# Reference Manual

**TopSURV OnBoard**

# Table of Contents

# Notes

# What's New with TopSURV

This chapter briefly describes new features and functions for version 5.11 of TopSURV.

| | |
|---|---|
| **Global**<br>The Global option is added to the Configuration menu to set Auto Linework type independent of the job configuration.<br>For details on this, see "Global" on page 2-9. | |
| **Layer**<br>Layers can be added/edited now.<br>For details on creating layers, see "Layers" on page 3-17. | |
| **Layer and Point Style**<br>The Layer and Style can be selected for points, lines and roads when editing.<br>For details on setting layers, see "Add (Edit) Point" on page 3-5. | |

| | |
|---|---|
| **New Import/Export Functionality**<br>Import of Layers, is added.<br>CLIP and ISPOL formats are added to import/export Roads.<br>For details on import/export, see "Import From File" on page 2-24 and "Export to File" on page 2-39. |  |
| **Design Point / Layer**<br>Now these options are available when staking out design points.<br>For details on using this feature, see "Design Pt/Layer" on page 6-4. |  |
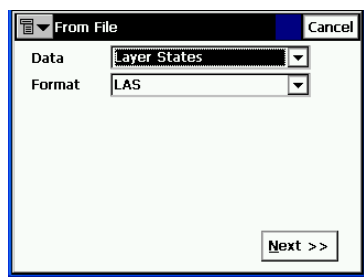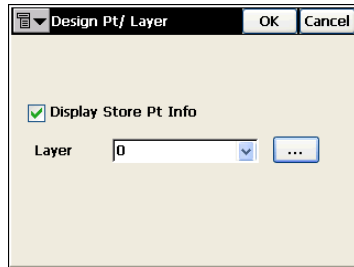
# Preface

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> NOTICE *NOTICE*
>
> *Please read these Terms and Conditions carefully.*

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## Manual Conventions

This manual uses the following conventions:

| Example | Explanation |
|---------|-------------|
| **File->Exit** | Click the File menu and click Exit. |
| **Enter** | Indicates the button or key labeled Enter. |
| *Notes* | Indicates a field on a dialog box or screen, or a tab within a dialog box or screen. |
| ***Topo*** | Indicates the name of a dialog box or screen. |
| OR | Alternate procedure for this step. |
| AND | Follow this step, and include this information, enable this function, or change this property. |

TIP

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

*NOTICE*

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

# Notes

# Introduction

TopSURV is Topcon's survey software available for Topcon Total Station controllers. When installed on a Topcon Total Station that runs the Windows® CE operating system, such as Topcon's GTS-720 and TopSURV is used for:

- field data collection
- stakeout and control work

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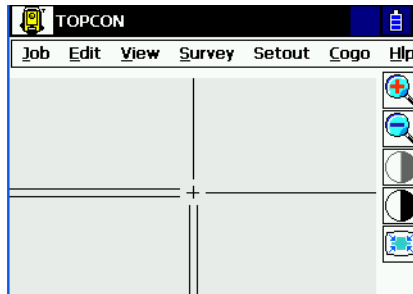


**Figure 1-1. TopSURV Main Screen**

# Title Bar

When on the main screen, the title bar displays the instrument button and the name of the job open (and the configuration name) .

**Job Name (Configuration Name)**



**Instrument**

**Connection Status**

**Figure 1-2. Title Bar – Main Screen**

When within a menu option, the title bar displays the bitmap button, the name of the screen, and any system buttons required for various operations.

**Bitmap      Name of Screen      System Buttons**
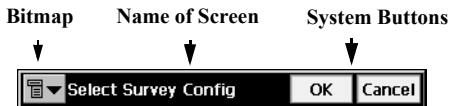


**Figure 1-3. Title Bar – Menu Functions**

The bitmap opens the pop-up menu containing the Help item to access the help files and some options specific for a screen open.

# Menu Bar

The menu bar has seven menus used to configure and manage a survey job, and to control data.
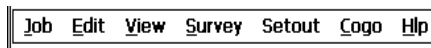


**Figure 1-4. Menu Bar**

See the following chapters for a description of each menu and its functions.

# Job

The Job menu includes the following menu items:

- Open
- New
- Delete
- Config
- Import
- Export
- Info
- Exit
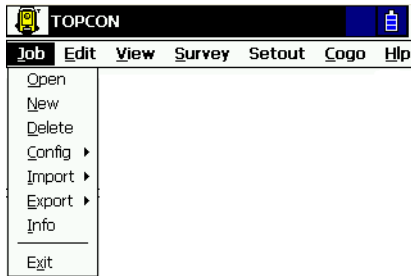


**Figure 2-1. Job Menu**

# Open Job

To open a job, tap **Job ▶ Open**.

The *Open Job* screen can be used to select a job.
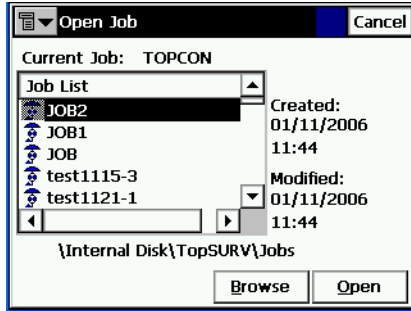


**Figure 2-2. Open Job**

The *Job List* field contains the names of all existing jobs created/ opened using TopSURV and indicated by the icon 🐞. Initially, the *Job List* is empty.

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

- 🔍 : displays the directory where the selected job was created.

- **Browse**: displays the screen to browse directories for selecting a job to open. Highlight the file and press **OK**.
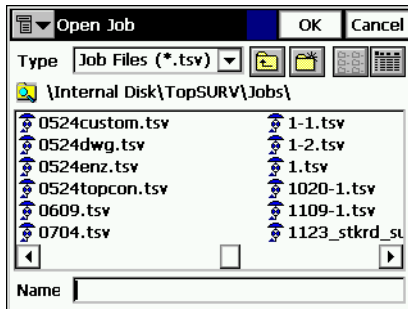


**Figure 2-3. Browse Job**

- **Open:** creates the chosen job current and returns to the main screen.

# New Job

To open a new job, tap **Job ▶ New**.

The *New Job* screen starts the new job creation process which is performed with the help of a Wizard.
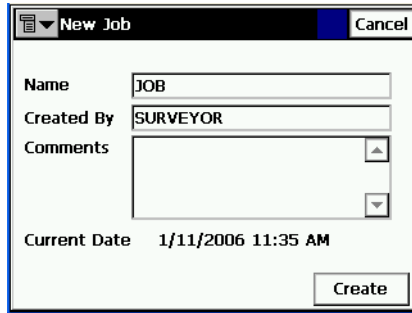


**Figure 2-4. New Job**

- ⬜ : displays the directory where the job will be created. By default, job files are stored in the Jobs folder in the directory where the application has been installed. Press **Browse** to change the directory.
- *Name:* the name of the new job.
- *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.
- **Browse**: changes the directory in which to look for a job.
- **Open**: after setting all fields of the screen, pressing this button opens the Job.

# Delete

To delete a job, tap **Job ▶ Delete**. The ***Delete Job*** screen deletes jobs. Once deleted from the Job List, the file containing the job chosen is deleted from the controller.
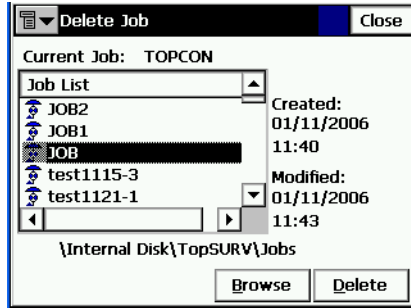


**Figure 2-5. Delete Job**

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

- ![icon] : displays the directory where the selected job was created.

- **Browse**: If a job is not listed in this list, browse through the directories to select the job for deletion.

- **Delete**: deletes the job.

- **Close**: closes the screen without deleting job.

# Configuration

The Config submenu changes the parameters set during Job creation.
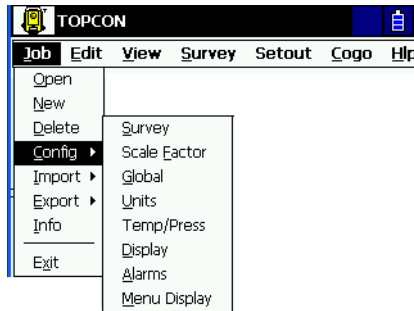


**Figure 2-6. Config Submenu**

## Survey

To configure a survey, tap **Job ▶ Config ▶ Survey**.

*Config: Survey Parms* screen contains the additional survey parameters.
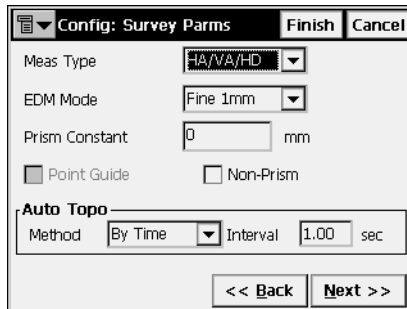


**Figure 2-7. Config: Survey Parameters – Second Screen**

- *Meas Type*: sets the order and the type of the measurements in one set.

  – *HA*: horizontal angle     – *HD*: horizontal distance

  – *VA*: vertical angle     – *VD*: vertical distance

  – *SD*: slope distance

- *EDM mode*: determines the sensitivity to use for the distance measurements, coarse or fine.

- *Tolerances*: the admissible deviation values of the horizontal and zenith angles and the distance.

- **Next:** opens the ***Config: Stakeout Parms*** screen.

- **Finish**: saves the changes and returns to the ***Select Survey Config*** screen. All the settings will be transmitted only when the configuration is used.

## Config: Stakeout Parameters

The ***Config: Stakeout Parms*** screen sets the default stakeout parameters. These parameters can be changed using the **Settings** button from any Stakeout screen in TS mode.
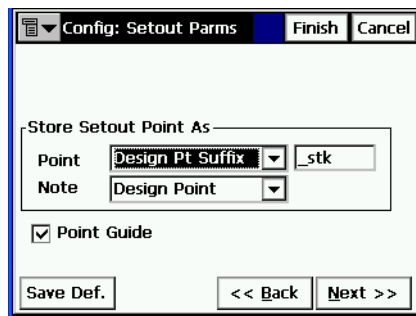


**Figure 2-8. Config: Stakeout Parameters**

- The *Store Staked Point As* field sets the rules for staked points naming. This is 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 point with a pre-defined prefix (that is, stk_01, where "stk_" is prefix), design point with a pre-defined suffix, or design point with a specified numerical constant added automatically.

  – *Note*: sets the rule for defining Notes for the staked-out points; either *Design Point*, *Design PT Prefix, Design PT Suffix,* or *Station & Offset*.

- **Point Guide:** Point Guide On/Off
- **Back**: returns to the previous screen.
- **Next**: opens the *Config: Miscellaneous* screen.
- **Save.Def**: saves the changes and returns to the *Select Survey Config* screen. All the settings will be transmitted only when the configuration is used.
- The bitmap menu on the upper-left corner contains two items:
    - *Display*: opens the *Staked Point Icon* screen to set an icon for the staked point.
    - *Help*: accesses the Help files.

## Config: Miscellaneous

The *Config: Miscellaneous* screen is used to customize the user interface (Figure 2-9 on page 2-7):

- *Edit Attributes after Meaurement:*when checked,Attributes can be changed after measurement.
- *Prompt for Rod Height*: when checked, prompts for a height of a Rod (Target) before a point is stored.
- *Prompt for BS Check*: when checked, will bring up the *Backsight Check* screen when the *Backsight Setup* screen is exited.
- *Prompt for ControlFeature:* when checked, a dialog will appear to specify the control code and attribute before a surveyed point is stored.
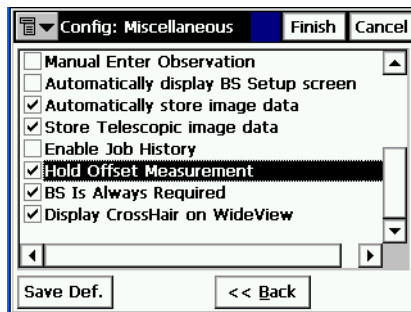


**Figure 2-9. Config: Miscellaneous**

- *Stakeout Sound*: makes a sound each time a point is staked-out.

- *Beep on Storing Points*: beeps each time a point is stored.

- *VA Zero at Level*: if checked, vertical angle measurements are oriented to be zero at the Horizontal ("Level") direction. If this option is unchecked, 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 is set in TopSURV.

- *Bs uses Backsight circle:* use Backsight circle for BS measurement.

- *Manual Enter Observation*: starts measurement with enterkey.

- *Automatically display BS Setup screen*: if checked, the **Backsight Setup** screen displays automatically when attempting to access any of the screens involving total station observations.

- *Enable Job Historu:* creates Job History.

- *Hold Offset Measurement*: if checked, the screen to measure an offset point with the help of the selected offset tool displays automatically after each measurement.

- *BS Is Always Required*: if checked, a warning to set Backsight always displays when attempting to access any of the screens involving total station and level observations.

- **Save.Def**: saves the changes and returns to the **Select Survey Config** screen. All the settings will be transmitted only when the configuration is used.

- **Back**: returns to the previous screen.

# Global

To set general settings in TopSURV, tap **Job ▶ Config ▶ Global**.

The *Global* screen sets mode for performing linework.
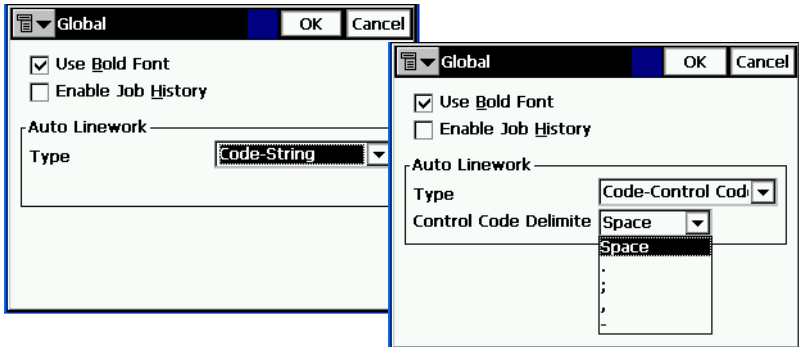


**Figure 2-10. Global**

- *Use Bold Font*: if checked, uses the bold font on the controller display to see more clearly.

- *Enable Job History*: if checked, saves every surveyor's operation on the job in a history file.

- *Auto Linework*: selects the type of linework to form open and closed polylines:
  - *Code-String:* all points with the same unique combination of Code and Strings are connected to form a line. This line is named as "~~~Code&String".
  - *Point/Line/Area:* all points are selected to be a part of either points or named lines or areas (GIS mode). Areas in this mode are simply closed lines. Strings and control codes are not supported in this mode.
  - *Code-Control Code:* the control codes /BEG and /END are indicated along with codes to start and end lines. All points with the same code between and indicating the points with the /BEG and /END control codes are then connected in the measurement order to form a line. This line is named as "~~~Code&XXXXXXXX", where the XXXXXXXX is an automatically generated number which increments for each

additional line created. Strings cannot be entered in this mode at all.

- If the selected mode is Code-Control Code mode, then the *Control Code Delimiter* option selects a delimiter for entering control codes along with codes in a single field, separated by this delimiter.

- **OK:** saves the changes and returns to the main screen.

# Units

**Job ▶ Config ▶ Units** opens the *Units* screen.

The *Units* screen displays the default units that will be used in the job.
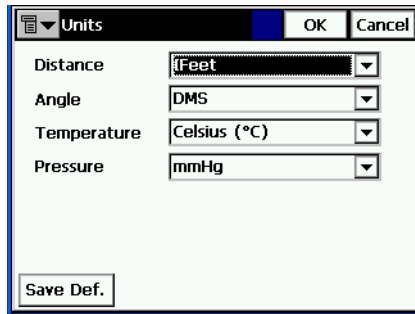


**Figure 2-11. Units**

- *Distance*: units of linear measurements for the job. These can be Meters; IFeet (International Feet, 1 Ifoot = 0.3048 Meters), US Feet (1 USFt = 1200/3937 Meters); IFeet and Inches, or US Feet and Inches (the latter two are calculated taking into account that 1 Foot = 12 Inches).

 TIP

If the selected units are USfeet, linear values can be entered as meters, or IFeet by appending "m" or "if" to the entered value.

If the selected units are in meters, then a linear value in USFeet, or International feet can be entered by appending "f", or "if" to the end of the entered value.

If the selected units are in IFeet, linear values can be entered in meters or USfeet by appending "m", or "f" to the entered value. The appended characters "m", "f", or "if" are case insensitive. In other words, enter "M", "F", or "IF".

- *Angle*: units of angular measurements for the job. These can be *Degrees*, *Grads (Gons), Radians (for Cogo use only)*, or *Mils (for Cogo use only). (*360 degrees = 400 grads = $2\pi$ radians = 6400 mils.)

TIP

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* : units of temperature, used only for the raw measurements. These can be *Celsius (C)*, or *Fahrenheit (F)*.
- *Pressure* : units of atmosphere pressure, used only for the raw measurements. These can be *mmHg*, or *hPa*.
- **Save.Def**: saves the changes and returns to the *Select Survey Config* screen. All the settings will be transmitted only when the configuration is used.
- **Finish**: saves the settings and returns to the main screen.

# Temperature/Pressure

This option is available only for Total Stations surveys.

**Job** ▶ **Config** ▶ **Temp/Press** opens the *Temperature/Pressure* screen to set the temperature and air pressure surrounding the total station to calculate atmospheric correction values for distances measured.



**Figure 2-12. Temperature/Pressure**

# Display

**Job** ▶ **Config** ▶ **Display** opens the *Display* screen.

The *Display* screen customizes the software interface.



**Figure 2-13. Display**

- *Coord Type*: sets the coordinate type for the coordinate system selected.

- *Coord Order*: sets the Northing/Easting order and displays the height type for the coordinate system selected.

- *Azimuth Origin*: the reference direction of azimuth.

- *Disp Dir As*: select whether to display the direction as bearing or azimuth.

- *Disp CL Pos As*: select how to display the position on the center line: as station or chainage.

- *Full Station*: available if Station selected for *Disp CL Pos As*; sets the measurement units used for the full station value and is usually 100 units.

- **Save.Def**: saves the changes and returns to the ***Select Survey Config*** screen. All the settings will be transmitted only when the configuration is used.

- **Finish**: saves the settings and returns to the main screen.

# Alarms

**Job ▶ Config ▶ Alarms** opens the ***Alarms*** screen.

The ***Alarms*** screen sets the sound alerts for situations of low power, low memory, poor radio link, and loss of initialization for total station (TS column). Place check marks to select the desired alert conditions.
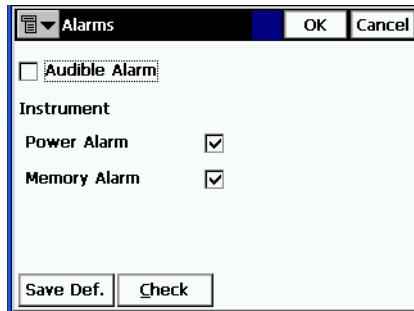


**Figure 2-14. Alarms**

- *Audible Alarm*: check this field to enable audible alarms. The alert will sound automatically when an alert situation occurs.

- **Finish**: saves the settings and returns to the main screen.

# Menu Display

With the *Config* submenu, the appearance of the menus can also be modified. Some rarely used functions are not displayed, but can be enabled through the **Config ▶ Menu Display** submenu and the *Config Menus* screen.

## Config Menus

The *Config Menus* screen displays the list of menus and submenus for each special submenu for the current job configuration.
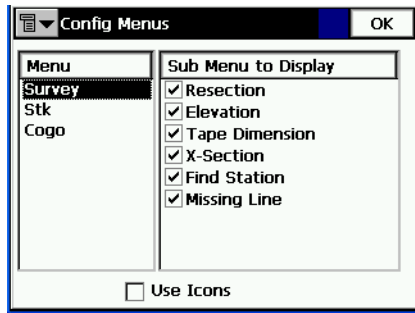


**Figure 2-15. Config Menus**

- *Menu*: the list of available menus.

- *Sub Menu to Display*: the list of the selected menu items available for display. Place a check mark near the item to display in the menu.

- *Use Icons*: check this box to display the menu items on the main screen as icons.

# Import

To import data, tap **Job ▶ Import** (Figure 2-16).
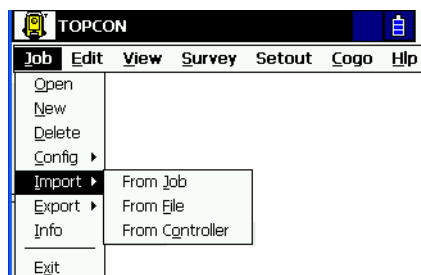
Figure 2-16. Import Submenu

The Import function is used to add points, codes and attributes, Code Libraries, Roads, Cross Section Templates, Point Lists.

The bitmap in the upper-left corner of the screen displays the floating menu of the *Help* item.

## Import From Job

To import from a job, tap **Job ▶ Import ▶ From Job**.

### Select Job

The *Select Job* screen (Figure 2-17 on page 2-16) selects the job for import. **Select** launches a wizard-based import process. The wizard will guide the steps through the import process by means of the **Next** button. When at the final stage, the Next button becomes unavailable, and the Finish button will be active.
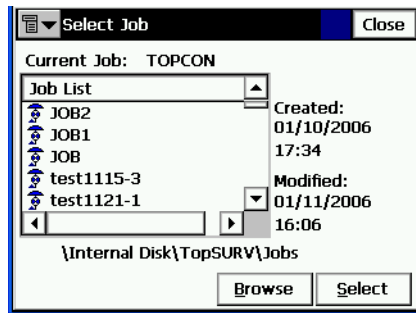
**Figure 2-17. Select Job**

If there is no desired job in the Job List, press the **Browse** button to select a job from the controller. The second *Select Job* screen will be opened to browse directories on the controller for a job.
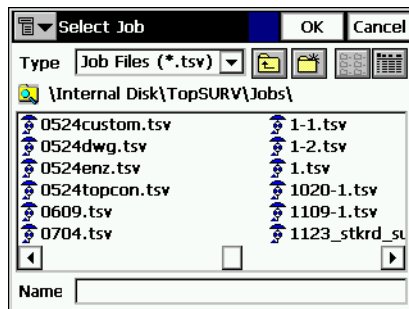


**Figure 2-18. Select Job**

• *Name*: the name of the imported file.

• **OK**: approves the selection and opens the *Import* screen.

## Import From Job

The *Import From Job* screen selects the data to import and, if necessary, filters the imported points.
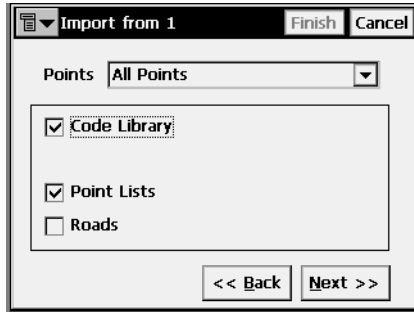


**Figure 2-19. Import From Job**

- *Points*: select the points for import, from the drop-down menu:

  – *All Points*
  – *By Type*
  – *By Range and Code*
  – *By Type, Range and Code*
  – *None*

- The following data can be imported along with points:

  – *Code Library*
  – *Point Lists*
  – *Roads*

- **Back**: returns to the previous screen.

- **Next**: depending on selections, opens either the *Select Point List(s) to Import* screen, or *Select Point Type(s) to Import* screen, or *Select Roads to Import* screen if only *Roads* is checked and *All points* is selected.

- **Finish**: starts the import process if only *Code Library* and/or *Localization* items are chosen and *All Points* is selected. Otherwise, the button is not available.

## Select Point Type(s) to Import

The *Select Point Type(s) to Import* screen is used to select the types of points to be imported if *Code Library, Localization* or *Roads* are checked (if points filter by type has been enabled in the *Import From Job* screen). This can be done by placing check marks in the list, next to the desired types of points.
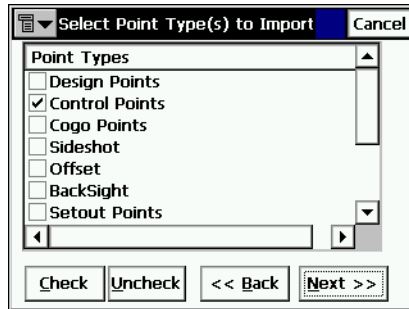


**Figure 2-20. Select Point Type(s) to Import**

- *Point Types*: the list of the point types. The following types are available for import:

| | | |
| --- | --- | --- |
| *Design Points* | *Control Points* | *Cogo Points* |
| | *Sideshot* | *Offset* |
| | | *BackSight* |
| *Stake Points* | *Stake Line* | *Check Points* |
| *Manually Typed* | *Tape Dimension* | *Edge Extraction* |

- **Check** and **Uncheck**: toggles the highlighted item(s) on or off, depending on the button being pressed. Press **Ctrl** while selecting to select more than one item.

- **Back**: returns to the previous screen.

- **Next**: opens *Points to Import* screen (if points filter by type, code and range has been enabled in the *Import From Job* screen). Otherwise, the button is not available.

## Points to Import

The *Points to Import* screen filters the imported points.
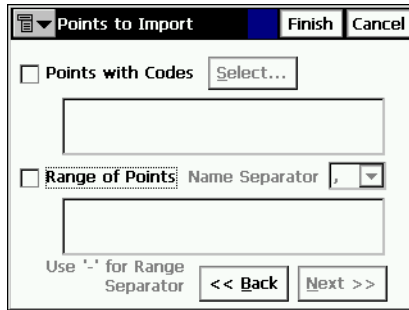


**Figure 2-21. Points to Import**

- *Points with Codes*: if set, all points with the selected codes will be imported.

- **Select**: opens the *Code* screen for code selection.

- *Range of Points*: select the points to import. These can be set by range ("-", ";" or "," can be used as a range separator) or by enumeration.

- **Back**: returns to the previous screen.

- **Next**: opens the *Select Road(s) to Import* screen (if *Roads* was checked in the *Import From Job* screen). Otherwise, the button is not available, and the **Finish** button appears to open the *Import Status* screen.

## Code

The *Code* screen contains a list of available codes. All points with codes selected here will be imported.
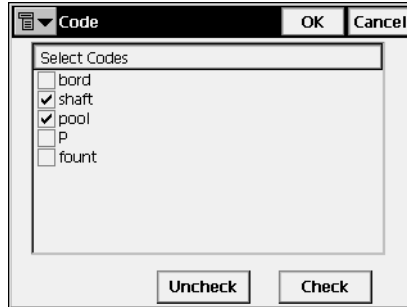


**Figure 2-22. Code**

- **Uncheck**: removes the mark from the highlighted code.
- **Check**: marks the highlighted entries.
- **OK**: returns to the previous screen with the codes selected.

## Select Road(s) to Import

The *Select Road(s) to Import* screen selects the roads to import along with the data. Select from the *Roads* list for import by placing check marks next to them.
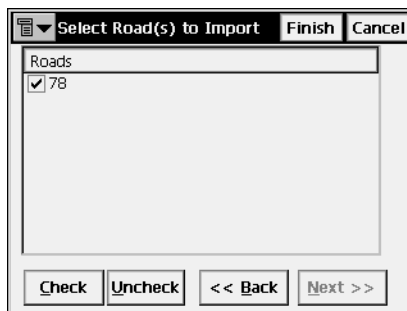


**Figure 2-23. Select Road(s) to Import**

- *Roads*: the list of available roads in the selected job.
- **Check** and **Uncheck**: toggles the highlighted item(s) on or off, depending on the button being pressed.

- **Back**: returns to the previous screen.

- **Finish**: starts the import process.

## Select Point List(s) to Import

The *Select Point List(s) to Import* screen is used to select the point lists (if available) to import along with the data. Place the check marks to select the lists to import.
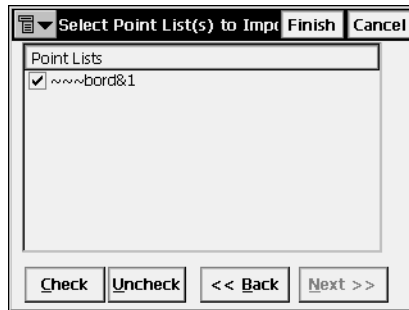


**Figure 2-24. Select Point List(s) to Import**

- *Point Lists*: the list of available point lists in the selected job.

- **Check** and **Uncheck**: toggles the highlighted item(s) on or off, depending upon the button being pressed.

- **Back**: returns to the previous screen.

- **Next**: is not available.

- **Finish**: starts the import process.

## Import Status

The *Import Status* screen reflects the import process and contains a progress bar and a comments window. The progress bar displays the percentage of the data being imported (Figure 2-25 on page 2-22).

Press the *Close* button to return to the main screen.
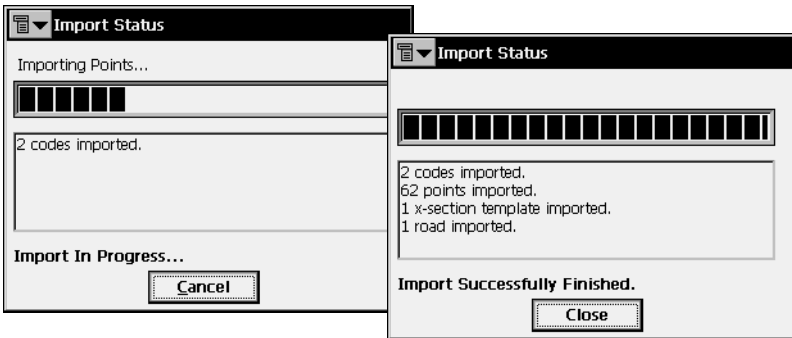
**Figure 2-25. Import Status**

## Duplicate Objects

If the existing job contains points, roads, or point lists with the same names as the imported job, the ***Duplicate Objects*** screen appears.
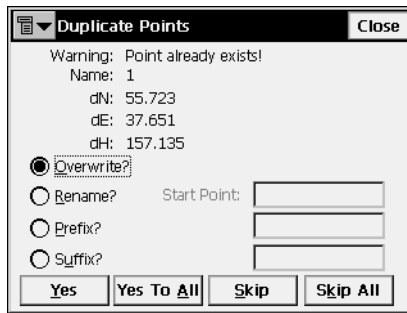


**Figure 2-26. Duplicate Objects**

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

• *Overwrite*: the imported object will overwrite the existing one. If the object represents a control point, a confirmation displays that the point is deleting (Figure 2-27 on page 2-23).
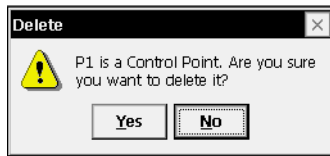
**Figure 2-27. Delete Message**

- *Rename*: the imported object will be renamed. The new name should be noted in the corresponding field.

