



Reference Manual

TopSURV OnBoard

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Preface

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



Please read these Terms and Conditions carefully.

Terms and Conditions

PROFESSIONAL USE – Topcon Products are designed to be used by a professional. The user is required to be a professional surveyor or have a good knowledge of surveying, in order to understand the user and safety instructions before operating, inspecting or adjusting. Always wear required safety attire (safety shoes, hard hat, etc.) when operating the Products.

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Manual Conventions

This manual uses the following conventions:

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



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



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

Introduction

TopSURV is Topcon's survey software available for Survey instruments. When installed on Survey instruments that runs the Windows® CE operating system, such as Topcon's GPT-7000, GPT-7000i, GPT-9000, GPT-7500 and Imaging Station for IS , TopSURV is used for:

- field data collection
- Setout and control work
- data conversions
- advanced COGO

Security



GTS-900A,GPT-9000A user only

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

- *Key Value* – the identification number of the device; record to give to a Topcon representative.

- *Activation IDs* – the fields in which to enter the security codes received from a Topcon representative to activate TopSURV On Board.



Figure 1-1. Security

The **Security** screen will also display if an inactive module is run in TopSURV. Inactive modules can run in Demo mode (see “Demo Mode” on page 1-4).

To view existing codes or add a new code, tap **Help ▶ Activate Modules**. The **Security** screen displays all codes that have been entered.

Open Job

Initially, TopSURV opens only a Default job created upon program installation (Figure 1-2). On the **Open Job** screen do the following:

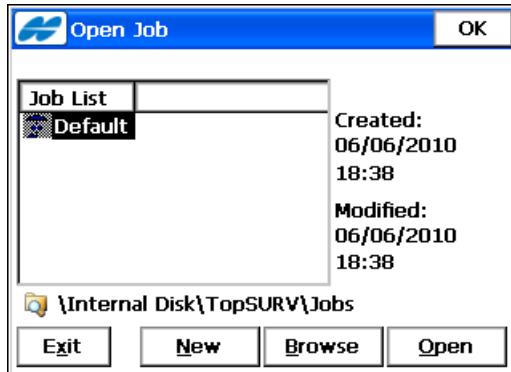


Figure 1-2. Open Job

- **Open** – press to create the Default (current) job and returns to the main screen.
- **New** – press to create a new job.
- **Exit** – press to quit the program.
- **Browse** – press to display browse directories to open a job from a remote directory. Highlight the file and press **OK** (Figure 1-3).

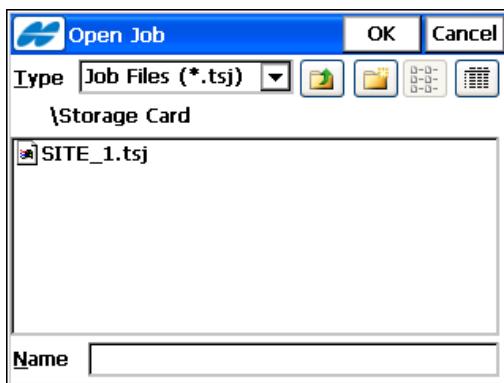


Figure 1-3. Open a New Job

Demo Mode

Upon initial startup, a Demo version of TopSURV is accessible after tapping either OK or Cancel on the **Security** screen.

To run the demo version, tap **OK** on both the **Security** screen and the warning message that displays (Figure 1-4).

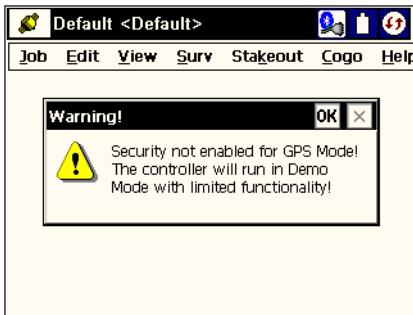


Figure 1-4. Access to Demo

A full-featured demo version of TopSURV will be available with operational data limited. This demo version can store up to 25 surveyed points and roads of 100 meters length.



NOTICE

Data corruption can occur during data collection if the controller is low on power. If a warning about low power level displays, save and close the current job.

Main Screen

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



Figure 1-5. TopSURV Main Screen



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

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

Table 1-1. Title Bar Icons

Icon	Description
	Topcon Logo Help Icon – opens a pop-up menu giving access to the help files and some options specific to the current open screen

Within a menu option, the title bar displays the Help Icon, the name of the open screen, and any system buttons (e.g., **OK**, **Cancel**, **Finish**) required for various operations (Figure 1-3 on page 1-3).

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

Table 1-2. Main Menu Icons

Icon	Description
	Job – opens a submenu to create, open, delete a job or get information about an active job. For details on the options, see “Working with a Job” on page 2-1.
	Configure – opens a submenu to create or change a configuration for a job. For details on the options, see “Configuring a Job” on page 3-1. The icon changes its appearance and reflects the instrument set for use in the current job.
	Export – opens a submenu to export job data to a new job, controller or a file. For details on the options, see “Exporting Data” on page 4-1.
	Import – opens a submenu to import data from a job, controller or a file. For details on the options, see “Importing Data” on page 5-1.
	Edit Job – opens a submenu to edit the job data. For details on the options, see “Editing Job Data” on page 6-1.
	Edit Roads – opens a submenu to edit roads. For details on the options, see “Editing Roads” on page 7-1.
	Setup – is used to set up backsight and occupation points to start a Total Station survey. For details on the options, see “Setting up TS Survey” on page 8-1.
	Survey – opens a submenu to conduct a survey. For details on the options, see “Total Station Survey” on page 9-1.
	Stake – opens a submenu to stake out objects. For details on the options, see “Staking out” on page 10-1.
	COGO – opens a submenu to calculate cogo tasks. For details on the options, see “COGO Calculations” on page 11-1.

Table 1-2. Main Menu Icons (Continued)

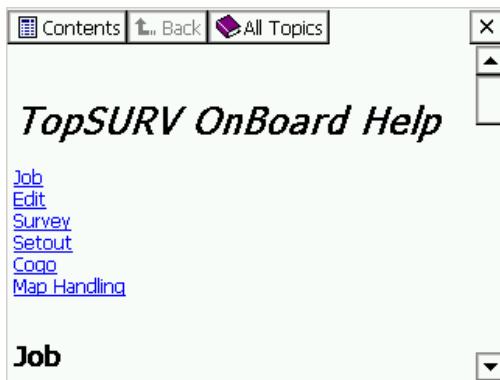
Icon	Description
 Map	Map – opens the map for the current job. For details on the options, see “Viewing Map” on page 12-1.

Help Icon’s Pop-up Menu

The Help Icon opens a pop-up menu giving access to the help files, menu interface selection, keyboard activation and information about TopSURV.

Help

The *Help* option opens the *TopSURV Help* topics screen (Figure 1-6).

**Figure 1-6. Help Topics**

Switch Menus

TopSURV has two implementations of menu interface: the Icon Menu and the List Menu. Use the *Switch Menus* option to toggle between the Icon and List Menu interfaces. TopSURV defaults to the Icon Menu interface (Figure 1-7 on page 1-8).

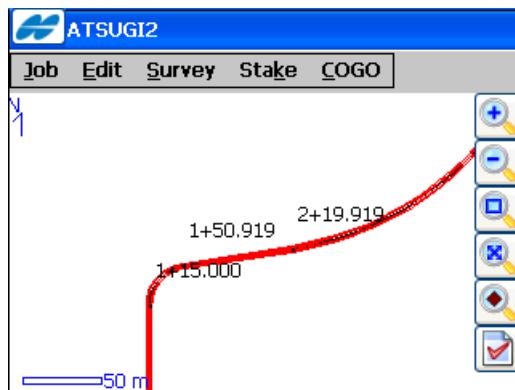


Figure 1-7. List Menu

Keyboard

When *Keyboard* is checked in the pop-up menu, place the cursor in the field to open the keyboard on-screen (Figure 1-8).

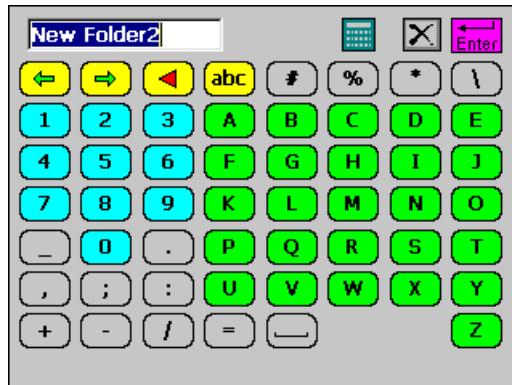


Figure 1-8. Keyboard

About

To view basic information about TopSURV, tap the *About* option. The ***About TopSURV*** screen (Figure 1-9) displays the software name, version and copyright.



Figure 1-9. About TopSURV

Working with a Job

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

The **Job** folder contains the following options:

1. New (create) a job
2. Open a job
3. Delete a job
4. Job Information (Print information from an active job)

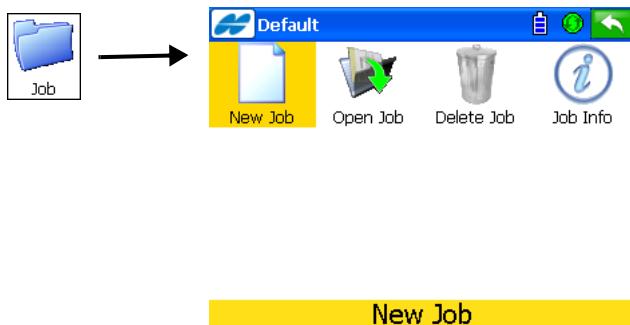


Figure 2-1. Job Menu



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

The *Help* Icon opens a pop-up menu, giving access to the help files, menu interface selection, keyboard activation and information about TopSURV. (for detail see “Help Icon’s Pop-up Menu” on page 1-7).

Creating a New Job

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

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

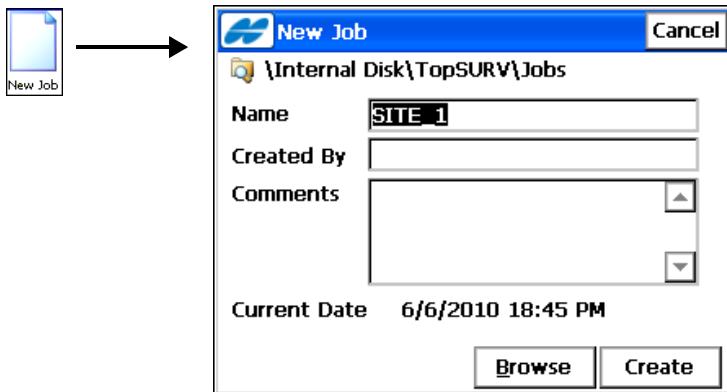


Figure 2-2. New Job

- *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. By default, job files are stored in the Jobs folder in the directory where the application was installed. The path to the job file displays in the upper-part of the screen. The last specified file path is retained.
- **Create** – saves the information and returns to the main screen. The new job becomes the current job and uses the settings from the previously open job, unless changed.

A l a r m s

The *Alarms* screen sets sound alerts for situations of low memory.



Figure 2-3. Alarms

- **Audible Alarm** – check mark this box to automatically sound an alert when an alert situation occurs.
- **OK** – saves the settings and returns to the main screen.
- **Cancel** – closes the screen without saving the settings.

Opening a Job

To open a job, tap the **Open Job** icon. The **Open Job** screen (Figure 2-4) displays. Select a job from the list.

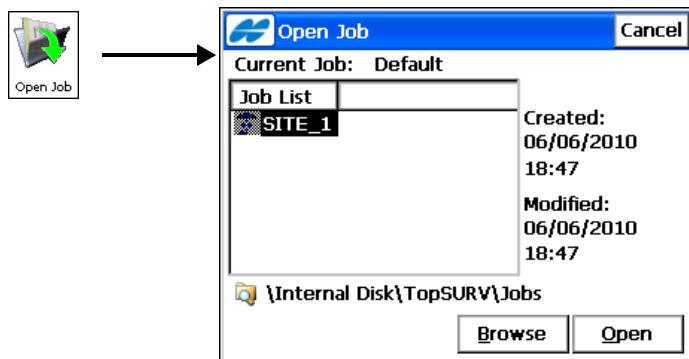


Figure 2-4. Open Job

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

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

The path below the Job List shows the directory where the selected job is located (Figure 2-5 on page 2-5).

- **Open** – opens a new job and returns to the main screen.
- **Browse** – displays the screen to browse directories to select a job to open. Use the standard navigation buttons to move up or down to the directory where the desired file resides. Highlight the file and press **OK**.

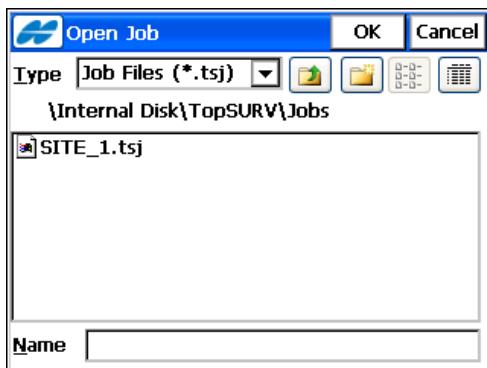


Figure 2-5. Browse Jobs

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

Deleting a Job

To delete a job, tap the **Delete Job** icon. Once deleted from the Job List, the file is deleted (Figure 2-6 on page 2-6).

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

- The path under the Job List displays the directory where the selected job was created.
- **Browse** – if a job is not listed in the job list, browse through the directories to select the job you want to delete.
- **Delete** – deletes the job.
- **Close** – closes the screen.

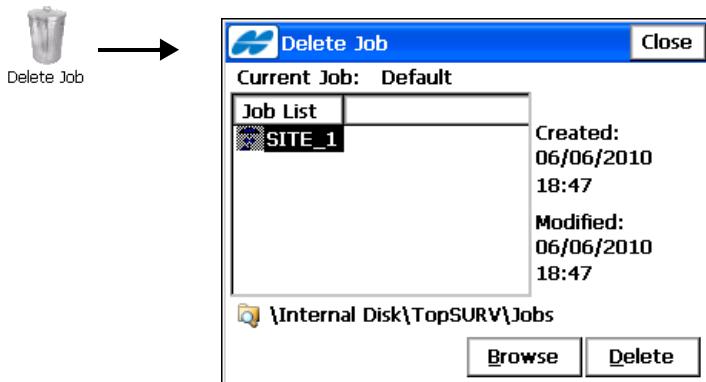


Figure 2-6. Delete Job



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

Viewing Job Information

To view job information, tap the **Job Info** icon. The **Job Info** screen contains information about the current job (Figure 2-7).

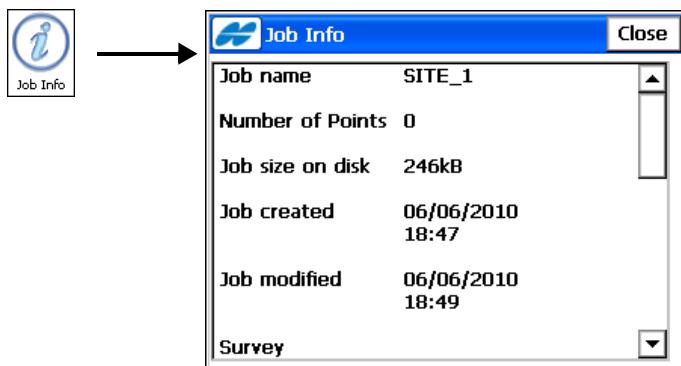


Figure 2-7. Job Information

- *Job name* – the name of the job.
- *Created by* – the name or some other identifier of the surveyor.
- *Comment* - comments input upon job creation.
- *Number of Points* – the amount of points stored in the job.
- *Points* – the names of the first point and the last point from the list of the points ordered by name.
- *Job size on disk* – the space that the job takes up on the disk.
- *Job created* – the time and date of job creation.
- *Job modified* – the time and date of job modification.
- *Coordinate Systems, Datum, Geoid Model* – the coordinate system, datum, and geoid model defined for the job.
- *Display Settings* – the customized interface settings for the job.

Configuring a Job

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

1. Create or edit a survey configuration.
2. Set a coordinate system for a job.
3. Log job history to a file, and set global parameters.
4. Set backup options.
5. Customize the interface to display data in a job.
6. Set alarm parameters.
7. Show/hide functions in the menus.
8. Set import options for creating new jobs.
9. Set code global parameters.

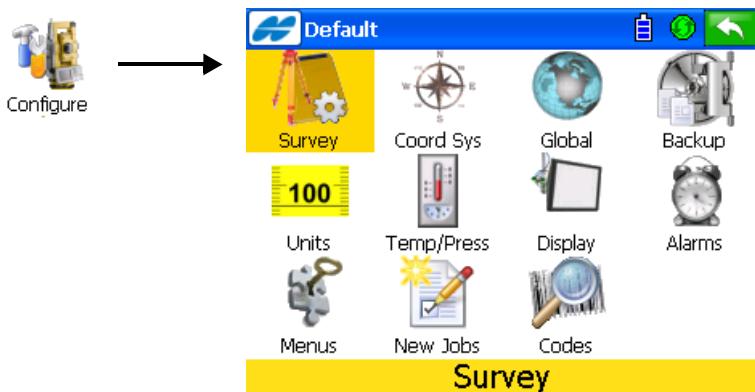


Figure 3-1. Configure Menu

The **Help** Icon

 opens a pop-up menu giving access to the help files, menu interface selection, keyboard activation and information

about TopSURV. (for details see “Help Icon’s Pop-up Menu” on page 1-7).

Configuring the Survey

To configure a survey, tap the **Survey** icon . The ***Config: Survey Params*** screen displays (Figure 3-2).

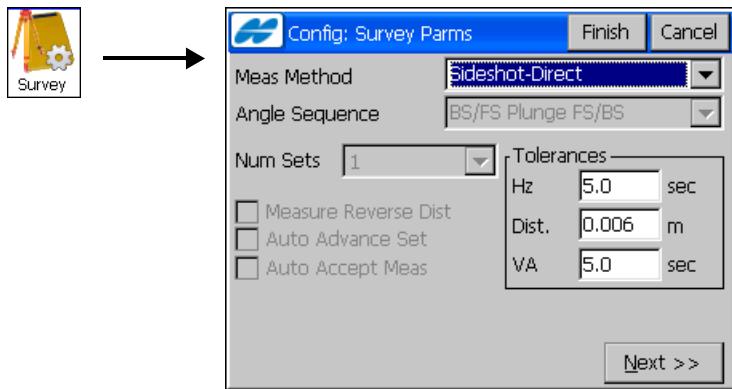


Figure 3-2. Survey Parameters: First Screen

- **Meas Method** – sets the mode of side-shot measurements; either *Sideshot-Direct*, *Sideshot Direct/Reverse*, or *Angle/Dist Sets-Dir/Rev*. See “Topo” on page 9-2 for a description of these methods.
- **Angle Sequence** – sets the sequence of measured angles. (Available in the *Angle/Dist Sets-Dir/Rev* mode.) Here, *BS* is backsight point (the previous occupation point), *FS* is foresight point (the next occupation point), and *Plunge* stands for flipping and rotating the total station telescope by 180 degrees. These are used for the reduction of the angle errors. Possible sequences are *BS/FS Plunge BS/FS*; *BS/FS Plunge FS/BS*; *FS/BS Plunge BS/FS*; *FS/BS Plunge FS/BS*; *BS Plunge BS/FS Plunge FS*; and *FS Plunge FS/BS Plunge BS*.
- **Num Sets** – the number of measurement sets participating in the average. Here, the Num Sets defaults to 1 and cannot be changed if *Sideshot-Direct* or *Sideshot Direct/Reverse* is selected in the

Meas Method field. Selecting *Angle/Dist Sets-Dir/Rev* in the *Meas Method* field allows NumSets to be greater than 1.

- *Tolerances* – the admissible deviation values of the horizontal and zenith angles and the distance.
- *Auto Advance Set* – sets the Automatic Repetition of the measurements to active mode, the survey automatically advances to the next set. Enabled only for the 9000Series surveys and only if a *Meas Method* of Angle/Dist Sets-Dir/Rev is selected.
- *Auto Accept Meas* – activates the review of automatic repetition needed to accept each measurement. Enabled only for the 9000Series and only when a *Meas Method* of Angle/Dist Sets-Dir/Rev is selected.
- *Measure Reverse Dist* – reverse distance measurements (if enabled). These are used for the reduction of the distance measurement errors.
- **Next** – opens the second (additional) **Survey Parameters** screen (Figure 3-3 on page 3-5).
- **Finish** – saves the changes and returns to the **Config: Survey Params** screen.
- The *Help* Icon in the upper-left corner of the screen opens the pop-up menu that contains the following two items:
 - *Point Properties*: opens the **Point Properties** screen to define the point increment value for Survey points.
 - *Help*: accesses the Help files.

The second (additional) **Survey Parameters** screen contains the following survey parameters (Figure 3-3 on page 3-5).

- *Meas Type* – sets the order and the type of the measurements in one set. There are five types:

– <i>HA</i> : horizontal angle	– <i>HD</i> : horizontal distance
– <i>VA</i> : vertical angle	– <i>VD</i> : vertical distance
– <i>SD</i> : slope distance	

- **Backsight/Foresight P.C. (Prism Constant)** – select a backsight and foresight prism from the drop-down list. Prism Constant is the parameter of the prism, characterizing the difference between the reflection plane and the center of the prism.
- **List [...] Button** – opens the **Edit Prisms** screen to add a new prism or change a prism existing in the list (Figure 3-4 on page 3-6).
- **Guide Light** – check and enable to operate the tracking lights.
Prism/360 Prism/Sheet/Non-Prism: select the appropriate prism mode, either Prism or Non-Prism.
- **AutoTopo** (only for the 9000Series) – the parameters of the automatic survey.
 - *Method:* select a method for taking auto measurements; either by *time*, or by *horizontal* or *slope distance*.
 - *Interval:* enter the interval for taking auto measurements.
- **Back** – returns to the previous screen.
- **Next** – opens the **Config: Stake Params** screen.
- **Finish** – saves the changes and returns to the **Config: Survey Params** screen. Settings are transmitted only when the configuration is used.

- **Cancel** – close the screen without saving the settings.

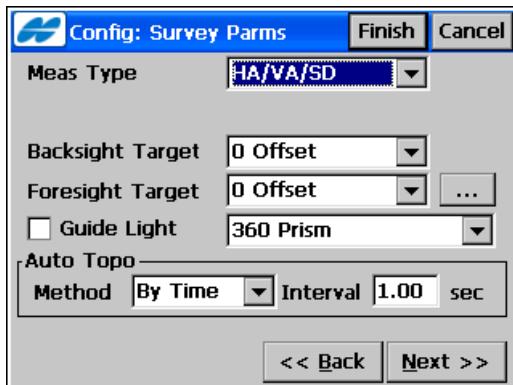


Figure 3-3. Survey Parameters – Second Screen

Edit Prisms

The **Edit Prisms** screen (Figure 3-4) allows the user to change the prism constant selected in the list.

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

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



Figure 3-4. Edit Prisms

Stakeout Parameters

The **Stake Params** screen sets the default stakeout parameters. These parameters can be changed using the **Settings** button from any **Stakeout** screen (Figure 3-5 on page 3-7).

- *H_Z Dist Tolerance* – enter a time to set for when the graph switches to a bull's eye in Stakeout.
- *Reference Direction* – sets the direction assumed to be the referenced direction during the stakeout. Select **Instrument Reference** only.
- *Turn TS to Design Pt* (only for the 9000Series) – controls the way the total station turns toward the design point.
- *Search After Turn* (only for the 9000Series) – causes the instrument to search for the prism after turning to the design point (when enabled).
- **Back** – returns to the previous screen.
- **Next** – opens another **Stake Params** screen (Figure 3-6 on page 3-7).

- **Finish** – saves the changes and returns to the *Config: Survey Params* screen. Settings are transmitted only when the configuration is used.
- **Cancel** – closes the screen without saving the settings.



Figure 3-5. Stake Params - First Screen

The second (additional) *Stake Params* screen (Figure 3-6 on page 3-7) sets parameters to save staked points.

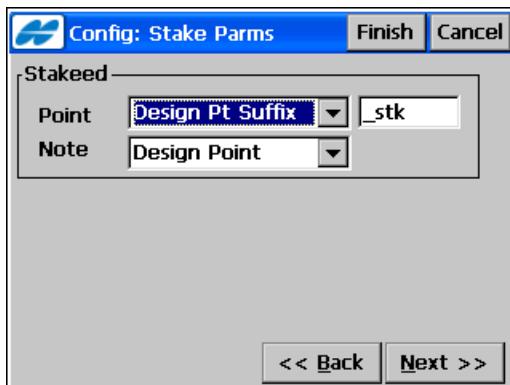


Figure 3-6. Stake Params - Second Screen

- *Staked* – sets the rules for naming staked points.

- *Point*: sets the rule for defining names for the staked-out points; either *design point name*, *next point name*, *Design Pt Suffix*, *Design Pt Prefix* (that is, *stk_01*, where “*stk_*” is the prefix), 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*.
- **Back** – returns to the previous screen.
 - **Next** – opens the **Miscellaneous** screen (Figure 3-7 on page 3-9).

Miscellaneous

The **Miscellaneous** screen is used to customize the user interface (Figure 3-7 on page 3-9):

- Display coordinates after measurements – if enabled, the **Store Point** screen automatically displays computed coordinates after a measurement is performed and the point information before the point coordinates are stored into the database.
- *Prompt for Target Height* – if enabled, prompts you for a height of a target before a point is stored.
- *Prompt for BS Check* – if enabled, prompts to check the backsight.
- *Stakeout Sound* – if enabled, makes a sound each time a point is staked-out.
- *Beep on Storing Points* – if enabled, beeps each time a point is stored.
- *VA Zero at Level* – if enabled, vertical angle measurements are oriented to be zero at the Horizontal (“Level”) direction. If this option is disabled, vertical angle measurements are oriented to be zero at the vertical (“Zenith”) direction (default). Only certain Total Stations allow TopSURV to set this value. For this reason, ensure that this option is set to the same value in the total station as that set in TopSURV.

- *Use Horizontal Angle Left* – if enabled, the horizontal angle measurements are shown in a counter-clockwise (“Left”) direction. If this option is disabled, the horizontal angle measurements are shown in a clockwise (“Right”) direction (default). TopSURV automatically sets the Total Station to “*HR*” or “*HL*” depending on the selection.
- *ENT Key needs to record data* – if enabled, the measurement data to be recorded by pressing ENT Key
- *Automatically display BS Setup screen* – if enabled, the **Backsight Setup** screen displays automatically when attempting to access any of the screens involving total station observations (see *Prompt for Feature Codes*).
- *Hold Offset Measurement* – if enabled, the screen to measure an offset point with the help of the selected offset tool displays automatically after each measurement (see *Prompt for Target Height*).
- *BS Is Always Required* – if enabled, a warning to set the Backsight to always display when attempting to access any of the screens involving total station observations.
- **Back** – returns to the previous screen.
- **Finish** – saves the changes and returns to the **Config: Survey Params** screen (Figure 3-2 on page 3-2). Settings are transmitted only when the configuration is used.
- **Cancel** – closes the screen without saving the settings.

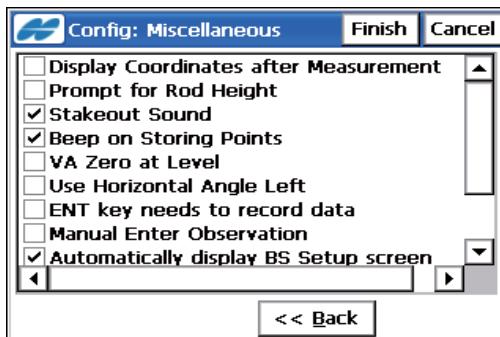


Figure 3-7. Miscellaneous

Setting Coordinate System Parameters

To set coordinate system parameters for the job, tap the *Coord System* icon. The ***Coord System*** screen displays coordinate system information for the job (Figure 3-8 on page 3-12).

- *Projection* – specifies the projection used. The **List** [...] button opens the ***Projections*** screen (see Figure 3-9 on page 3-13) where active projections can be manipulated (added from a list of pre-defined projections, deleted).
- *Use Grid to Ground* – when a grid projection is selected, this box is available. If enabled, the **List** [...] button is activated to open the ***Grid to/from Ground Params*** screen where transformation parameters are set to place grid coordinates to a near ground reference surface and vice versa.
- *Datum* – shows the datum for the selected projection. The drop-down list of datums is available only when the current grid projection allows appropriate datum selection. The **List** [...] button opens the ***Custom Datums*** screen to add/edit user-defined datums.

The NAD83 datum has three independent realizations in TopSURV with respect to the WGS84 datum: *NAD83*, *NAD83(ITRF96)* and *NAD83_NO_TRANS* to reflect the updates to these datums.

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

The confusion arises when we start to talk about the realization of the WGS 84 and NAD 83 datums. When NAD 83 was first realized in 1986, it used the same control stations as WGS 84,

some of which were Doppler stations, which were accurate to about one meter. Consider the datums to be identical.

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

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

To be compatible with other manufacturers, TopSURV provides transformation parameters from WGS 84 to NAD 83 where all the parameters are zero. This means WGS 84 equals NAD 83. This set of datum transformation parameters is called NAD 83 No_Trans.

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

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

- **Geoid Model** – shows the geoid selected (if any). The **List**  button opens the **Geoids List** screen where geoids can be added, deleted, or their properties viewed. See “Geoid List” on page 3-23 for more information.
- **OK** – saves the settings and returns to the main screen.
- **Cancel** – returns to the main screen without saving changes.

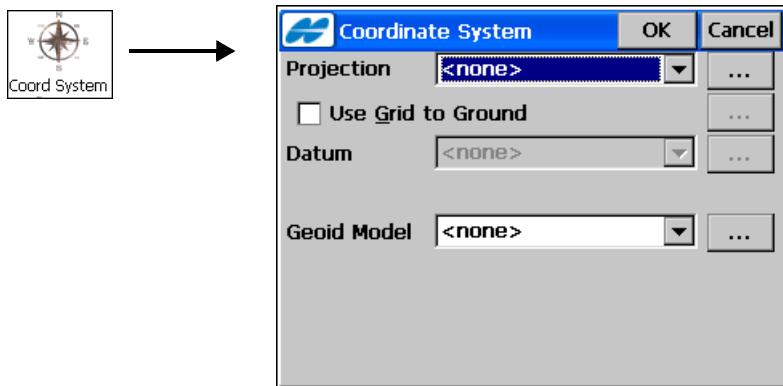


Figure 3-8. Coordinate System

Projections

The **Projections** screen contains a list of cataloged projections to select for the job (Figure 3-9 on page 3-13).

- **Pre-Defined** – contains a tree of available projections divided by regions.
- **Custom** – opens the **Custom Projections** screen to add/edit user-defined projections (Figure 3-10 on page 3-13).
- **Active** – contains a list of selected projections (corresponds to the drop-down list in the *Projections* field of the **Coordinate System** screen). The first time the screen is opened, it is empty (Figure 3-9 on page 3-13).
- – selects the chosen projection in the *Pre-Defined* panel and inserts it into the *Active* panel.
- – deletes the highlighted projection from the *Active* panel.
- **OK** – saves the changes and returns to the **Coord System** screen (Figure 3-8).
- **Cancel** – closes the screen without saving the settings.



Figure 3-9. Projections

Custom Projections

The **Custom Projections** screen (Figure 3-10) contains a list of custom projections (grid systems). Initially, this list is empty.

- **Delete** – press to delete the selected custom grid systems.
- **Edit** – opens the **Custom Projection** screen (Figure 3-11 on page 3-14) to edit parameters of the selected custom grid system.
- **Add** – opens the **Custom Projection** screen (Figure 3-11 on page 3-14) to enter parameters for the new custom grid system.

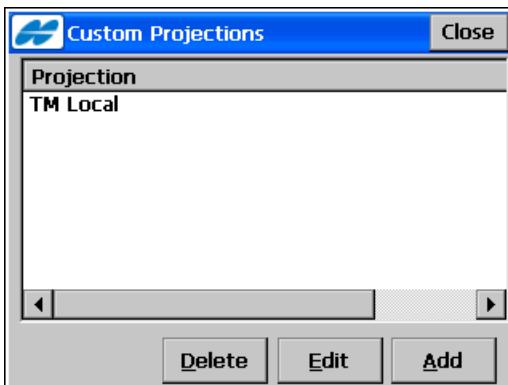


Figure 3-10. Custom Projections – Add New Custom Grid System

On the **Custom Projection** screen, enter or select the following parameters for the custom grid (Figure 3-11).

- **Name** – enter the name of the new projection.
- **Type** – select a sample projection to construct a custom projection from the following list of available types:
 - *Albers Equal Area* (orthembadic): conic projection.
 - *Cassini-Soldner*: cylindrical projection.
 - *Double Stereographic*: conformal azimuthal projection.
 - *Lambert*: conformal conic projection.
 - *Oblique Mercator*: conformal cylindrical projection.
 - *Stereographic*: conformal azimuthal projection.
 - *Transverse Mercator*: conformal cylindrical projection (see Figure 3-12 on page 3-15 for more information).

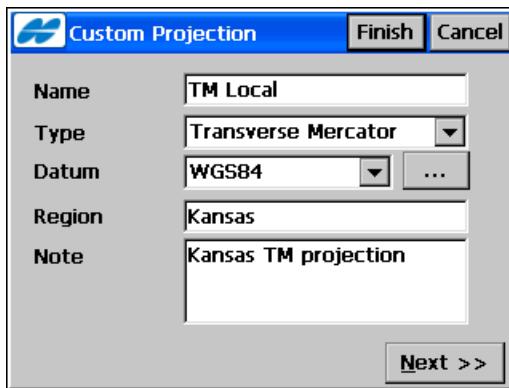


Figure 3-11. Custom Projection – Add New Custom Grid System

- **Datum** – select the datum for the projection from the list of available types.
- **Region** – displays the region.
- **Note** – enter any additional information about the projection, if preferred.

- **Next** – opens another **Custom Projection** screen to enter the new projection specifications depending on the selected sample projection.
- **Finish** – saves the changes, closes the screen, and returns to the **Custom Projections** screen.
- **Cancel** – closes the screen without saving the settings.

