in the controller (Figure 13-18).
- **Delete** – erases the image from the screen.

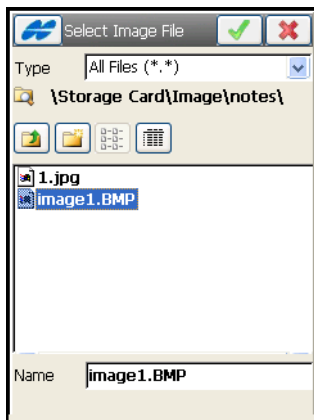


Figure 13-18. Select Image File

**Design tab** on the *Store Point* screen is available only for stakeout tasks when the program calculates design points for staking, for example in *Line & Offsets*.

**Figure 13-19. Design Point To Store**

- *Name* – set the starting name for the staked points.
- *Code* – select the code for the point from the drop-down list.
- *Layer* – select the layer for the point from the drop-down list.
- *Note* – enter a note for the point.
- *Pt Inc/Dec* – enter a value for increment/decrement of names of points.

## DL Stakeout

The DL Stakeout of design points can be accessed from both the Stakeout menu for the current DL job and the top-left menu on the *Level Run* screen (for details, see “Level Run” on page 12-2).

## Stake Point

The **Stake** screen (Figure 13-20 on page 13-18) selects a design point to determine the elevation and to compute a cut/fill value.

- **Design Point** – selects the point to stake (either enter manually or select from the map or list).
- **BS Point** – selects the backsight point for the stake measurement (entered manually or selected from the map or list).
- **BS** – if not already measured, takes a BS measurement before staking.
- **Stakeout** – opens the level **Stakeout** screen (Figure 13-21 on page 13-19).

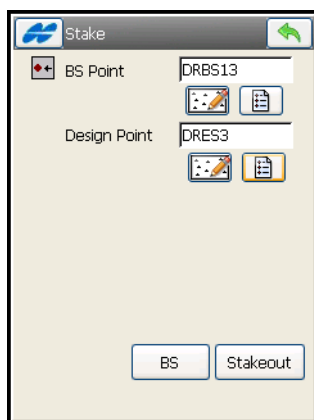


Figure 13-20. DL Stake Point

## Stakeout

The level *Stakeout* screen (Figure 13-21) displays the design point and the BS point.

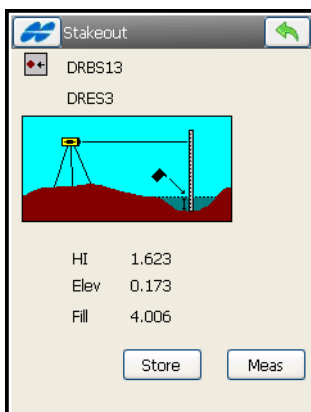


Figure 13-21. DL Stakeout

- **Meas** – measures the elevation and computes a cut/fill value.
- **Store** – saves the point and shows a warning about that.

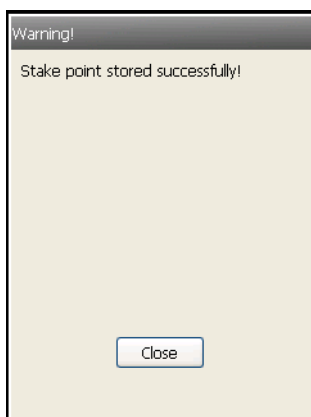


Figure 13-22. Store Point

The *Vertical Offset* option from the pop-up menu opened with the Help icon on the top left corner of the screen allows setting a vertical offset for the point.

Staked out points are not added to the Level Run; instead they are listed as observed points on the **Points** screen (Figure 13-23).

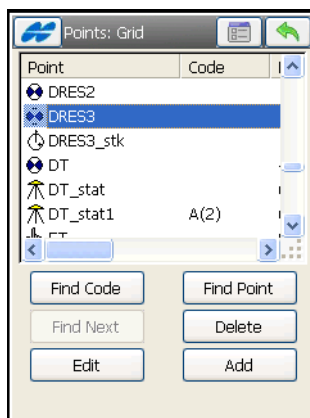


Figure 13-23. Points – Staked Out

## Lines

To stakeout a line, select the **Lines** icon. The **Line** screen (Figure 13-24) contains the initial data for the line stakeout.

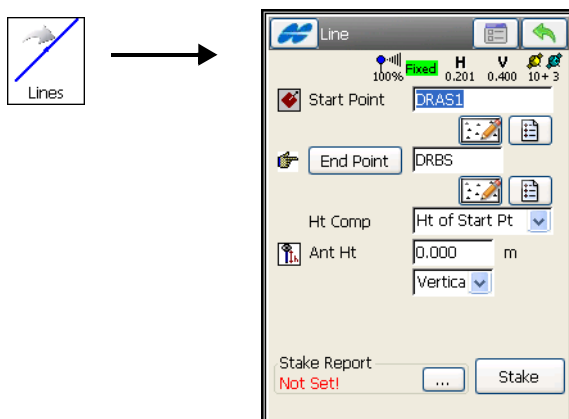



Figure 13-24. Stakeout Line

- *Start Point* – sets the starting point of the reference line.



- **End Point/Azimuth** – sets the direction of the reference line through another point or azimuth.
- **Ht Comp** – the type of height computations for the stakeout point.
  - *Ht of Start Pt* (height of starting point): the stakeout point has the same height as the starting point of the line.
  - *Interpolate Ht*: the height of the stakeout point will be computed through linear interpolation, using the height of the starting and ending points of the line (unavailable when the direction of the reference line is set through azimuth).
- **Antenna Ht** (for GPS mode) – sets the height of the antenna reference point (ARP) above the mark. Also, specifies the measurement type for the height: either *slant* or *vertical*.
- **HR** (for TS mode) – the height of the rod (target).
- **Stake** – opens the *Stake* screen to perform measurements.
-  – opens the *Stakeout Parameters* screen. For details, see “Stakeout Point” on page 13-2.

## GPS+ Stakeout

The *Stake* screen (Figure 13-25) displays the north direction, the reference direction, and the target line.

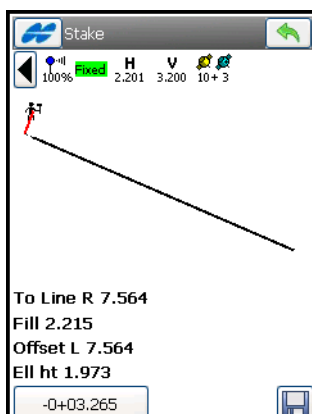







Figure 13-25. Stakeout Line

-  – saves the location. Check the parameters of the stored point on the **Store Point** screen (see “Store Point” on page 13-13).
-  – closes the screen and returns to the **Line** screen.

For details on the Help Icon in the upper-left corner of the screen, see “Points” on page 13-2.

## TS Stakeout

The **Stake** screen (Figure 13-26 on page 13-22) displays the stakeout process: the current station (in the bottom-left corner of the screen), the layout of the target and the current position, the direction, and the values of the distances to the target.

- **EDM** – selects distance measurement mode: either *Coarse*, *Fine*, or *Coarse Tracking*.
- **HR** (for TS mode) – the height of the rod (target).
-  – causes a measurement to be made and displays the result.
-  – takes a measurement and opens the **Store Point** screen to store the current position (see “Store Point” on page 13-13).
-  – returns to the **Line** screen (Figure 13-24 on page 13-20).

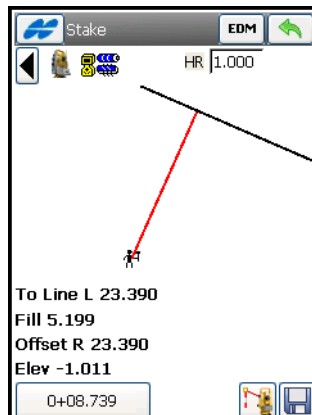


Figure 13-26. Stake Point

For details on the Help Icon in the upper-left corner of the screen, see “Points” on page 13-2.

# Offsets

To stake Line, Intersection, Curve, 3 Pt Curves, or Spiral with Offsets, tap the **Offsets** icon.

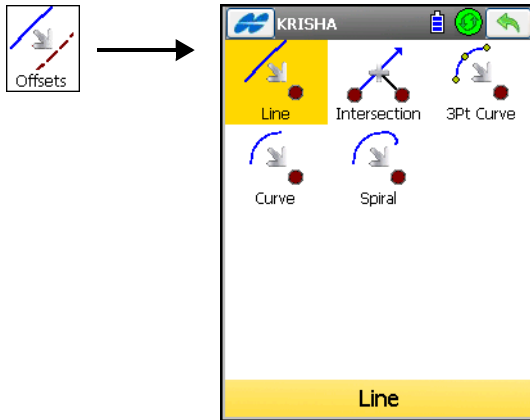


Figure 13-27. Offsets Menu


## Line & Offsets

To stakeout lines and offsets, tap the **Line** icon. The **Line & Offsets** screen displays.

The **Line & Offset** screen (Figure 13-28 on page 13-24) performs a stakeout of a line with offsets in the Horizontal and Vertical directions.

- **Start Point** – the starting point of the line. The line is defined by the azimuth, the azimuth to another point, or the the *End Point* of the line.
- **End Point/Azimuth** – the direction of the line set through either the azimuth of the line or the ending point of the line.
- **Ht Comp** – the type of height computations for the stakeout point.
  - *Ht of Start Pt* (height of starting point): the stakeout point has the same height as the starting point of the line.
  - *Interpolate Ht*: the height of the stakeout point will be computed through linear interpolation using the height of the

starting and ending points of the line (unavailable when the direction of the line is set through azimuth).

- *Num Subs* – designates the number of subdivisions you want to subdivide the line. For instance, a value of 3 indicates the stakeout of four points by subdividing the line into three equal segments.
- *Include Transition Point* – check mark and enable if the transition point should be included in spite of the station distance.
- *Start Sta* – the starting station (chainage) of the line.
- **Next** – opens the *Station & Offsets* screen (Figure 13-29 on page 13-25) (see “Station & Offsets” on page 13-25).
-  – opens the *Stakeout Parameters* screen (see “Stake Parameters” on page 3-50).

For details on the Help Icon menu in the upper-left corner of the screen, see “Points” on page 13-2. The menu options are the same for all the Offsets stakeout.

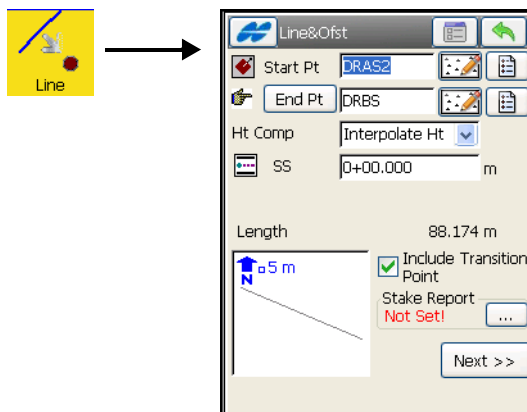


Figure 13-28. Stakeout Line & Offset

## Station & Offsets

The *Station & Offsets* screen (Figure 13-29) contains the settings for the stakeout stations with offsets from the line.

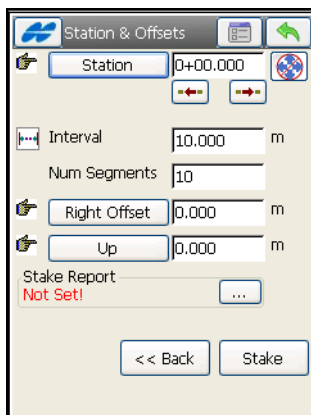





Figure 13-29. Stakeout

- **Station / Chainage** – the station or chainage along the line being staked. The two arrows below decrease or increase the station by the interval specified in the *Sta Interval* shown in the next line.
-   – retreats/advances the station by the specified Station Interval, for staking out the previous/next station, respectively. Stations before the beginning and past the end of the alignment can also be staked.
-  – uses the right/left arrow keys of the keyboard to increase or decrease the station.
- *Sta Interval* – sets the station staking interval.
- *Num Segments* – displays the calculated number of segments along the line according to the station interval which is set.
- **Right Offset/Left Offset** – the right or left offset of the stakeout point, with respect to the line at the station in the *Station* field.
- **Up/Down** – the *Up* or *Down Height* offset, with respect to the height of the line at the station.
- **Stake** – starts stakeout process.

## GPS+ Stakeout

The *Stake* screen (Figure 13-30) shows the north direction, and the relative position of the antenna and the target.

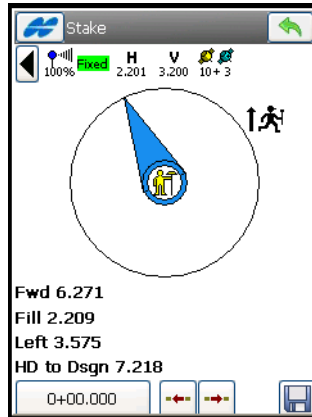





Figure 13-30. Stakeout

-  – retreat/advance the station by the specified Station Interval, for staking out the previous/next station, respectively. Stations before the beginning and past the end of the alignment can also be staked.
-  – saves the location. Check the parameters of the staked point in the *Store Point* screen (see “Store Point” on page 13-13).
-  – closes the screen and returns to the *Stake Line* screen.
- The Help Icon in the upper-left corner of the screen displays a pop-up menu of options that is the same for all the Offsets stakeout. For details, see “Points” on page 13-2. There is only one additional option allows performing *Real Time Stakeout*.

## TS Stakeout

The **Stake** screen (Figure 13-31) reflects the progress of the stakeout, displaying the current station (in the bottom-left corner of the screen), the layout of the target, and the current position, the necessary direction, and the values of the distances to the target.

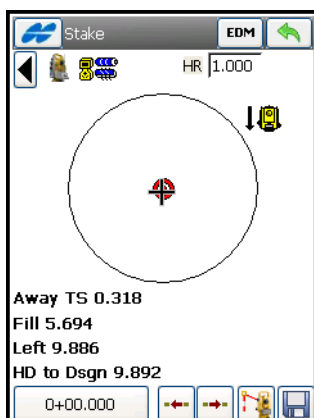






Figure 13-31. Stakeout

- **EDM** – selects distance measurement mode: either *Coarse*, *Fine*, or *Coarse Tracking*.
- **HR** – the height of the rod (target).
-  – retreats/advances the station by the specified Station Interval for staking. Stations before the beginning and past the end of the alignment can also be staked.
-  – takes a measurement and opens the **Store Point** screen to store the current position (see “Store Point” on page 13-13).
-  – causes a measurement to be made and displays the result on the screen.

-  – saves the changes and closes the screen.



Tapping in the current station string enables the floating information about the design point.

The Help Icon in the upper-left corner of the screen displays the pop-up menu of options that is the same for all the Offsets stakeout. For details, see “Points” on page 13-2. There is only one additional option allows performing *Real Time Stakeout*.

## Stakeout Intersections & Offsets

To stakeout Intersection & Offsets, tap the **Intersection** icon. The **2Line&Ofst** screen stakes out the intersection point of two lines parallel to two other lines at specified offsets (Figure 13-32). The first screen defines one line (Line 1) and the offset of the first parallel line. The second screen (Figure 13-33 on page 13-29) defines another line (Line 2) and the offset of the second parallel line. The intersection point of these two parallel lines defines the stakeout point.

The first screen contains parameters for Line 1.

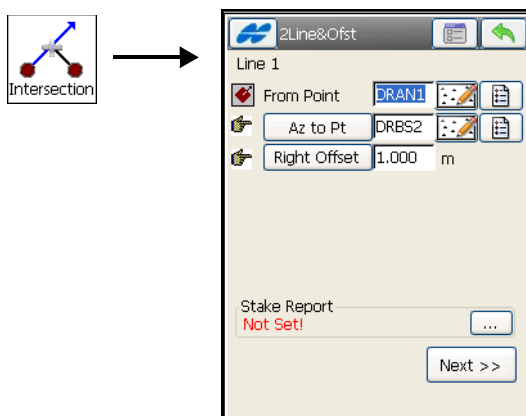



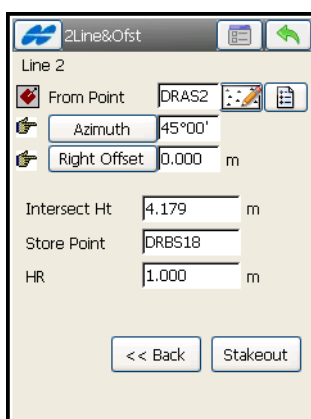
Figure 13-32. Intersection & Offsets – Line 1

- *From Point* – starting point of Line 1.



- **Az to Pt/Azimuth** – the direction of the line; set through the azimuth of the line, the azimuth from the start point to the point selected.
- **Right Offset/Left Offset** – the right or left offset of the stakeout point, with respect to the line.
- **Next** – opens the second *2Line&Ofst* screen (Figure 13-33 on page 13-29).
-  – opens the *Stakeout Parameters* screen (see “Stake Parameters” on page 3-50).

The second screen contains parameters of Line 2: a starting point, direction of the line and offset from the line (Figure 13-33 on page 13-29). After defining Line 2, this screen will show an intersection data.



2Line&Ofst

Line 2

From Point DRAS2

Azimuth 45°00'

Right Offset 0.000 m


Intersect Ht 4.179 m

Store Point DRBS18

HR 1.000 m


<< Back Stakeout

**Figure 13-33. Intersection & Offsets – Line 2**

- *Intersect Ht* – the height of the intersection point.
- *Store Point* – the name of the intersection point.
- *Ant Ht* (for GPS mode) – the height of the antenna.
- *HR* (for TS mode) – the height of the rod (target).
- **Stakeout** – opens the *Stakeout* screen.
-  – opens the *Stakeout Parameters* screen. See “Stake Parameters” on page 3-50.

## GPS+ Stakeout

The *Stake* screen (Figure 13-34 on page 13-30) reflects the progress of the stakeout, displaying the current point name (in the upper-left corner of the screen), the layout of the target and the current position, the direction, and the distance to the targets.

-  – saves the location. Check the parameters of the stored point in the *Store Point* screen (see “Store Point” on page 13-13).

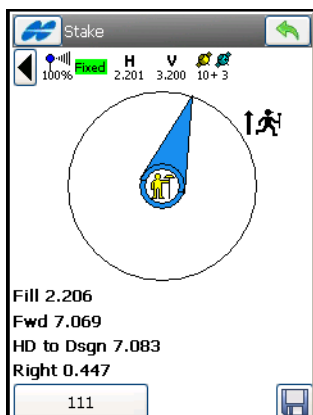





Figure 13-34. Stakeout

-  – returns to the *2Line&Ofst* screen (Figure 13-33 on page 13-29).

## TS Stakeout

The *Stake* screen (Figure 13-35) reflects the progress of the stakeout, displaying the current station (in the upper-left corner of the screen), the necessary direction, and the value of the distance to the targets.

-  – opens the *Store Point* screen to store the current position as a point (see “Store Point” on page 13-13).
-  – causes a measurement to be made and displays the result on the screen.

- **EDM** – selects distance measurement mode: either *Coarse*, *Fine*, or *Coarse Tracking*.
-  – saves the changes and closes the screen.

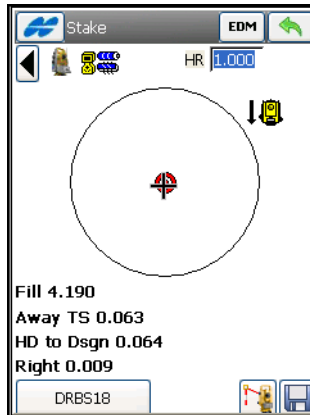


Figure 13-35. Stakeout

## Three Point Curve & Offsets

To stakeout a Three Point Curve and Offset, select the **3Pt Curve** icon (Figure 13-36).

The **3 Pt Curve** screen creates a curve by selecting three points: PC point, PT point and either any curve point or the RP point (see Figure 13-36 on page 13-32).

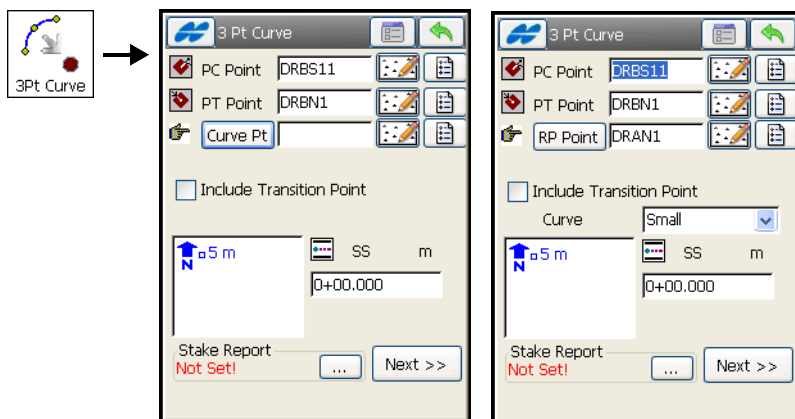



Figure 13-36. Three Point Curve

Enter either manually or select from the list or map the following sets of points:

- *PC Point, PT Point, Curve Point* – the starting PC (Point of Curvature) and ending PT (Point of Tangency) points on the circle, and a third point on the curve.
- *PC Point, PT Point, RP Point* – the starting PC (Point of Curvature) and ending PT (Point of Tangency) points on the circle, and the center point (also called as Radius Point).

For this set of points, the distance between the RP and PC should be equal to the distance between the RP and PT. The radius, and the PC/PT points, define two curves: one with delta less than or equal to  $180^\circ$  (small curve), the other with delta greater than or equal to  $180^\circ$  (large curve). The value of *Small* or *Large* can be selected from the **Curve** drop-down box to indicate which of these two curves should be used for staking.

- *Include Transition Point* – check mark and enable if the transition point should be included in spite of the station distance.
- *SS* – the starting station (chainage) of the line.
- **Next** – opens the *Station and Offset* screen (see “Station & Offsets” on page 13-25).

-  – opens the *Stakeout Parameters* screen (see “Stake Parameters” on page 3-50).

GPS and TS stakeouts are performed in the same way described in “Line & Offsets” on page 13-23.

## Curves & Offsets

To stakeout Curves & Offsets, select the **Curve** icon (Figure 13-37).

The *Curv&Ofst* screen (Figure 13-37) function performs a stakeout of a curve (section of an arc) at a specified horizontal and vertical offset from the curve.

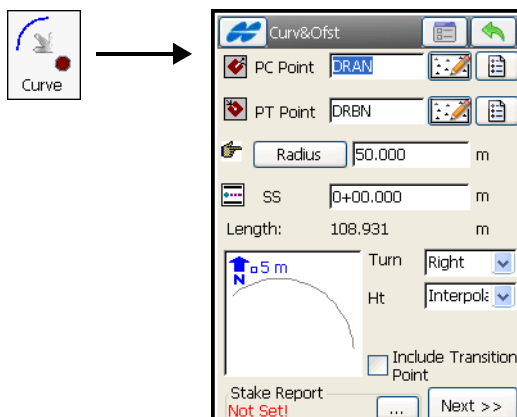



Figure 13-37. Stakeout Curve & Offset

- *PC Point* – the Point of Curve, the starting point of the arc.
- *PT Point* (Tangent Azi) – the azimuth of the *Tangent* of the curve (arc) at the PC point.
- **Radius/Deg Curve/Deg Chord** – the radius parameters of the curve.
- *Num Subs* – check and enable to designate the number of subdivisions you want to subdivide the line. For instance, a value of 3 indicates a calculation of four points by subdividing the line into three equal segments.

- *Include Transition Point* – check mark and enable if the transition point should be included in spite of the station distance.
- *Turn* – the direction of turn, relative to the PC Point.
- *Ht* – the type of height computations for the stakeout point.
  - *Ht of Start Pt* (height of starting point): the stakeout point has the same height as the starting point of the line.
  - *Interpolate Ht*: the height of the stakeout point will be computed through linear interpolation using the height of the starting and ending points of the line (unavailable when the direction of the line is set through azimuth).
- *SS* – the starting station (chainage) of the line.
- **Next** – opens the *Station and Offsets* screen (see “Station & Offsets” on page 13-25).
-  – opens the *Stakeout Parameters* screen (see “Stake Parameters” on page 3-50).

GPS and TS stakeouts are performed in the same way as described in “Line & Offsets” on page 13-23.

## Spiral & Offset

To stakeout Spirals & Offset, select the **Spiral** icon (Figure 13-38).

On the *Spiral&Offset* screen (Figure 13-38) you can stake points at specified *Horizontal* and *Vertical* offsets with respect to a specified spiral.

- *TS Point* – enter a *Tangent* to the *Spiral* point (the starting point of the spiral).
- *Tangent Azi* – the azimuth of the tangent to the spiral at the point TS.
- **Radius/Deg Chord/Deg Curve** – the radius parameter of the spiral at the ending point.
- **Length/Sp Const** – the length of the spiral at the ending point, or the *Spiral Constant* (the constant of the spiral).

- *SS* – the starting station (chainage) of the line.
- *Turn* – specifies whether the spiral turns right or left.
- *Include Transition Point* – check mark and enable if the transition point should be included in spite of the station distance.
- *Dir* – the direction of “moving”:
  - *TS -> SC*: Tangent Spiral->Spiral Circle. The incoming spiral to the internal circle.
  - *CS -> ST*: Circle Spiral->Spiral Tangent. The outgoing spiral from the circle to the Tangent.

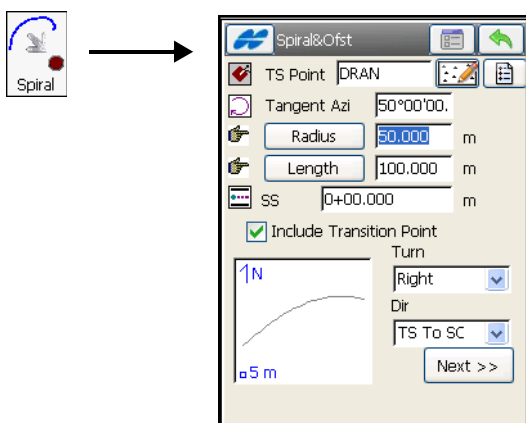




Figure 13-38. Stakeout Spiral & Offset

- **Next** – opens the *Station & Offsets* screen (see “Station & Offsets” on page 13-25).
-  – opens the *Stakeout Parameters* screen (see “Stake Parameters” on page 3-50).
-  – closes the screen without any settings being made.

GPS and TS stakeouts are performed in the same way as described in “Line & Offsets” on page 13-23.

# Digital Terrain Model Stakeout

To start the DTM (Digital Terrain Model) stakeout, select the **DTM** icon. The **DTM Stk** screen displays (Figure 13-39). You have to select a desired DTM file to show the graphic on the screen.

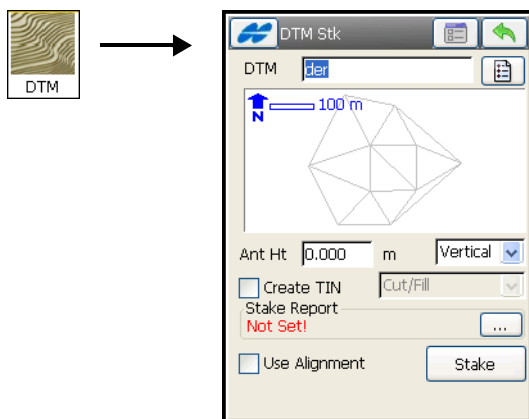




Figure 13-39. DTM Stakeout

- **DTM** – the name of the TN3 file, which is stored on disk.
-  – opens the **Open DTM** screen to select the desired file (Figure 13-40 on page 13-37).
- **Ant Ht** and **m** (for GPS+ stakeout) – the antenna height and method of height measurement.
- **Use Alignment** – check mark and enable to report stations and offsets.
- **Create TIN** – check mark and enable to generate a TIN (TN3) cut/sheet model.
- **HR** – for TS stakeout, the height of reflector.
-  – closes the screen without any settings being made.
- **Stake** – opens a warning about the DTM area (see Figure 13-41 on page 13-38).