- *Prefix/Suffix*: the imported object will differ from the existing object by prefix or suffix. The prefix/suffix should be noted in the corresponding field.

- **Yes**: press the button to accept the decision.

- **Yes To All**: press the button to accept the same decision for all similar cases.

- **Skip**: press the button to skip the object without importing.

- **Skip All**: press the button to skip all the objects with names that coincide with the names of existing objects, without importing.

- **Close**: disables the import process and opens the *Import Status* screen to remove all the objects already imported.
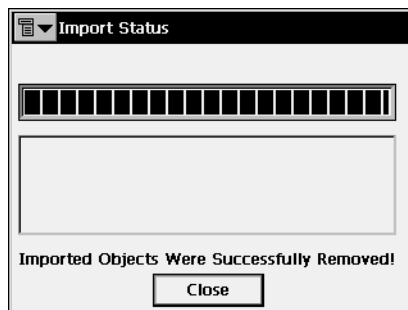


**Figure 2-28. Import Status of Removing Objects**

# Import From File

To import data from a file, tap **Job ▶ Import ▶ From File**.

## From File

The *From File* screen imports points, roads, cross section templates, from files with either pre-defined or custom formats. For a description of these formats, see Appendix A.
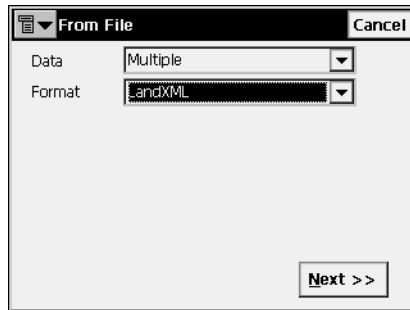


**Figure 2-29. Import From File**

- *Data Type*: select the data type to import from the file: *Points*, *Lines*, *Point Lists*, *Code Library*, *Roads*, *X-Sect Templates*, *Surfaces (TINs), Layer States,* or *Multiple*.

- *Format*: select the type of the file being imported:
  - For *Points* and *Point Lists* data types: FC-4, FC-5, GTS-6, FC-6/GTS-7, GTS-7 with strings, GT, GT-FIN,MMH360,DXF, SHP, CMM, LandXML, CR5, MOSS GENIO, NEZ, NEZ with strings, Custom Format with QC info, and Text (Custom Format).
  - For *Lines* data type: DXF, SHP, and Text (Custom Format).
    The TopSURV linework consists of the lines and points whereas the imported linework contains no points, it includes positions only (names will start with the question mark) (Figure 2-30 on page 2-25).
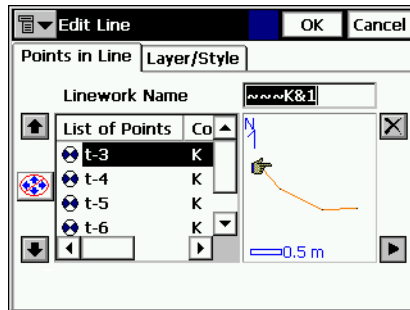
**Figure 2-30. Edit Imported Linework**

– For *Code Library* data type: TDD, XML, DBF.

Code Library is a set of codes with attributes used in the job. Once created, it can be saved as a file with *.tdd, *.xml, or *.dbf extensions.

– For *Roads* data type: SSS Road, TDS Road, MC Road, LandXML, TopSURV Road, CLIP, or ISPOL.

X-Sections are stored as Zones in LandXML files.

The header of the TopSURV Road format contains the starting azimuth if the Road is not a straight line.

– For *X-Sect Template* data type: SSS Template, TDS X-Section Template or TopSURV Template

– For *Surfaces (TINs)* data type: DXF, LandXML.

– For *Layer States* data type: LAS (AutoCAD Layer Format).

– For *Multiple* data type: LandXML, DXF, SHP, and Text (Custom Format).

TopSURV imports layers from DWG/DXF files along with the appropriate data types (Figure 2-31 on page 2-26).
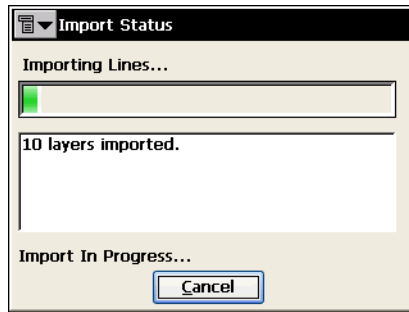
**Figure 2-31. Import Layers from DWG/DXF Files**

For *Points* and *Point Lists* data types the ***From File*** screen displays additional settings.
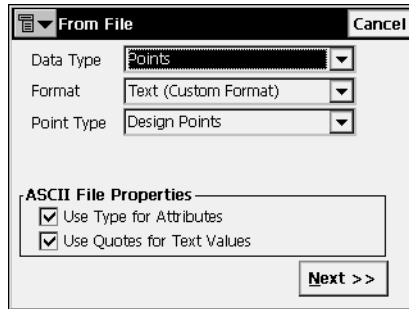


**Figure 2-32. Import From Text File**

- *Point Type*: the type of the imported points.

  – *Design Points*: points used as targets for stakeout.

  – *Control Points*: the points with coordinates, known from the catalog; used for localization.

- *ASCII File Properties*: define the conditions of the imported file interpretation. These conditions use the same type for the attributes, and quotes for the text values. The *ASCII FIle Properties* field appears for a .txt imported files.

- **Next**: opens the ***Import From Format*** screen for the format being chosen in the *File Type* field.

## Import From Format

The **Import From Format** screen browses directories from which to select the file to import data from.
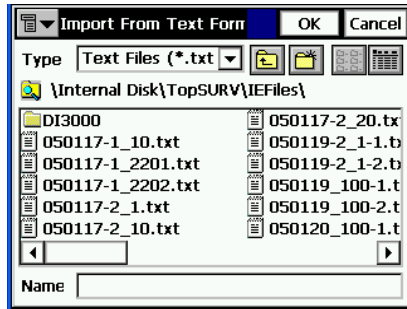


**Figure 2-33. Import From Format**

- *Type*: specifies the extension for the filename.
- *Name*: the name of the imported file.
- **OK**: approves the selection and opens the **Coordinate System** screen. For text file types, the **Text File Format** screen opens.

  For *Surfaces (TINs)* data type, **OK** opens the **Import Status** screen and starts the import process to save results into TN3 files.

  When *Multiple Types* data type is chosen, **OK** opens the **Import Status** screen. Then the **Import from LandXML** screen displays.

## Text File Format

The **Text File Format** screen imports a file of arbitrary text format.
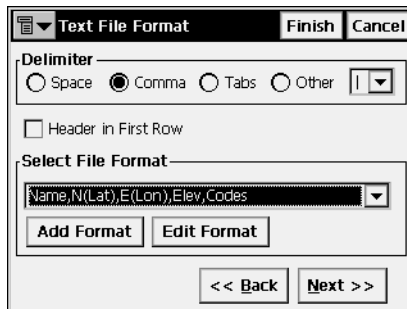


**Figure 2-34. Text File Format**

- *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*: check if the text file has a header.

- *Select File Format*: sets the order of fields in the selected file.

- **Add Format**: creates a new file format with the help of the *Custom Style* screen.

- **Edit Format**: changes the selected file format with the help of the same *Custom Style* screen.

- **Back**: returns to the previous screen.

- **Next**: opens the *Coordinate System* screen.

- **Finish**: opens the *Import Status* screen and starts the import process.

## Custom Style

Using the arrows, move the necessary items from the left side of the screen (the *Available* column) to the right side (the *Order* column) in the desired order.
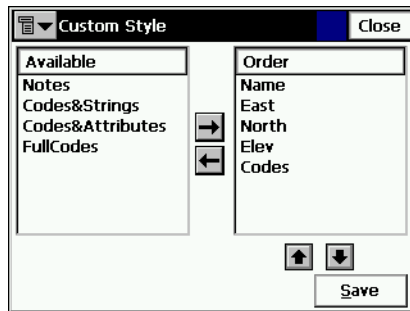


**Figure 2-35. Custom Style**

- **Save**: saves the File Style and returns to the *Text File Format* screen. A new string appears in the Select File Format drop-down menu.

- **Close**: returns to the previous screen.

## Import Multiple Data

For *Multiple Types* data type (see Figure 2-29 on page 2-24 for and example this data type) select the specific data group from the file to be imported. For the LandXML example: Point Lists, Parcels, Surfaces, and Alignments (Figure 2-36).
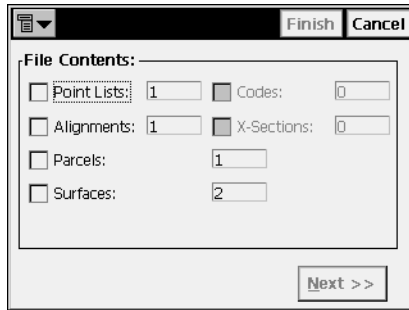


**Figure 2-36. Import Multiple Data**

- **Next**: becomes active after selection of a data group from the file contents, and opens the ***Select Data For Import*** screen.

## Select Data For Import

The ***Select Data For Import*** screen is used to choose objects for importing from the file.
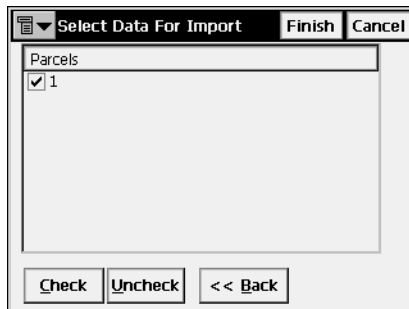


**Figure 2-37. Select Data For Import**

- *Objects*: the list of available objects in the selected file.
- **Check** and **Uncheck**: toggles the highlighted item(s) on or off, depending on the button being pressed.

- **Back**: returns to the previous screen.

- **Finish**: opens the *Import Status* screen and starts the import process.

# Import From Controller

To import a job (or any other file) from a controller device, tap **Job ▸ Import ▸ From Controller**.

## Import/Export Settings

The *Import/Export Settings* screen is used to set the Import/Export options for file interchange with another controller.
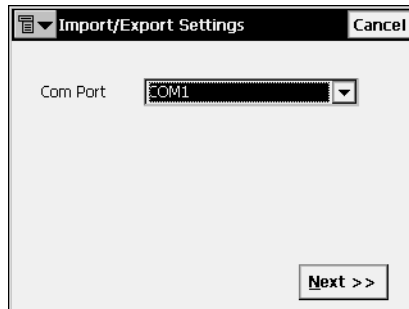


**Figure 2-38. Import/Export Settings**

- *Com Port*: selects the Communication port.

- **Next**: opens the *File Import Directory* screen.

## File Import Directory

The *File Import Directory* screen selects the destination directory for data import.
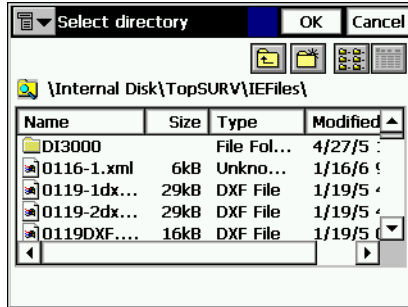


**Figure 2-39. File Import Directory**

- **Back**: returns to the previous screen.
- **Close**: returns to the main screen.
- **Finish**: opens the *Import File* screen reflecting status of importing the file to the chosen directory.
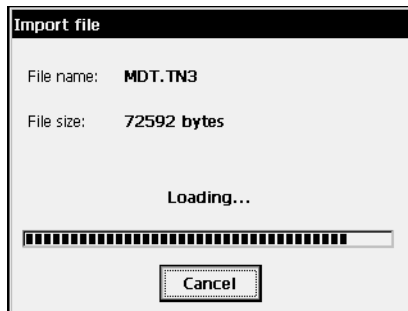


**Figure 2-40. Import File**

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

# Export

To export data, tap **Job ▶ Export** (Figure 2-41).
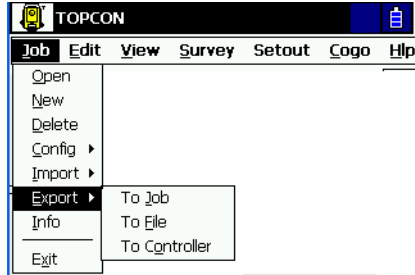


**Figure 2-41. Export Submenu**

The Export function is used to export points, codes and attributes, Code Libraries, Roads, Cross Section Templates, Point Lists, Road Survey and Raw Data from the current job to another job, file.

## Export to Job

To export data to a job, tap **Job ▶ Export ▶ To Job**.

### Select Job

The *Select Job* screen selects the destination job to export to. If there is no desired job in the Job List, press the **Browse** button to select a job from the disk.
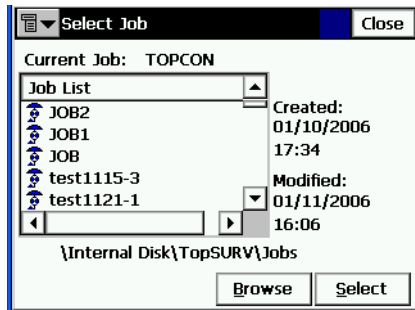


**Figure 2-42. Select Job**

- **Select:** starts the export process wizard. Follow the wizard's **Next** button until the Finish button is available.

## Export To Job

The *Export To Job* screen is used to select the code library, roads, and/or point lists that should be exported along with the point data.
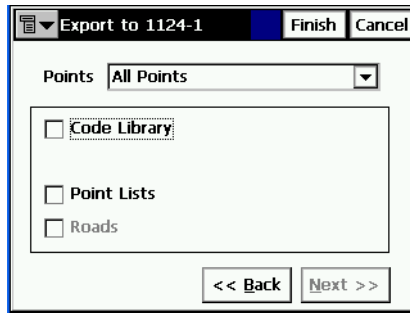


**Figure 2-43. Export To Job**

- *Points*: select the points for export, from the drop-down menu:

  - *All Points*
  - *By Type*
  - *By Range and Code*
  - *By Type, Range and Code*
  - *None*

- The following data can be exported along with points:

  - *Code Library*
  - *Roads*
  - *Point Lists*

- **Back**: returns to the previous screen.

- **Next**: depending on selections, opens either one of the *Select Point List(s) to Export* screens, or *Select Point Type(s) to Export* screen, or *Select Roads to Export* screen if only *Roads* is checked and *All points* is selected.

- **Finish**: starts the export process if only *Code Library* items are chosen and *All Points* is selected. Otherwise the button is not available.

## Select Point Type(s) to Export

The **Select Point Type(s) to Export** screen selects the types of points to export if *Code Library*, *Localization* or *Roads* are checked (if points filter by type has been enabled in the **Export** screen). Place check marks near the desired types.
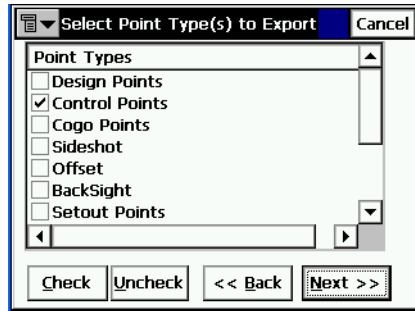


**Figure 2-44. Select Point Type(s) to Export**

- *Point Types*: the list of point types. The following types are available for exporting:

| | | |
|---|---|---|
| *Design Points* | *Control Points* | *Cogo Points* |
| | *Sideshot* | *Offset* |
| | | *BackSight* |
| *Stake Points* | *Stake Line* | *Check Points* |
| *Manually Typed* | *Tape Dimension* | *Edge Extraction* |

- **Check** and **Uncheck**: toggles the highlighted item(s) on or off, depending on the button being pressed. Press **Ctrl** while selecting to select more than one item.

- **Back**: returns to the previous screen.

- **Next**: opens **Points to Export** screen (if points filter by code and range has been enabled in the **Export To Job** screen).

## Points to Export

The *Points to Export* screen filters the exported points.



**Figure 2-45. Points to Export**

- *Points with Codes*: export all points with the selected codes.
- **Select**: opens the *Code* screen.
- *Range of Points*: selects the points to export. These can be set by range ("-", ";" or "," can be used as range separators) or by enumeration.
- **Back**: returns to the previous screen.
- **Next**: opens the *Select Road(s) to Export* screen (if *Roads* was checked in the *Export To Job* screen). Otherwise, the button is not available, and the **Finish** button appears to open the *Export Status* screen.

## Code

The *Code* screen contains a list of available codes. All the points with the codes chosen here will be imported.
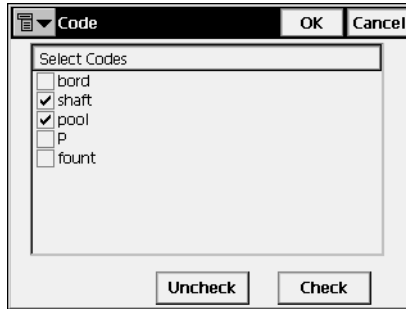


**Figure 2-46. Code**

- **Uncheck**: removes the mark from the highlighted code.

- **Check**: marks the highlighted entries.

- **OK**: returns to the previous screen with the codes selected.

## Select Road(s) to Export

The *Select Road(s) to Export* screen selects the roads to export along with the data. Place the check marks to select the exported roads.



**Figure 2-47. Select Road(s) to Export**

- *Roads*: the list of available roads in the job.

- **Check** and **Uncheck**: toggles the highlighted item(s) on or off, depending upon the button being pressed.

- **Back**: returns to the previous screen.

- **Next**: is not available.

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

## Select Point List(s) to Export

The *Select Point List(s) to Export* screen selects the Point Lists (if available) to export along with the data. Place check marks near the exported point lists.
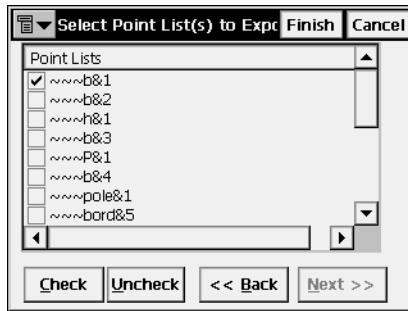


**Figure 2-48. Select Point List(s) to Export**

- *Point Lists*: the list of available point lists in the selected job.

- **Check** and **Uncheck**: toggles the highlighted item(s) on or off, depending upon the button being pressed.

- **Back**: returns to the previous screen.

- **Next**: is not available.

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

## Export Status

The *Export Status* screen 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 2-49. Export Status

Press the *Close* button to return to the main screen.

## Duplicate Objects

If the existing job contains points, roads or point lists with the same names as the job that these are exported to, the *Duplicate Objects* screen displays.
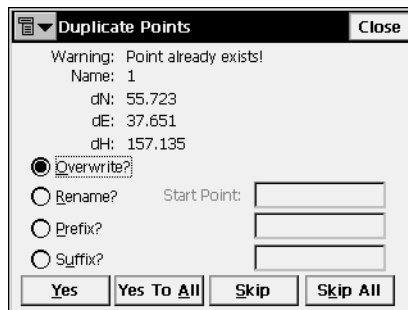


Figure 2-50. Duplicate Objects

This screen is the same as the *Duplicate Objects* screen for the import process (for details, see "Duplicate Objects" on page 2-22).

# Export to File

To export data to a file, tap **Job ▶ Export ▶ To File**.

### To File

The *To File* screen exports points, codes, roads, cross section templates, localization, roads survey and raw data to files with either pre-defined or custom formats. For a description of these formats, see Appendix A.
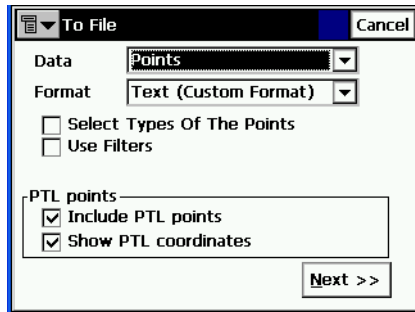


**Figure 2-51. To File**

- *Data Type*: select the data type to export: Points, Lines, Point Lists, Code Library, Roads, X-Sect Templates, Localization, Scanning Data, Roads Survey, Raw Data, Job History, Surfaces (TINs), Layer States, or Multiple.

- *Format*: select the file type to export data to.
    - For *Points* and *Point Lists* data type: FC-4, FC-5, GTS-6, FC-6/GTS-7, GTS-7 with strings, GT, GT-FIN, MMH360, DXF, SHP, Cut Sheet Standard, Cut Sheet User Defined, Check Sheet, PTL Sheet, CMM, LandXML, CR5, MOSS GENIO, NEZ, NEZ with strings, Text (custom format), or Custom Format with QC info.
    - For *Lines* data type: DXF, SHP, or Text (custom format).
    - For *Code Library* data type: TDD, XML, DBF.

      Code Library is a set of codes with attributes used in the job. Once created, it can be saved as a file with *.tdd, *.xml, or *.dbf extensions.

– For *Roads* data type: SSS Road, TDS Road, MC Road, Land XML, TopSURV Road, CLIP or ISPOL.
X-Sections are stored as Zones in LandXML.
The header of the TopSURV Road format contains the starting azimuth if the Road is not a straight line.

– For *X-Sect Templates* data type: SSS Template, TDS X-Section Template, or TopSURV Template.

– For *Roads Survey*: X-Section Surveys or Find Station Report.

– For *Raw Data*: FC-5, GTS-6, FC-6/GTS-7, LandXML, TDS Raw Data, MOSS Survey, or Field Book (only to Total Station .fbk format).

– For *Surfaces (TINs)* data type: DXF, LandXML.

– For *Job History* data type: CSV and Report.
The Job History file is formed if the Enable Job History checkbox is selected on the **Select Survey Config** screen (see "Survey" on page 2-5).

– For *Layer States* data type: LAS (AutoCAD Layer Format).

– For *Multiple* data type: LandXML, DXF, SHP, and Text (Custom Format).

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

• *Select Types of the Points* (for *Points* and *Point Lists* data types): check this field if not all types of points should be exported.

• *Use Filters* (for *Points* and *Point Lists* data types): check this field if filters (by code and by range) should be used for exported points.

• *Stored Stakeout Points* (for *Points* and *Point Lists* data types): check to export stored points saved by stakeout process.

• *ASCII File Properties* (for *Points* and *Point Lists* data types): define the conditions of the exported file interpretation. These are the use of the same type for the attributes or not, and the use of quotes for the text values. This field appears only for the text format of the exported file.

• **Next**: opens the following screen:

– the *Select Point Type(s) to Export* screen if *Select Types of The Points* is checked.

– the *Points to Export* screen if *Use Filters* is checked.

– the *Select TN3* screen if *Surfaces (TINs)* data type is chosen.

– the *Export To File* screen in all other cases for the format chosen in the *File Type* field.

## Select Point Type(s) to Export

The *Select Point Type(s) to Export* screen is similar to that described in the section "Select Point Type(s) to Export" on page 2-34, except for the behavior of the **Next** button. Here, **Next** opens the *Points to Export* screen (if *Points* data type was selected and *Use Filters* was checked in the *To File* screen) or the *Export To Format* screen.

## Points to Export

The *Points to Export* screen is similar to that described in the section "Points to Export" on page 2-35, except for the behavior of the **Next** button. Here, **Next** opens the *Export To Format* screen.

## Select TN3

The *Select TN3* screen is used to select a TN3 file to export data to DXF, or DWG, or LandXML files.
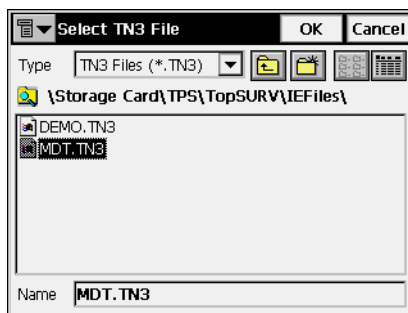


**Figure 2-52. Select TN3 File**

- *Type*: specifies the extension for the files being searched.

- *Name*: the name of the file whose data will be exported.

- **OK**: approves the selection and opens the *Export To Format* screen.

## Export To Format

The *Export To Format* screen selects a destination directory and the name of the created file.
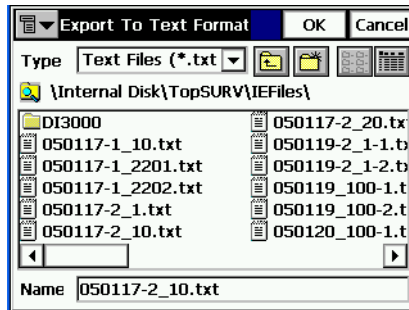


**Figure 2-53. Export to Format**

- *Type*: specifies the file extension.

- *Name*: the name of the created file.

- **OK**: approves the selection and opens the *Coordinate System* screen. See "Import Multiple Data" on page 2-29. For text file types, OK opens the *Text File Format* screen.

## Text File Format

The *Text File Format* screen exports a file of arbitrary text format.
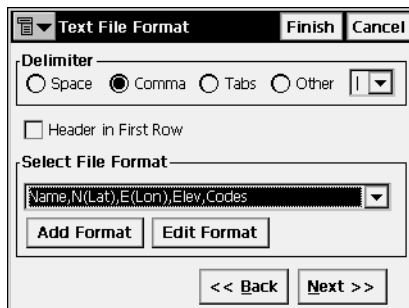


**Figure 2-54. Text File Format**

- *Delimiter*: selects the delimiting symbol between the data in the exported file; either space, comma, tab or other.
- *Header in First Row*: select to output a header in the file.
- *Select File Format*: sets the order of fields in the exported file.
- **Add Format**: creates a new file format with the help of the *Custom Style* screen.
- **Edit Format**: changes an existing file format with the help of the same *Custom Style* screen.
- **Back**: returns to the previous screen.
- **Next**: opens the *Coordinate System* screen. See "Import Multiple Data" on page 2-29.
- Press **Finish** to start the export process.

## Custom Style

Using the arrows, move items from the *Available* column to the *Order* column and arrange in the desired order.
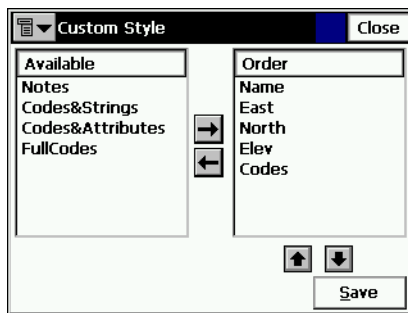


**Figure 2-55. Custom Style**

- **Save**: saves the File Style. A new entry appears in the Select File Style drop-down menu.
- **Close**: returns to the previous screen.

## Export Multiple Data

For *Multiple* data type there is ability to choose specific data group in the job available to export. For the LandXML example: Points, Alignments, TS Raw Objects, Surfaces (Figure 2-56).
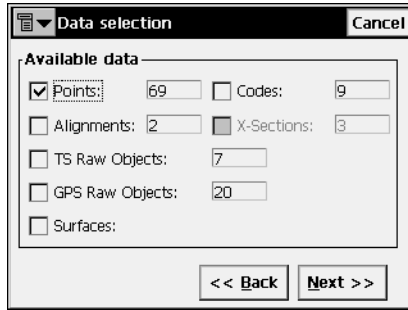


**Figure 2-56. Export Multiple Data**

- **Next**: depending on the data selected for export, opens the *Points Selection* screen, or the *Select Road(s) to Export* screen (see "Select Road(s) to Export" on page 2-36), or the *Export to Format* screen (see "Export To Format" on page 2-42).

## Points Selection

The *Points to Export* screen filters the exported Points.
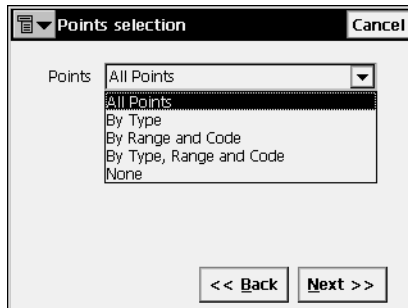


**Figure 2-57. Points Selection**

# Export to Controller

To export a file to a controller, tap **Job ▸ Export ▸ To Controller**.

## Import/Export Settings

The *Import/Export Settings* screen sets import/export options for data transfer with another controller.
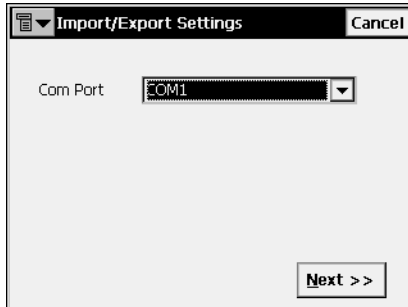


**Figure 2-58. Import/Export Settings**

- *Com Port*: the Communication port. Fixed as *COM2*.
- **Next**: opens the *Files To Export* screen.

## Files To Export

The *Files To Export* screen browses directories for selecting the file to export.
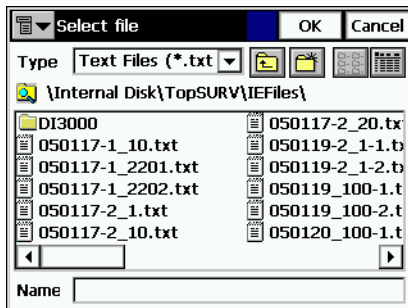


**Figure 2-59. Files to Export**

- **Back**: returns to the previous screen.
- **Close**: returns to the main screen.

• **Finish**: opens the *Export File* screen reflecting status of exporting the file chosen (Figure 2-60).
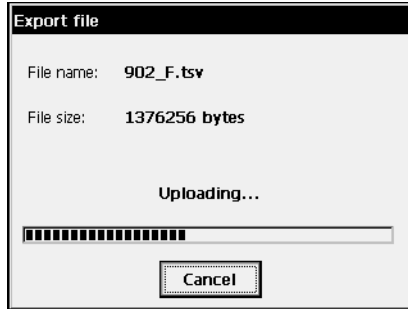


**Figure 2-60. Export File**

A successful completion of file export returns to the main screen.

# Information

To get job information, tap **Job ▶ Info**.

## Job Information

The *Job Info* screen contains information about the current job.