If the **Transverse Mercator** projection is the selected type for constructing a custom projection, the **Custom Projection** screen displays the following fields (Figure 3-12):

- *Central (Meridian)* – sets the longitude of the central meridian of a zone. The central meridian is a line of constant longitude (zero eastings) at the center of a graticule of a zone of custom projection. The central meridian is usually used as a base for constructing the other lines of the graticule.
- *Scale* – sets a constant scale factor along the central meridian. By this number, a distance along the central meridian of custom projection is multiplied to obtain the actual distance on the datum of the projection.
- *Lat0* – latitude of a point chosen as the origin on the central meridian of the zone grid.

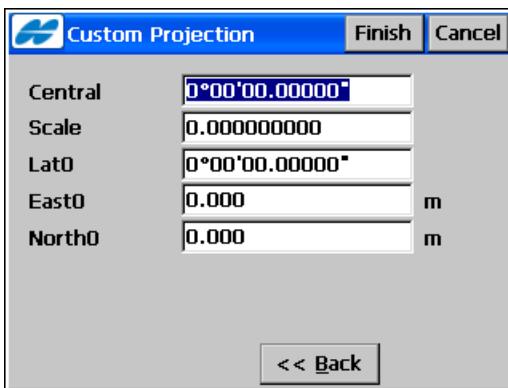


Figure 3-12. New Projection Specifications

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



Latitudes is entered as a positive number in the Northern Hemisphere, and as a negative number in the Southern Hemisphere.

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

- **Back** – returns to the previous screen.
- **Finish** – creates the custom projection and returns to the *Custom Projection* screen with the new projection added.
- **Cancel** – closes the screen without saving the settings.

From Grid-to-Ground/Ground-to-Grid Transformation

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

TopSURV has three modes to set up grid-to-ground parameters. Select one of these modes from the *Parameters* field (Figure 3-13 on page 3-17):

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

For *Scale Factor*, the **Grid to/from Ground Params** screen (Figure 3-13) sets the *Combined Scale Factor* for *Grid-to-Ground* or *Ground-to-Grid* coordinate transformation.

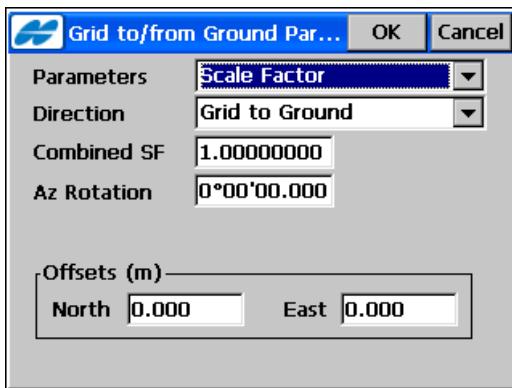


Figure 3-13. Grid to/from Ground - Scale Factor

- *Direction* – switches between the *Grid to Ground* and *Ground to Grid* coordinate transformation types.
- *Combined SF* – sets the combined scale factor.
- *Az Rotation* – sets the angle between the North directions of the grid and the ground coordinate systems. This angle defines the reference direction for ground azimuths.
- *Offsets* – enter offset values of the grid origin along the North and East axes to reduce ground coordinates to manageable values.

For **Average Job Height**, the **Grid to Ground** screen (Figure 3-14 on page 3-18) sets the *Average Height* of the job points for *Grid-to-Ground* coordinate transformation.

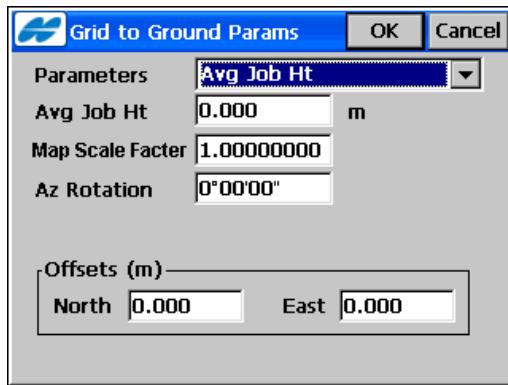


Figure 3-14. Grid to Ground - Average Job Height

- *Avg Job Ht* – sets the average job height to compute the elevation scale factor. An elevation factor is determined by using a constant value for the mean radius of the earth. An approximation of the earth's radius used in TopSURV is 6,371,000 meters.
- *Map Scale Factor* – sets the value of the zone scale factor (how many grid distance units correspond to one distance unit on the ellipsoid).
- *Az Rotation* – sets the angle between the axes of the grid and the ground coordinate systems. This angle defines the reference direction for ground azimuths.
- *Offsets* – enter offset values of the origin along the North and East axes to reduce ground coordinates to manageable values.

For Origin Point, the **Grid to Ground Params** screen displays the parameters to set the origin of the ground coordinates (Figure 3-15 on page 3-19).

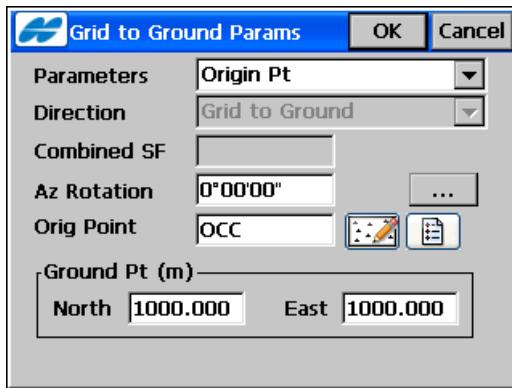


Figure 3-15. Grid to Ground - Origin Point

- **Direction – Grid to Ground** only.
- **Combined SF** – shows the combined scale factor.
- **[...]** – opens the **Compute Rotation** screen (Figure 3-16 on page 3-20) to compute the *Azimuth Rotation* value. For details, see Figure 3-17 on page 3-21.
- **Orig Point** – sets a desired grid point from the job as a ground origin; can be selected from a map, a list, or entered manually.
- **Ground Pt** – sets the ground coordinates for the origin point.
- **OK** – calculates all needed transformation parameters (offsets, scale factor, rotation) and returns to the **Coord System** screen. The scale factor for this mode is a calculated value. The value (not equal to "1") depends on the height of the origin point.

Compute Rotation

The **Compute Rotation** screen (Figure 3-16 on page 3-20) computes azimuth rotation using ground and grid azimuths.

- **Azimuth** – sets the azimuths in the ground and grid systems.
- **Compute** – opens the **Compute Azimuth** screen to compute azimuths in the ground and grid systems, respectively.
- **Rotation** – shows the azimuth rotation after pressing **OK**.
- **OK** – saves the results and returns to the **Grid to Ground Parameters** screen.
- **Cancel** – closes the screen without saving the settings.

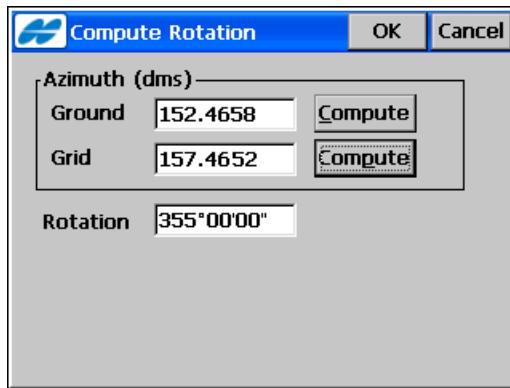


Figure 3-16. Compute Rotation

Compute Azimuth

The **Compute Azimuth** screen (Figure 3-17 on page 3-21) computes the azimuth of the direction using two points.

- **From** – sets the start point for the direction.
- **To** – sets the end point for the direction.
- **Add to Azimuth** – adds an additional value to the azimuth.
- **Azimuth** – displays the result after pressing the **OK** button for the first time.

- **OK** – saves the results and returns to the *Compute Rotation* screen (Figure 3-16).
- **Cancel** – closes the screen without saving the settings.

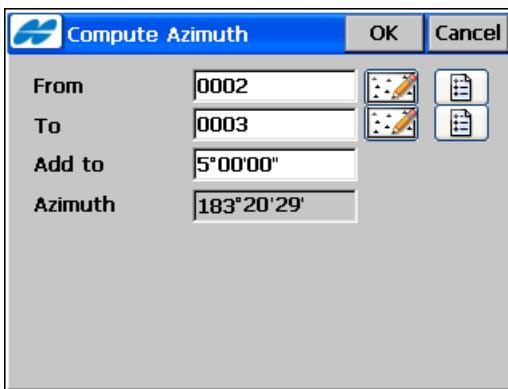


Figure 3-17. Compute Azimuth

Custom Datums

The *Custom Datums* screen (Figure 3-18) contains a list of custom datums. Initially, the list is empty.

- **Delete** – deletes the selected custom datum.
- **Edit** – opens the *Custom Datum* screen to edit parameters of the selected custom datum.

- **Add** – opens the **Custom Datum** screen to enter parameters for a new custom datum (Figure 3-19 on page 3-23).

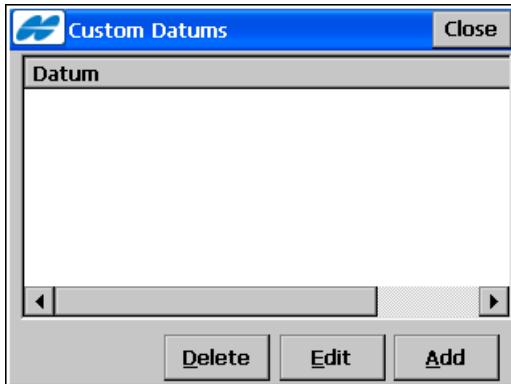


Figure 3-18. Custom Datums

To set parameters for a new custom datum, press the **Add** button (Figure 3-18 on page 3-22).

The **Custom Datum** screen (Figure 3-19) displays to enter or select parameters for a new custom datum.

- *Name* – sets the name of the new datum.
- *Ellipsoid* – selects the ellipsoid for the datum from the list of available types.
- *Note* – any additional information about the datum.

- **Next** – opens another *Custom Datum* (Figure 3-19) screen to set offsets, rotations, and scale for the new datum.

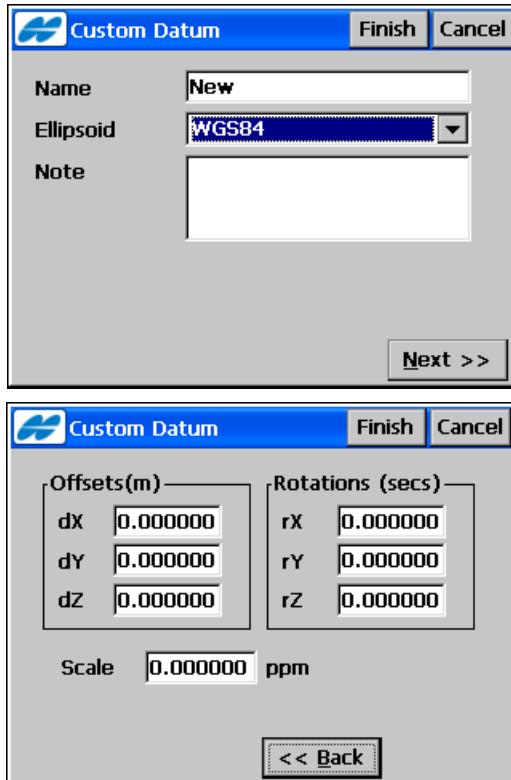


Figure 3-19. Custom Datum

- **Back** – returns to the previous *Custom Datum* screen.
- **Finish**: creates the custom datum and returns to the *Custom Datums* screen with the new datum added.
- **Cancel** – closes the screen without saving the settings.

Geoid List

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

The **Geoids List** screen (Figure 3-20) contains a list of active *Geoids* available for selection.

- **Remove** – deletes the geoid from the list.
- **Edit** – opens the *Add Geoid* screen (Figure 3-21 on page 3-25) to change the geoid.
- **Add** – opens the *Add Geoid* screen (Figure 3-21 on page 3-25) to add a geoid file to the list. Install the geoid file prior to adding it to the list. Some geoid files can be installed during TopSURV installation. They are provided to the user with the TopSURV installation program as ‘.gff’ files.
- **OK** – the job refers to the selected geoid file when performing calculations.
- **Cancel** – closes the screen without saving the settings.



Figure 3-20. Geoid List

Add a Geoid File

On the *Add Geoid* screen (Figure 3-21 on page 3-25), select a Geoid file to view the boundaries of the geoid application.

- *Geoid Format* – the format of the geoid; either *Geoid 99/2003*, *Australian*, *Canadian 2000*, *Canadian 95*, *Geoid File Format*, *Mexico 97*, *Sweden*, *Denmark*, *Dutch2004 Files*, or *Norwegian Files*.

-  – displays the directory where the geoid file is stored. Usually, the geoid files are stored in the Geoids folder in the directory where the application was installed.
- **Browse** – navigates to the geoid file previously downloaded

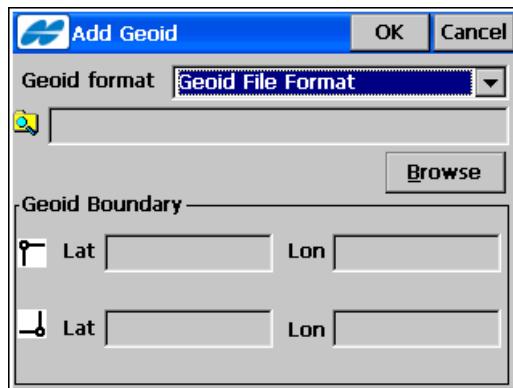


Figure 3-21. Geoid Parameters

- **Geoid Boundary** – displays the boundary of the geoid application after pressing the **OK** button.
 -  (Lat/Lon): the longitude and latitude of the point that sets the north-west boundary of the geoid.
 -  (Lat/Lon): the longitude and latitude of the point that sets the south-east boundary of the geoid.
- **OK** – returns to the **Geoid List** screen (Figure 3-20 on page 3-24).
- **Cancel** – closes the screen without saving the settings.

Setting Global Parameters for Job

To set global parameters in TopSURV, tap the **Global** icon. The **Global** screen (Figure 3-22 on page 3-26) sets the mode for collecting data.

- **Use Bold Font** – if enabled, creates bold fonts.
- **Enable Job History** – if enabled, saves the job history of every surveyor's operation on the job.
- **OK** – saves the changes and returns to the main screen.
- **Cancel** – closes the screen without saving the settings.

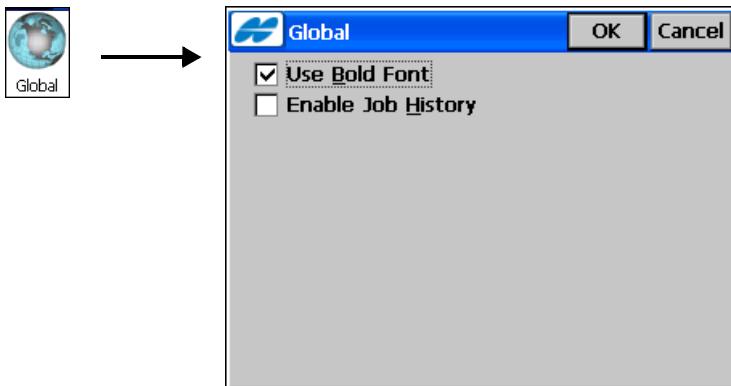


Figure 3-22. Global Screen

Backup

To increase the reliability of work with jobs in TopSURV, a backup copy is automatically created for the current job. This automatic renewal occurs about every ten minutes (Figure 3-23 on page 3-27). And it is safely stored with a new name, i.e., *file_name!YY-MM-DD!.tsj.bak* in a folder where the original *.tsj file is located (Figure 3-23 on page 3-27). TopSURV will create a separate *.bak file for the current job every time the user opens the *.tsj file during

the day with another date, but there cannot be more than three such files. If the *.tsj file is opened on subsequent days, the *.bak files previously formed will be overwritten to the ones with the newer dates.

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

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

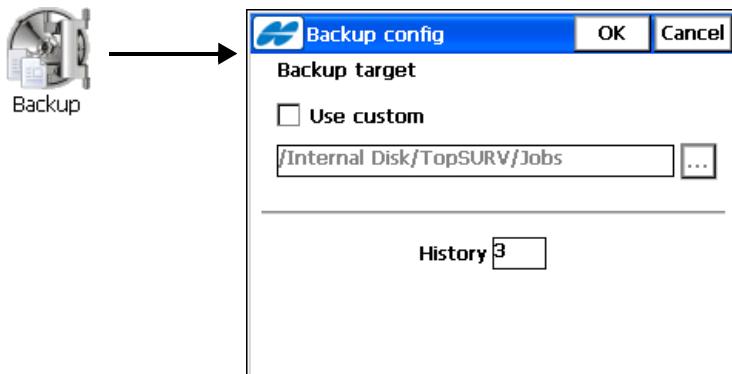


Figure 3-23. Backup Config Screen

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

- **OK** – saves the changes and returns to the main screen.
- **Cancel** – closes the screen without saving the settings.

Setting Units

Tap the **Units** icon, to set default units for a job. The **Units** screen displays. For details, see “Units” on page 3-28.

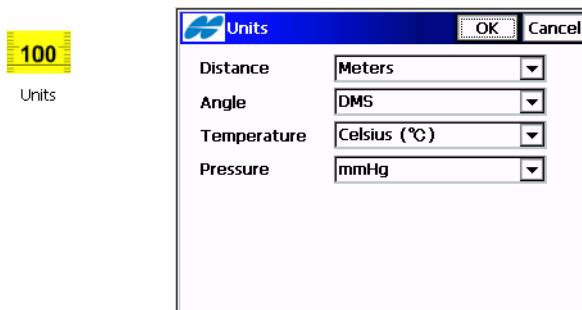


Figure 3-24. Units

Customizing Data Display

The **Display** icon opens the **Display** screen (Figure 3-25) to customize the software interface.

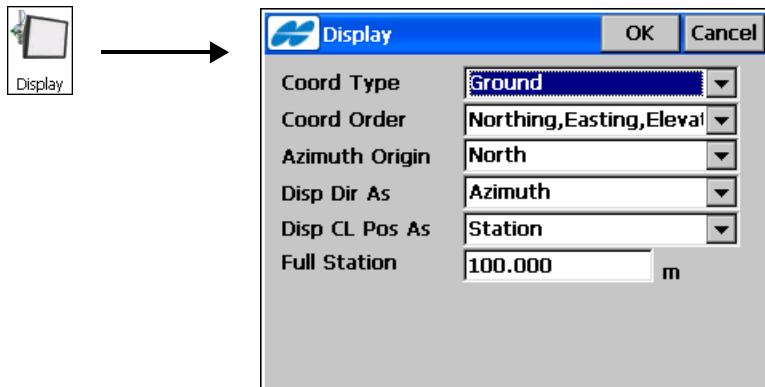


Figure 3-25. Display

- *Coord Type* – selects the coordinate type for the coordinate system selected.

- *Coord Order* – selects the *Northing/Easting* order and displays the height type for the coordinate system selected.
- *Azimuth Origin* – selects the reference direction of azimuth.
- *Disp Dir As* – selects whether to display the direction as *bearing* or *azimuth*.
- *Disp CL Pos As* – selects how to display the position on the center line; select either station or chainage.
- *Full Station* – available if *Station* is selected for *Disp CL Pos As*; sets the measurement units used for the full station value and is usually 100 units.
- **OK** – saves the settings, and returns to the main screen.

Setting Alarms

The **Alarms** icon opens the *Alarms* screen (Figure 3-26).



Figure 3-26. Alarms

- *Audible Alarm* – check mark this box to automatically sound an alert when an alert situation occurs.
- **OK** – saves the settings and returns to the main screen.
- **Cancel** – closes the screen without saving the settings.

- **Check**– pressing this button checks the status of selected situations for the instruments being used is shown (Figure 3-27).

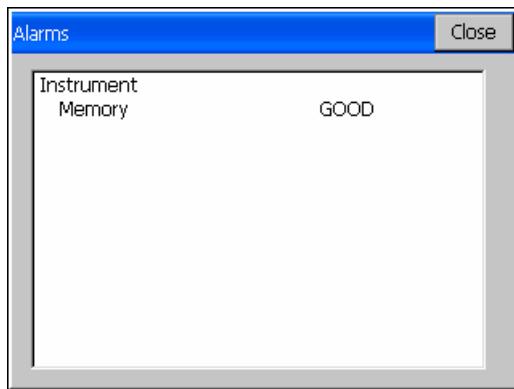


Figure 3-27. Checking Status

Modifying Menus

Tap the **Menus** icon to modify the appearance of the menus. Some rarely used functions are not displayed. If the menu options you need are not visible (available), enable these options in the corresponding menu in the **Config Menus** screen (Figure 3-28).

The **Config Menus** screen displays a list of menus and submenus for each special submenu for the current job configuration (Figure 3-28).

- **Menu** – shows the list of available menus.

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

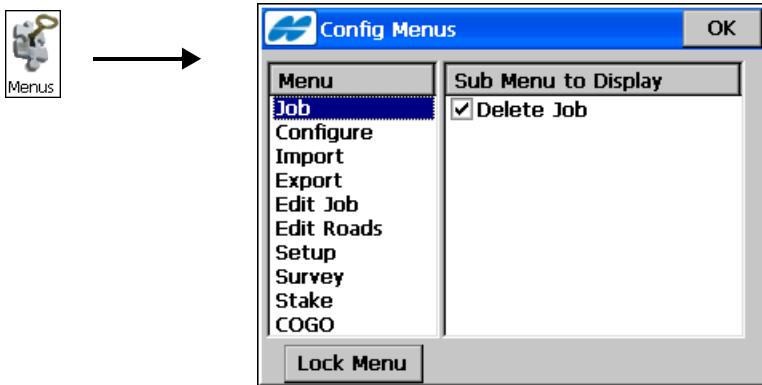


Figure 3-28. Config Menu Options

- **OK** – press to save the settings made and return to the main screen.
- *Use Icons* – check and enable this box to use the icon main menu instead of the list of names (Figure 3-29 on page 3-32).
This operation makes sense only when TopSURV is in the List menu mode (For details on switching to the List Menu, see “Switch Menus” on page 1-7.)

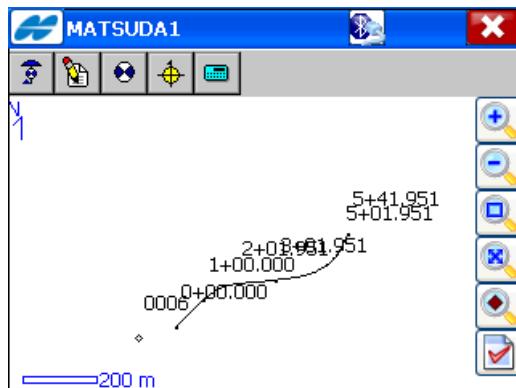


Figure 3-29. List Menu Icons

- **Lock Menu** – press to lock current menu selection using password protection to prevent other users changing menu configurations.

New Jobs

Tap the **New Jobs** icon to set parameters for automatic import of Localization from the previous job and Global code library. The *New Jobs* screen displays (Figure 3-30 on page 3-33).

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

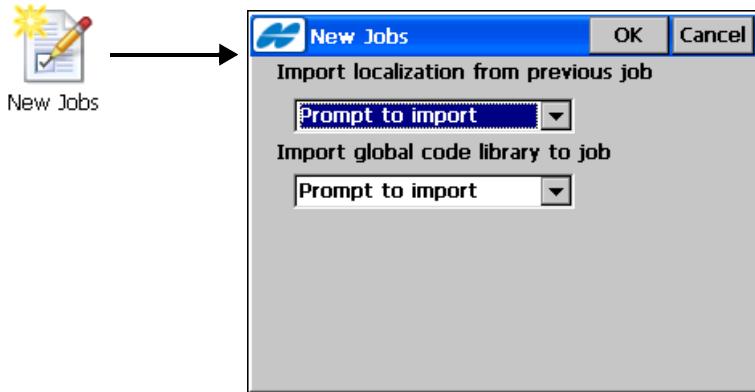


Figure 3-30. New Jobs Screen

- **OK** – saves the changes and returns to the main screen.
- **Cancel** – closes the screen without saving the settings.

Codes

Tap the Codes icon to set global parameters and prompts for codes. The Global Code Options screen displays that includes two tabs: Code Settings and Code Prompts.

Code Settings

The Code Settings tab sets global parameters for codes and control codes (see Figure 3-31 on page 3-35).

For Codes:

- *Data Entry* - select Codes to enter in the field during survey in the main Topo dialog (Figure 9-21 on page 9-22).
- *Code File* - sets a Code File to use the file's codes and layers with the currently selected job



When using a Code File, the codes immediately become available for selection from the Code drop-down list. The layers from the Code File display in the Layer list of the current job only as points are saved with the file's codes selected.

- **Browse** - tap to select an XML file to use for the Code File above.
- *Code with Description* - if this box is check marked, the drop-down menu for Code selection displays descriptions along with code names to select during survey.
- For Control Codes:
 - *Allow Custom* - if this box is check marked, TopSURV will not use its linework package. In this case, the user can enter any string to mark it as a control code. TopSURV will not interpret these control codes.
 - *Allow Persistent* - if this box is check marked, the control codes will be persistent between recorded points and not cleared when surveying. This option available, only if the Allow Custom Control Code option is turned on above.

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

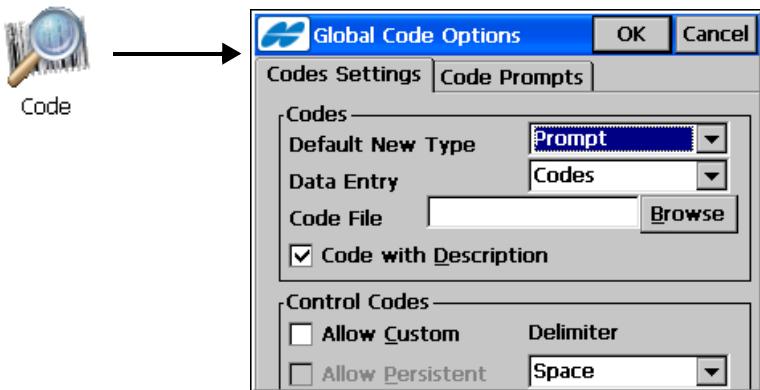


Figure 3-31. Codes Options

Code Prompts

- The *Code Prompts* tab allows setting global prompts for code while performing TS Survey, Stakeout and COGO tasks (see

Figure 3-32, GPS Survey is not available). Check mark a corresponding box to enable prompts for codes.

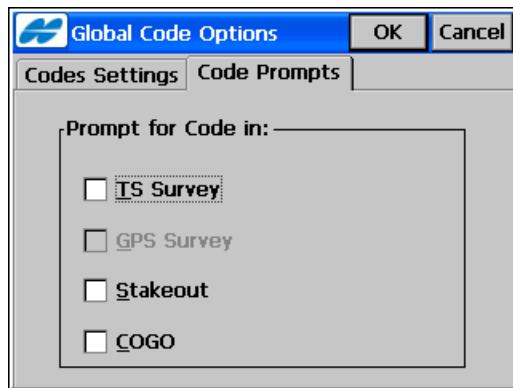


Figure 3-32. Code Prompt

Exporting Data

To export data, tap the **Export** icon in the main menu.

The Export function is used to save points, codes and attributes, Code Libraries, Roads, Cross Section Templates, Point Lists, Localization, Road Survey, and Raw Data in another job, controller, or file.

The **Export** menu (Figure 4-1) includes options to:

1. Export data from an active job to a new job
2. Export job data to a controller
3. Export data to a file

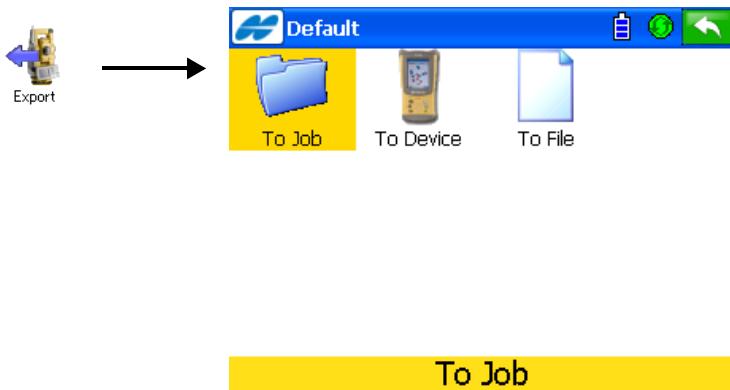


Figure 4-1. Export Menu

Tap the Help Icon  to open a pop-up menu, giving access to the help files, menu interface selection, keyboard activation and information about TopSURV. (for details see “Help Icon’s Pop-up Menu” on page 1-7).

Exporting To a Job

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

Select a Job

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

- **Job List** – a list of jobs to open.
- **Created/Modified** – shows the date the file was created and when it was last modified.
- **Browse** – tap to select a job from the disk if there is no job in the Job List that you want.
- **Select** – starts the export process wizard. Follow the wizard's **Next** button until the **Finish** button is available.

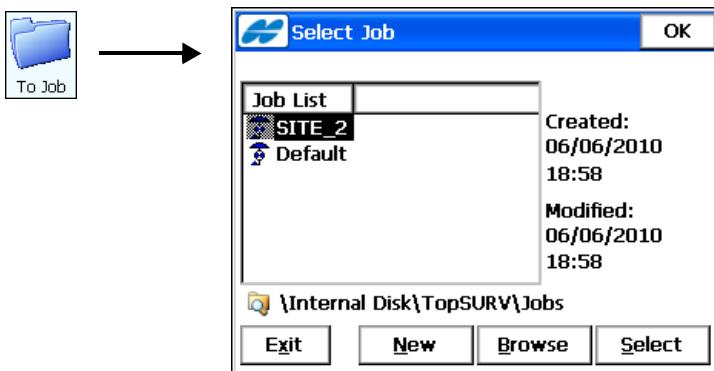


Figure 4-2. Select Job

Export To the Job

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

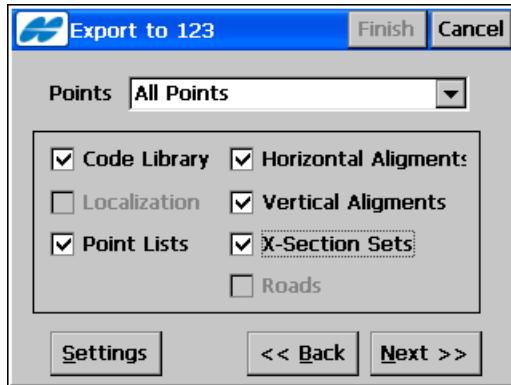


Figure 4-3. Export To Job

- *Points* – select the points to import from the drop-down list; either *All Points*, *By Type*, *By Range and Code*, *By Type, Range and Code*, or *None*.
- Check mark the data to be imported along with the points; either *Code Library*, *Localization*, *Point Lists*, *Horizontal Alignments*, *Vertical Alignments*, *X-Section Sets* or *Roads*.
- **Settings** - opens the *Settings* screen.
- **Back** – returns to the previous screen.
- **Next** – depending on data selections, opens an appropriate screen to select either *Point Types Point*, *Point List*, *Horizontal Alignments*, *Vertical Alignments*, *X-Section Sets* or *Roads* to export.
- **Finish** – starts the export process only if *Code Library* and/or *Localization* items are chosen and *All Points* is selected. Otherwise, the option becomes available after all data are selected by the **Next** button.
- **Cancel** – closes the screen without saving the settings.

Select Point List to Export

The **Point List(s) To Export** screen (Figure 4-4) selects the point lists to export along with the data chosen.

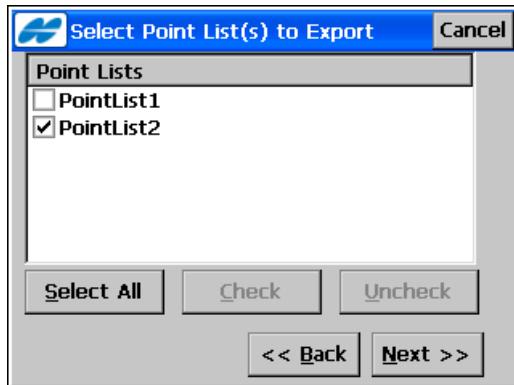


Figure 4-4. Select Point List to Export

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

Select Point Types To Export

The **Select Point Type(s) to Export** screen (Figure 4-5) 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 to Job** screen). Place check marks near the desired point types.

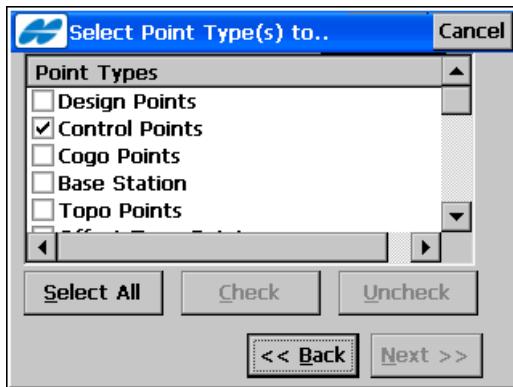


Figure 4-5. Select Point Type(s) to Export

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

Select Points to Export

The **Points to Export** screen (Figure 4-6) filters the exported points.

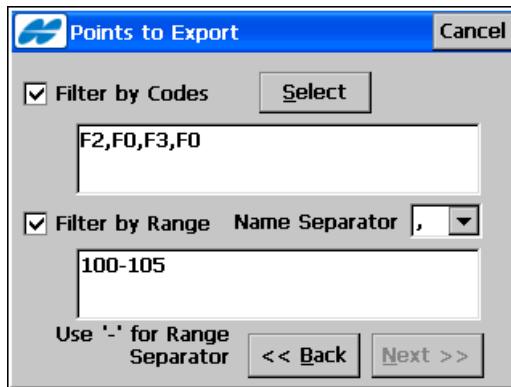


Figure 4-6. Points to Export

- **Filter by Codes** – export all points with the selected codes.
- **Select** – opens the **Code** screen (Figure 4-7 on page 4-7).
- **Filter by Range** – selects a range of points to export. These can be set by range (“,” or “;” can be used as range separators) or by enumeration.
- **Name Separator** – selects a parameter to use as a name separator,
- **Use ‘-’ for Range Separator** – shows the separator used as a range separator.
- **Back** – returns to the previous screen.
- **Next** – opens the next screen to select data. The button is available until all data of chosen types is selected, and the **Finish** button appears to open the **Export Status** screen.
- **Cancel** – closes the screen without saving the settings.