For details on the Help Icon menu in the upper-left corner of the screen, see “Points” on page 13-2.



## Open DTM

On the *Open DTM* screen (Figure 13-40), select a surface file to open.

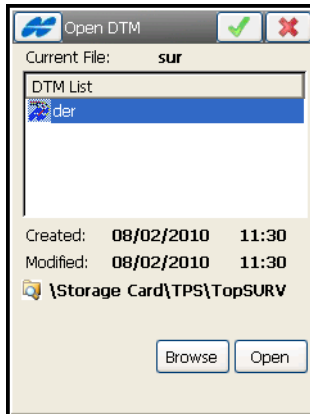


Figure 13-40. Open DTM

- *Current File* – displays the file that is currently open.
- *DTM List* – lists all surface files in the DTM directory on the controller.
- **Browse** – searches for the file on disk.
- **Open** – opens the selected file in the *DTM Stk* screen with the graphic displayed (Figure 13-39 on page 13-36).

## DTM Area

A stakeout point must be located on the inside of the DTM. When opening the DTM file selected, TopSURV displays a warning about the minimum and maximum values of coordinates in the area covered by the DTM. Tap **Close** to open the *Stake* screen.



If a stakeout point is located on the outside of the DTM for the job, TopSURV neither calculates nor writes the coordinates of this point.

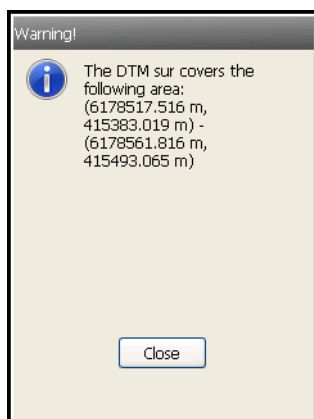


Figure 13-41. DTM Area

## GPS+ Stakeout

The *Stake(out)* screen (Figure 13-42) shows the relative position of the antenna. The current DTM name displays in the bottom-left corner of the screen.

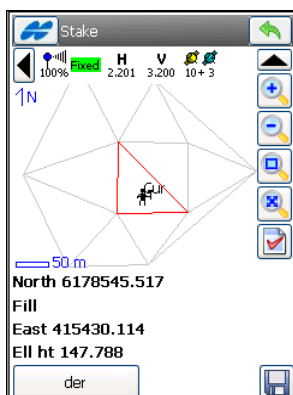



Figure 13-42. Stakeout -DTM

-  – saves the location. Check the parameters of the stored point in the *Store Point* screen.

For details on the Help Icon menu in the upper-left corner of the screen, see “Points” on page 13-2.

## TS Stakeout

The *Stake(out)* screen (Figure 13-43) reflects the relative position of the target.

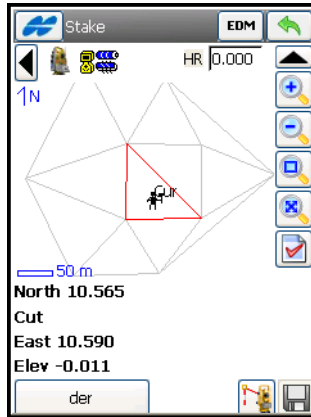





Figure 13-43. Stakeout (TS)

- **EDM** – selects distance measurement mode: either *Coarse*, *Fine*, or *Coarse Tracking*.
-  – saves the location. Check the parameters of the stored point in the *Store Point* screen.
-  – causes a measurement to be made and displays the result on the screen.
-  – saves the changes and closes the screen.

The Help Icon in the upper-left corner displays the pop-up menu that contains the same options as in the **Points** stakeout.

## Point in Direction

To perform the Point and Direction stakeout, select the **Point in Direction** icon (Figure 13-44).

On the **Point in Dir** screen (Figure 13-44) you can stakeout a point using a known point, the azimuth, and the offsets from the azimuth line.

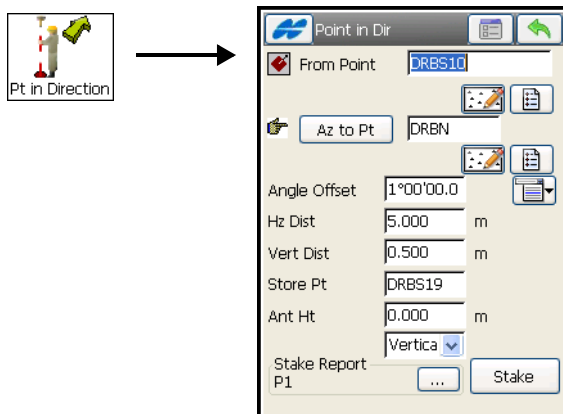




Figure 13-44. Stakeout Point & Direction

- *From Point* – the starting point. Enter the name manually or select a name either from the list or from the map.
- *Az to Pt* – the azimuth can be set by value or as the direction to another known point.
- *Angle Offset* – the angle offset from the azimuth line.
- *Hz Dist* – the distance offset along the angle offset line.
- *Vert Dist* – the height offset.
- *Store Pt* – enter a point in this field to store the computed point to the data set.
- *Ant Ht* (for the GPS mode) – sets the height of the antenna reference point (ARP) above the mark. Also, specifies the measurement type: either *slant* or *vertical*.
- *HR* (for the TS mode) – the height of the rod (target).

- **Stake** – opens the *Stakeout* screen to perform the stakeout.
-  – opens the *Stakeout Parameters* screen (see “Stakeout Parameters” on page 3-74).
-  – saves the changes and closes the screen.

See the Points stakeout for a description on the options that display by the Help Icon in the upper-left corner of the screen.

## GPS+ Stakeout

The *Stake* screen (Figure 13-45 on page 13-41) shows the status of the stakeout, displaying the current point name (in the bottom-left corner of the screen), the layout of the target and the current position, the direction, and the values of the distances to the target.

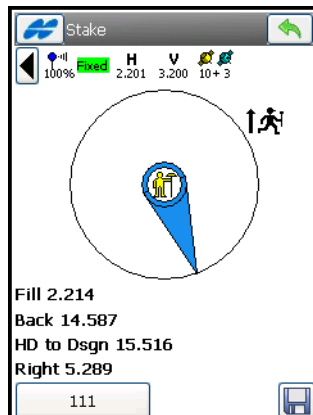







Figure 13-45. Point in Direction – Stakeout

-  – performs the measurement and opens the *Store Point* screen to store the current position as a point.
-  – saves the changes and closes the screen.

## TS Stakeout

The *Stakeout* screen (Figure 13-46 on page 13-42) reflects the progress of the stakeout, displaying the current point name (in the upper-left corner of the screen), the layout of the target and current position, the necessary direction, and the values of the distances to the target.

- **EDM** – sets the distance measurement mode: either *Coarse*, *Fine*, or *Coarse Tracking*.
-  – closes the screen.
-  – opens the **Store Point** screen to store the current position as a point (see “Store Point” on page 13-13).
-  – causes a measurement to be made and displays the result on the screen.

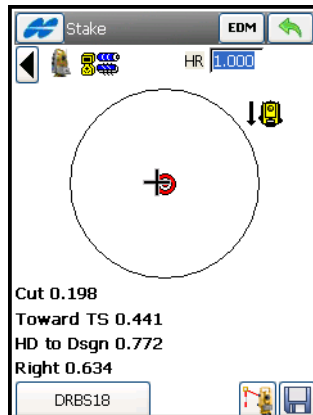


Figure 13-46. Point in Direction – Stakeout

The Help Icon in the upper-left corner displays the pop-up menu that contains the same options as in the Points stakeout.

# Point List

To stakeout points from a list, select the **Point List** icon (Figure 13-47 on page 13-43).

The stakeout of points from the list can be enabled from the Main View (see “Actions on the Map” on page 15-4). Select the linework, press and hold your stylus. The *Stakeout Vertices* item from the pop-up menu appears.

The **Point List** screen (Figure 13-47) performs a stakeout of existing points from a point list, selects the starting stakeout point, and lists stakeouts in direct or reverse order.

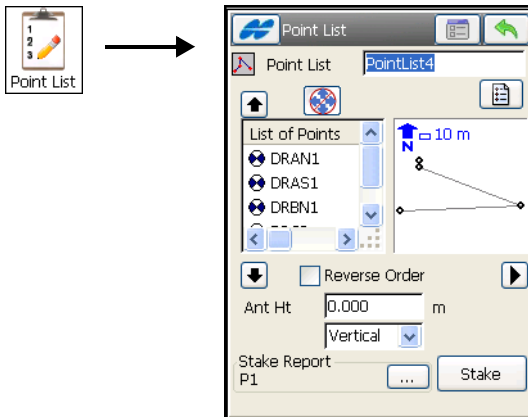




Figure 13-47. Stakeout Point List

- *Point List* – the name of preexisting points list: either select from the list or enter manually.
- *List of Points* – the list of points.
- Up and down arrows moves the highlighted point(s) up and down in the order of the points.
-  – if activated, uses the up/down arrows on the keyboard to move the highlighted point up and down.
-  – closes the scheme of the polygon. Only the list of points are available.

- *Ant Ht* (for GPS mode) – sets the height of the antenna reference point (ARP) above the mark. Also, specifies the measurement type for the height: either *slant* or *vertical*.
- *HR* (for the TS mode) – the height of the rod (target).
- *Reverse Order* – check mark and enable to start a stakeout from the end of the Point List.
- **Stake** – opens the *Stake* screen.

See the Points stakeout for a description of the options on the Help Icon in the upper-left corner of the screen.

## Stakeout (GPS and TS)

GPS and TS stakeouts are performed in the same way as described in “Stakeout Point” on page 13-2.

The Help Icon in the upper-left corner displays the pop-up menu that contains the same options as in the Points stakeout.

## Digital Level Stakeout

DL Stakeout of point lists can be accessed from both the Stakeout menu of DL job and the top-left menu icon in the Level Run screen (for details, see “Level Run” on page 12-2).

The level *Stake Point List* screen (Figure 13-48 on page 13-45) selects a list of design points to determine the elevation and compute a cut/fill value at every point on the list.

- *BS Point* – the backsight point for the stake measurement (either enter manually or select from the map or list).
- *Point List* – the point list point to stake (either enter manually or select from the list). The point list is displayed in the tab and in the plot.
- *Reverse Order* – stakes in reverse order of the point list.
- **BS** – if not already measured, takes a backsight measurement before staking.



- **Stakeout** – opens the level *Stakeout* screen for every point of the list (see Figure 13-21 on page 13-19).

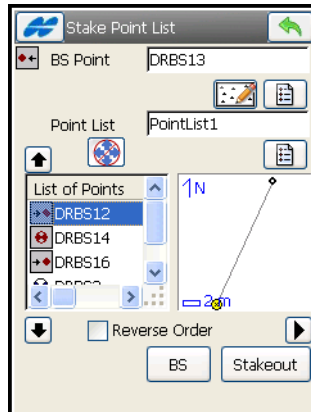


Figure 13-48. DL Stake Point List

## DL Stakeout of Elevations

The DL Stakeout of elevations can be accessed from the main menu by selecting the **Elevation** icon (Figure 13-49) or from top-left menu in the Level Run screen (for details, see “Level Run” on page 12-2).

On the *Stakeout Elev* screen (Figure 13-49), select a backsight point and the elevation to determine.

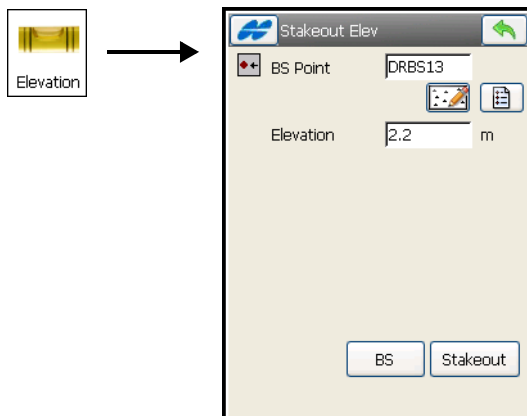


Figure 13-49. Stakeout Elevation

- **BS** – if not already measured, takes a BS measurement before staking.
- **Stakeout** – opens the level *Stakeout* screen for the elevation you want.

## Stakeout

The level *Stakeout* screen (Figure 13-21) displays the design point and elevation.

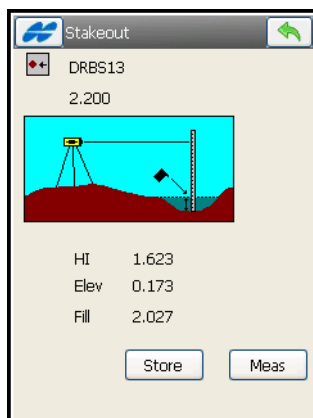


Figure 13-50. DL Stakeout Elevation

- **Meas** – measures the elevation and computes a cut/fill value.
- **Store** – opens the *Store Point* screen to save the staked out point.

## Curve

To stakeout along a horizontal curve, select the **Curve** icon. The **Curve** screen displays (Figure 13-51) to select two points of the curve.

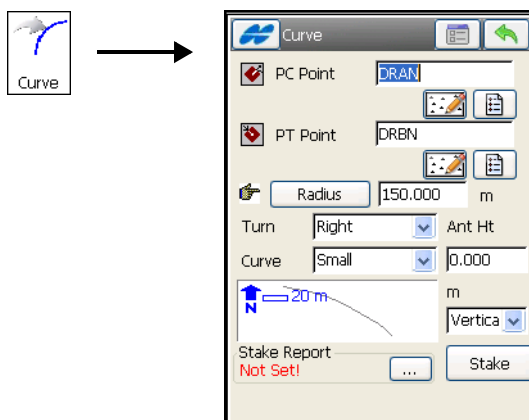



Figure 13-51. Curve

- **PC Point, PT Point** – manually enter or select from the list or the map the starting PC (*Point of Curvature*) and ending PT (*Point of Tangency*) points on the circle.
- **Radius/Deg Chord/Deg Curve** – the radius parameter of the curve at the ending point.
- **Turn** – specifies whether the curve turns right or left.

The radius, and the PC/PT points, define two curves: one with delta less than or equal to  $180^\circ$  (small curve), the other with delta greater than or equal to  $180^\circ$  (large curve). The value of *Small* or *Large* can be selected from the **Curve** drop-down box to indicate which of these two curves should be used for staking.

- **Antenna** (for GPS+) – the antenna height.
- **HR** (for TS) – the rod (target) height.

- **Stake** – opens the *Stakeout Curve* screen.
-  – opens the *Stakeout Parameters* screen (see “Stake Parameters” on page 3-50).

The Help Icon in the upper-left hand corner displays the same pop-up menu as for the Points stakeout, see “Points” on page 13-2.

## GPS+ Stakeout

The *Stake Point* screen (Figure 13-52) shows the GPS antenna position graphically and display the distance along the curve and offset values.

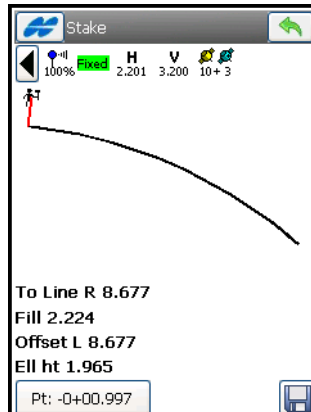






Figure 13-52. Stakeout Curve

-  – saves the location. Check the parameters of the stored point in the *Add/Edit point* screen.
-  – closes the screen and returns to the *Stakeout Line* screen.

## TS Stakeout

The *Stake Point* screen (Figure 13-53) displays the rod position graphically and reports the necessary direction, and the values of the distances to the curve.

- **EDM** – selects distance measurement mode: either *Coarse*, *Fine*, or *Coarse Tracking*.

-  – causes a measurement to be made and displays the result.
-  – takes a measurement and opens the **Store Point** screen to store the current position as a point (see “Store Point” on page 13-13).

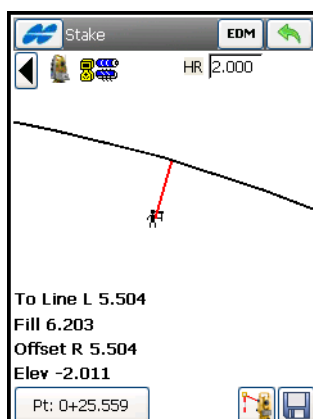
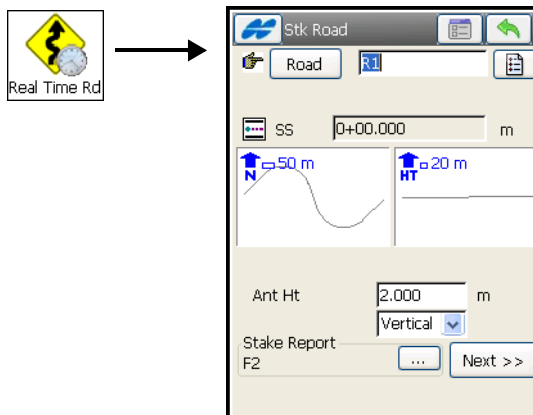


Figure 13-53. Stakeout

## Real Time Road

To start the road stakeout in real time, select the **Real Time Rd** icon (Figure 13-54). The **Stakeout Road** screen displays.

The **Stk Road** screen (Figure 13-54) selects a road for stakeout and displays the plan of the chosen road.



**Figure 13-54. Stakeout Road**

- **Road/H Alnt/HV Alnt** – the road, horizontal alignment, and horizontal/vertical alignments to be staked-out. Can be entered manually or chosen from the list.
- **SS (Start Stn)** – the starting point of the stakeout, the distance from the beginning of the road.
- **Ant Ht** (for GPS+) – the antenna height and the measurement type, *Slope* or *Vertical*.
- **HR** (for TS) – the rod (target) height.
- **Stake Report** – below shows the name of the report or tells that it is *not set!* Pressing the [...] button opens the dialog to set a stake report. For details on setting reports, see “Stake Reports” on page 3-105.
- [Icon] – opens the **Stakeout Parameters** screen (see “Stakeout Parameters” on page 3-74).
- [Icon] – saves the changes and closes the screen.
- The Help Icon in the upper-left hand corner displays the same pop-up menu as for Points stakeout. For details, see “Points” on page 13-2.

- **Next** – opens another *Stk Road* screen (Figure 13-55) to view the road cross-section at the station.

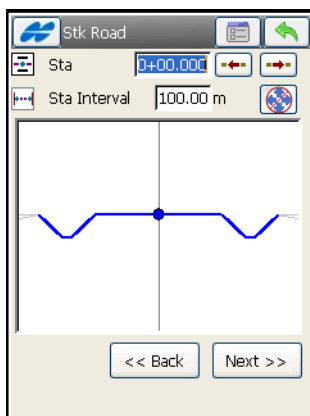


Figure 13-55. Road Surface

- **Next** – opens another *Stk Road* screen (Figure 13-56) to enter / change *Cut/Fill Slope* parameters.

	Left	Right
Cut	0.000	0.000
Fill	-5.000	-5.000

<input checked="" type="checkbox"/> Cut	1.000
<input checked="" type="checkbox"/> Fill	2.000

Figure 13-56. Stakeout Road – Cut/Fill

- **Stakeout** – opens the *Stake* screen.

The *Stake* screen reports the cut/fill values computed for the current observed point. The design elevation of the road is automatically calculated for the observed point, using the alignment and templates.

## GPS+ Stakeout

The *Stake* screen shows the relative position of CL and GPS antenna.

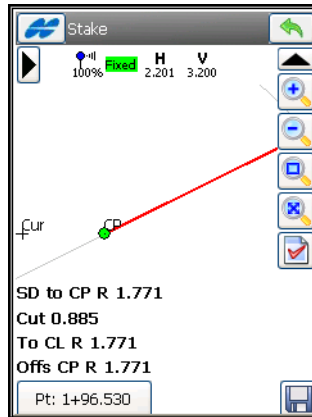


Figure 13-57. Stakeout

## TS Stakeout

The *Stakeout* screen reflects the relative position of CL and the target.

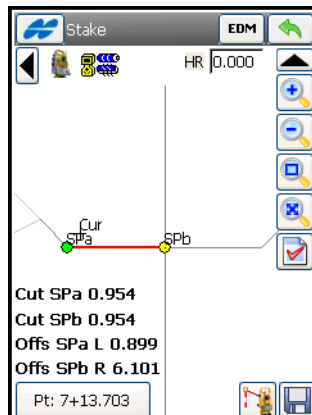


Figure 13-58. Stakeout Real Time Road

The Help Icon in the upper-left corner of the GPS and TS *Stake* screen displays the same pop-up menu as for Points stakeout. For details, see “Points” on page 13-2. But there are two additional options for Real Time Road stakeout:



- *Set References*: opens the **Set References** screen to select references, surfaces or segment points, for additional reporting options. See “Set References” on page 13-58.
- *Initial Point Name*: opens a screen to set Initial Point Name for stakeout. See “Initial Point Name” on page 13-59.

## Road

To start the Road stakeout, select the **Road** icon (Figure 13-60). The **Roads** screen displays.

The **Roads** screen selects the road for stakeout and displays the plan of the chosen road.

Pressing the ok  button opens the **Stakeout Road** screen.

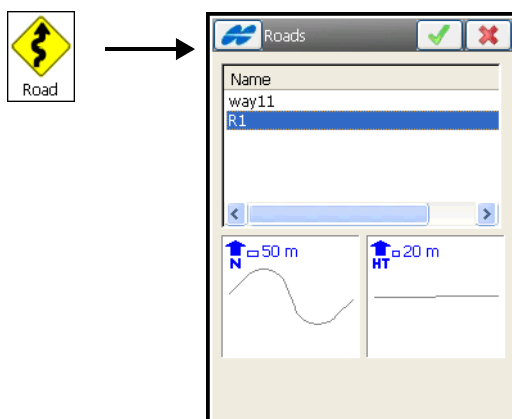
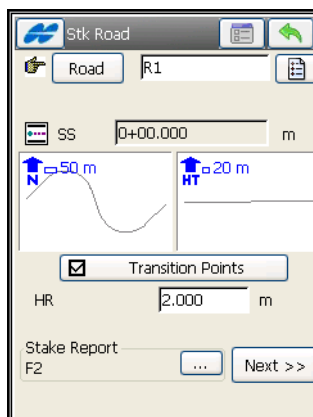


Figure 13-59. Select Road

- The *Stk Road* screen (Figure 13-60) set the starting station to begin stakeout.



**Figure 13-60. Stakeout Road**

- **Road/H Alnt/HV Alnt** – the road, horizontal alignment, and horizontal/vertical alignments to be staked-out. Can be entered manually or chosen from the list.
- **SS** (Start Station) – the starting point of the stakeout, the distance from the beginning of the road.
- **Ant Ht** (for GPS+) – the antenna height and measurement type.
- **HR** (for TS) – the rod (target) height.

- *Transition Points* – checking this box opens the *Transition Points* screen to select types of transition points to be included, in spite of the station distance (Figure 13-61).

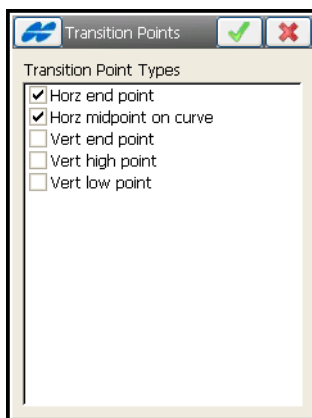






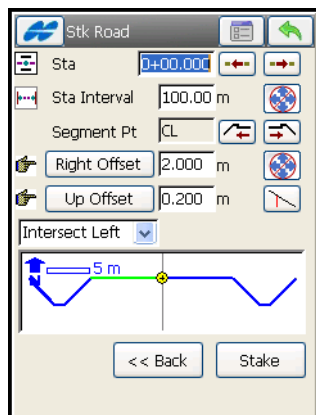
Figure 13-61. Transition Points

-  – opens the *Stake Parameters* screen (see “Stake Parameters” on page 3-50).
- **Next** – opens the second *Stk Road* screen.
-  – saves the settings and closes the screen.


The Help Icon in the upper-left corner displays the same pop-up menu as the *Line & Offsets* screen (see “Line & Offsets” on page 13-23).






The second *Stk Road* screen (Figure 13-62) displays the properties of the cross section on the stakeout station and performs the stakeout of all selected points.

- *Station* – the station where the stakeout is performed. The arrow buttons change the station number by the value of Station Interval.
-   – advances the station by the specified Station Interval for staking out points at the Next station.
- *Sta Interval* – the interval of the station increment.



**Figure 13-62. Stakeout Road**

- *Segment Pt* – the hinge point of the current segment. The arrow icons  next to this field moves the current segment point along the cross-section. The result displays on the scheme at the bottom of the screen.
- *Right/Left Offset* – the horizontal offset from the current segment point.
- *Up/Down Offset* – the vertical offset from the current segment point.
- Select the type of template offsets:
  - *Centerline*: both the horizontal and vertical offset starts at the centerline.
  - *Intersect Left*: the vertical offset starts at the segment point; the horizontal offset starts at the point of intersection of the line parallel to the left segment with the cross-section.
  - *Intersect Right*: the vertical offset starts at the segment point; the horizontal offset starts at the point of intersection of the line parallel to the right segment with the cross-section.
  - *Segment*: the horizontal offset starts at the beginning of the segment; the vertical offset starts at the centerline.

- *Surface Left*: the horizontal left offset starts at the beginning of the segment; the vertical offset starts at the point on the surface of the segment that corresponds with the horizontal offset.
- *Surface Right*: the horizontal right offset starts at the beginning of the segment; the vertical offset starts at the point on the surface of the segment that corresponds with the horizontal offset.
-  /  – available when *Intersect Left or Right* is selected; toggles between the vertical offset and offset perpendicular to the current segment.
-  – switches on/off the arrow keys on the keyboard. The upper button stands for the station increment/decrement, the lower button stands for the current segment point location. Only one button can be enabled at a time.
- **Stake** – opens the *Stake* screen.
-  – opens the *Stakeout Parameters* screen (see “Stake Parameters” on page 3-50).
-  – saves the settings and closes the screen.

The Help Icon in the upper-left corner of the GPS and TS *Stake* screen displays the same pop-up menu as for Points stakeout. For details, see “Points” on page 13-2. But there are three additional options for Road stakeout:

- *Real Time Stakeout*: allows performing stakeout in real time.
- *Set References*: opens the **Set References** screen to select references, surfaces or segment points, for additional reporting options. See “Set References” on page 13-58.
- *Initial Point Name*: opens a screen to set Initial Point Name for stakeout. See “Initial Point Name” on page 13-59.

# Set References

The *Set References* screen allows selecting references, surfaces or segment points, for additional reporting options.

- Tap desired surfaces or points to highlight them in green.

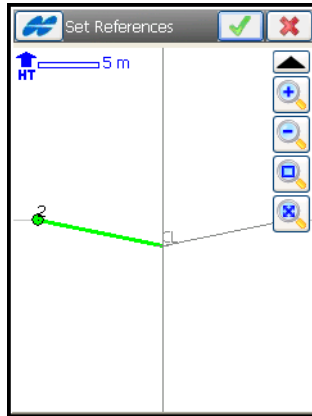




Figure 13-63. Set References

- Clicking the ok  button returns to the *Stake* screen (see Figure 13-57 on page 13-52).
- The  button on the *Stake* screen opens the *Data* tab on the *Store Point* dialog before saving positions as points.

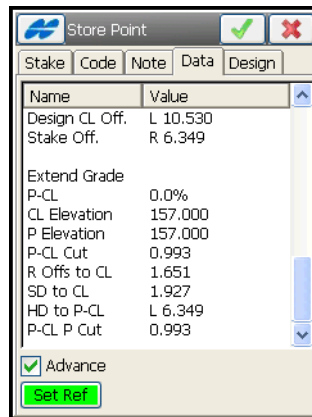




Figure 13-64. Store Point

- The **Set Ref** button opens the *Set Reference* map to view/edit the references (Figure 13-63 on page 13-58). The green **Set Ref** button means that the references are already defined.
- Clicking the ok  button on the *Store Point* screen saves the point and reporting data to the stake report, if available.