**Figure 2-61. Job Information**

- *Job name*: the name of the job open.
- *Number of Points*: the amount of the points stored in the job.
- *Points*: the names of the first point and the last one 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.

# Notes

**TopSURV Reference Manual**

# Edit

Edit menu includes the following menu items:

- Points
- Codes
- Point Lists
- Layers
- X-Sect Templates (when Roads are activated)
- Roads (when Roads are activated)
- Linework
- Raw Data
- Traverse adjustment (for GTS702/GPT7000)
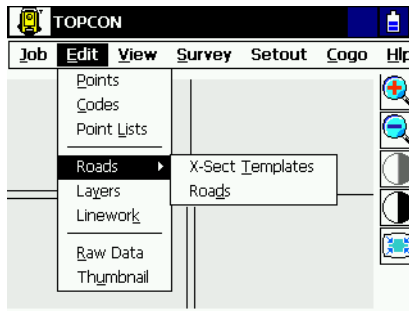


**Figure 3-1. Edit Menu**

🌞 TIP

To edit object properties, double-tap on the object or select the object and tap the Edit button.

# Points

To edit points, tap **Edit ▶ Points**.

The *Points* screen contains the list of stored points with coordinates and codes, and a set of tools for database operation (Figure 3-2).

In the Point column, an icon displays the point type:

⊕ – TS observed                ⟳ – staked out

▲ – control                      ▦ – cogo

⊕ – design or imported      ✋ – manually entered
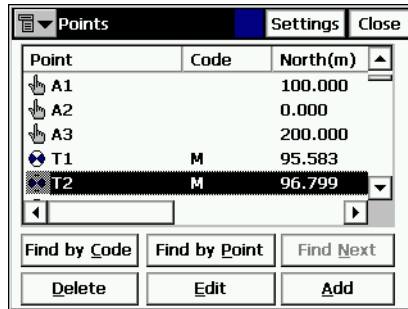


**Figure 3-2. Points**

- **Find by Code**: opens the *Find by Code* screen to enter a code for searching for a point.

- **Find by Point**: opens the *Find by Point* screen to enter a point name (or a part of the name) for searching.

- **Find Next**: finds next point that satisfies the same conditions as the previous found point.

- **Delete**: deletes the point from the list.

- **Edit**: opens the *Edit Point* screen to edit point parameters: name, code, coordinates and/or other parameters stored with the point.

- **Add**: creates a new point through the *Add Point* screen.

• The bitmap on the upper-left corner displays the following pop-up menu:

*PTL Mode*: switches on the PTL (Point-To-Line) Mode. (The screen changes its appearance on **Points (PTL)**.) For details, see "PTL Mode" on page 5-13.

    – *String*: switches on the strings displaying function along with the codes.

    – *Show Scan Points*: switches on the scan points displaying function.

    – *Show AutoTopo Points*: switches on the AutoTopo points displaying function.

    – *Help*: accesses the help files.

• **Settings**: opens the *Display* screen.

# Display

The *Display* screen is used to customize the interface.
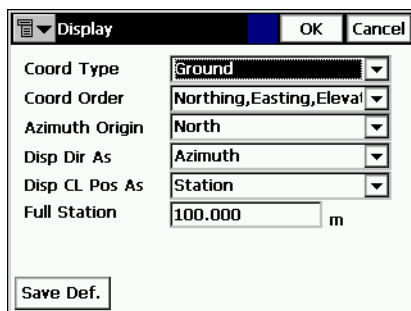


**Figure 3-3. Display**

• **OK**: saves the settings and returns to the *Points* screen.

For details on the screen settings, see "Display" on page 2-12.

# Find by Point

The *Find by Point* screen contains settings for searching for a point by its name.
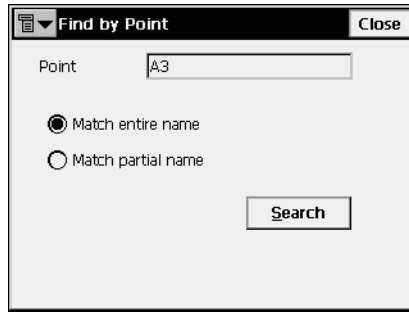


**Figure 3-4. Find by Point**

- *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 Name* field.

- **Search**: starts the search process and returns to the *Points* screen, highlighting the point found.

# Find by Code

The *Find by Code* screen contains a form of searching for a point by its code.
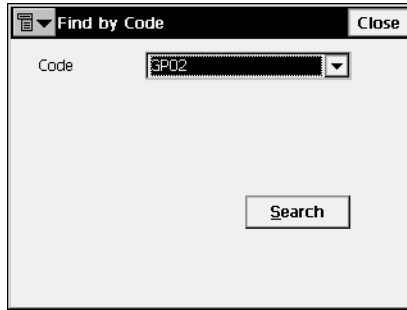
**Figure 3-5. Find by Code**

- *Code*: the name of the code selected from the drop-down list.

- **Search**: starts the search process and returns to the *Points* screen, highlighting the first point with the code selected.

# Add (Edit) Point

The *Add (Edit) Point* screen displays the form of the point properties.
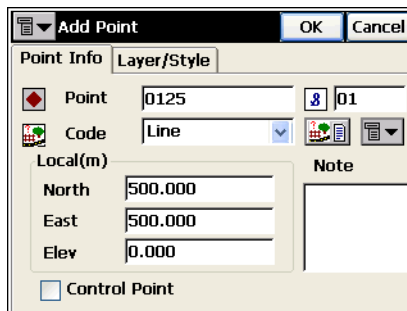
**Figure 3-6. Add/Edit Point**

The *Point Info* tab contains the following fields (Figure 3-6):

- *Point*: sets the name of the point.

- *Code*: sets the code for the point. Can be entered manually or chosen from the drop-down list.

- : the *Attributes List* bitmap, opens the ***Code-Attributes*** screen to set values for attributes available for the code chosen (Figure 3-12 on page 3-9).

- The fields for the coordinates of the point in the current coordinate system (the field name changes with the display type).

- *Control Point*: check this field to use the point as the Control.

- *Note*: the short note for the point.

- The bitmap next to the *Attributes List* bitmap displays the following list:

  - *String*: toggles on the *String* field. Also, the sign sign appears.

  - *Layer*: opens the ***Select Layer*** screen in which to enter the point.

  - *Note*: opens the ***Note*** screen.

- **OK**: saves the changes and returns to the ***Points*** screen. Points which have no codes, or have codes but no strings associated with the codes, are simply stored as points.

The *Layer/Style* tab contains the following fields (Figure 3-7):
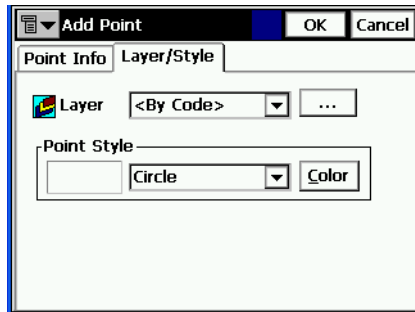


**Figure 3-7. Add/Edit Point – Layer/Style Tab**

- *Layer*: selects the layer to locate the point.

- *Point Style*: sets and shows the style to designate the point on the map:

  - The drop down list contains the point symbols to select.

  - **Color**: opens the ***Select Color*** screen.

- **OK**: saves the point settings and returns to the ***Points*** screen.

If the point has some duplicate points and the weighted average is used, the ***Edit Point*** screen will contain the *Check Points* and *Weighted Average* tabs.

The *Check Points* tab displays the coordinates of check points and the deviations from the coordinates of the original point.
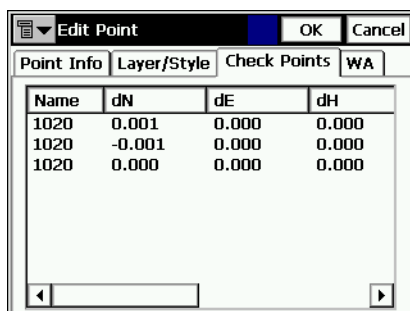


**Figure 3-8. Edit Point – Check Points**

The *Weighted Average* tab displays coordinate residuals of the check point.
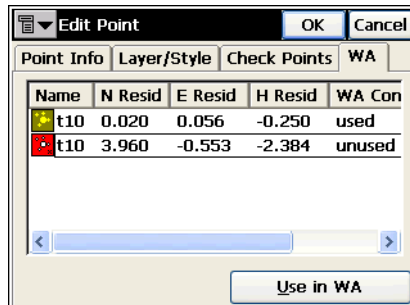


**Figure 3-9. Edit Point – WA**

• **Use In WA**: uses the station as a weighted average.

## Select Color

The *Select Color* screen sets the color of the point mark to show on the map.
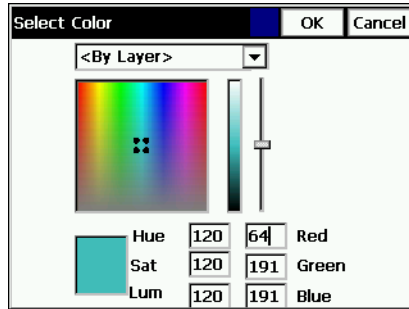


**Figure 3-10. Select Color**

Tap in the area of the desired color and move the slider to select the level brightness. If needed, check the color's values.

If the PTL Mode is on, the *Add Point* screen has the *PTL* tab with the following parameters:
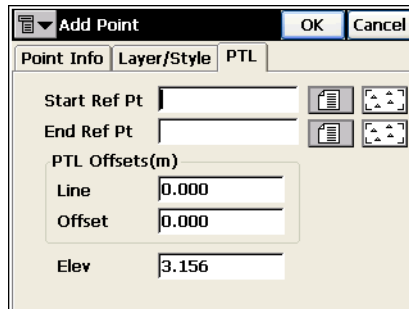


**Figure 3-11. Add Point (PTL)**

- *Start Ref Pt, End Ref Pt*: the reference points. Can be selected from map, from list or entered manually.

- *PTL Offsets*: the offsets from the reference line formed by the reference points:

  – *Line*: the distance from start reference point along the reference line, where the perpendicular to this line passes though the target.

– *Offset*: the horizontal distance from the target.

- *Ell ht*: the height of the target.

- **OK**: saves the point settings and returns to the *Points* screen.

# Code-Attributes

The *Code-Attributes* screen sets attribute values for the selected code.
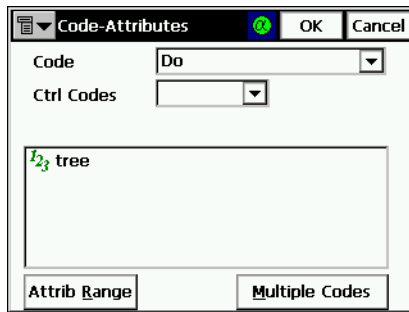


**Figure 3-12. Code-Attributes**

- *Code*: shows the code selected.

- *Ctrl Code*: shows the control code list. The Control Code is a special type of code that can be 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.

- The lower field shows the available attributes and provides a field to enter its value.

- **OK**: saves the changes and returns to the *Add (Edit) Point* screen. The program prompts if the value is not within the range specified.

- **Attrib Range**: opens the *Attribute Ranges* screen to view the ranges for the attributes. Attributes can only be added using the *Codes - Attributes* screen.

- **Multiple Codes**: opens the *Multiple Code-Attributes* screen. Multiple codes and strings associated with a point make the point a part of numerous lines.

# Multiple Code - Attributes

The *Multiple Code-Attributes* screen is used to edit multiple codes and strings.
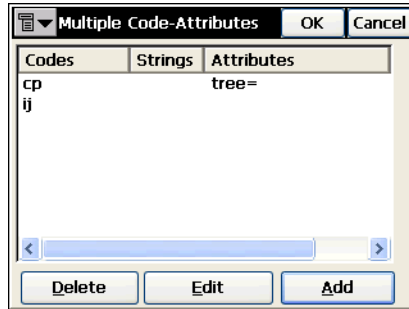


**Figure 3-13. Multiple Code-Attributes**

- **Delete**: deletes the code from the list.

- **Edit**: opens the *Code-Attributes* screen to edit the code.

- **Add**: creates a new code through the *Code-Attributes* screen.

- **OK:** saves the settings and returns to the *Add Point* screen.

- The bitmap on the upper-left corner displays the following pop-up menu:
  - *String*: switches on the strings display along with the codes.
  - *Show Second Ctrl Code*: switches on the field to enter another code.
  - *Help*: accesses the help files.

# Codes and Attributes

To edit codes and attributes, tap **Edit ▸ Codes**.

## Codes - Attributes

The ***Codes - Attributes*** screen contains a list of codes used for the 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.
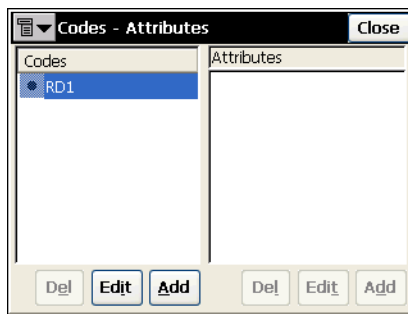


**Figure 3-14. Codes – Attributes**

- *Codes*: contains a list of codes.

- *Attributes*: contains a list of attributes for the selected code.

- **Del**: deletes the highlighted entry.

- **Edit**: opens the applicable ***Code*** or the ***Attribute*** 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 bitmap at the upper-left corner displays a pop-up menu:

- *Export To File*: opens the ***To File*** screen to export code library to the file format selected.

- *Help*: accesses the Help files.

# Code

The *Code* screen contains the parameters of a code.
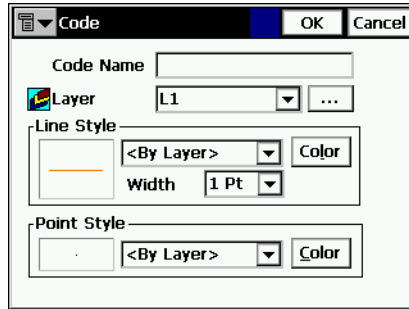


**Figure 3-15. Code**

- *Code Name*: the name of the code.
- *Layer*: the name of the layer in which the code resides.
- *Line Style* and *Point Style*: selects the line and point plotting attributes for the linework. The **Color** button opens the *Color* screen (see "Select Color" on page 3-8).
- **OK**: saves the changes, closes the screen, and returns to the *Codes - Attributes* screen.
- The bitmap menu in the upper right corner of the screen contains two items:
  - *Edit Layers:* opens the the *Layers* screen to edit layers. For details, see "Layers" on page 3-17.
  - *Help:* accesses the help files.

# Attributes

The *Attributes* screen contains the parameters of an attribute.
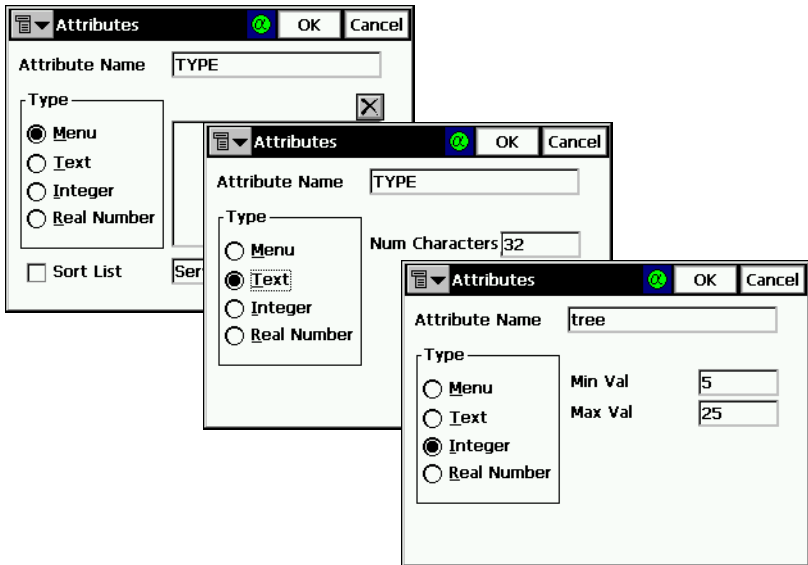


**Figure 3-16. Attributes – Menu, Text, and Integer Examples**

- *Attribute Name*: the name of the code attribute.
- *Type*: sets the type of the code attribute:
  - *Menu*: the attribute value can only be selected from a list of available values. The **Add** button adds admissible values entered in the *Add* entry field. The ☒ button deletes the selected entry from the menu.
  - *Text*: the attribute value is an alpha-numeric string. Enter the number of characters available for the text value.
  - *Integer*: the attribute value is an integer. Enter the minimum and maximum values of the attribute.
  - *Real Number*: the attribute value is a real number. Enter the minimum and maximum values of the attribute.
- **OK**: saves the changes, closes the screen and returns to the *Code - Attributes* screen.

# Point Lists

The Point List is a group of points that can be simultaneously processed. Point list 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, select **Edit ▶ Point Lists**.

## List of Point Lists

The *List of Point Lists* screen contains a list of existing Point Lists on the left part of the screen, and the two windows on the right part, that present the general view of the selected list in the horizontal and vertical planes. To view the current selected point list in a larger map, double-tap one of the map plots.
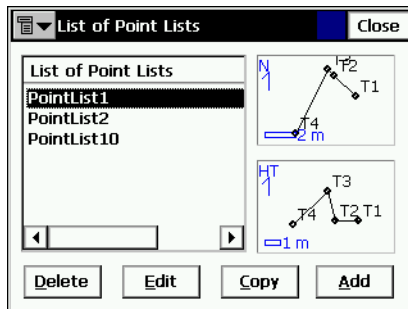


**Figure 3-17. List of Point Lists**

- **Delete**: press to delete the Point List from the list.
- **Copy**: press to create a copy of the selected List.
- **Edit**: opens the *Edit Point List* screen. Press to edit the properties of the selected List.
- **Add**: opens the *Add Point List* screen. Press to create a new List.
- The bitmap on the upper-left corner displays the following pop-up menu:
  - *Edit Points*: displays the *Points* screen. For details, see "Points" on page 3-2.
  - *Help*: accesses the help files.

# Add/Edit Point List

The *Point List* tab displays general properties of the Point List.
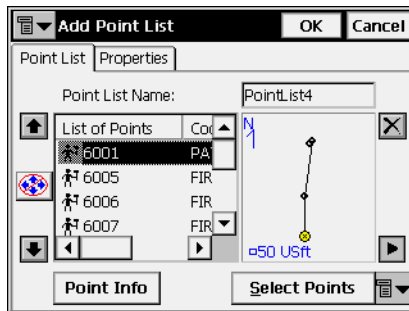


**Figure 3-18. Add Point List – Point List Tab**

- *Point List Name*: the name of the Point List.

- *List of Points*: the list of currently selected points. Adding the point to the list can be performed in two ways.

  – Through the map: tap the plot on the right. The large *Map* screen opens (for details on the screen icons, see Chapter 4). Select the points by tapping them on the map; the two sequentially tapped points will be connected with a line. Press **Close** to return to the *Add/Edit Point List* screen.

  – Through the Select Points button: pressing the button displays the floating menu of five items: *By Range*, *By Code*, *By CodeString*, *By Radius*, *From Map*, and *From List*. Select the desired way of adding points and enter in this way: set the range, check the codes, set the center point and the radius of the area, select the points from the map or using the list.

- **Point Info**: shows the point information of a current selected single point.

- 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.

- ⊕ : switches on/off the keyboard arrow keys that duplicate the arrows on the screen.

- ☒ : deletes the highlighted point from the list.

- ▶ : closes the plot of the point list. Only the list of points table
will be available.

- The bitmap on the upper-left corner displays the following pop-up menu:
  – *Edit Points*: displays the **Points** screen. For details see
    "Points" on page 3-2.
  – *Help*: accesses the help files.

The *Properties* tab shows only the *Name* field, that duplicates the
*Point List Name* on the *Point List* tab.
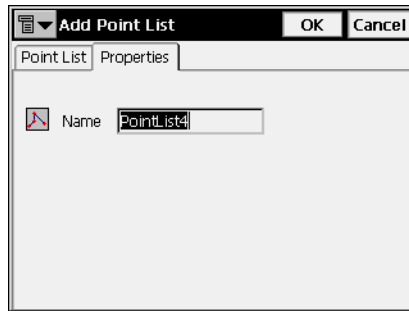


**Figure 3-19. Add Point List – Properties Tab**

# Layers

To edit layers, tap **Edit ▶ Layers**.

The *Layers* screen displays the list of all layers existing in the current job and layer status.
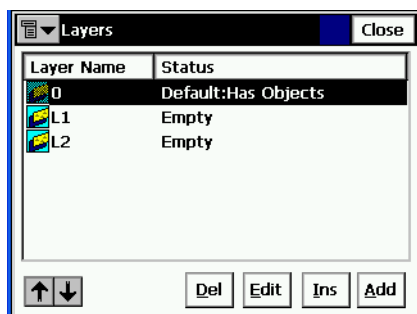


**Figure 3-20. Layers**

- *Layer Name*: contains a list of Layers.

- *Status*: shows if the layer is empty or has objects.

- **Del**: deletes the highlighted layer.

- **Edit**: opens the applicable *Edit Layer* screen with the properties of the highlighted layer.

- **Add**: opens the *Add Layer* screen to add a new layer.

- **Ins**: opens the *Add Layer* screen to insert a new layer below the selected layer.

- ↑↓ : moves the highlighted layer up or down in the order of the layers.

The bitmap at the upper-left corner displays a pop-up menu of the *Help* item.

# Add Layer

The *Add Layer* screen sets properties for a new layer. The *Layer* tab contains general settings.

- *Layer Name*: sets the name of the layer.
- *Visible*: hides or shows the layer objects on the map.
- *Note:* any additional information on the layer.
- **OK:** saves the settings and returns to the *Layers* screen.
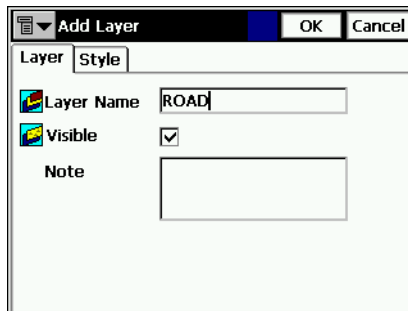
**Figure 3-21. Add Layer Name**

The *Style* tab sets plotting parameters for lines and points on the layer.
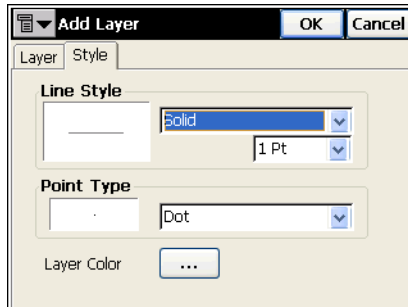
**Figure 3-22. Add Layer Style**

- *Line Style*: selects the shape and width of the line.
- *Point Type*: selects the shape of the point.
- *Layer Color:* the browse button opens the *Select Color* screen to set the color for the layer (see Figure 3-10 on page 3-8).

# Edit Layer

If a layer has objects, the ***Edit Layer*** screen contains the *Objects* tab that displays points and other objects of the given layer.
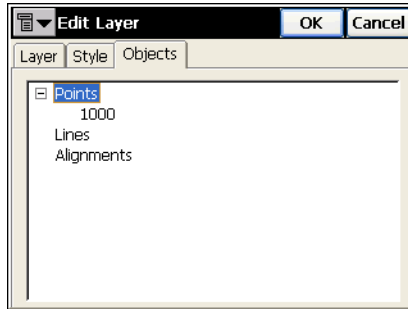


**Figure 3-23. Edit Layer Objects**

# X-Sect 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 slope and fill slope.

The ***X-Sect Templates*** screen 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.
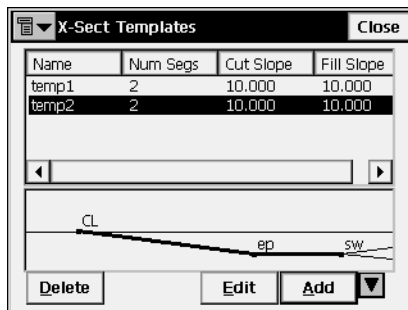


**Figure 3-24. X-Sect Templates**

The list contains four columns: *Name* (the name of the template), *Num Segs* (the number of segments), *Cut Slope*, and *Fill Slope* values.

- **Delete**: deletes the template from the list.

- **Edit**: opens the properties of the selected template in the *X-Sect Templates* screen.

- **Add**: opens the blank *X-Sect Templates* screen to enter the properties for a new template.

- ▼ : hides and shows the plot of the highlighted template.

- **Close**: saves the changes and returns to the main screen.

The *X-Sect Templates* screen opened for editing contains parameters of the highlighted template.
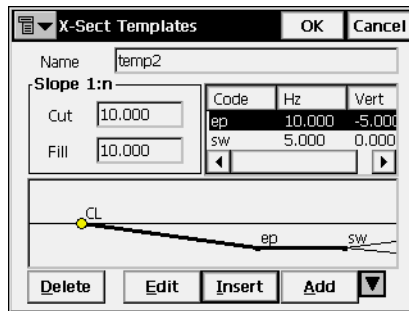


**Figure 3-25. Edit X-Sect Template**

- *Name*: the name of the template.

- *Slope*: the cut and fill parameter values (run values for cut and fill for a unit rise). These values represent the horizontal increment of the slope for a unit vertical increment. The cut slope is used when the road surface is below the terrain, and the fill slope is used when the road surface is above the terrain.

Also the screen contains a list of segments comprising the template and a plot of the template. A list of segments consists of three columns: *Code* (the code of the segment), *Hz* (the horizontal offset), *Vert* (the vertical offset).

- **Delete**: deletes the segment from the template.

- **Edit**: opens the *Segment* screen with the parameters of the highlighted segment.

- **Insert**: opens the blank *Segment* screen. The added segment is inserted in the list above the currently highlighted segment.

- **Add**: opens the blank *Segment* screen. The added segment will be attached after the last segment in the list.

- ▼ : hides and shows the plot of the highlighted template.

- **OK**: saves the changes and returns to the *X-Sect Templates* screen.

The *Segment* screen contains the parameters of the highlighted segment.
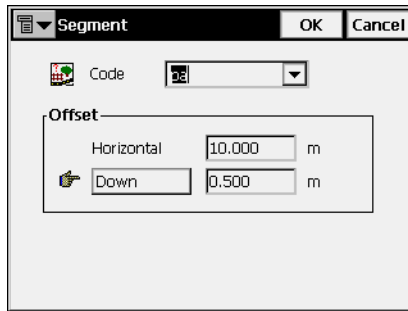


**Figure 3-26. Segment**

- *Code*: the code of the segment. Select the code from the drop-down list or type a new code.

- *Offset*: the horizontal and vertical offsets. Press the **Down/Up/Grade** button to select the type and value of the vertical offset. Being input as **Grade** (in %), the vertical offset will be recalculated to meters (or other selected units) after the **OK** button is pressed.

☀ TIP

The "hand" symbol means the function is selectable.

- **OK**: saves the changes being made and closes the screen.

# Roads

The road as an object can be described through the horizontal and vertical projections of the center line, called *alignments*, and the line describing the surface of the road and lying in the plane perpendicular to the center line, called a *cross section*.

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 point*s. *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 *long sections*.

The cross section can be described using templates (see "X-Sect Templates" on page 3-19 for details).

The *Roads* screen displays a list of the created roads, and plots of the horizontal and vertical alignments for each road.
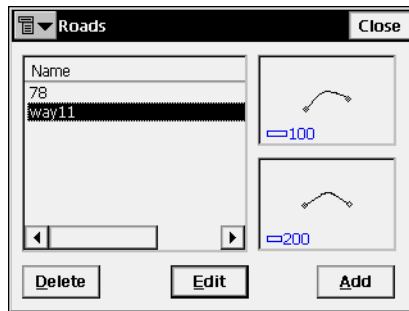


**Figure 3-27. Roads**

The left part of the screen displays the list of created roads. The right part shows the corresponding plots of alignments.

- **Delete**: deletes the road from the job.

- **Edit**: opens the *Edit Road* screen, displaying the parameters of the selected road.

- **Add**: opens the *Add Road* screen.

The first *Add Road* screen sets the name of the road and selects the VAL (vertical alignment) type of the created road.
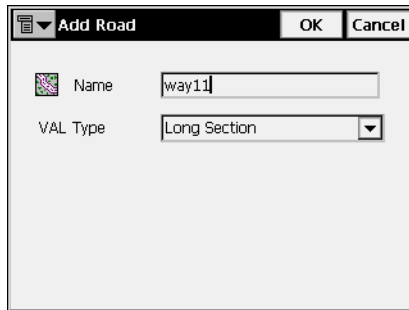


**Figure 3-28. Add Road – VAL Type Selection**

There are two ways of creating roads.

- *Long Section*: select Long Section to create the road by sections. 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.

- *Elements:* select Element to create the road element by element, finishing wherever desired and starting again.

- **OK**: opens the second *Add Road* screen.

The second *Add Road* screen contains the features of the road.

# Start Point

The *Start Pt* tab displays the parameters of the road's starting point.



**Figure 3-29. Add Road – Start Point**

- *Point*: the point name. Can be entered manually (if a new point name is entered, the point will be created with the coordinates entered in the *North, East* and *Height fields*), chosen from the map, or selected from the list.

- *Code*: the point code. Can be entered manually or chosen from the drop-down list. The code of an existing point cannot be edited.

-  : the *Attributes List* bitmap opens the ***Code-Attributes*** screen to set the values for the attributes available for the code chosen.

- *North, East, Height*: the local coordinates of the point.

- *Start Stn/ Start Chain*: the starting station number with distance to it, or the starting chain distance.

- *Stn Interval*: the interval between the points where the road related computations are made.

# Horizontal Alignment

The *Hz* tab shows the list of horizontal alignment elements, the horizontal alignment plot and the starting station (or chainage) of each element.
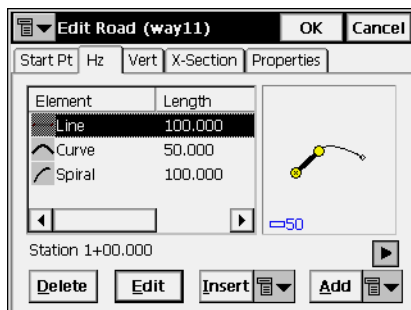


**Figure 3-30. Add Road – Horizontal Alignment**

The element list has the following columns:

- *Element*: the icon and the name of the element: 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).
- **Delete**: deletes the element from the road.
- **Edit**: opens a screen with properties of the selected element.
- **Insert**: displays a floating menu from which to select elements for insertion at the selected location in the list.
- **Add**: displays a floating menu from which to select elements for addition after the last element.