Select Code

The **Code** screen (Figure 4-7) contains a list of available codes. All codes that have been check marked are imported.

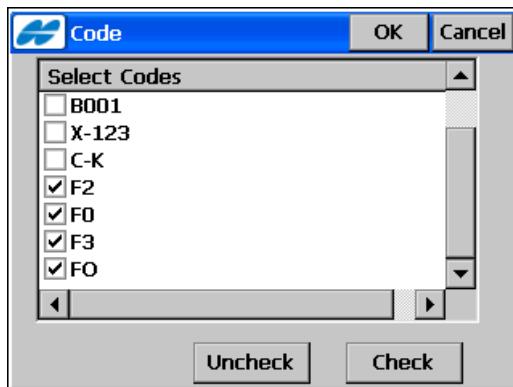


Figure 4-7. Select Code

- **Uncheck** – removes the mark from the highlighted code.
- **Check** – marks the highlighted codes.
- **OK** – returns to the **Points to Export** screen with the codes selected.
- **Cancel** – closes the screen without saving the settings.

Export Status

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

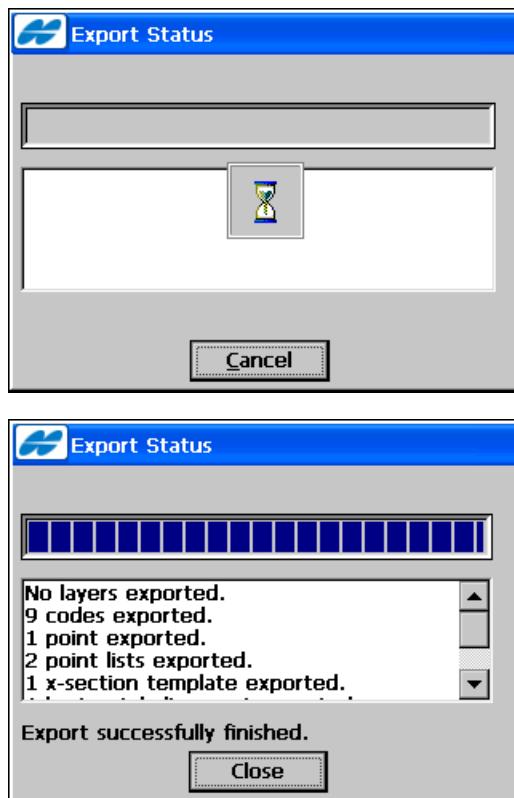


Figure 4-8. Export Status

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

Duplicate Objects

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

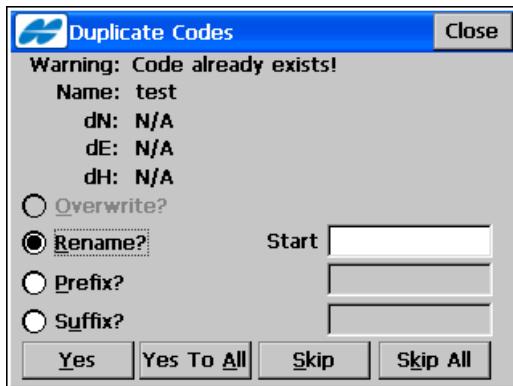


Figure 4-9. Duplicate <Objects>

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

- *Overwrite* – the exported object overwrites the existing one.
- *Rename* – the imported object is renamed. The new name should be noted in the corresponding field (*Start Name*).
- *Prefix/Suffix* – the imported object differs from the existing object by prefix or suffix. The prefix/suffix should be noted in the corresponding field.
- **Yes** – press to accept the decision.
- **Yes To All** – press to accept the same decision for all similar cases.
- **Skip** – press to skip the object without exporting.
- **Skip All** – press to skip all the objects with names that coincide with the names of existing objects, without exporting.

- **Close** – disables the export process and opens the *Export Status* screen to remove all the objects already exported.

Exporting to Device

To export a file to an external device, tap the **To Device** icon.

Select File To Export

On the *Select file* screen, you can navigate to the file to export (Figure 4-10).

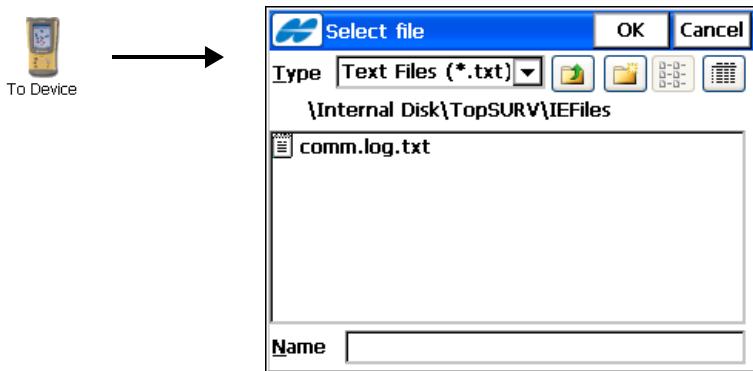


Figure 4-10. Select File to Export

- **OK** – opens the *Export file* screen reflecting the status of exporting the selected file (Figure 4-11), then returns to the main screen if successful.

- **Cancel** – returns to the main screen.

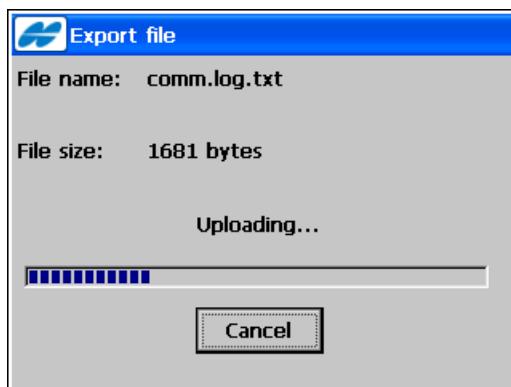


Figure 4-11. Export File

Exporting to File

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

The **To File** screen selects data type from the current job to export to files of either pre-defined or custom formats. For a description of these formats, see Appendix A (Figure 4-12).

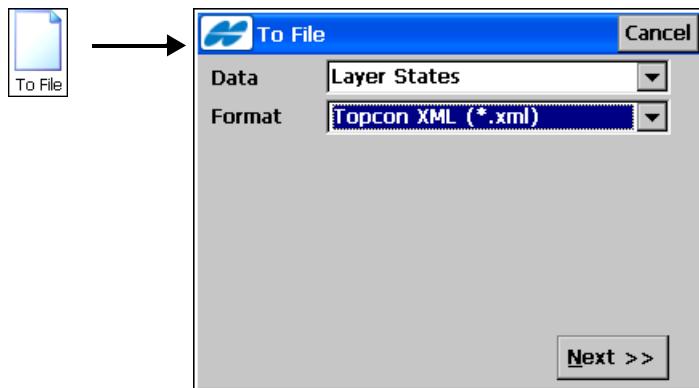


Figure 4-12. Export To File

- **Data** – select the data type to export: either *Points*, *Lines*, *Areas*, *Point Lists*, *Code Library*, *Raw Data*, *Horizontal Alignments*, *Vertical Alignments*, *X-Section Sets*, *Roads*, *X-Sect Templates*, *Localization*, *Scanning Data*, *Roads Survey*, *Job History*, *TINs*, *Layer States*, or *Multiple*.
- **Format** – select the file type to export data to.
- **Next** – opens the **To < name of Format>** screen to specify the file name and the directory where the file will be saved.
- **Cancel** – returns to the main screen.

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

Points and Point Lists

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

Sokkia SDR33 (.sdr)*, *Topcon Text Custom (*.txt)*, *Text Custom Report (*.txt)*, *Topcon Text Custom QC (*.txt)*, *Topcon FC-4 (*.fc4)*, *Topcon FC-5 (*.fc5)*, *Topcon GTS-6 (*.gts6)*, *Topcon FC-6/GTS-7 (*.pnt)*, *Topcon GTS-7 with strings (*.txt)*, *Topcon GT (*.pnt)*, *Topcon GT Finland (*.gt)*, *MOSS GENIO (*.mgn)*, *AutoCAD DXF (*.dxf)*, *AutoCAD Drawing (*.dwg)*, *ESRI Shape (*.shp)*, *Cut Sheet Standard (*.txt)*, *Cut Sheet User Defined (*.txt)*, *Check Sheet (*.txt)*, *TDS Coordinates (*.cr5)*, *PTL Sheet (*.txt)*, *LandXML (*.xml)*, *NEZ (*.txt)*, *NEZ with strings (*.txt)*, *CMM (*.cor)*, *MMH360 (*.360)*, *KOF (*.kof)*, *MMH360_Z000 (*.360)*, *Microstation 95/ISFF (*.dgn)*, *MicroStation V8 (*.dgn)*, *SBG Pxy (*.PXY)* or *SBG Geo (*.Geo)*

For Points or Point Lists data and for most formats the **To File** screen (Figure 4-13 on page 4-13) has the following options.

- *Select Types of the Points* (for *Points* and *Point Lists* data types) – check mark this field if not all types of points should be exported. In this case the **Select Point Type(s) to Export** screen first displays (see Figure 4-5 on page 4-5).
- *Use Filters* (for *Points* and *Point Lists* data types) – check mark this field if filters (by code and by range) should be used for exported points.

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

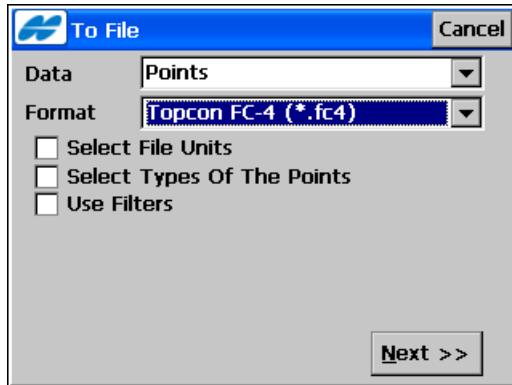


Figure 4-13. Points to File

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

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

Topcon Text Custom

If the *Text Custom* format is selected, the **To File** screen (Figure 4-14) shows the *ASCII File Properties* field.

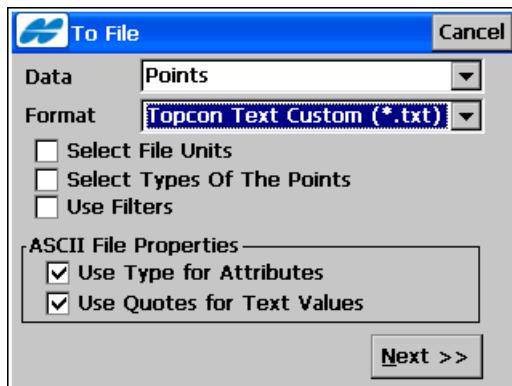


Figure 4-14. Points to Text File

- *ASCII File Properties* (this field appears only for the text format of the exported file) – defines the conditions of the exported file interpretation.
- **Next** – opens the **To Text Format** screen (Figure 4-15).

On the **To Text Format** screen (Figure 4-15), select a destination directory and the name of the created file.

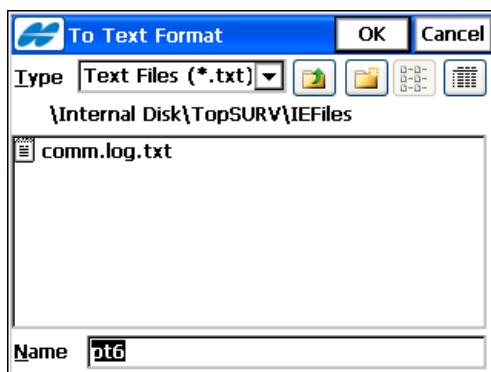


Figure 4-15. Select the File

- **Type** – specifies the file extension (file type).
- **Name** – the name of the created file.
- **OK** – opens the ***Text File Format*** screen.
- **Cancel** – returns to the main screen.

On ***Text File Format*** screen (Figure 4-16), select a desired text format.

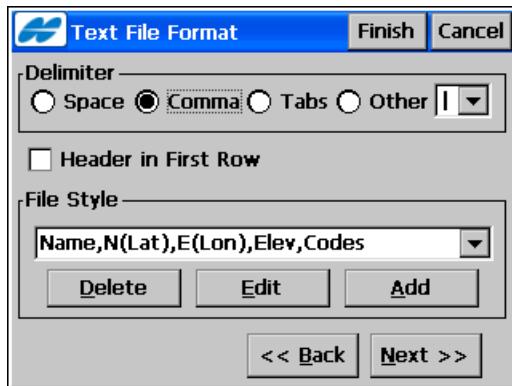


Figure 4-16. Text File Format

- **Delimiter** – enables the delimiting symbol between the data in the exported file; either *Space*, *Comma*, *Tabs* or *Other* delimiter selected from the list.
- **Header in First Row** – enable to output a header in the file.
- **File Style** – selects the order of fields in the exported file.
- **Delete** – deletes an existing file format.
- **Edit (Format)** – edits an existing file format. The ***Custom Style*** screen displays (Figure 4-17 on page 4-16).
- **Add (Format)** – adds a new file format. The ***Custom Style*** screen (Figure 4-17 on page 4-16) displays.
- **Back** – returns to the previous screen.
- **Next** – opens the ***Coordinate System*** screen (Figure 4-18 on page 4-17).
- **Finish** – press to start the export process (Figure 4-20 on page 4-18).

- **Cancel** – closes the screen without saving the settings.

On the *Custom Style* screen (Figure 4-17), using the arrows, move items in the *Available* column to the *Order* column and arrange in the preferred order with the *Left* and *Right* arrows under the *Order* column.

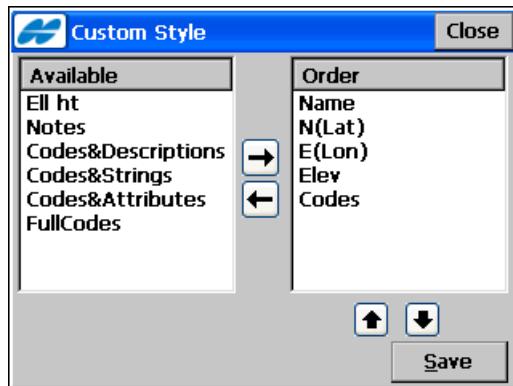


Figure 4-17. Custom Style

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

On the **Coord System** screen (Figure 4-18 on page 4-17) select the coordinate type and distance units for the data in the file exported:

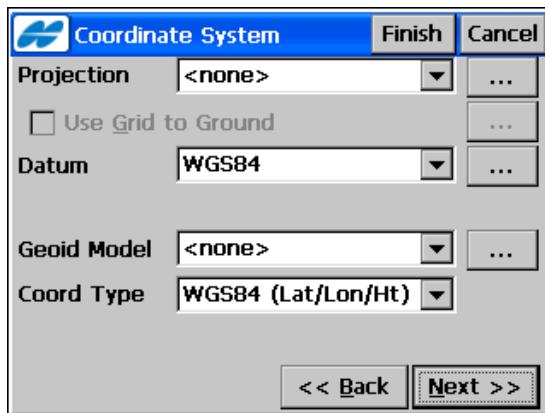


Figure 4-18. Coordinate System

- **Coord Type** – select either *Ground*, *Datum (Lat/Lon/Ht)*, *Datum (X/Y/Z)*, *WGS84 (Lat/Lon/Ht)*, or *WGS84 (X/Y/Z)*.

This screen also displays information about the coordinate system in the job whose data is exported.

- **Back** – returns to the previous screen.
- **Next** – opens the **Units Format** screen (Figure 4-19 on page 4-18).
- **Finish** – opens the **Export Status** screen and starts the export process. (See Figure 4-20 on page 4-18.)
- **Cancel** – close the screen without saving the settings.

On the **Units Format** screen (Figure 4-19 on page 4-18), select from the drop-down list the format you want to represent the degrees of Latitude and Longitude/planes coordinates precision/elevation precision/ in the file exported.

- **Back** – returns to the previous screen.
- **Finish** – opens the **Export Status** screen and starts the Export process (see Figure 4-20.)

- **Cancel** – closes the screen without saving the settings.

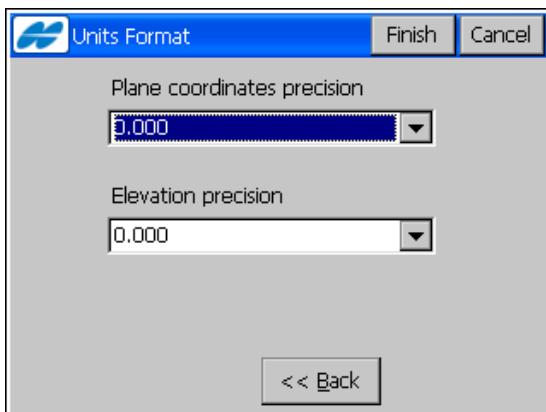


Figure 4-19. Select Latitude/Longitude Format

On the **Export Status** screen (Figure 4-20), tap the **Close** button to return to main screen.



Figure 4-20. Export Status

Text Custom Report

If the **Text Custom Report** format is selected, the **To File** screen displays the **Code Style** button (Figure 4-20).

Note that report files cannot be imported back to TopSURV.

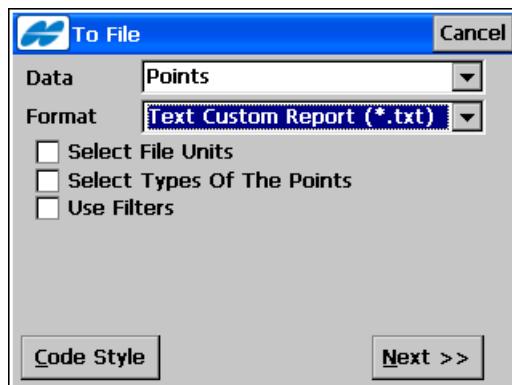


Figure 4-21. To Text Custom Report

- **Code Style** – opens the *Code Style* screen to set a format for point properties (codes, control codes, strings and notes) to export to the file.
- **Next** – with the help of the export wizard, follow next screens which are similar to those for the Topcon Text Custom format.
- **Cancel** – closes the screen without saving the settings.

On the *Code Style* screen (Figure 4-22 on page 4-20), select or create a desired format for information on every point to arrange it on one line in the exported file.

- **Style** – selects a defined format style. The pre-defined styles are: *Topcon*, *Carlson* and *Eagle Point*.
- Using the arrows, move items from the *Available* column to the *Order* column and arrange in the preferred order.
- **Separators** – opens the *Separators* screen to display separators for a selected style.
- **Close** – returns to the previous screen without changes made.
- **Delete** – deletes the selected style from the list.

- **Save** – saves the custom report format and a new entry appears in the *Style* drop-down menu.

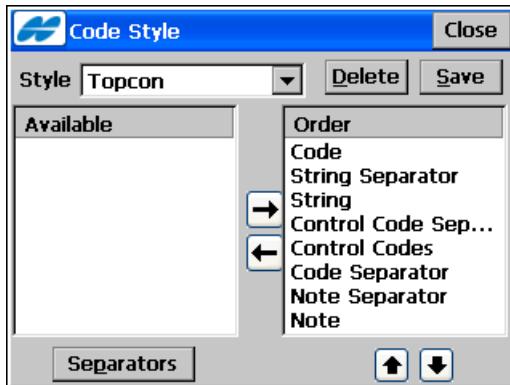


Figure 4-22. Code Style

On the Separators screen (Figure 4-23), you can enter *Code*, *String*, *Control Code*, and *Note* separators for a new style.

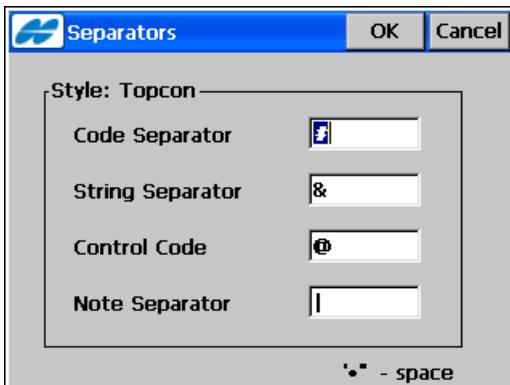


Figure 4-23. Separators

Topcon Text Custom QC

The procedure of exporting points and point lists to the Topcon Text Custom QC format is the same as for the Topcon Text Custom format. For details, see “Topcon Text Custom” on page 4-14. The only

difference is that this format allows selection of parameters of Quality Control in the **Custom Style** screen (Figure 4-24).

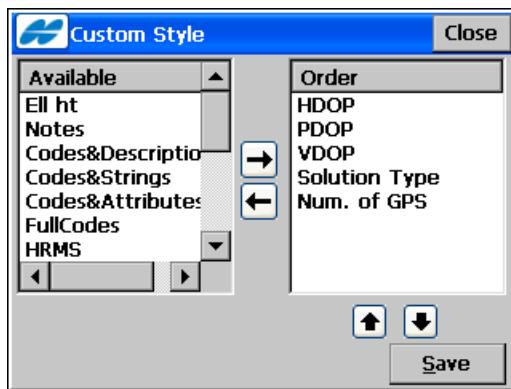


Figure 4-24. Custom Style with QC

AutoCAD DXF and AutoCAD Drawing

If the *AutoCAD DXF* or *AutoCAD Drawing* format is selected, the **To File** screen has the following additional options for point export (Figure 4-25 on page 4-22).

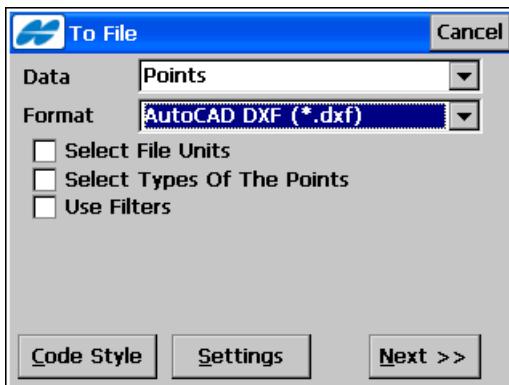


Figure 4-25. AutoCAD DXF



TopSURV only exports AutoCAD 2000 format DWG files.

- **Code Style** – opens the *Code Style* screen to set a format for point properties (codes, control codes, strings and notes) to export to the file. For details, refer to “On the Code Style” on page 4-19.
- **Settings** – opens the *Settings* screen to select point and line styles.
- **Next** – with the help of the export wizard, follow next screens to export points.
- **Cancel** – closes the screen without saving the settings.

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

- *Point Style* – selects the style for points; either *AutoCAD Points*, *AutoCAD Points with Text Fields*, *Carlson Point Blocks*, or *TopSURV Point Blocks*.
- *Line Style* – selects the style for lines; either *AutoCAD Lines*, *AutoCAD Lines with Text Fields*, or *TopSURV Line Blocks*.
- *Use 3D coordinates* – check mark this box to use 3D coordinates.

- **OK** – saves the settings and returns to the previous screen.
- **Cancel** – closes the screen without saving the settings.

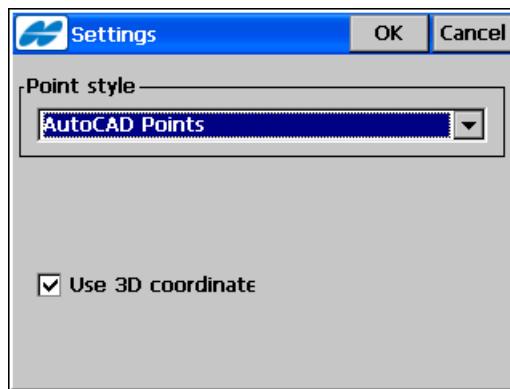


Figure 4-26. Settings

ESRI Shape

If the *ESRI Shape* format type is selected, the *To File* screen has the *Store Description as Attribute* option for point export available. Enable this option to save point descriptions as attributes in the file (Figure 4-27 on page 4-24).

- *Store Description as Attribute* – check mark this box to save point descriptions as attributes in the file.

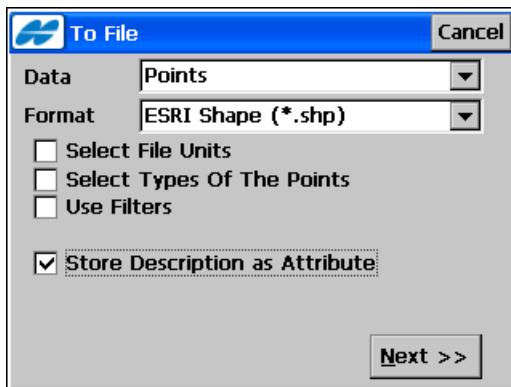


Figure 4-27. ESRI Shape

- Next – with the help of the export wizard, follow next screens to export points. Note that while exporting, TopSURV creates three files for every code in the selected directory (Figure 4-28).

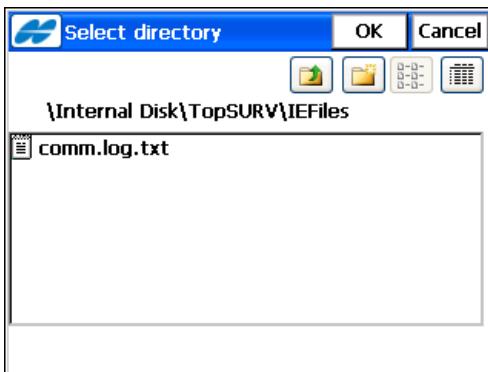


Figure 4-28. Select Directory

TDS Coordinates

If the *TDS* format is selected, the *To File* screen has the following additional option to export points.

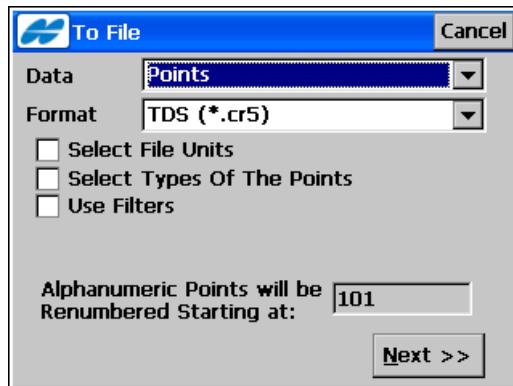


Figure 4-29. To TDS Coordinates

- When selected, the TDS Coordinate format demands points have only numerical names. The screen displays a number at which TopSURV will start renaming points with alphanumeric names.
- **Next** – with the help of the export wizard, follow next screens to export points.

Lines

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

Code Library

For Code Library data, the export is allowed for the formats: *Topcon XML (*.xml)*, or *DBF (*.dbf)*.

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

Raw Data

For Raw Data, the following formats are available on the **To File** screen (Figure 4-30):

Sokkia SDR33 (.sdr), LandXML (*.xml), Topcon FC-5 (*.fc5), Topcon GTS-6 (*.gts6), Topcon FC-6/GTS-7 (*.gts7), TDS Raw Data (*.RAW), MOSS Survey (*.txt), Field Book (*.fbk), KOF (*.kof), Topcon Vector Format (*.tvf), TVF with Code Style (*.tvf), Berlin GNSS-Messprotocoll (*.txt) or Berlin GNSS- Mittelwerte (*.txt).*

When choosing *TDS Raw Data*, *Field Book* or *KOF* file, select the type of raw data to export: *Export TS Raw Data* and/or *Export GPS Raw Data*.

In addition to being exported to a TDS Raw Data file, raw data can be saved in a format compatible with the *FBK* format. Selection of the *FBK Compatible* option is available if control codes are saved as notes. When selected, the *FBK Compatible* option demands points have only numerical names. The screen displays a number at which TopSURV will start renaming points with alphanumeric names.

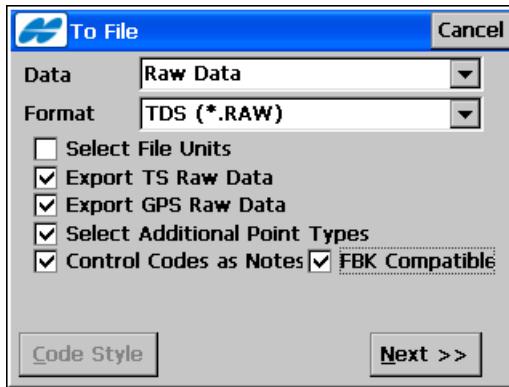


Figure 4-30. Export Raw Data To TDS Raw Data

Horizontal Alignments

For Horizontal Alignments data, you can export the following formats: *SSS H. Alignment (*.hal)*, *TopSURV (*.thl)*, *CLIP H.*

Alignment (.PLT), or ISPOL H. Alignment (*.ALI)* (Figure 4-31) from the *Format* drop-down list.

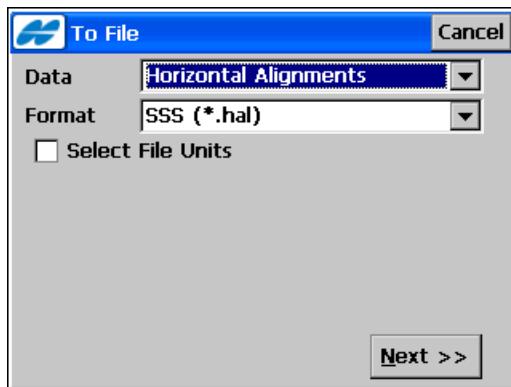


Figure 4-31. Horizontal Alignments

- **Next** – opens the *Select H.Alignment(s) to Export* screen to select alignments (Figure 4-32).

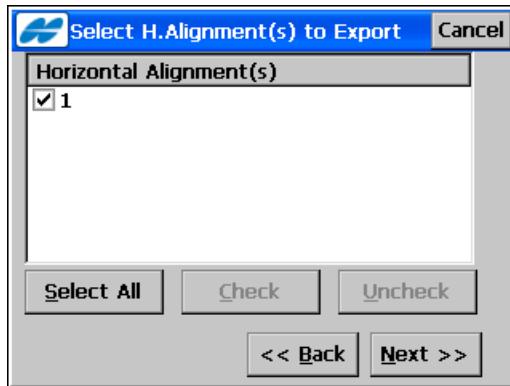


Figure 4-32. Select Horizontal Alignments

- *Horizontal Alignment(s)* – lists the available horizontal alignments in the job.
- **Check** – marks the highlighted entries.
- **Uncheck** – removes the mark from the highlighted alignment.

- **Back** – returns to the previous screen.
- **Next** – opens the **Select directory** screen (Figure 4-33) to select the directory to save the file. The file will have the same name of the exported alignment .



When exporting, TopSURV opens similar screens, to select other objects (vertical alignments, roads, x-section sets or x-sections templates).

- **OK** – opens the **Export Status** screen and starts the export process.
- **Cancel** – closes the screen without saving the settings.

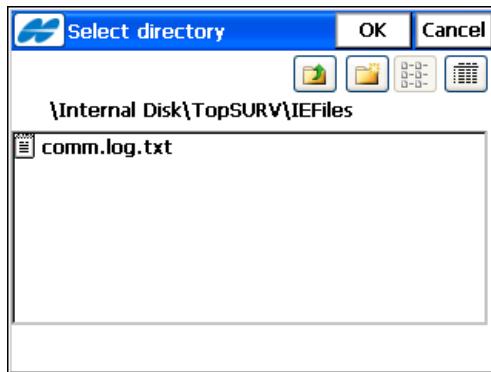


Figure 4-33. Select Directory

Vertical Alignments

For Vertical Alignments data, you can export the following formats: *SSS V. Alignment (*.val)*, *TopSURV V. Alignment (*.tv1)*, *CLIP V. Alignment (*.ALZ)*, or *ISPOL V. Alignment (*.RAS)*.

X-Section Sets

For X-Section Sets data, you can export the following formats: *SSS Cross Section Set (*.rd)*, *TopSURV Section Set (*.trd)*, *CLIP*

Cross Section Set (.TRV), ISPOL Cross Section Set (*.SC1), or Custom X-Sections (*.cxs).*

Roads

For Roads data, you can export the following formats:

Land XML (.xml), SSS Road (*.hal; *.val; *.rd), TDS Road (*.rd5), Topcon 3D Road (*.rd3), TopSURV (*.thl; *.tvl; *.trd), CLIP Road (*.PLT; *.ALZ; *.TRV), ISPOL Road (*.ALI; *.RAS; *.SC1), Tekla Roads (*.vgp), MX GENIO Road (*.txt), or SBG Road (*.LIN).*

In LandXML file, X-Sections are stored as Zones when the *Use Zone elements for x-sections* box is check marked (Figure 4-34).

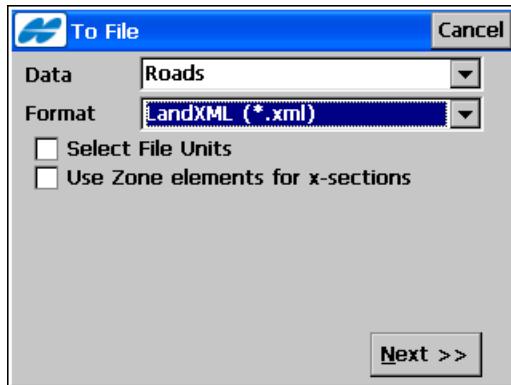


Figure 4-34. Roads to LandXML

Also select the desired distance units (Figure 4-35 on page 4-30).

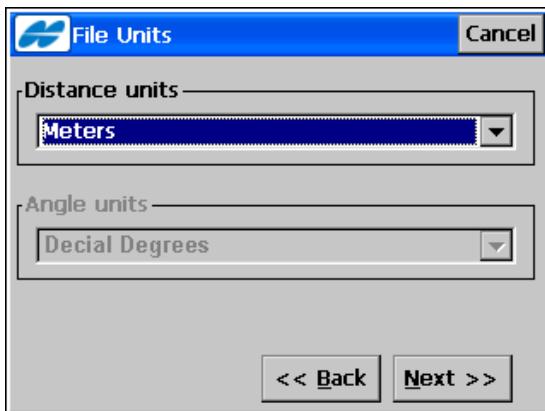


Figure 4-35. Roads to TopSURV Road

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

X-Section Templates

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

Also select the desired distance units (Figure 4-36 on page 4-30).