## Initial Point Name

The *Init Pt Name* screen specifies the name of the first point and sets a value for increment/decrement of names of points calculated for the stakeout task.

Clicking the ok  button returns to the *Stake* screen.

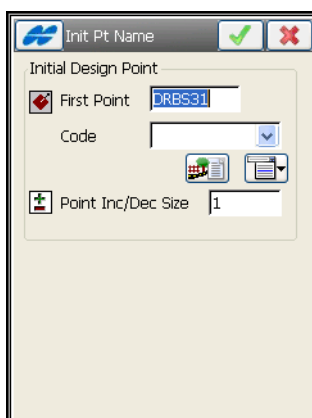


Figure 13-65. Initial Point Name

## Slope

To start the slope stakeout, select the **Slope** icon. The *Stk Slope* screen displays (see Figure 13-66 on page 13-60).

The *Stk Slope* screen selects on which alignment the slope should be staked out.

- **Road/H Alnt/HV Alnt** – the road, horizontal alignment, horizontal/vertical alignments to be staked-out. Can be entered manually or chosen from the list.

- *SS (Start Stn)* – the starting point of the stakeout, the distance from the beginning of the road.
- *Ant Ht* (for GPS+) – the antenna height.
- *HR* (for TS) – the rod height.
- *Transition Points* – checking this box opens the **Transition Points** screen to select types of transition points to be included, in spite of the station distance (Figure 13-61 on page 13-55).

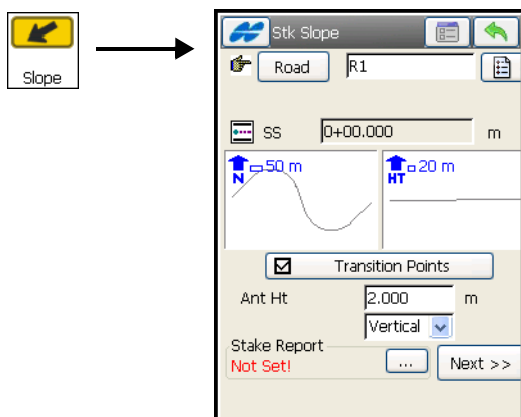


Figure 13-66. Select Alignment

- **Next** – opens another *Stake Slope* screen.

The Help Icon in the upper-left corner displays the same pop-up menu as the **Line & Offsets** screen (see “Line & Offsets” on page 13-23).

The second **Stk Slope** screen (Figure 13-66) allows setting the hinge point and offsets to the hinge point.

- *Sta* – the station where the stakeout is performed. The arrow buttons change the station number on the *Station Interval*.
- *Sta Interval* – the interval of the station increment.
- *Hinge Point* – allows stakeout of a slope at any point in the cross-section. The arrows in this field move the hinge point along the cross section. This is reflected on the scheme in the bottom of this screen.
- *Right/Left Offset* – the horizontal offset from the current hinge point.



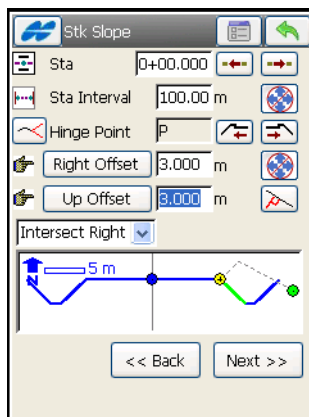




Figure 13-67. Stakeout Settings

- *Up/Down Offset* – the vertical offset from the current hinge point.
-  /  – available when *Intersect Left or Right* is selected; toggles between the vertical offset and offset perpendicular to the current segment.
- Select the type of template offsets:
  - *Auto*: automatically set the last template point (without offsets).
  - *Intersect Left*: the vertical offset starts at the hinge point; the horizontal offset starts at the point of intersection of the line parallel to the left segment with the cross-section.
  - *Intersect Right*: the vertical offset starts at the hinge point; the horizontal offset starts at the point of intersection of the line parallel to the right segment with the cross-section.
  - *Segment*: the horizontal offset starts at the beginning of the segment; the vertical offset starts at the centerline.
  - *Surface Left*: the horizontal left offset starts at the beginning of the segment; the vertical offset starts at the point on the surface of the segment that corresponds with the horizontal offset.

– *Surface Right*: the horizontal right offset starts at the beginning of the segment; the vertical offset starts at the point on the surface of the segment that corresponds with the horizontal offset.

- **Next** – opens another *Stake Slope* screen.

This third *Stk Slope* screen (Figure 13-68) allows editing cut/fill slope to stake.

	Left	Right
Cut	0.000	0.000
Fill	-5.000	-5.000

☐ Enter Slopes

☐ Cut

☐ Fill

  >

**Figure 13-68. Set Cut/Fill Slope**

- **Stakeout** – opens the *Stake* screen to stakeout the catch point (the point where the slope crosses the surface of the terrain).

The Help Icon in the upper-left corner of the GPS and TS *Stake* screen displays the same pop-up menu as for Roads stakeout. For details, see “Road” on page 13-53.

The *Store Point* dialog (Figure 13-64 on page 13-58) has an additional option to select offset to catch point.

Check mark the *Stk Offset Pt* box to enable setting an offset to the catch point (Figure 13-69).

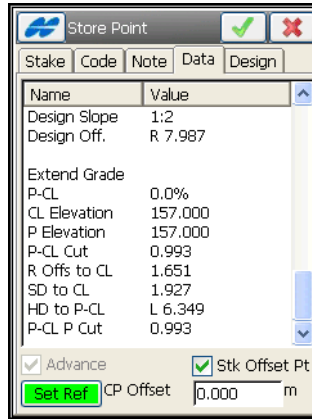


Figure 13-69. Store Staked Point for Slope

# Linework

To start a Linework stakeout, select the **Linework** icon. The *Linework* screen displays (Figure 13-70).

- **Code/Linework** – toggles through two linework selections:
  - **Code:** allows linework selection by CodeString.

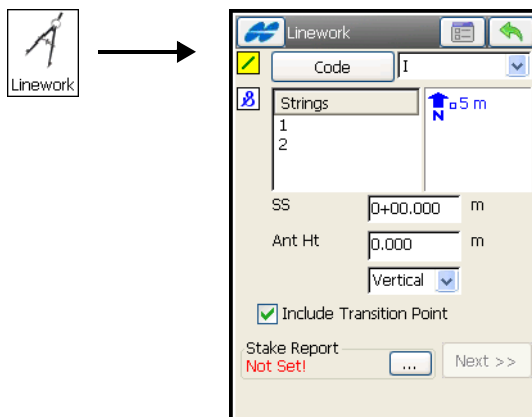
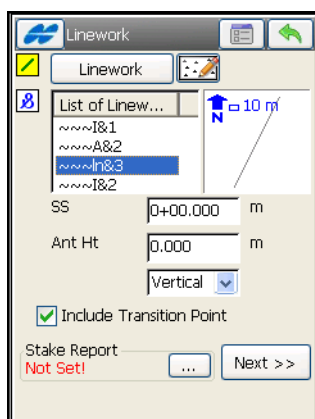


Figure 13-70. Linework Selected by Code

- **Linework**: allows linework selection from the job lineworks (listed in the dialog) or a polyline selected from the Map.



**Figure 13-71. Linework Selection**

If the line is a background line, copy the line to the job, update the list of lineworks and select it in the list.

- *SS (Start Station)* – the starting point of the stakeout, the distance from the beginning of the road.
- *Ant Ht* (for GPS+) – the antenna height and measurement type.
- *HR* (for TS) – the rod height.
- *Include Transition Point* – check mark and enable if the transition point should be included in spite of the station distance.
- **Next** – opens the *Station & Offsets* screen to set offsets for stakeout.

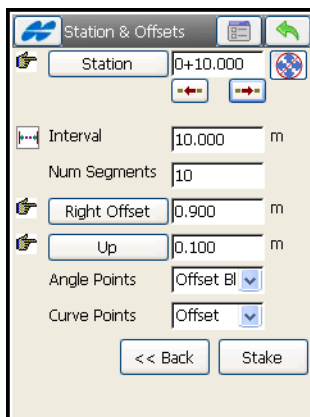







Figure 13-72. Station Stakeout

- **Station/Real Time** – toggles through station stakeout and stakeout in real time mode.
-   –left/right arrows decreases/increases the distance by the station staking interval shown in the next line.
-  – uses the right/left arrow keys of the keyboard to increase or decrease the station.
- **Interval** – sets the station staking interval.
- **Num Segments** – displays the calculated number of segments along the line according to the station interval which is set.
- **Right Offset/Left Offset** – the right or left offset of the stakeout point, with respect to the line at the station shown in the *Station* field.
- **Up/Down** – the *Up* or *Down Height* offset, with respect to the height of the line at the station.
- **Angle Points** – this option allows the user to stake one of the three possible offset locations when they stakeout to an angle point:
  - *Offset Bk*: the stake location will be on the (back) segment before the angle point.

- *Offset Ahd*: the stake location will be on the (ahead) segment after the angle point.
- *Bisector*: when bisector is selected, the proposed stake location will be on the bisectrix of the angle at the computed offset from the angle point.
- **Curve Points** – this option allows the user to stake one of the four possible locations when they stakeout to a curve point:
  - *Offset*: the stake location will be on the curve at the offset distance from the curve point.
  - *RP*: the radius point.
  - *PI*: the point of intersection of tangents to the curve drawn at the start and end curve points.
  - *MOC*: the point in the middle of the curve.
- **Stake** – starts stakeout process.
-  – opens the *Stakeout Parameters* screen (see “Stake Parameters” on page 3-50).
-  – saves the changes and closes the screen.

The Help Icon in the upper-left corner displays the same pop-up menu as the *Line & Offsets* screen (see “Line & Offsets” on page 13-23).

# COGO Calculations

To calculate a COGO task, tap on the **COGO** icon in the main menu. The COGO menu (Figure 14-1 on page 14-1) allows calculation of the following tasks:

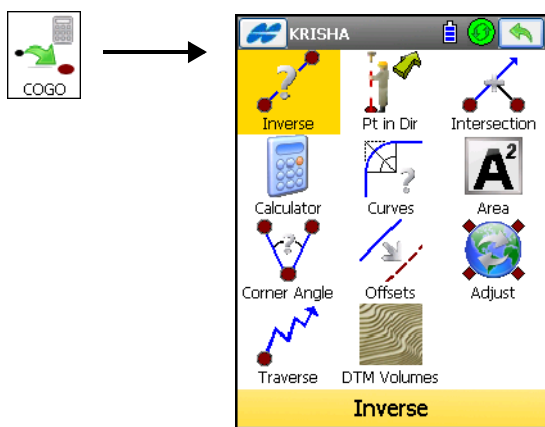



Figure 14-1. Cogo Menu



If the menu options you need are not visible (available), tap on the **Configure/Menus** icons to enable these options in the *Config Menus* screen.

The Help Icon  opens a pop-up menu giving access to the help files, module activation codes, port data logging, changing menu interface, and information about the TopSURV used (for detail see “Help Icon’s Pop-up Menu” on page 1-9).



The icon in the upper-left corner of every COGO screen displays graphically the task being performed. Tap this bitmap to open the greater map. Tap the screen area to hide it.

# Inverse

Tap the **Inverse** icon to access the Inverse menu for various inverse solutions: Point To Point, Point To Line, and Point To List (Figure 14-2).

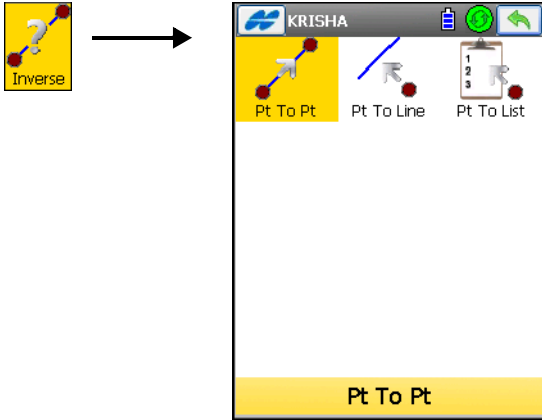


Figure 14-2. Inverse Menu

## Point to Point

To calculate the Point-to-Point Inverse, tap the **Pt To Pt** icon. The *Two-Point Inverse* screen displays (Figure 14-3).

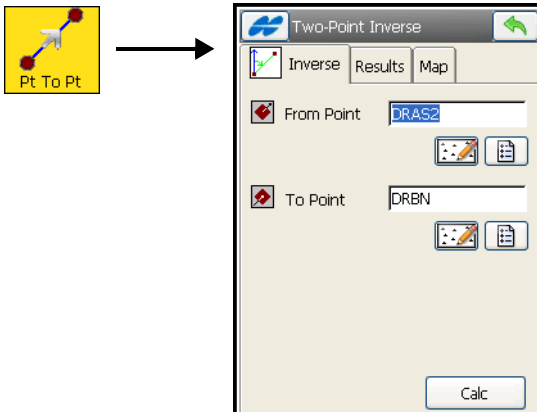


Figure 14-3. Two-Point Inverse



On the **Two-Point Inverse** screen, compute the inverse between two known points. Inverse is comprised of the azimuth from one point to the other and the distance between these points.

The **Inverse** tab contains initial data for the following parameters:

- **From Point** – the first point name; either enter manually or select from the map or from the list.
- **To Point** – the second point name; either enter manually or select from the map or from the list.
- **Calc** – calculates the inverse.

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing two items:

- **Edit Points** – opens the **Points** screen (see “Points” on page 6-3).
- **Help** – accesses the Help files. This item is common for all screens.

The **Results** tab shows the initial data (**From Point**, **To Point**) and the results of the calculation (Figure 14-4). The results can vary, based on whether a geodesic display system is selected or not.

When **Grid** or **Ground** is the selected display system, the results tab lists the following parameters (Figure 14-4).

The screenshot shows a software window titled "Two-Point Inverse" with three tabs: "Inverse", "Results", and "Map". The "Results" tab is active, displaying a list of parameters and their values:

From Point	DRAS2
To Point	DRBN
Azimuth	110°44'16"
HDist	86.480 m
dNorth	-30.622 m
dEast	80.877 m
dHeight	0.014 m
Grade(Slope)	0.02 %
Slope distance	86.480 m

At the bottom of the results list is a horizontal scroll bar.

Figure 14-4. Two-Point Inverse – Results in Non-Geodesic Display System

- **Azimuth** (or **Bearing**) – to the second point from the first point.

- *HDist* (Horizontal Distance)/*VDist* (Vertical distance) – from one point to another (Horiz). The “-” sign means that the height of the second point is lower than the height of the first point (Vert).
- *dNorth* – the increment of the North coordinate.
- *dEast* – the increment of the East coordinate.
- *dHeight* – the increment of the height.
- *Grade(Slope)* – the increment of the height in percent.
- *Slope distance* – the computed distance between two points.

When selecting a geodesic system, the following parameters display (Figure 14-5):

- *Forward Azimuth* – the forward geodesic azimuth.
- *Backward Azimuth* – the backward geodesic azimuth.
- *Geodesic Dist* – the shortest distance between two points on an ellipsoid.
- *Ground Dist From* – the horizontal distance on the geodetic horizon plane, at the height of the *From Point*.
- *Ground Dist To* – the horizontal distance on the geodetic horizon plane, at the height of the *To Point*.
- *Delta Ell ht* – the difference in ellipsoidal heights.

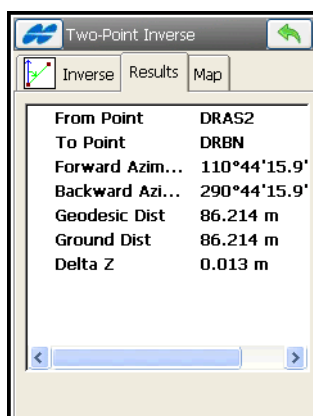


Figure 14-5. Two-Point Inverse – Results in Geodesic Display System

The *Map* tab shows the illustration for the results (Figure 14-6).

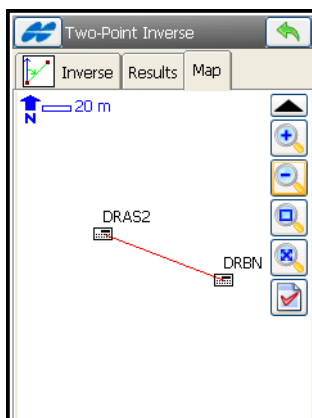


Figure 14-6. Two-Point Inverse – Map

For a description of the icons to the right, see “Toolbar” on page 15-2

## Point to Line

To calculate the station of the known point inverse to the known line, select the **Point to Line** icon. The *Inverse Point to Line* screen displays (Figure 14-7).

On the *Inverse Point to Line* tab, enter the following parameters.

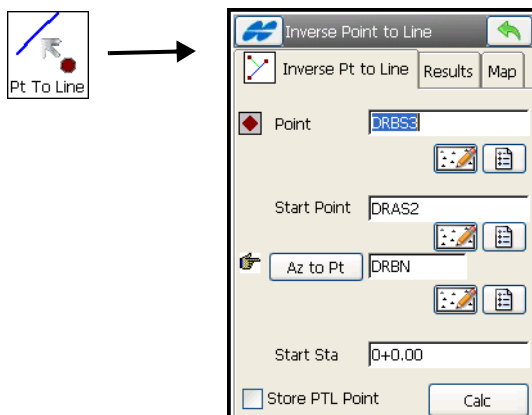


Figure 14-7. Inverse Point to Line

- *Point* – sets the current point name: either enter manually, or select from the map or from the list.
- *Start Point* – the starting point of the reference line.
- **Azimuth/Az to Pt** – sets the azimuth of the reference line. Rotates through selections when tapped.
  - **Azimuth:** sets the azimuth from the starting point by value.
  - **Az to Pt:** sets another known point to which the direction is calculated and input as azimuth.
- *Start Sta* – the starting station of the reference line.
- *Store PTL Point* – stores the point as PTL point (see “PTL Mode” on page 11-8).
- **Calc** – calculates the inverse and displays the results on the *Results* tab.

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing the item:

- *Edit Points* – opens the **Points** screen to edit the points (see “Points” on page 6-3).

The *Results* tab (Figure 14-8) shows the initial data and the results of the calculation: *Station*, *Offset*, and *Height* parameters.

From Point	DRBS3
Line	
Start Point	DRAS2
Azimuth	110°44'16"
Start Sta	0+00.000
Sta	0+10.326
Offset	13.569 m
Height	-4.238 m

Figure 14-8. Inverse Point to Line – Results Tab

The *Map* tab (Figure 14-9) shows the results graphically.

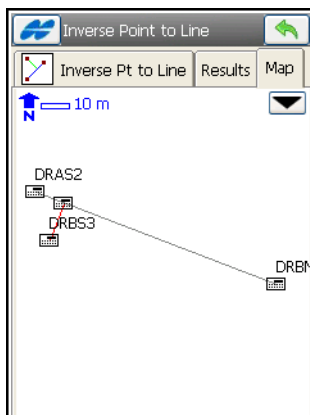


Figure 14-9. Inverse Point to Line – Map Tab

## Point to Point List

To calculate the inverse for all the points in the Points list with respect to a known point, tap the **Point to List** icon. The *Inverse Point to Point List* screen displays (Figure 14-10).

The *Inverse Pt to Pt List* tab illustrates the point inverse operation.

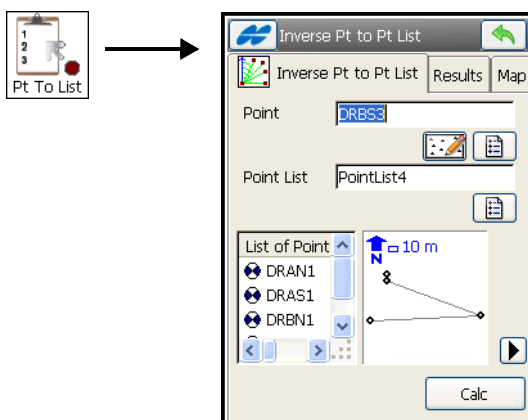



Figure 14-10. Inverse Point to Point List

- *Point* – sets the known point name: either enter manually or select from the map or from the list.

- *Point List* – the Point List name: either enter manually or from the list of Point Lists.
- *List of Points* – the list of currently selected points. For details see “Point Lists” on page 6-36.
-  – closes the plot of the polygon. Only the list of points is available.
- **Calc** – calculates the inverse and displays the results on the *Results* tab.

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing the following items:

- *Edit Points* – opens the **Points** screen to edit the points (see “Points” on page 6-3).
- *Edit Point Lists* – opens the **List of Point Lists** screen to edit the point lists (see “Point Lists” on page 6-36).

The *Results* tab (Figure 14-11) shows the results of calculation (*azimuth, distance, height, slope/grade and slope distance*) for the given points.

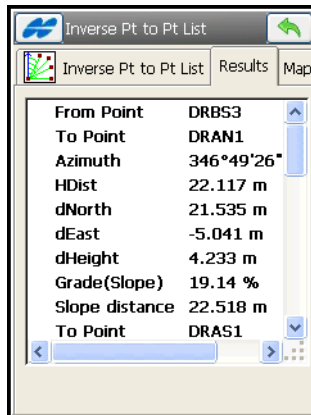


Figure 14-11. Inverse Point to Point List – Results Tab

The *Map* tab shows the inverse point to point operation results graphically.

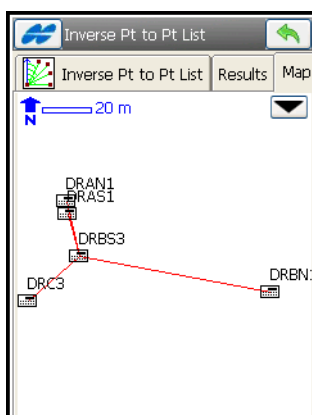


Figure 14-12. Inverse Point to Point List – Map Tab

## Point in Direction

To calculate the coordinates of a point, using a known point, the azimuth, the angle offset from the azimuth line, and the distance offsets from the From Point, tap the **Point in Direction** icon. The *Point in Direction* screen displays (Figure 14-13).

On the *Point in Direction* tab, enter the following parameters.

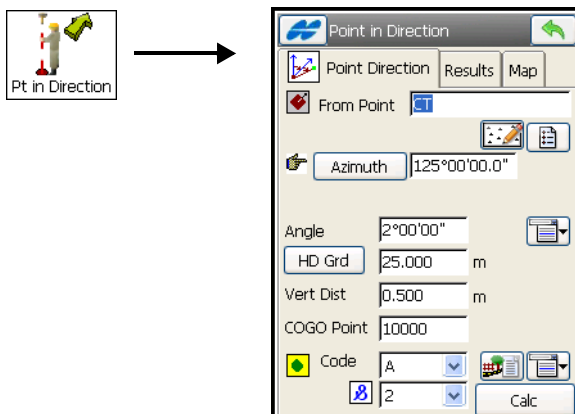








Figure 14-13. Point in Direction

- *From Point* – the starting point: either enter manually or select from the list or from the map.
- **Azimuth/Az to Pt** – sets the azimuth of the line from the From Point. Rotates through selections when tapped.
  - **Azimuth:** sets the azimuth by value.
  - **Az to Pt:** sets another known point to which the direction is calculated and input as azimuth.
- *Angle (Offset)* – the angle offset from the azimuth line.
- *Hz Dist* – the distance offset along the angle offset line.
- *Vert Dist* – the height offset.
- *Cogo Pt* – the computed point name.
- *Code* – the computed point code with a symbol that show the code entity type ( Point,  Line, or  Area). Select a code from the drop-down list or enter a new code. Code needs to be defined at the time it is entered (see “Edit Code” on page 6-19) if it is not a code that exists in the codes dialog. A field, marked by the  sign, is displayed only for a Code Type of Line or Area and intended for entering a string.
-  – the *Attributes List* icon, opens the **Point-Attribute** screen to set the code and attributes available for the code chosen, layer and photo notes (Figure 6-7 on page 6-9).
- The  icon next to the *Attributes List* icon displays the pop-up menu of the following items:
  - *Layer:* opens the **Select Layer** screen (see “The Topo Menu” on page 9-3).
  - *Note:* opens the **Note** screen to enter any additional information on the point. For details, see “The Topo Menu” on page 9-3.
- **Calc** – calculates the coordinates and displays the results on the *Results* tab.



The Help Icon in the upper-left corner of the screen displays a pop-up menu containing the *Edit Points* item that opens the *Points* screen to edit the points (see “Points” on page 6-3).

The *Results* tab (Figure 14-14) on the *Point in Direction* screen shows the results of the calculation. Tap **Save** to save the point.

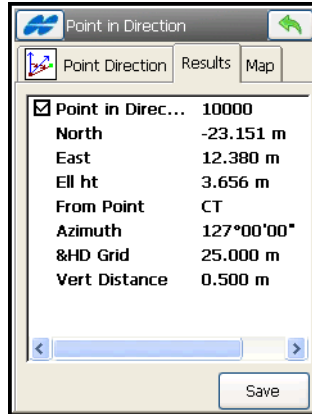


Figure 14-14. Point in Direction – Results Tab

The *Map* tab (Figure 14-15) shows the results graphically.

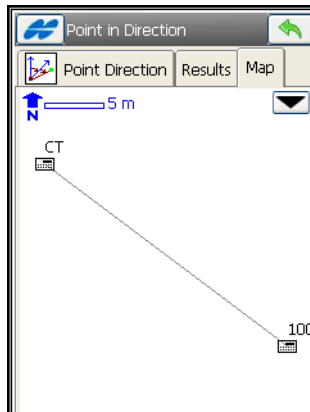


Figure 14-15. Point in Direction – Map Tab

# Compute the Intersection Point

To compute the intersection point or points when given two known points and either the directions or distances from the known points, tap the **Intersection** icon. The *Intersection* screen displays (Figure 14-16).

The *Intersection* tab contains initial data for the intersection task.

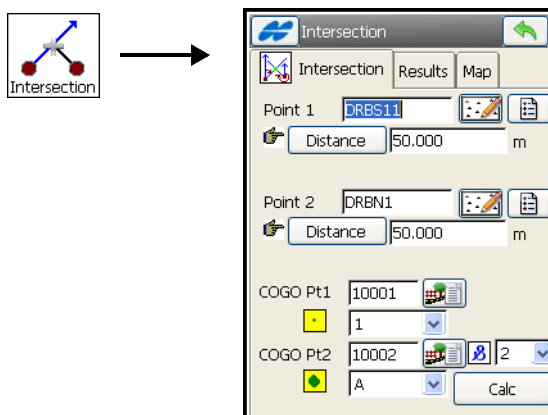







Figure 14-16. Intersection

- **Point 1** – the first known point; either enter manually or select from the map or the list.
- **Point 2** – the second known point; either enter manually or select from the map or the list.
- **Azimuth/Distance/Az to Pt:** rotates through selections for both known points.
  - **Azimuth:** sets the azimuth from the known point to the unknown point.
  - **Distance:** sets the distance between the known point to the unknown point.
  - **Az to Pt:** sets another known point to which the direction will be calculated and input as azimuth.

- *COGO Point* – enter the name and code for the resulting point of the calculation. If Distance is specified for any known point in the *Intersection* tab, there will be two solutions for the *Intersection* calculation (Figure 14-18 on page 14-14).
- The code can be selected from the menu or entered manually. The code entity type will be shown by an icon:  - for Point,  - for Line, and  - for Area. Code needs to be defined at the time it is entered (see “Edit Code” on page 6-19) if it is not a code that exists in the codes dialog. A lower field, marked by the  sign, is displayed only for a Code Type of Line or Area and intended for entering a string. Note that the *Code/String* field remembers and displays the last user-saved code/string.
- Also, the Attributes and photo notes can be selected through the *Attribute List* icon .



To edit angles, azimuths, distances, and so forth, use the entry fields to add/subtract angle and linear values directly or by using the Calculator.

The *Results* tab shows the results of the calculation: the coordinates of corresponding points (Figure 14-17).