Select a horizontal alignment, then double-click the *Station* information under the element list to display start and final positions for the selected element.
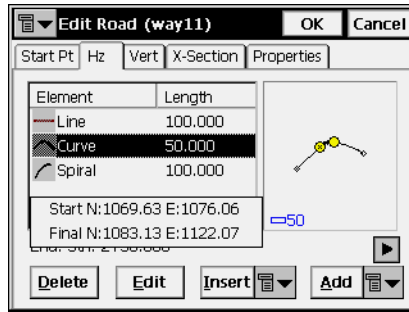
**Figure 3-31. Element Information**

Also the graphics interface can display information on the selected element. Double-tap in the horizontal plot area to open the greater *Map* screen for horizontal alignments.
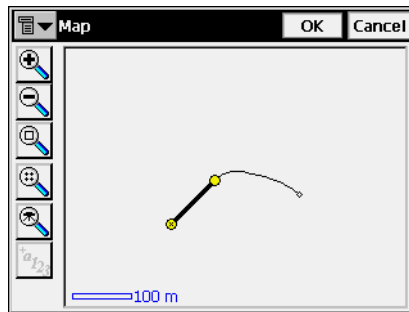


**Figure 3-32. Map**

Select the alignment element, then double-tap it to display information on the alignment.
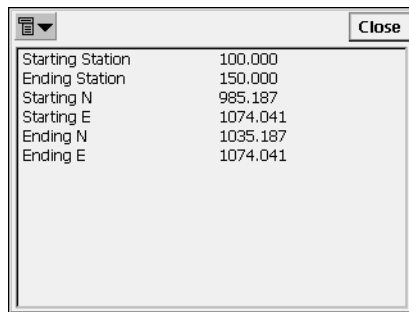


**Figure 3-33. Alignment Element Information**

## Line

To add a line, press the **Insert** or **Add** buttons in the *Hz* tab of the *Add Road* screen and select the *Line* item from the floating menu. The *Line* screen will open.
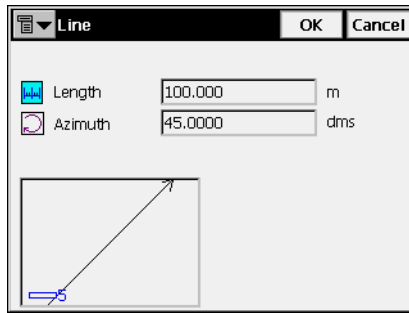


**Figure 3-34. Line**

The plot at the bottom-left corner will show the element's appearance.

- *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, the check mark from the *Tangent to Previous Item* menu on the bitmap in the upper-left corner of the screen should be removed.

NOTICE  *NOTICE*

*Caution should be exercised when setting the azimuth, since road elements are usually tangential to each other.*

- **OK**: saves the element to the Road and returns to the *Add Road* screen.

## Curve

To add a curve, press the **Insert** or **Add** buttons in the *Hz* tab of the *Add Road* screen and select the *Curve* item from the floating menu. The *Curve* screen will open.
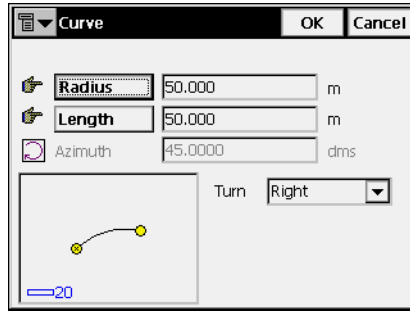


**Figure 3-35. Curve**

The plot in the bottom-left corner will show 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 as follows:

$$R = \frac{50}{\sin\left(\frac{DCH}{2} \times \frac{\Pi}{180}\right)}, \; R = \frac{100 \times 180}{\Pi} \times \frac{1}{DCV}$$

• *Length/Chord/Tangent/Mid Ord/External/Delta*: the length of the curve element, or one of five parameters unambiguously defining the curve length: chord, tangent, middle ordinate (the distance from the midpoint of a chord to the midpoint of the corresponding curve), external (the distance from the midpoint of the curve to the 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, the check mark from the *Tangent to Previous Item* menu on the bitmap in the upper-left corner of the screen should be removed.

⬡ NOTICE *NOTICE*

> *Caution should be exercised when setting the azimuth, since road elements are usually tangential to each other.*

- *Turn*: the direction of turn. The *Right* value stands for clockwise direction, the *Left* value for counter-clockwise direction.
- **OK**: saves the element to the road and returns to the ***Add Road*** screen.

## Spiral

To add a spiral, press the **Insert** or **Add** buttons in the *Hz* tab of the ***Add Road*** screen and select the *Spiral* item from the floating menu. The ***Spiral*** screen will open.
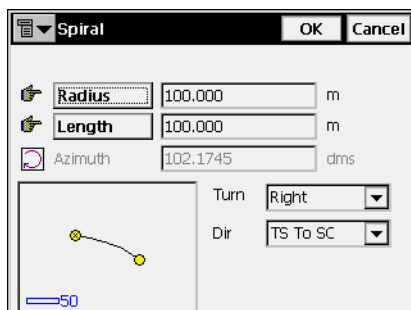


**Figure 3-36. Spiral**

The plot in the bottom-left corner displays the element's appearance.

- **Radius/ Deg Chord/ Deg Curve**: the radius of the curve, or one of two parameters unambiguously defining the radius: degree of chord, or degree of curve (as shown in "Curve" on page 3-28).
- **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, the check mark

from the *Tangent to Previous Item* menu on the bitmap in the upper-left corner of the screen should be removed.

*NOTICE*

*Caution should be exercised when setting the azimuth, since road elements are usually tangential to each other.*

- *Turn*: the direction of turn. The *Right* value stands for clockwise direction, the *Left* value for counter-clockwise direction.

- *Dir*: the direction of movement along the spiral, TS to SC (entering the turn), or CS to ST (exiting the turn)[1].

- **OK**: saves the element to the road and returns to the ***Add Road*** screen.

## Intersection Point

To add an intersection point, press the **Insert** or **Add** buttons in the *Hz* tab of the ***Add Road*** screen and select the *Intersection Point* item from the floating menu. The ***Intersection Point*** screen will open.

**Figure 3-37. 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.

---

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 as shown in "Curve" on page 3-28.
- **Length1/Sp Const 1**, **Length2/Sp Const 2**: the length of the corresponding spiral elements, or the spirals constants. The spiral constants are defined as shown in "Spiral" on page 3-29.
- **OK**: saves the element to the road and returns to the *Add Road* screen.

# Vertical Alignment

The *Vert* tab shows the list of vertical alignment elements, or long sections (for the Long Section vertical alignment type), the vertical alignment plot, and the starting station (or chainage) at each element.
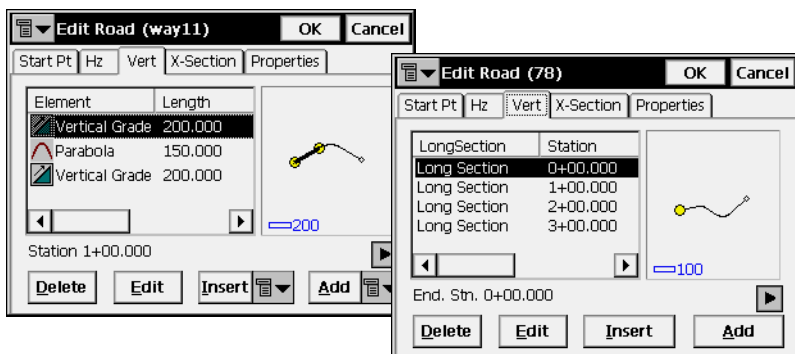


Figure 3-38. Add Road – Vertical Alignment

For Element vertical alignment types, the element list has the following columns:

- *Element*: the icon and name of the element: vertical grade or parabola.
- *Length*: the length of the element.
- *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.

In the case of the Long Sections vertical alignment type, the element list has the following columns:

- *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.
- **Delete**: deletes the element from the road.
- **Edit**: opens a screen with properties of the selected element.
- **Insert**: opens a blank ***Long Section*** screen in which to insert an element at the selected location in the list (Figure 3-42 on page 3-34). The bitmap next to the button displays a menu of elements for the Elements vertical alignment type.
- **Add**: opens a blank ***Long Section*** screen for adding an element to the end of the list (Figure 3-42 on page 3-34). The bitmap next to the button displays a menu of elements for the Elements vertical alignment type.

In the case of the Long Sections vertical alignment type, the graphics interface can display information on the points stationing a vertical curve.

Double-tap in the vertical plot area to open the greater ***Map*** screen for vertical alignment. The ***Map*** screen will display the PVC point where the curve begins, the PVI point of intersection of two tangents and the PVT point where the curve ends (Figure 3-39).
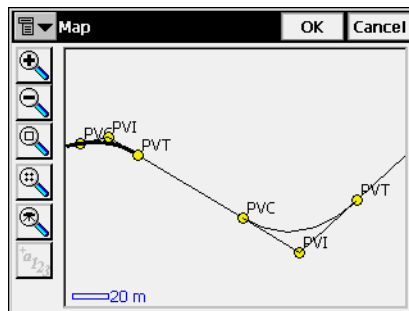


**Figure 3-39. PV Points**

## Vertical Grade

To add a vertical grade, press the **Insert** or **Add** buttons in the *Vert* tab of the ***Add Road*** screen and select the *Vertical Grade* item from the floating menu. The ***Vertical Grade*** screen will open.
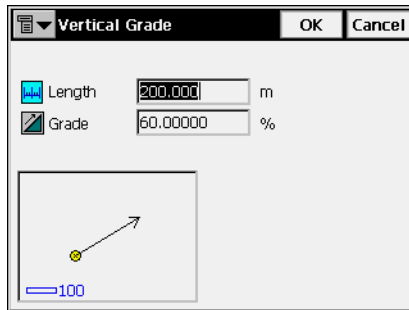


**Figure 3-40. Vertical Grade**

The plot in the bottom-left corner will show the element's appearance.

- *Length*: the length of the vertical grade element.

- *Grade*: the grade of the element, in percents. If the grade is falling, the value should be set negative.

- **OK**: saves the element to the road and returns to the ***Add Road*** screen.

## Parabola

To add a parabola, press the **Insert** or **Add** buttons in the *Vert* tab of the *Add Road* screen and select the *Parabola* item from the floating menu. The *Parabola* screen will open.
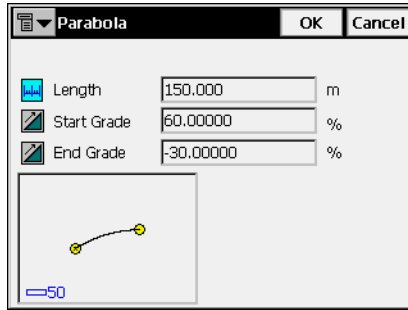


**Figure 3-41. Parabola**

The plot in the bottom-left corner will show the element appearance.

- *Length*: the length of the parabola element.
- *Start Grade, End Grade*: the starting and ending grades of the element, in percents. If the grade is falling, the value should be set negative.
- **OK**: saves the element to the road and returns to the *Add Road* screen.

## Long Section

The *Long Section* screen contains parameters of the section.
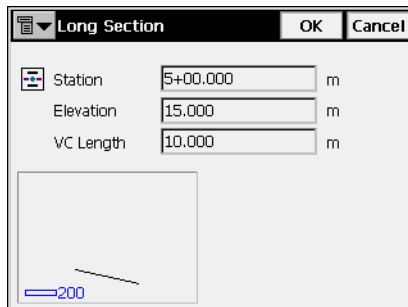


**Figure 3-42. Long Section**

The plot in the bottom-left corner will show the element appearance.

- *Station*: the station distance from the beginning of the road.
- *Height*: the height at the station.
- *VC length*: the length of the vertical curve at the station (with the assumption that the station is located in the middle of the interval).
- **OK**: saves the element to the road and returns to the *Add Road* screen.

# X-Section

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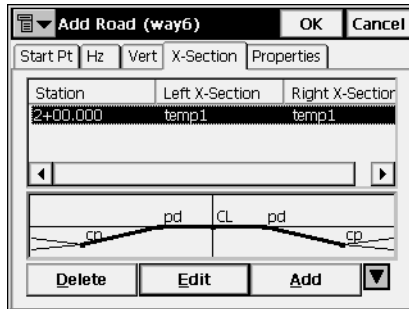


**Figure 3-43. Add Road – X-Section Tab**

The list of templates contains the following columns:

- *Station*: the station where the template is applied.
- *Left X Section, Right X Section*: the names of the templates for the left and right parts of the road relative to the center line. The left and right cross sections can be different.

**NOTICE**

*If two or more templates are defined, the intermediate cross sections are calculated using interpolation.*

- **Delete**: deletes the station from the list.

- **Edit**: opens the *X-Section* screen displaying properties of the selected cross section.
- **Add**: opens a blank *X-Section* screen.

The *X-section* screen contains the parameters and the plot of the cross section.
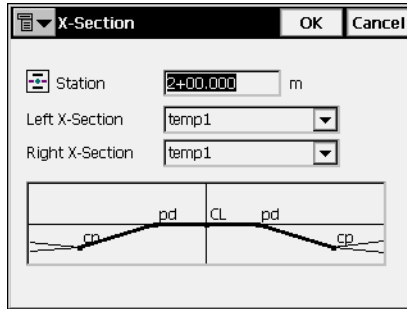


**Figure 3-44. X-Section**

- *Station*: the station distance.
- *Left X-Section, Right X-Section*: the cross section templates for the left and right parts of the road. These can be chosen only from the existing cross section templates.
- **OK**: saves the X-section in the list and returns to the *Add Road* screen.

## Properties

The *Properties* tab contains general properties of the road.
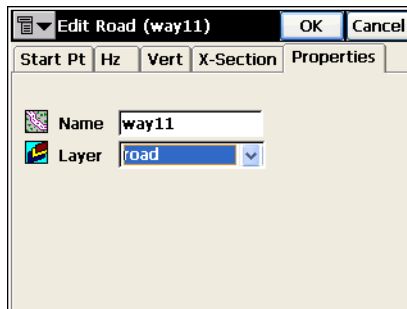


**Figure 3-45. Add Road – Properties Tab**

- *Name:* sets the name of the road.
- *Layer:* selects the layer for the road from the drop down list.
- **OK**: saves the road and return to the *Roads* screen.

After the Road is created, calculate the road points. The ⊞▼ bitmap displays the menu of the following items:

- *Calculate Road Points*: opens the *Calculate Road Points* screen.
- *Edit Points*: opens the *Points* screen (see "Points" on page 3-2).
- *Help*: accesses the Help files.

# Calculate Road Points

The *Calculate Road Points* screen generates points along, to the right and to the left of the center line of the road, along all its entire length.
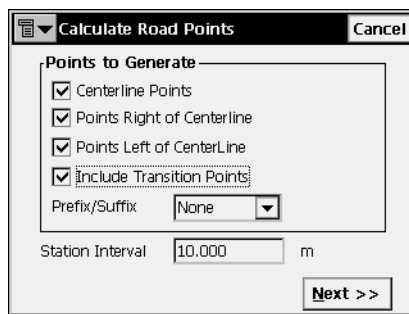


**Figure 3-46. Calculate Road Points**

- *Points to Generate*: defines the points to generate - 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 it is desired to include the transition points, place the check mark in the corresponding field and select a prefix/suffix for them, if necessary, in the appearing field below.

- *Station Interval*: sets the interval between the generated points. By default it is the Station Interval set in the *Start Pt* tab in the *Roads* screen.

- **Next**: opens the *Centerline Points Params* screen.

The *Centerline Points Params* screen displays the parameters of points to be computed along the center line (Figure 3-47).
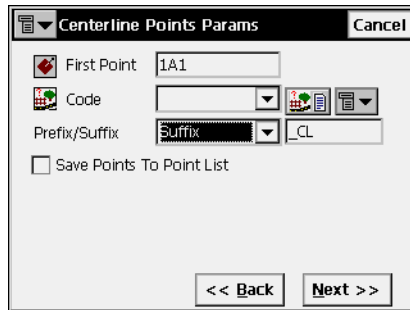


**Figure 3-47. Centerline Points Parameters**

- *First Point*: the name of the first point.

- *Code*: the code of the points being generated; enter manually or select from the drop-down list.

- ![icon]: accesses the attributes of the chosen code and opens the *Code-Attributes* screen (see "Code-Attributes" on page 3-9).

- ![icon]: displays the following list:

    – *String*: toggles on the *String* field. Also, the ![icon] sign appears.

    – *Layer*: opens the *Select Layer* screen to put the point.

    – *Note*: opens the *Note* screen.

- *Prefix/Suffix*: when chosen, sets the prefix or suffix to be added to the generated point name.

- *Save points to Point List*: check if it is necessary to save the generated points to a separate points list. When checked, 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.

The *Right Offset Points Params* screen displays the parameters of points to be computed to the right of the center line.



Figure 3-48. Right Offset Points Parameters

- *First Point*: the name of the first point.

- *Code:* the code of the points being generated; enter manually or chose from the drop-down list.

- ⬛ : accesses the attributes of the chosen code and opens the *Code-Attributes* screen (for details see "Code-Attributes" on page 3-9).

- ⬛▼ : displays the following list:

    – *String*: toggles on the *String* field. Also, the ⬛ sign appears.

    – *Note*: opens the *Note* screen.

- *Prefix/Suffix*: when chosen, sets the prefix or suffix to be added to the generated point name.

- *Save points to Point List*: check if it is necessary to save the generated points to a separate points list. When checked, 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.

The *Left Offset Point Params* screen is similar to the *Right Offset Points Params* screen, except for the direction of the offset.
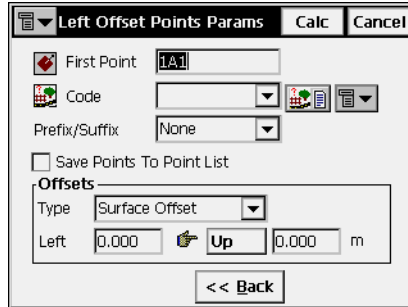


**Figure 3-49. Left Offset Points Parameters**

- **Calc**: calculates the points and stores them to the data set.

# Linework

The Linework is a group of points connected with a line and defined by the same code and string.

To edit a linework, tap **Edit ▶ Linework**.

The *Linework* screen contains a list of existing Lineworks on the left part of the screen, and the two windows on the right part, that present the view of the selected linework in the horizontal and vertical planes (Figure 3-50 on page 3-41).

To view the current selected linework in a larger map, double-tap one of the map plots.

- **Delete**: press to delete the Linework from the list.
- **Edit**: opens the applicable *Edit Line* screen.
- **Add**: opens a blank *Edit Line* screen.
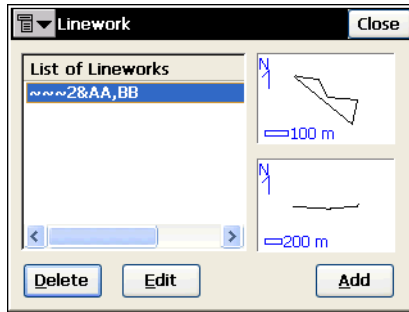
**Figure 3-50. Linework**

The bitmap on the upper-left corner displays the following pop-up menu:

- *Edit Points*: displays the ***Points*** screen. For details, see "Points" on page 3-2.
- *Help*: accesses the help files.

# Edit Line

The *Point in Line* tab of the ***Edit Line*** screen displays a list of existing points in the selected Linework on the left part of the screen, and the general view of the linework on the right part. To view the current selected linework in a large map, double-tap on the map plot.
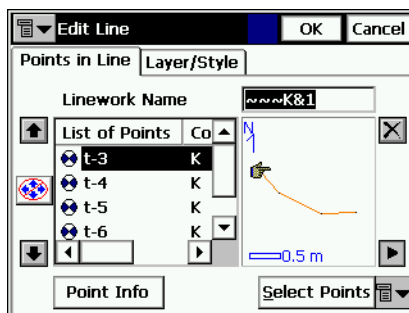


**Figure 3-51. Edit Line – Points in Line**

- *Point List Name*: the name of the Linework.
- *List of Points*: points in the currently 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.

• ⬥ : switches 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.

The bitmap on the upper-left corner displays the following pop-up menu:

• *Edit Points*: displays the ***Points*** screen. For details see "Points" on page 3-2.

• *Help*: accesses the help files.

The *Layer/Style* tab of the ***Edit Line*** screen sets a type and color to display the line in the selected Linework on the map.
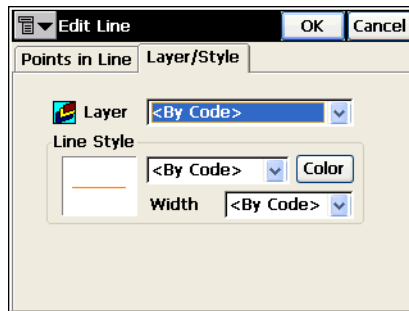


**Figure 3-52. Edit Line**

• *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 to choose the color for the line (see "Select Color" on page 3-8).

# Raw Data

To edit raw data, tap **Edit ▶ Raw Data**.

This screen has the following columns and buttons.
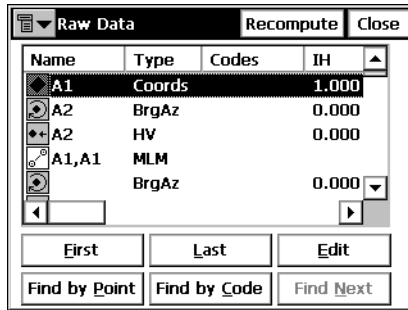


**Figure 3-53. Raw Data**

- *Name*: point name and the icon displaying the type of the point
- *Type*: the type of measurement
- *Codes*: codes for the point
- *HI*: the height of the instrument.
- *Coordinates*: the coordinates of the point.
- *Ctrl Code*: control code for the point.
- *Notes*: additional information on the point.
- *Local Time*: the local time when the point is collected.
- **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.
- **Recompute**: recomputes the point coordinates after editing the point's raw data.
- **Find by Point**: finds a point by its name or a part of its name.
- **Find by 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.

- **Close**: closes the screen.

The button in the upper-left corner of the screen enables the menu of three items:

- *Job Info*: displays the ***Job Info*** screen.

- *Help*: opens the Help files.

# Edit Raw Data

The ***Edit Raw Data*** screen is used to edit the name and code of the surveyed point, and the antenna/instrument height at this point. The title of the first tab is the survey type for the point being edited.
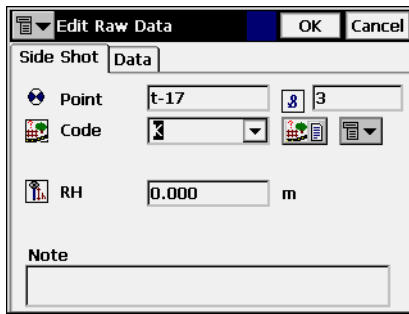


**Figure 3-54. Edit Raw Data**

The *Data* tab displays information on the point's measurements.
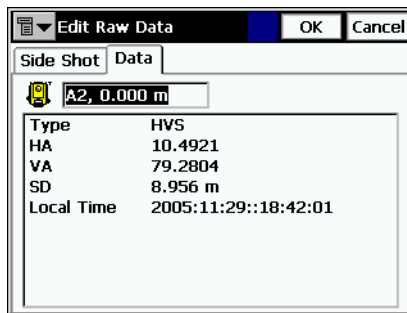


**Figure 3-55. Edit Raw Data – Data Tab**

# View

The View menu contains the following menu items:

- Enable
- Zoom In
- Zoom Out
- Zoom Window
- Zoom All
- Zoom To Point
- Toolbar
- Properties
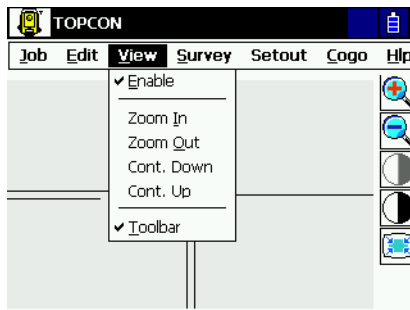


**Figure 4-1. View Menu**

# Enable

To display the job map on the main screen, tap **View ▶ Enable**.
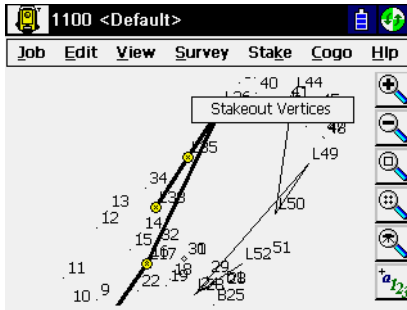


**Figure 4-2. Main View**

# Zoom In/Out/Window
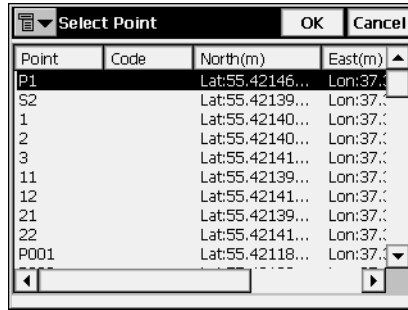
For display customizing, tap **View ▶ Zoom In**, or **View ▶ Zoom Out**, or **View ▶ Zoom Window** to zoom the plot inwards, or outwards, or scales the plot to fit it the screen, respectively.

# Zoom All

To return the map to the initial view, tap **View ▶ Zoom All**.

# Zoom To Point

To select a point for centering, tap **View ▶ Zoom To Point** and choose the point in the Select point screen.



**Figure 4-3. Select Point**

# Toolbar

To display the bar of control buttons of viewing options, tap **View ▶ Toolbar**.
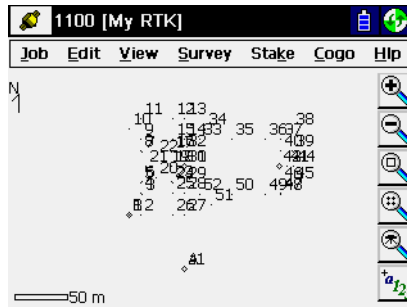


**Figure 4-4. Toolbar**

-  : zooms in

-  : zooms out

-  : selects a frame for display

-  : displays all points in the job

-  : opens the *Points* screen

-  : opens the *Map Properties* screen

# Properties

The *Map Properties* screen customizes the map view by adding properties to the points (names, codes, heights, etc.), displays the points, or sets the application to adjust the scale automatically (the *Autoscale* field).

Autoscaling works to display 30 most recent points of a survey on the map screen.
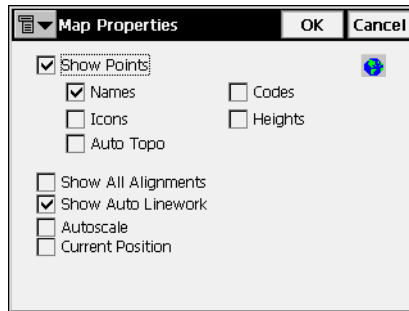


**Figure 4-5. Map Properties**

The world bitmap in the upper-right corner of the screen informs that a background image is selected.

To enable the points displaying, place a check mark in the *Show Points* field. Along with the points their names, codes, icons, heights, and/or points can be displayed.

Also it is possible to display alignments, turn on the linework on the map, perform autoscaling and start each time from the current

position. Checking the *Current Position* field also means that if the current position moves off the edge of the map it will automatically snap back to the center.

Most TopSURV functions can be performed with the help of the Map view. Depending upon the task, the appearance of the view changes. Mostly it duplicates the controls located on the main task page. But it also contains some controls that do not depend on the function being performed. These controls correspond to the viewing options and display customizing.



**Figure 4-6. Map**

# Notes
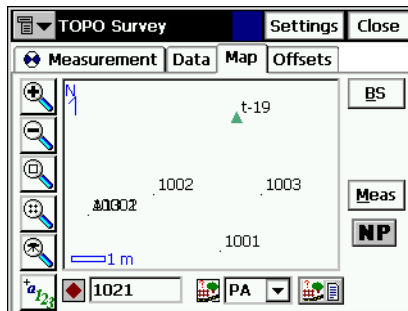
# Total Station Survey

The Survey menu includes the following menu items for Total Station surveys:

- Occ/BS Setup
- BS/FS Survey
- Observations
- Resection
- Elevation
- X-Section
- Find Station
- Tape Dimension
- Missing Line (optional)
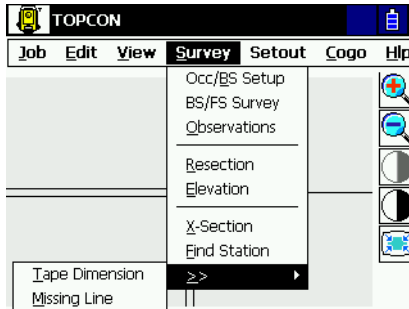


**Figure 5-1. TS Survey Menu**

# Occupations and Backsight Survey Setup

To set up a survey with localization, tap **Survey ▶ Occ/BS Setup**.

## Backsight Survey

The *Backsight Survey* screen contains Backsight station parameters.

The *BS Setup* tab contains following parameters:



**Figure 5-2. Backsight Survey**

- *Occ. Point*: the name of the point where the total station is located.

- ⟦icon⟧ : opens the map for choosing the occupation point.

- The bitmap next to the Map icon in the *Occ. Point* field opens a floating menu of four items:
  - *From List*: opens the list of points.
  - *Resection*: opens the **Resection** screen from which to determine the occupation point coordinates by solving the resection task, using the known point's coordinates.
  - *Elevation*: opens the **Elevation** screen.
  - *Properties*: opens the **Add/Edit Point** screen that displays the properties of the current point, or can create a new point if no point is chosen yet.