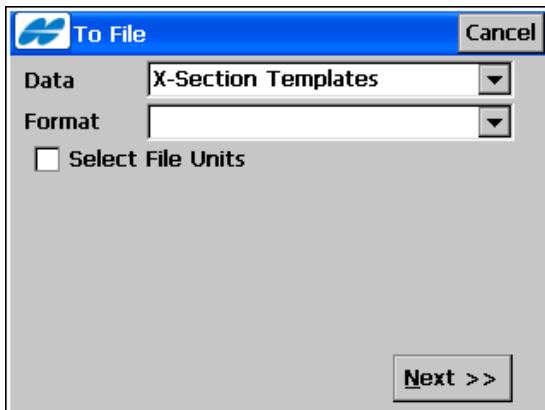


Figure 4-36. X-Section Templates to TopSURV Templates

Localization

For *Localization* data, you can export the following formats: *Topcon 3D (*.gc3)*, *TDS (*.RAW)* and *Carlson (*.loc)*. Control Points are exported together with Localization data.

Scanning Data

For *Scanning Data*, you can export the following formats: all scanning data are exported for *DI-3000 Project (*.fsc)*.

Roads Survey

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

Job History

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

The Job History file is formed if the Enable Job History box is checked marked on the ***Global Settings*** screen (see “Setting Global Parameters for Job” on page 3-26).

TINs Data

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

TopSURV stores surfaces in TN3 files (in the DTM directory). Select a desired TN3 file to export in the **Select TN3** screen (Figure 4-37).

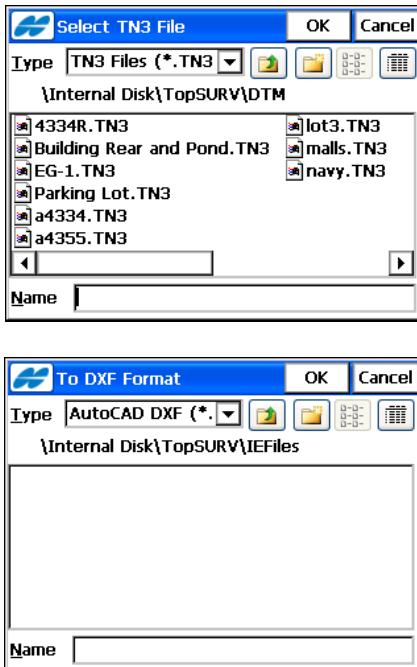


Figure 4-37. Select TN3>Select File

- **OK** – opens the *To <Format>* screen to select a destination directory and the name of the created file.
- **Cancel** – closes the screen without saving the settings.

Layer States

For *Layer States* data, you can export the following formats:
Autodesk (.las)*, *Topcon 3D XML (*.xml)*.

Multiple

For *Multiple* data, you can export the following formats:
Topcon Text Custom (.txt)*, *AutoCAD DXF (*.dxf)*, *AutoCAD Drawing (*.dwg)*, *ESRI Shape (*.shp)*, *LandXML (*.xml)*, *KOF*

(*.kof), Microstation 95/ISFF (*.dgn), MX GENIO (*.txt), SBG Pxy (*.PXY), or SBG Geo (*.Geo).



TopSURV only exports AutoCAD 2000 format DWG files.

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

The **Next** button on the *To File* screen opens the **Data selection** screen (Figure 4-38 on page 4-33).

On the **Data selection** screen (Figure 4-38 on page 4-33), select a specific data group in the job available to export to a specified format. For the LandXML as an example, Points, Lines, Alignments, Codes, Surfaces, X-sections, TS Raw Objects are available for selection.

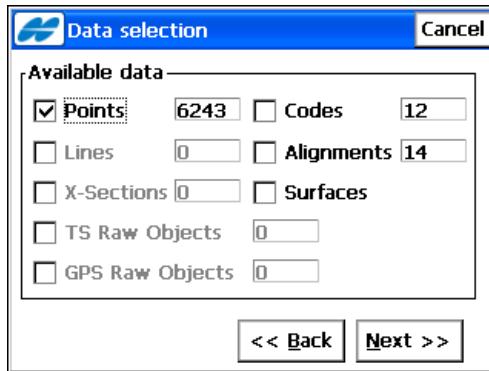


Figure 4-38. Export Multiple Data

- **Next** – depending on the data selected for export, opens different screens:
 - **Points selection** for Points (Figure 4-39 on page 4-34)
 - **Select Point List(s) to Export** for Point lists (Figure 4-4 on page 4-4)
 - **Select Road(s) to Export** for Alignments (Figure 4-32 on page 4-27 which is similar to this one)

- **Select TN3 file** for Surfaces (Figure 4-40 on page 4-34)
- **To <name of Format>** screen (Figure 4-15 on page 4-14).

On the **Point Selection** screen (Figure 4-39 on page 4-34), select the filter type to select the exported Points (Figure 4-39).

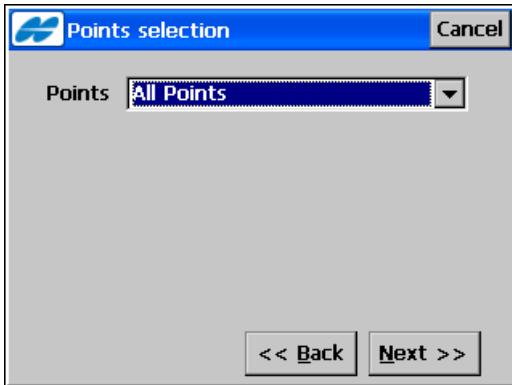


Figure 4-39. Points Selection

On the **Select TN3** screen (Figure 4-40), select a destination directory and the name of the created file.

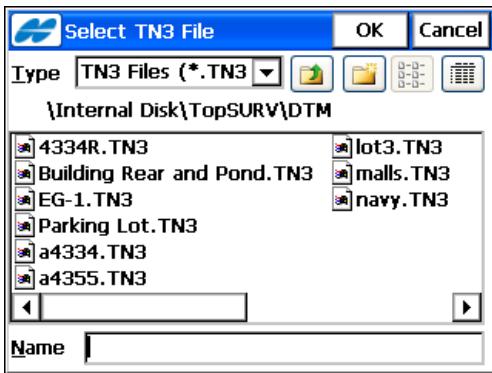


Figure 4-40. Select TN3

- **OK** – starts the export process.
- **Cancel** – closes the screen without saving the settings.

Importing Data

To import data, tap the **Import** icon.

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

The **Import** menu (Figure 5-1) includes options to:

1. Import data from a job (From Job)
2. Import data from a controller (From Device)
3. Import data from a file (From File)



From Job

Figure 5-1. Import Menu

The *Help* Icon  opens a pop-up menu, giving access to help files, menu interface selection, keyboard activation and information about TopSURV. (for detail see “Help Icon’s Pop-up Menu” on page 1-7).

Importing From Job

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

Select a Job

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

- **Current Job** – shows the name of the job selected from the job list.
- **Created** – shows the date the selected job was created.
- **Modified** – shows the last date the selected job was modified.
-  – displays the directory where the job file is stored.
- **Browse** – opens the browse screen for choosing the job file from files previously downloaded.
- **Select** – selects the job file highlighted in the job list.
- **Close** – returns to the previous screen without changes being made.

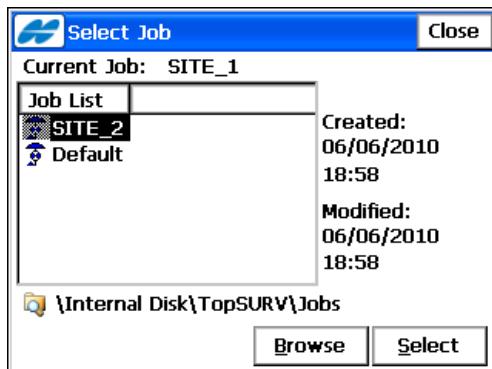


Figure 5-2. Select Job

Import From the Job

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

- **Points** – select the points to import from the drop-down list; either *All Points*, *By Type*, *By Range and Code*, *By Type, Range and Code*, or *None*.
- Check mark the data to be imported along with the points; either *Code Library*, *Localization*, *Point Lists*, *Horizontal Alignments*, *Vertical Alignments*, *X-Section Sets*, or *Roads*.
- **Back** – returns to the previous screen.
- **Next** – becomes available, depending on the data selection and opens the screens:
 - **Select Point Type(s) to Import** if the points are filtered *By Type* (see Figure 5-4 on page 5-4)
 - **Points To Import** if the points are filtered *By Range and Code* (see Figure 5-5 on page 5-6)
 - **Select Point List(s) (or Horizontal Alignments, Vertical Alignments, X-Section Sets, Roads) to Import** if the corresponding data are check marked in the *Import from Job* screen

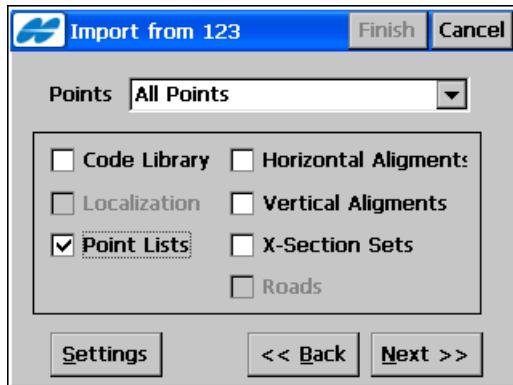


Figure 5-3. Import From Job

- **Finish** – starts the import process if only *Code Library* and/or *Localization* items are selected and *All Points* is selected. Otherwise, the option becomes available after all data are selected by the **Next** button.
- **Cancel** – closes the screen without saving the settings.

Select Point Types To Import

On the *Select Point Type(s) To Import* (Figure 5-4), select the types of points to be imported; only if the *Code Library*, *Localization*, or *Roads* box is check marked and if the *points filter by type* has been enabled in the **Import From Default** screen. Place a check mark next to the point type that you want (Figure 5-3 on page 5-3).

- *Point Types* – check mark the point types for import; either *Design Points*, *Control Points*, *Cogo Points*, *Base Station*, *Topo Points*, *Offset Topo Points*, *Auto Topo Points*, *Sideshot*, *Offset*, *Remote*, *Reflectorless*, *BackSight*, *Stake Points*, *Stake Line*, *Check Points*, *Manually Typed*, *Tape Dimension*, *Scanned Points*, *Edge Extraction*, or *Design Elevation Points*.
- **Select All** - highlights all entries.
- **Check / Uncheck** – toggles the highlighted item(s) on or off, depending on the button being pressed. To select more than one item, press **Ctrl** while making a selection.

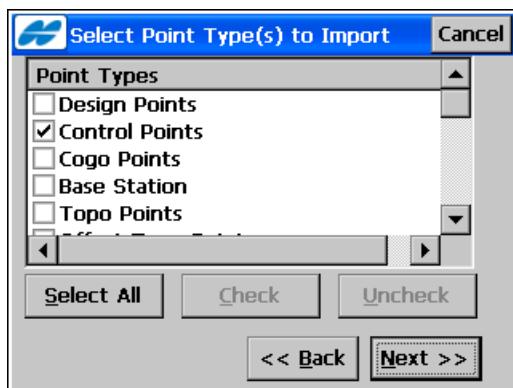


Figure 5-4. Select Point Type(s) to Import

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

- **Next** – if available opens the next screen to select objects; once the button becomes grayed out, tap **Finish**.
- **Finish** – opens the **Import Status** screen and starts the export process.
- **Cancel** – closes the screen without saving the settings.

Select Points to Import

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

- *Filter by Codes* – if enabled, all points with the selected codes are imported.
- **Select** – opens the **Code** screen (see Figure 5-6 on page 5-7) for code selection.
- *Filter by Range* – select the points to import. These can be set by range (“.”, “,” or “;” can be used as a range separator) or by enumeration.
 - *Name Separator*: selects a delimiter to use for point names.
 - *Use ‘-’ for Range Separator*: shows the delimiter being used as a range separator.
- **Back** – returns to the previous screen.
- **Finish** – opens the **Import Status** screen and starts the import process.

- **Cancel** – closes the screen without saving the settings.

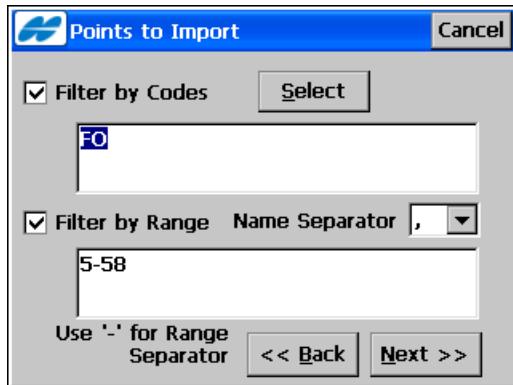


Figure 5-5. Points to Import

- **Next** – if available, opens the next screen to select objects; once the button becomes grayed out, tap the **Finish** button to start the export process.

Code

The **Code** screen contains a list of available codes. All points with codes selected here are imported (Figure 5-6 on page 5-7).

- **Uncheck** – deselects the highlighted code.
- **Check** – check marks the highlighted entries.
- **OK** – returns to the **Points to Import** screen with the selected codes.
- **Cancel** – closes the screen without saving the settings.

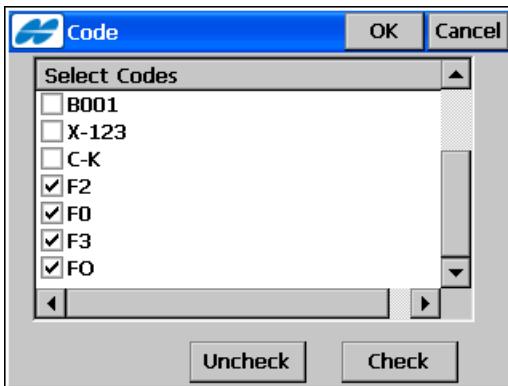


Figure 5-6. Code

Select Point List to Import

The **Select Point(s) List To Import** screen (see Figure 5-7 on page 5-8) selects the point list to import. Place a check mark next to the point list you want to import from the list of Point Lists.

- **Point Lists** – the list of available point lists in the selected job.
- **Select All** - highlights all entries.
- **Uncheck** – deselects the highlighted point list.
- **Check** – selects the highlighted entries.
- **Back** – returns to the previous screen.
- **Next** – available if other data is chosen to import in the **From Job** screen. Opens the next screen to select other objects (horizontal alignments, vertical alignments, roads or x-section sets) which are similar to the **Point List to Import** screen. Once the button becomes grayed out, tap the **Finish** button.
- **Finish** – opens the **Import Status** screen and starts the import process.

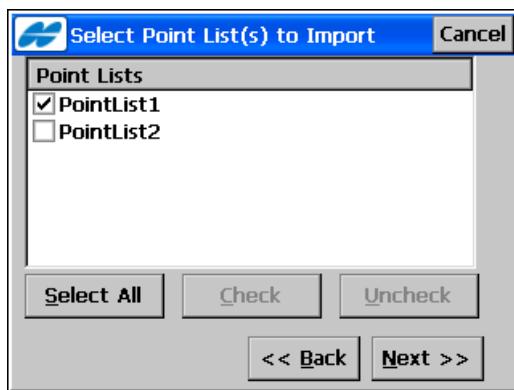


Figure 5-7. Select Point List to Import

Import Status

The **Import Status** screen (Figure 5-8) reflects the import process and contains a progress bar and a comments window. The progress bar displays the percentage of the data being imported. Tap **Close** to return to the main screen.

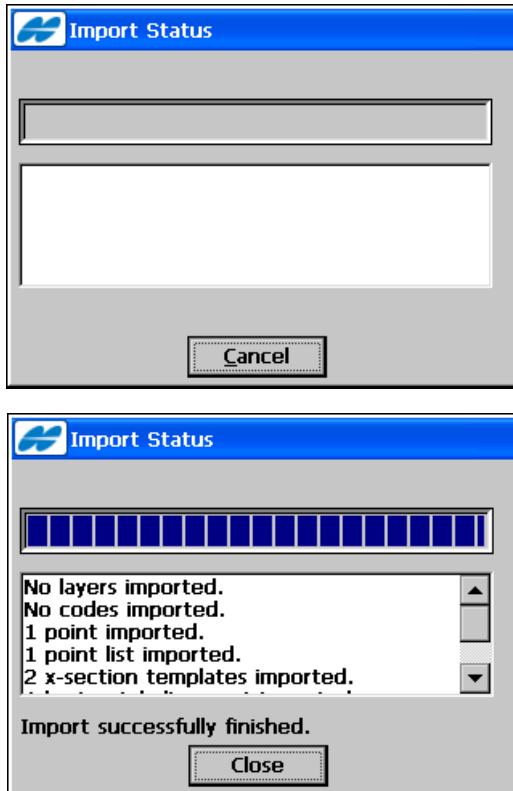


Figure 5-8. Import Status

Duplicate Objects

If the existing job contains objects with the same names as the job they are imported from, the **Duplicate <Objects>** screen displays (Figure 5-9).

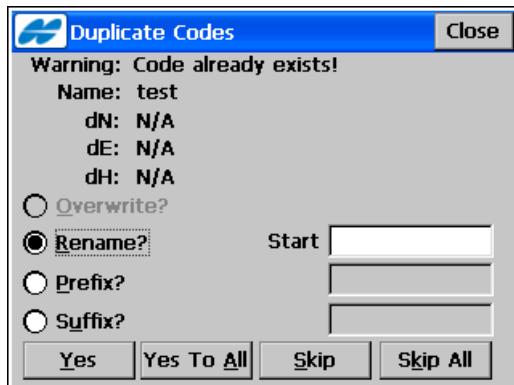


Figure 5-9. Duplicate <Objects>

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

- **Overwrite** – the imported object overwrites the existing one.
- **Rename** – the imported object is renamed. The new name should be noted in the corresponding field.
- **Prefix/Suffix** – the imported object differs from the existing object by prefix or suffix. The prefix/suffix should be noted in the corresponding field.
- **Yes** – accepts the decision.
- **Yes To All** – accepts the same decision for all similar cases.
- **Skip** – skips the object without importing.
- **Skip All** – skips all the objects with names that coincide with the names of existing objects, without importing.
- **Close** – disables the import process and opens the **Import Status** screen to remove all the objects already imported (Figure 5-10).



Figure 5-10. Import Status for Removed Objects



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

Importing From Device

To import a job (or any other file) from a controller device, tap the **From Device** icon.

File Import Directory

On the *Select directory* screen (Figure 5-11), select the destination directory for data import.

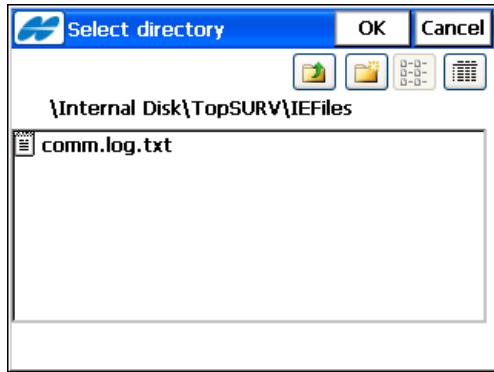


Figure 5-11. Select Directory

- **OK** – opens the *Import File* screen reflecting import status to the selected directory (Figure 5-12)
- **Cancel** – returns to the main screen.

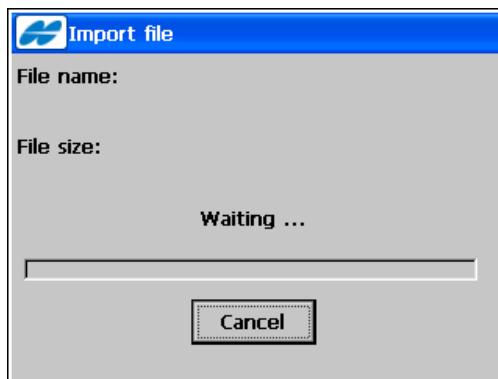


Figure 5-12. Import File

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

Importing From a File

To import data from a file, tap the *From File* icon (Figure 5-13).

On the **From File** screen (Figure 5-13) you can import points, roads, cross section templates, and localization from files of either pre-defined or custom formats. For a description of these formats, see Appendix A.

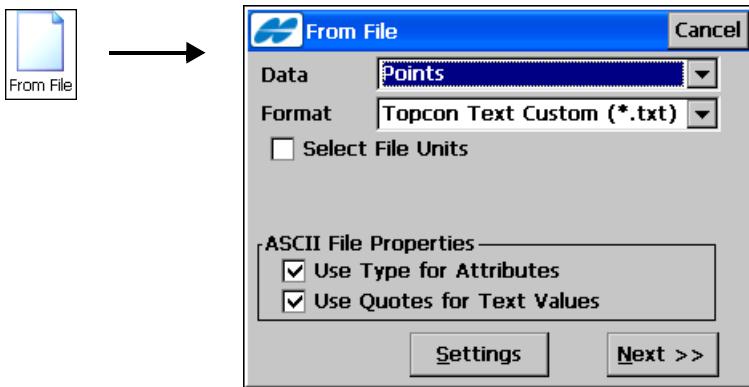


Figure 5-13. Import From File

- *Data* – select the data type to import from the file; either *Points*, *Lines*, *Areas*, *Point Lists*, *Code Library*, *Horizontal Alignments*, *Vertical Alignments*, *X-Section Sets*, *Roads*, *Parcels*, *X-Sect Templates*, *Localization*, *Scanning Data*, *TINs*, *Layer States*, or *Multiple*.
- *Format* – select the type of file being imported.
- **Next** – opens the **From < name of Format >** screen to navigate to the directory where the file is located.
- **Cancel** – closes the screen without saving the settings.

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

Points and Point Lists

On the **From File** screen (Figure 5-14) for *Points* and *Point Lists* data, you can import the following formats: *Sokkia SDR33 (*.sdr)*, *Topcon Text Custom (*.txt)*, *Topcon FC-4 (*.fc4)*, *Topcon FC-5 (*.fc5)*, *Topcon GTS-6 (*.gts6)*, *Topcon FC-6/GTS-7 (*.pnt)*, *Topcon GTS-7 with strings (*.txt)*, *Topcon GT (*.pnt)*, *Topcon GT Finland (*.gt)*, *MOSS GENIO (*.mgn)*, *AutoCAD DXF (*.dxf)*, *AutoCAD Drawing (*.dwg)*, *ESRI Shape (*.shp)*, *TDS Coordinates (*.cr5)*, *LandXML (*.xml)*, *NEZ (*.txt)*, *NEZ with strings (*.txt)*, *CMM (*.cor)*, *MMH360 (*.360)*, *KOF (*.kof)*, *MMH360_Z000 (*.360)*, *Microstation 95/ISFF (*.dgn)*, *MicroStation V8 (*.dgn)*, *SBG Pxy (*.PXY)* or *SBG Geo (*.Geo)*.

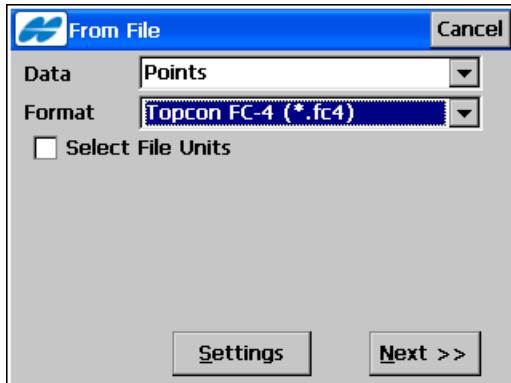


Figure 5-14. Import From File

- **Settings** – opens the *Settings* screen to select the type of the imported points from the drop-down list.
 - *Design Points*: point used as targets for stakeout.
 - *Control Points*: points with coordinates, known from the catalog; used for localization.
- **Next** – opens the **From < name of Format >** screen.
- **Cancel** – closes the screen without saving the settings.

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

Topcon Text Custom

If the *Text Custom* format is selected, the ***From File*** screen (Figure 5-15) has an *ASCII File Properties* field.

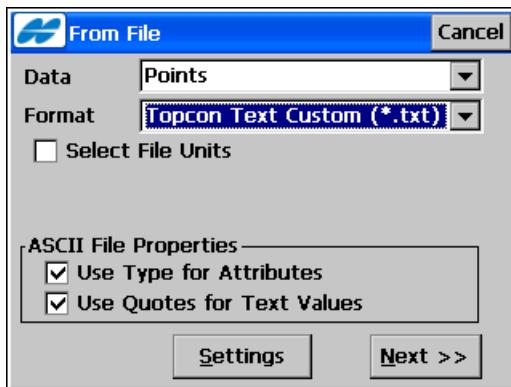


Figure 5-15. Import From Text File

- *ASCII File Properties* – defines the condition of the imported file interpretation. Check and enable *Use Type for Attributes* and *Use Quotes for Text Values* (one or both). These conditions use the same type for the attributes and quotes for the text values (Figure 5-15).

The *ASCII File Properties* field appears for .txt imported files.

- **Settings** – opens the *Settings* screen to select the type of the imported points from the drop-down list.
- **Next** – opens the *From Text Format* screen (Figure 5-16 on page 5-16).
- **Cancel** – closes the screen without saving the settings.

The *From Text Format* screen browses directories from which to select the file to import data (Figure 5-16 on page 5-16).

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

- **Cancel** – closes the screen without saving the settings.

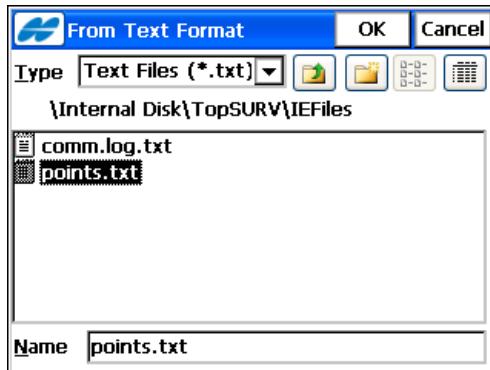


Figure 5-16. Import From Format

The **Text File Format** screen (Figure 5-17 on page 5-17) imports a file of arbitrary text format.

- **Delimiter** – sets the separator symbol between data in the import file; either a *space*, a *comma*, *tabs* or other (select from the list).
- **Header in First Row** – enable if the text file has a header.
- **File Style** – sets the order of fields in the selected file.
- **Delete** – deletes the selected file format.
- **Edit (Format)** – changes the selected file format with the help of the same **Custom Style** screen (see Figure 5-18 on page 5-17).
- **Add (Format)** – creates a new file format with the help of the **Custom Style** screen.
- **Back** – returns to the previous screen.
- **Next** – opens the **Coordinate System** screen (see Figure 5-19 on page 5-18).
- **Finish** – opens the **Import Status** screen and starts the import process (see “Import Status” on page 5-9).

- **Cancel** – closes the screen without saving the settings.

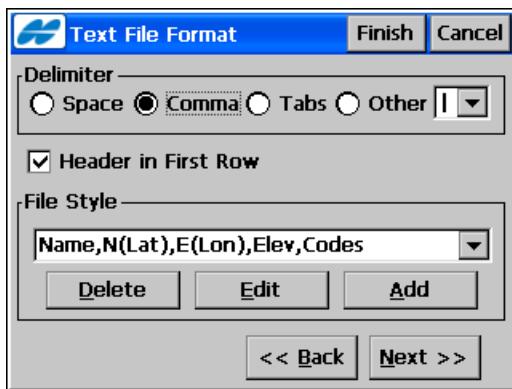


Figure 5-17. Text File Format

On the **Custom Style** screen (Figure 5-18), use the arrows (left and right) to move the parameters you want from the left (*Available* panel) to the right (*Order* panel) of the screen in ascending or descending order.

- **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.



Figure 5-18. Custom Style

On the **Coordinate System** screen (Figure 5-19) select the coordinate system and the coordinate type for the data in the file imported.

- *Coordinate Type* – select either Ground, Datum (Lat/Lon/Ht), Datum (X/Y/Z), WGS84 (Lat/Lon/Ht), or WGS84 (X/Y/Z).

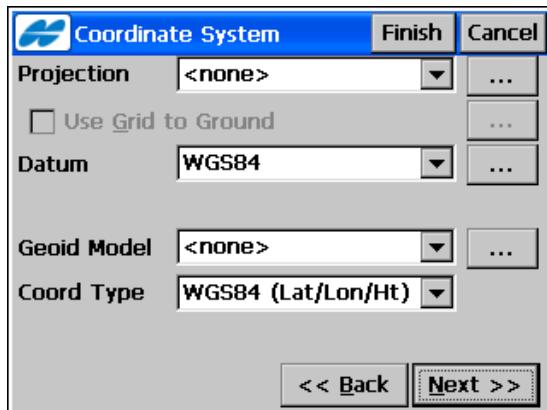


Figure 5-19. Coordinate System

- **Back** – returns to the previous screen.
- **Next** – opens the **File Units** screen if a type of geodetic coordinate is selected (Figure 5-20 on page 5-19).
- **Finish** – opens the **Import Status** screen and starts the import process. See “Import Status” on page 5-9.
- **Cancel** – closes the screen without saving the settings.

On the **File Units** screen (Figure 5-20 on page 5-19), select the format you want to represent the degrees of Latitude and Longitude in the exported file from the drop-down list.

- **Back** – returns to the previous screen.
- **Next** – opens the **Import Status** screen and starts the Export process (Figure 5-20 on page 5-19).
- **Cancel** – closes the screen without saving the settings.

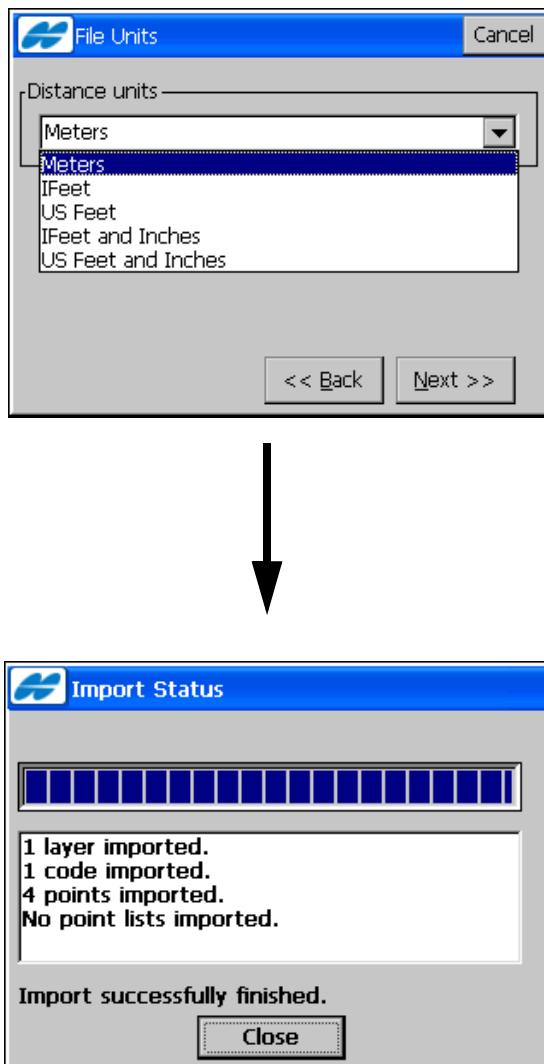


Figure 5-20. Select Latitude/Longitude Format

On the **Import Status** screen (Figure 5-20), tap the **Close** button to return to the main screen.

AutoCAD DXF and AutoCAD Drawing

If the *AutoCAD DXF* or *AutoCAD Drawing* format is selected, the **From File** screen has the following additional options for point import (Figure 5-21 on page 5-20).

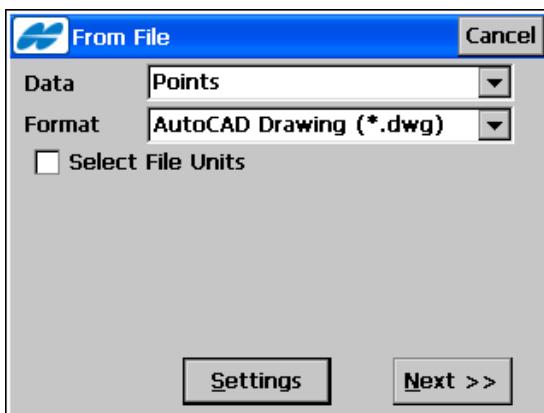


Figure 5-21. AutoCAD DXF



TopSURV only imports AutoCAD 2000 format DWG files.

- **Settings** – opens the *Settings* screen to select point and line styles.
- **Next** – with the help of the import wizard, follow next screens to import points.
- **Cancel** – closes the screen without saving the settings.

TopSURV imports layers from DWG/DXF files, along with the appropriate data types.

On the *Settings* screen (Figure 5-22 on page 5-21), select desired drawing styles to represent points and lines.

- *Import block base points* – enable to import central points in blocks as points.
- *Load as background* – enable to load data as background.

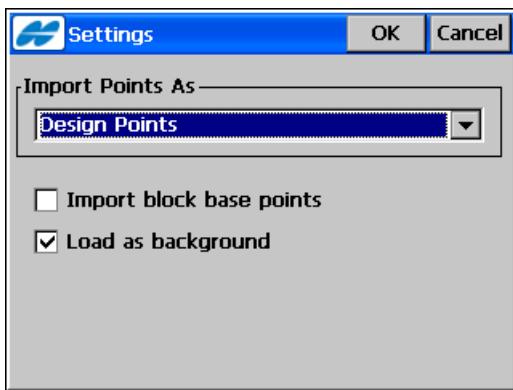


Figure 5-22. Settings Screen

TDS Coordinates

If the *TDS Coordinates* format is selected, the *From File* screen has the following additional option to import points.

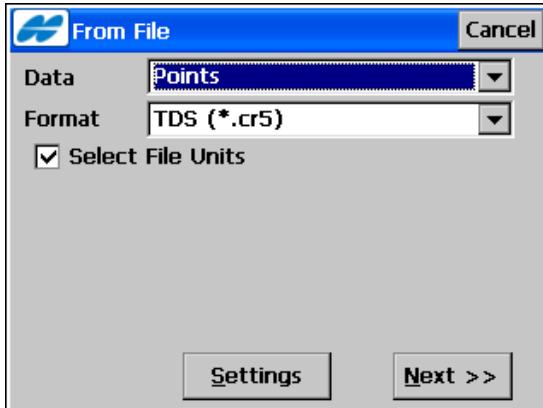


Figure 5-23. From TDS Coordinates

- **Next** – follow next screens with the help of the export wizard.
- **Cancel** – closes the screen without saving the settings.