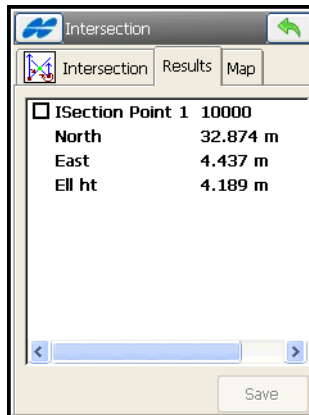


Figure 14-17. Intersection – Results Tab

- **Save** – saves the point if the box near the name is checked.

The *Map* tab shows the solution of the task graphically. The right hand picture shows two solutions for the *Intersection* calculation. (Figure 14-18)

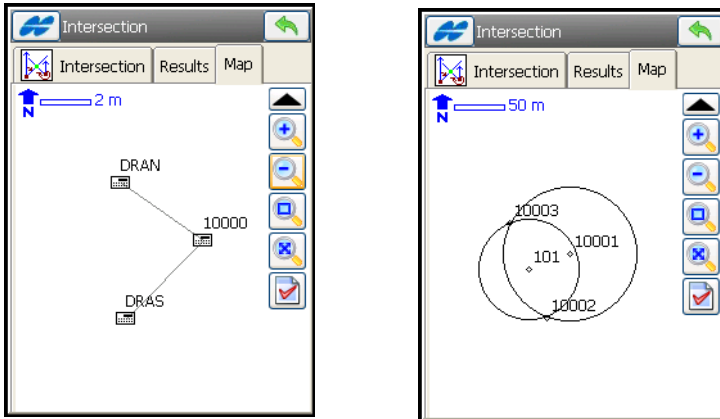


Figure 14-18. Intersection – Map Tab

For a detailed description of the Map view, see “Viewing Map” on page 15-1.

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing the *Edit Points* item that opens the **Points** screen to edit the points (see “Points” on page 6-3).

# Calculator

A built-in calculator in TopSURV performs calculations and conversions. To access the calculator, tap the **Calculator** icon. The *Calculator* screen displays (Figure 14-19).

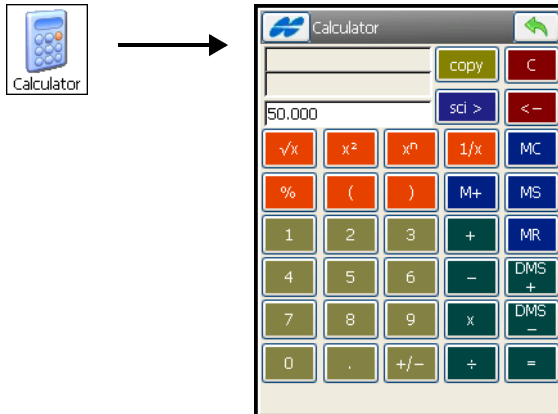



Figure 14-19. Calculator



To enter a calculated value to any entry field in TopSURV, start the calculator from this field by pressing the F1 button on the controller keyboard, or by tapping the  button on the pop-up keyboard for controllers with soft input panels.

- *Input* field – enter the entire equation here, then press the **equals** [=] button to calculate the result.
- *Result* field – shows calculation results. This field is also used as the ‘y’ or ‘theta’ values for rectangular/polar conversions.
- *Previous Result* field – once equals is pressed, the previous result is moved up to this field. This field is also used as the ‘x’ or ‘r’ values for rectangular/polar conversions.
- **MC** – clears the memory.
- **MR** – recalls the memory value, indicated by M in the Input field.
- **MS** – saves the already computed result into memory.

- **M+** – adds the already computed result to the value in memory.
- **C** – clears all the fields.
- **backspace** (<-) – removes the last entry.
- **copy** – if the calculator was started from a field in TopSURV, copies calculation results to that field; closes the calculator in case it was started from the COGO menu.
- **sci** – brings up the scientific calculator.

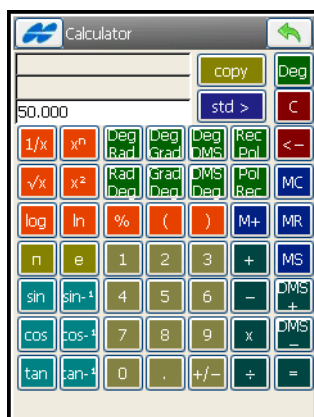


Figure 14-20. Scientific Calculator

## Curve Solutions

A Curve is part of a circle and can thus be described through the center point (also called a Radius Point), the radius value and the starting and ending points on the circle, also called a PC (Point of Curvature) and PT (Point of Tangency). Using these values, the Curve Solutions finds other Curve parameters.

Tap the **Curve** icon to access the Curve menu for various curve solutions: Curve, Three-Points Curve, PI & Tangents, and Radius & Points.

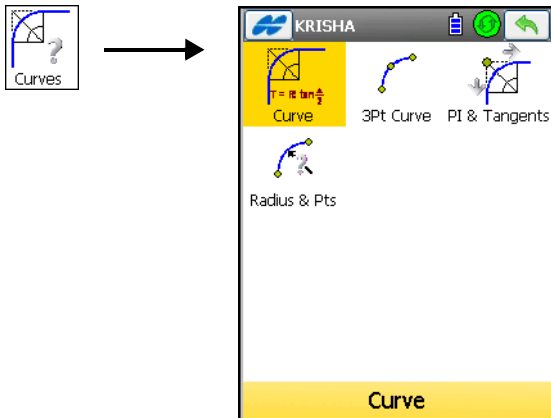


Figure 14-21. Curve Menu

## Calculating the Parameters of a Curve

To calculate the full set of parameters for any curve, given one for each of the curvature parameter and the length parameter of the curve, tap the **Curve** icon. The *Curve Solution* screen displays (Figure 14-22).

The *Curve Solution* tab (Figure 14-22) contains the initial data and a window for the curve plan.

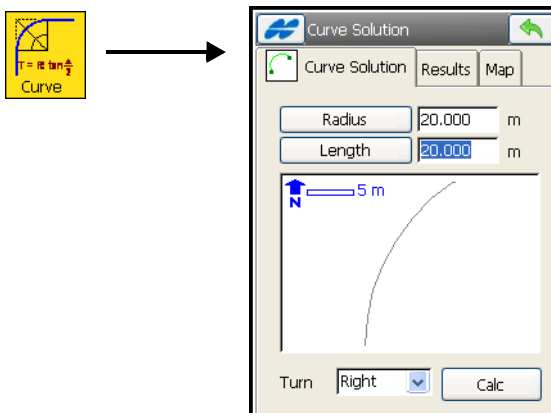


Figure 14-22. Curve Solution

- **Radius/Deg Chord/Deg Curve** – the curvature parameters of the curve.
- **Length/Chord/Tangent/Mid Ord/External/Delta** – the length parameters of the curve.
- **Turn** – the direction of turn relative to the starting point.
- **Calc** – press to calculate the parameters of the curve.

The *Results* tab shows the calculated parameters (Figure 14-23).

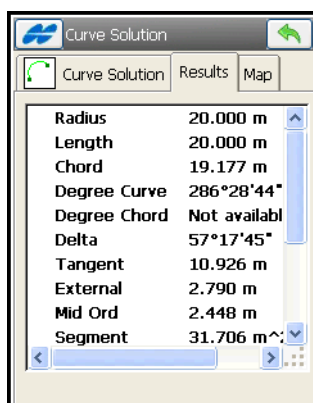


Figure 14-23. Curve Solution – Results Tab

The first three parameters display the radius and the length of the curve and the length of the chord connecting the PC and PT points.

- *Chord* – PC-PT length. If the Chord is defined, then taking into account, that

$$\sin \frac{\Delta}{2} = \frac{\text{Chord}}{2} / (R)$$

the *Length* can be calculated as  $\text{Length} = R \times \Delta$

(note that delta is the angle subtended at the center), where R is *Radius*.

The *Degree Curve* defines the angle in degrees, which is used to compute the radius of a curve with a length of 100 units.

The *Degree Chord* defines the angle in degrees, which is used to compute the radius of a curve whose chord is 100 units long.

*Delta* – internal angle from center to tangent points (PC-RP-PT).



- *Tangent* – the PI-PT length, where PI is the Point of Intersection. If the Tangent is defined, then taking into account, that:

$$\tan \frac{\Delta}{2} = \frac{\text{Tangent}}{R}$$

- *Mid Ord* – mid ordinate, the piece of PI-RP section from the curve to the chord. If the Mid Ord is known, then assuming that:

$$\cos \frac{\Delta}{2} = \frac{R - \text{MidOrd}}{R}$$

- *External* – the piece of PI-RP section from PI to the curve. If the External is defined, then assuming that:

$$\cos \frac{\Delta}{2} = \frac{R + \text{External}}{R}$$

- *Sector* – the area of a circle bounded by two radii and the minor arc they determine.
- *Segment* – the area of a circle bounded by a chord and the minor arc that it cuts off.
- *Fillet* – the area between the arc of a circle and the two tangents at the end points of the arc.

The *Map* tab (Figure 14-24 on page 14-19) shows graphically the results of the calculation.

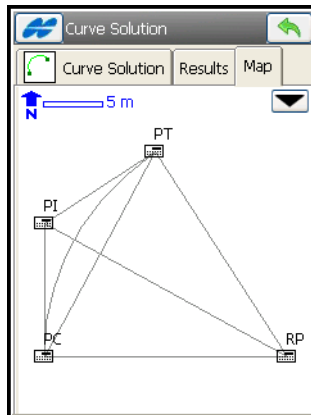


Figure 14-24. Curve Solution – Map Tab

## Three-Points Curve

To define the curve using three points: PC point, any curve point, and PT point or the RP, PC, and PT points, tap the **Three Pt Curve** icon. The *Three Pt Curve* screen displays (Figure 14-25). The screen display changes, depending upon the first point selected.

The *Three Points Curve* tab displays the initial data.

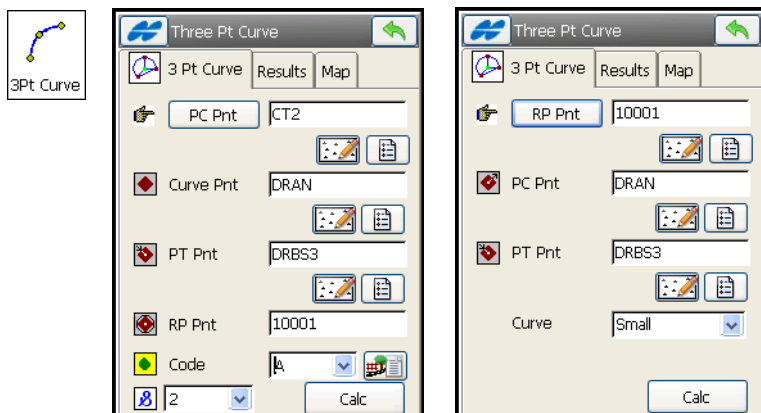


Figure 14-25. Three Pt Curve

Either enter manually or select from the list or from the map, the following sets of points.

- *RP Point, PC Point, PT Point* – for this set of points, the distance between the RP Point and the PC point should be equal to the distance between the RP Point and the PT point. The radius and the PC and PT points define two curves, one with delta, less than or equal to 180 degrees (Small curve), and the other with delta greater than or equal to 180 degrees (Large curve). Select either *Small* value or *Large* value from the **Curve** drop-down list to indicate which of these two curves should be used for computations.
- *PC Point, Curve Point, PT Point* – for this set of points, the coordinates for the RP Point are calculated, along with curve parameters. The name and the code for this calculated point can be set.

- **Calc** – press to calculate the curve parameters.

The *Results* tab (Figure 14-26) displays the results of the calculation.

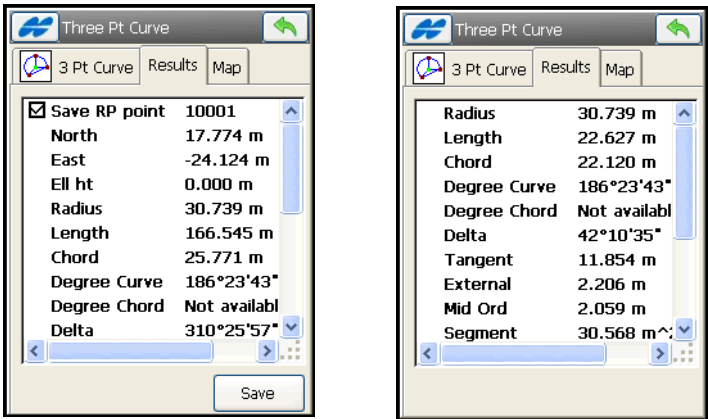


Figure 14-26. Three Pt Curve – Results Tab

For a description of curve parameters, see “Calculating the Parameters of a Curve” on page 14-17.

- **Save** – press to store the point being found.

The *Map* tab (Figure 14-27) displays the results of the calculation graphically.

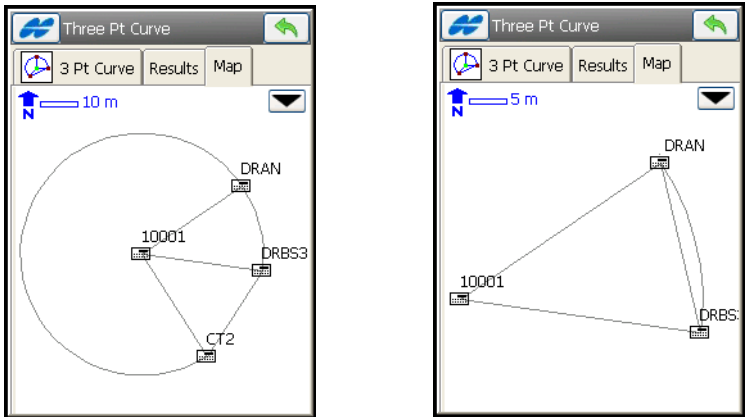


Figure 14-27. Three Pt Curve – Map Tab

## Point of Intersection and Tangents

To compute the PC point, the PT point and the center (Radius Point) of a Curve, given the Point of Intersection (PI), the radius, and the azimuths from the PI point to the PC, and PT points respectively, tap the **PI & Tangents** icon. The **PI & Tangents** screen displays (Figure 14-28 on page 14-23).

The **PI & Tangents** tab contains the initial data.

- **PI Point** – the Point of Intersection. Can be manually entered, or chosen from the map or from the list.
- **Az PI to PC** – the azimuth from the PI point to the starting curve point.
- **Az PI to PT** – the azimuth from the PI point to the ending curve point.
- **Radius/ Deg Curve/Deg Chord/Tangent** – the radius parameters of the curve.
- **PC Point** – the name and the code for the calculated starting curve point.
- **PT Point** – the name and the code for the calculated ending curve point.
- **RP Point** – the name and the code for the calculated radius point.
- **Calc** – calculates the parameters of the curve and the coordinates of the PC, PT, and RP points

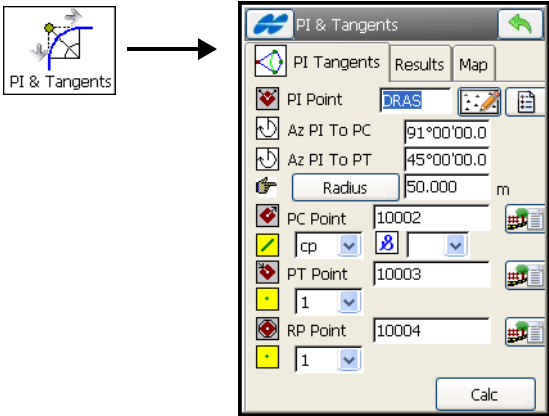


Figure 14-28. PI & Tangents

The *Results* tab (Figure 14-29 on page 14-23) shows the results of the calculation.

Put a check mark next to the points you want to save, then press the **Save** button.

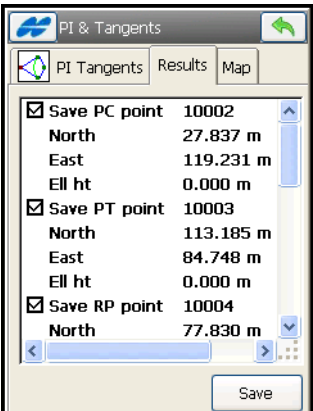


Figure 14-29. PI & Tangents – Results Tab

The *Map* tab shows graphically the results of the calculation.

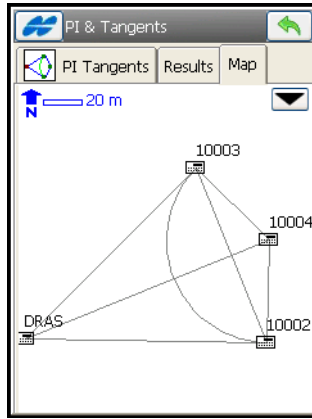


Figure 14-30. PI & Tangents – Map Tab

## Radius and Two Points

To define a curve using the PC and PT points, and a radius parameter, tap the **Radius & Points** icon. The *Radius & Points* screen displays (Figure 14-31).

The *Radius & Point* tab contains the initial data for the task.

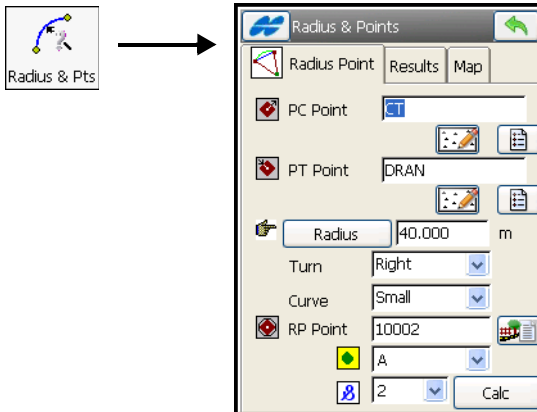


Figure 14-31. Radius & Points

- *PC Point* – the Point of Curvature: either enter manually or select from the map or from the list of points.

- **PT Point** – the Point of Tangency: either enter manually or select from the map or from the list of points.
- **Radius/Deg Curve/Deg Chord** – the radius parameters of the curve.
- **Turn** – the direction of turn, relative to the PC Point.
- **Curve** – defines the curve in the circle that should be considered. The radius and the PC and PT points define two curves, one with delta less than or equal to 180 degrees (Small curve), and the other with delta greater than or equal to 180 degrees (Large curve).
- **RP Point** – the point to be defined. Enter the name and select the code, if necessary.
- **Calc** – press to calculate the curve parameters.

The *Results* tab (Figure 14-32) displays the results of the calculation.

Radius & Points	
Radius Point   Results   Map	
<input checked="" type="checkbox"/> Save RP point	10002
North	6.785 m
East	29.539 m
Ell ht	3.156 m
Radius	40.000 m
Length	46.701 m
Chord	44.094 m
Degree Curve	143°14'22"
Degree Chord	Not availabl
Delta	66°53'42"
Save	

Figure 14-32. Radius & Points – Results Tab

For a description of curve parameters, see “Calculating the Parameters of a Curve” on page 14-17.

- **Save** – press to store the point being found.

The *Map* tab (Figure 14-33) displays the results of the calculation graphically.

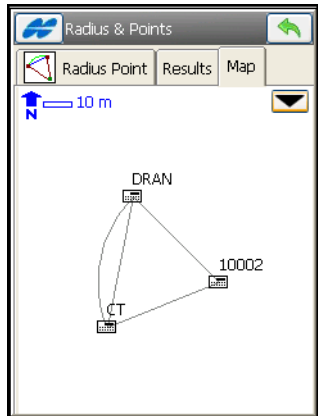


Figure 14-33. Radius & Points – Map Tab

# Area

Tap the **Area** icon to access the Area menu to calculate the area of a polygon formed by any points or the coordinates of a point/points that forms a polygon of the desired area

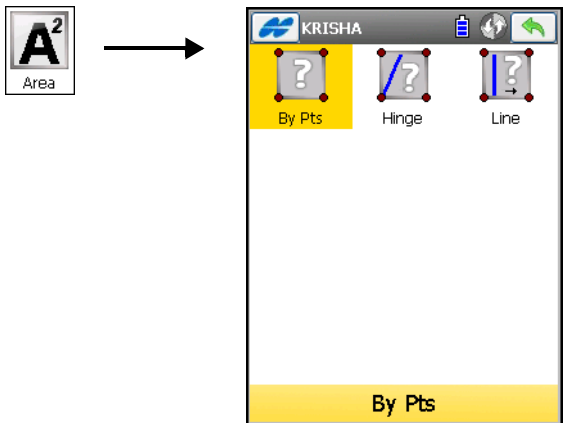


Figure 14-34. Area Menu



## By Points

To calculate the area of a polygon formed by any points, tap the **By Points** icon. The **Comp Area** screen displays (Figure 14-35).

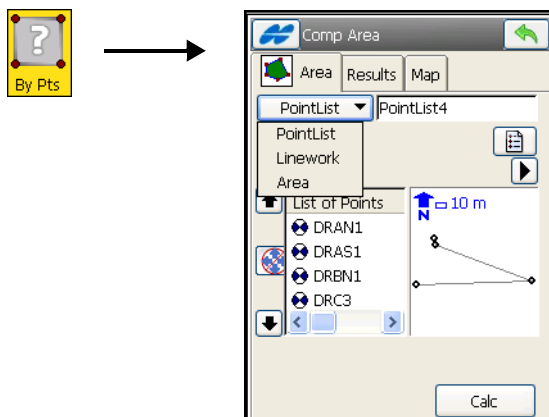




Figure 14-35. Area by Points

The **Area** tab allows selecting a point list or linework or area to form the polygon.

- *Point List/ Linework/ Area*– select the desired item and it's name from corresponding drop-down lists.
- *List of Points* – the list of currently selected vertices for the polygon.
- Up and down arrows move the highlighted point up and down in the order of the points.



For the correct operation of the application, the sides of the polygon should not cross each other.

-  – switches the keyboard arrow keys on/off (duplicates the operation of the arrows on the screen).
-  – closes the plot of the polygon. Only the list of points will be available.

- **Calc** – calculates the area of the polygon and displays the results of the calculation on the *Results* tab (Figure 14-36).

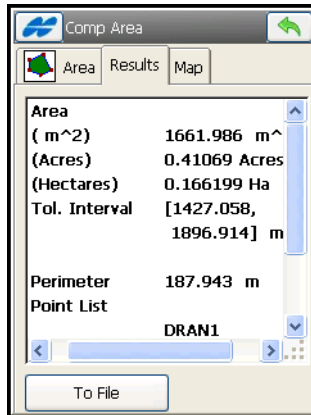


Figure 14-36. Area – Results Tab

The *Map* tab (Figure 14-37) shows a view of the polygon.

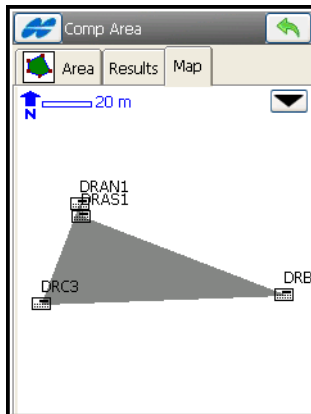


Figure 14-37. Area – Map Tab

## The Hinge Method

The Hinge method generates a polygon of the desired area by rotating a ray from a fixed rotation point. This method calculates the coordinates of a point of intersection of the ray with the boundary formed by selected points in a list.



For the correct operation of the application, the sides of the polygon should not cross each other, that is, the polygon should be simple and convex.

To start the Hinge task, select the **Hinge** icon. The **Known Area - Hinge** screen displays (Figure 14-38 on page 14-29).

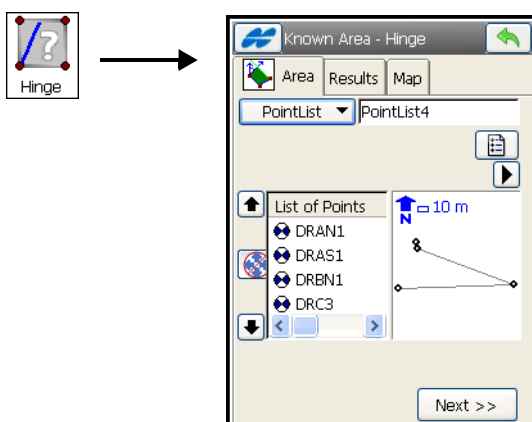


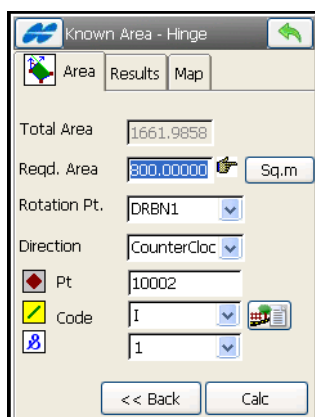


Figure 14-38. Hinge – Area Tab 1




The **Area** tab contains the initial data of the Hinge task.


- *Point List/ Linework/ Area*— select the desired item and it's name from corresponding drop-down lists.
-  — closes the plot of the polygon. Only the list of points is available.
- *List of Points* – the list of currently selected vertices of the polygon.

- Up and down arrows move the highlighted point up and down to change the order of the points.
-  – switches the keyboard arrow keys on/off (duplicates the arrows on the screen).
- **Next** – opens the second screen of the *Area* tab (Figure 14-39 on page 14-30).



**Figure 14-39. Known Area Hinge – Area Tab 2**

- *Total (Area)* – the calculated area of a polygon formed with the currently selected points of the point list.
- *Req'd. Area* – the requested known area.
- **Sq.m** (Job Units)/**Acres**: press to set the area units.
- *Rotation (Pt)* – the point in the list that fixed for rotation of a ray to the new point to form a polygon of the requested area.
- *Direction* – the direction of rotation.
- *COGO Point* – the name of the new point calculated.
- *Code* with a symbol that show the code entity type ( Point,  Line, or  Area) – select a code from the drop-down list or enter a new code. Code needs to be defined at the time it is entered (see “Edit Code” on page 6-19) if it is not a code that exists in the codes dialog.

-  – the *Attributes List* icon, opens the **Point-Attribute** screen to set the code and attributes available for the code chosen, and photo notes (Figure 6-7 on page 6-9).
- **Calc** – calculates the coordinates of the new point and displays it on the *Results* tab.

The *Results* tab (Figure 14-40) shows the results of the calculation.

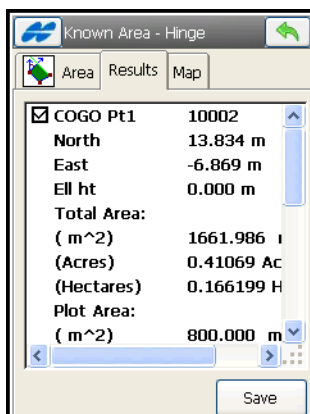


Figure 14-40. Hinge – Results Tab

The *Map* tab (Figure 14-41) shows the view of the polygon.

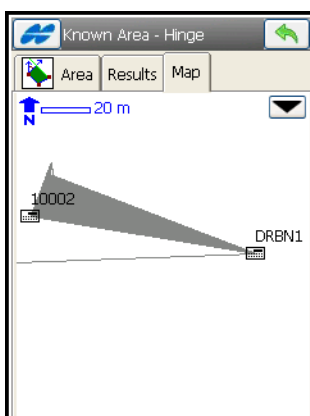


Figure 14-41. Hinge – Map Tab

## The Line Method

The Line method computes the coordinates of two points that, along with two other known points, form a quadrilateral of the known area.

To start the Line task, select the **Line** icon. The **Known Area - Line** screen (Figure 14-42 on page 14-32) displays.

The **Area** tab (Figure 14-42) contains the initial data of the **Line** task. See “The Hinge Method” on page 14-29 for description of this screen.