- *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).
- *HR*: sets the height of the target above the mark.
- **BS Point (BS Azimuth)**: sets the backsight point location, or the direction to it.
- The bitmap next to the Map icon in the *BS Point* field displays the following list:
  - *From List*: opens the list of points.
  - *Multiple BS*: opens the **Multi-Point BS** screen, to involve several Backsight points for performing survey.
  - *Properties*: opens the **Add/Edit Point** screen that displays the properties of the current point, or suggests to create a new point if no point is chosen yet.
- *BS Circle*: displays the horizontal circle reading corresponding to the backsight point.
- The bitmap next to the *BS Circle* field displays the floating menu that suggests to set the BS Circle value to zero, azimuth, or to change the value by +/- 90 or 180 degrees.
- ▤ : shows the battery and memory status for the controller.
- **Check BS**: opens the **Check Backsight** screen for the backsight point checking.
- **HC Set**: sets the horizontal circle as defined in the *BS Circle* field.
- **Meas BS**: measures the Backsight point.
- **Settings**: opens the *Mode* screen (identical to the screen "Survey" on page 2-5).
- The bitmap on the upper-left corner displays the following pop-up menu:
  - *Edit Points*: opens the **Points** list (see "Points" on page 3-2).
  - *Edit Raw*: opens the **Raw Data** screen (see "Raw Data" on page 3-43).

    – *Inverse*: opens the **Inverse** COGO screen (see "Inverse" on page 7-2).

    – *Intersection*: opens the **Intersection** COGO screen (see "Intersection" on page 7-6).

    – *Help*: opens the Help files.

The *Data* tab displays the available values of the backsight point parameters.
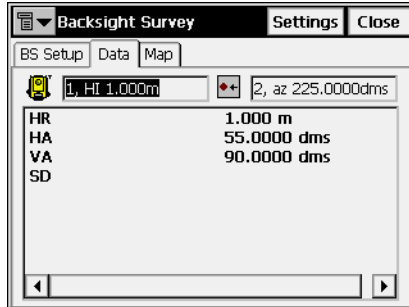


**Figure 5-3. Backsight – Data**

- *HR* (Height of Rod/target) and *HA* (Horizontal Angle)

- *VA* (Vertical Angle) and *SD* (Slope Distance)

There are two fields in the top of the page that display the height of the instrument and the azimuth.

The *Map* tab shows all points in a graphic mode. For details on map properties and customizing, see "Properties" on page 4-4.
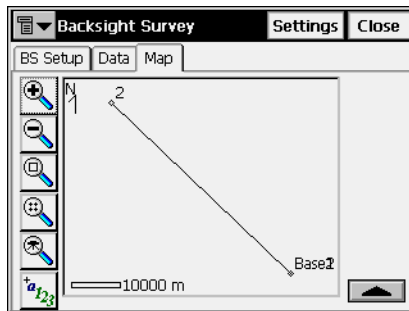


**Figure 5-4. Backsight – Map**

# Resection

To access the *Resection* screen, tap **Survey ▸ Resection**.
Alternatively, tap **Survey ▸ Occ/BS Setup**, then press the bitmap next
to the Map icon in the *Occ. Point* field and select the *Resection* item.

The method of resection computes the coordinates of a point using
measurements from two (or more) points with known coordinates.
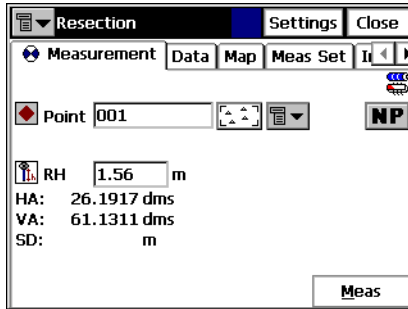


**Figure 5-5. Resection**

- *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).

- **Meas**: takes the sideshot to the point.

- **Settings**: opens the *Mode* screen (see "Survey" on page 2-5).

- The bitmap on the upper-left corner displays the following pop-
  up menu:

  – *Edit Points*: opens the *Points* list (see "Points" on page 3-2).

  – *Inverse*: opens the *Inverse* COGO screen (see "Inverse" on
     page 7-2).

  – *Notes*: opens the **Note** screen for adding notes to the
     measurement session.

  – *PTL Mode*: switches on the PTL (Point-To-Line) Mode. (The
     screen changes its appearance to *Points (PTL)*.) For details,
     see "PTL Mode" on page 5-13.

  – *Options*: opens the *Resection Options* screen.

– *Help:* opens the Help files.

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 "Properties" on page 4-4.

The *Meas Set* tab displays the result of the sideshots being done during one set (Figure 5-6 on page 5-6).



**Figure 5-6. Resection – Meas Set Tab**

- *Sd N*, *Sd E*, *Sd H*: displays Standard deviations for North, East and Height, respectively.

- *Ground to Grid*: displays the calculated scale factor.

- **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 Horizontal angle, Vertical angle and the Slope Distance were used.

- **Re-Meas**: replaces the current measurement with a new measurement.

- **Accept**: stores the new coordinates in the database.

# Resection Options

The *Resection Options* screen calculates along the scale factor and set the resection type: whether to calculate the height (3-D) or just the horizontal coordinates (2-D).
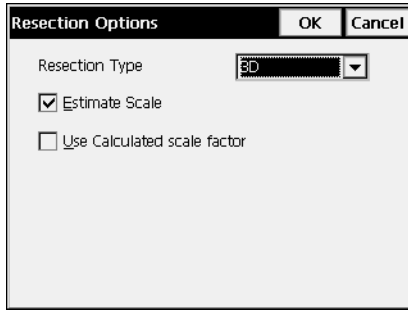
**Figure 5-7. Resection Options**

# Elevation

To access the *Elevation* screen, tap **Survey ▸ Elevation**. Alternatively, tap **Survey ▸ Occ/BS Setup**, then press the bitmap next to the Map icon in the *Occ. Point* field and select the *Elevation* item.

Computation or estimation of elevation (vertical coordinate) will typically use measurements from two or more points with known coordinates.
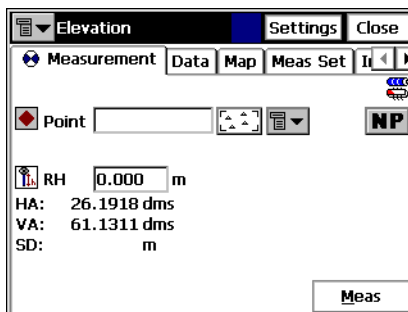
**Figure 5-8. Elevation**

- *Point*: the known point name, which can be selected from the map or from the list.

- *Code*: the known point code.

- *HR*: the height of the rod (target).

- **Meas**: takes the sideshot to the point.

- **Settings**: opens the *Mode* screen (see "Survey" on page 2-5).

- The bitmap on the upper-left corner displays the same pop-up menu except of the *Options* item, as for the Resection task.

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 "Properties" on page 4-4.

The *Meas Set* tab displays the results of the sideshots being done during one set, the same as for the **Resection** task.



**Figure 5-9. Elevation – Meas Set Tab**

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, etc.) The *Ht Diff* column represents the difference between the calculated height and the height of that measurement.

- **Use Ctrl**: toggles through specific measurements in the resection, for example the horizontal angle, but not the vertical, or vice versa.

- **Re-Meas**: replaces the current measurement with a new measurement.

- **Accept**: stores the new coordinates in the database.

# Multi-Point Backsight

To access the *Multi-Point BS* screen, tap **Survey ▶ Occ/BS Setup**, press the bitmap next to the Map icon in the *BS Point* field and select the *Multiple BS* item.

Multiple backsight points can generate more precise measurements.
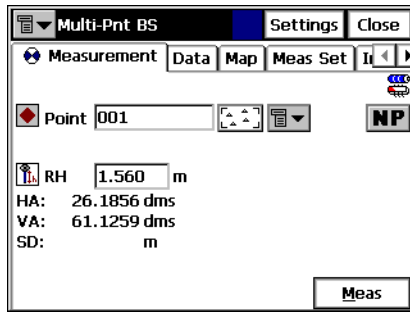


**Figure 5-10. Multi-Point BS**

- *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).
- **Meas**: takes the sideshot to the point.
- **Settings:** opens the *Mode* screen (see "Survey" on page 2-5.
- The bitmap on the upper-left corner displays the same pop-up menu as for the Resection task.

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 graphic mode. For details on map properties and customizing, see "Properties" on page 4-4.

The *Meas Set* tab displays the result of the sideshots being done during one set.



**Figure 5-11. Multi Point BS – Meas Set Tab**

The table represents the result list of the measurements being made: the residuals of the horizontal angles, the measured and initial parameters (HR, HA, etc.)

- **Use Ctrl**: toggles through specific measurements in the resection; for example the horizontal angle, but not the vertical, or vice versa.

- **Re-Meas**: replaces the current measurement with a new measurement.

- **Accept**: stores the new coordinates in the database.

# Check Backsight

The *Check Backsight* screen contains information about the backsight point errors. Note, that HD and VD will not appear if only an azimuth (direction) has been entered for the backsight.

**Figure 5-12. Check Backsight**

# Observations

The *Measurement* tab of the *Sideshot-Dir* screen contains the initial data for the performing single sideshots and displays the information during survey.

**Figure 5-13. Sideshot-Dir – Measurement Tab**

- *Point*: sets the current point name. During the survey the numerical part of the name changes automatically by one.

- *Code*: sets the Code for the current point. Can be entered manually or chosen from the drop-down list.

- ![icon] : accesses the attributes of the chosen code, opens the **Code-Attributes** screen (for details see "Code-Attributes" on page 3-9).

- The bitmap next to the *Attributes List* bitmap displays the following list:

  – *String*: adds a string to the point.

  – *Note*: opens the **Notes** screen.

- *HR*: sets the height of the target above the mark (rod height).

- **BS Setup**: opens the **Backsight Survey** screen for setting the backsight point. The information displayed is the same as has been entered.

- The bitmap on the upper-left corner of the screen displays the following pop-up menu:

  – *Adv*: (Advance) 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.

  – *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 5-13).

  – *Help*: opens the Help files.

![TIP icon] TIP

If more than two points have been tagged as Traverse Points, the ADV button displays a list box with all tagged Traverse points from which to select the next occupation point. Upon selecting

OK, the Backsight screen displays and automatically updates, as in the case when one TP point is available.

- **Meas**: takes the sideshot to the point. The result is given in the information window.

- **Settings:** opens the *Mode* screen (for a description of parameters on this screen, see "Survey" on page 2-5).

# PTL Mode

The Point-To-Line mode (PTL) is a method of interpretation of the point coordinates. The coordinates are defined through the two reference points. The line trace through these points is set as one axis and its perpendicular as another.
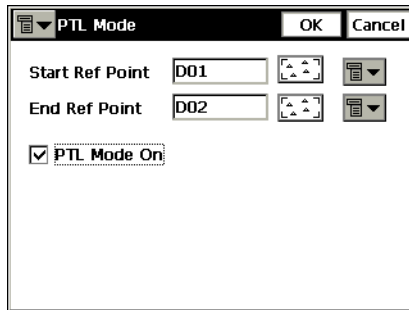


**Figure 5-14. PTL Mode**

- *Start Ref Point, End Ref Point*: the names of the reference points. Select these points from the map or select from the list of points.

- *PTL Mode On*: enables the PTL mode.

- **OK**: saves the changes and returns to the previous screen.

The *Data* tab contains the results of the measurements along with the initial data.
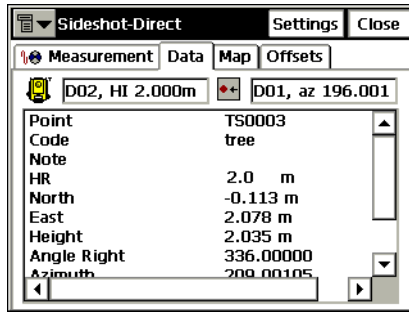


**Figure 5-15. Sideshot-Dir – Data Tab**

The *Map* tab performs sideshots in the graphic mode. The buttons on the right duplicate the controls on the first page.
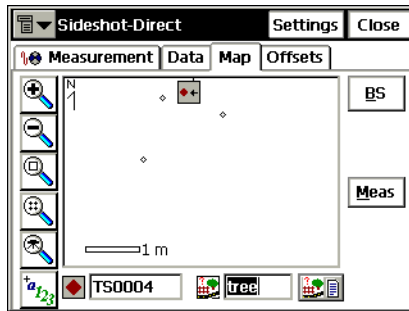


**Figure 5-16. Sideshot-Dir – Map Tab**

For details on map properties and customizing, see "Properties" on page 4-4.

# Offsets

The *Offsets* tab contains a set of tools for defining the offsets.
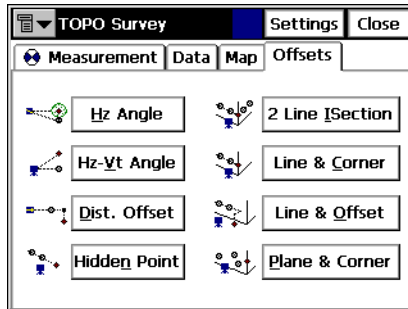


**Figure 5-17. Offsets**

- *Hz Angle*: defines a point using the horizontal angle from one point and the distance to another.
- *Hz-Vt Angle*: defines a point using the horizontal and vertical angles.
- *Dist. Offset*: defines a point giving the ability to add or subtract distances, horizontally and vertically.
- *2 Line ISection*: determines a point by the intersection of the two lines. Each line is defined by two points or two measurements.
- *Line & Corner*: determines a point on the corner using one line defined by two points and 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 and vertical angle measurements.

## Horizontal Angle Offset

The *Measurement* tab of the ***Horizontal Angle Offset*** screen contains data for definition of a point using the horizontal angle from one point and the distance to another.



**Figure 5-18. Horizontal Angle Offset – Measurement Tab**

- *Point*: name for the offset point to be stored.
- *Code*: code for the offset point to be stored. Can be entered manually or chosen from the drop-down list.

- : the *Attributes List* bitmap, opens the list of available attributes (for details see "Code-Attributes" on page 3-9).

- The bitmap next to the *Attributes List* bitmap displays the following list:
  - *String*: switches on the *String* field on the *Topo* tab (for details).
  - *Note*: opens the ***Notes*** screen.

- *HR*: sets the target height above the mark (rod height).

- **Settings**: opens the ***Mode*** screen for setting the backsight point.

- **Side and Center**: take measurements to Center and obtain vertical angle and horizontal angle measurements, then a Side measurement provides VA, HA, and distance measurements. With these two sets of measurements, the computation can be made for point at center of a tree; for example, when taking measurements, a comment will appear on the screen.

- The bitmap on the upper-left corner of the screen displays the following pop-up menu:
  - *Edit Points*: opens the **Points** list.
  - *Edit Raw*: opens the **Raw TS** screen (see "Raw Data" on page 3-43).
  - *Inverse*: opens the **Inverse** COGO screen (see "Inverse" on page 7-2).
  - *Intersection*: opens the **Intersection** COGO screen (see "Intersection" on page 7-6).
  - *Note*: opens the **Notes** screen.
  - *Adv* (Advance): 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.
  - *PTL Mode*: opens the **PTL Mode** screen.
  - *Help*: opens the Help files.

The following three tabs are similar to the Offset tasks:

- The *Data* tab contains the data collected during the offset measurement.
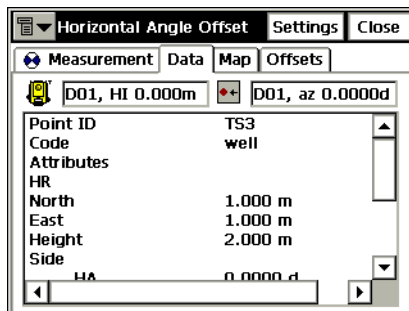


**Figure 5-19. Horizontal Angle Offset – Data Tab**

• The *Map* tab contains the graphic view and duplicated controls from the *Measurement* tab. For the details on viewing properties customizing, see "Properties" on page 4-4.
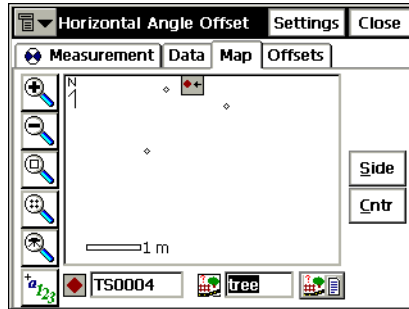


**Figure 5-20. Horizontal Angle Offset – Map Tab**

• The *Offsets* tab switches to another offset task.

## Horizontal/Vertical Angle

The *Measurement* tab in the Horizontal/Vertical Angle mode contains data for definition of a point using the horizontal and vertical angles.



**Figure 5-21. Horizontal/Vertical Angle – Measurement Tab**

• *Point*: name for the offset point to be stored.

• *Code*: code for the offset point to be stored, which can be entered manually or chosen from the drop-down list.

• ⬚ : the *Attributes List* bitmap, lists available attributes (see "Code-Attributes" on page 3-9).

- The bitmap next to the *Attributes List* bitmap displays the same list as for the ***Horizontal Angle Offset*** task.

- *HR*: sets the target height (Rod Height).

- *Prism*: stores horizontal distance and horizontal angle measurements (to prism).

- *VA*: combines vertical angle measurement with Prism mode measurements to determine point location.

- *HA/VA*: combines horizontal angle and zenith angle measurements with horizontal distance logged in Prism step to determine point location.

- **Settings**: opens the ***Mode*** screen for setting the backsight point.

The *Data*, *Map* and *Offsets* tabs are similar to that of the ***Horizontal Angle Offset*** measurement.

## Distance Offset

The *Measurement* tab of the ***Distance Offset*** screen contains the data for definition of a point giving the ability to add or subtract distances, horizontally and vertically.



**Figure 5-22. Distance Offset – Measurement Tab**

- *Point:* name for the offset point to be stored.

- *Code:* code for the offset point to be stored. Can be entered manually or chosen from the drop-down list.

- ![icon] : The *Attributes List* bitmap, opens the list of available attributes.

- The bitmap next to the *Attributes List* bitmap displays the same list as for the ***Horizontal Angle Offset*** task.

- *HR*: sets the target height above the mark (rod height).

- ▓▓ : shows the battery and memory status for the controller.

After the sideshot is taken, the ***Enter Distance Offsets*** screen will be displayed and contains the following three parameters for the offset:

- **Forward/Backward**: sets the distance between the current point and the projection of the offset point on the line of sight.

- **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 of sight.

- **Meas**: performs the measurement.

- **Settings**: opens the ***Mode*** screen for setting the backsight point.

- The *Data*, *Map* and *Offsets* tabs are similar to that of the ***Horizontal Angle Offset*** measurement.

## Hidden Point

The *Measurement* tab of the ***Hidden Point*** screen defines a point on the ground surface, with a slanted rod touching the ground point. The rod has two targets.
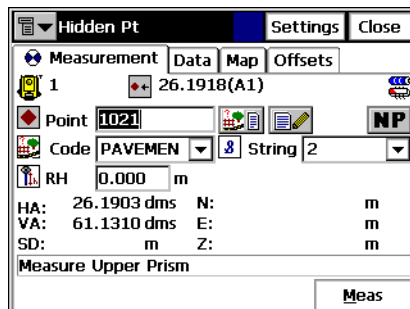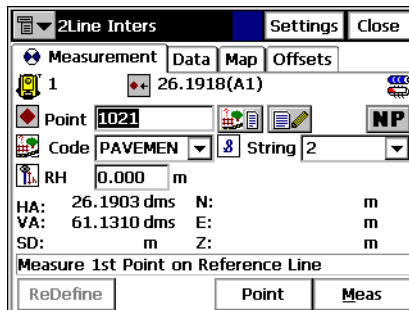


**Figure 5-23. Hidden Point – Measurement Tab**

- *Point*: name for the offset point to be stored.

- *Code*: code for the offset point to be stored. Can be entered manually or chosen from the drop-down list.

- [icon] : the *Attributes List* bitmap, opens a list of available attributes.

- The bitmap next to the *Attributes List* bitmap displays the same list as for the ***Horizontal Angle Offset*** task.

- **Single**: toggles between the *Single* and *Repeat* sideshot modes.

- **Fine**: toggles between the *Fine* and *Coarse* sideshot modes.

- **Rod Pt1**: measures the first target on the rod.

- **Rod Pt2**: measures the second target on the rod.

## Two Line Intersection

The *Measurement* tab of the ***Two Line Intersection*** screen contains data for determination of a point by the intersection of the two lines. Each line is defined by two points or two measurements.
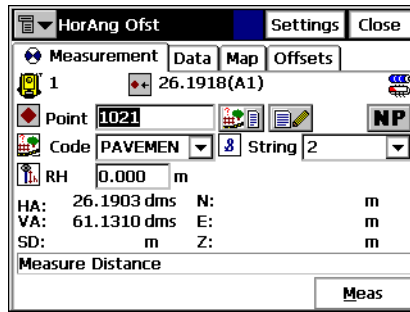


Figure 5-24. Two LIne Intersection – Measurement Tab

- *Point*: name for the offset point to be stored.

- *Code*: code for the offset point to be stored. Can be entered manually or chosen from the drop-down list.

- [icon] : the *Attributes List* bitmap, opens the list of available attributes.

- The bitmap next to the *Attributes List* bitmap displays the same list as for the **Horizontal Angle Offset** task.

- *HR*: sets the target height above the mark (rod height).

- **Line 1 Pt1** and **Line 1 Pt2**: obtains measurements to determine the first and second points defining first line.

- **Line 2 Pt 1** and **Line 2 Pt 2**: obtains measurements to determine the first and second points defining second line.

- **Settings**: opens the **Mode** screen for setting the backsight point.

The *Data*, *Map* and *Offsets* tabs are similar to that of the **Horizontal Angle Offset** measurement.

## Line and Corner

The *Measurement* tab of the **Line and Corner** screen contains data for determination of a point on the corner using one line defined by two points.
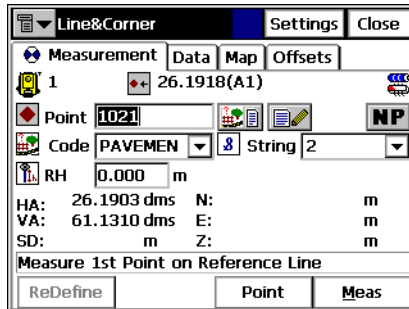


**Figure 5-25. Line and Corner – Measurement Tab**

- *Point*: name for the offset point to be stored.

- *Code*: code for the offset point to be stored. Can be entered manually or chosen from the drop-down list.

-  : the *Attributes List* bitmap, opens a list of available attributes.

- The bitmap next to the *Attributes List* bitmap displays the same list as for the **Horizontal Angle Offset** task.

- *HR*: sets the target height above the mark (rod height).
- **Line Pt1**: obtain measurements to determine first point defining a line.
- **Line Pt2**: obtain measurements to determine first point defining a line.
- **Corner**: obtain horizontal angle to locate point on line at corner.
- **Settings**: opens the *Mode* screen for setting the backsight point.

The *Data*, *Map* and *Offsets* tabs are similar to that of the ***Horizontal Angle Offset*** measurement.

## Line and Offset

The *Measurement* tab of the ***Line and Offset*** screen contains data for determination of a point distant from a line defined by two points.
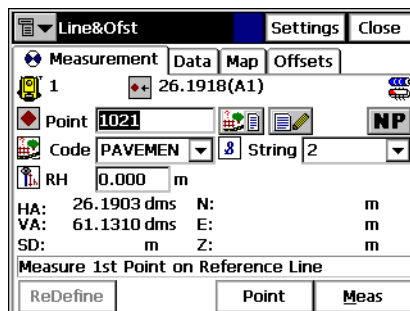


**Figure 5-26. Line and Offset – Measurement Tab**

- *Point*: name for the offset point to be stored.
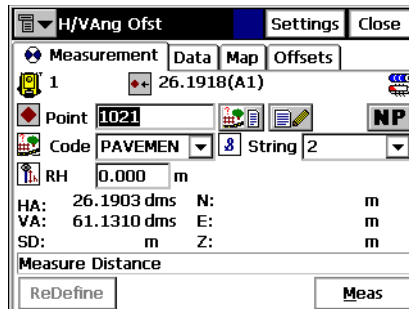- *Code*: code for the offset point to be stored. Can be entered manually or chosen from the drop-down list.
- ![] : the *Attributes List* bitmap, opens a list of available attributes.
- The bitmap next to the *Attributes List* bitmap displays the same list as for the ***Horizontal Angle Offset*** task.
- *HR*: sets the target height above the mark (rod height).
- **Line Pt1**: obtains measurements to first point on a line.

- **Line Pt2**: obtains measurements to second point on a line.

- **Settings**: opens the *Mode* screen for setting the backsight point.

After the lines are measured, the ***Enter Distance Offsets*** screen will be displayed and contains the following three parameters for the offset:

- **Forward/Backward**: sets the distance between the current point and the projection of the offset point on the line of sight.

- **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 of sight.

The *Data*, *Map* and *Offsets* tabs are similar to that of the ***Horizontal Angle Offset*** measurement.

## Plane and Corner

The *Measurement* tab of the ***Plane and Corner*** screen helps determine a point (Corner) using a plane defined with three points and an angle measurement.
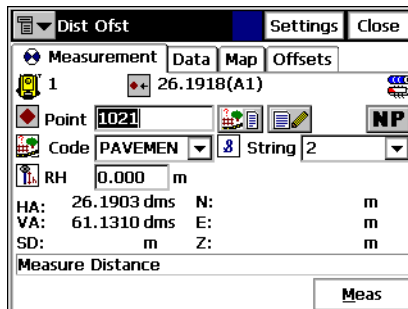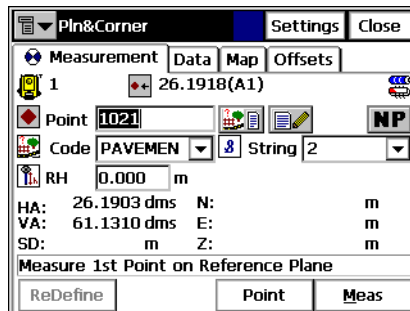


**Figure 5-27. Plane and Corner – Measurement Tab**

- *Point*: name for the offset point to be stored.

- *Code*: code for the offset point to be stored. Can be entered manually or chosen from the drop-down list.

-  : the *Attributes List* bitmap, opens a list of available attributes for the chosen code.

- The bitmap next to the *Attributes List* bitmap displays the same list as the ***Horizontal Angle Offset*** task.

- *HR*: sets the target (rod) height above the mark.

- **Plane 1**: obtains measurements to determine first point in a plane.

- **Plane 2**: obtains measurements to determine second point in a plane.

- **Plane 3**: obtains measurements to determine third point in a plane.

- **Corner**: obtains horizontal and vertical angle measurements to determine corner point in a plane.

NOTICE *NOTICE*

*The three points defining a plane must be not be colinear (all on the same line).*

- **Settings**: opens the ***Mode*** screen for setting the backsight point.

The *Data*, *Map* and *Offsets* tabs are similar to that of the ***Horizontal Angle Offset*** measurement.

# Cross-Section

The Cross-Section task surveys of the cross section. To start working, select the **Survey ▶ X-Section**.

The *Cross Section* screen contains the settings of the station, where the cross section survey is to be performed.



**Figure 5-28. Cross Section**

- *Road*: select the road from the drop-down menu, or from the list, if the road is not present in the *Roads* list.

- *Cl Code*: the code of the center line points. Insert manually, or select one from the drop-down list.

- ![icon] : the *Attributes List* bitmap, opens the list of available attributes (for details see "Code-Attributes" on page 3-9).

- The bitmap next to the *Attributes List* bitmap displays the following list:

    - *String*: switches on the *String* field.

- *Station*: sets the station where the cross section is surveyed. For the first cross section, this field is shown only if the road is set.

- *Interval*: the increment of distance towards the next station.

**NOTICE**

*The Station and Interval fields appear only if the road is chosen.*

- The bitmap in the upper-left corner of the screen displays the menu of two items:
  - *Edit Roads*: enables the Roads screen. See "Roads" on page 3-22.
  - *Help*: opens Help files.
- OK: saves the changes and opens the *XSect-Direct* screen.

The *XSect-Direct* screen performs the usual observation work relative to the cross section.
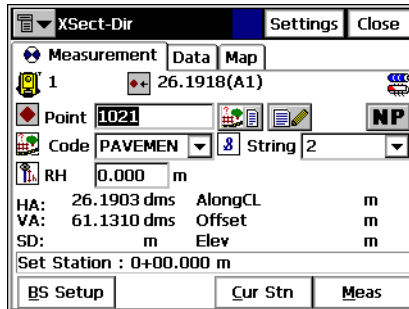


**Figure 5-29. XSect-Direct**

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 each next point has a different code, for example A, B, C, cl, D, E, F. After the **Close** button is pressed, the station number automatically changes. The application will suggest that the survey on the next station using the same codes in the opposite order: F, E, D, cl, C, B, A. The line will be created along the points with "cl" code.

For a detailed description of the survey process, see "Observations" on page 5-11. The only difference lies in the presence of the **Cur Stn** button. Similar to the **Meas** button, it makes the measurement, but does not store the point to the data set.

# Find Station

To start working, select **Survey ▶ Find Station**.

The *Measurement* tab of the *Find Station* screen is used for the identification of 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.
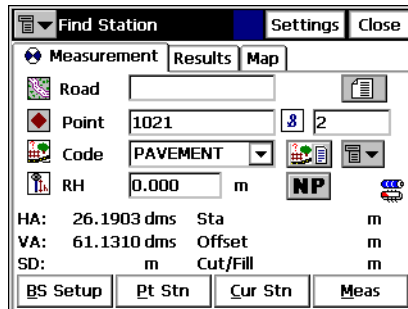
**Figure 5-30. Find Station – Measurement Tab**

• *Road*: type the name for the road, or select it from the list.

• *Point*: the name of the point.

• *Code*: the code. Can be entered manually or chosen from the drop-down list.

• ![attributes] : the *Attributes List* bitmap, opens a list of available attributes (for details, see "Code-Attributes" on page 3-9).

• ![battery] : shows the battery and memory status for the Total Station.

• The bitmap next to the *Attributes List* bitmap displays the following list:
  – *String*: switches on the *String* field.
  – *Note*: opens the *Notes* screen.

• *HR*: sets the target height above the mark (rod height).

• **BS Setup**: opens the *Backsight Survey* screen for setting the backsight point. The information displayed is the same as has been entered.

- **Pt Stn**: computes the result.

- **Cur Stn**: computes the result, takes the sideshot to the point, and stores the point to the data set.

- **Meas**: computes the result and takes the sideshot to the point. The result reflects in the *Result* tab.

- **Settings**: opens the ***Mode*** screen (see "Survey" on page 2-5).

- The bitmap in the upper-left corner of the screen displays the following pop-up menu:
    - *Edit Points*: opens the ***Points*** list (see "Points" on page 3-2).
    - *Inverse*: opens the ***Inverse*** COGO screen (see "Inverse" on page 7-2).
    - *Notes*: opens the ***Notes*** screen (see "Observations" on page 5-11).
    - *PTL Mode*: opens the ***PTL Mode*** screen (see "PTL Mode" on page 5-13).
    - *Help*: opens the Help files.