Lines

For *Lines* data, you can import the following formats:

Topcon Text Custom (.txt)*, *AutoCAD DXF (*.dxf)*, *AutoCAD Drawing (*.dwg)*, *ESRI Shape (*.shp)*, *LandXML (*.xml)*, *KOF (*.kof)*, *Topcon 3D Linework (*.ln3)*, *Microstation 95/ISFF (*.dgn)*, *MicroStation V8 (*.dgn)*, *MX GENIO (*.txt)*, *SBG Pxy (*.PXY)* or *SBG Geo (*.Geo)*.

On the **Edit Line** screen (Figure 5-24), TopSURV linework consists of lines and points, whereas the imported linework contains no points. It includes positions only (names start with a question mark).

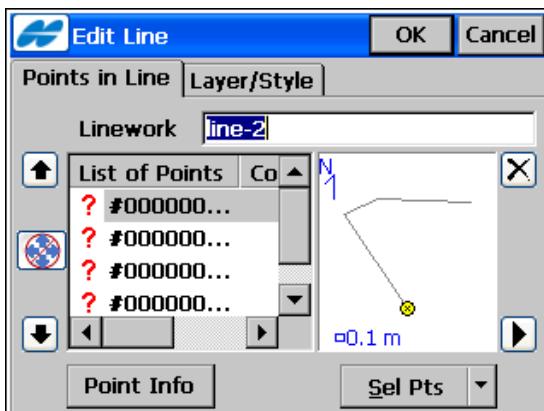


Figure 5-24. Edit Imported Linework

Code Library

For *Code Library* data, you can import the following formats: *Topcon Text (*.tdd)*, *Topcon XML (*.xml)*, or *DBF (*.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.

Horizontal Alignments

For *Horizontal Alignments* data, you can import the following formats: *SSS H. Alignment (*.hal)*, *TopSURV H. Alignment (*.thl)*, *CLIP H. Alignment (*.PLT)*, or *ISPOL H. Alignment (*.ALI)*.

Vertical Alignments

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

X-Section Sets

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

Roads

For Roads data, you can import the following formats:

Land XML (.xml), SSS Road (*.hal; *.val; *.rd), TDS Road (*.rd5), Topcon 3D Road (*.rd3), TopSURVRoad (*.thl; *.tvl; *.trd), CLIP Road (*.PLT; *.ALZ; *.TRV), ISPOL Road (*.ALI; *.RAS; *.SC1), Tekla Roads (*.vgp), MX GENIO Road (*.txt), or SBG Road (*.LIN).*

In TopSURV or TDS Road format, select the desired distance units (Figure 5-25 on page 5-24).

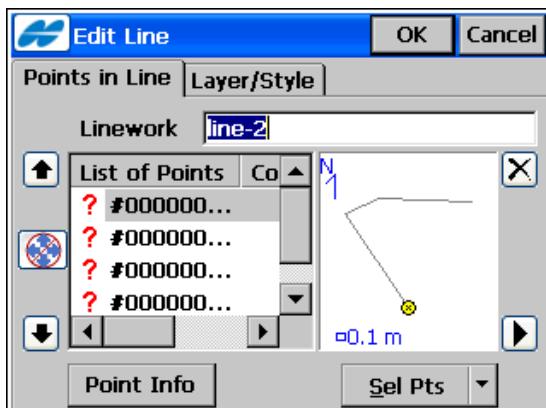


Figure 5-25. Roads from TopSURV Road

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

X-Section Templates

For *X-Section Templates* data (Figure 5-26 on page 5-25), you can import the following formats: *SSS X-Section Templates (*.xtl)*, *TDS X-Section Templates (*.tp5)*, or *TopSURV X-Section Templates (*.xst)*.

When importing from TopSURV or TDS Road format, select the desired distance units after pressing **Next**.

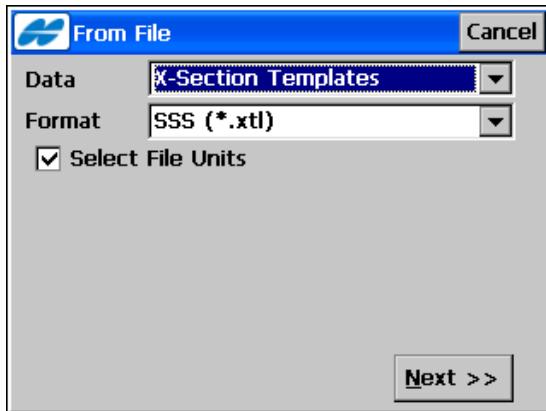


Figure 5-26. X-Section Templates from TopSURV Templates

Localization

For *Localization* data, you can import the following formats: *Topcon 3D (*.gc3)*, *TDS (*.RAW)* and *Trimble DC (*.dc)*, and *Carlson (*.loc)*, which contain coordinates of control points in two coordinate systems. Control Points are imported together with Localization data.

Scanning Data

For *Scanning Data*, all scanning data can be imported from *DI-3000 (*.cmr; *.imc *.csv)*.

TINs

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

When importing from an AutoCAD DXF or Drawing file, tap the **Settings** button to select desired drawing styles to represent points and lines (for detail, see “On the Settings” on page 5-20).

The **OK** button on the **From <Format>** screen opens the **Import Status** screen and starts the import process to save results into TN3 files. The TN3 files will have the same name of the file imported, and will be saved in the DTM directory.

Layer States

For *Layer states* data, you can import the following formats: *Autodesk (*.las)*, *Topcon XML (*.xml)*.

Multiple Data

For Multiple data, you can import the following formats: *Topcon Text Custom (*.txt)*, *AutoCAD DXF (*.dxf)*, *AutoCAD Drawing (*.dwg)*, *ESRI Shape (*.shp)*, *LandXML (*.xml)*, *KOF (*.kof)*, *Microstation 95/ISFF (*.dgn)*, *MicroStation V8 (*.dgn)*, *MX GENIO (*.txt)*, *SBG Pxy (*.PXY)*, or *SBG Geo (*.Geo)*.



TopSURV only imports AutoCAD 2000 format DWG files.

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

For *Land XML* file as an example, select the file from which you want to import data on the **From <Format>** screen and tap the **OK** button.

The **Import Status** screen first opens to retrieve information on the file contents (Figure 5-27 on page 5-27).

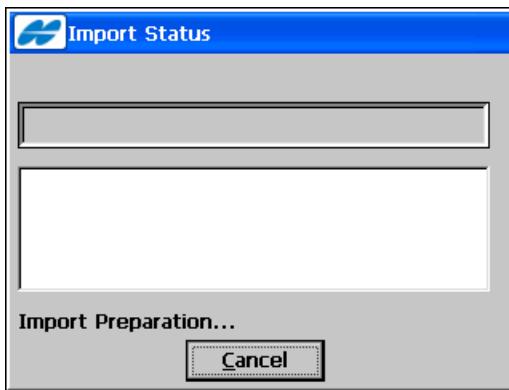


Figure 5-27. Import Preparation

The **Data Selection** screen displays to select desired data types (Figure 5-28).

On the **Data selection** screen (Figure 5-28), select the specific data group from the file to be imported. For *LandXML* as an example, you can select *Point Lists*, *Lines*, *Alignments*, *Codes*, *Surfaces*, *X-Sections* and *Parcels*.

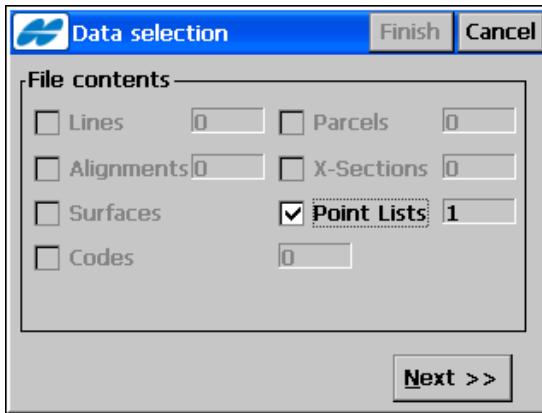


Figure 5-28. Data Selection

- **Next** – if available opens the **Select Data For Import** screen (Figure 5-29 on page 5-28).

The **Next** button becomes active after selection of a data group from the file contents which needs further selection from the list (Point Lists, Alignments, Surfaces and X-Sections).

- **Finish** – starts the import process. This button is not available (grayed out) until the data, not demanding further selection, is chosen and the **Next** button becomes inactive.
- **Cancel** – closes the screen without saving the settings.

On the *Select Data For Import* screen (Figure 5-29), select objects from the list to import. Follow the **Next** button until the **Finish** button appears on the screen.

- **Check** – check marks the highlighted entries.
- **Uncheck** – deselects the highlighted entries in the list.
- **Back** – returns to the previous screen.
- **Next** – tap until the **Finish** button displays on screen.
- **Finish** – opens the *Import Status* screen and starts the import process.
- **Cancel** – closes the screen without saving the settings.

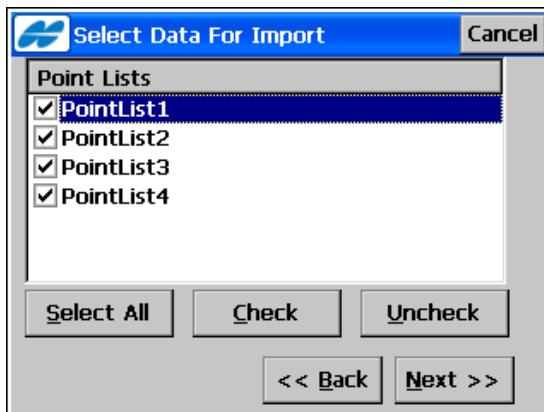
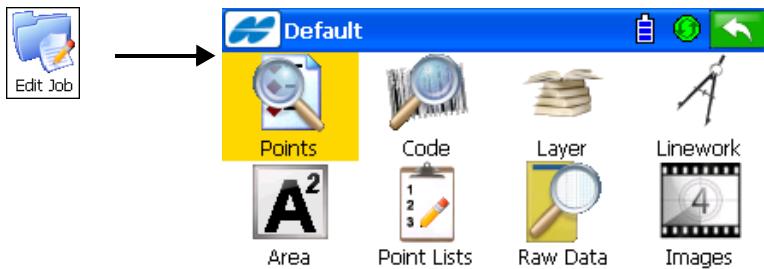


Figure 5-29. Select Data For Import

Editing Job Data

To edit data in a job, tap the **Edit Job** icon in the main menu.

The **Edit Job** menu (Figure 6-1) includes options to edit the following data in the current job: Points, Codes, Layers, Linework, Area, Point Lists, Raw Data, and Images.



Points

Figure 6-1. Edit Job



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

The Help Icon opens a pop-up menu, giving access to the help files, menu interface selection, keyboard activation and information about TopSURV. (for details see “Help Icon’s Pop-up Menu” on page 1-7).



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

Points

To edit points, tap the **Points** icon. The **Points** screen contains the list of stored points with coordinates and codes, and a set of tools for database operation (Figure 6-2).

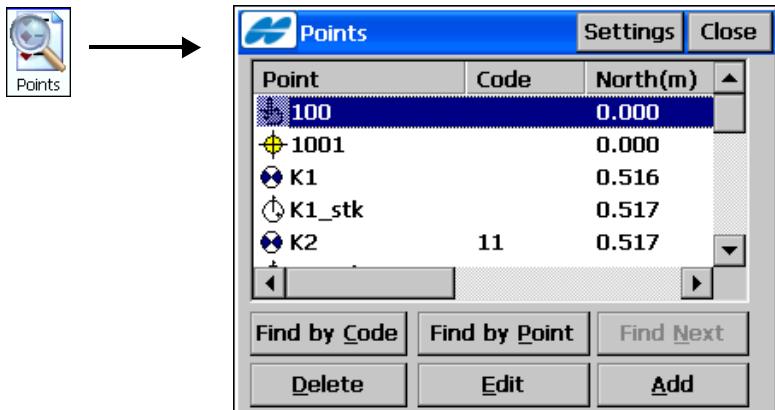


Figure 6-2. Points

In the Point column, an icon displays the point type (Table 6-1):

Table 6-1. Points Icons

Point Icon	Point Type
TS observed	
control	
design or imported	
staked out	
TS scanned point	
cogo	
manually entered	

- **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) to perform a search.
- **Find Next** – finds next point that satisfies the same conditions as the previously found point.
- **Delete** – deletes the point from the list.
- **Edit** – opens the *Edit Point* screen to edit the point parameters: *name, code, coordinates* and/or other parameters stored with the point.
- **Add** – opens the *Add Point* screen to create a new point.

The *Help* Icon in the upper-left corner of the screen displays the pop-up menu containing the following items:

- *PTL Mode* – switches on the PTL (Point-To-Line) Mode. (The screen changes its appearance on **PTL Points**). For details, see “*PTL Point*” on page 6-12.
- *Show Scan Points* – switches on the scan points displaying function.
- *Show AutoTopo Points* – switches on the AutoTopo points displaying function.
- *Recompute* – recomputes the point coordinates after editing the point’s raw data (if the recomputation was not performed in Raw Data).
- *Help* – accesses the Help files.
- **Settings** – opens the *Display* screen (Figure 6-3 on page 6-4).

Display Settings

On the **Display** screen (Figure 6-3) select the display parameters to customize the software interface, then press **OK** to save the settings and return to the **Points** screen.

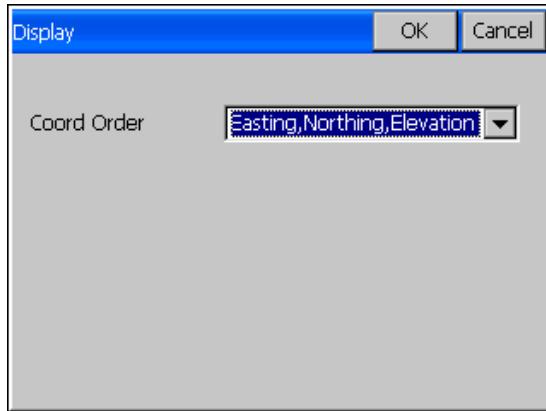


Figure 6-3. Display

For details on the display settings, see “Display” on page 3-28.

Finding Point by Name

The **Find by Point** screen (Figure 6-4 on page 6-5) contains settings for searching for a point by its name.

- *Point* – the name of a point or a part of the name.
- *Match entire name* – set if the whole name was entered in the *Point Name* field.

- *Match partial name* – set if a part of the searched name was entered in the *Point* field.

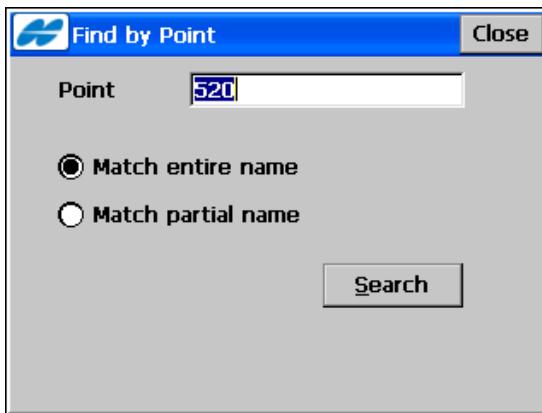


Figure 6-4. Find by Point Name

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

Finding Point by Code

The *Find by Code* screen (Figure 6-5) searches for point information by its code.

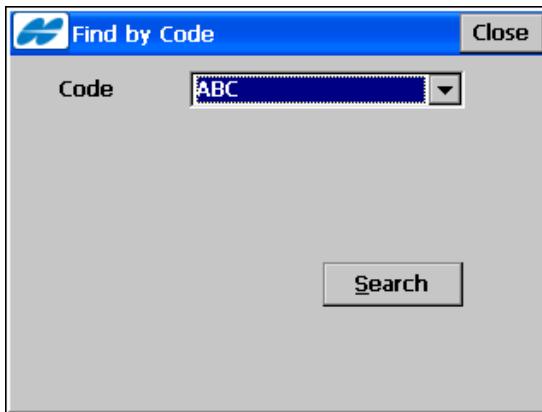


Figure 6-5. Find by Code

- *Code* – select a code from the drop-down list.

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

Editing a Point

The *Edit Point* screen (Figure 6-6) shows the properties of a point to edit.

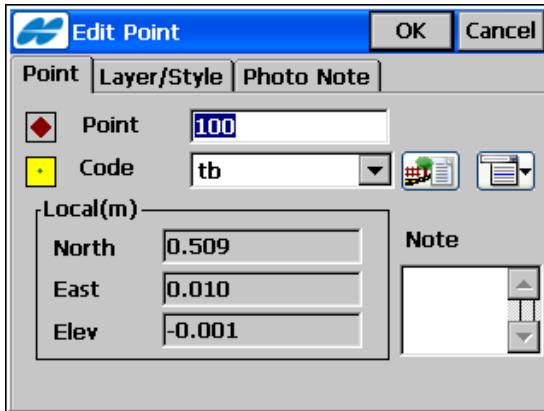


Figure 6-6. Add/Edit Point

Edit Point Information

On the *Edit Point* screen (Figure 6-6), tap the *Point* tab and edit the following fields:

- *Point* – enter the name of the point.
- *Code* – enter a code for the point, either manually or from the drop-down list.
The lower field, marked by the sign, is intended for entering a string for a Code Type of Line or Area.
- – the *Attributes List* icon, opens the *Point Attributes* screen to set the code and attributes available for the code chosen (Figure 6-7 on page 6-7).
- The icon next to the *Attributes List* icon displays the pop-up menu containing two items:

- *Layer*: opens the **Select Layer** screen (see “On the Select Layer” on page 6-10).
 - *Note*: opens the **Note** screen.
 - *Local(m)* – the field for the coordinates of the point in the current coordinate system (the field name changes with the coordinate type selection).
 - *Note* – enter any additional information about the point (if preferred).
 - **OK** – saves the changes and returns to the **Points** screen.
- Points that have no codes, or have codes, but no strings associated with the codes, are simply stored as points.

On the **Point Attributes** screen (Figure 6-7), you can set a code, control code, string and attributes’ values for the point on the *Code Attributes* tab.

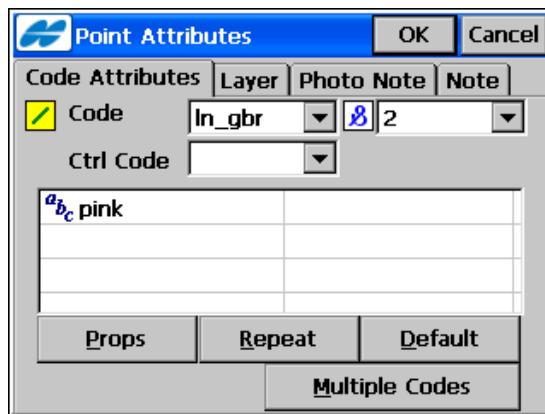


Figure 6-7. Point Attributes

- *Code* – select a code. By default, the lower panel shows the control code list available for a Code Type of Line or Area. The Control Code is a special type of code that is used by the graphic tool for the interpretation of survey results.

The supported control codes (*AS*, *AE*, *C*, *R*) control line behavior when creating arcs, closure of lines, and rectangles respectively. The *AS* control code indicates the start of an arc, and the *AE* control code indicates the end of the arc. *Arc* parameters are determined using additional points in the line.

TopSURV will not use this linework package if the *Allow Custom Control Code* box on the **Global** screen is check marked. In this case, the user can enter any string to mark it as a control code. TopSURV will not interpret these control codes.

- The field, marked by the  sign is intended for entering a string to generate a line for a Code Type of Line or Area. Code Type is set when editing the code.
- The lower panel shows the available attributes. Tap on the attribute to display a field to enter its value.
- **Props** – opens the **Attribute Ranges** screen (Figure 6-8 on page 6-9) to view the ranges for the attributes.
- **Repeat** – erases the entered values.
- **Default** – sets default values.
- **Multiple Codes** – opens the **Point Attributes** screen with multiple codes to edit (Figure 6-9 on page 6-9).
- **OK** – saves the changes and returns to the **Edit (Add) Point** screen. The program displays a message prompt if the attribute value is not within the range specified.

The *Help* icon in the upper-left corner of the screen displays the pop-up menu containing three items:

- *Show Second Ctrl Code*: switches on the field to enter another control code.
- *Help*: accesses the Help files

On the **Attribute Ranges** screen (Figure 6-8 on page 6-9), you can view the ranges for the attributes.

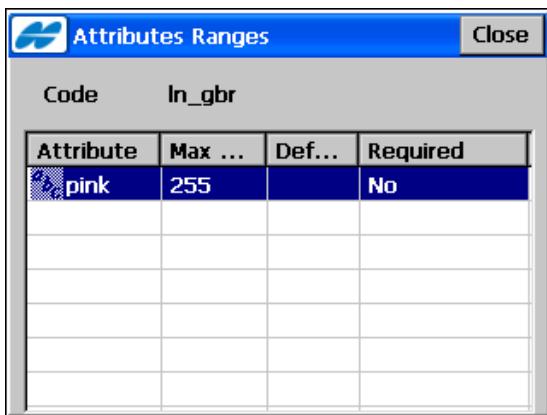


Figure 6-8. Attribute Range

Attributes can only be added on the ***Code-Attributes*** screen (Figure 6-16 on page 6-15).

On the ***Point Attributes***, screen (Figure 6-9), tap the Multiple Codes tab. You can edit multiple codes and strings. Multiple codes and strings associated with a point make the point a part of numerous lines.

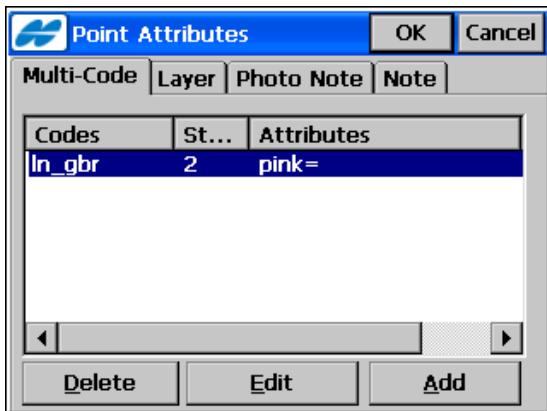


Figure 6-9. Multiple Code-Attributes

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

- **Edit** – opens the **Codes-Attributes** screen to edit the selected code.
- **Add** – creates a new code through the **Code-Attributes** screen.
- **OK** – saves the settings and returns to the **Edit Point** screen.
- **Cancel** – closes the screen without saving the settings.

On the **Select Layer** screen (Figure 6-10), select the layer in which to locate the point.

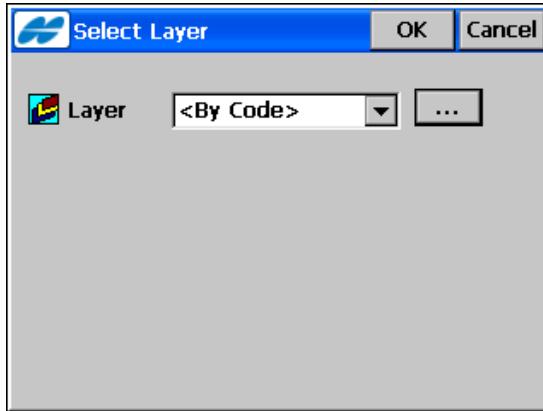


Figure 6-10. Select Layer

- The **List** button opens the **Layers** screen to edit layers. (For details on editing layers, see “Edit Layers” on page 6-21.)
- **OK** – saves the settings and returns to the **Edit Point** screen.
- **Cancel** – closes the screen without saving the settings.

Layer and Style

On the **Edit Point** screen, you can change the layer and graphic properties of the point (Figure 6-11 on page 6-11):

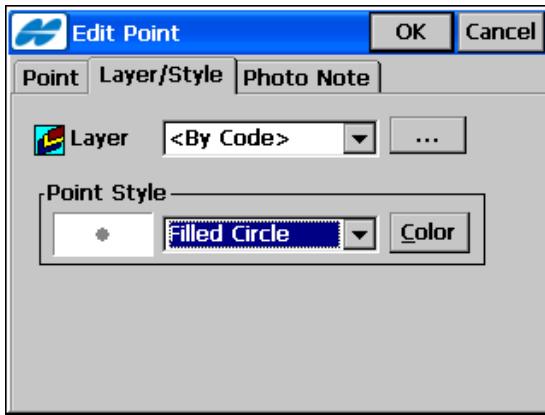


Figure 6-11. Add/Edit Point – Layer/Style Tab

Tap the *Layer/Style* tab to change the layer and graphic properties of the point:

- **Layer** – selects the layer to locate the point.
- The List button opens the **Layers** screen to edit layers. (For details on editing layers, see “Edit Layers” on page 6-21.)
- **Point Style** – select a point style from the drop-down list. The box to the left shows the style to designate the point on the map.
- **Color** – opens the **Select Color** screen (see “On the Select Color” on page 6-11) to edit the color you desire.

On the **Select Color** screen (Figure 6-12), set the color of the point mark to show on the map.

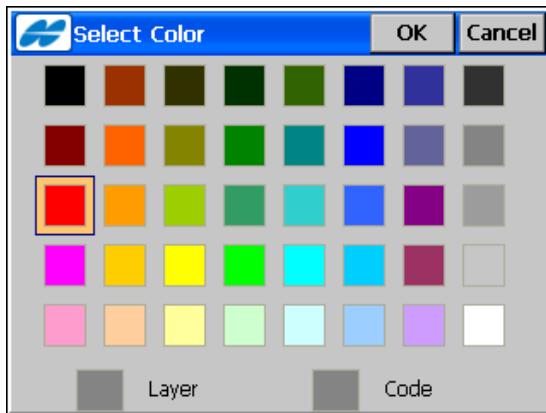


Figure 6-12. Select Color

Tap in the area of the color you want. You can select the color of the point for either the *Layer* or the *Code* by highlighting the *Layer* or *Code* node on the screen (Figure 6-12).

PTL Point

In PTL Mode, the *PTL* tab displays on the **Edit Point** screen with the following parameters (Figure 6-13 on page 6-13).

- *Start Ref Pt, End Ref Pt* – selects reference points, either from the map, from the list, or when entered manually.
- *PTL Offsets* – the offsets from the reference line formed by the reference points:
 - *Line*: the distance from the start of the reference point along the reference line, where the perpendicular to this line passes through the target.
 - *Offset*: the horizontal distance from the target.
- *Elev* – the height of the target.

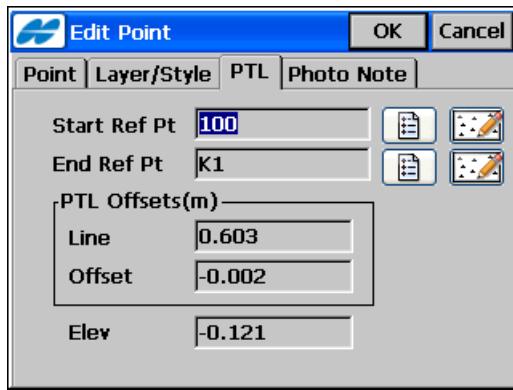


Figure 6-13. Edit Point (PTL)

Photo Note

The *Photo Note* tab on the **Edit Point** screen displays a photo note—a picture of the situation at the point—if a picture has been taken and added (using the **Add** button) (Figure 6-14).

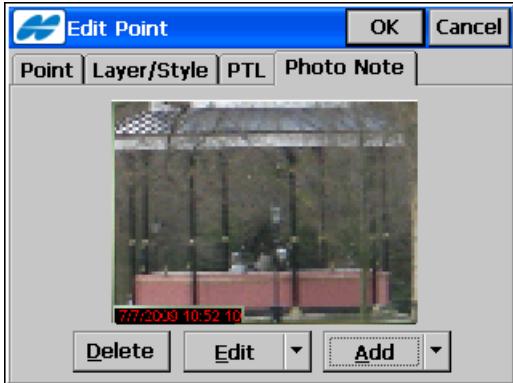


Figure 6-14. Add/Edit Point – Photo Note Tab

- **Delete** – erases the picture for the point.
- **Add** – opens the *Select Image File* screen to browse for the picture to attach.

Check Points

The *Check Points* tab appears on the **Edit Point** screen if the point has duplicate points and these points are saved as check points (Figure 6-15).

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

Name	dN	dE	dH
K1	0.086	0.307	0.008
K1	0.087	0.299	0.008

Figure 6-15. Edit Point – Check Points

Codes

To edit codes and attributes, tap the **Code** icon. The **Code-Attributes** screen displays (Figure 6-16).

The **Code-Attributes** screen (Figure 6-16) contains a list of codes used for a survey, the list of attributes for each code, and a set of tools

for editing the codes and attributes. Codes already in use cannot be edited or deleted.

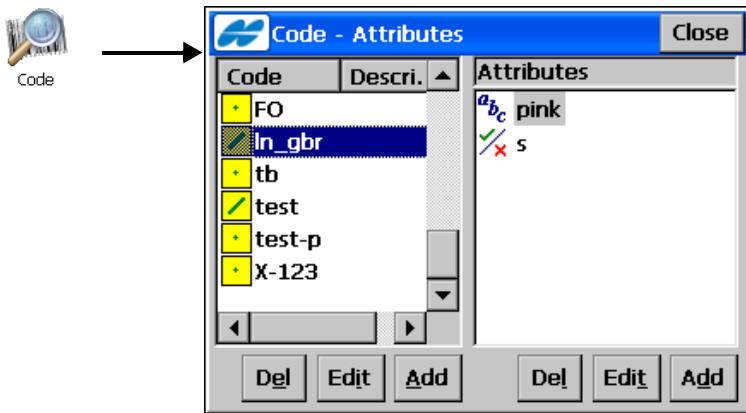


Figure 6-16. Code – Attributes

- **Code** – contain a list of codes with their associated icons:
■ Point, ■ Line, or ■ Area.
- **Attributes** – contains a list of attributes for the selected code.
- **Del** – deletes the highlighted entry.
- **Edit** – opens the applicable **Code** (Figure 6-18 on page 6-17) or **Attribute** (Figure 6-21 on page 6-19) screen with the properties of the highlighted entry.
- **Add** – opens the applicable blank **Code** or the **Attribute** screen. A new attribute can be added if at least one code exists and is highlighted.
- The **Help** Icon in the upper-left corner of the screen opens the pop-up menu containing the *Export To File* option. The **To File** screen (Figure 6-17) displays to export the code library to the selected file format.

On the **To File** screen (Figure 6-17) select the file format from which to export codes of the current job. The **Next** button runs the export process.

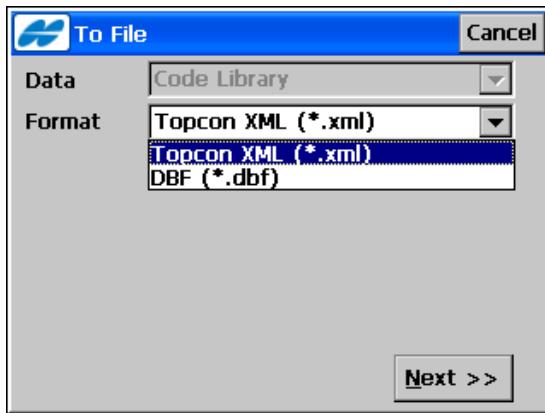


Figure 6-17. Export to Code Library

Edit Code

On the **Code** screen (Figure 6-18 on page 6-17), set the following code parameters:

- *Name* – the name of the code.
- *Desc* – the description for the code.
- *Type* – the type of objects the code describes: *Point*, *Line* or *Area*. A Code Style of Point, Line, or Area can be edited. Each style has an associated plotting attributes and colors.
 - *Point*: when *Point* is selected in the *Type* field, color and symbol attributes for the point displays (Figure 6-18 on page 6-17). The **Color** button opens the **Color** screen (see “On the Select Color” on page 6-11).
 - *Line*: when *Line* is selected in the *Type* field, color, symbol for node, style, and thickness for line attributes display (Figure 6-19 on page 6-17).
 - *Area*: when *Area* is selected in the *Type* field, color, symbol for node, style and thickness for boundary, fill color, fill style

and transparency attributes display on the *Area* tab (Figure 6-20 on page 6-18).

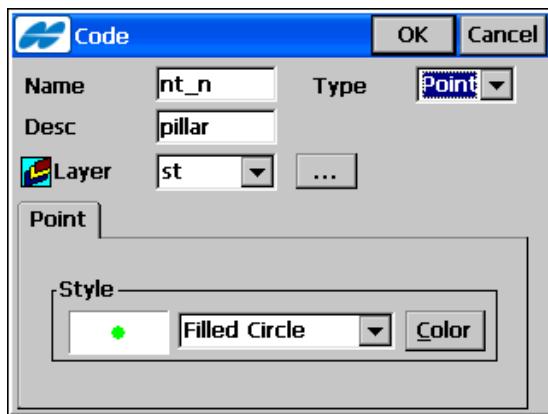


Figure 6-18. Edit Code - Point Type

- *Layer* – the name of the layer in which the code resides.
- The **List** [...] button opens the *Layers* screen to edit layers. (For details on editing layers, see “Edit Layers” on page 6-21.)

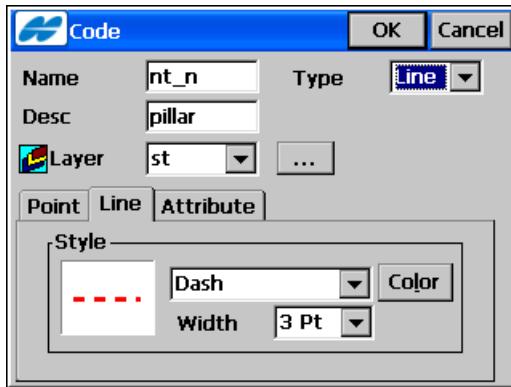


Figure 6-19. Edit Code - Line Type

- *Attribute* – the radio buttons selected on this tab determine whether the prompt for code should be at the beginning of a line/area (*Start*) or at every point along the line/area (*Each Node*).

- **OK** – saves the changes, closes the screen, and returns to the **Code-Attributes** screen.

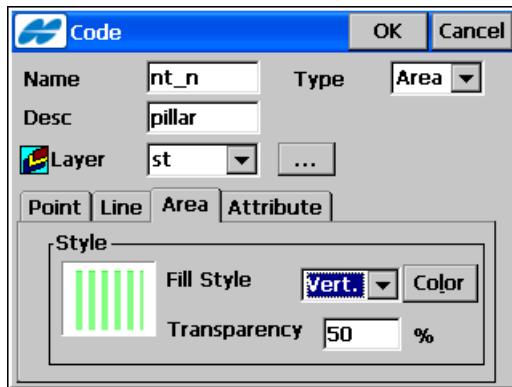


Figure 6-20. Edit Code - Area Type

Edit Attributes

On the **Attributes** screen, you can set attributes for the code selected on the **Code-Attributes** screen (Figure 6-16 on page 6-15). This screen sets different parameters depending on the attribute type chosen from the **Type** drop-down menu: *Bool* (*boolean* with default *True or False*), *Date-Time*, *Integer*, *Menu*, *Real Number* or *Text*.