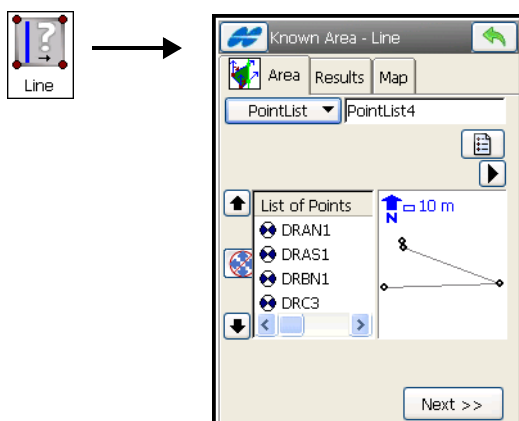


Figure 14-42. Line – Area Tab 1

- **Next** – opens the second screen of the **Area** tab (Figure 14-43).

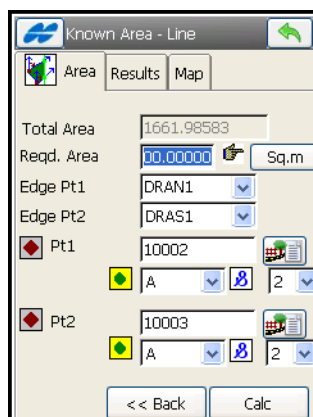







Figure 14-43. Line – Area Tab 2

- *Total Area* – the calculated area of a polygon formed with the currently selected points of the point list.
- *Reqd. Area* – the requested known area.
- *Pt1 of Edge, Pt2 of Edge* – the known points of the quadrilateral.
- *COGO Pt 1, COGO Pt 2* – the calculated points on the lines emanating from the *Pt1 of Edge* and *Pt2 of Edge*, respectively.
- The field below is intended for entering a code. Select a code from the drop-down list or enter a new code. Code needs to be defined at the time it is entered (see “Edit Code” on page 6-19) if it is not a code that exists in the codes dialog. The icon will show the code entity type ( Point,  Line, or  Area).
- The field, marked by the  sign, is displayed only for a Code Type of Line or Area to enter a string.
-  – the *Attributes List* icon, opens the **Point-Attribute** screen to set the code and attributes available for the code chosen, layer and photo notes (Figure 6-7 on page 6-9).
- *Area* – the known area.
- **Sq.m** (Job Units)/**Acres** – press to set the area units.
- **Calc** – calculates the coordinates of the line points and displays it on the *Results* tab.



For the correct operation of the application, the sides of the polygon should not cross each other, that is, the polygon should be simple and convex.

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing two items: *Edit Points* (see “Points” on page 6-3) and *Help* to access the help files.

The *Results* tab (Figure 14-44) shows the results of the calculation.

Put a check mark next to the points you want to save, then press the **Save** button.

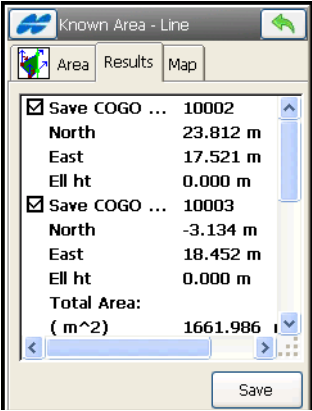


Figure 14-44. Line – Results Tab

The *Map* tab (Figure 14-45 on page 14-34) shows the view of the quadrilateral.

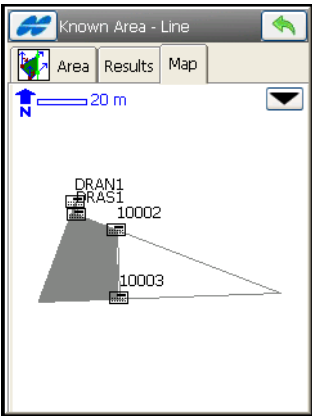


Figure 14-45. Line – Map Tab



# Corner Angle

To calculate a corner angle, tap the **Corner Angle** icon (Figure 14-46). The *Corner Angle* screen displays.

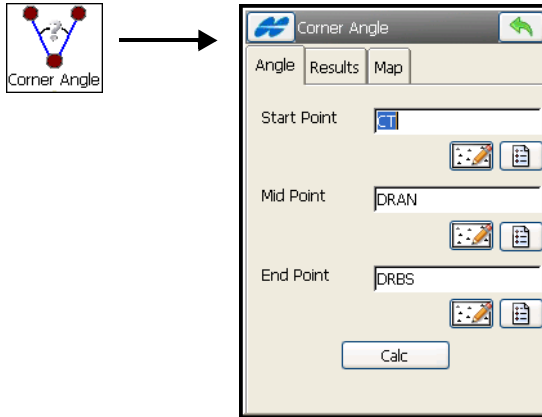


Figure 14-46. Corner Angle

The *Angle* tab contains initial data for the angle creation and calculates the angle:

- *Start Point* – the point that defines the first side of the angle; either enter manually or select from the map or from the list.
- *Mid Point* – the point that defines the corner of the angle; either enter manually or select from the map or from the list.
- *End (Point)* – the point that defines the second side of the angle; either enter manually or select from the map or from the list.
- **Calc** – calculates the corner angle.

The Help Icon in the upper-left corner of the screen displays a pop-up menu of the items:

- *Edit Points* – opens the **Points** screen (see “Points” on page 6-3).
- *Calculator* – accesses the calculator (see “Calculator” on page 14-15).

The *Results* tab shows the results of the calculation: calculation of various angles, distances, and azimuths to the start and end points.

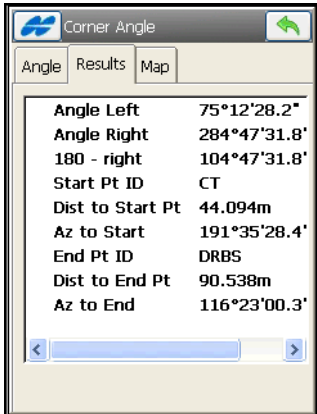


Figure 14-47. Corner Angle – Results Tab

The *Map* tab (Figure 14-48) shows the view of the angle.

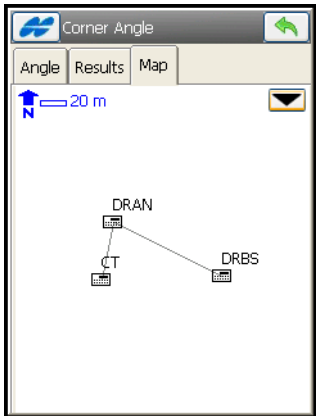


Figure 14-48. Corner Angle – Map Tab

# Offsets

Tap the **Offsets** icon to access the Offsets menu to create COGO points along a line, curve or road and, using other COGO tool such as Station & Offsets, compute accurate positions for them.

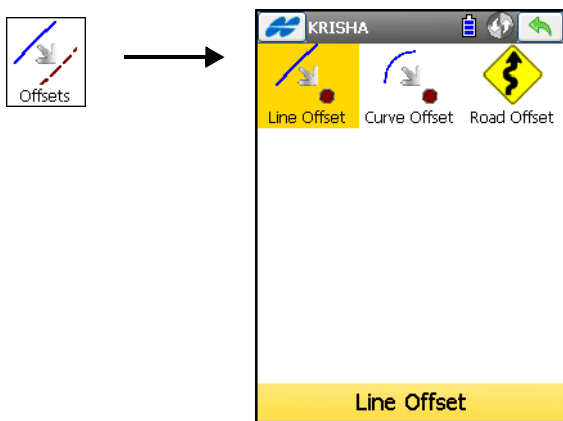


Figure 14-49. Offsets Menu

## Line Offset

To calculate the coordinates of points along a line, tap the **Line Offset** icon (Figure 14-50). The **Line & Offsets** screen displays.

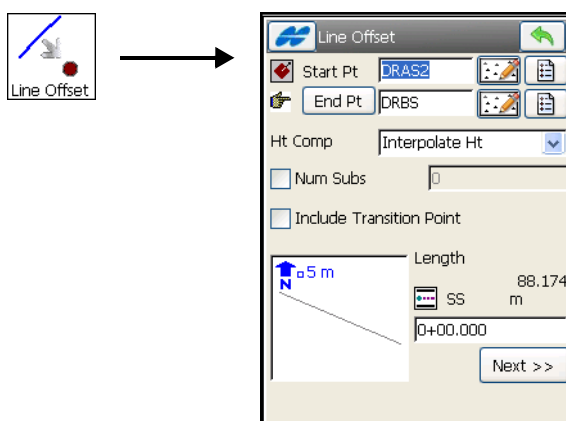




Figure 14-50. Line & Offset

- *Start Point* – the starting point of the line. The line is defined by the End point of the line or the azimuth to another point: either enter manually or select from the map or from the list.
- **End Point/Azimuth** – the ending point of the line / the azimuth to another point: either enter manually or select from the map or from the list.
- *Ht Comp* – select the type of height computations for the calculated points from one of the following:
  - *Interpolate Ht*: the height of the calculated point will be computed through linear interpolation using the height of the starting and ending points of the line.
  - *Ht of Start Pt* (height of starting point): the calculated point will have the same height as the starting point of the line.
- *Num Subs* – check and enable to designate the number of subdivisions you want to subdivide the line. For instance, a value of 3 indicates a calculation of four points by subdividing the line into three equal segments.
- *Include Transition Point* – check mark and enable if the transition point should be included in spite of the station distance.
- *SS (Start Sta)* – enter the starting station (chainage) of the line.
- **Next** – opens the *Station (Chainage) & Offsets* screen.

## Station & Offset

The *Station & Offsets* screen contains the settings for the calculated stations (Figure 14-51 on page 14-39).

- *Station* – enter the station along the line. The two arrows  decrease or increase the station by the interval specified in the *Interval* field.
-  – uses the right/left arrow keys of the keyboard to increase or decrease the station.
- *Interval* – the station interval calculated.
- *COGO Point* – sets the starting name for the points calculated.

- **Right Offset/Left Offset** – the right or left offset of the calculated point with respect to the line at the station shown on the *Station* field above.
- **Up/Down/Grade** – the Up or Down Height offset, or the vertical Grade (in percentage) with respect to the height of the line at the station. If the grade is falling, the value is set negative.

The 'Station & Offsets' dialog box is shown with the following values:

- Station: 0+00.000
- Interval: 10.000 m
- Right Offset: 2.000 m
- Up: 0.500 m
- COGO Point: 10002
- Code: A
- Page: 2

Buttons include '<< Back' and 'Calc'.

Figure 14-51. Station & Offsets

- **Calc** – calculates the points along the line. A successful message displays.

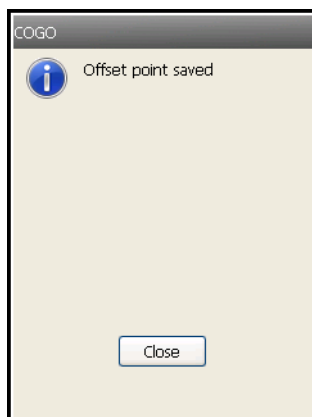


Figure 14-52. Successful Message

- **Close** – opens the *Station & Offsets* screen for the next point.

## Curve Offset

To calculate the coordinates of points along a curve, tap the **Curve Offset** icon. The *Crv Offset* screen (Figure 14-53) displays.

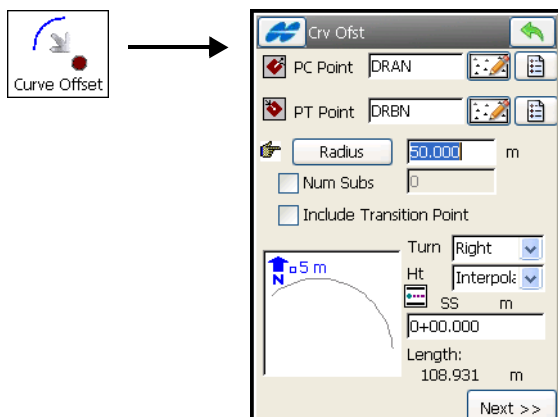


Figure 14-53. Curve & Offset

- *PC Point* – the Point of Curve, the starting point of the arc; either enter manually or select from the map or from the list of points.
- *PT Point* – the Point of Tangency; either enter manually or select from the map or from the list of points.
- **Radius/Deg Curve/Deg Chord** – the radius parameters of the curve.
- *Num Subs* – check and enable to designate the number of subdivisions you want to subdivide the curve. For instance, a value of 3 indicates a calculation of four points by subdividing the curve into three equal segments.
- *Include Transition Point* – check mark and enable if the transition point should be included in spite of the station distance.
- *Turn* – the direction of turn, relative to the PC Point.
- *SS* – the starting station (chainage) of the curve.
- **Next** – opens the *Station (Chainage) & Offsets* screen.

The *Station & Offsets* screen (Figure 14-51 on page 14-39) contains the settings for the calculated stations with offsets from the curve.

## Calculating a Road Offset

To calculate the coordinates of points along a road, tap the **Road Offset** icon (Figure 14-54). The **Road Offset** screen displays.

The **Road Offset** screen selects the road to calculate the offset points and displays the plan of the chosen road.

- **Road/H Alnt/HV Alnt** – the road/horizontal/horizontal and vertical alignments to calculate the offset points: either enter manually or select from the map or from the list of points.
- **SS (Start Stn)** – the starting point of the calculated points, the distance from the beginning of the road.

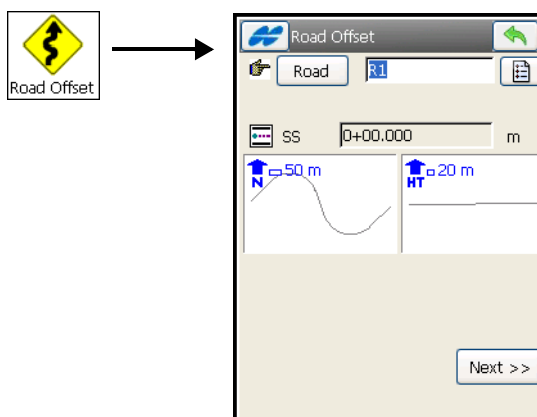


Figure 14-54. Road Offset

- **Next** – opens the **Station (Chainage) & Offsets** screen.

The **Station & Offsets** screen (see Figure 14-51 on page 14-39) contains the settings for the calculated stations with offsets from the road.

# Adjusting Points

To transform points or perform traverse adjustment, tap the **Adjust** icon (Figure 14-55). The Adjust menu opens to access the *Rotate*, *Translate*, *Scale*, *2D Transform*, and *Traverse* options.

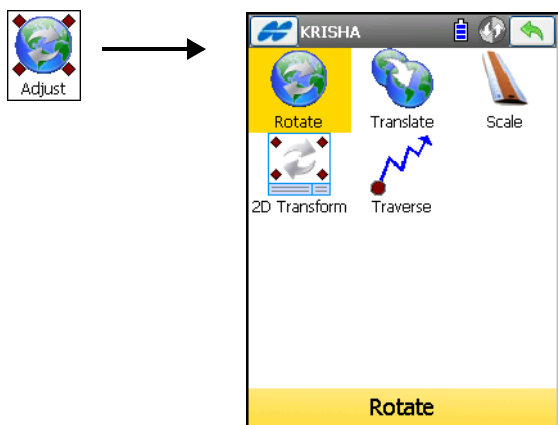


Figure 14-55. Adjust Menu

## Rotate

To rotate points, tap the **Rotate** icon. The *Rotate* screen displays (Figure 14-56 on page 14-43).

To rotate the selected points around a specific point, select a rotation method: either *Rotation Angle* or *Azimuth*.

- *Select points* – select the point/points to be rotated by one of the following methods:
  - **By Range**: press to display the *By Range* screen. For a description of the *By Range* screen, see “Select Points by Range” on page 14-43.
  - Select points for rotation from the map or the list using the icons to the right.
  - Tap the **Layer** icon to rotate all points on a layer selected in the Layers screen.



- *Rotation Point* – sets the center of rotation: either enter manually or select from the map or the list.
- *Rotation Method* – select either *Rot. Angle* (if the rotation angle is input directly) or *Azimuth* (as a difference between the new and old azimuths/bearings).
- *Rotation Angle* – enter the value of the rotation right angle.
- *Old Azimuth* – enter the value of the old azimuth.
- *New Azimuth* – enter the value of the new azimuth.

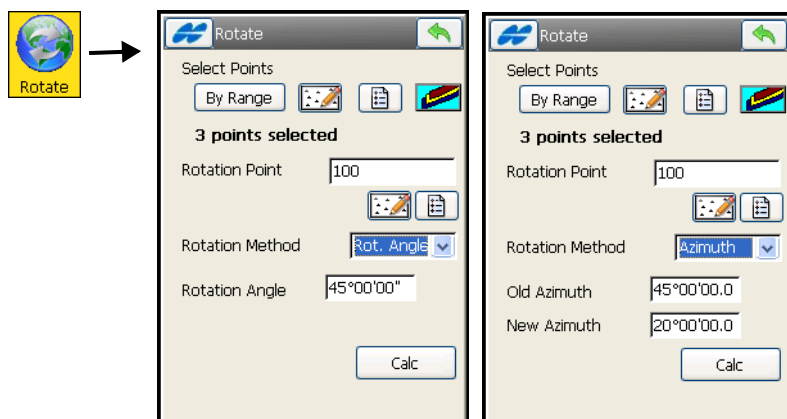



Figure 14-56. Rotate

- **Calc** – press to rotate the selected points. A successful message displays.

## Select Points by Range

In the *Range of Points* field on the *By Range* screen (Figure 14-57 on page 14-44), the range can be set by enumeration of the points separated by commas, or by specifying the first and the last point included in the range. Press the ok  button to save the specified range. The number of points selected displays on the corresponding task screen in the *Select Points* field.

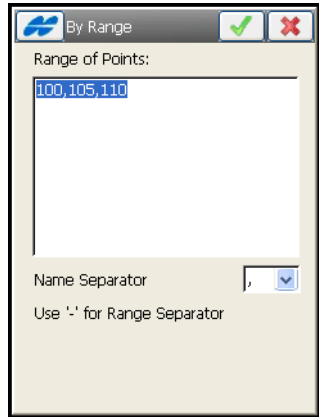


Figure 14-57. Select Points by Range

# Translate

To translate a set of points, tap the **Translate** icon. The Translate screen (Figure 14-58) displays. To move a group of points selected on the *Translate* screen, select a translation method: select either *Coords/Pts* or *Az/Brg, Dist, Ht*.

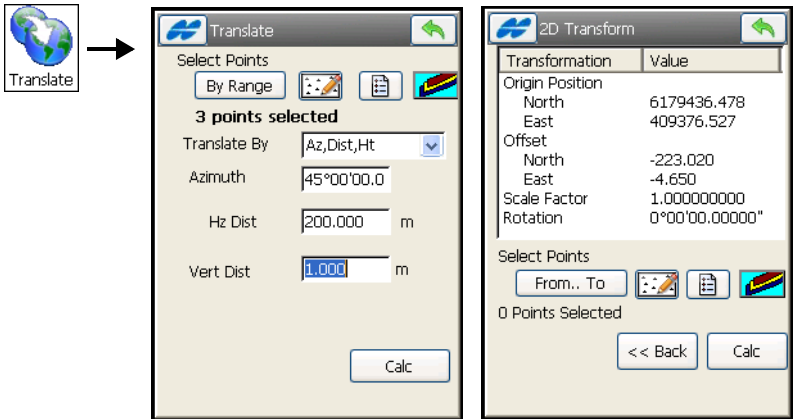


Figure 14-58. Translate

- *Select points* – select the points for translation from one of the following methods:

- **By Range:** press to display the **By Range** screen. For a description of the **By Range** screen, see “Select Points by Range” on page 14-43.
- Select points for rotation from the map or the list using the icons to the right.
- Tap the **Layer** icon to rotate all points on a layer selected in the Layers screen.
- **Translate By** – select either *Coords/Pts* or *Az/Brg, Dist, Ht* as the translating method.
  - *Coords/Pts*: all the selected points are moved in the same direction and distance as between the points (locations), set by the next two fields: **From Pt (From Crd)** and **To Pt (To Crd)**.  
In the first case, define only the point name; in the second case, define the local coordinates and the height of the location.
  - *Az/Brg, Dist, Ht*: all the selected points are moved in the specified direction by a specified distance. These parameters are set through the *Azimuth(Bearing)* field, *Ht, Dist* and *Vert Dist* fields.
- **Calc** – press to translate the selected points. A successful message displays.



The limit for translation of points is 20,000 meters.

---

## Scale

To scale a set of points, tap the **Scale** icon. The **Scale** screen displays. To scale the distance of a range of points relative to a Base Point on the Scale screen, set the following parameters.

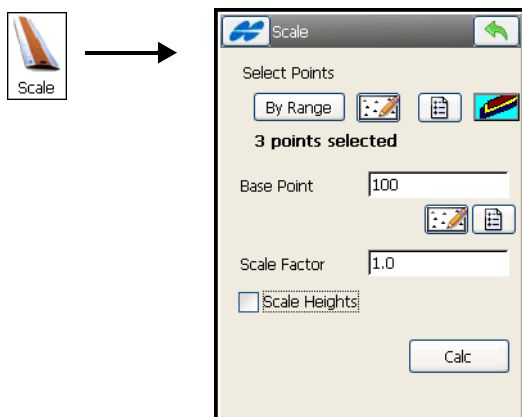


Figure 14-59. Scale

- *Select points* – select the points to scale using one of the following methods:
  - **By Range**: press to display the **By Range** screen. For a description of the **By Range** screen, see “Select Points by Range” on page 14-43.
  - Select points for rotation from the map or the list using the icons to the right.
  - Tap the Layer icon to rotate all points on a layer selected in the Layers screen.
- *Base Point* – sets the reference point for the scale transformation: either enter manually or select from the map or from the list.
- *Scale Factor* – the scale factor for the coordinate transformation.
- *Scale Heights* – check mark and enable this box if the height values should be scaled also.
- **Calc** – press to scale the selected points. A successful message displays.

## 2D Transform

To perform a linear two dimensional transformation of a set of points, tap the **2D Transform** icon. The **2D Transform** screen (Figure 14-60) displays.

The **2D Transform** screen contains a list of point pairs used for getting the transformation parameters. Initially this screen is empty.

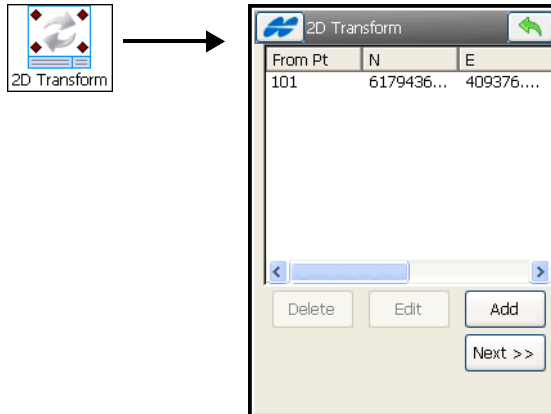


Figure 14-60. 2D Transform

- **Add** – press to enter pairs of points or coordinates in the **Point Pair Info** screen (Figure 14-62 on page 14-49).
- **Edit** – press to change the information about the point pair highlighted.
- **Delete** – press to erase the point pair selected.
- **Next** – opens another **2D Transform** screen with the transformation parameters calculated (Figure 14-61).

The second **2D Transform** screen displays the transformation parameters which will be applied to the set of points needing transformation.

- **Select points** – select the points using either method:
  - **From.. To:** press to display the **By Range** screen. For a description of the **By Range** screen, see “Select Points by Range” on page 14-43.

- Select points for transform from the map or the list using the icons to the right.
- Tap the Layer icon to transform all points on a layer selected in the Layers screen.

Once the set of desired points is specified, the number of points selected will display on the *2D Transform* screen.

The screenshot shows a dialog box titled "2D Transform". It contains a table of transformation parameters and a section for selecting points.

Transformation	Value
Origin Position	
North	6179436.478
East	409376.527
Offset	
North	-223.020
East	-4.650
Scale Factor	1.000000000
Rotation	0°00'00.00000"

Below the table, there is a "Select Points" section with a "From.. To" button and three icons: a map, a list, and a layer icon. Below these icons, it says "0 Points Selected". At the bottom, there are two buttons: "<< Back" and "Calc".

Figure 14-61. 2D Transformation Parameters

- **Calc** – performs the two dimensional transform and displays a successful message.

## Point Pair Info

The *Point Pair Info* screen selects the pairs of points or coordinates to obtain transformation parameters (see Figure 14-62 on page 14-49).

- **From Pt/From Crd** – changes the field to enter either the point or coordinates from which the parameters will be calculated.
- **To Pt/To Crd** – changes the field to enter either the point or coordinates to which the parameters will be calculated.
- The ok button – returns to the *2D Transform* screen with the pair added.
- The exit button – returns to the *2D Transform* screen without changes made.

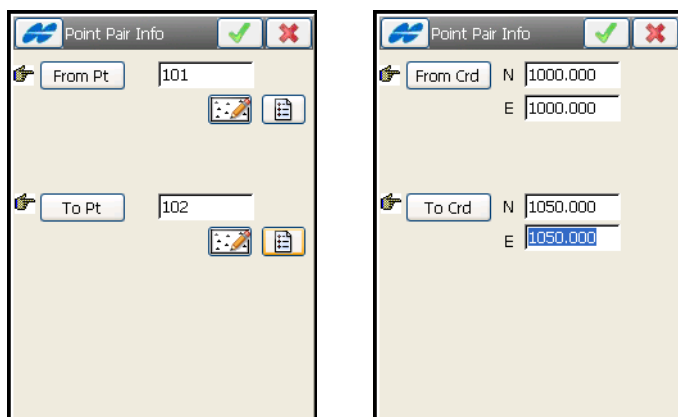


Figure 14-62. Point Pair Information

## Traverse Adjustment

Traverse adjustment is performed to provide a mathematically closed figure and at the same time, to get the best estimates for positions of all the traverse stations.

To perform an adjustment of a surveyed traverse, tap the **Traverse** icon. The **Adjustment** screen displays (Figure 14-63 on page 14-50).

### Adjustment Parameters

The first **Adjustment** screen contains general settings for adjustment:

- *Start Point* – the station on which the traverse originates; either enter manually or select from the map or from the list of points.
- *End Point* – the station on which the traverse closes; either enter manually or select from the map or from the list of points.
- *Adjust Elevations* – check mark and enable this box to include adjusting elevations if elevations were determined in the traverse.
- *Adjust Sideshots* – check mark and enable this box to include adjusting side shots.
- *Curvature refraction* – if needed select an Earth curvature refraction value from 0.14 and 0.2

- *Job to store the results* – the **New** button opens the **New Job** screen to create a new job to store the adjusted traverse stations.
- **Next** – opens the next **Adjustment** screen to perform adjustment.

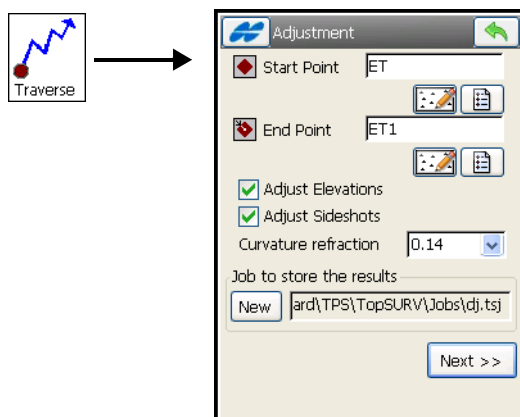


Figure 14-63. Adjustment Settings

## Adjustment

The next **Adjustment** screen (Figure 14-64) selects the method of traverse adjustment to use and a technique to close the traverse if it is unclosed.

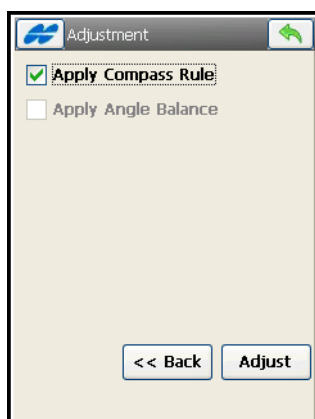


Figure 14-64. Adjustment



- *Apply Compass Rule* – check mark and enable this box to adjust the traverse by the compass rule.
- *Apply Angle Balance* – check mark and enable this box to adjust the traverse by the angle balance. In this case the closing angle will be shown for the traverse adjustment.
- **Adjust** – press to adjust the traverse. The *Adjustment Results* screen opens to display results. The traverse points adjusted will be saved in the new job as calculated points.