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. For details on map properties and customizing, see "Properties" on page 4-4.

The *Meas Set* tab (if available) displays the result of the sideshots being done during one set.

# Tape Dimension

To start working, select **Survey ▶ Tape Dimension**.

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 the so called *reference line*.

The *Ref Line* tab contains information about the two points comprising the reference line.
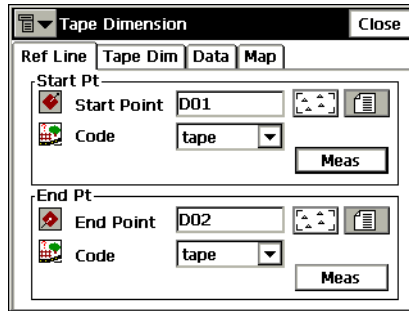


**Figure 5-31. Tape Dimension Ref Line Tab**

- *Start Pt*: contains properties of the starting point: the name (can be entered manually or chosen from the map or list) and code. Also, the point can be measured by pressing the **Meas** button.

- *End Pt*: contains properties of the ending point: the name (can be entered manually or chosen from the map or list) and code. Also, the point can be measured by pressing the **Meas** button.

The *Tape Dim* tab contains the settings for performing the survey.
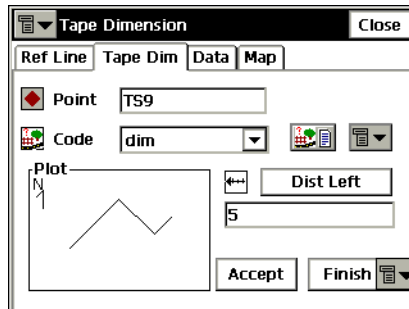


**Figure 5-32. Tape Dimension – Tape Dim Tab**

- *Point*: the name of the next point in the survey.

- *Code*: the code of the point. Can be entered manually or chosen from the drop-down list.

- [image] : the *Attributes List* bitmap, opens the list of available attributes (for details see "Code-Attributes" on page 3-9).
- The bitmap next to the *Attributes List* bitmap displays the following list:
  - *String*: switches on the *String* field.
  - *Note*: opens the **Notes** screen.
- **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 bitmap 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 **Survey ▶ Missing Line**.

The *Missing Line* screen emulates the total station measurement from one point to another and stores the result to the Raw Data database.
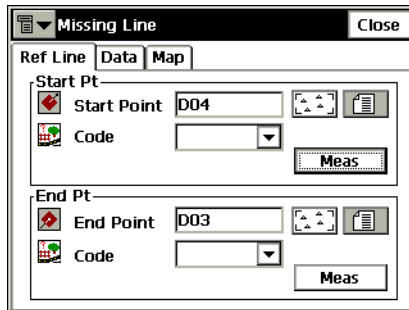


**Figure 5-33. Missing Line – Ref Line Tab**

- 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.
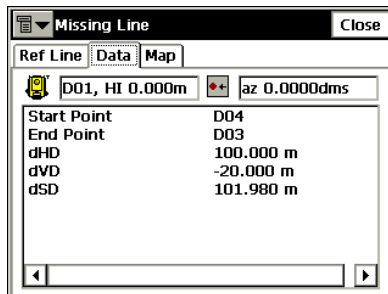


**Figure 5-34. Missing Line – Data Tab**

The same results are reflected in the ***Raw Data*** screen.

The *Map* tab shows the relative position of the points and the measured line.

# Stake

The Stake menu includes the following menu items:

- Points
- Point in Direction
- Point List
- Lines
- Offsets
- Roads
- DTM
- CodeStrings
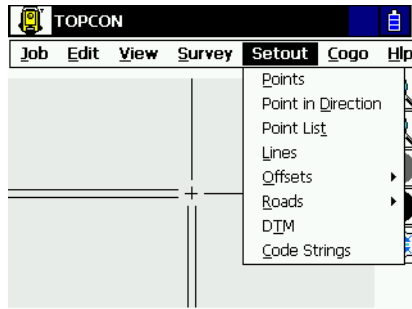


**Figure 6-1. Stake Menu**

# Points

To stakeout a point, tap **Stake ▶ Points**.

## Stakeout Point

The *Stakeout Point* screen contains initial data for the stakeout point.
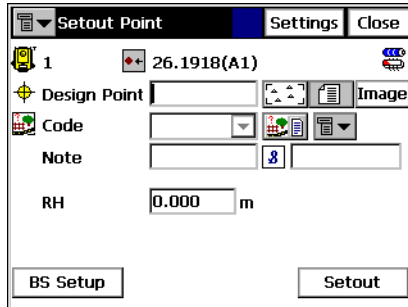


**Figure 6-2. Stakeout Point**

- The bitmap in the upper-left corner displays the following pop-up menu:
  - *Edit Points*: opens the **Points** screen (see "Points" on page 3-2).
  - *PTL Mode*: switches on the PTL (Point-To-Line) Mode. (The screen changes its appearance to **Stakeout Point (PTL)**.) For details, see "PTL Mode" on page 5-13.
- *Design Point*: sets the identifier of the design point. Choose it from a map, from the list, or add a new point.
- *HR* : the height of the rod (target).
- *BS Setup*: opens the **BS Setup** screen (see "Backsight Survey" on page 5-2).
- **Settings**: opens the **Stakeout Parameters** screen (see "Config: Stakeout Parameters" on page 2-6).
- **Stakeout**: opens the **Stakeout** screen.

The ***Stakeout*** screen reflects the progress of the stakeout.
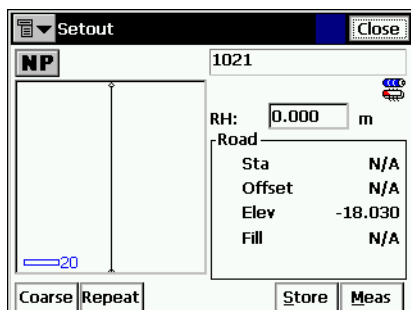


**Figure 6-3. Stakeout**

The ***Stakeout*** screen displays the current point name (in the upper-left corner of the screen), the layout of the target and current position, the direction, and the values of the distances to the target.

- **EDM**: displays the menu with two choices: Coarse and Fine. Selecting one of them sets a check mark in the menu.

- **Repeat**: toggles single/repeat measurement.

- **Dist**: measure distance.

- **Next**: switches to the next target.

- **Meas**: takes a measurement and stores the current position as a point.

- **Cur Pos**: causes a measurement to be made and displays the result on the screen.

- **Store**: performs the measurement, then displays and stores the point.

- **Dsp**: toggles stakeout information.

- **Close**: closes the screen.

- The bitmap at the upper-left corner displays the following pop-up menu:

  – *Auto Advance Pt*: if checked, after storing a staked point opens automatically the Stakeout screen for the next point.

– *Store Design Pt / Layer*: opens the **Design Pt /Layer** screen to select options to store the points.

– *Help*: opens the help files.

## Design Pt/Layer

The **Design Pt /Layer** screen selects parameters for storing staked points.
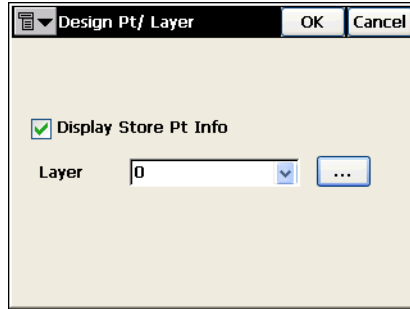


**Figure 6-4. Design Pt/Layer**

- *Display Store Pt Info:* if checked, the **Store Point** screen will appear before storing a staked point.

- *Layer:* selects the layer from the drop down list.

- [ ... ] : opens the **Layers** screen to edit layers (see "Layers" on page 3-17).

## Store Point

The ***Store Point*** screen displays information on the staked point before storing.



**Figure 6-5. Staked Point Information**

The *Point Info* tab contains the following fields (Figure 6-5):

- *Point*: sets the name of the point.
- *Code*: sets the code for the point. Can be entered manually or chosen from the drop-down list.
- ![icon] : the *Attributes List* bitmap, opens the ***Code-Attributes*** screen to set the values for the attributes available for the code chosen ("Code-Attributes" on page 3-9).
- The fields for the coordinates of the point in the current coordinate system (the field name changes with the display type).
- *Note*: the name of the previous point.
- The bitmap next to the *Attributes List* bitmap displays the following list:
    - *String*: toggles on the *String* field. Also, the ![icon] sign appears.
    - *Layer*: opens the ***Select Layer*** screen to put the point.
    - *Note*: opens the ***Note*** screen.

The *Layer/Style* tab contains the following fields:
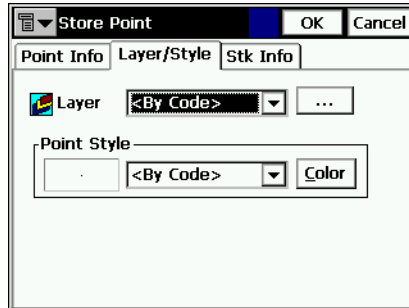


**Figure 6-6. Store Point – Layer/Style Tab**

- *Layer*: selects the layer to locate the point.
- *Point Style:* sets and shows the style to designate the point on the map.
  - The drop down list contains the point simbols to select.
  - **Color**: opens the *Select Color* screen.

The *Stk Info* tab displays results of staking.
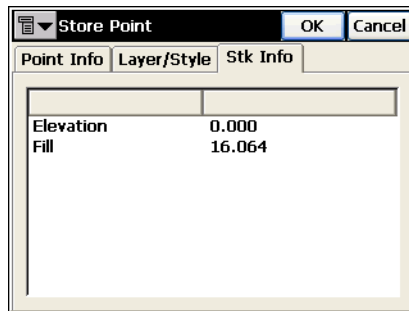


**Figure 6-7. Store Point – Stk Info**

## Design Elevation

The *Design Elev* screen contains an option to change the elevation of the staked point.
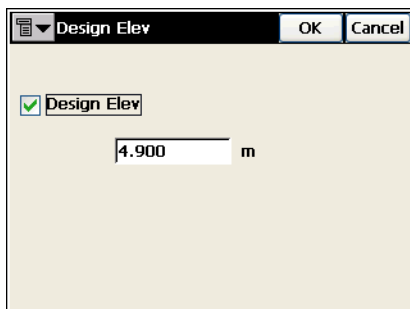


**Figure 6-8. Design Elevation**

• *Design Elev:* check this box to enable the entry field for editing the elevation value manually.

Staked out points are listed as observed points on the *Points* screen.
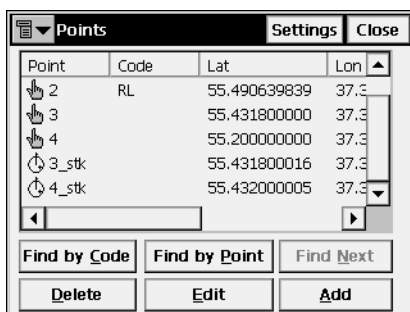


**Figure 6-9. Points – Staked out**

# Point in Direction

To perform the Point and Direction stakeout, select **Stake ▶ Point in Direction**.

## Point in Direction

The *Point in Direction* screen performs the stakeout of a point, using known point, the azimuth, and the offsets from the azimuth line.

**Figure 6-10. Stakeout Point & Direction**

- *From Point*: the starting point. Type the name manually or select it from the list or from the map.

- *Azimuth/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*: check this field if it is desired to store the computed point to the data set.

- *HR* : the height of the rod (target).

- **Stakeout**: opens the *Stakeout* screen to perform the stakeout.

- *BS Setup*: backsight measurement.

- **Settings**: opens the *Stakeout Parameters* screen. See "Configuration" on page 2-5.

- The bitmap on the upper-left corner displays the following pop-up menu:
  - *Edit Points*: opens the ***Points*** screen (see "Points" on page 3-2).

The ***Stakeout*** screen reflects the progress of the stakeout.
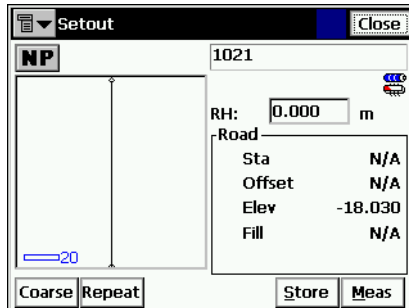


**Figure 6-11. Stakeout**

The ***Stakeout*** screen displays the current point name (in the upper-left corner of the screen), the layout of the target and current position, the direction, and the values of the distances to the target.

- **EDM**: displays the menu with two choices: Coarse and Fine. Selecting one of them sets a check mark in the menu.

- **Repeat**: toggles single/repeat measurement.

- **Dist**: measure distance.

- **Next**: switches to the next target.

- **Meas**: takes a measurement and stores the current position as a point.

- **Cur Pos**: causes a measurement to be made and displays the result on the screen.

- **Store**: performs the measurement, then displays and stores the point.

- **Dsp**: toggles stakeout information.

- **Close**: closes the screen.

• The bitmap at the upper-left corner displays the following pop-up menu:

  – *Auto Advance Pt*: if checked, after storing a staked point opens automatically the Stakeout screen for the next point.

  – *Store Design Pt / Layer*: opens the **Design Pt /Layer** screen to select options to store the points.

  – *Help*: opens the help files.

# Point List

To stakeout points from a list, select **Stake ▶ Point List**.

The stakeout of points from the list can be enabled from the Main View (see Figure 4-2 on page 4-2). Press **Alt** on the keyboard and tap the linework. Select the Stakeout Vertices item from the pop-up menu appear to open the ***Stakeout Point List*** screen.

## Stakeout Point List

The ***Stakeout Point List*** screen performs a stakeout of existing points, creates a pointlist to stakeout, selects the starting stakeout point, and stakeouts in direct or reverse order.
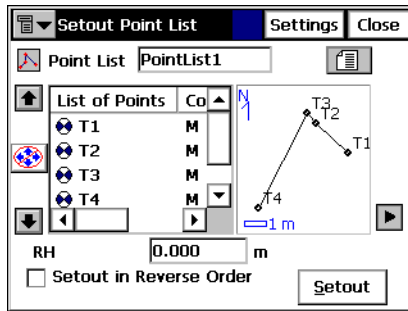


**Figure 6-12. Stakeout Point List**

• *Point List*: the preexisting points list. Can be chosen from the list or entered manually.

• *List of Points*: the list of currently selected points.

• Up and down arrows moves the highlighted point 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.

• ✕ : deletes the highlighted point from the list.

• ▶ : closes the scheme of the polygon. Only the list of points will be available.

- *HR* : the height of the rod (target).
- *Stakeout in Reverse Order*: check to perform stakeout starting from the end of the Point List.
- **Stakeout**: opens the ***Stakeout*** screen.
- The bitmap on the upper-left corner displays the following pop-up menu:
    - *Edit Point Lists*: opens the ***Point Lists*** screen (see "Point Lists" on page 3-14).

# Stakeout

Stakeouts are performed in the same way as in "Stakeout Point" on page 6-2. Here, points can be staked out in any order by selecting the next stakeout point using an additional option from the bitmap menu in the upper left corner:

- *Select Stakeout Point*: opens the ***Select Point*** screen to select a stakeout point from the list.

### Select Point

The ***Select Point*** screen displays the Point List being staked, from which points can be randomly chosen to continue the stakeout.

The new starting point can be selected from the list, or by double-taping a point on the map to the right of the list.
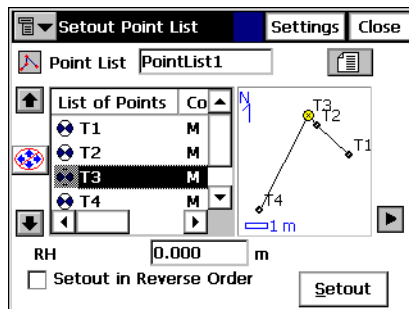


**Figure 6-13. Select Point**

- Show Remaining Points: check to show all the points that have not yet been staked out.
- *Show Staked Points*: check/uncheck to display the points in the list that have already been staked out.
- *Reverse Order*: check to stakeout the points from last point in the list to first.
- **OK**: saves changes and closes the screen.

# Lines

To stakeout a line, select **Stake ▶ Lines**.

## Stakeout Line

The *Stakeout Line* screen contains the initial data for the line stakeout.

- The bitmap on the upper-left corner displays the same pop-up menu as for the *Stakeout Points&Direction* screen (see "Point in Direction" on page 6-8).
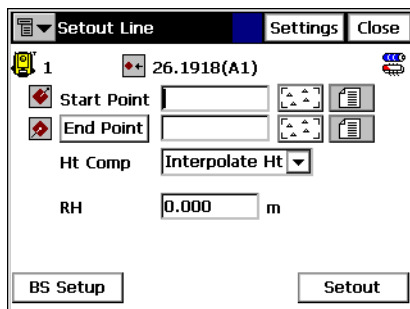


**Figure 6-14. Stakeout Line**

- *Start Point*: sets the starting point of the reference line.
- **End Point/Azimuth**: sets the direction of the reference line thorough another point, or azimuth.
- *Ht Comp*: the type of height computations for the stakeout point. Can be one of the following:

  – *Ht of Start Pt* (height of starting point): the stakeout point will
     have 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.
- *HR* : the height of the rod (target).
- **Stakeout**: opens the second *Stakeout Line* screen.
- **Settings**: opens the *Stakeout Parameters* screen. For details, see
  "Stakeout Point" on page 6-2.

The *Stakeout* screen reflects the progress of the stakeout.
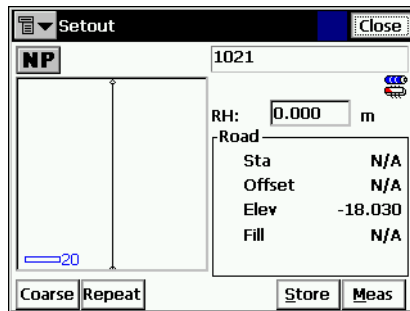


**Figure 6-15. Stakeout**

The *Stakeout* screen displays the current point name (in the upper-left
corner of the screen), the layout of the target and current position, the
direction, and the values of the distances to the target.

- **EDM**: displays the menu with two choices: Coarse and Fine.
  Selecting one of them sets a check mark in the menu.

- **Repeat**: toggles single/repeat measurement.

- **Dist**: measure distance.

- **Next**: switches to the next target.

- **Meas**: takes a measurement and stores the current position as a
  point.

- **Cur Pos**: causes a measurement to be made and displays the result on the screen.
- **Store**: performs the measurement, then displays and stores the point.
- **Dsp**: toggles stakeout information.
- **Close**: closes the screen.
- The bitmap at the upper-left corner displays the following pop-up menu:
  - *Auto Advance Pt*: if checked, after storing a staked point opens automatically the Stakeout screen for the next point.
  - *Store Design Pt / Layer*: opens the ***Design Pt /Layer*** screen to select options to store the points.
  - *Help*: opens the help files.

# Offsets

The Offsets submenu contains four items:

- Line & Offsets
- Intersection & Offsets
- Curve & Offsets
- Spiral & Offsets

## Line & Offset

To stakeout Line & Offset, select **Stake ▶ Offsets ▶ Line & Offsets**.

## Stakeout Line & Offset

The *Stakeout Line & Offset* screen performs a stakeout of a line with offsets in the Horizontal and Vertical directions.
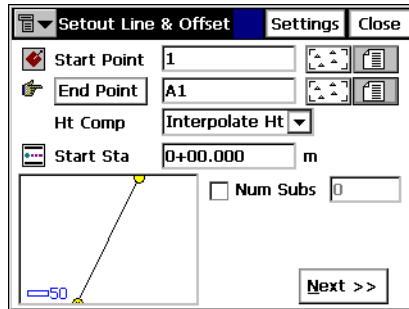


**Figure 6-16. Stakeout Line & Offset**

- *Start Point*: the starting point of the line. The line is defined, by its azimuth, azimuth to another point, or 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. Can be one of the following:
  - *Ht of Start Pt* (height of starting point): the stakeout point will have 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.

- *Num Subs*: designates the number of subdivisions if it is desired to subdivide the line. For instance a value of 3, indicates that the user wants to stakeout four points by subdividing the line in three equal segments.

- *Start Stn*: The starting station (chainage) of the line.

- **Next**: opens the *Station & Offsets* screen.

- **Settings**: opens the *Stakeout Parameters* screen. See "Configuration" on page 2-5.

- The bitmap on the upper-left corner displays the following pop-up menu:

  – *BS Setup:* opens the **BS Setup** screen (see "Backsight Survey" on page 5-2).

  – *Edit Points*: opens the **Points** screen (see "Points" on page 3-2).

  – *Help*: accesses Help files.

# Intersection & Offsets

To stakeout Intersection & Offsets, select **Stake ▶ Offsets ▶ Intersection & Offsets**.

### Intersection & Offsets

The *Intersection & Offsets* screen stakeouts out the intersection point of two lines parallel to two other lines at specified offsets. The first screen defines one line (Line 1) and the offset of the first parallel line. The second screen field 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 the first line.



**Figure 6-17. Intersection & Offsets – Line 1**

- *From Point*: starting point of the Line 1.

- **Az to Pt/Azimuth**: the direction of the line set through the azimuth of the line, 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 *Intersection&Offsets* screen.

- **Settings**: opens the *Stakeout Parameters* screen (see "Configuration" on page 2-5).

- The bitmap on the upper-left corner displays the same pop-up menu as the *Points in Direction* screen (see "Point in Direction" on page 6-8).

The second screen contains the parameters of the second line.



**Figure 6-18. Intersection & Offsets – Line 2**

- *From Point*: starting point of the Line 2.

- **Az to Pt/Azimuth**: the direction of the line; set through the azimuth of the line, 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 corresponding line.

- *Intersect Ht*: the height of the intersection point.

- *Store Point*: the name of the intersection point.

- *HR* : the height of the rod (target).

- **Stakeout**: opens the *Stakeout* screen.

- **Settings**: opens the *Stakeout Parameters* screen. See "Configuration" on page 2-5.

The *Stakeout* screen reflects the progress of the stakeout.



**Figure 6-19. Stakeout**

The *Stakeout* screen displays the current point name (in the upper-left corner of the screen), the layout of the target and current position, the direction, and the values of the distances to the target.

- **EDM**: displays the menu with two choices: Coarse and Fine. Selecting one of them sets a check mark in the menu.

- **Repeat**: toggles single/repeat measurement.

- **Dist**: measure distance.

- **Next**: switches to the next target.

- **Meas**: takes a measurement and stores the current position as a point.

- **Cur Pos**: causes a measurement to be made and displays the result on the screen.

- **Store**: performs the measurement, then displays and stores the point.

- **Dsp**: toggles stakeout information.

- **Close**: closes the screen.

- The bitmap at the upper-left corner displays the following pop-up menu:

  – *Auto Advance Pt*: if checked, after storing a staked point opens automatically the Stakeout screen for the next point.

– *Store Design Pt / Layer*: opens the **Design Pt /Layer** screen to
    select options to store the points.

– *Help*: opens the help files.

# Curve & Offsets

To stakeout Curve & Offsets, select **Stake ▶ Offsets ▶ Curve &
Offsets**.

## Curve & Offsets

The **Curve & Offsets** screen function performs a stakeout of a curve
(section of an arc) at a specified horizontal and vertical offset from
the curve.



**Figure 6-20. Stakeout Curve & Offset**

- *PC Point*: the Point of Curve, the starting point of the arc.

- *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.

- **Length/Chord/Tangent/Mid Ord/Extern/Delta**: the length
  parameter of the curve. For the description of the curve (arc)
  parameters, see "Curve Solution" on page 7-16.

- *SS*: The starting station (chainage) of the line.

- **Next**: opens the *Station and Offsets* screen (see "Stakeout Curve & Offset" on page 6-20).

- **Settings**: opens the *Stakeout Parameters* screen (see "Configuration" on page 2-5).

- The bitmap on the upper-left corner displays the same pop-up menu as for the *Line & Offsets* screen (see "Line & Offset" on page 6-15).

# Spiral & Offset

To stakeout Spiral & Offset, select **Stake ▸ Offsets ▸ Spiral & Offset**.

## Stakeout Spiral & Offset

The *Stakeout Spiral & Offset* screen is used to stakeout points at specified Horizontal and Vertical offsets with respect to a specified spiral.
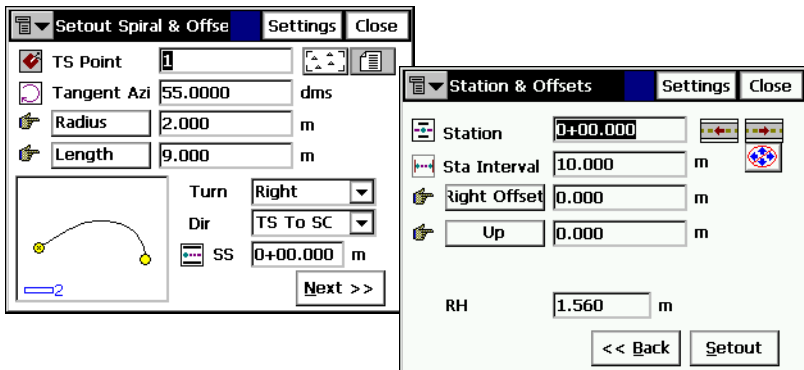


**Figure 6-21. Stakeout Spiral & Offset**

- *TS Point*: Tangent to Spiral point. This is 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.

  For any spiral point $R \times Length = (SpiralConst)$, where R is the *Radius,* and *Length* is the length of the spiral, both at the same specified point.

- *Turn*: specifies whether the spiral turns right or left:

- *Dir*: the direction of "moving":

  > *TS -> SC* = Tangent Spiral->Spiral Circle. This is the incoming spiral to the internal circle.

  > *CS -> ST* = Circle Spiral->Spiral Tangent. The outgoing spiral from the circle to the Tangent.

- *SS*: the starting station (chainage) of the line.

- **Next**: opens the *Station & Offsets* screen (see "Stakeout Curve & Offset" on page 6-20).

- **Settings**: opens the *Stakeout Parameters* screen (see "Configuration" on page 2-5).

- The bitmap on the upper-left corner displays the same pop-up menu as for the *Line & Offsets* screen (see "Line & Offset" on page 6-15).

# Roads

The Roads submenu contains three items:

- Road
- Slope
- Real Time Road

The same menu can display in the Main View to enable the stakeout from the graphics interface (see Figure 4-2 on page 4-2 in Chapter 4). To open the menu, press **Alt** on the keyboard and tap the road to be staked.

## Stakeout Road

To start the Road stakeout, select **Stake ▶ Roads ▶ Road**.

The *Stakeout Road* screen selects the road for stakeout and displays the plan of the chosen road.

The bitmap in the upper-left corner displays the same pop-up menu as the *Line & Offsets* screen (see "Line & Offset" on page 6-15).
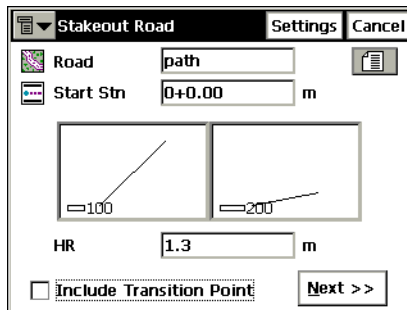


**Figure 6-22. Stakeout Road**

- *Road*: the road to be staked-out. Can be entered manually or chosen from the list.
- *Start Stn*: the starting point of the stakeout, the distance from the beginning of the road.
- *HR* : the rod (target) height.

- *Include transition point*: set a check mark if the transition point should be included in spite of the station distance.
- **Settings**: opens the *Stakeout Parameters* screen (see "Config: Stakeout Parameters" on page 2-6).
- **Next**: opens the second *Stakeout Road* screen.

The second *Stakeout Road* screen is used to set the offsets from CL for the stakeout points.
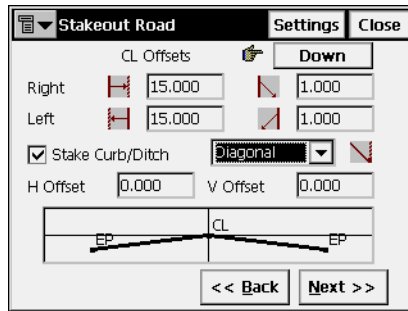


**Figure 6-23. Stakeout Road**

- **Next**: opens the third *Stakeout Road* screen.

The third *Stakeout Road* screen displays the properties of the cross section on the stakeout station and performs the stakeout of all the desired points.
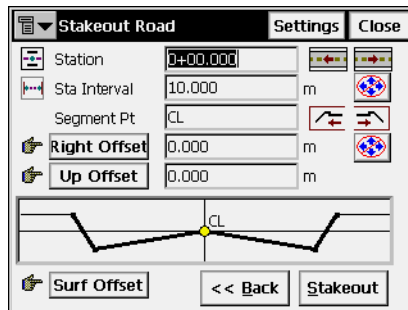


**Figure 6-24. Stakeout Road**

- *Station*: the station where the stakeout is performed. The arrow buttons change the station number by the value of Station Interval.

- *Stn Interval*: the interval of the station increment.
- *Segment Pt*: the point code of the current segment. The arrow buttons in this field move the current segment point along the cross section. This will reflect on the scheme in the bottom of this screen.
- *Right/Left Offset*: the horizontal offset from the current segment point.
- *Up/Down Offset*: the vertical offset from the current segment point.
- *Flat/Surface Offset*: the reference line for offsets, the horizontal plane or the surface of the road.

- ⬤ : switches on/off the keyboard arrow keys. The upper button stands for the station increment/decrement, the lower button for the current segment point location. Only one button can be enabled at a time.
- **Back**: returns to the first *Stakeout Road* screen.
- **Stakeout**: opens the *Initial Point Name* screen.
- **Settings**: opens the *Stakeout Parameters* screen (see "Config: Stakeout Parameters" on page 2-6).

## Initial Point Name

The *Initial Point Name* screen specifies the starting name for the points calculated for the stakeout task.



**Figure 6-25. Initial Point Name**

- **OK**: opens the *Stakeout* screen.