For **Date-Time** type, use the default (current date) and time for the code attribute or set the date and time from the drop-down list (Figure 6-21).

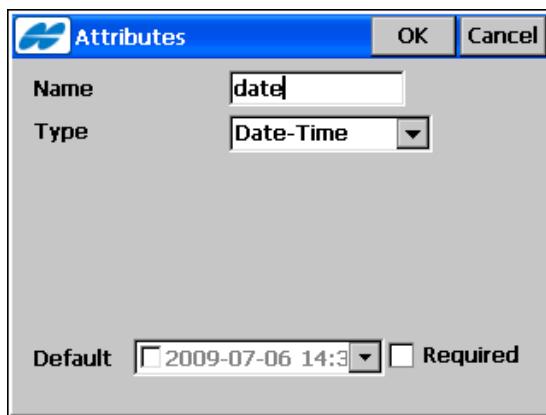


Figure 6-21. Date-Time Attribute

- *Attribute Name* – the name of the code attribute.
- *Required* – enable to always use the default value with the code attribute.
- **OK** – saves the changes, closes the screen and returns to the *Code-Attributes* screen.

For **Integer** type, the attribute value is an integer. Enter the minimum and maximum values of the attribute (Figure 6-22).

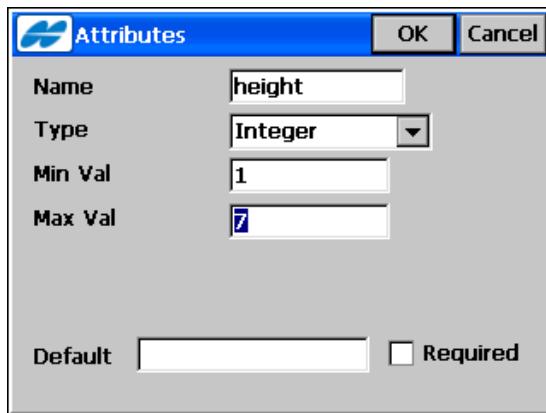


Figure 6-22. Integer Attribute

For **Menu** type, the attribute value is selected only from a list of available values (Figure 6-23).

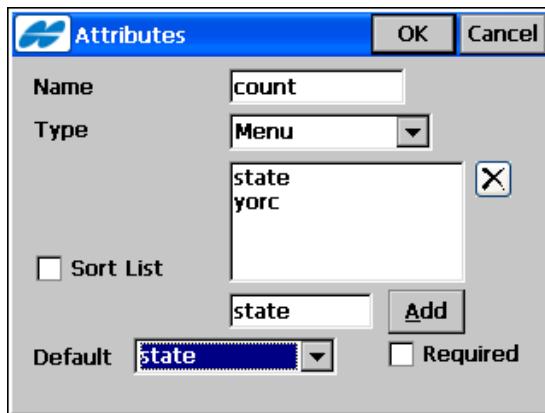


Figure 6-23. Menu Attribute

- **Add** – adds admissible values entered in the *Add* entry field.
- *Sort List* – enable to arrange the list in alphabetical order.
- **Delete** – deletes the selected entry from the menu.

For **Real Number** type, the attribute value is a real number. Enter the minimum and maximum values of the attribute (Figure 6-24).

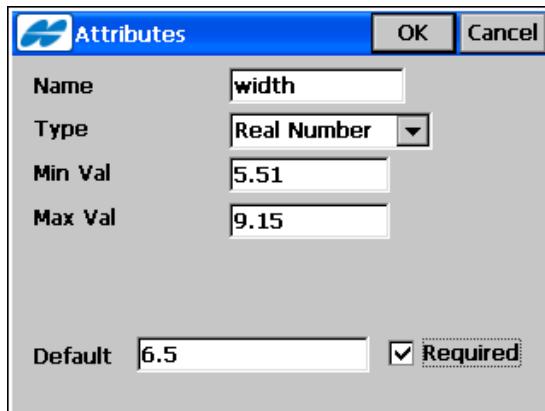


Figure 6-24. Real Number Attribute

For **Text** type, the attribute value is an alpha-numeric string. Enter the number of characters available for the text value (Figure 6-25).

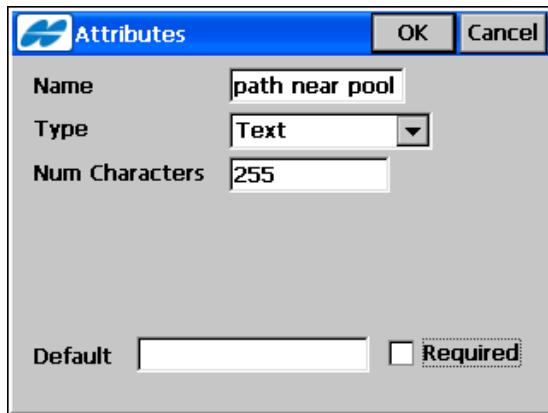


Figure 6-25. Text Attribute

Edit Layers

To edit layers, tap the **Layers** icon.

The **Layers** screen (Figure 6-26) displays the list of all existing layers in the current job and the layer status of each.

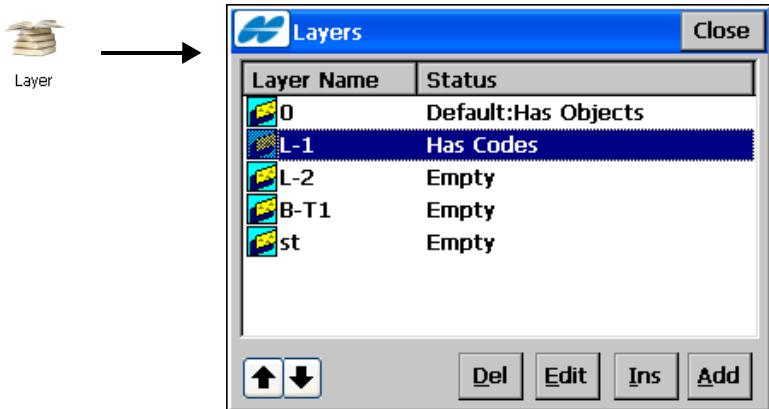


Figure 6-26. Select Layer

- *Layer Name* – a list of Layers. Each layer has an icon to show whether the layer is unhidden () or hidden (). To turn on/off the visibility of the selected Layer, tap on the Layer Name column header.
- *Status* – shows whether the layer is empty or contains objects.
- – moves the highlighted layer up or down.
- **Del** – deletes the highlighted layer.
- **Edit** – opens the applicable **Edit Layer** screen to display the properties of the highlighted layer (Figure 6-27 on page 6-23).
- **Ins** – opens the **Add Layer** screen to insert a new layer below the selected layer.
- **Add** – opens the **Add Layer** screen to add a new layer.
- **Close** – closes the screen without saving the changes.

The Help Icon in the upper-left corner of the screen displays a pop-up *Help* menu.

View Objects on the Layer

The **Edit Layer** screen (Figure 6-27) is similar to the **Add Layer** screen but has the additional *Objects* tab to view objects on the layer.

Layer Name

The *Layer* tab contains general settings. You can edit the following to set new parameters for the layer:

- *Layer Name* – shows the name of the layer.
- *Visible* – hides/shows the layer objects on the map.
- *Note* – enter any additional information on the layer (if preferred).
- **OK** – saves the settings and returns to the **Layers** screen.

- **Cancel** – closes the screen without saving the changes.

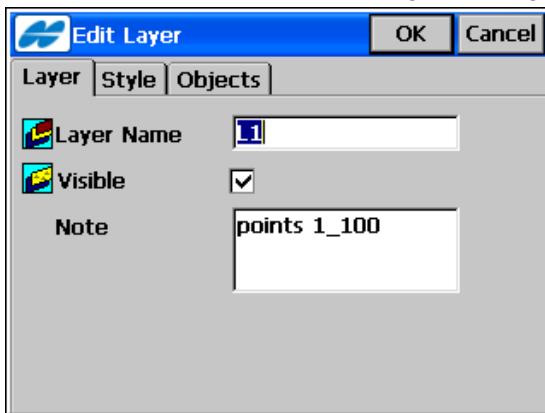


Figure 6-27. Edit Layer Name

Style Tab

The *Style* tab plots parameters for lines and points on the layer. Do the following to set parameters for the lines and points on the layer (Figure 6-28 on page 6-24).

- *Point Style* – selects a color and a symbol for the Point.
- *Line Style* – selects a color, a style, and thickness for Line.
- *Area Style* – selects a fill color, a fill style and transparency for the Area.

- **Color** – opens the *Select Color* screen to set the color for the layer (see Figure 6-12 on page 6-12).

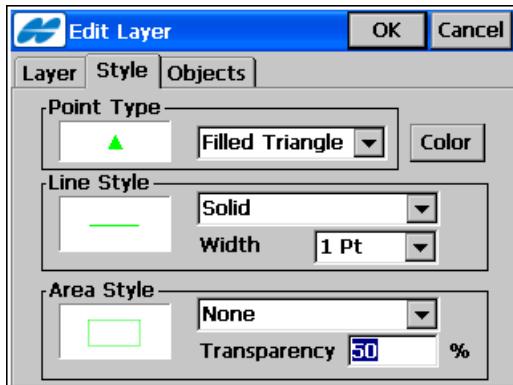


Figure 6-28. Edit Layer Style

Objects Tab

If the layer has objects, the *Objects* tab (Figure 6-29 on page 6-24) on the **Edit Layer** screen appears that displays points and other objects of the current layer.

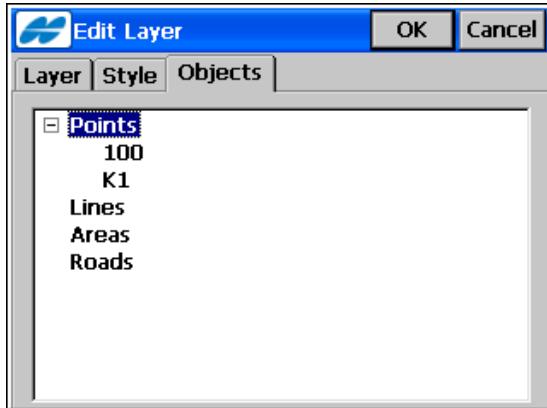


Figure 6-29. Edit Layer Objects

Edit Multiple Layers

To turn on/off the visibility of multiple layers at a time, select the layers you want using the following procedure.

Press {FUNC CTRL} on the instrument to display the Status bar.

Tap  to display the Input Panel. Tap and hold **Ctl/Shift** on the input panel and select the desired layers.

The *Status* column shows the status of the layer.

Linework

Linework is a group of points connected with a line. Points defined by the same code-string combination automatically form a linework.

To edit a linework, tap the **Linework** icon.

The **Linework** screen (Figure 6-30) contains a list of existing Lineworks on the left side of the screen, and the two windows on the right side that represent the view of the selected linework in the horizontal and vertical planes (Figure 6-30).

- **Delete** – press to delete the Linework from the list.
- **Edit** – opens the applicable **Edit Line** screen (Figure 6-31 on page 6-27).
- **Add** – opens a blank **Add Line** screen to create a new linework.
The Linework can be created in four ways: by either selecting the

points with the desired codes and strings, by tapping the points on the map, or by selecting the points from the list.

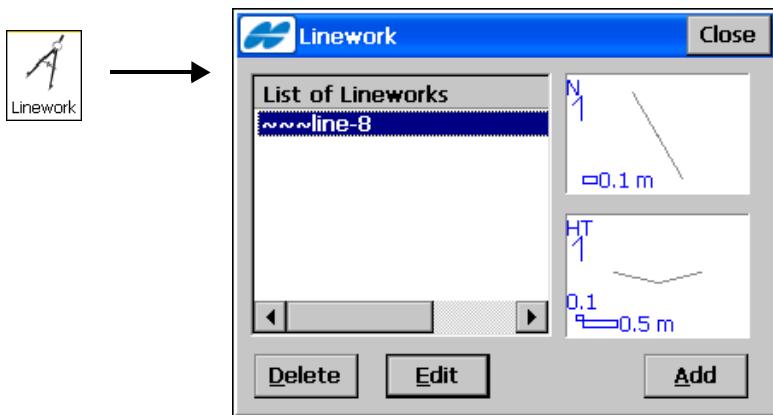


Figure 6-30. Linework

- **Close** – closes the screen without saving the settings.

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

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

- *Edit Points* – displays the **Points** screen. For details, see “Points” on page 6-2.
- *Help* – accesses the Help files.

Edit Line

On the **Edit Line** screen (Figure 6-31), you can edit the points and the layer of the selected linework.

Points in Line

The *Point in Line* tab displays a list of existing points in the selected Linework on the left side of the screen, and the general view of the linework on the right side (Figure 6-31).

The hand symbol on the plot indicates the point highlighted in the list

of points. To view the current selected linework on a large map, tap on the map plot.

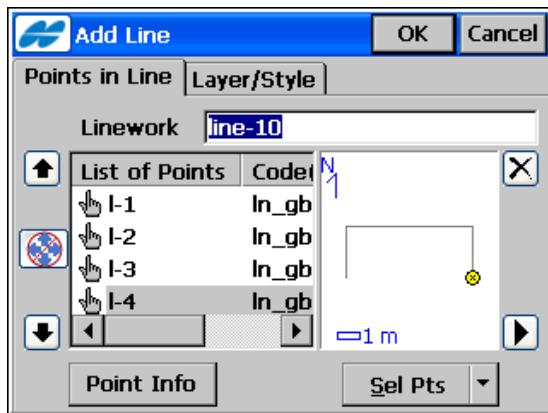


Figure 6-31. Edit Points in Line

- *Linework* – the name of the Linework.
- *List of Points/Code(s)* – points and their codes (if any) in the selected linework.
- The up and down arrows to the left of List of Points move the highlighted point up or down in the order of the points in the linework.
- – toggles on/off the keyboard arrow keys that duplicate the arrows on the screen.
- – deletes the highlighted point from the linework.
- – closes the plot of the point list. Only the list of points table will be available.
- **Point Info** – displays information on the selected point.
- **Sel Pts** – displays a floating menu of four items. Select one of the following methods of adding points to the beginning of the line:
 - *By Code*: select the codes with which the points are added to the line.
 - *By Code String*: select the codes and strings with which the points are added to the line.

- *From Map*: select the points by tapping them on the map; points that are sequentially tapped are connected with a line.
- *From List*: select the points from the drop-down list.

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

- *Edit Points* – displays the **Points** screen. For details see “*Points*” on page 6-2.
- *Help* – accesses the Help files.

Layer/Style

On the **Edit Line** screen (Figure 6-32), tap the *Layer/Style* tab to set a type and a color to display the line in the selected Linework on the map.

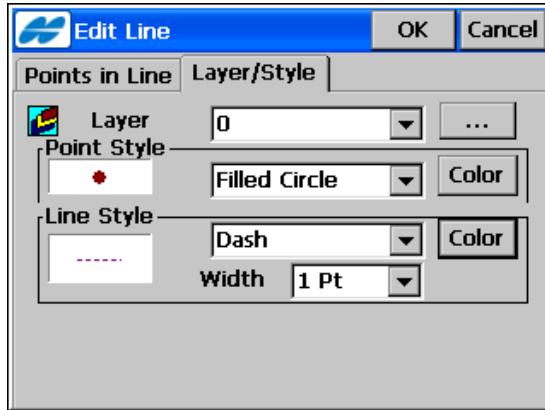


Figure 6-32. Edit Line Layer

- **Layer** – selects the layer for the line from the drop-down list.
- **Line Style** – selects the form and width of the line from the drop-down lists and shows the result.
- **Color** – opens the **Select Color** screen (see “*On the Select Color*” on page 6-11) to choose the color for the line.
- The **List** [...] icon opens the **Layers** screen to edit layers. (For details on editing layers, see “*Edit Layers*” on page 6-21.)

Area

Area is bound with a closed line. Line nodes (points) have the same code of area type to form an area boundary.

To edit an area, tap the **Area** icon.

The **Area** screen (Figure 6-33 on page 6-29) contains a list of existing areas on the left side of the screen, and the two windows on the right side that represent the view of the selected area in the horizontal and vertical planes.

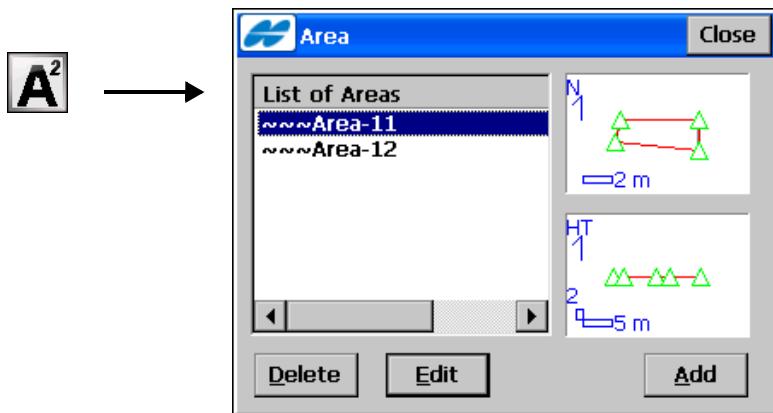


Figure 6-33. Area Screen

- **Delete** – press to delete the highlighted Area from the list.
- **Edit** – opens the applicable **Edit Area** screen (Figure 6-34 on page 6-30).
- **Add** – opens a blank **Add Area** screen to create a new area. The Area can be created in five ways: by selecting the points with the desired codes or code strings, by selecting the points from the list or from a line, by tapping the points on the map.

To view the current selected area in a larger map, tap one of the map plots.

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

- *Edit Points* – displays the **Points** screen. For details, see “Points” on page 6-2.
- *Help* – accesses the Help files.

Edit Area

On the **Edit Area** screen (Figure 6-34 on page 6-30), you can edit the name, the points, and the layer of the selected area.

Points in Area

The **Points in Area** tab displays a list of existing points (*Area Name*) in the selected Area on the left side of the screen (Figure 6-34), and the general view of the area lines on the right side.

The point highlighted in the list of points will be marked with a yellow circle. The **Point Info** button displays information on the selected point.

To view the current selected area on a large map, tap on the map plot.

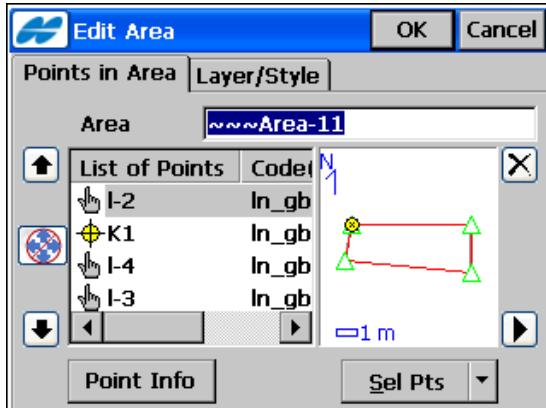


Figure 6-34. Edit Points in Area

Edit a Layer/Style

On the **Edit Area** screen, tap the *Layer/Style* tab to edit a style and color to display the points, lines and area in the selected Area on the map (Figure 6-35 on page 6-31).

- *Layer* – selects the layer for the line from the drop-down list.

- The **List** [...] icon opens the **Layers** screen to edit layers. (For details on editing layers, see “Edit Layers” on page 6-21.)
- Point Style** – selects the color and the symbol for the Point. **Color** opens the **Select Color** screen (see “On the Select Color” on page 6-11) to choose the fill color for the point.
- Line Style** – selects color, style and thickness for Line.
- Area Style** – selects fill color, fill style and transparency for Area.

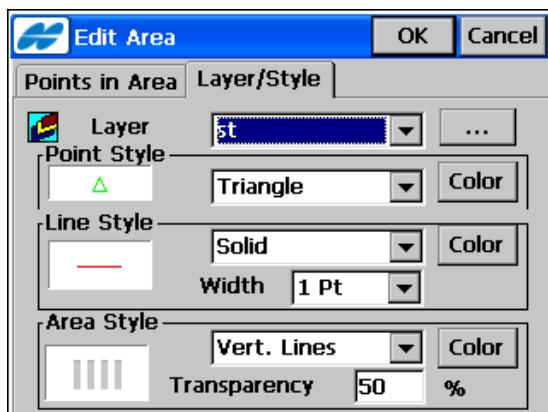


Figure 6-35. Edit Area Layer/Style

Point Lists

The Point List is a group of points that can be simultaneously processed and is tightly integrated throughout TopSURV. Depending on the context, the points may or may not be connected with a line. A Point List with its points connected forms a polyline.

To use the Point Lists, tap the **Point Lists** icon. The **List of Point Lists** screen displays (Figure 6-36).

List of Point Lists

The **List of Pt Lists** screen (Figure 6-36 on page 6-32) contains a list of existing Point Lists on the left side of the screen, and the two

windows on the right side, that displays a general view of the selected list in the horizontal and vertical planes. To view the current selected point list on a larger map, double-click one of the map plots.

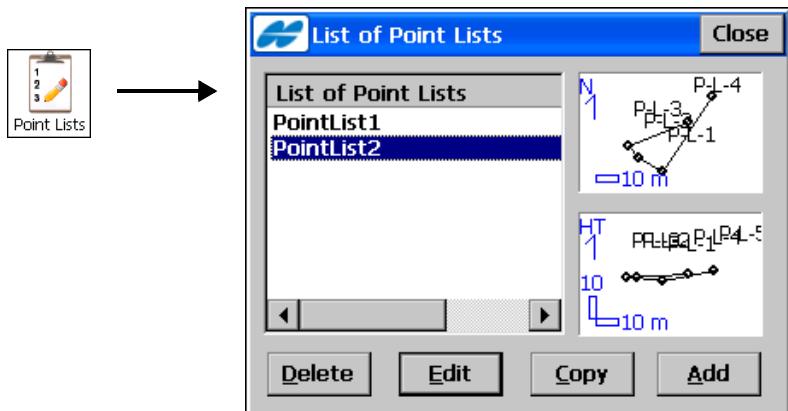


Figure 6-36. List of Point Lists

- **Delete** – deletes the Point List from the list.
- **Copy** – creates a copy of the selected List.
- **Edit** – edits the properties of the selected List. The **Edit Point List** screen displays (Figure 6-37 on page 6-33).
- **Add** – creates a new point List. The **Add Point List** screen displays.
- The Help Icon in the upper-left corner of the screen displays the pop-up menu containing two items:
 - *Edit Points*: displays the **Points** screen. For details, see “Points” on page 6-2.
 - *Help*: accesses the Help files.

Edit Point List

The **Edit Point List** screen (Figure 6-37 on page 6-33) is similar to the **Add Point List** screen.

The **Point List** tab displays the points included in the list to edit.

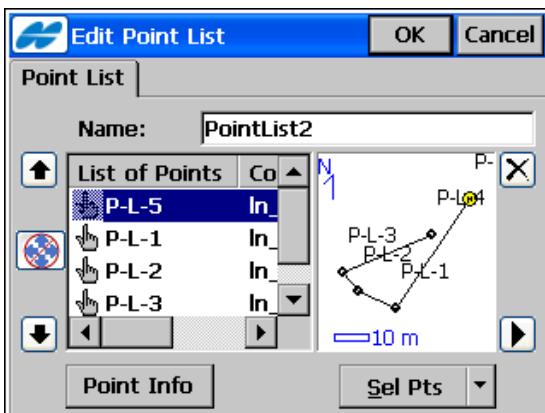


Figure 6-37. Edit Point List

- **Point List Name** – the name of the Point List.
- **List of Points** – the list of currently selected points. Use the up and down arrows to the left to select a point. Adding a point to the list can be performed in two ways.
 - Tap the map plot on the right: The large **Map** screen opens (for details on the screen icons, see “Points” on page 6-2). Select the points by tapping them on the map; the two sequentially tapped points are connected with a line. Press **Close** to return to the **Edit Point List** screen.
 - **Sel Pts**: displays the seven methods of adding points: select either *By Range*, *By Code*, *By CodeString*, *By Radius*, *From Map*, *From List*, or *From Layer*. Enter in this sequence: set the range, check the codes, set the center point and the radius of the area, then select the points from the map or use the list.
- **Point Info** – shows the point information of the currently selected single point.
- – toggles 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 is available.
- The *Help* Icon in the upper-left corner of the screen displays the pop-up menu containing two items:
 - *Edit Points*: displays the **Points** screen. For details see “Points” on page 6-2.
 - *Help*: accesses the Help files.

Raw Data

To edit raw data, tap the **Raw Data** icon.

The **Raw Data** screen has the following columns and buttons.

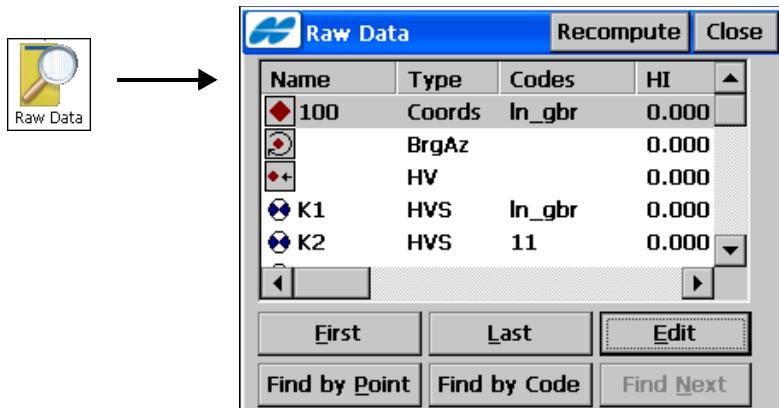


Figure 6-38. Raw Data - TS

- *Name* – point name and the icon displaying the type of point
- *Type* – the type of measurement
- *Codes* – codes for the point
- *HR* – for TS mode, 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 **Help** Icon in the upper-left corner of the screen enables the menu of four items:
 - *Job Info*: displays the **Job Info** screen (For details, see “Viewing Job Information” on page 2-6).
 - *Show Raw GPS+/TS*: toggles between displaying GPS+ raw data and TS raw data.
 - *Help*: accesses the Help files.

Edit Raw Data

The **Edit Raw Data** screen (Figure 6-39 on page 6-36) is used to edit the name and code of the surveyed point, and the instrument height at this point.

The title of the first tab is the survey type for the point being edited.

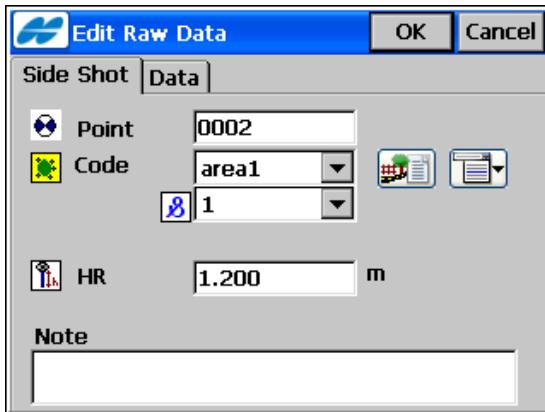


Figure 6-39. Edit Raw Data

The *Data* tab (Figure 6-40) displays information on measurements:

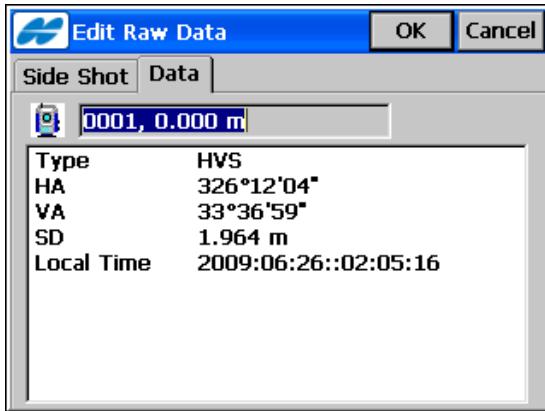


Figure 6-40. Edit Raw Data – Data Tab

Background Images

To edit background images in the current job, tap the **Images** icon.

Any raster image with a TIF, JPG, or BMP extension is supported. To be positioned correctly under all observed data on the map screen, the images must have geo-referenced data. GeoTIFF images already include geo-referenced data, while the others use a separate file that

references the geographic location of the image. This file is called a **World File**. The World File contains information about the size of the corresponding image and the coordinates of the geo-reference point (the upper left corner of the image) in the coordinate system of the job. The World File must have the same filename extension associated with the image format (TFW, JGW or BPW) and should be located in the same directory as the image file.

The **Background Images** screen (Figure 6-41) displays a list of available image files. Initially, the list is empty.

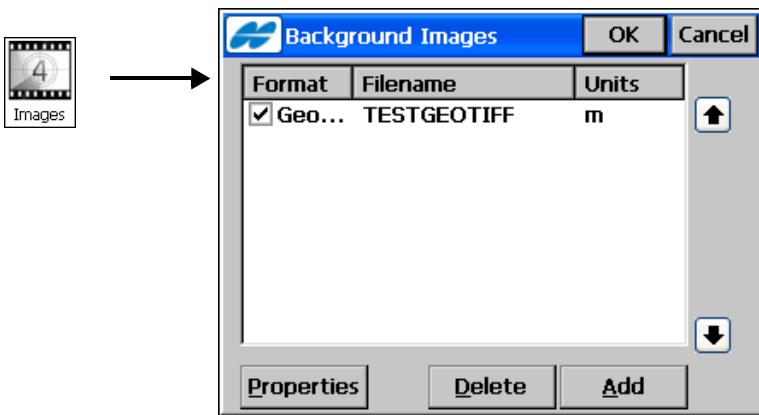


Figure 6-41. Select Image to Open

- **Properties** – opens the *Properties* screen for the highlighted file.
- **Delete** – deletes the currently selected file from the list.
- **Add** – opens the *Add Image* screen (Figure 6-42 on page 6-38) to browse the directories for the desired file.
- **Up/Down** arrows – moves the selected images up or down in the list.
- **OK** – opens the selected file. If no World File exists for the background image file selected, a warning displays, and the *Add Image* screen appears again to select another file. Multiple background images can be selected, but is limited by the amount of free space in the memory.

Add Image

The **Add Image** screen (Figure 6-42) selects an image file to add to the *Background Images* list.



Figure 6-42. Add Image

- *Type* – selects the type of the image to be added, either GeoTIFF, TIFF, JPEG, or BITMAP.
- *Name* – displays the name of the selected file.
- **OK** – opens the *Properties* screen (Figure 6-43 on page 6-39) for the selected file.

Properties

If the selected image uses a **World File**, select the projection in which the coordinates in the World File are given: either *Current* job projection or *UTM*.



Figure 6-43. Properties of Background Image

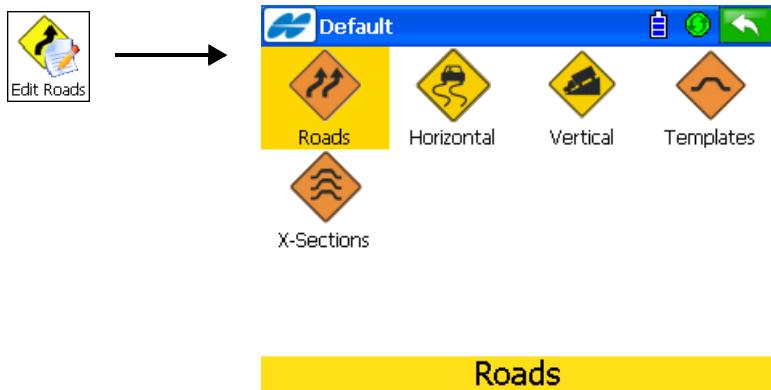
- **OK** – returns to the **Background Images** screen (Figure 6-41 on page 6-37) with the file added to the list. To use a file once it is added, make sure the file is selected in the list.



To map a Background Image correctly, the image (it's geo-reference point) should be in the job's current coordinate system or at least in a very similar one (for example, in a corresponding UTM zone).

Editing Roads

To edit road data in a job, tap the **Edit Roads** icon in the main menu. The **Edit Roads** menu opens (Figure 7-1), which includes options to edit road data in the current job: Roads, Horizontal Alignments, Vertical Alignments, Templates, X-Sections



Roads

Figure 7-1. Edit Roads Menu

The **Help Icon** opens a pop-up menu, giving access to the help files, menu interface selection, keyboard activation and information about TopSURV. (for details see “Help Icon’s Pop-up Menu” on page 1-7).



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

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 points*.

Intersection point is defined as the intersection of the two lines tangential to the 'incoming' and 'exiting' spirals, or to the central curve at the PC and PT points, if spirals are not specified. The vertical alignment can be described through *vertical grades* and *parabolas*, or *long sections*.

The cross section can be described using templates (see “The next X-Sect Temp screen (Figure 7-24) displays the parameters of the highlighted template to edit.” on page 7-25 for details).

To edit a road as a whole, tap the **Roads** icon.

The **Roads** screen (Figure 7-2) displays a list of the created roads, and plots of the horizontal and vertical alignments for each road.

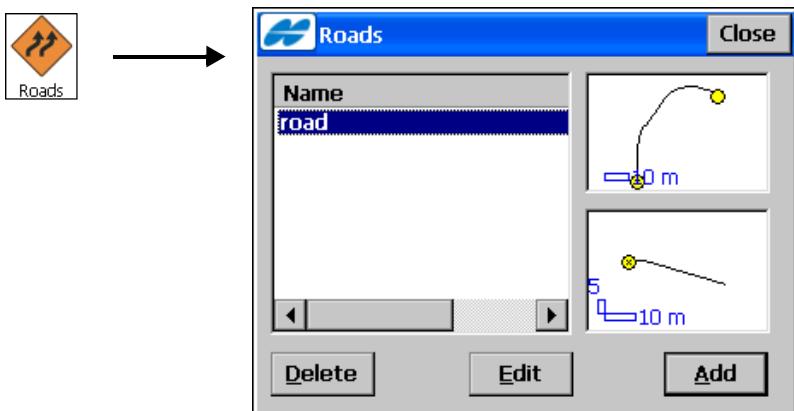


Figure 7-2. Select Road

The left side of the screen displays the list of created roads. The right side displays the corresponding alignment plots.