## Traverse Calculation

This COGO task calculates Traverse and Sideshot points, based on horizontal and vertical offsets along a direction, which is defined by an azimuth, or right, left, or deflection angles.

To start a Traverse task, tap the **Traverse** icon (Figure 14-65). The *Traverse Calc* screen displays.

The *Traverse Calc* (Figure 14-65) tab displays the initial data for the traverse task.

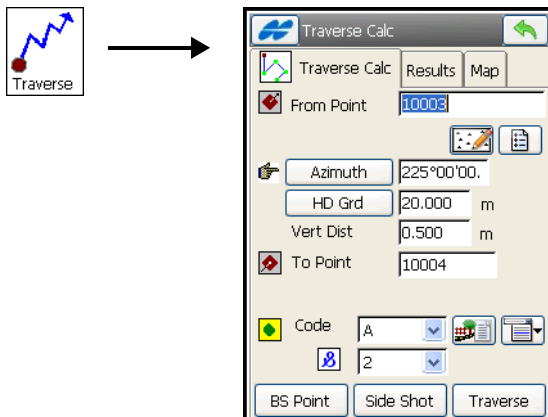


Figure 14-65. Traverse Calc

- *From Point* – indicates the occupation (the traverse point): either enter manually or select from the map or list.

- **Azimuth/Angle Right/Angle Left/Deflection** – determines the azimuth from the known point to the calculated point (To Point). The azimuth can be entered as is, or can be computed from the right or left angles, or deflection entered in this field and Backsight information.
  - **Azimuth:** sets the azimuth by value.
  - **Angle Right:** angle to the right is the angle at the known point from the backsight point to the calculated point in a clockwise direction.
  - **Angle Left:** angle to the left is the angle at the known point from the backsight point to the calculated point in an counter clockwise direction.
  - **Deflection:** the angle at the known point between the prolongation of the line from the backsight point and the line to the calculated point
- *H<sub>z</sub> Dist* – the Horizontal Distance along the azimuth line.
- *Vert Dist* – the Vertical Distance along the azimuth line.
- *To Point* – the name of the calculated point.
- *Code* – the code associated with the calculated point.
- **BS Point** – displays the **BS Point** screen for entering the Backsight Point or Backsight Azimuth (Figure 14-67 on page 14-53). If a BS point has not been entered, an Azimuth is required. In this case, if an angle value is entered as *Angle Right*, *Angle Left*, or *Deflection*, this value is considered to be azimuth.
- **SideShot** – if pressed, the coordinates of the *To Point* are calculated based on the entered values for *Azimuth/Angle Right/Angle Left/Deflection*, *Horizontal* and *Vertical* distances. The *From Point* parameter does not change and the *To Point* parameter is incremented to the next new Point in the database.
- **Traverse:** if pressed, the coordinates of the *To Point* are calculated based on the entered values for (*Azimuth/Angle Right/Angle Left/Deflection*), *Horizontal* and *Vertical* distances. The *From Point* changes to the *To Point*, and the *To Point* changes to the next new name in the database.

The *Results* tab (Figure 14-66) shows the initial data and results of the calculation. The *Map* tab shows the results graphically.

Field	Value
Save Traverse	10003
North	-22.282 m
East	-21.733 m
Ell ht	3.640 m
From Point	CT2
To Point	10003
Azimuth	225°00'00"
Bearing	S45°00'00"
HD Grid	20.000 m
Vert Distance	0.500 m

Figure 14-66. Traverse Calc – Results Tab

## BS Point

The *BS Point* screen (Figure 14-67) enters the parameters for the *Backsight Point* or *Backsight Azimuth*. Tap the **BS Point/BS Azimuth** button to determine which parameters will display.

Figure 14-67. BS Point

# DTM Volume

This COGO task calculates cut/fill data when computing between two surfaces. To start a DTM Volume task, tap the **DTM Volume** icon. The *DTM Volume* screen displays (Figure 14-68).

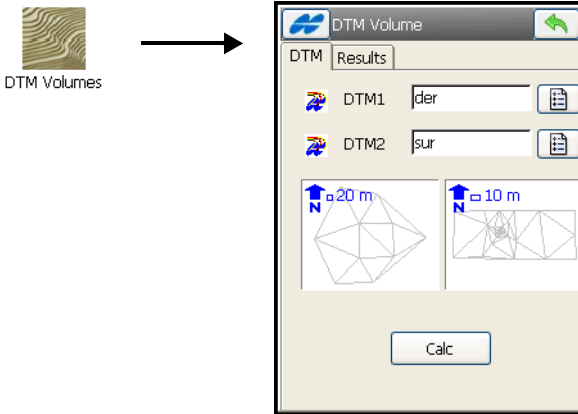


Figure 14-68. DTM Volume

- Select two DTM files and tap **Calc** to compare two surfaces.

In the *Results* tab, the report shows the volume data between the pair.

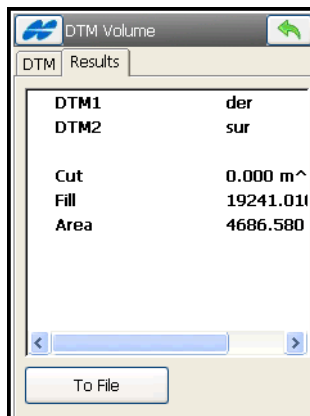
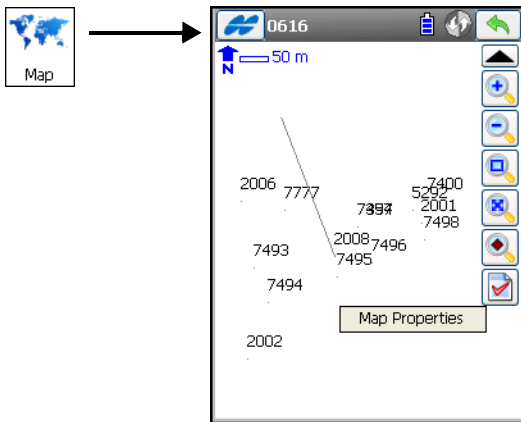


Figure 14-69. Calculate DTM Volume

- **To File** button - allows the user to save the report to a file.


# Viewing Map

The **Map** Icon in the main menu opens a map on the main screen for the current job.



**Figure 15-1. Job Map**

The Map screen displays the plot of the current job, the toolbar and the scale bar. The Map maintains the scale after changing the status of the main map. Pressing and holding the stylus on the map area displays the *Map Properties* option.

The Help Icon  opens a pop-up menu giving access to the help files, module activation codes, port data logging, changing menu interface, and information about the TopSURV used (for detail see “Help Icon’s Pop-up Menu” on page 1-9).

# Toolbar







The Toolbar of the Map screen contains icons of the viewing options.



Figure 15-2. Toolbar Viewing Options

Table 15-1 describes the toolbar icons.

Table 15-1. View Menu Toolbar Options

Toolbar Icon	Icon Description
	Zooms the plot inwards
	Zooms the plot outwards
	Selects a frame of objects for zoom-in display; draw from left to right to get the object you want.
	Displays all objects in the job
	Opens the <i>Points</i> screen to select a point to center the plot (see Figure 15-3 on page 15-3)
	Opens the <i>Properties</i> screen (see Figure 15-4 on page 15-3). This screen also displays by selecting the <i>Map Properties</i> option from the pop-up menus (see Figure 15-1 on page 15-1 and Figure 15-5 on page 15-5).

## Select Point

The *Select Point* screen selects a point from the list to center the plot.

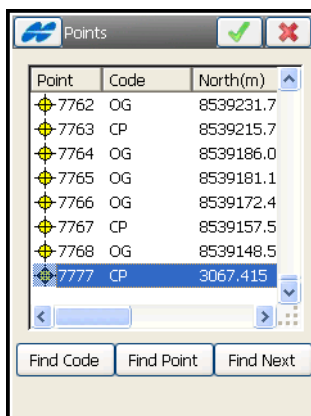


Figure 15-3. Select Point

## Properties

The *Properties* screen (Figure 15-4) customizes the map view by adding properties to the points or setting the application to adjust the scale automatically.

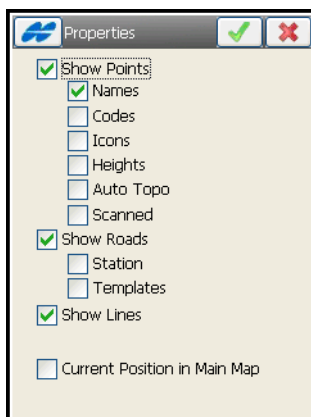


Figure 15-4. Map Properties


Place the check mark in the corresponding boxes to:

- Display, along with the points, their names, codes, icons and heights.
- Show Auto topo and scanned points.
- Display roads, turn on the linework on the map.
- Start each time from the current position. If the current position moves off the edge of the map, it will automatically snap back to the center if you place a check mark in the Current Position box.

## Actions on the Map

The main Map screen not only displays spatial job overview but also provides access the job database by actions on the map view. It is realized by pop-up menus which offer the relevant actions on particular objects.

On the main **Map** screen, you can:

- Tap on the desired object (point, line, road) to select/deselect objects on the map.
- Press the  button and draw a frame from right to left to highlight selected objects.
- Press and hold the stylus on (or near) the selected object to display map options.

A pop-up menu displays the options available for the selected object (Figure 15-5 on page 15-5):

- *Stakeout*: performs stakeout of the selected point, point in direction, linework, road, real-time road and slope.
- *Edit*: changes properties of a single selected object (point, line, road).
- *Delete*: deletes selected objects.
- *Add to Layer*: places selected objects on a selected layer.
- *Create a Road*: creates a road from the selected linework.
- *Calc Area*: calculates the area of the selected area, closed linework or point list.



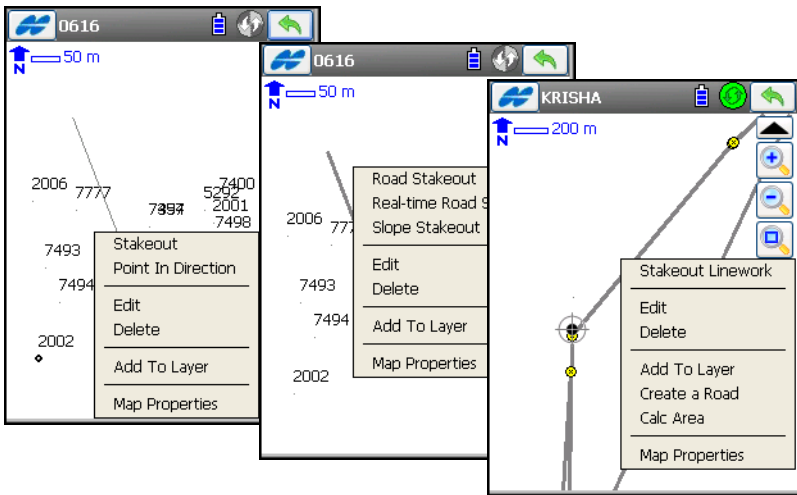


Figure 15-5. Map Options

Most TopSURV functions can be performed on the Map opened in a TopSURV task (for example, see Figure 15-6 for a Topo survey). Depending upon the task, the appearance of the view changes. Mostly the controls located on the main task page are duplicated. There are also some controls that are independent of the function being performed. These controls correspond to the viewing options and customized display options.

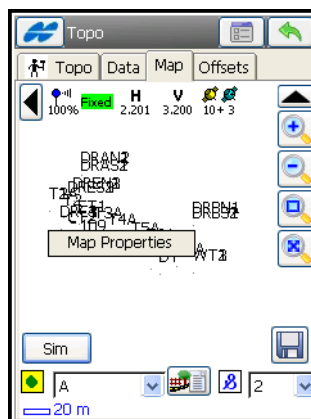


Figure 15-6. Topo – Map

## Notes:

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# Switching Instruments

The **Connections** Icon sets the instrument mode for surveying. The **Connections** screen displays (Figure 16-1).

## Connections

On the **Connections** screen, select the instrument type and wireless control options.

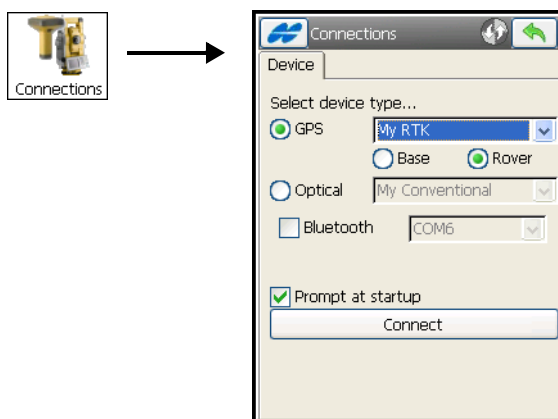


Figure 16-1. GPS+ Mode

- **Select Device Type** – sets the operation mode for surveying; select either *GPS* to work with GNSS receivers or *Optical* to work with total stations and digital levels. Also, you can change the job style and the Base or Rover receiver to work at the site.
- **Bluetooth** – the option for remote (wireless) control on short distances. Only available if a Bluetooth device is available.

Disconnect from the current device before changing observation mode. For details on connection settings, see “Connections” on page 2-12.

## Notes:

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# File Formats

The following sections describe the formats used to import/export different file types.

## Point Coordinate Formats

The files used to import/export point data can be in different formats: text formats such as DXF, MOSS and many others, or binary formats such as DWG and CR5.

## Text (Custom Format)

This format contains a set of user-defined fields in the user-defined order. This format can contain points and lines. Lines are defined by continuous list of the points with the same name.

The following fields are available:

- Name
- N(Lat)
- E(Lon)
- Elev
- Ell ht
- Notes
- Codes
- Codes&Strings
- Codes&Attributes
- FullCodes

Four variants of code fields are available to support all code features in TopSURV:

1. Codes - includes only codes: Code1, Code2,..., CodeN...

2. **Codes&Strings** - includes only code names and strings:

Code1&"code string1",..., CodeN&"code stringM"...

3. **Codes&Attributes** - includes only code names and attributes:

Code1:[attribute name1].[type of the attribute]="value of the attribute"...  
\$Code1:[attribute nameN].[type of the attribute]="value of the attribute"...

4. **FullCodes** - includes code names, attributes, code strings and control codes:

Code1:[attribute name1].[type of the attribute]="value of the attribute"&"code string"@ "control code"... \$Code1:[attribute nameN].[type of the attribute]="value of the attribute"&"code stringM"@ "control codeK"...



Select only one type of the code output to one file.  
Selection of several Codes fields for export is not supported

---

## **FC-4**

The FC-4 format is as follows:

Name, Northing, Easting, Elevation, Code

### **Example:**

```
101
12.32000
45.10000
23.12000
a
102
34.20000
9.40000
3.22000

103
2.33400
8.45000
```

45.00000

b

104

78.60000

45.00000

56.60000

## FC-5

### Example:

#### OutPut

```
_+BS_ f+012500000m_ g+011500000m_ h+000050000m_+PJ1_
f+012000000m_ g+011002106m_ h+000049970m_+PJ11_ f+012000000m_
g+011002106m_0063
```

```
h+000049970m_+PJ12_ f+011994478m_ g+011004703m_
h+000050025m_+PJ13_ f+011990588m_ g+011003698m_
h+000049863m_+PJ2_ f+011994476m1051
```

#### InPut

```
_+BS_ x+012500000m_ y+011500000m_ z+000050000m_+PJ1_
f+012000000m_ g+011002106m_ h+000049970m_+PJ11_ f+012000000m_
g+011002106m_0063
```

```
h+000049970m_+PJ12_ f+011994478m_ g+011004703m_
h+000050025m_+PJ13_ f+011990588m_ g+011003698m_
h+000049863m_+PJ2_ f+011994476m1051
```

## GTS-6

GTS-6 coordinate input and output is the same format. Refer to the GTS-6 interface manual to confirm details.

The format of GTS-6 is the same as FC-5 coordinate input.

## FC-6/GTS-7

The format of FC-6 is the same as GTS-7 coordinate format. The GTS-7 format is as follows:

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

### Example:

```
1,1000.0000,1000.0000,100.0000
2,990.0000,1010.0000,100.0000
101,994.8159,1000.9684,100.1130
102,993.9304,1007.7991,100.8000
103,998.5150,1009.6329,100.4026
104,1002.0648,1002.5682,100.3421
1001,1004.7210,997.6496,100.1153
1002,1003.7027,990.8382,100.7989
1003,998.7911,990.3286,100.4033
1004,997.3111,998.0951,100.3421
```

## GTS-7 with strings

The GTS-7 with strings format is as follows:

ptno, X(easting), Y(northing), Z(elevation), pt code, string

### Example:

```
1,1000.0000,1000.0000,100.0000,STN,001
2,990.0000,1010.0000,100.0000,STN,001
101,994.8159,1000.9684,100.1130,STN,002
102,993.9304,1007.7991,100.8000,STN,001
103,998.5150,1009.6329,100.4026,STN,002
104,1002.0648,1002.5682,100.3421,STN,001
1001,1004.7210,997.6496,100.1153,PT,09
1002,1003.7027,990.8382,100.7989,PT,05
1003,998.7911,990.3286,100.4033,PT,09
1004,997.3111,998.0951,100.3421,PT,05
```



## GT

The GT Format is as follows:

0 Code Name North East Elev 0 0

### Example:

0	a	101	12.320	45.100	23.120	0 0
0		102	34.200	9.400	3.220	0 0
0	b	103	2.334	8.450	45.000	0 0
0		104	78.600	45.000	56.600	0 0

## GT-FIN

The File Extension for this format is \*.GT

Format is 8,8,8,8,14,14,14:

- 1: Surface (Eight marks)
- 2: Line (Eight marks)
- 3: Code (Eight Marks)
- 4: Point (Eight marks)
- 5: X-coordinate (N) (fourteen marks)
- 6: Y-Coordinate (E) (fourteen marks)
- 7: Z-Coordinate (H) (fourteen marks)

### Example:

9 1 0 1 44318.541 72090.844 0.000

where

- 9 = Surface Code (ctrl code)
- 1 = Line Code (String code)
- 0 = Code
- 1 = Point number
- 44318.541 = North
- 72090.844 = East
- 0.000 = Height

## MMH360

The File Extension for this format is \*.360

MMH360-format is as follows:

- 1: Empty (Four marks)
- 2: Control Code (three marks)
- 3: String (Four Marks)
- 4: Point (pointnumber: seven marks)
- 5: Empty (four marks)
- 6: Code (Three marks)
- 7: Control Code 2 (two marks)
- 8: Empty mark (One mark)
- 9: X-coordinate (N) (11 marks, three after comma)
- 10: Empty mark (One mark)
- 11: Y-coordinate (E) (11 marks, three after comma)
- 12: Empty (Eight marks)
- 13: Z-coordinate (H)(8 marks, three after comma)

### Example:

```
25 4 10 60101 7062800.100 3513639.300 17.800
```

where

- 25 = Control code
- 4 = String
- 10 = Point Number
- 601 = Code
- 01 = Control Code 2
- 7062800.100 = North
- 3513639.300 = East
- 17.800 = Height

## DXF

AutoCAD® DXF (Drawing eXchange Format) is the native vector file format of Autodesk's AutoCAD application.

## KOF

KOF is a Norwegian format that consists of a set of data blocks.

### Example:

00 Starting off with total station:

```
02 P10                      1.690 31
09 40
03 100      45      100.1230 100.1230 100.123 1.670
03 101      45      200.3210 100.3210 200.321 1.670
03 101      45      .3215 299.6786 200.322 1.670
03 100      45      300.1236 299.8770 100.134 1.670
09 40
03 100      45      200.1260 299.8770 100.126 1.670
03 101      45      300.3350 299.6791 200.345 1.670
03 101      45      100.3206 100.3215 200.256 1.670
03 100      45      .1247 100.1234 100.139 1.670
09 39
03 2        7002      110.0000 101.3955 50.002 1.350
03 3        7002      125.3600 100.2500 48.369 1.350
03 4        7002      136.2300 100.2500 48.369 1.350
09 91
03 5        7002      148.0000 100.2500 48.369 1.350
03 6        7002      150.0000 100.2500 48.369 1.350
03 7        7002      158.0000 100.2500 48.369 1.350
03 8        7002      168.0000 100.2500 48.369 1.350
03 9        7002      170.0000 100.2500 48.369 1.350
03 10       7002      180.0000 100.2500 48.369 1.350
09 99
```

00 Then a couple of coordinates:

05 100 1000 134721.459 9867.343 21.633

05 101 1000 134741.349 9881.834 21.514

00 And some GNSS-vectors:

42 Bauta 2210658.5530 618726.6390 5930812.0680 1.341

43 D1 4.5619 230.4119 -47.0982 2.054

44 1.4314 0.6481 4.5640 1.0000 0.4382 0.8757 1.0000 0.4811 1.0000

42 Bauta 2210658.5530 618726.6390 5930812.0680 1.341

43 D2 -0.6466 176.7444 -33.8989 2.054

44 0.2134 0.1012 0.5657 1.0000 -0.0395 0.8015 1.0000 -0.1045 1.0000

The examples shown are not complete blocks, but show typical use of the blocks. Several of the blocks have a two-digit code that describes the kind of measurement being done.

The relevant values are:

30 = TS, Traverse

31 = TS, Free station / eccentric station

32 = TS, Known station

33 = TS, Other

91 = GPS, code differential (DGPS)

92 = GPS, autonomous

96 = GPS, RTK fixed

97 = GPS, RTK float

Block 00 - Header

DB FreeText

^I2 ^ A64

Example:

00 This is just a comment!!

Block 02 - Station

DB Station Feat.Code NR Press Temp Ih Type Comm

^I2 ^A10 ^A8 ^ I8 ^ I8 ^ I8 ^ F6.3 ^ I2 ^ A7

Example:

02 P100 1000 1.723

DB is the data bloc-number (02), Station is name of station (point where total station is situated), Feat. Code is feature code, NR could be left blank. Pressure in mmHg and temperature in C. Ih=instrument height, Type is type of measurement, and Comm is comment.

#### Block 03 - Total Station observations 1

DB AimPoint Feat.Code Hor Vert Dist Ph Type Comm  
 ^I2 ^ A10 ^ A8 ^ F8.4 ^F8.4 ^F8.3 ^ F6.3 ^ I2 ^ A7

Example:

03 PP230 7002 100.1230 100.1230 100.123 1.670

DB is data block-number (03). Aim Point is point name of point at which the total station is aimed. Feature code is feature code of Aim Point. Hor is horizontal angle (gon). Vert is vertical angle (gon). Dist is slope distance. Ph is pole height / prism height. Type is type of observation, and Comm is comment.

#### Block 04 - Total Station observations 2

DB AimPoint Feat.Code Hor Dh DistH Ph Type Comm  
 ^I2 ^ A10 ^ A8 ^ F8.4 ^F8.3 ^F8.3 ^ F6.3 ^I2 ^ A7

Example:

04 PP231 7002 100.1230 2.113 144.341 1.670

DB is data block (04). Aim Point is the point at which the total station is aimed. Feat.Code is feature code for Aim.Point. Hor is horizontal angle (gon). Dh is height difference. DistH is horizontal distance. Ph is pole height / prism height. Type is type of observation, and comm is comment.

#### Block 05 - Coordinates

DB Pointname Feat.Code North East Height Type Comment  
 ^I2 ^ A10 ^ A8 ^ F12.3 ^ F11.3 ^ F8.3 ^ I2 ^ A7

Example:

05 P101 1000 134741.349 9881.834 21.514

DB is datablock (05). Pointname is occupation name (point name). Feat.Code is feature code. North, East, Height is coordinate in selected system. Type is type of calculation/measurement, and comment is a free-text comment.

## Block 09 - Program information

DB PI Connection Free text

^I2 ^ I2 ^ A10 ^ A50

Example (line coding):

09 91

05 P100 1000 134654.123 9800.123 21.000

05 P101 1000 134741.349 9881.834 21.514

09 99

DB is datablock (09). PI is program information, which is a code that can give extra information to the program reading the KOF file, and can be used to start/end lines in a coordinate export. Connection is sometimes used and is a point number of an existing point.

## Block 41 - GNSS base, no coordinate

DB BaseName Feat.Code Bk Spaces Ant.H. Type Comm.

^I2 ^ A10 ^ A8 ^ I8 x31 F6.3 ^I2 ^ A7

Example::

41 Bauta 1.341

This block brings on base point name and antenna height. It has the same layout as block 42 (fields are described there), except that the coordinates are replaced by spaces.

## Block 42 - GNSS base, with coordinate

DB BaseName Feat.Code X Y Z Nr Ant.H. Bk Comm.

^I2 ^ A10 ^ A8 ^ F12.4^F12.4^F12.4^I8^F6.3 ^I2 ^ A7

Example:

42 Bauta 2210658.5530 618726.6390 5930812.0680 1.341

DB is data-block (42). BaseName is the point name of the base. Feat.Code is feature code. X, Y, and Z is coordinate of base in WGS84 geocentric coordinates. Nr should be left blank. Ant.H is antenna height. Bk should be left blank, and Comm. is a freetext comment.

## Block 43 - GNSS vector

DB PointName Feat.Code dX dY dZ Ant.H Bk Comm

^I2 ^ A10 ^ A8 ^ F12.4^F12.4^F12.4^ F6.3 ^I2 ^ A7

Example:

43 P1 4.5619 230.4119 -47.0982 2.054

This is the vector. DB is data-block (43). PointName is the (rover) occupation name (point name). Feat.Code is feature code. dX, dY, and dZ is the vector components in WGS84 geocentric coordinates. Ant.H is antenna height of the rover. Bk is not used, and Comm. is a freetext comment.

#### Block 44 - GNSS RMS and correlation coefficients, geocentric

DB sX sY sZ rXX rXY rXZ rYY rYZ rZZ Comm  
 ^I2 ^F8.4 ^F8.4^F8.4^F7.4^F7.4^F7.4^F7.4^F7.4^F7.4^A7

Example:

44 1.4314 0.6481 4.5640 1.0000 0.4382 0.8757 1.0000 0.4811 1.0000

This block follows block 43 with additional data on the vector. DB is data-block (44). sX, sY, sZ is the vector components standard deviation (or RMS-values). The r-fields are correlation coefficients between the vector components. rXX, rYY, rZZ are all equal to 1.

#### Block 45 - Coordinates in geocentric system (WGS84)

DB PointName Feat.Code X Y Z Ant.H. Bk Comm.  
 ^I2 ^A10 ^A8 ^F12.4^F12.4^F12.4^F6.3 ^I2 ^A7

Example:

42 P1048 1234 2210658.5530 618726.6390 5930812.0680

DB is data-block (45), PointName is occupation name (pointname), and Feat.Code is feature code. X, Y, and Z is the coordinate in WGS84 geocentric coordinates. Ant.H is antenna height. NB be left blank if coordinate is already adjusted for antenna height. Bk is left blank, and Comm. is a freetext comment.

#### Block 46 - Additional GNSS information

DB Date Time(UTC) #SVs PDOP Ant.Height Epochs Type  
 ^I2 ^I8 ^I2:I2:I2 ^I2 ^F5.2 ^F6.3 ^I3 ^I3

Example:

46 31122004 23:59:59 13 1.45 001 96

DB is data-block (46), Date is date in format DDMMYYYY, Time is UTC-time in format HH:MM:SS (24h notation), #SVs is

number of satellites included in position calculation, PDOP is PDOP, Ant height is antenna height. NB should be left blank if coordinate (or vector) is already adjusted for antenna height. Epochs is number of epochs measured, and type is type of solution, from this list:

Block 50 - coordinate in selected system, with ellipsoidal height

DB Pointname Feat.Code North East Ell.H Type Comm.