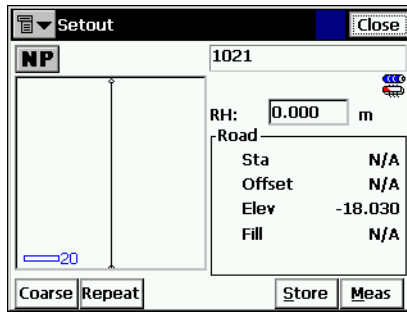The *Stakeout* screen reflects the progress of the stakeout.



**Figure 6-26. Stakeout**

The *Stakeout* screen displays the current point name (in the upper-left corner of the screen), the layout of the target and current position, the direction, and the values of the distances to the target.

- **EDM**: displays the menu with two choices: Coarse and Fine. Selecting one of them sets a check mark in the menu.

- **Repeat**: toggles single/repeat measurement.

- **Dist**: measure distance.

- **Next**: switches to the next target.

- **Meas**: takes a measurement and stores the current position as a point.

- **Cur Pos**: causes a measurement to be made and displays the result on the screen.

- **Store**: performs the measurement, then displays and stores the point.

- **Dsp**: toggles stakeout information.

- **Close**: closes the screen.

- The bitmap at the upper-left corner displays the following pop-up menu:

  - *Auto Advance Pt*: if checked, after storing a staked point opens automatically the Stakeout screen for the next point.

– *Store Design Pt / Layer*: opens the **Design Pt /Layer** screen to select options to store the points.

– *Help*: opens the help files.

# Stakeout Slope

To start the slope stakeout, select **Stake ▶ Roads ▶ Slope**.

The **Stakeout Slope** screen selects a road, which slope should be staked-out.

The bitmap on the upper-left corner displays the same pop-up menu as for the **Line & Offsets** screen (see "Line & Offset" on page 6-15).
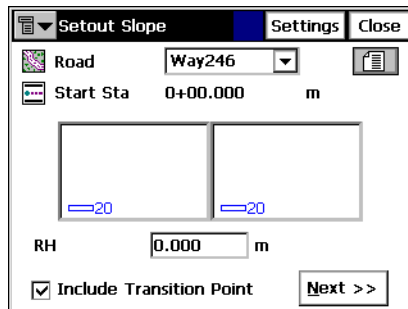


**Figure 6-27. Stakeout Slope**

- *Road*: the road to be staked-out. Can me entered manually, or chosen from the list.

- *Start Stn*: the starting point of the stakeout, the distance from the beginning of the road.

- *HR* : the rod height.

- *Include transition point*: set the check mark if the transition point should be included in spite of the station distance.

- **Settings**: opens the **Stakeout Parameters** screen (see "Configuration" on page 2-5).

- **Next**: opens another **Stakeout Slope** screen. This

This screen displays the properties of the cross section at the stakeout station and helps to perform the stakeout of the catch point (the point where the slope crosses the surface of the terrain) and/or the offset of the catch point.
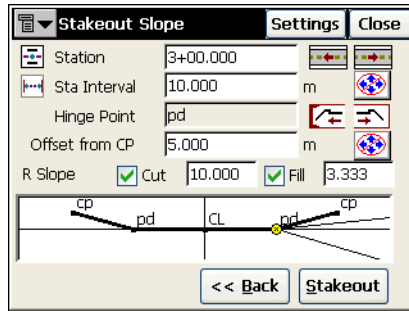


**Figure 6-28. Stakeout Alignment**

*   *Station*: the station where the stakeout is performed. The arrow buttons change the station number on the value of Station Interval.

*   *Stn Interval*: the interval of the station increment.

*   *Hinge Point*: the hinge point code. The hinge point is a point of rotation of the Cut/Fill Slopes. The arrow buttons in this field move the hinge point along the cross section. This will reflect on the scheme in the bottom of this screen.

*   *Offset from CP*: the offset from the catch point.

*   *Right/Left Slope Cut/Fill*: the values of the Cut and Fill Slope parameters, applied to the hinge point.

*   ⊕ : switches on/off the keyboard arrow keys. The upper button stands for the station increment/decrement, the lower button stands for the current hinge point location. Only one button can be enabled at a time.

*   **Back**: returns to the *Slope Stakeout* screen.

*   **Stakeout**: opens the *Stakeout* screen.

*   **Settings**: opens the *Stakeout Parameters* screen (see "Configuration" on page 2-5).

**T**The *Stakeout* screen reflects the progress of the stakeout.
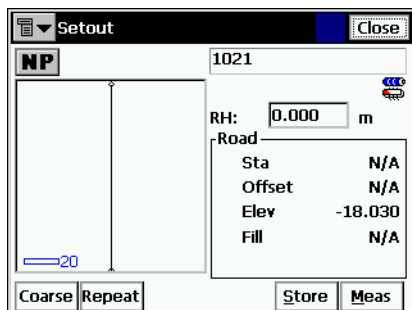


**Figure 6-29. Stakeout**

The *Stakeout* screen displays the current point name (in the upper-left corner of the screen), the layout of the target and current position, the direction, and the values of the distances to the target.

- **EDM**: displays the menu with two choices: Coarse and Fine. Selecting one of them sets a check mark in the menu.

- **Repeat**: toggles single/repeat measurement.

- **Dist**: measure distance.

- **Next**: switches to the next target.

- **Meas**: takes a measurement and stores the current position as a point.

- **Cur Pos**: causes a measurement to be made and displays the result on the screen.

- **Store**: performs the measurement, then displays and stores the point.

- **Dsp**: toggles stakeout information.

- **Close**: closes the screen.

- The bitmap at the upper-left corner displays the following pop-up menu:

  – *Auto Advance Pt*: if checked, after storing a staked point opens automatically the Stakeout screen for the next point.

- *Store Design Pt / Layer*: opens the **Design Pt /Layer** screen to select options to store the points.
- *Help*: opens the help files.

# Stakeout Real Time Road

To start the road stakeout in real time, select **Stake ▶ Roads ▶ Real Time Road**.

The **Stakeout Road** screen selects a road for stakeout and displays the plan of the chosen road.

The bitmap on the upper-left corner displays the same pop-up menu as for the **Line & Offsets** screen (see "Line & Offset" on page 6-15).
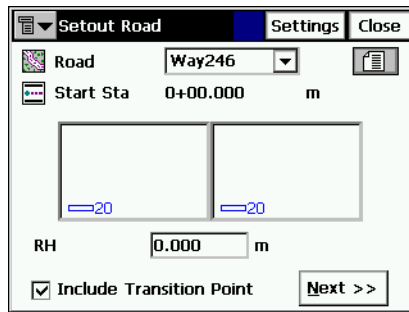


**Figure 6-30. Stakeout Road**

- *Road*: the road to be staked-out. Can be entered manually or chosen from the list.

- *Start Stn*: the starting point of the stakeout, the distance from the beginning of the road.

- *HR* : the rod (target) height.

- *Include transition point*: set a check mark if the transition point should be included in spite of the station distance.

- **Settings**: opens the **Stakeout Parameters** screen (see "Config: Stakeout Parameters" on page 2-6).

- **Next**: opens the second **Stakeout Road** screen to set the offsets from CL for the stakeout points.

**Figure 6-31. Stakeout Road**

- **Next**: opens the third *Stakeout Road* screen to set *Cut*/*Fill Slope* parameters.



**Figure 6-32. Stakeout Road – Cut/Fill**

- **Stakeout**: opens the *Initial Point Name* screen.

## Initial Point Name

The *Initial Point Name* screen specifies the starting name for the points calculated for the stakeout task.
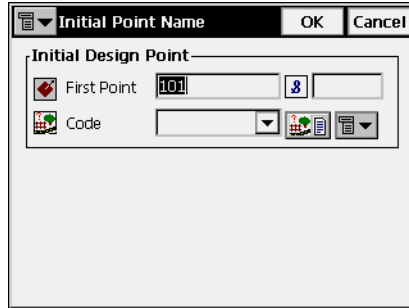


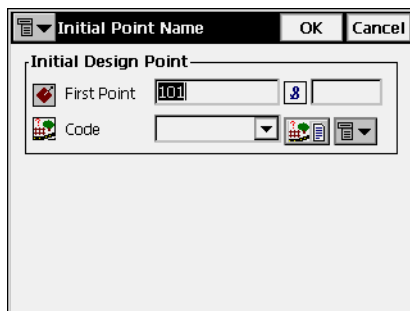**Figure 6-33. Initial Point Name**

• **OK**: opens the *Stakeout* screen.

The *Stakeout* screen reports the cut/fill values computed tor the current observed point. The design elevation of the road is automatically calculated for the observed point using the alignment and the templates.

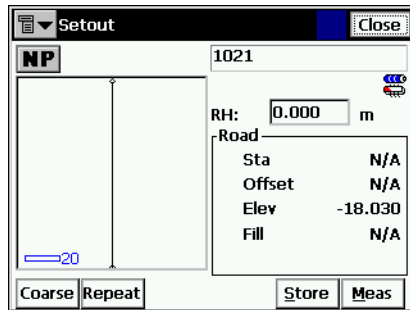The *Stakeout* screen reflects the progress of the stakeout.
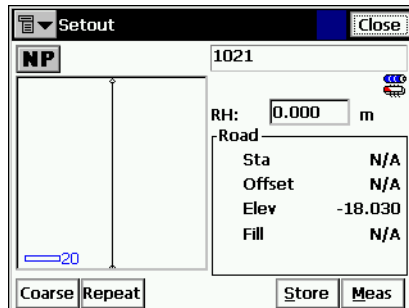


**Figure 6-34. Stakeout**

The *Stakeout* screen displays the current point name (in the upper-left corner of the screen), the layout of the target and current position, the direction, and the values of the distances to the target.

- **EDM**: displays the menu with two choices: Coarse and Fine. Selecting one of them sets a check mark in the menu.

- **Repeat**: toggles single/repeat measurement.

- **Dist**: measure distance.

- **Next**: switches to the next target.

- **Meas**: takes a measurement and stores the current position as a point.

- **Cur Pos**: causes a measurement to be made and displays the result on the screen.

- **Store**: performs the measurement, then displays and stores the point.

- **Dsp**: toggles stakeout information.

- **Close**: closes the screen.

- The bitmap at the upper-left corner displays the following pop-up menu:
    - *Auto Advance Pt*: if checked, after storing a staked point opens automatically the Stakeout screen for the next point.
    - *Store Design Pt / Layer*: opens the **Design Pt /Layer** screen to select options to store the points.
    - *Help*: opens the help files.

# DTM

To start the DTM (Digital Terrain Model) stakeout, select
**Stake ▶ DTM**.
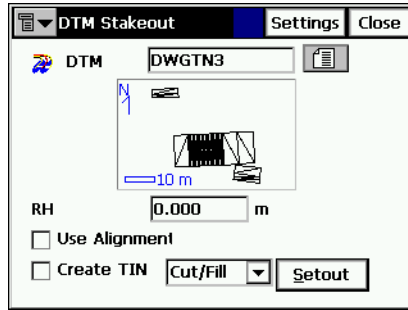


**Figure 6-35. DTM Stakeout**

- *DTM name*: the name of the TN3 file, which is stored at the disk.

- *HR* : the height of reflector.

- *Use Alignment*: if checked, stations and offsets will be reported.

- *Create TIN*: if checked, a TIN (TN3 file) cut/sheet model can be
  generated.

- **Stakeout**: opens the ***Initial Point Name*** screen (see Figure 6-18
  on page 6-18) and then the ***Stakeout*** screen by pressing **OK**.

⬭ NOTICE *NOTICE*

*If a stakeout point is located on the outside of the DTM for the
job, TopSURV will neither calculate nor write the coordinates of
this point.*

# Open DTM

The *Open DTM* screen opens the selected surface file.
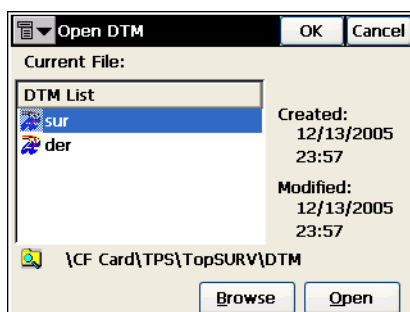


**Figure 6-36. Open DTM**

- *Current File:* displays currently open file.

- *DTM List:* lists all surface files in the DTM directory on the controller.

- **Browse:** searches for the file on the disk.

- **Open:** opens the selected file in the *DTM Stakeout* screen.

## TS Stakeout

The *Stakeout* screen reflects the relative position of the target. The current point name and the parameters of the target display on the right of the screen.
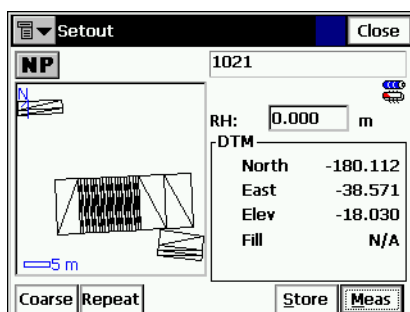


**Figure 6-37. Stakeout (TS)**

- **Cur Pos**: causes a measurement to be made and displays the result on the screen.

- **Close:** saves the changes and closes the screen.

# CodeStrings

To start a CodeString stakeout, select **Stake ▸ CodeStrings**.
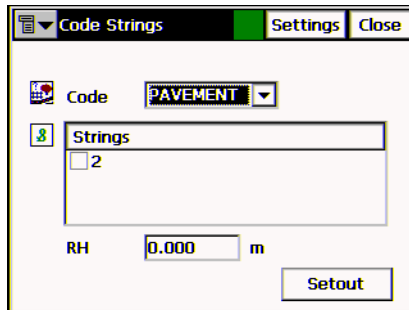


**Figure 6-38. CodeStrings**

- The bitmap on the upper-left corner displays the following pop-up menu:

- *HR* : the height of the rod (target).

- **Settings**: opens the *Stakeout Parameters* screen. For details see "Config: Stakeout Parameters" on page 2-6.

- **Stakeout**: opens the *Stakeout* screen, assisting in the stakeout process. The Stakeout screen for CodeStrings is similar to the Stakeout screen for Points (see Figure 6-3 on page 6-3).

# COGO

The COGO menu includes the following menu items:

- Inverse
- Inverse Pt to Pts List
- Intersection
- Inverse Pt to Line
- Point in Direction (optional)
- Traverse
- Curve Solutions (optional)
- Area
- Known Area (optional)
- Transformations (optional)
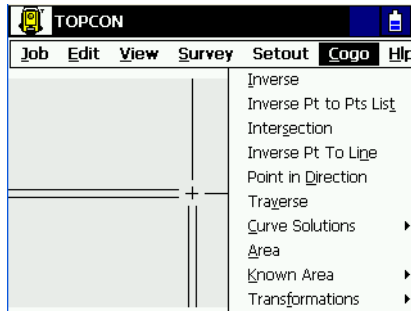


**Figure 7-1. Cogo Menu**

# Inverse

To open the Inverse screen, tap **COGO ▶ Inverse**.

The ***Two-Point Inverse*** task computes the inverse between two known points. Inverse comprises the azimuth from one point to the other, and the distance between these points.
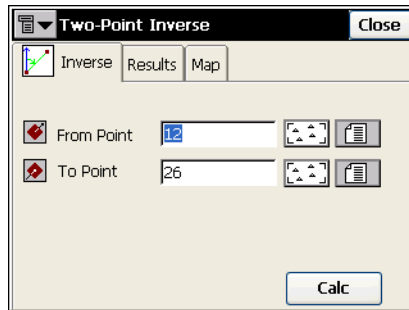


**Figure 7-2. Two-Point Inverse**

The *Inverse* tab contains initial data for the task:

- *From Point*: the first point name; entered manually or chosen from the map or from the list.
- *To Point*: the second point name; entered manually or chosen from the map or from the list.
- **Calc**: calculates the inverse.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Points*: opens the ***Points*** screen (see "Points" on page 3-2).
- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map (Figure 7-3). Tap the large image to hide it.



**Figure 7-3. Large Image of COGO Task**

The *Results* tab shows the initial data (From Point, To Point) and results of the calculation (Figure 7-4). The display of 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 has the below described fields (Figure 7-4).
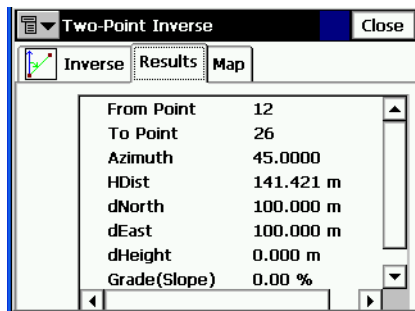


**Figure 7-4. Two-Point Inverse – Results in Non-Geodesic Display System**

- *Azimuth* or *Bearing*: to the second point from the first point.

- *Horizontal Distance* (HDist): from one point to another.

- *Vertical distance* (VDist): the "-" sign means that the height of the second point is lower than the height of the first point.

- *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.

The *Map* tab shows the illustration for the results.
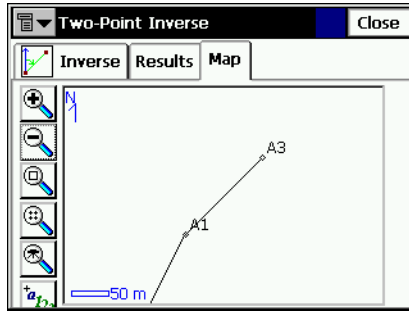


**Figure 7-5. Two-Point Inverse – Map**

For a description of the buttons, see "Toolbar" on page 4-3.

# Inverse Point to Points List

To perform the Inverse Point to Point List task, select **COGO** ▶ **Inverse Pt to Pts List**.

The ***Inverse Point to Point List*** tab calculates the inverse for all the points in the Points list with respect to a known point.
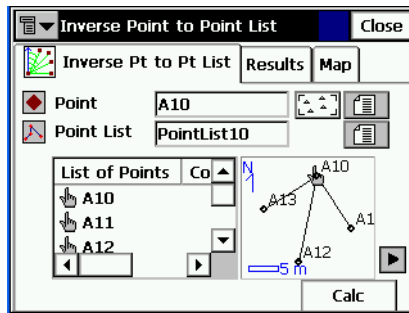


**Figure 7-6. Inverse Point to Point List**

- *Point*: sets the known point name; entered manually or selected from the map or from the list.

- *Point List*: the Point List name. Can be selected from the list of Point Lists or entered manually.

- *List of Points*: the list of currently selected points. For details see "Point Lists" on page 3-14.

- ▶ : closes the plot of the polygon. Only the list of points will be available.

- **Calc**: calculate the inverse and displays the results on the *Results* tab.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Points*: opens the **Points** screen to edit the points (see "Points" on page 3-2).

- *Edit Point Lists*: opens the **List of Point Lists** screen to edit the point lists (see "Point Lists" on page 3-14).

- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

The *Results* tab shows the initial data and the results of the calculation: closest point, azimuth, distance, height, slope and grade.
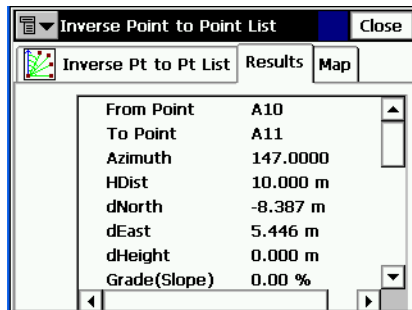


**Figure 7-7. Inverse Point to Point List – Results Tab**

The *Map* tab shows the results graphically.
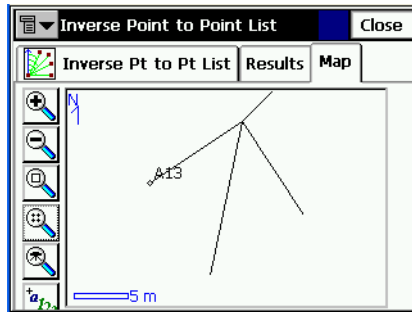


**Figure 7-8. Inverse Point to Point List – Map Tab**

# Intersection

To perform the Intersection task, tap **COGO ▶ Intersection**.

The ***Intersection*** screen computes the intersection point or points when given two known points and either the directions or distances from the known points.
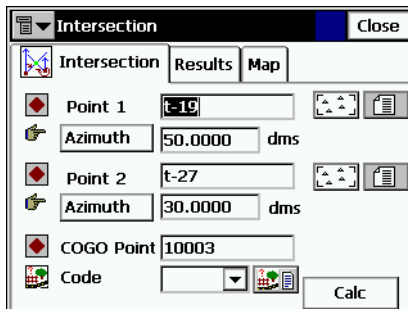


**Figure 7-9. Intersection**

The *Intersection* tab contains initial data for the intersection task.

- *Point 1*: the first point; entered manually, chosen from the map, or chosen from the list.

- **Azimuth/Distance/Az to Pt**: rotates through selections when tapped.
  - **Azimuth**: sets the azimuth from the first point to the unknown point.
  - **Distance**: sets the distance between the first point to the unknown point.
  - **Az to Pt**: sets another known point to which the direction will be calculated and input as azimuth.
- *Point 2*: the second point; entered manually, chosen from the map, or chosen from the list.
- C*OGO Pt*: sets the name and code for the resulting point of the calculation. The code can be selected from the menu or entered manually. Also, the Attributes can be selected through the *Attribute List* bitmap. Note that the Code/String field will remember and display the last user-saved code/string.
- **Calc**: starts calculation process.

TIP

To edit angles, azimuths and distances etc, use the entry fields to add/subtract angle and linear values, applying units as needed.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Points*: opens the **Points** screen to edit the points (see "Points" on page 3-2).
- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

The *Results* tab shows the results of the calculation.
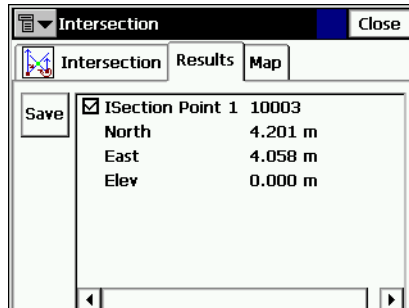


**Figure 7-10. Intersection – Results Tab**

- *North*: the North local coordinate of the corresponding point.

- *East*: the East local coordinate of the corresponding point.

- *Height*: the height of the first corresponding point.

- **Save**: saves the result of the calculation.

The *Map* tab shows the graphic solution of the task. In the example below, there are two solutions for the Intersection calculation.
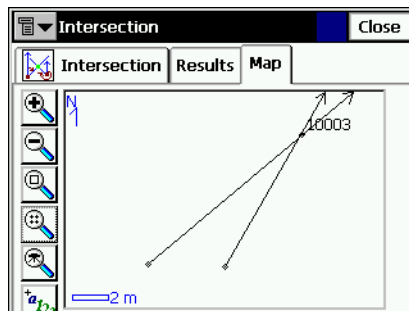


**Figure 7-11. Intersection – Map Tab**

For a detailed description of the Map view, see Chapter 4.

# Inverse Point to Line

To perform the Inverse Point to Line task, select **COGO ▶ Inverse Point to Line**.

The *Inverse Point to Line* screen calculates the station of the known point inverse to the known line.
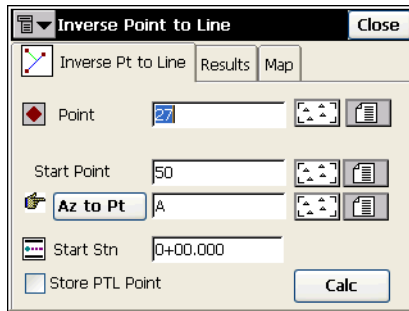


**Figure 7-12. Inverse Point to Line**

- *Point*: sets the current point name. Can be entered manually, or selected 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 will be calculated and input as azimuth.

- *Start Stn*: the starting station of the reference line.

- *Store PTL Point*: store the point as PTL point (see "PTL Mode" on page 5-13).

- **Calc**: calculates the inverse and displays the results on the *Results* tab.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Points*: opens the *Points* screen to edit the points (see "Points" on page 3-2).

• *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.
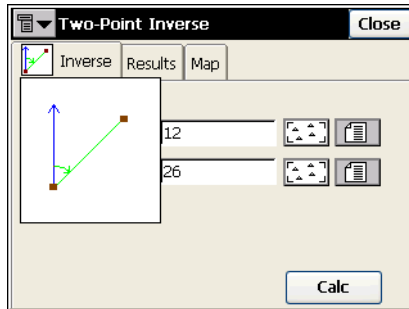
The *Results* tab shows the initial data and the results of the calculation: station, offset and height.
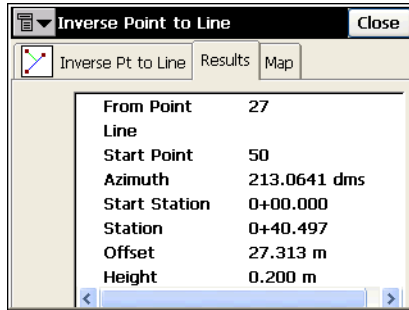


**Figure 7-13. Inverse Point to Line – Results Tab**

The *Map* tab shows the results graphically.
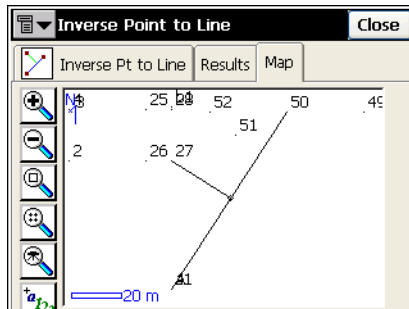


**Figure 7-14. Inverse Point to Line – Map Tab**

# Point in Direction

To perform the Point in Direction task, select **COGO ▶ Point in Direction**.

The ***Point in Direction*** tab calculates the coordinates of a point, using known point, the azimuth, the angle offset from the azimuth line and the distance offsets from the From Point.
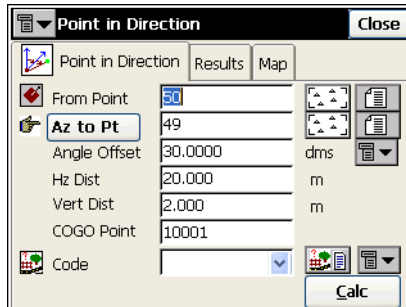


**Figure 7-15. Point in Direction**

- *From Point*: the starting point. Type the name manually or select it 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 will be 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.

- **Calc**: calculates the coordinates and displays the results on the *Results* tab.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Points*: opens the **Points** screen to edit the points (see "Points" on page 3-2).

- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

The *Results* tab shows the initial data and results of the calculation.
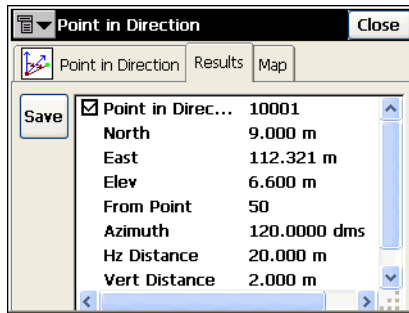


**Figure 7-16. Point & Direction – Results Tab**

- **Save**: saves the results of the calculation.

The *Map* tab shows the results graphically.
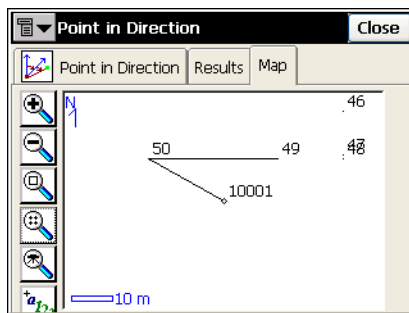


**Figure 7-17. Point & Direction – Map Tab**

# Traverse

This function is used to calculate Traverse, and Sideshot points, based Horizontal, and Vertical Offsets along a direction which is defined by an azimuth, or right, left or deflection angles. To start a Traverse task, select **COGO ▸ Traverse**.

The *Traverse Calc* tab displays the initial data for the traverse task.
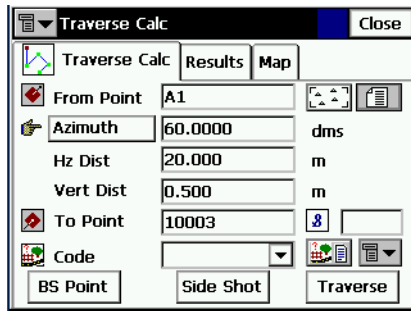


**Figure 7-18. Traverse Calc**

- *From Point*: indicates the occupation (the traverse point), and can be manually entered, or chosen 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
- *Hz 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 7-20 on page 7-15). 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 will be considered as azimuth.
- **SideShot**: if pressed, the coordinates of the To Point will be calculated based on the entered values for Azimuth/Angle Right/Angle Left/Deflection, Horizontal and Vertical distances. The From Point does not change, and To Point is incremented to the next new Point in the database.
- **Traverse**: if pressed, the coordinates of the To Point will be 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 menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Points*: opens the ***Points*** screen to edit the points (see "Points" on page 3-2).
- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

The *Results* tab shows the initial data and results of the calculation.



**Figure 7-19. Traverse Calc – Resuts Tab**

The *Map* tab shows the results graphically.

# BS Point

The *BS Point* screen enters the parameters for the Backsight Point or Backsight Azimuth. Tapping the **BS Point/BS Azimuth** button determines which parameters will display.
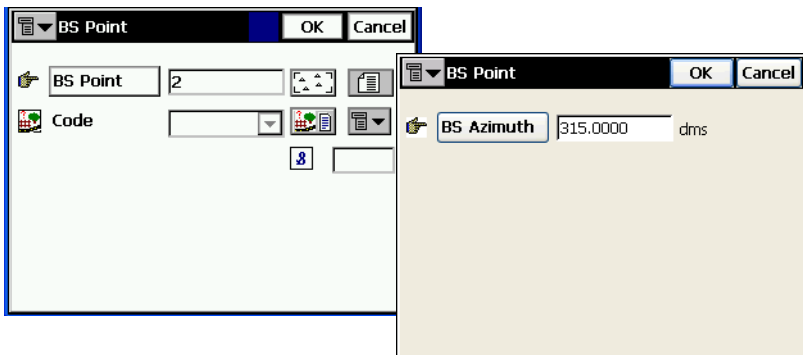


**Figure 7-20. BS Point**

- In **BS Azimuth** mode, the azimuth is set directly.

- In **BS Point** mode, a point can be chosen from the list or map, then the azimuth to this point will be calculated and input as the BS Azimuth.

- The point code is not available for changing.

• Press **OK** to return to the *Traverse Calc* screen.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

• *Edit Points*: opens the *Points* screen to edit the points (see "Points" on page 3-2).

• *Help*: opens the help files.