- **Delete** – deletes the road from the job.
- **Edit** – opens the **Edit Road** screen (Figure 7-3 on page 7-3), displaying the parameters of the selected road.
- **Add** – opens the **Add Road** screen blank parameter fields to set a new road.

The *Help* Icon in the upper-left corner of the screen displays a pop-up menu containing five items:

- *Import Road(s) From Job* – starts the import of roads from the job selected (“Importing From Job” on page 5-2).
- *Import Road(s) From File* – starts the import of roads from the file of the selected format (“Importing From a File” on page 5-13).
- *Export Road(s) To Job* – starts the export of roads to the job selected (“Exporting To a Job” on page 4-2).
- *Export Road(s) To File* – starts the export of roads to the file of the selected format (“Exporting to File” on page 4-11).
- *Help* – accesses the Help files.

Edit Road

The **Edit Road** screen (Figure 7-3) displays the general properties of the road.



Figure 7-3. Edit Road

- *Name* – enter a name for the road.
- *Layer* – selects the layer on which the road is located.
The **List** [...] button opens the **Layers** screen to edit layers (for details see “Edit Layers” on page 6-21).
- *Hz Alnt* – selects a pre-defined horizontal alignment to use in designing the road.
The **List** [...] button opens the **Hz Alnt** screen to edit horizontal alignments (for details see “Horizontal Alignment” on page 7-5).
- *Vt Alnt* – selects a pre-defined vertical alignment from to use in designing the road.
The **List** [...] button opens the **Vt Alnt** screen to edit vertical alignments (for details see “Vertical Alignments” on page 7-14).
- *X-Sect Set* – selects a set of cross section templates to use in designing the road.
The **List** [...] button opens the **X-Sect Set** screen to edit cross section sets (for details see “Cross Section Sets” on page 7-27).
- *Start Stn/Start Chn* – the starting station number with distance to the station, or the starting chain distance, depending on a selection made in the **Display** screen (for details see “Display” on page 3-28).
- *Stn Interval/Chain Interval* – the interval between the points where road related computations are made.

After the Road is created, calculate the road points. The **Help** Icon in the upper-left corner of the screen displays a pop-up menu containing two items:

- *Calculate Road Points* – opens the **Calculate Road Points** screen (see “Calculate Road Points” on page 7-30).
- *Help* – accesses the Help files.

Horizontal Alignment

To edit a horizontal alignment, tap the **Horizontal** icon. The **H_z Alnt** screen (Figure 7-4) displays a list of the horizontal alignments, and the map area displaying the plot of the highlighted horizontal alignment.

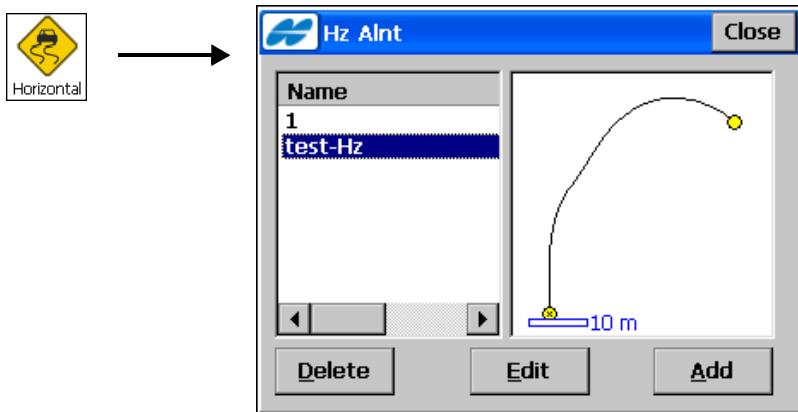


Figure 7-4. Horizontal Alignment

- **Delete** – deletes the horizontal alignment from the job.
- **Edit** – opens the **Edit H_z Alnt** screen, displaying the parameters of the selected horizontal alignment.
- **Add** – opens the **Add H_z Alnt** screen with empty parameter fields to set a new horizontal alignment (see Figure 7-5 on page 7-6).
- **Close** – closes without saving settings.

The **Help** Icon in the upper-left corner of the screen displays a pop-up of the **Help** menu.

Edit the Horizontal Alignment

The **Edit Hz Alnt** screen (Figure 7-5) contains the features of the horizontal alignment.

The **Start Pt** tab (Figure 7-5) displays the starting point of the horizontal alignment parameters.

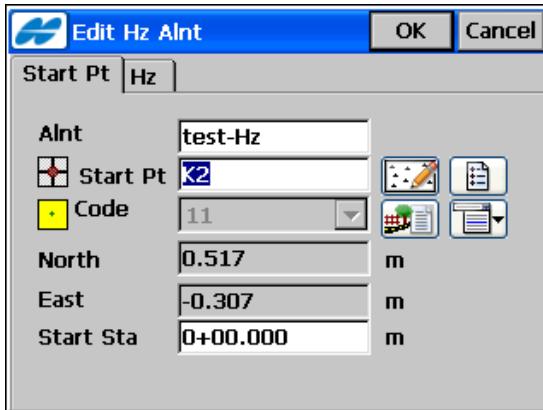


Figure 7-5. Edit Horizontal Alignment

- *Alnt Name* – the horizontal alignment name.
- *Start Pt* – the start point name. Do the following to enter the start point name, either manually, from the map icon, or from the list icon.
- *Code* – Shows the point code and its type.
- *North, East* – the local coordinates of the point.
- *Start Sta/Start Chn* – the starting station number with distance to the station, or the starting chain distance, depending on a selection made in the Display screen (for details see “Display” on page 3-28).

The **Help** Icon in the upper-left corner of the screen displays a pop-up menu containing two items:

- *Edit Points* – opens the **Points** screen to edit points (see “Edit X-Section Template” on page 7-25).
- *Help* – accesses the Help files.

The **H_z** tab displays a list of horizontal alignment elements, the horizontal alignment plot, and the ending station (or chainage) of each element. The selected horizontal alignment element is highlighted in the plot displayed to the right of the screen (Figure 7-6 on page 7-7)

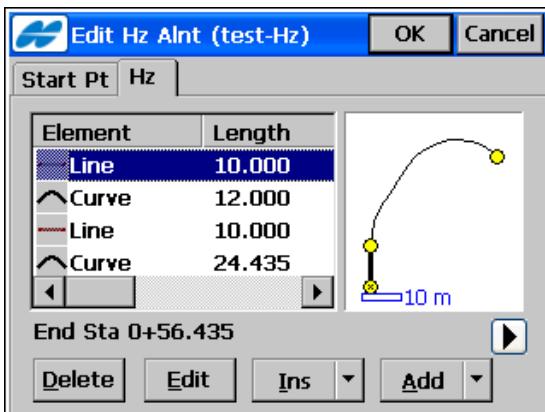


Figure 7-6. Edit Horizontal Alignment Elements

On the *H_z* tab, the element list has the following columns:

- *Element* – the icon and the name of the element; either *line*, *spiral*, *curve*, or *intersection point*.
- *Length* – the length of the element.
- *Azimuth* – the azimuth at the beginning of the element.
- *Radius* – the radius of the curve, spiral, or intersection point (the radius of the spiral is the radius at the end of the ‘incoming’ spiral or at the beginning of the ‘exiting’ spiral; the radius of the intersection point is the radius of the corresponding curve).
- **Delete** – deletes the element from the road.
- **Edit** – opens a screen with properties of the selected element.
- **Ins** – inserts elements selected from a floating menu (*Line*, *Curve*, *Spiral*, or *Intersection Point*) at the selected location in the list.

- **Add** – adds elements selected from the floating menu to the end of the list:
 - *Line*: for more information, see “Add a Line” on page 7-9.
 - *Curve*: for more information, see “Add a Curve” on page 7-10.
 - *Spiral*: for more information, see “Add a Spiral” on page 7-11.
 - *Intersection Point*: for more information, see “Intersection Point” on page 7-12.

Select a horizontal alignment element, then tap and hold the *Station* information under the element list to display the start and end stations (or chainages) information for the selected alignment element (Figure 7-7).

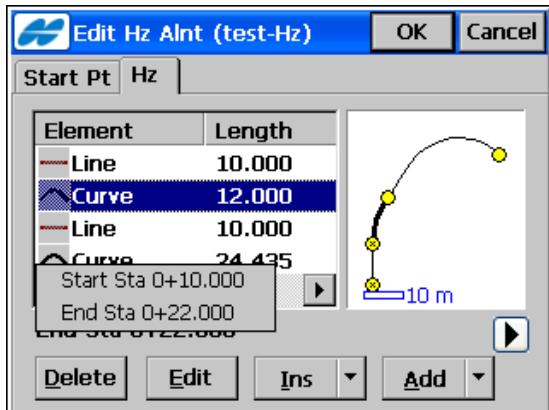


Figure 7-7. Alignment Element Information

Also, the graphics interface can display information on the start and final positions of the selected element. Double-click in the plot area to open the greater **Map** screen for horizontal alignments.

Add a Line

To add a line, select the *Line* option from the **Insert** or **Add** floating menu on the *Hz* tab of the **Edit Hz Alnt** screen.

The *Line* screen displays (Figure 7-8).

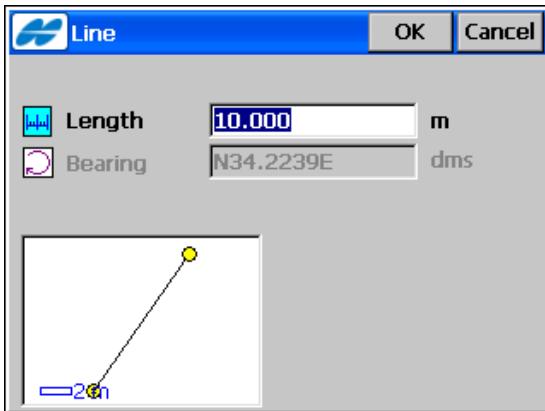


Figure 7-8. Line

The plot illustration at the bottom-left corner of the *Line* screen shows the element's appearance (Figure 7-8).

- *Length* – the length of the line element.
- *Azimuth* – by default, the azimuth is set tangent to the previous element. This field is editable only for the starting element of the road. To change the azimuth of all other elements, remove the check mark from the *Tangent to Previous Item* box on the Help Icon in the upper-left corner of the screen.



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

- **OK** – saves the element to the road and returns to the *Edit Hz Alnt* screen.
- **Cancel** – closes the screen without saving the settings.

Add a Curve

To add a curve, select the *Curve* option from the **Insert** or **Add** floating menu on the *Horizontal* tab of the *Edit Hz Alnt* screen. The *Curve* screen displays (Figure 7-9).

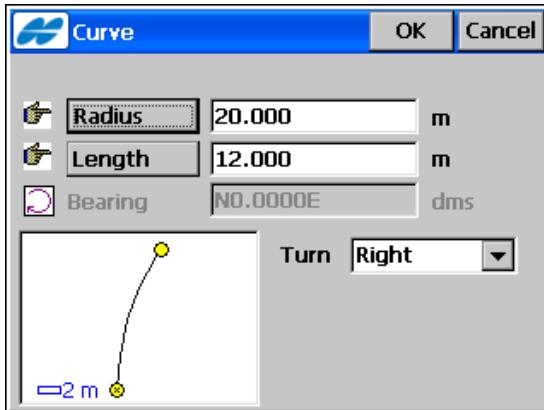


Figure 7-9. Curve

The plot illustration at the bottom of the *Curve* screen shows the element's appearance.

- *Radius/ Deg Chord/ Deg Curve* – the radius of the curve, or one of the two parameters unambiguously defining the radius: *degree of chord*, or *degree of curve*.

Using the degree of chord (DCH) or degree of curve (DCV) parameters, the radius can be calculated 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, remove the check mark from the *Tangent to Previous Item* menu on the bitmap icon in the upper-left corner of the screen.



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

- *Turn* – the direction of turn. Select either the *Right* value (clockwise direction) or the *Left* value (counter-clockwise direction).
- **OK** – saves the element to the road and returns to the *Edit Hz Alnt* screen.

Add a Spiral

To add a spiral, select the *Spiral* option from the **Insert** or **Add** floating menu on the *Hz* tab of the *Edit Hz Alnt* screen. The *Spiral* screen displays (Figure 7-10).

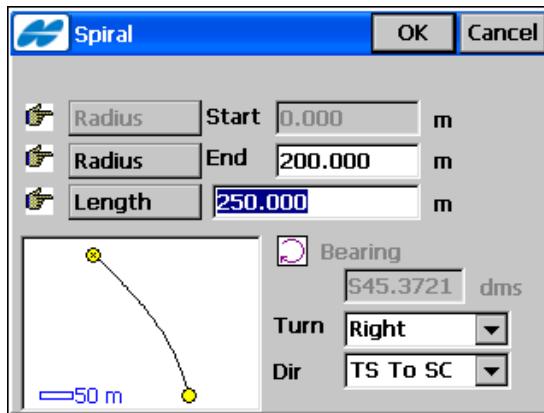


Figure 7-10. Spiral

The plot at the bottom of the screen displays the element's appearance.

- *Radius/ Deg Chord/ Deg Curve* – the radius of the curve, or one of two parameters unambiguously defining the radius: the *degree*

of chord, or the *degree of curve* (see “Add a Curve” on page 7-10).

- *Length/Sp Const* – the parameter is the square root of the product of the length and the radius of the spiral, as defined above. Consequently, the spiral constant has the units of length.
- *Azimuth* – by default, the azimuth is set tangent to the previous element. This field is editable only for the starting element of the road. To change the azimuth of all other elements, remove the check mark from the *Tangent to Previous Item* box on the bitmap in the upper-left corner of the screen.



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

- *Turn* – the direction of turn. Select either the *Right* value (clockwise direction) or the *Left* value (counter-clockwise direction).
- *Dir* – the direction of movement along the spiral, *TS* to *SC* (entering the turn), or *CS* to *ST* (exiting the turn)¹.
- **OK** – saves the element to the road and returns to the *Add Horizontal Alignment* screen.

Intersection Point

To add an intersection point, select the *Intersection Point* option from the **Insert** or **Add** floating menu on the *Horizontal* tab of the **Edit Hz Alnt** screen. The **Intersection Point** screen (Figure 7-11 on page 7-13) displays.

1. The traverse points on the turn have the following markers: TS-traverse-spiral; SC-spiral-circle; CS-circle-spiral; and ST-spiral traverse.

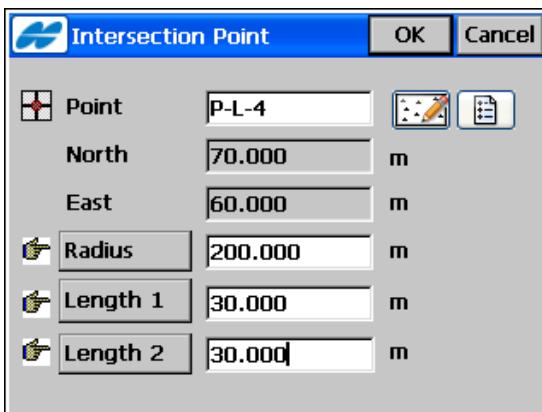


Figure 7-11. Intersection Point

- *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.
- *North, East* – the local coordinates of the intersection point; cannot be changed for an existing point.
- *Radius/ Deg Chord/ Deg Curve* – the radius of the corresponding curve, or the parameter, unambiguously defining the radius, degree of chord, or degree of curve. See “Add a Curve” on page 7-10.
- *Length1/Sp Const 1, Length2/Sp Const 2* – the length of the corresponding spiral elements, or the spirals constants. The spiral constants are defined. See “Add a Spiral” on page 7-11.
- **OK** – saves the element to the road and returns to the *Edit Hz AInt* screen.

Vertical Alignments

To edit a vertical alignment, tap the **Vertical** icon. The **Vt Alnt** screen (Figure 7-12) displays a list of the created vertical alignments and the map area to show the plot of the highlighted vertical alignment.

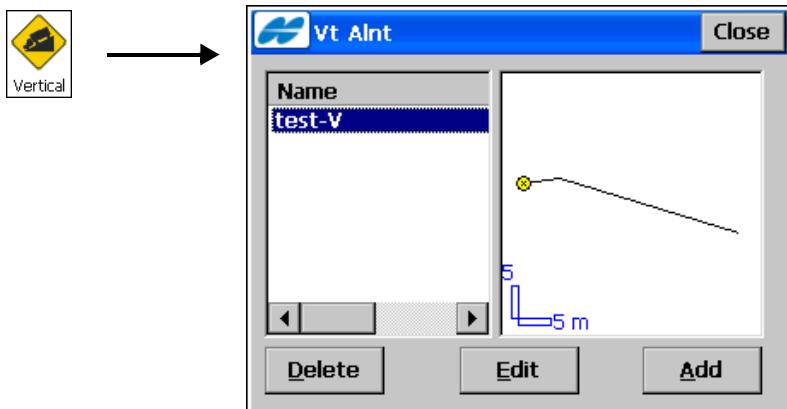


Figure 7-12. Vertical Alignment

- **Delete** – deletes the vertical alignment from the job.
- **Edit** – opens the **Edit Vt Alnt** screen (Figure 7-14 on page 7-16), to edit a vertical alignment highlighted in the list.
- **Add** – opens the **Add Vt Alnt** screen (Figure 7-13 on page 7-15) to add a new vertical alignment.

The *Help* Icon in the upper-left corner of the screen displays a pop-up menu of the *Help* and *High/Low Positions* item.

Add Vertical Alignments

Tap the **Add** button on the *Vertical Alignment* screen (Figure 7-13). The **Add Vt Alnt** screen selects a method of creating this alignment and sets the name of the new vertical alignment.

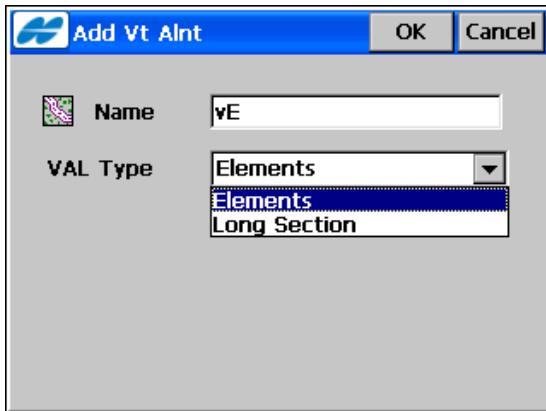


Figure 7-13. Add Vertical Alignment

- Name – enter a name for the new vertical alignment.
- VAL Type – the method of creating the vertical alignment, which include:
 - *Long Section*: select to create the vertical alignment 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 to create the vertical alignment by element, starting and finishing where you want and starting again.
- OK – opens the next *Add Vt Alnt* screens similar to those for editing vertical alignments.

Edit Vertical Alignments

Select the alignment and tap the **Edit** button on the **Vertical Alignment** screen.

Elements

For Element vertical alignment types, the *Start Pt* tab on the **Edit Vt Alnt** screen (Figure 7-14) sets the parameters of the point starting the vertical alignment.

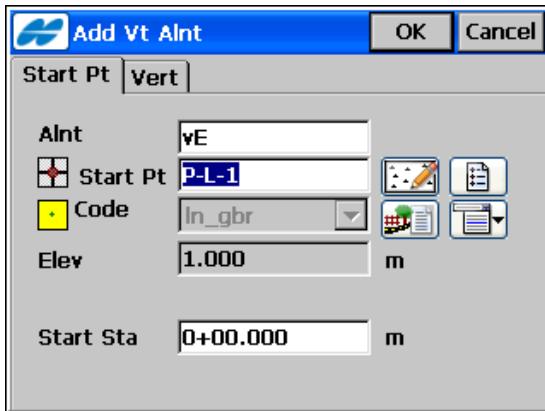


Figure 7-14. Edit Vertical Alignment

- *Alnt Name* – the vertical alignment name.
- *Start Pt* – the start point name. Enter manually (if a new point name is entered, the point is created with the height entered in the *Ell ht* field or in one of two other ways):
 - : select from the map
 - : select from the point name list
- *Code* – the point code; enter either manually or select a point code from the drop-down list. The code of an existing point cannot be edited. The *Attributes List* icon opens the **Point Attributes** screen to set the values for the attributes available for the code selected.
- *Elev/Ell ht* – the point height.

- The  icon next to the *Attributes List* icon displays the pop-up menu containing three items:
 - *Layer* – opens the **Select Layer** screen (see “On the Select Layer” on page 6-10).
 - *Note* – opens the **Note** screen.
- *Start Sta/Start Chn* – the starting station number with distance to the station, or the starting chain distance, depending on a selection made in the Display screen (for details see “Display” on page 3-28).

The *Vert* tab on the **Edit Vt Alnt** screen (Figure 7-15) displays a list of vertical alignment elements, the vertical alignment plot, and the ending station (or chainage) of each element.

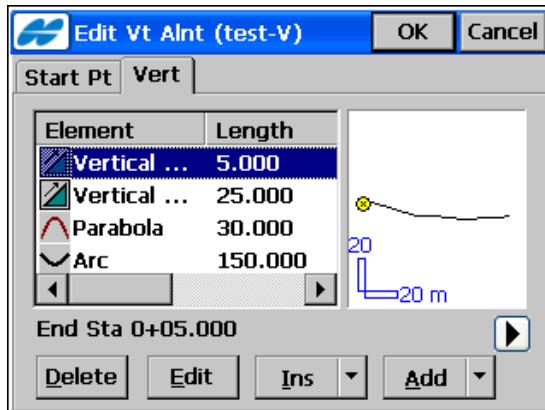


Figure 7-15. Edit Vertical Alignment Elements

The element list has the following columns for the vertical alignment elements:

- *Element* – the icon and name of the element: either *vertical grade*, *parabola*, or *arc*.
- *Length/Arc Radius* – depending upon the selection: either the length of the element or the radius of the circular arc.
- *Start Grade, End Grade* – the grades of the element, in percentage, at the starting and ending points. For a *Vertical grade* element, values are the same.

- **Ins** – inserts elements selected from a floating menu (*Vertical Grade* and *Curve*) at the selected location in the list.
- **Add** – displays a menu of two elements: select to add either *Vertical Grade* or *Curve*.

The *Help* Icon in the upper-left corner of the screen displays the pop-up menu containing two items:

- *Edit Points* – opens the **Points** screen to edit points (see “Edit X-Section Template” on page 7-25).
- *High/Low Positions* - opens the **High/Low** screen
- *Help* – accesses the Help files.

Select a vertical alignment element, then tap and hold the *Station* information under the element list to briefly display information (Figure 7-16) on the start and end stations (or chainages) for the selected alignment element.

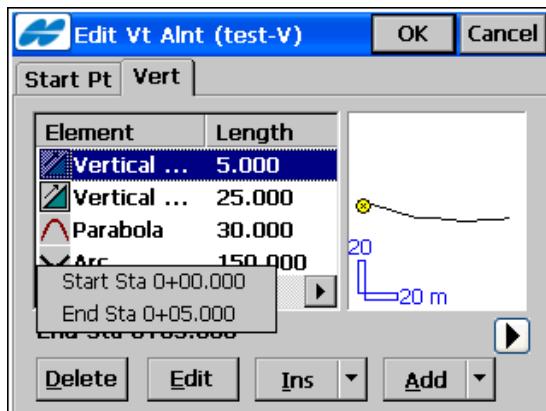


Figure 7-16. Alignment Element Information

The graphical interface also displays the start and final positions of the selected element. Double-tap in the plot area to open the greater **Map** screen (Figure 7-17) for vertical alignments.

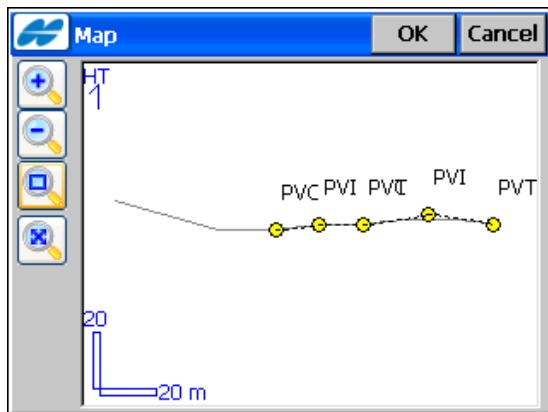


Figure 7-17. Alignment Map

For vertical curves, the **Map** screen displays the *PVC* point where the curve begins, the *PVI* point of intersection of two tangents, and the *PVT* point where the curve ends.

Vertical Grade

To add a vertical grade, select the *Vertical Grade* option from the **Insert** or **Add** floating menu on the *Vertical* tab of the *Edit Vt Alnt* screen. The *Vertical Grade* screen (Figure 7-18) displays.

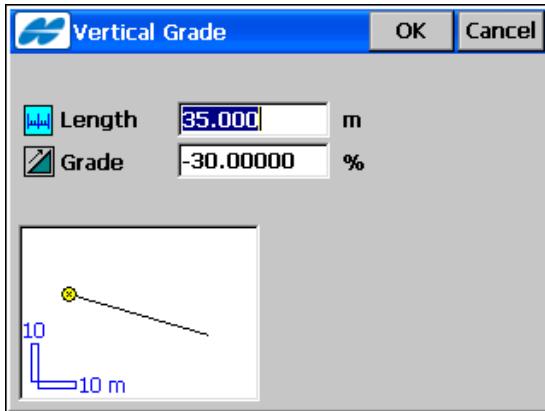


Figure 7-18. Edit Vertical Grade

The plot at the bottom of the screen shows the element's appearance.

- *Length* – the length of the vertical grade element.
- *Grade* – the grade percentage of the element. If the grade is falling, the value should be set to negative.
- **OK** – saves the element to the road and returns to the *Edit Vt Alnt* screen.
- **Cancel** – closes the screen without saving the settings.

Edit a Curve

To edit a curve, select the *Curve* option from the **Insert** or **Add** floating menu on the *Vertical* tab of the **Edit Vt Alnt** screen. The **Curve** screen (Figure 7-19) displays.

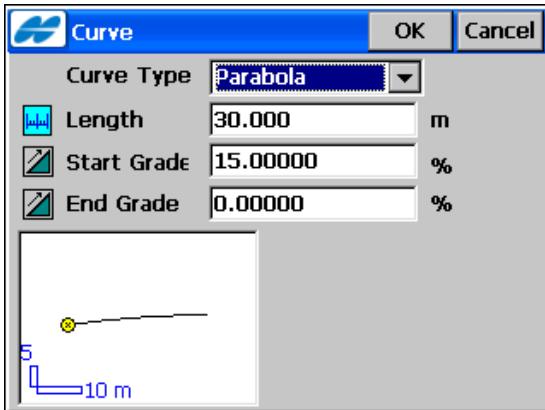


Figure 7-19. Edit Vertical Curve

- *Curve Type* – selects the type of curve to add, either *Circular Arc* or *Parabola*. The plot in the bottom of the screen shows the element appearance.
- *Length/Arc Radius* – the radius of the arc or the length of the parabola element, depending on the type of curve selected.
- *End Grade/Start Grade* – the percentage of the starting and ending grades of the element. If the grade is falling, use a negative value.
- **OK** – saves the element to the road and returns to the **Edit Vt Alnt** screen.

Long Sections

For Long Sections vertical alignment types (Figure 7-20), the *Start Pt* tab displays only the vertical alignment name.

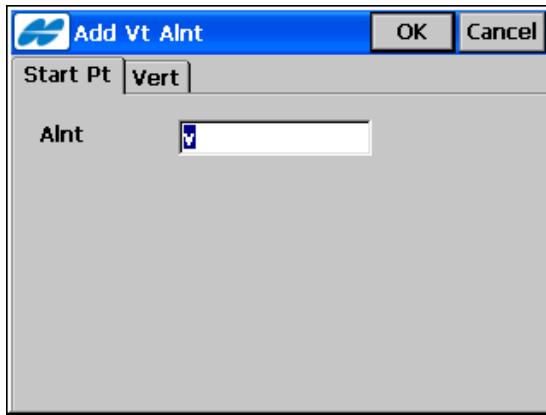


Figure 7-20. Edit Vertical Alignment Name

The *Vert* tab on the ***Edit Vt Alnt*** screen (Figure 7-21) displays the list of vertical long sections, the vertical alignment plot, and the ending station (or chainage) at each element.

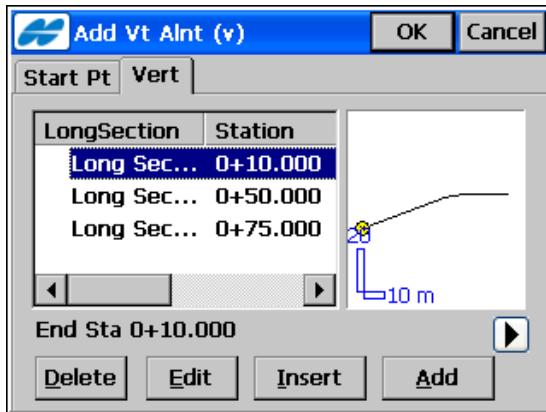


Figure 7-21. Edit Vertical Alignment Long Sections

The long section list has the following columns (Figure 7-21 on page 7-22) for vertical long sections:

- *Long Section* – the name of the element.
- *Station* – the station distance.
- *Elevation* – the elevation value on the station.
- *VC Length* – the vertical curve length is the length of the interval near the station, where the alignment has a parabolic shape.
- **Insert** – opens a blank *Long Section* screen in which to insert an element at the selected location in the list (Figure 7-22).
- **Add** – opens a blank *Long Section* screen for adding an element to the end of the list (Figure 7-22).
- **Delete** – deletes the element from the road.
- **Edit** – opens a screen with properties of the selected long section.

The **Long Section** screen (Figure 7-22) adds a new long section to the vertical alignment.

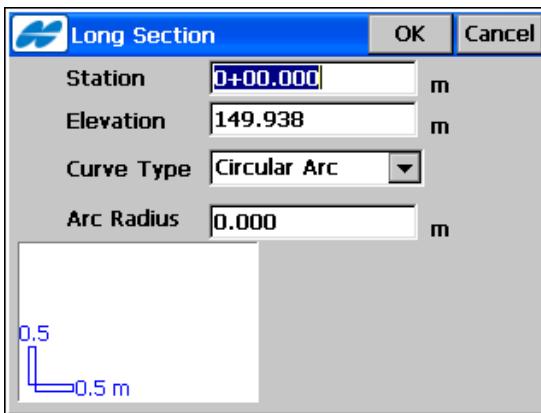


Figure 7-22. Long Section

- *Station* – the station distance from the beginning of the road.
- *Elevation* – the height at the station.
- *Curve Type* – selects the type of curve to add, either *Parabola* or *Circular Arc*. The plot at the bottom of the screen shows the element appearance.
- *VC Length* or *Arc Radius* – the length of the parabola at the station (assuming that the station is located in the middle of the

interval), or the radius of the arc, depending on the type of curve selected.

- **OK** – saves the element to the road and returns to the *Edit Vt AInt* screen.

Cross Section Templates

A cross-section template is a template for the creation of a complex cross-section view of the road. The cross-section template consists of several sets of *segments*, *cut slopes*, and *fill slopes*.

To create a template for a cross-section view of the road, tap the **Templates** icon.

The *X-Sect Templates* screen (Figure 7-23) displays a list of the existing templates in the upper part of the screen and a plot of the highlighted template in the lower part.

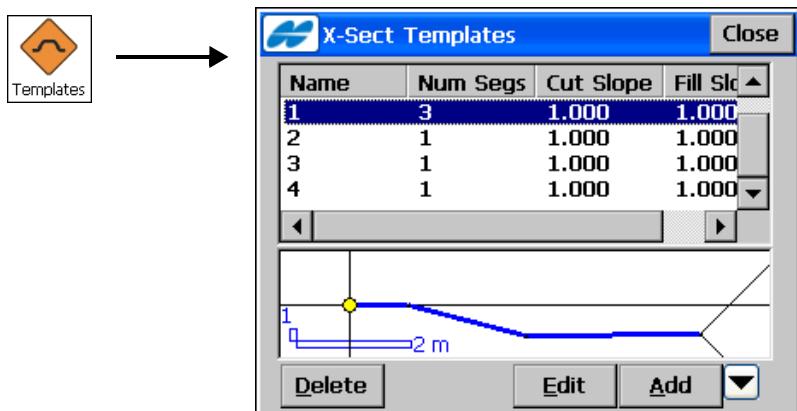


Figure 7-23. X-Sect Templates

- 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 next *X-Sect Templates* screen (Figure 7-24).

- **Add** – opens the blank *X-Sect Templates* screen to enter the properties for a new template.
- **Close** – returns to the main screen.

Edit X-Section Template

To edit an existing template, highlight it and tap the **Edit** button in the *X-Sect Templates* screen (Figure 7-23 on page 7-24).

The next *X-Sect Temp* screen (Figure 7-24) displays the parameters of the highlighted template to edit.

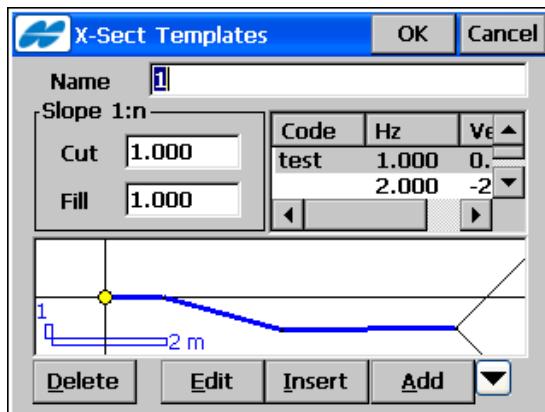


Figure 7-24. Edit X-Sect Template

- *Name* – the name of the template.
- *Slope* – the cut and fill parameter values (ratio of run values for cut and fill for a unit rise). These values represent the horizontal increment of the slope for a unit vertical increment.
 - *Cut*: the cut slope is used when the road surface is below the terrain.
 - *Fill*: the fill slope is used when the road surface is above the terrain.

The *X-Sect Temp* screen (Figure 7-24 on page 7-25) also 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).

- **Edit** – opens the *Segment* screen (Figure 7-25 on page 7-26) with the parameters of the highlighted segment.
- **Insert** – opens a blank *Segment* screen. The inserted segment is inserted in the list above the currently highlighted segment.
- **Add** – opens a blank *Segment* screen. The added segment is attached after the last segment in the list.
- **Delete** – deletes the segment from the template.
- **OK** – saves the changes and returns to the *X-Sect Templates* screen (Figure 7-23 on page 7-24).
- **Cancel** – closes the screen without saving the settings.