^I2 ^ A10 ^ A8 ^ F12.3 ^ F11.3 ^ F8.3 ^ I2 ^ A7

Example:

50 Point2345 1000 134741.349 9881.834 62.643

DB is data-block (50), PointName is the name of the occupation (point), and Feat.Code is feature code. North, East is coordinate from the measurement in selected system. Ell.H is ellipsoidal height in WGS84. Type is left blank. Comm. is a free text comment.

Block 51 - GNSS RMS and correlation coefficients, NEU (North,East,Up)

DB sN sE sU rNN rNE rNU rEE rEU rUU Comm

^I2 ^ F8.4 ^F8.4^ F8.4^ F7.4^ F7.4^ F7.4^ F7.4^ F7.4^ F7.4^ A7

Example:

50 Point2345 1000 134741.349 9881.834 21.514 62.643 2.054

This block follows block 05 or 50 (coordinate) with additional data on the measurement. DB is data-block (51). sN, sE, sU is the coordinate components' standard deviation (RMS-values), and the r-fields are correlation coefficients between the coordinate components. rNN, rEE, rUU are all equal to 1.

## **SHP**

SHP is an ArcView® GIS data format used to represent a set of geographic features.

Refer to the following website for details:

<http://dl1.maptools.org/dl/shapelib/shapefile.pdf>



## Cut Sheet Standard

Cut Sheet Standard format is as follows:

Header:

Date

Time

Job Name

Dist Units (Meter, US. Feet, Int. Feet, US. Inches, Int. Inches)

Design Point Record:

Point Name

Code

North East Elev

Stakeout Station Record:

Station Name

North East Elev

deltaNorth deltaEast deltaElev Cut

## Cut Sheet User Defined

This format contains a set of user-defined fields in the user-defined order.

The following fields are available:

Design Point

Code

Staked Point

Cut

Fill

Cut(Fill)

Time Stamp

Station

Offset Direction  
Offset Distance  
Design North  
Design East  
Design Elevation  
Station North  
Station East  
Station Elevation  
Delta North  
Delta East  
Delta Elevation

## **Check Sheet**

Check Sheet format is as follows:

Header:

Date

Time

Job Name

Dist Units (Meter, US. Feet, Int. Feet, US. Inches, Int. Inches)

Observed Point Record:

Point Name

Code

North East Elev

Check Station Record:

Station Name

North East Elev

deltaNorth deltaEast deltaElev

## PTL Sheet

PTL Sheet format is as follows:

Header:

Date

Time

Job Name

Dist Units (Meter, US. Feet, Int. Feet, US. Inches, Int. Inches)

Point Record:

PointName North East Elev Code FirstReferencePointName  
SecondReferencePointName

## CMM

The ASCII format file that consists of two files with extensions \*.cor and \*.lev containing coordinates and heights, respectively.

## Land XML

LandXML is a standard data exchange format.

Refer to LandXML Website for details:

<http://www.landxml.org/schema/landxml-1.0/Documentation/LandXMLDoc.htm>

## CR5

This is a file format of TDS-48 Coordinate file. The TDS Coordinate File is a binary file consisting of a 38 byte header, followed by coordinate point records 45 bytes in length.

CR-5 format is as follows:

Header:

Bytes 1- 10 is the file name in ASCII

Bytes 11- 20 are not used

Bytes 21- 34 is the starting point number in MS long integer format. This record is -1 if the file is non-sequential

Bytes 35- 38 is the last point number in MS long integer format

**Coordinate Point Records:**

Bytes 1- 4 is the point number in MS long integer format.  
This record is -1 if the point is unused (sequential files only)

Bytes 5- 12 is the northing of the point in MS double precision real

Bytes 13- 20 is the easting of the point in MS double precision real

Bytes 21- 28 is the elevation of the point in MS double precision real

Bytes 29- 45 is the point descriptor in ASCII

## **MOSS GENIO**

**Example:**

```
GENIO D:\J0119A
001,FORMAT(3F14.4)
003,ORDR,4=1,1,2,3
080,PT01,7=3
    1002.6092   1013.9337   2.3165
    1007.5266   992.8522   1.9564
    0.0000      0.0000      0.0000
080,PT02,7=3
    991.2378   1002.7609   1.5545
    993.2974   1014.3845   2.3475
    0.0000      0.0000      0.0000
080,CD02,7=3
    1002.6079   1013.9361   2.3148
    0.0000      0.0000      0.0000
080,CD03,7=3
    1007.5318   992.8488   1.9562
    0.0000      0.0000      0.0000
```

```

080,OCC,7=3
    1000.0000    1000.0000    0.0000
    0.0000      0.0000      0.0000
080,PT01,7=3
    1002.6079    1013.9361    2.3148
    1007.5318    992.8488     1.9562
    991.2376     1002.7602    1.5557
    993.2994     1014.3841    2.3509
    0.0000      0.0000      0.0000
999
FINISH

```

## NEZ

NEZ format is as follows:

Name, North, East, Elev, Code

### Example:

```

101,12.3200,45.1000,23.1200,a
102,34.2000,9.4000,3.2200,
103,2.3340,8.4500,45.0000,b
104,78.6000,45.0000,56.6000,

```

This format is also used for PTL coordinate system. In this case the NEZ format is:

Name, North, East, Elev, Code, First Reference Point Name, Second Reference Point Name

## NEZ with strings

The NEZ with strings coordinate format is as follows:

Name, North, East, Elev, Code, String

### Example:

```

101,12.3200,45.1000,23.1200,a,123
102,34.2000,9.4000,3.2200,,
103,2.3340,8.4500,45.0000,b,

```

104,78.6000,45.0000,56.6000,,

This format is also used for PTL coordinate system. In this case the format is:

Name, North, East, Elev, Code, String, First Reference Point Name, Second Reference Point Name

## Custom Format with Quality Control information

This format contains a set of user-defined fields in the user-defined order.

The following fields are available:

Name  
E(Lon)  
N(Lat)  
Ell ht  
Elevation  
Notes  
Codes  
Codes&Strings  
Codes&Attributes  
FullCodes  
Date  
Solution Type  
VRMS  
HRMS  
Time  
PDOP  
HDOP  
VDOP  
Num. of GPS  
Num. of GLONASS  
Design Elevation  
Station North

Station East  
 Station Elevation  
 Delta North  
 Delta East  
 Delta Elevation

## Code Libraries

The following sections describe the code formats used in the import/export code libraries.

### Topcon Data Dictionary Format (TDD)

Topcon's Data Dictionary Format supports String, Integer, Float and List types as fields of the codes. The Draw properties is also supported. All exported codes are stored in the one file. Each code is placed on a new line.

The format is as follows:

```
CodeName#1<Point?R*G*B?MStyle|Line?R*G*B?DashStyle?
Width> (field#1(FIELD_TYPE),... field#N(FIELD_TYPE))
CodeName#2<Point?R*G*B?MStyle|Line?R*G*B?DashStyle?
Width> (field#1(FIELD_TYPE),... field#N(FIELD_TYPE))
```

Comments:

Point, Line – types of the supported objects

R,G,B – color of the objects with such code

MStyle – mark style of the points with such code:

- 0 = Dot
- 1 = Filled Rectangle
- 2 = Filled Diamond
- 3 = Filled Circle
- 4 = Filled Triangle
- 5 = Rectangle
- 6 = Diamond

7 = Circle

8 = Triangle

9 = Cross

DashStyle – dash style of the lines with such code:

0 = Solid

1 = Dash

2 = Dot

3 = Dash Dot

4 = Dash Dot Dot

Width – width of the lines with such code

FIELD\_TYPE can be: String, Integer, Float, List.

For FIELD\_TYPE List we use next format:

List(item#1,...,item#N).

Example:

```
test_code(menu_item<Point?255*128*255?3|Line?255*255*128?3?1>(List(blue,
green,red)), text_item(String), int_item(Integer), real_item(Float))
```

## **XML File as Storage of the Code Library (XML)**

The XML Code Library format supports String, Integer, Float and List types as fields of the codes. The format also supports Layers dictionary and draw information for each code. All exported codes are stored in one file. The format uses the XML syntax and is as follows:

Example:

```
<?xml version="1.0"?>
<CodeDictionary version="1.1">
  <Layers>
    <Layer name="lay1" active="1" plot="1" notes="first">
      <Params type="Line">
        <DrawParams colorRValue="87" colorGValue="65" colorBValue="189"
dashStyle="1" width="2"/>
      </Params>
    </Layer>
```



```

<Layer name="lay2" active="1" plot="1" notes="second">
  <Params type="Line">
    <DrawParams colorRValue="153" colorGValue="98" colorBValue="156"
      dashStyle="2" width="3"/>
  </Params>
</Layer>

<Layer name="0" active="1" plot="1">
  <Params type="Line">
    <DrawParams colorRValue="128" colorGValue="128" colorBValue="128"
      dashStyle="0" width="1"/>
  </Params>
</Layer>
</Layers>

<Code name="code1" layer="0">
  <Params type="Point">
    <DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
      markStyle="-1"/>
  </Params>

  <Params type="Line">
    <DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
      dashStyle="-1" width="1"/>
  </Params>

  <Attributes/>
</Code>

<Code name="code2" layer="0">
  <Params type="Point">
    <DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
      markStyle="-1"/>
  </Params>

  <Params type="Line">
    <DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
      dashStyle="-1" width="1"/>
  </Params>

  <Attributes/>
</Code>

<Code name="code3" layer="0">

```

```
<Params type="Point">
<DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
markStyle="-1"/>
</Params>
<Params type="Line">
<DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
dashStyle="-1" width="1"/>
</Params>
<Attributes/>
</Code>
</CodeDictionary>
```

## **Data Base Format as Storage of the Code Library (DBF)**

This format supports String, Integer, Float types as fields of the codes. The List type is unsupported. Each exported code is stored in a separate file. The format uses DBF syntax. This is a binary format.

## **Roads Formats**

The following sections describe the road formats used in the import/export of road data.

### **SSS Road**

Alignments are uploaded as elements, and begins with the START definition which includes the starting chainage and a coordinate. The elements are: PT, STRAIGHT, ARC or TRANSITION.

The general format for each record is:

KEYWORD nnnn, nnnn [,nnnn]

where:

START            chainage, easting, northing

STRAIGHT       bearing, distance

ARC	radius, length
SPIRAL	radius, length
PT	easting, northing[, radius[, A1, A2: clothoid length]]

Example 1:

```
START 1000.000, 8.8888, 199.1200
STRAIGHT 25.0000, 48.420
SPIRAL 20.000, 20.000
ARC 20.000, 23.141
SPIRAL 20.000, 20.000
STRAIGHT 148.3000, 54.678
```

Example 2:

```
START 1000, 1050, 1100
PT 1750, 1300, 100, 80, 80
PT 1400, 1750, 200
PT 1800, 2000
```

## TDS Road

TDS road file has a file extension of “.RD5”. This format is divided into eight sections. Each section is started with a line that has a two letter code and is followed by exactly 50 '+' characters. These section header lines have to be included in the file even if there is no definition under them. For example, super-elevation and widening are not required, but their header lines must exist. Each header line may be followed by component definitions of that section.

Section codes:

```
HR  : Start Horizontal alignment
VR  : Start Vertical alignment
XR  : Start Right Template
XL  : Start Left Template
SR  : Start Right Super Elevation
SL  : Start Left Super Elevation
```

WR : Start Right Widening

WL : Start Left Widening

**Example:**

```
HR+++++
HL,25.49380,630.000
HS,-1.000000,1000.000,200.000,R,T
HC,-1.000000,1000.000,895.900,R
HS,-1.000000,1000.000,200.000,R,C
HL,-1.00000,250.000
VR+++++
VG,271.840,-2.000
VC,500.000,-2.000,1.800
VG,1254.060,1.800
VG,150.000,1.800
XR+++++
RT,100,0.000,NORMAL
XL+++++
LT,100,0.000,NORMAL
SR+++++
RS,106,30.000,108,30.000,-2.000,-6.000,0,0,0.000,0.000
RS,117,25.900,119,25.900,-6.000,-2.000,0,0,0.000,0.000
SL+++++
LS,104,30.000,108,30.000,-2.000,6.000,0,0,0.000,0.000
LS,117,25.900,121,25.900,6.000,-2.000,0,0,0.000,0.000
WR+++++
RW,104,35.000,105,35.000,22.000,14.000,0
RW,106,35.000,107,35.000,14.000,22.000,0
WL+++++
LW,104,35.000,105,35.000,22.000,14.000,0
LW,106,35.000,107,35.000,14.000,22.000,0
```

Component definitions:

Horizontal Alignments

HL,%5lf,%3f	Horizontal Line	
	Azimuth of line (DMS)	%5lf
	(-1 if tangent to previous segment)	
	Horiz distance of line (ft or meter)	%3f
HC,%lf,%3f,%3f,%c	Horizontal Curve	
	Tangent azimuth	%lf
	(-1 if tangent to previous segment)	
	Radius	%3f
	Arc length	%3f
	Turn ( R-Right or L-Left )	%c
HS,%lf,%3f,%3f,%c,%c	Horizontal Spiral	
	Tangent azimuth	%lf
	(-1 if tangent to previous segment)	
	Radius	%3f
	Arc length	%3f
	Turn	%c ( R-Right or L-Left )
	Direction	%c (T-Tangent or C-Curve)
Vertical Alignments		
VG,%3f,%3f	Vertical Grade	
	Horiz distance	%3f
	Grade	%3f
VC,%3f,%3f,%3f	Vertical Parabolic Curve	
	Horiz distance	%3f
	Begin grade	%3f
	End grade	%3f
Cross section Templates		
RT,%d,%3f,%s	Right or Left Cross Section Template	
LT,%d,%3f,%s		

Station number	%d
Station offset	%.3f
Template name	%s

**Super Elevation****Right or Left Super Elevation**

RS,%d,%.3f,%d,%.3f,%.3f,%.3f,%c,%c,%.3f,%.3f or

LS,%d,%.3f,%d,%.3f,%.3f,%.3f,%c,%c,%.3f,%.3f

Start Station number	%d
Start Station offset	%.3f
End Station number	%d
End Station offset	%.3f
Start slope	%.3f
End slope	%.3f
End of SE flag	%c

(0-End station number and End station offset are  
in fields 3 and 4

1-length of SE interval is in field 4)

Hinge on center or edge %c  
of road (0-center,1-edge)

Parabolic transition length %.3f  
at start of SE

Parabolic transition length %.3f  
at end of SE

**Widening****Right or Left Widening**

RW,%d,%.3f,%d,%.3f,%.3f,%.3f,%c or

LW,%d,%.3f,%d,%.3f,%.3f,%.3f,%c

Start Station number	%d
----------------------	----

Start Station offset	%.3f
End Station number	%d
End Station offset	%.3f
Width at start of widening	%.3f
Width at end of widening	%.3f
End of widening flag	%c

(0-End station number and End station offset are in fields 3 and 4 1-length of widening interval is in field 4)

## MC Road

MC road file has a file extension of “.RD3” and is a binary file.

## LandXML Road

LandXML is a standard data exchange format.

Refer to LandXML website for details:

<http://www.landxml.org/schema/landxml-1.0/Documentation/LandXMLDoc.htm>

## TopSURV Road format v.1.3

Distance/angle units are stored in the header record. If the Road is not a straight line, the header contains the starting azimuth.

TopSURV road format consists of three files:

1. \*.thl: contains a horizontal alignment and must start with the START definition which includes the starting chainage and coordinates.

The elements are: PT, STRAIGHT, ARC or SPIRAL.

The general format for each record is:

KEYWORD nnnn, nnnn [,nnnn]

where:

START            chainage, easting, northing

STRAIGHT bearing, distance

ARC radius, length [, bearing]

SPIRAL first radius, second radius, length [, bearing]

PT easting, northing[, radius[, A1, A2]]  
(A1, A2 : clothoid length)

- If the horizontal alignment starts with ARC or SPIRAL, the 'direction' field is used to define the start bearing of the horizontal alignment.
- If the spiral isn't a avoid clothoid, the corresponding not used radius equal zero.

Example1:

START 1000.000, 8.8888, 199.1200

STRAIGHT 25.0000, 48.420

SPIRAL 20.000, 20.000

ARC 20.000, 23.141

SPIRAL 20.000, 20.000

STRAIGHT 148.3000, 54.678

Example 2:

START 1000, 1050, 1100

PT 1750, 1300, 100, 80, 80

PT 1400, 1750, 200

PT 1800, 2000

2. \*.tv1: contains a vertical alignment with long sections (LS). Every LS requires chainage, level and curve length.

Starting and ending curve lengths should be zero.

The format is:

chainage, level, length

Example:

1000.000, 100.000, 0.000

1100.000, 125.000, 50.000

1250.000, 100.000, 60.000



3. \*.trd: contains cross sections set.

The format is:

Chainage, Template name, Turn (Left or Right), Cut, Fill,  
Segment name, Horizontal Offset, Vertical Offset

## CLIP

The CLIP file format is a europe road format.

### Example:

\*ALZ1

Calzada Derecha Ajustada

```
16512.029, 699.021C, 0.000T
18374.058, 749.296C, 10000.000R
19101.891, 785.687C,-15000.000R
19693.957, 807.105C,-25000.000R
20010.319, 815.960C, 25000.000R
20322.145, 829.250C, 22500.000R
21305.065, 878.500C,-12750.000R
21629.230, 888.160C, 14500.000R
21770.000, 894.966C, 0.000R
22000.000, 906.790C, 0.000T
22100.000, 911.900C, 25000.000R
22230.000, 918.790C,-10000.000R
22380.000, 4.975P, 50000.000R
22500.000, 932.525C,-20000.000R
22800.000, 947.100C, 50000.000R
22970.000, 955.547C,-25000.000R
23100.000, 961.800C,-10000.000R
23200.000, 966.370C, 22500.000R
23320.000, 972.200C, 45000.000R
23600.000, 986.660C,-100000.000R
23786.000, 5.000P,-10000.000R
23982.080, 1002.100C, -8250.000R
```

24258.306, 1005.121C, -9250.000R  
24693.967, 991.888C, 15000.000R  
25903.863, 985.839C, 9894.424R  
27440.115, 997.484C, -0.968F  
28690.632, 991.237C, -1.995F

## ISPOL

The ISPOL file format is a europe road format. The ISPOL road consists of three files: \*.ali (horizontal alignment), \*.ras (vertical alignment) and \*.sc1 (x-section sets).

To import an Ispol road, place the files (\*.ali, \*.ras and \*.sc1) in the same folder of TopSURV. When importing, select only the first offered (\*.ali) file and data from others will be considered by TopSURV.

### Example for ALI:

```
#-----  
# FIchero : EJE6.ALI  
# FOrmato : Istram 9.22 30/01/09 09:43:21 2332  
# PProyecto : AUTOPISTA SAN JOSE-CALDERA 181208 : dic'08_ene'09  
# EJe : 6 : Sector II. Autopista San José- Caldera  
# COmentario:  
# COmentario:  
#-----  
#PK.origen  
#-----  
14025.000  
#(Tipos 1:recta 2:circ.dcha 3:circ.izqu 4,5,6,7:clotoides 4:1->3 5:3->1 6:2->1 7:1->2) 0:Ultimo Punto  
# Tipo LONGITUD X tangencia Y tangencia X:tan/cen/inf Y:tan/cen/inf  
AZIMUT RADIO/PARAMETRO *  
#-----  
-----  
1 49.0501173 512601.0797000 213372.5271000 512601.0797000  
213372.5271000 294.9849339581 0.0000000 0.0000000000
```

```

2 131.2853885 512552.1817000 213368.6671000 512457.7477955
214564.9455950 294.9849403694 1200.0000000 0.0530516477

1 198.5004465 512420.9998000 213365.5084000 512420.9998000
213365.5084000 301.9498271952 0.0000000 0.0000000000

7 82.4942472 512222.5924492 213371.5870843 512222.5924492
213371.5870843 301.9498271952 203.0938788 0.0000000000

2 144.4248165 512140.2624197 213376.3778569 512196.7028959
213873.1821168 307.2015740844 500.0000000 0.1273239545

6 82.4979525 512001.0860785 213413.0364217 511927.0754097
213449.4262107 325.5903128439 203.0984398 82.4979524598

1 98.4084103 511927.0754097 213449.4262107 511927.0754097
213449.4262107 330.8422956155 0.0000000 0.0000000000

7 120.0022131 511839.9916369 213495.2588601 511839.9916369
213495.2588601 330.8422956155 176.6368461 0.0000000000

2 89.7947503 511738.6461417 213558.9894587 511909.1543980
213755.2722510 345.5337920791 260.0000000 0.2448537586

6 99.9896582 511682.2647898 213628.3033348 511645.0543034
213720.9343134 367.5203741969 161.2368169 99.9896582282

1 9.8708950 511645.0543034 213720.9343134 511645.0543034
213720.9343134 379.7617960162 0.0000000 0.0000000000

# fin de fichero -----

```

## Example for RAS:

```

#-----
# Fichero : EJE6.RAS
# FOrmato : Istram 9.22 30/01/09 15:26:47 2332
# PRoyecto : AUTOPISTA SAN JOSE-CALDERA 181208 : dic'08_ene'09
# EJe : 6 : Sector II. Autopista San José- Caldera
# COmentario:
# COmentario:
#-----
# VERTICE | TG. ENTRADA | TG. SALIDA |
# Pk Cota | Pk Cota | Pk Cota | Pendiente (%) K.V.
#-----
----
```

14025.0000	852.8730	0.0000	0.0000	0.0000	0.0000	0.000000	
0.0000							
14140.0600	855.2670	14025.0600	852.8742	14255.0600	849.8247		
2.080654	3375.8639						
14485.0000	838.9430	14425.0000	841.7825	14545.0000	837.1429	-	
4.732417	6927.2901						
14883.2150	826.9960	14808.2150	829.2461	14958.2150	822.5396	-	
3.000138	5099.0115						
15184.6850	809.0830	15064.6850	816.2133	15304.6850	810.4656	-	
5.941885	3383.1133						
15424.8400	811.8500	15304.8400	810.4674	15544.8400	806.3915		
1.152173	4209.8485						
16005.0000	785.4600	15885.0000	790.9185	16125.0000	785.3400	-	
4.548745	5394.7797						
16505.0000	784.9600	16385.0000	785.0800	16625.0000	789.6002	-	
0.100000	6050.1627						
16900.0000	800.2340	16750.0000	794.4337	17050.0000	803.8905		
3.866835	20991.3659						
17489.8650	814.6130	17314.8650	810.3471	17664.8650	809.5794		
2.437676	6586.3544						
18170.0000	795.0500	18080.0000	797.6387	18260.0000	795.0500	-	
2.876341	6257.9512						
18396.0000	795.0500	18301.0000	795.0500	18491.0000	796.1938		
0.000000	15780.8962						
# fin de fichero -----							

**Example for SC1:**

#-----

# Fichero : EJE6.SC1

# FOrmato : Istram 9.22 30/01/09 15:58:32 2332

# PRoyecto : AUTOPISTA SAN JOSE-CALDERA 181208 : dic'08\_ene'09

# EJe : 6 : Sector II. Autopista San José- Caldera

# COmentario:

# COmentario:

#-----

# Perfil por la Subrasante

#-----

# | Puntos: DespHrz-&gt;Respecto eje en planta DespVet-&gt;Respecto a Rasante

# Pk | DespHrz DespVrt Codigo

#-----

14025.000 21.995 -0.941 100.00 21.985 -0.950 99.00 20.240 -0.915 11.00 18.410 -  
 0.878 2.00 4.100 -0.592 1.00 3.500 -0.580 -11.00 0.000 -0.513 -1000.00 0.000 -  
 0.513 -1000.00 -3.360 -0.580 -11.00 -4.000 -0.593 1.00 -14.950 -0.812 2.00 -  
 16.750 -0.848 11.00 -17.920 -0.871 99.00 -17.930 -0.748 100.00 -18.430 -0.248  
 1103.00 -18.930 -0.248 1104.00 -19.521 2.115 1221.00 -19.521 2.116 1231.00 -  
 19.522 2.117 1241.00 -19.523 2.118 1251.00 -19.524 2.120 1399.00 -20.089 2.684  
 2399.00

14030.000 22.858 -0.934 100.00 22.848 -0.967 99.00 21.140 -0.933 11.00 19.310 -  
 0.896 2.00 4.100 -0.592 1.00 3.500 -0.580 -11.00 0.000 -0.514 -1000.00 0.000 -  
 0.514 -1000.00 -3.291 -0.580 -11.00 -3.941 -0.593 1.00 -14.891 -0.812 2.00 -  
 16.691 -0.848 11.00 -17.861 -0.871 99.00 -17.871 -0.748 100.00 -18.371 -0.248  
 1103.00 -18.871 -0.248 1104.00 -19.461 2.110 1221.00 -19.461 2.111 1231.00 -  
 19.462 2.112 1241.00 -19.463 2.114 1251.00 -19.464 2.115 1399.00 -20.030 2.681  
 2399.00

14040.000 24.920 -0.918 100.00 24.910 -1.008 99.00 23.290 -0.976 11.00 21.440 -  
 0.939 2.00 4.100 -0.592 1.00 3.500 -0.580 -11.00 0.000 -0.541 -1000.00 0.000 -  
 0.541 -1000.00 -3.128 -0.580 -11.00 -3.807 -0.588 1.00 -14.757 -0.724 2.00 -  
 16.558 -0.746 11.00 -17.728 -0.760 99.00 -17.737 -0.646 100.00 -18.237 -0.146  
 1103.00 -18.737 -0.146 1104.00 -19.301 2.110 1221.00 -19.302 2.111 1231.00 -  
 19.303 2.112 1241.00 -19.304 2.114 1251.00 -19.305 2.115 1399.00 -19.878 2.687  
 2399.00

14046.774 26.478 -0.851 100.00 26.468 -1.039 99.00 25.000 -1.010 11.00 23.140 -  
 0.973 2.00 4.100 -0.592 1.00 3.500 -0.580 -11.00 0.000 -0.563 -1000.00 0.000 -  
 0.563 -1000.00 -2.980 -0.580 -11.00 -3.660 -0.584 1.00 -14.610 -0.648 2.00 -  
 16.410 -0.659 11.00 -17.580 -0.666 99.00 -17.590 -0.559 100.00 -18.090 -0.059  
 1103.00 -18.590 -0.059 1104.00 -19.103 1.992 1221.00 -19.104 1.994 1231.00 -  
 19.104 1.995 1241.00 -19.105 1.996 1251.00 -19.107 1.998 1399.00 -19.760 2.651  
 2399.00

14046.878 15.060 -0.592 100.00 15.050 -0.811 99.00 13.630 -0.782 11.00 11.410 -  
 0.738 2.00 4.100 -0.592 1.00 3.500 -0.580 -11.00 0.000 -0.563 -1000.00 0.000 -  
 0.563 -1000.00 -2.978 -0.580 -11.00 -3.668 -0.584 1.00 -14.618 -0.647 2.00 -  
 16.418 -0.657 11.00 -17.588 -0.664 99.00 -17.598 -0.557 100.00 -18.098 -0.057  
 1103.00 -18.598 -0.057 1104.00 -19.111 1.994 1221.00 -19.111 1.996 1231.00 -  
 19.112 1.997 1241.00 -19.113 1.999 1251.00 -19.115 2.000 1399.00 -19.769 2.654  
 2399.00

14050.000 14.985 -0.568 100.00 14.975 -0.810 99.00 13.590 -0.782 11.00 11.400 -  
 0.738 2.00 4.100 -0.592 1.00 3.500 -0.580 -11.00 0.000 -0.572 -1000.00 0.000 -  
 0.572 -1000.00 -2.905 -0.580 -11.00 -3.615 -0.582 1.00 -14.565 -0.612 2.00 -

16.365 -0.617 11.00 -17.535 -0.621 99.00 -17.545 -0.517 100.00 -18.045 -0.017  
1103.00 -18.545 -0.017 1104.00 -19.034 1.940 1221.00 -19.035 1.942 1231.00 -  
19.036 1.943 1241.00 -19.037 1.944 1251.00 -19.038 1.946 1399.00 -19.738 2.646  
2399.00

14060.000 14.707 -0.473 100.00 14.697 -0.804 99.00 13.450 -0.779 11.00 11.400 -  
0.738 2.00 4.100 -0.592 1.00 3.500 -0.580 -11.00 0.000 -0.598 -1000.00 0.000 -  
0.598 -1000.00 -2.640 -0.580 -11.00 -3.360 -0.575 1.00 -14.310 -0.500 2.00 -  
16.110 -0.488 11.00 -17.280 -0.480 99.00 -17.290 -0.400 100.00 -17.790 0.100  
1103.00 -18.290 0.100 1104.00 -18.687 1.688 1221.00 -18.688 1.690 1231.00 -  
18.688 1.691 1241.00 -18.690 1.693 1251.00 -18.692 1.695 1399.00 -19.591 2.594  
2399.00

# fin de fichero -----

## **MX GENIO**

MX GENIO format is a GENeralized Input/Output format that is used to import and export model information to and from Infrasoftware's MX Professional. MX is a roadway design CADD application that uses a string-based modeling concept rather than a template-based approach used by civil design applications developed by other vendors.