# Curve Solutions

A Curve is a part of a circle and thus can be described through the center point (also called as Radius Point), the radius value and the starting and ending points on the circle, also called as PC (Point of Curvature) and PT (Point of Tangency). Using these values, the Curve Solutions find other Curve parameters.

## Curve Solution

The Curve Solution COGO task calculates the full set of parameters for any curve, given one of each of the curvature parameter and the length parameter of the curve. To start the Curve Solution task, select **COGO ▶ Curve Solutions ▶ Curve Solution**.

The *Curve Solution* tab screen contains the initial data and a window for the curve plan.
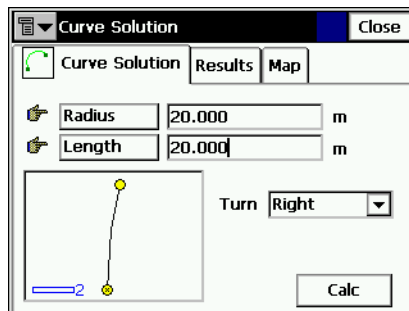


**Figure 7-21. Curve Solution**

• **Radius/Deg Chord/Deg Curve**: the curvature parameter of the curve.

- **Length/Chord/Tangent/Mid Ord**: the length parameter of the curve.

- *Turn*: the direction of turn relative to the starting point.

- **Calc**: press to calculate the parameters of the curve.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the *Help* item to open the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

The *Results* tab shows the calculated parameters.
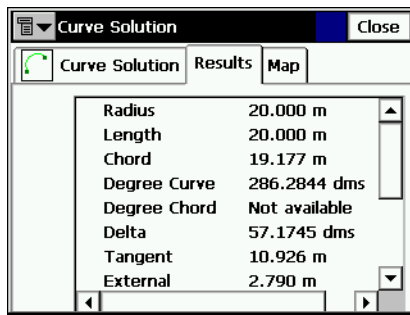


**Figure 7-22. Curve Solution – Results Tab**

The first three parameters displayed are the radius and 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

$$\sin\frac{Delta}{2} = \frac{Chord}{2}/(R)$$

the Length can be calculated as $Length = R \times Delta$ (note that delta is the angle subtended at the center).

The *Degree Curve* defines the angle in degrees which is used to compute the radius of a curve with a length of 100 units:

$$\frac{DegreeCurve \times \pi}{180} = \frac{100}{R}$$

where R is Radius.

The *Degree Chord* defines the angle in degrees which is used to compute the radius of curve whose chord is 100 units long. So

$$\sin \frac{DegreeChord \times \pi}{180} / 2 = \left( \frac{100}{2 \times R} \right)$$

where R is Radius.

- *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:

$$\tan \frac{Delta}{2} = \frac{Tangent}{R}$$

where R is Radius, the Length is $Length = R \times Delta$.

*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:

$$\cos \frac{Delta}{2} = \frac{R - MidOrd}{R}$$

where R is Radius, the Length is $Length = R \times Delta$.

- *External*: the piece of PI-RP section from PI to the curve. If the External is defined, then assuming that:

$$\cos \frac{Delta}{2} = \frac{R + External}{R}$$

where R is Radius, the Length is $Length = R \times Delta$ .

- *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 shows graphically the results of the calculation.
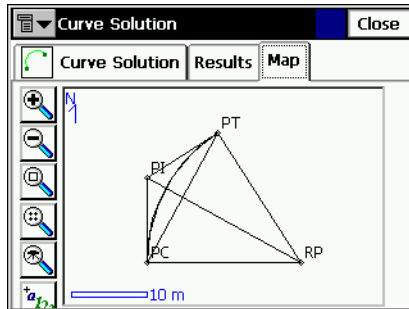


**Figure 7-23. Curve Solution – Map Tab**

# PI & Tangents

The PI & Tangents task computes 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. To start the PI & Tangents task, select **COGO ▸ Curve Solutions ▸ PT & Tangents**.

The *PI & Tangents* tab contains the initial data.
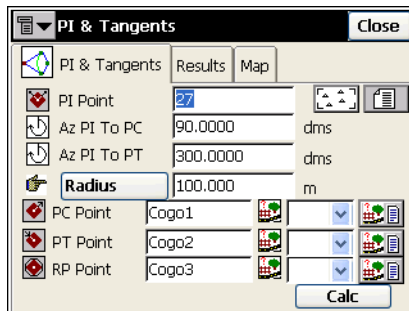


**Figure 7-24. PI & Tangents**

- *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 parameter 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.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Points*: opens the ***Points*** screen to edit the points (see "Points" on page 3-2).

- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.
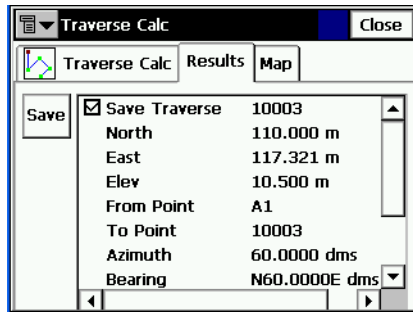
The *Results* tab shows the results of the calculation.



**Figure 7-25. PI & Tangents – Results Tab**

Check the points that are needed to be saved and press the **Save** button.

The *Map* tab shows graphically the results of the calculation.
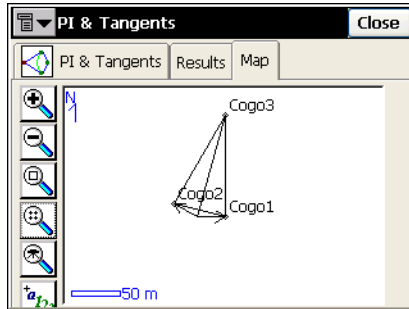


**Figure 7-26. PI & Tangents – Map Tab**

# Three Pt Curve

The *Three Pt Curve* task defines the curve using three points: PC point, any curve point and PT point; or the RP, PC and PT points. To start the Three PT curve task, select **COGO ▶ Curve Solutions ▶ Three Pt Curve**.

The *Three Points Curve* tab displays the initial data.
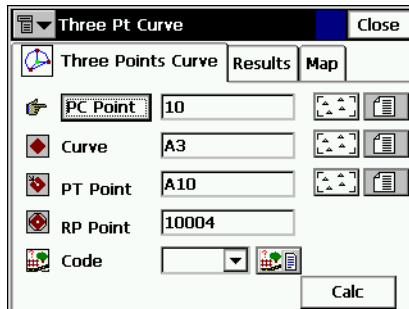


**Figure 7-27. Three Pt Curve**

The screen changes its appearance depending upon the first point chosen. Manually enter, or select from the list or from the map, the following sets of points.

- *PC Point, Curve Point, PT Point* – for this sets of points, the coordinates for the RP Point will be calculated along with curve

parameters. The name and the code for this calculated point can be set.

- *RP Point, PC Point, PT Point* – for this sets of points, the distance between RP Point and PC point should be equal to distance between RP Point and 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). Values of *Small* or *Large* can be selected from the **Curve** drop-down box to indicate which of these two curves should be used for computations.

- **Calc**: press to calculate the curve parameters.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Points*: opens the ***Points*** screen to edit the points (see "Points" on page 3-2).

- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

The *Results* tab displays the results of the calculation.



**Figure 7-28. Three Pt Curve – Results Tab**

For the description of curve parameters, see "Curve Solution" on page 7-16.

- **Save**: press to store the point being found.

The *Map* tab displays the results of the calculation graphically.
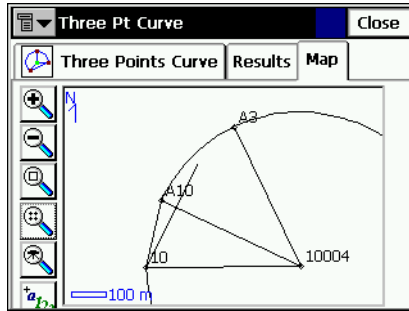


**Figure 7-29. Three Pt Curve – Map Tab**

# Radius & Points

The Radius & Points task defines a curve using the PC and PT points, and a radius parameter. To start the Radius & Points task, select **COGO ▶ Curve Solutions ▶ Radius & Points**.

The *Radius & Point* tab contains the initial data for the task.
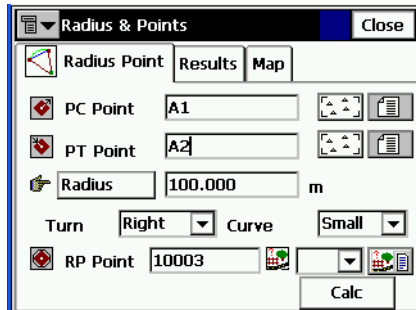


**Figure 7-30. Radius & Points**

- *PC Point*: the Point of Curvature. Can be manually entered, or selected from the map or from the list of points.

- *PT Point*: the Point of Tangency. Can be manually entered, or selected from the map or from the list of points.

- **Radius/Deg Curve/Deg Chord**: the radius parameter of the curve.

- *Turn*: the direction of turn, relative to the PC Point.

- *Curve*: defines the curve in 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. Type the name and select the code, if necessary.

- **Calc**: press to calculate the curve parameters.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Points*: opens the ***Points*** screen to edit the points (see "Points" on page 3-2).

- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

The *Results* tab displays the results of the calculation.



**Figure 7-31. Radius & Points – Results Tab**

For the description of curve parameters, see "Curve Solution" on page 7-16.

- **Save**: press to store the point being found.

The *Map* tab displays the results of the calculation graphically.
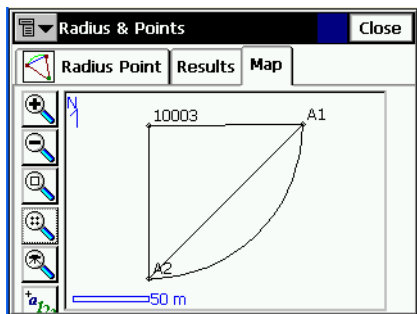


**Figure 7-32. Radius & Points – Map Tab**

# Area

To calculate the area of a polygon, select **COGO ▶ Area**.

The *Area* tab contains the list of points, vertices of the polygon, and the plot of the polygon.
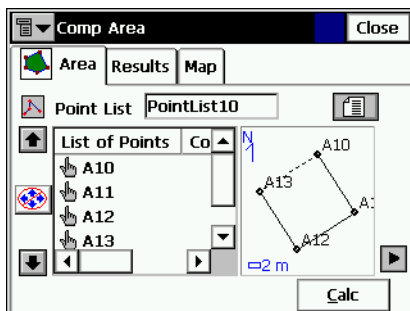


**Figure 7-33. Area**

- *Point List*: the Point List name. Can be selected from the list of Point Lists or entered manually.

- *List of Points*: the list of currently selected vertices of the polygon.

- Up and down arrows move the highlighted point up and down in the order of the points.

*NOTICE*

> *For the correct operation of the application, the sides of the polygon should not cross each other.*

- : switches on/off the keyboard arrow keys that duplicate 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 it on the *Results* tab.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Point Lists*: opens the **List of Point Lists** screen to edit the point lists (see "Point Lists" on page 3-14).

- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

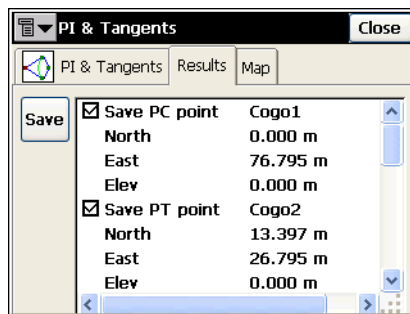The *Results* tab shows the results of the calculation.
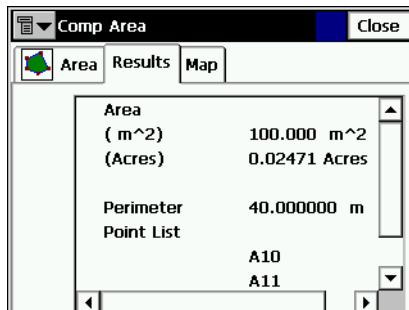
**Figure 7-34. Area – Results Tab**

The *Map* tab shows a view of the polygon.
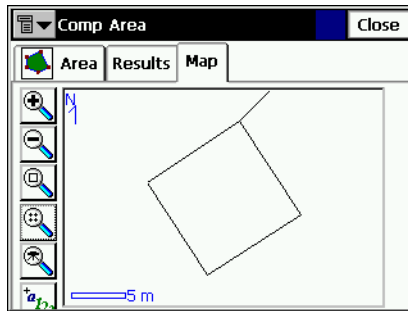


**Figure 7-35. Area – Map Tab**

# Known Area

The Known Area task calculates the coordinate of a point/points that after being added to Point List form a polygon of known area. There are two methods: *Hinge* and *Line*.

## Hinge

The Hinge method calculates the coordinates of a point, that meets the following conditions:

- it is located on a known azimuth taken from the first point of Point List;
- being added to the Point List between the first and the last points, forms a polygon of a known area.

To start the Hinge task, select **COGO ▶ Known Area ▶ Hinge**.

## Known Area - Hinge

The *Area* tab contains the initial data of the Hinge task.
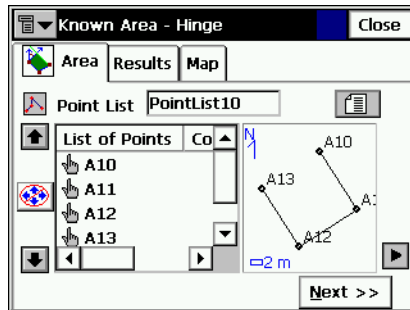


<p align="center">**Figure 7-36. Known Area - Hinge – Area Tab 1**</p>

- *Point List*: the Point List name. Can be selected from the list of Point Lists or entered manually.

- *List of Points*: the list of currently selected vertices of the polygon.

- Up and down arrows move the highlighted point up and down in the order of the points.

NOTICE *NOTICE*

*For the correct operation of the application, the sides of the polygon should not cross each other.*

- ⊕ : switches on/off the keyboard arrow keys that duplicate the arrows on the screen.

- ▶: closes the plot of the polygon. Only the list of points will be available.

- **Next**: opens the second screen under *Area* tab (Figure 7-37 on page 7-29).
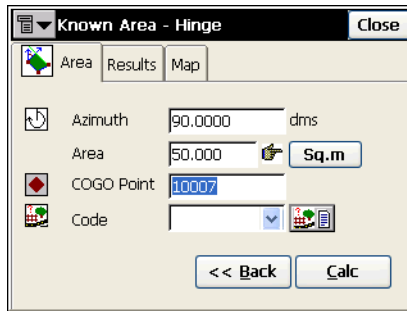
**Figure 7-37. Known Area - Hinge – Area Tab 2**

- *Azimuth*: the known azimuth from the first point in the list, where the hinge point is located.

- *Area*: the known area.

- **Sq. (Job Units)/Acres**: press to set the area units.

- *Cogo Point*: the name of the new point.

- *Code*: select the code from the drop-down menu, or press the

  button to open the list of available attributes.

- Back: returns to the first *Area* tab.

- **Calc**: calculates the coordinates of the hinge point and displays it on the *Results* tab.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Point Lists*: opens the *List of Point Lists* screen to edit the point lists (see "Point Lists" on page 3-14).

- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.
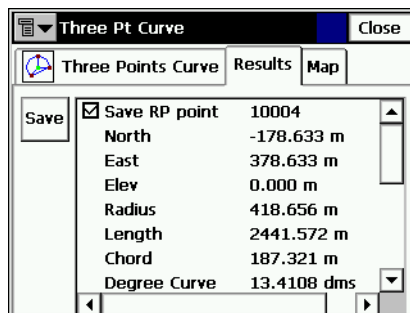
The *Results* tab shows the results of the calculation.
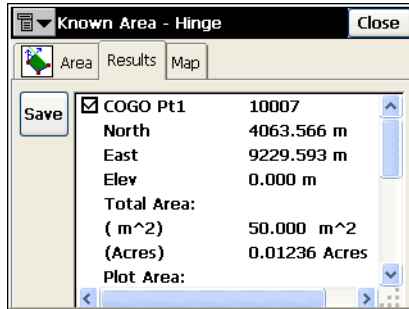


**Figure 7-38. Known Area - Hinge – Results Tab**

The *Map* tab shows the view of the polygon.
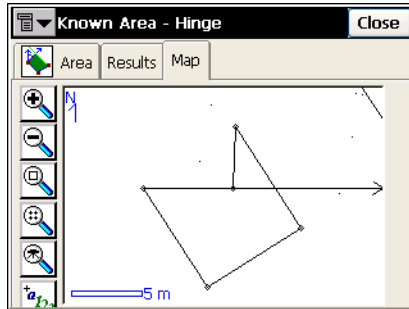


**Figure 7-39. Known Area - Hinge – Map Tab**

# Line

The Line method computes the coordinates of two points that along with two other known points form a quadrilateral of known area.

To start the Line task, select **COGO ▶ Known Area ▶ Line**.

### Known Area - Line

The *Area* tab contains the initial data of the *Line* task.



**Figure 7-40. Known Area - Line – Area Tab**

- *Start Pt, End Pt*: the known starting and the ending points of the quadrilateral.

- *Az1, Az 2*: the azimuths of the lines emanating from the Start and the End points (Line 1 and Line 2), to the calculated points, *COGO Pt 1* and *COGO Pt 2*, respectively.

- *Area*: the known area.

- **Sq. (Job Units)/Acres**: press to set the area units.

- **Azimuth/Parallel**: the azimuth of a line that will intersect Line1 at *COGO Pt 1* and Line2 at *COGO Pt 2* with an area of the quadrilateral equal to the known area. If **Parallel** is set, the line *COGO Pt 1->COGO Pt 2* will be parallel to the line defined by the Start and End Points.

- *COGO Pt1, COGO Pt2*: the names of the points.

- ![icon]: the *Code* field. Select the code from the drop-down menu, or press the ![icon] button to open the list of available attributes.

- **Calc**: calculates the coordinates of the line points and displays it on the *Results* tab.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Points*: opens the ***Points*** screen to edit the points (see "Points" on page 3-2).

- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.
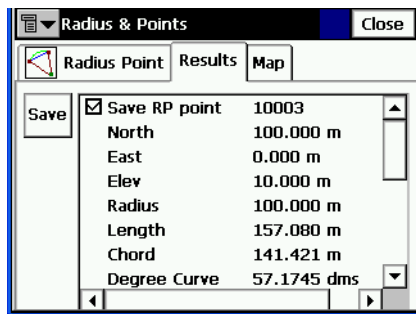
The *Results* tab shows the results of the calculation.
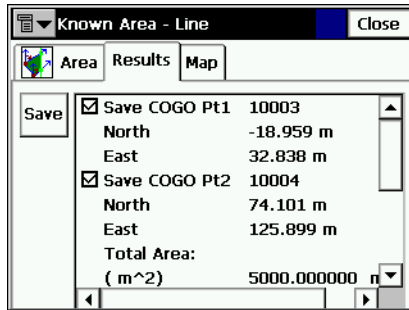


**Figure 7-41. Known Area - Line – Results Tab**

The *Map* tab shows the view of the quadrilateral.
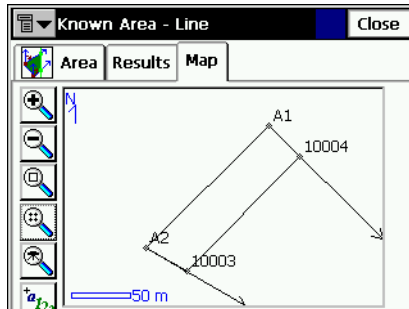


**Figure 7-42. Known Area - Line – Map Tab**

# Transformations

The transformations include the three tasks: *Rotate, Translate* and *Scale*.

The menu bitmap in the upper-left corner of the screens displays a floating menu of the following items:

- *Edit Points*: opens the **Points** screen to edit the points (see "Points" on page 3-2).
- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

## Rotate

To rotate points, tap **COGO ▸ Transformations ▸ Rotate**.

The **Rotate** task rotates the selected points around a specific point.
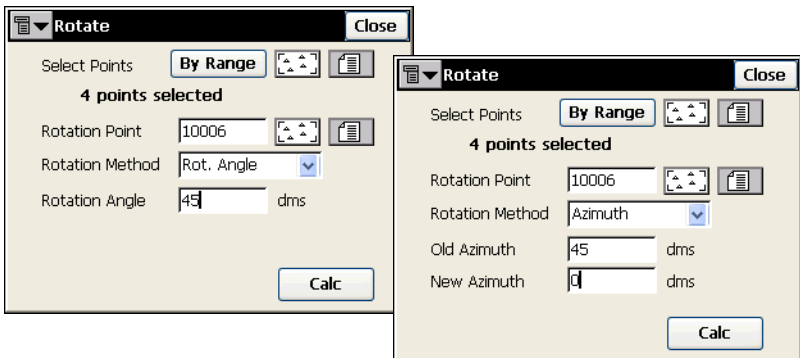
**Figure 7-43. Rotate**

- *Select points*: select points for Rotation from the map or the list, or by setting the point range. The point range can be set in the **Select Points by Range** screen opened by the **By Range** button. For a description of the **Select Points by Range** screen, see "Select Points by Range" on page 7-36.
- *Rotation Point*: sets the center of rotation.

- *Rotation Method*: sets if the rotation angle will be input directly (the Rot. Angle entry), or as a difference between the new and old azimuths/bearings.

- *Rotation Angle*: sets the value of the rotation angle.

- *Old Azimuth*: sets the value of the old azimuth.

- *New Azimuth*: sets the value of the new azimuth.

- **Calc**: press to rotate the selected points.

# Translate

To translate a set of points, tap **COGO ▶ Transformations ▶ Translate**.

The ***Translate*** task moves a group of points.
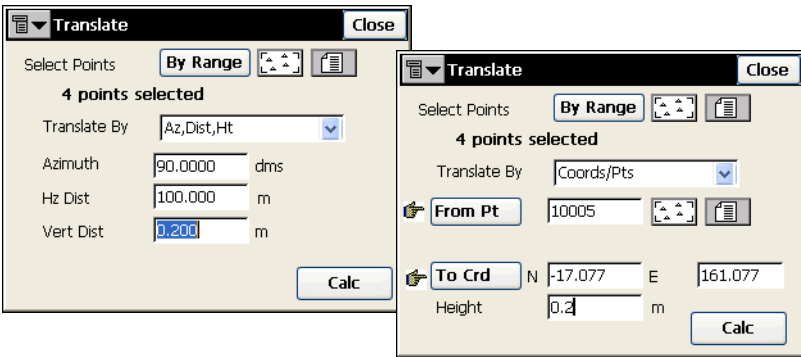


**Figure 7-44. Translate**

- *Select points*: select points for the translation from the map or the list or by setting the point range. The point range can be set in the ***Select Points by Range*** screen, opened by the **By Range** button. Description of the ***Select Points by Range*** screen see "Select Points by Range" on page 7-36.

- *Translate By*: sets the method of translating, either *Coords/Pts* or *Az/Brg, Dist, Ht*.

- *Coords/Pts*: all the selected points will be 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, the local coordinates and the height of the location.

- *Az/Brg, Dist, Ht*: all the selected points will be moved in the specified direction by a specified distance. These parameters are set through the *Azimuth(Bearing)* field, *Hz Dist* and *Vert Dist* fields.

- **Calc**: press to translate the selected points.

# Scale

To scale a set of points, tap **COGO ▸ Transformations ▸ Scale**.

The *Scale* task scales the distances of a range of points relative to a Base Point.
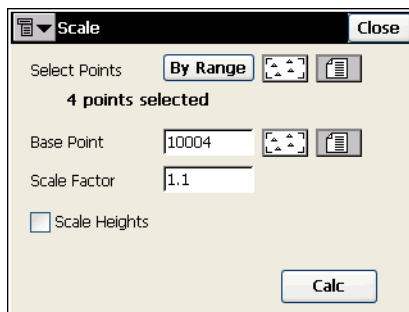


**Figure 7-45. Scale**

- *Select points*: select points for scaling from the map or the list, or by setting the point range. The point range can be set in the *Select Points by Range* screen opened by the **By Range** button. Description of the *Select Points by Range* screen see "Select Points by Range" on page 7-36.

- *Base Point*: sets the reference point for the scale transformation. Can be manually entered or, chosen from the map or from the list.

- *Scale Factor*: the scale factor for the coordinate transformation.

- *Scale Heights*: check this field if the height values should be scaled also.

- **Calc**: press to scale the selected points.

# Select Points by Range

In the ***Range of Points*** field, the range can be set by enumeration of the points separated by commas, or by specifying the first and the last included point in the range. Press the **OK** button to save the specified range. The number of the selected points display on the corresponding task screen under the *Select Points* field.
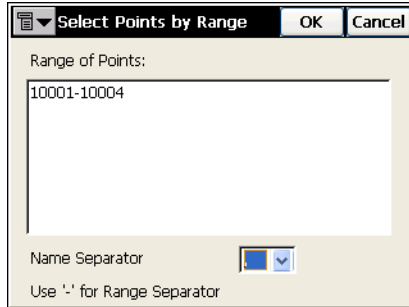


**Figure 7-46. Select Points**

# Help

The Help menu includes the following menu items:

- Contents
- Activate Modules
- About TopSURV
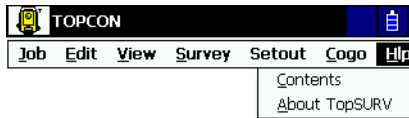


**Figure 8-1. Help Menu**

## Contents

To open the TopSURV Help Contents screen, tap **Help ▶ Contents**.



**Figure 8-2. TopSURV Help Contents**

**All Topics** opens the contents of help for other software embedded in the controller.

# About TopSURV

To view basic information about TopSURV, click **Help ▶ About TopSURV**. The *About TopSURV* screen displays the software name, version, copyright and build date.
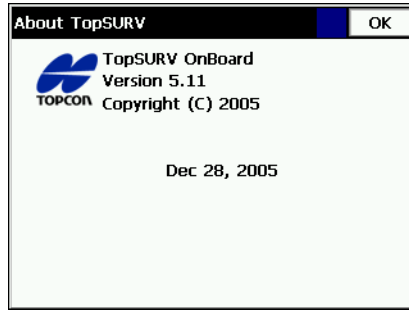


**Figure 8-3. About TopSURV**

# File Formats

The following sections describe the formats used in the import/export of files.

## 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.

### 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 |

# DXF

The AutoCAD® DXF (Drawing eXchange Format) format is the native vector file format of Autodesk's AutoCAD application. Refer to Autodesk's Website for details:

http://usa.autodesk.com/adsk/servlet/item?id=752569&siteID=123112

# 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

# CMM

The ASCII format file that consists of two files with extentions *.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

# 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

# Code Libraries

The following sections describe the code formats used in the import/ export code libraries.

## Topcon Data Dictionary (TDD) Format

Topcon's Data Dictionary Format supports String, Integer, Float and List types for code fields. All exported codes are stored in the one file. Each code definition is placed to a new line as follows:

    CodeName#1(field#1(FIELD_TYPE),...field#N(FIELD_TYPE))

    CodeName#2(field#1(FIELD_TYPE),... field#N(FIELD_TYPE))

Comments:

    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(List(blue,green,red)), text_item(String), int_item(Integer), real_item(Float))

    test_code2(text_item2(String))

# XML Format

The XML Code Library format supports String, Integer, Float and List types as code fields. All exported codes are stored in the one file. The syntax of the XML format is as follows:

**Example**:

```
<?xml version="1.0" ?>
<!DOCTYPE DATADICTIONARY
[
<!ELEMENT DATADICTIONARY (ATTRIBUTE)>
<!ELEMENT ATTRIBUTE (ATTNAME, FIELD) >
<!ELEMENT ATTNAME (#PCDATA)>
<!ELEMENT FIELD (NAME, TYPE) >
<!ELEMENT NAME (#PCDATA)>
<!ELEMENT TYPE (List | String | Integer | Float) >
<!ELEMENT List (VALUE)>
<!ELEMENT VALUE (#PCDATA)>
<!ELEMENT String (#PCDATA)>
<!ELEMENT Integer (#PCDATA)>
<!ELEMENT Float (#PCDATA)>
]>
<DATADICTIONARY>
<ATTRIBUTE>
<ATTNAME>test_code</ATTNAME>
    <FIELD>
        <NAME>menu_item</NAME>
        <TYPE>List
            <VALUE>blue</VALUE>
            <VALUE>green</VALUE>
            <VALUE>red</VALUE>
        </TYPE>
    </FIELD>
    <FIELD>
        <NAME>text_item</NAME>
```

```
        <TYPE>String</TYPE>
    </FIELD>
    <FIELD>
        <NAME>int_item</NAME>
        <TYPE>Integer</TYPE>
    </FIELD>
    <FIELD>
        <NAME>real_item</NAME>
        <TYPE>Real</TYPE>
    </FIELD>
</ATTRIBUTE>

<ATTRIBUTE>
<ATTNAME>test_code2</ATTNAME>
    <FIELD>
        <NAME>text_item2</NAME>
        <TYPE>String</TYPE>
        </FIELD>
</ATTRIBUTE>

</DATADICTIONARY>
```

# Data Base Format (DBF)

This format is ArcInfo's DBF format for code libraries supporting String, Integer, Float types as fields of the codes. The List type is unsupported. All exported codes are stored separate files.

# 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 start 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 Curv

| | |
|---|---|
| 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

TopSURV road format consists of three files:

1. *.thl: contains horizontal elements of the road and must start 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]]

                    (A1, A2 : clothoid length)

   **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. *.tvl: contains vertical elements of the road (vertical curves) and require 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:

    The format is:

    Chainage, Template name, Turn (Left or Right), Cut, Fill, Segment name, Horizontal Offset, Vertical Offset

# 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,%.3f,%.3f

Number of segments       %d

Slope cut            %.3f

Slope fill           %.3f

TS  : Template Segment    format: TS,%.3f,%.3f,%c,%s

Segment length      %.3f

Vertical dist or      %.3f

  Slope %

Vertical flag          %c    (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 | 145.3520,271.1510,5.275 |
| 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

# 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

Refer to the GTS-600 Series, GTS-700 Series, GTS-800 Series, GMT-100 Series Reference Manual for details.

# 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

# 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)

  ----------------------------------------------------------------------------------------

  BKB1pppppppppppp 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

  BKB2pppppppppppp 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-

  BKB3pppppppppppp 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

  BKB4pppppppppppp 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

# Notes

# IMAGING TOTAL STATION

# GPT-7000i

TopSURV OnBoard 0601(1A)