MX GENIO format can be used to import a wide variety of string types into MX, including master alignment strings and geometry strings created from horizontal and vertical alignment definitions.

This is an example of a GENIO file that will create a 3D feature string in MX.

MOSS

GENIO,DESIGN

017,NORM

001FORMAT(3D23.17)

003,ORDR,4=1,1,2,3,

080,CECI,7=3

0.86278740486024506D+060.23557974062420847D+060.51777335135235114D+03

0.86278725732131349D+060.23558072925923113D+060.51778031070319832D+03

0.86278720921827410D+060.23558172768451227D+060.51778404785966120D+03

0.86278726103175664D+060.23558272592411647D+060.51778561243843410D+03

0.86278741224405798D+060.23558371400396363D+060.51778605405621181D+03

0.86278766134431469D+060.23558468205148648D+060.51778642232968866D+03

0.86279182182447857D+060.23559013383718926D+060.51787511440594790D+03

```

0.86281114482140180D+060.23559653051477592D+060.52051708265943284D+03
0.86281131684491527D+060.23559658416659472D+060.52054181820995780D+03
0.86281591805419116D+060.23559801922184543D+060.52113322369797083D+03
0.86281609007772699D+060.23559807287367119D+060.52115270941608628D+03
0.86281706168931420D+060.23559837590624942D+060.52126223300564516D+03
0.0000000000000000D+000.0000000000000000D+000.52126223300564516D+03
999

```

A detailed explanation of each of the lines in this file follow.

## MOSS

MX files begin with this line to clear any previous errors

## GENIO,DESIGN

Begin the GENIO option. Include the model name that the string(s) will be created in.

## 017,NORM

This command changes the Angular Input format for the file. 017,NORM will use the system default format for MX which is typically radians. Other alternatives for this are:

DEGR - Decimal Degrees

DMS - Degrees - Minutes - Seconds (in the format D23.17)

RADI - Radians

GRAD - Grads

QUAD - Quads

To specify angles in one of these other formats, substitute the appropriate Keyword for "NORM".

## 001FORMAT(3D23.17)

**Formats** The INPUT Information in the Data Block.

The format is described by a number of field descriptors separated by commas and is contained within parentheses.

A field descriptor in a format specification has the form:

**[r]Cw[d]**

where

**r** represents a repeat count which specifies the field descriptor is to be applied for 'r' successive fields. The default is 1 if omitted.

**C** is a format code: I - Integer, A - Alpha character, X - Space, F - Real number, D and E - Double precision.

**w** specifies the width of the field.

**d** specifies the number of decimal places.

Example: 3D23.17 specifies that each data line will consist of 3 double-precision records representing the X, Y, and Z coordinates of each point. Each field will be 23 columns wide, and each number will have 17 decimal places.

003,ORDR,4=1,1,2,3,

**Change Order** - This command changes the order of the items of information in a string element. The first two dimensions of a point on a string are always Cartesian Coordinates, but the other dimensions may describe different properties of the point. In this example, the first part of the line "003,ORDR" will always remain the same. The last part of the command line indicates how the data block is organized.

**4=1** indicates that 1 row of data in the data block is used to define each point. (for 3D features this is pretty straight-forward, but MX had more complex string types such as Geometry Strings that have 12-dimensional points that may be described over a number of lines.)

**,1,2,3,** indicates the string point dimensions the data should be assigned to. (X,Y,Z for a 3D string.)

080,CECI,7=3

**String Input** - This command indicates what type of string is being created. The MX string label

being created in this example is **CECI**, and each point on this string will have 3 dimensions (**7=3**).

0.86278740486024506D+060.23557974062420847D+060.51777335135235114D+03

0.00000000000000000D+000.0000000000000000D+000.52126223300564516D+03

**Data Block** - These lines define the points for string CECI as defined in the 080 line above. Each is in the format specified in the 001Format line, 3D23.17, which is 3 fields of 23 columns in double-precision format, and 17 places to the right of the decimal point.

To end the data block defining this string's points, a final data line is added with the X and Y coordinates set to **0.000**. The data in the 3rd column of this row is of no concern other than the fact an appropriate value of the specified type must be provided. In most cases, it will suffice to provide the same Z coordinate as the preceding line (the last actual point on the string.)

In the example above, a string was created that consisted of a continuous series of points. In many cases, you may want to create strings that have gaps in them (i.e. discontinuities). To represent the point on the beginning of a discontinuity (gap), set the X value of that point to a negative value. The point representing the end of a discontinuity (gap) should have the Y value set to a negative value.

Add a new "080" command to specify the new string.

999

999 - Tell MX to end the GENIO command.



## Tekla XRoad & XStreet (VGP)

This format has the extension \*.vgp.

### Horizontal Elements

Every line starts with feature information with element information following. Line's mark combines from three characters: Road's badge, alternative's badge, line's badge. KEYWORD is on every line and after that the parameters.

Parameters are: c = text, inf = integer, f = decimal number; with coordinates 4 decimals. Parameters are separated with spaces.

#### ROAD

Road's badge

TIE      badge  
          c10

#### ROAD ALTERNATIVE

Alternative's badge

TIEVE      badge  
              c10

#### LINE

Line's badge, description code (survey line, road's side etc), start sta

LINJA      badge      description      start sta  
              c10           int               f

#### ELEMENT

Element's informations are: Element's number; description code (for drawing) if different than line's description code (if not, then 0), geometry (1 = straight, 2 = circle, 3 = circular arch, 13 = circular arch over half circle, 4 = clothoid), start radius, end radius, clothoid's parameter (a)

ELEM      number      description      geometry      r1    r2    a  
              int           int           int           f    f    f

#### ELEMENT P1

Element's start sta information: Element's number, start sta, x1, y1

ELEMP1    number      start sta      x1      y1  
              int           f           f           f

## ELEMENT P2

Element's end sta information: Element's number, end sta, x1, y1

ELEMP2	number	end sta	x1	y1
	int	f	f	f

## ELEMENT CP

Circle's centre point's information: Element's number, x, y

ELEMCP	number	x	y
	int	f	f

## Vertical Elements

### ROAD

Road's badge

TIE	badge
	c10

### ROAD ALTERNATIVE

Alternative's badge

TIEVE	badge
	c10

### LINEZ

CL's badge, horiz line badge (stations)

LINJAZ	badge	hl badge
	c10	c10

### ELEMENTZ

Tangents intersections informations: point number, sta, z and radius between tangents. With first and last the radius = 0.

ELEMZ	number	sta	z	radius
	int	f	f	f

**Example:**

```
Horizontal Elements:
TIE          V9aito
TIEVE        b
LINJA        ml
ELEM          1      0      3      135.000      135.000      0.000
ELEM1         1      0.000      6825003.0699      2497735.2184      0.000
ELEM2         1      1.073      6825003.8922      2497734.5289
ELEMCP        1      6825090.2157      2497838.3233
123456789012345678901234567890123456789012345678901234567890123
```

```
Vertical Elements:
TIE          V9aito
TIEVE        b
LINJAZ       ml      ml
ELEMZ        1      20.0000      111.4300      0.000
ELEMZ        2      47.0000      110.4000      500.000
ELEMZ        3      120.0000      112.4000      0.000
123456789012345678901234567890123456789012345678901234567890123
```

## X-sect Templates Formats

Cross section is defined by templates. Each template is stored in a file. A template file consists of a series of segments and each segment has a horizontal and a vertical component. The following sections describe the formats used in the import/export of X-section Template data.

### SSS Template

SSS Template format is as follows:

Template Record:

Template Name, 0, Cut, Fill

Segment Record:

Template Name, 1, Offset, Height[, Code]

**Example:**

SIMP,0,6.000,6.000

SIMP,1,1.000,0.000,1

NAME,0,4.000,4.000

NAME,1,1.000,-0.250,EP

NAME,1,0.000,0.150,1  
NAME,1,0.500,0.000,2  
NAME,1,0.200,-1.000,3  
NAME,1,0.300,0.000,4

## **TDS X-section Template**

The following sample template file describes a cross section in two segments.

Number of segments: 2, Cut slope: 0.500 %, Fill slope: 1.000 %  
First segment: hd: 22.000 ft slope: -2.000 %  
Second segment: hd: 2.000 ft vd: -2.000 ft

### **Example:**

TH,2,0.500,1.000  
TS,22.000,-2.000,0,roadbed  
TS,2.000,-2.000,1,ditch

Definition of components in template file:

TH : Template Header format: TH,%d,%d,%d,%d  
Number of segments %d  
Slope cut %d  
Slope fill %d  
TS : Template Segment format: TS,%d,%d,%d,%d,%d  
Segment length %d  
Vertical dist or %d  
Slope %  
Vertical flag %d (0-Slope % is in  
field 2  
1-Vertical dist is in field 2)  
Segment name %s

## TopSurv Template

TopSURV Template format is as follows:

Template Name, Code, Offset, Height

### Example:

```
SIMP, 1, 1.000, 0.000
NAME, EP, 1.000, -0.250
NAME, 1, 0.000, 0.150
NAME, 2, 0.500, 0.000
NAME, 3, 0.200, -1.000
NAME, 4, 0.300, 0.000
```

## Localization Format

### GC3

This is a binary file containing localization data.

## Roads Survey Formats

The following sections describe the data formats used in the export of road raw data.

### X-Section Surveys

The format is as follows:

chainage, offset, level [,code]

### Example:

```
0.000,-4.501,18.527
0.000,-3.500,18.553
0.000,0.000,18.658,CL01
0.000,3.500,18.553
0.000,5.501,18.493
```

12.669,-4.501,18.029

12.669,-3.500,18.059

12.669,-0.000,18.164,CL01

12.669,3.500,18.059

12.669,5.501,17.999

## **Find Station Report**

The format is as follows:

FindChainageReport:

Reference road

FindChainage:

PointName Chainage Offset North East Elev [Cut]

## **Raw Data Formats**

The following sections describe the formats used in the export of raw data.

### **FC-5**

Refer to the FC-5 interface manual to confirm details on FC-5 data format.

#### **Example:**

```
_!SAMPLE_"SOMEONE_#GX0021_$06/01/  
95_%24C_&990HP_'X1000_(_)1.200_+A001_ a+2755858d_ b0881003d  
c+00010942m_*NS001_,1.200_+A002_ a+0006  
3265752d_ b0952330d c+00003366m_*NS001_,1.200_+A003_ a+0420820d_  
b0894549d c+00006913m_*NS001_,1.200_  
1002
```

## GTS-6

The data is GTS-6 and FC-5 unformatted data.

Refer to the GTS-6 interface manual to confirm details.

### Example:

```

_!SAMPLE_"SOMEONE_#GX0021_$06/01/
95_%24C_&990HP_'X1000_(_)1.200_+A001_
?+00010942m0881003+2755858d+00010936***+***+**054_*NS001_,0064
1.200_+A002_
?+00003366m0952330+3265752d+00003351***+***+**063_*NS001_,1.200_
+A003_ ?+00006913m0894549+0420820d+00006912***+***+**1039
055_*NS001_,1.200_
2037

```

## FC-6/GTS-7

The format of the GTS-7 data is the same as the FC-6 data format.

The general format of each record is as follows:

CONTROL WORD      field1 . . . ,fieldn

Where:

CONTROL WORD is terminated by a space.

Fields 1 to n-1 are terminated by commas.

Field n is terminated by the end-of-line.

Each field may be preceded by a number of space characters which should be ignored but may contain spaces after the first non-space character.

GTS-600 v3.1

JOB	job name, description
DATE	date, time
NAME	surveyors name
INST	instrument id
UNITS	Meter/Feet, Degree/Gon

SCALE	grid factor, scale factor, elevation
ATMOS	temp, press
STN	ptno, ins ht, stn id
XYZ	X(easting), Y(northing), Z(elevation)
BKB	ptno, backsight bearing, backsight angle
BS	ptno[, target height]
FS	ptno, target height, pt code[,string number]
SS	ptno, target height, pt code[,string number]
CTL	control code[,pt code 2[,string no 2]](optional)
HV	HA, VA
SD	HA, VA, SD
OFFSET	radial offset, tangential offset, vertical offset
PTL_OFF	offset along ref. line, offset perpendicular to line, vertical offset
NOTE	comments
MLM	from point, to point, delta HD, delta VD, delta SD
RES_OBS	ptno, target height, observation count
XYZ	if present follows the STN record
BKB	if present follows the BKB record or STN record if no BKB.
CTL	if present follows the FS or SS header record.
HV, SD or HD	must follow a BS, FS or SS header and follows the CTL if present.
OFFSET	may follow any SD or HD record.

**Example:**

```
GTS-600  v3.1
JOB      TEST1,TOPO COLLECTION
NAME     FRED
INST     GTS-7
```



UNITS	M,D
STN	1,1.500,STN
SS	1001,1.500,BLDG,01
SD	0.0000,84.4650,9.746
SS	1002,1.500,BLDG,01
SD	0.0000,84.4650,9.746
SS	1003,1.500,BLDG,01
SD	0.0000,84.4650,9.747
SS	1004,1.500,BLDG,01
CTL	CL
SD	359.1740,84.4650,9.747
SS	1005,1.500,NS
SD	359.1740,84.4650,9.747
SS	1006,1.500,NS
SD	359.1740,84.4650,9.747
FS	2,1.500,NS
SD	179.1740,84.4650,9.747
STN	2,1.500,STN

GTS-600 v3.1

JOB	TEST2, SET COLLECTION
NAME	FRED
INST	GTS-7
UNITS	M,D
STN	1,1.500,STN
XYZ	1000.000,1000.000,100.000
BKB	2,315.0000,0.0000
BS	2,1.500
HV	344.0620,86.3810
FS	101,1.500,STN
SD	325.3420,88.4750,5.275
FS	102,1.500,STN
SD	7.0610,85.2210,9.914

FS	103,1.500,STN
SD	36.1350,87.3800,9.755
FS	104,1.500,STN
SD	83.4730,84.0410,3.313
FS	104,1.500,STN
SD	263.4820,275.5530,3.313
FS	103,1.500,STN
SD	216.1430,272.2150,9.755
FS	102,1.500,STN
SD	187.0650,274.3730,9.916
FS	101,1.500,STN
SD	145.3520,271.1510,5.27
BS	2,1.500
HV	164.0640,273.2340

## Land XML

LandXML is a standard data exchange format.

Refer to LandXML Website for details:

<http://www.landxml.org/schema/landxml-1.0/Documentation/LandXMLDoc.htm>

## SurvCE RW5 Format

This Carlson format is a comma delimited ASCII file containing record types, headers, recorded data and comments. The format is based on the TDS RW5 raw data specification, with the exception of angle sets.

### Backsight Record

Record type: BK

Field headers:

- OP - Occupy Point
- BP - Back Point
- BS - Backsight
- BC - Back Circle

Sample(s):

BK,OP1,BP2,BS315.0000,BC0.0044

## Job Record

Record type: JB

Field headers:

NM - Job Name

DT - Date

TM - Time

Sample(s):

JB,NMSAMPLE,DT06-27-2003,TM14:21:53

## Line of Sight Record

Record type: LS

Field headers:

HI - Height of Instrument

HR - Height of Rod\*

\*GPS heights may be recorded to phase center or ARP depending on GPS make.

Sample(s):

LS,HI5.000000,HR6.000000

LS,HR4.000000

## Mode Setup Record

The mode setup will be recorded at the beginning of the raw data file.

Record type: MO

Field headers:

AD - Azimuth direction (0 for North, 1 for South)

UN - Distance unit (0 for feet, 1 for meter)

SF - Scale factor

EC - Earth Curvature (0 for off, 1 for on)

EO - EDM offset (inch)

Sample(s):

MO,AD0,UN0,SF1.00000000,EC1,EO0.0,AU0

## Occupy Record

Record type: OC

Field headers:

OP - Point Name

N - Northing (the header is N space)

E - Easting (the header is E space)

EL - Elevation

-- - Note

Sample(s):

OC,OP1,N 5000.00000,E 5000.00000,EL100.000,--CP

### Off Center Shot Record

Record type: OF

Field headers:

AR - Angle right

ZE - Zenith (actual)

SD - Slope Distance

Sample(s):

OF,AR90.3333,ZE90.0000,SD25.550000

OF,ZE90.3333,--Vert Angle Offset

### Store Point Record

Record type: SP

Field headers:

PN - Point Name

N - Northing

E - Easting

EL - Elevation

-- - Note

Sample(s):

SP,PN100,N 5002.0000,E 5000.0000,EL100.0000,--PP

### Traverse / Sideshot Record / Backsight Direct / Backsight

### Reverse / Foresight Direct / Foresight Reverse

Record type: TR / SS / BD / BR / FD / FR

Field headers:

OP - Occupy Point

FP - Foresight Point

(one of the following)

AZ - Azimuth

BR - Bearing

AR - Angle-Right

AL - Angle-Left

DR - Deflection-Right

DL - Deflection-Left

(one of the following)

ZE - Zenith

VA - Vertical angle

CE - Change Elevation

(one of the following)

SD - Slope Distance

HD - Horizontal Distance

-- - Note

Sample(s):

TR,OP1,FP4,AR90.3333,ZE90.3333,SD25.550000,--CP

SS,OP1,FP2,AR0.0044,ZE86.0133,SD10.313750,--CP

BD,OP1,FP2,AR0.0055,ZE86.0126,SD10.320000,--CP

BR,OP1,FP2,AR180.0037,ZE273.5826,SD10.315000,--CP

FD,OP1,FP3,AR57.1630,ZE89.4305,SD7.393000,--CP

FR,OP1,FP3,AR237.1612,ZE270.1548,SD7.395000,--CP

## GPS

Record type: GPS

Field headers:

PN - Point Name

LA - Latitude (WGS84)

LN - Longitude (WGS84, negative for West)

EL - Ellipsoid elevation in meters\*

-- - Note

\*GPS heights may be recorded to phase center or ARP depending on GPS make.

Sample(s):

GPS,PN701,LA42.214630920,LN-71.081409184,EL-21.8459,--C

P /Brass Disk

## TDS RawData

### Example:

```
JB,NMA_meas,DT03-15-02,TM15:17:53
MO,AD0,UN1,SF1.000000,EC0,EO0.0000
SP,PN1,N 90.0000,E 200.0000,EL 50.0000,--man
OC,OP1,N 90.0000,E 200.0000,EL 50.0000,--man
LS,HI1.0100,HR0.0000
--user has entered the following Azimuth
BK,OP1,BP2,BS0.0000,BC65.4618
--SS,OP1,FP2,AR65.4618,ZE102.0935,SD4.7720,--DOOR
LS,HI1.0100,HR2.5600
SS,OP1,FP3,AR61.1834,ZE84.2723,SD6.5740,--BEN
```



TopSURV can import/export localization data from/to this file and can only export GPS and TS observations.

---

## MOSS Survey

Both traverse and detail raw data formats can be exported.

### Example:

```
SURVEY D:\J0119A
017,DMS
190,,,DECR,0900000
180,,,9000,,1000.000,1000.000,0.000
200,9000,9001,SDVA,3595958,,,1.600,,1.000000
201,,,PT01,0103620,14.194,0870623,0.000,,,1001
201,,,PT01,1333115,10.386,0880200,0.000,,,1002
201,,,PT02,2872920,9.187,0901702,0.000,,,1003
201,,,PT02,3350057,15.887,0871812,0.000,,,1004
201,CD2,02,PP01,0103555,14.196,0870649,0.000,,,1005
201,CD2,03,PP01,1333053,10.392,0880209,0.000,,,1006
201,,,P101,2872902,9.187,0901634,0.000,,,1007
```

201,,,P101,3350118,15.886,0871727,0.000,,,1008

999

FINISH

## Field Book

Field Book files are text files that contain the observed point data. Data from a data collector can be exported to a Field Book file to import into a drawing and project.

### Example (for GPS data):

!NOTE Start Survey Date/Time DT07-30-2007,TM19:08:23

!NOTE End Survey Date/Time DT07-31-2007,TM18:35:21

UNIT FOOT DMS

HORIZ ANGLE RIGHT

PRISM CONSTANT 0

PRISM OFFSET 0

EDM OFFSET 0

CR OFF

TEMP 20 C

PRESSURE 1013.300 MM

COLLIMATION OFF

JOB gr3r

VERT ANGLE ZENITH

NEZ 999 9950.370 10012.484 1202.250 "BASE"

NEZ 1000 10000.000 10000.000 1200.000 "SSB"

NEZ 1001 10270.261 10001.970 1193.982 "SSB"

NEZ 1002 10330.897 10227.397 1193.548 "5/8"

NEZ 1003 10288.979 9594.926 1192.965 "SSB"

NEZ 1004 9998.380 9593.835 1193.349 "1/2"

NEZ 1005 7698.778 12840.197 1209.085 "5/8"

NEZ 1 10029.789 10076.702 1199.442 "TP"

NEZ 2 9756.259 10244.498 1199.587 "TP"

### Example (for TS data):

!NOTE Start Survey Date/Time DT08-23-2005,TM02:40:28

!NOTE End Survey Date/Time DT08-24-2005,TM20:11:01

UNIT FOOT DMS

HORIZ ANGLE RIGHT

PRISM CONSTANT 0  
PRISM OFFSET 0  
EDM OFFSET 0  
CR OFF  
TEMP 68 F  
PRESSURE 760.037 MM  
COLLIMATION OFF  
JOB OFFICE  
VERT ANGLE ZENITH  
NEZ 107 0.000 0.000 100.000  
STN 107 0.000  
NEZ 108 0.000 0.000 100.000  
AZ 107 108 0.000000  
BS 108  
PRISM 0.000000  
END  
AD VA 108 359.594000 00.000 51.580000 "AZMK"  
END  
F1 VA 102 61.310500 10.740 60.515000  
F1 VA 103 35.332500 7.800 65.022000  
F1 VA 104 359.583000 8.440 51.573500  
AZ 107 102 61.312500  
BS 102  
PRISM 0.000000  
END  
AD VA 102 61.323500 00.000 51.582000 "AZMK"  
END  
AZ 107 104 359.585000  
BS 104  
PRISM 0.000000  
END  
! BS Circle Check : angular err= 0.000  
! BS Circle Check : angular err= 0.000  
AD VA 104 61.323500 00.000 51.582000 "AZMK"  
END  
AZ 107 10001 359.585000  
BS 10001  
PRISM 0.000000



END

AD VA 103 93.430000 00.000 77.232500 "AZMK"

END

F1 VA 106 86.192000 12.240 86.512500

## Berlin GNSS

This format is a German format that consists of two separate files of quality report: GNSS-Messprotokoll and GNSS-Mittelwerte.

# Scanning Data Format

Scanning data includes an orientation file, control points for orientation and Camera calibration file for DI-3000.

## DI-3000

Project:

Header(FIELD\_SCAN\_FSC\_FILEVER1.0)

\*Text Format

Orientation Information File:

Name of Image

Size of Image Width[pixel] Height[pixel]

Number of Image Coordinates of Orientation Points

Image coordinates of Orientation point:

: Point Name,X,Y

\*Text Format

Control Point(Terrain) For Orientation File:

Point Name,X,Y,Z

\*CSV Text Format

**Results of Orientation Calculation(Single Orientation):**

ERR MAX,X Maximum Error,Y Maximum Error, 0.000000

ERR RMS,X Standard Dev[Pixel],Y Standard Deviation[Pixel], 0.000000

Discrepancy of each orientation point[Pixel]

\*Text Format

**Camera Calibration For Digital Camera:**

7.955772 // focal length [mm]

1.866217 // x of principal point [m]

1.375943 // y of principal point [m]

2 // distortion model

4 // number of distortion parameters

3.596956e-003 // distortion parameter 1

-1.414950e-004 // distortion parameter 2

-1.786501e-004 // distortion parameter 3

4.303863e-004 // distortion parameter 4

0.005600 // x resolution [mm/pixel]

0.005600 // y resolution [mm/pixel]

0 // number of fiducial marks

0 // number of radial distortion values

\*Text Format

**Setting Information:**

Instrument Point,X,Y,Z

Backsight Point,X,Y,Z

mh 0.0000 0.0000 IH(Instrument Height)

\*Text Format

**Point Clouds(Scanning Data):**

Header(SFILE\_VER01)

point name,X,Y,Z,Wide Image name,Tele Image Name,,Layer Name,Point Attribute

\*Binary Format(Fix)

**Point Clouds(Scanning Data):**

point name,X,Y,Z,Layer Name

\*CSV Format

## Job History

Job history can be exported to the CSV file or text report.

### CSV

All job history data are represented in text format with comma separated values.

### Report

In the current version only resection data are output.

The completed resection measurements prints out or writes to a file in the order of measuring. Also, all changes made when editing raw data are visible in the report file.

#### Example:

+++ TopSURV Version 5.04 +++ Date, Time

=====

Resection

=====

Job : Job-Name

Occ-point name : PPPPPPPPPP (E: EEEEEEE.EEEE[m], N: NNNNNNN.NNNN[m], Z: ZZZZ.ZZZZ[m])

Instr. height : ii.iiii[m]

Surveyor : name

Temperature : TT.T[°C]

Pressure : xxx (mmHg)

Date/Time : JJJJ-MM-DD HH:MM:SS

Dim-Type : 2D or 3D

Orientation : ggg.gggg[gon] (Standarddev.: dg.gggg[mgon])

OCC.Std.deviation : dE: dE[mm] dN: dN[mm] dZ: dZ[mm]

Scale : fix/calculated 1.00000000

Backbearing-Name Hz [gon] V [gon] SD [m] dHz[mgon] dV[mgon] dS[m]  
tH[m]

East [m] North [m] Height [m] dE[m] dN[m] dZ[m]  
USE(HVSD)

-----  
BKB1ppppppppppp HHH.HHHH VVV.VVVV DDDD.DDDD dH.HHHH  
dV.VVVV dS.SSS t.ttt

EEEEEEE.EEEE NNNNNNN.NNNN ZZZZ.ZZZZ dE.EEE dN.NNN  
dZ.ZZZ HVSD

BKB2ppppppppppp HHH.HHHH VVV.VVVV DDDD.DDDD dH.HHHH  
dV.VVVV dS.SSS t.ttt

EEEEEEE.EEEE NNNNNNN.NNNN ZZZZ.ZZZZ dE.EEE dN.NNN  
dZ.ZZZ HV-

BKB3ppppppppppp HHH.HHHH VVV.VVVV DDDD.DDDD dH.HHHH  
dV.VVVV dS.SSS t.ttt

EEEEEEE.EEEE NNNNNNN.NNNN ZZZZ.ZZZZ dE.EEE dN.NNN  
dZ.ZZZ HVSD

BKB4ppppppppppp HHH.HHHH VVV.VVVV DDDD.DDDD dH.HHHH  
dV.VVVV dS.SSS t.ttt

EEEEEEE.EEEE NNNNNNN.NNNN ZZZZ.ZZZZ dE.EEE dN.NNN  
dZ.ZZZ HVSD

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**Topcon Positioning Systems, Inc.**  
7400 National Drive, Livermore, CA 94550  
800-443-4567    [www.topconpositioning.com](http://www.topconpositioning.com)

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