Cross Section Segments

The *Segment* screen (Figure 7-25 on page 7-26) contains the parameters of the highlighted segment.

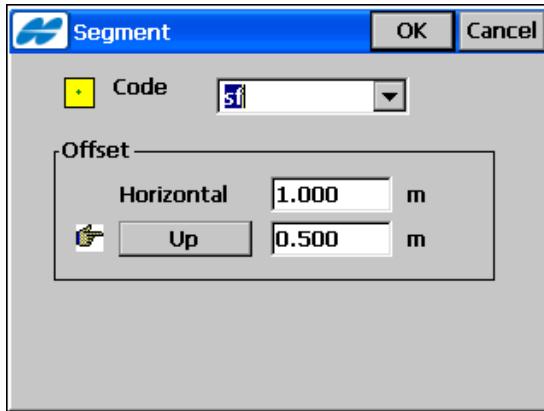


Figure 7-25. Segment Screen

- *Code* – the code of the segment. Select the code from the drop-down list or enter a new code.
- *Offset* – horizontal and vertical offsets. Press the **Down/Up/Grade** button to select the type and value of the vertical offset. The “hand” symbol means the function is selectable. Although the value is input as **Grade** (in percents), the vertical offset is

recalculated to meters (or another selected unit) after pressing the **OK** button.

- **OK** – saves the changes and closes the screen.

Cross Section Sets

To edit cross-section sets in the current job, tap the **X-Sections** icon.

The **X-Sect Set** screen (Figure 7-26 on page 7-27) contains a list of cross -section sets and a general scaled view of the highlighted cross section set.

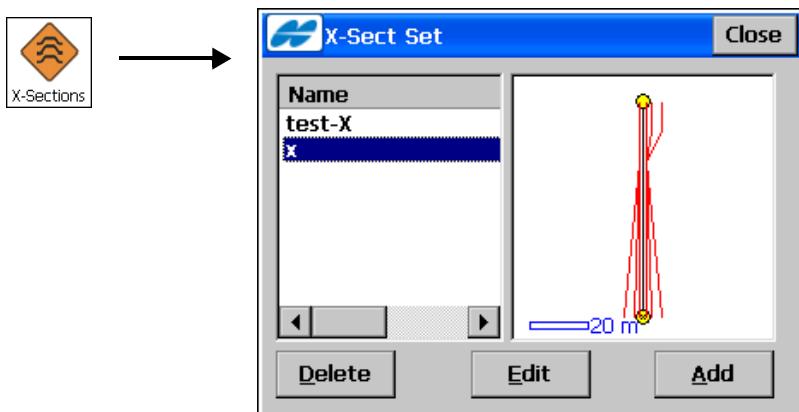


Figure 7-26. Cross Section Set

- **Delete** – deletes the cross section set from the list.
- **Edit** – opens the **Edit X-Sect Set** screen, displaying properties of the selected cross section set (Figure 7-26).
- **Add** – opens a blank **Add X-Sect Set** screen to create a new set of cross sections.

Edit Cross Section Set

The **Edit X-Sect Set** screen (Figure 7-27 on page 7-28) contains a list of stations where cross sections are applied, and a scaled plot of a cross section at the highlighted station.

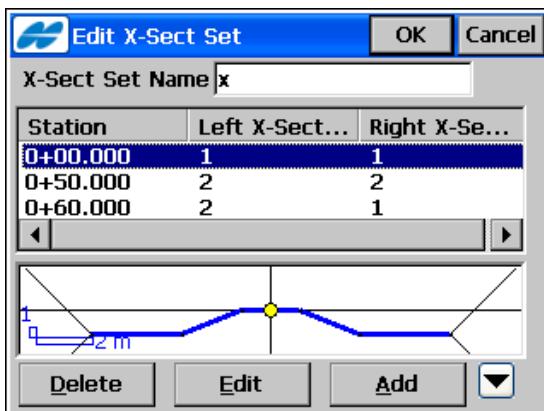


Figure 7-27. Edit X-Section Set Parameters

- *X-Sect Set Name* – the name of the cross-section set.
- The list of stations contains the following columns:
 - *Station*: the station where the cross-section is applied.
 - *Left X-Section/Right X-Section*: the names of the cross-section templates for the left and right side of the road cross section relative to the center line. The left and right side cross sections can be different.



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

-
- **Delete** – deletes the station with the road cross-section from the list.
 - **Edit** – opens the **X-Section** screen (Figure 7-28 on page 7-29) to edit the selected cross section.
 - **Add** – opens a blank **X-Section** screen.

Cross-Section

The **X-Section** screen (Figure 7-28) contains parameters of the road cross-section at a given distance and a plot of the cross-section.

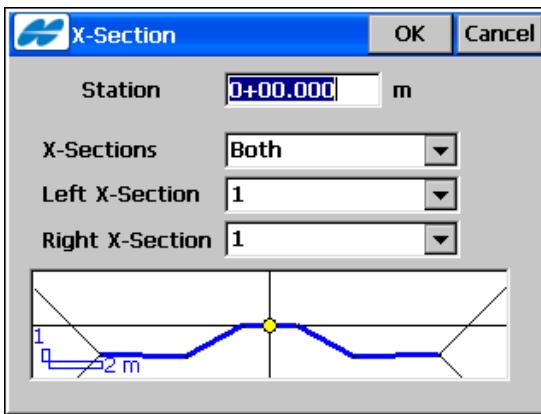


Figure 7-28. Cross Section Parameters

- *Station/Chainage* – the station where the cross-section is applied, or the distance to this station.
- *X-Sections* – selects whether the cross-section is created for both parts of the road or only for the left or right side of the road. The screen display changes, depending on the selection.
- *Left X-Section/Right X-Section* – the cross-section templates for the left and right side of the road cross-section. These can be selected only from the existing cross-section templates.
- **OK** – saves the cross-section in the list and returns to the *Edit X-Sect Set* screen.

The *Help* Icon in the upper-left corner of the screen displays the pop-up menu containing two items:

- *Edit X-Sect Templates* – opens the *X-Sect Templates* screen to edit cross section templates (see “Edit X-Section Template” on page 7-25).
- *Help* – accesses the Help files.

Calculate Road Points

To calculate road points, select the *Calculate Road Points* option from the Help pop-up menu on the **Edit Road** screen (Figure 7-3 on page 7-3).

The **Calculate Road Points** screen (Figure 7-29) generates points along to the right and to the left of the center line of the road, along the entire length.

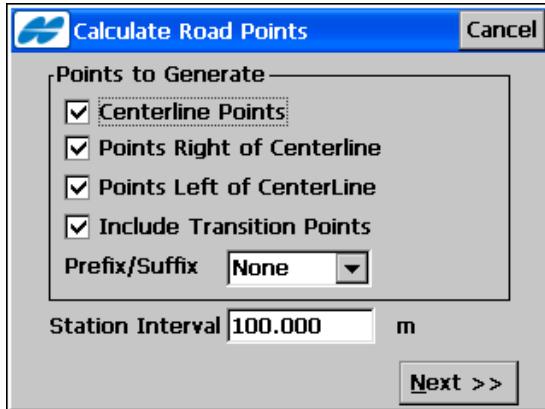


Figure 7-29. Calculate Road Points

- *Points to Generate* – defines the points to generate, either *center line* points, the points to the *right of the center line*, and/or the points to the *left of the center line*. Also, if you want to include transition points, place a check mark in the corresponding fields, and select a prefix/suffix for them, if necessary, in the *Prefix/Suffix* field drop-down list.
- *Station Interval/Chainage Interv* – sets the interval between the generated points. By default, it is the Station (or Chain) Interval set in the *Start Pt* tab on the **Roads** screen.
- **Next** – opens the appropriate screen, depending on the selection made in the *Points to Generate* panel. The last screen contains the **Calc** button to calculate the road points along the line.

Centerline Points Parameters

The **Centerline Points** screen (Figure 7-30) displays the parameters of points to be computed along the center line.

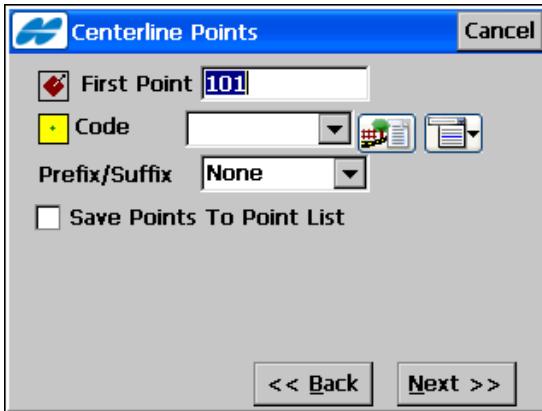


Figure 7-30. Centerline Points Parameters

- *First Point* – the name of the first point.
- *Code* – the code of the points being generated; either enter manually or select from the drop-down list. The *Attributes List* icon accesses the attributes of the chosen code and opens the **Point Attributes** screen to set the values for the attributes available for the selected code.
- The icon next to the *Attributes List* bitmap displays the pop-up menu containing two items:
 - *Layer*: opens the **Select Layer** screen (see “On the Select Layer” on page 6-10).
 - *Note*: opens the **Note** screen.
- *Prefix/Suffix* – when selected, sets the prefix or suffix to be added to the generated point name.
- *Save points to Point List* – enable if you want to save the generated points to a separate points list. If it is selected, a field appears where the name for the list can be set.
- Back – returns to the previous screen.

- Next – opens the ***Right Offset Points*** screen.

Right Offset Points Parameters

The ***Right Offset Points*** screen (Figure 7-31) displays the parameters of points to be computed to the right of the center line.

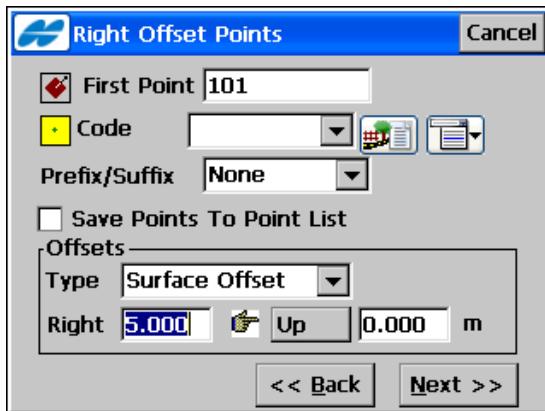


Figure 7-31. Right Offset Points Parameters

- *First Point* – the name of the first point.
- *Code* – the code of the points being generated; either enter manually or select from the drop-down list. The *Attributes List* icon accesses the attributes of the chosen code and opens the ***Points Attributes*** screen to set the values for the attributes available for the selected code.
- The icon next to the *Attributes List* icon displays the pop-up menu containing three items:
 - *Layer*: opens the ***Select Layer*** screen (see “On the Select Layer” on page 6-10).
 - *Note*: opens the ***Note*** screen.
- *Prefix/Suffix* – when selected, sets the prefix or suffix to be added to the generated point name.

- *Save points to Point List* – enable (if necessary) to save the generated points to a separate points list. When check marked, a field appears where the name for the list can be set.
- *Offsets* – set the offset of the point from the center line along two dimensions: horizontal (the *Right* field) and vertical (the *Up/Down* field) relative to the surface (*Surface Offset* type) or to the horizontal line (*Flat Offset* type).
- **Back** – returns to the previous screen.
- **Next** – opens the **Left Offset Points** screen (Figure 7-32 on page 7-33).

Left Offset Point Parameters

The **Left Offset Points** screen (Figure 7-32) is similar to the **Right Offset Points** screen, except for the direction of the offset.

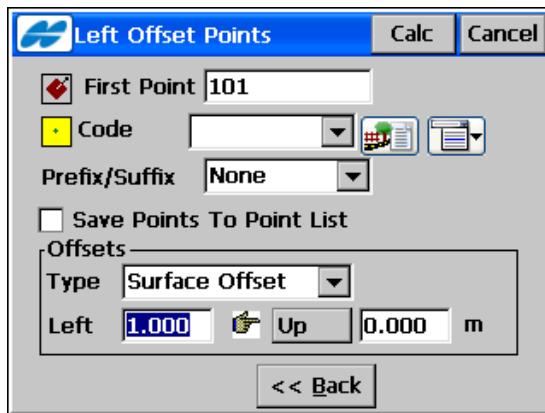


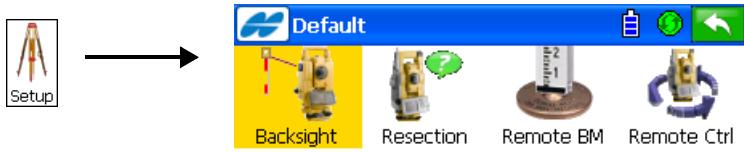
Figure 7-32. Left Offset Points Parameters

The **Calc** button calculates the points and stores them to the data set.

Setting up TS Survey

To set up a TS survey, tap the **Setup** icon in the main menu when in TS mode. The **Setup** menu (Figure 8-1) includes options to:

1. Start a backsight survey (Backsight).
2. Calculate a resection task (Resection).
3. Calculate a point's elevation from remote benchmarks (Remote BM).
4. Remote Control (available only for the 9000Series).



Backsight

Figure 8-1. Setup TS Menu

The Help Icon  opens a pop-up menu giving access to the help files, menu interface selection, keyboard activation and information about TopSURV. (for details see “Help Icon’s Pop-up Menu” on page 1-7).

Backsight Survey

To set up a Total Station survey with localization, tap the **Backsight** icon. The **Backsight Survey** screen (Figure 8-2) displays.

On the **Backsight Survey** screen (Figure 8-2), the **BS Setup** tab contains the following *Backsight* parameters.

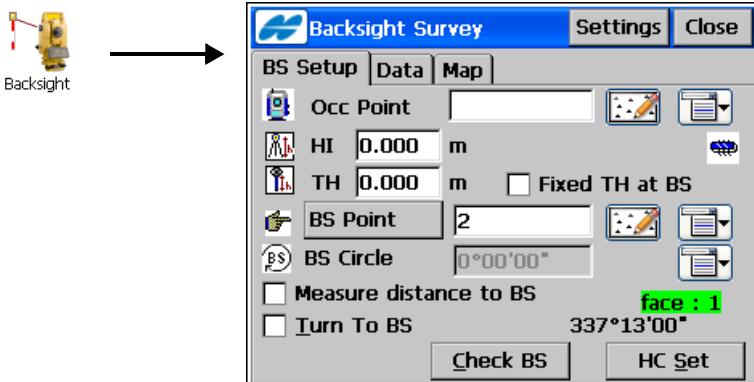


Figure 8-2. Backsight Survey

- *Occ. Point* – the name of the point where the total station is located.
- – opens the map for choosing the occupation point (*map* icon).
- The menu icon next to the *Occ Point* field opens a pop-up menu containing five items:
 - *From List*: opens the list to choose the occupation point.
 - *Station and Offset*: opens the **Station and Offset** screen to add an arbitrary occupation point near a road.
 - *Properties*: opens the **Add/Edit Point** screen that displays the properties of the current point, or you can create a new point if no point is selected yet.
 - *Resection*: opens the **Resection 3D** screen to determine the occupation point coordinates by solving the resection task, using the known point's coordinates (for details, see “Resection” on page 8-12.)

- *Elevation*: opens the **Known Elevation** screen (for details, see “Remote Benchmarks” on page 8-17).
-  – shows memory status.
-  (**HI**) – sets the height of the instrument above or below the mark (the HRvalue can be negative, so points above the prism, such as those on a bridge, can be measured from below).
-  (**TH**) – sets the height of the target above the mark.
- **BS Point (BS Azimuth)** – sets the backsight point location or the direction to it.
-  – opens the map for choosing the backsight point (*map* icon).
- The menu icon next to the *BS Point* field  displays the pop-up menu to set the backsight point:
 - *From List*: opens the list of points.
 - *Station Offset*: opens the **Station and Offset** screen to add an arbitrary occupation point near a road.
 - *Properties*: opens the **Add/Edit Point** screen that displays the properties of the current point, or creates a new point if no point is chosen yet.
 - *Multiple BS*: opens the **Multi-Point BS** screen, to involve several Backsight points for performing a survey (see “Multi-Point Backsight” on page 8-6).
- **BS Circle** – displays the horizontal circle reading corresponding to the backsight point.
- The menu icon next to the *BS Circle* field  displays the pop-up menu that sets the BS Circle value to zero, azimuth, input value, obtains the value from the instrument, or changes the value by +/- 90 or 180 degrees.
- **Measure distance to BS** – set if the distance to backsight point should be measured.
- **Turn To BS** (available only for the 9000Series) – select to turn the total station to the Backsight Point.

- **Fixed HRat BS** – set if the height of the backsight point is fixed for the whole set of measurements. If the box is check marked, an additional HRbox displays. This is useful when one target is mounted at the BS for the duration of an occupation and another is used for the sideshots.
- **Check BS** – opens the **Check Backsight** screen to check the Backsight point (see “Check Backsight” on page 8-8).
- **HC Set** – sets the horizontal circle as defined in the *BS Circle* field and opens the *Data* tab.
- **Settings** – opens the **Mode** screen (see “Set Measurement Mode” on page 8-10).
- The Help Icon  in the upper-left corner displays the pop-up menu containing seven items:
 - *Edit Points*: opens the **Points** list screen (see “Points” on page 6-2).
 - *Edit Raw*: opens the **Raw Data** screen (see “Raw Data” on page 6-34).
 - *Remote Control*: opens the **Remote Control** screen (see Figure 8-20 on page 8-20).
 - *Inverse*: opens the **Two-Point Inverse COGO** screen (see “Inverse” on page 11-3).
 - *Intersection*: opens the **Intersection COGO** screen (see “Compute the Intersection Point” on page 11-14).
 - *Help*: accesses the Help files.

The *Data* tab on the **Backsight Survey** screen (Figure 8-3 on page 8-5) displays the available values of the backsight point

parameters: *HR*(Target Height), *HA* (Horizontal Angle), *VA* (Vertical Angle), and *SD* (Slope Distance).

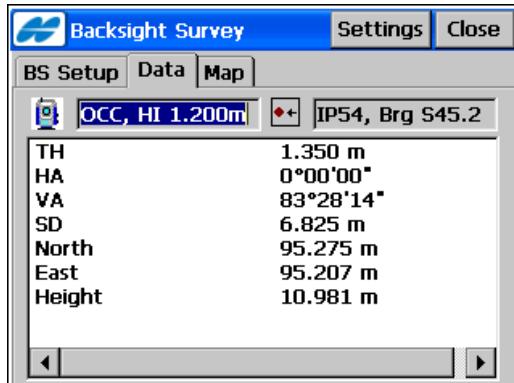


Figure 8-3. Backsight – Data

The two fields at the top of the page display the height of the instrument and the azimuth respectively.

The *Map* tab (Figure 8-4) shows all points in a graphic mode. For details on map properties and customizing, see “Viewing Map” on page 12-1.

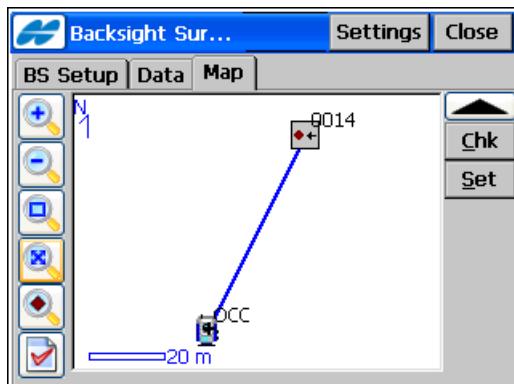


Figure 8-4. Backsight – Map

Multi-Point Backsight

To access the ***Multi-Point BS*** screen (Figure 8-5), press the menu icon in the *BS Point* field and select the *Multiple BS* item. Multiple backsight points can generate more precise measurements.

On the *Measurement* tab, edit the following parameters:

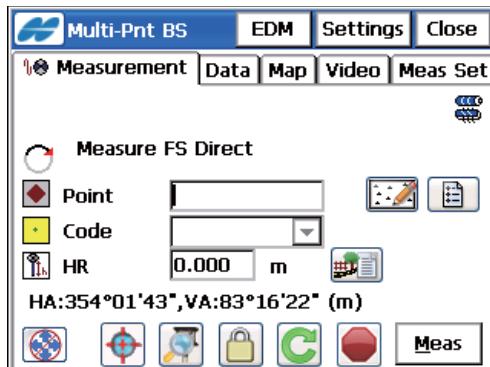


Figure 8-5. Multi-Point BS

- *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 target.
- **Measure FS Direct** – press the **Meas** button to take the sideshot of the point.

The following functions except are for the 9000Series only.

- – Start auto aimig to prism.
- – makes the instrument search for the prism.
- – locks onto the prism or “tracks” it.
- – opens the ***Rotate*** screen (Figure 8-21 on page 8-22) which allows the total station to turn to various angles or points.

-  – makes the total station stop tracking the prism and go into “Standby” mode.
- **Settings** – opens the **Mode** screen (see “Mode - Measurement Method” on page 8-11).
- The Help Icon on the upper-left corner of the **Multi-Point BS** screen displays a pop-up menu containing six items:
 - *Edit Points*: opens the **Points** list (see “Points” on page 6-2).
 - *Inverse*: opens the **Inverse COGO** screen (see “Inverse” on page 11-3).
 - *Notes*: opens the **Note** screen.
 - *PTL Mode*: opens the **PTL Mode** screen (see “PTL Point” on page 6-12).
 - *Display Coords*: if selected, the coordinates of the previous point measured displays below HRdata.
 - *Help*: accesses the Help files.

The *Data* tab (Figure 8-6) on the **Multi-Point BS** screen 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 “Viewing Map” on page 12-1.

The *Meas Set* tab on the **Multi-Point BS** screen (Figure 8-6) displays measurement results of the sideshots being done during one set: the *Res HA* (residuals of the horizontal angles) and the measured and initial parameters (*TH*, *HA*, and so forth)

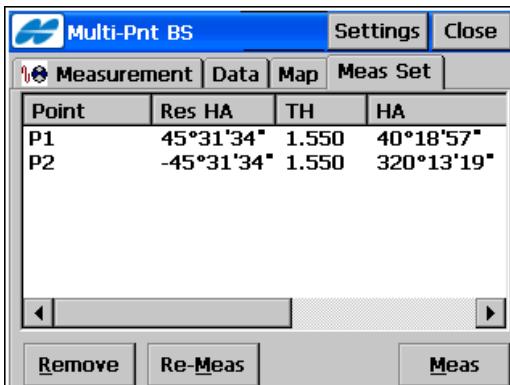


Figure 8-6. Multi Point BS – Meas Set Tab

- **Remove** – deletes the highlighted measurement from the set.
- **Re-Meas** – replaces the current measurement with a new measurement.
- **Accept** – stores the new coordinates in the database.

Check Backsight

The **Backsight Survey** screen (Figure 8-7) shows information about the backsight point errors.



HD and VD do not display if only an azimuth (direction) has been entered for the backsight.

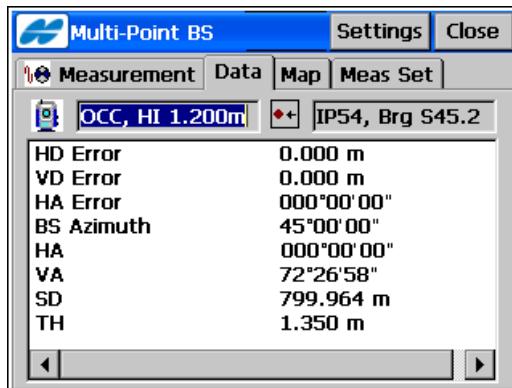


Figure 8-7. Check Backsight

There are two fields at the top of the page for the height of the instrument and the azimuth.

Station and Offset

The **Station and Offset** screen (Figure 8-8 on page 8-10) calculates a point defined by the number of stations on the road and an offset from this station.

Select the road from the list and enter the desired station, offset and elevation.

Press the **OK** button to open the **Add Point** screen on which to add the calculated point to the list of points. The **Backsight Survey** screen opens with this occupation point.

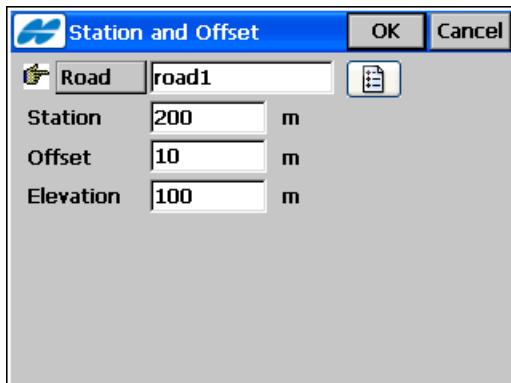


Figure 8-8. Station and Offset

Set Measurement Mode

To toggle between sideshot modes, press the **Settings** button on any **Survey** screen. The **Mode** screen (Figure 8-9 on page 8-11) displays. Select one of three measurement methods, *Sideshot Direct*, *Sideshot-Direct/Reverse*, or *Ang/Dist Sets-Dir/Rev*.

- *Sideshot-Direct* – defines the measurement to a single point, taken using the Direct position of the Total Station.
- *Sideshot-Direct/Reverse* – defines that the measurement to a single point is taken using the Direct Position and the Reverse Position of the Total Station (that is, Plunge – Flip and Rotate the Total station by 180 degrees to get the reverse measurement). This measurement method is known as *Multiple*, in which case the *Meas Set* tab appears in the *Sideshot-Direct/Reverse* screen. One set consists of one direct and one reverse measurement. These measurements are used to eliminate the Vertical and Horizontal circle centering errors.
- *Ang/Dist Sets-Dir/Rev* – during the measurement, defines the instrument that uses the specified Angle sequence to perform repeated measurements. In this case the *Sideshot-Direct/Reverse* screen also has the *Meas Set* tab. The sequence of four

measurements constitutes one set. One measurement is the backsight in *Direct* face or the Foresight in *Reverse* face in two positions of the Total Station. These measurements are used to eliminate the Vertical and Horizontal circle centering errors.

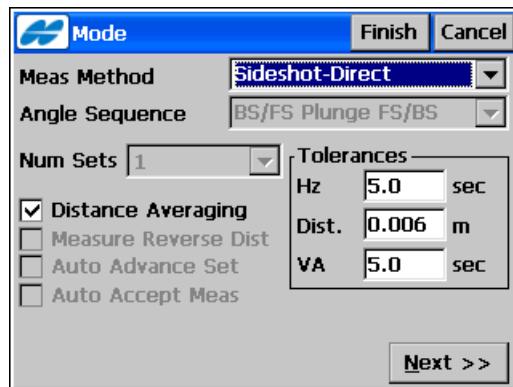


Figure 8-9. Mode - Measurement Method

- **Next** – opens the next **Mode** screen to set the order and the type of the measurements in one set (Figure 8-10).

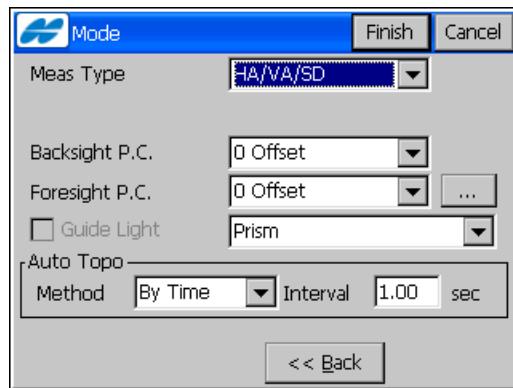


Figure 8-10. Mode - Type of Measurements

For a description of other parameters on these screens, see “Survey Parameters: First Screen” on page 3-2.

Resection

The method of resection computes the coordinates of an occupation point, where the instrument is set up, using measurements to two (or more) points with known coordinates.

To access the **Resection** option, tap the **Resection** icon. The **Occupation Pt** screen displays first to set the occupation point (Figure 8-11).

To perform resection for the occupation point selected in the **BS Survey** screen, press the menu icon next to the **Map** icon in the **Occ. Point** field of this screen and select the **Resection** item (Figure 8-2 on page 8-2).

Occupation Point

The **Resection** screen sets the name of the point, the heights of the instrument, and the target (Figure 8-11).

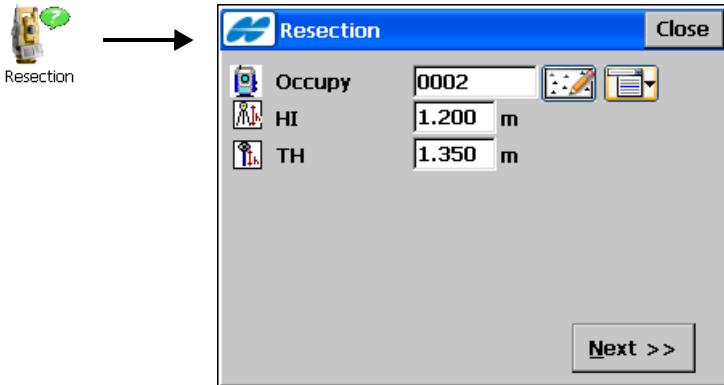


Figure 8-11. Resection

- **Next** – opens the resection screen to take measurements to known points.

Resection 3D

The **Resection 3D** screen calculates a three dimensional resection of the occupied point (Figure 8-12). Use the 2D/3D option to select performing either a two or three dimensional resection.

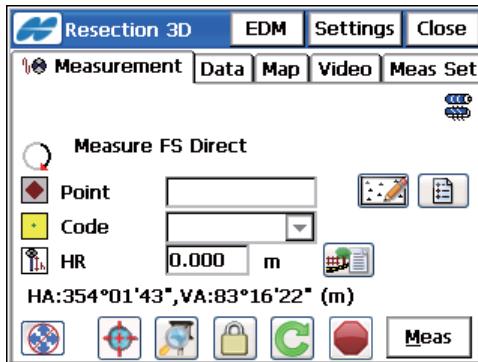


Figure 8-12. Resection 3D

The **Measurement** tab takes the measurements to known points.

- **Point** – the known point name; select from either the map or from the list.
- **Code** – the known point code.
- **HR** – the height of the target. Saves settings from the **Resection** screen.
- **Meas** – takes the sideshot to the point and displays the measurements of the point below the HRdata.
- **Settings** – opens the **Mode** screen (see “Mode - Type of Measurements” on page 8-11).
- The Help Icon in the upper-left corner displays the following pop-up menu items:
 - **Edit Points**: opens the **Points** list (see “Points” on page 6-2).
 - **Inverse**: opens the **Inverse COGO** screen (see “Inverse” on page 11-3).

- *Notes*: opens the **Note** screen for to add notes to the measurement session (if preferred).
- *PTL Mode*: switches on the PTL (Point-To-Line) Mode. (The screen changes to **Points (PTL)**.) For details, see “**PTL Mode**” on page 9-6.
- *Options*: opens the **Resection Options** screen (see “**Resection Options**” on page 8-16).
- *Help*: accesses the Help files.

The *Data* tab shows the current measurement data.

The *Map* tab shows all points in a graphic mode and allows selection of a point for measurement and performing measurements (Figure 8-13).

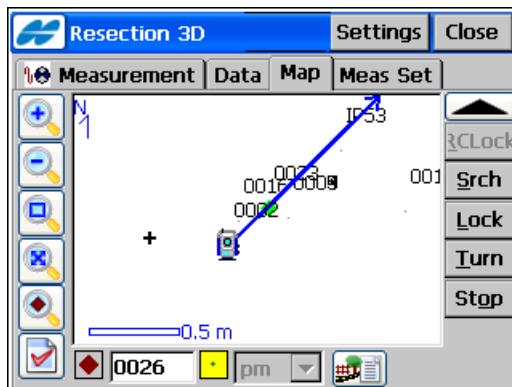


Figure 8-13. Resection 3D - Map Tab

For details on map properties and customizing, see “**Viewing Map**” on page 12-1.

The *Meas Set* tab displays the result of the sideshots being done (Figure 8-14 on page 8-15).

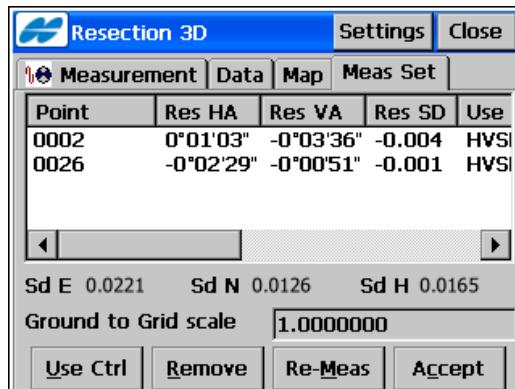


Figure 8-14. Resection – Meas Set Tab

- *Sd N, Sd E, Sd H* – displays Standard deviations for North, East and Height, respectively.
- *Ground to Grid scale* – displays the calculated scale factor.
- **Accept** – opens the *Edit Point* screen (Figure 8-15 on page 8-16) to save the new point.
- **Re-Meas** – replaces the current measurement with a new measurement.
- **Remove** – deletes the selected measurement.
- **Use Ctrl** – toggles through specific measurements in the resection, for example the horizontal angle, but not the vertical, or vice versa. The used measurements are listed in the Use column. For example, *HVSD* indicates that the *Horizontal* angle, *Vertical* angle and the *Slope Distance* were used.

Edit Point

The *Edit Point* screen (Figure 8-15 on page 8-16) saves the resection point in the job.

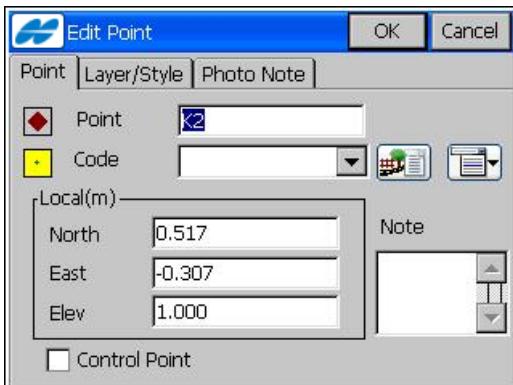


Figure 8-15. Edit Point

This is a standard screen adding a new point. For details on this screen see “Editing a Point” on page 6-6.

Resection Options

Select *Options* from the Help Icon in the upper-left corner of the **Resection 3D** screen. The **Resection Options** screen (Figure 8-16) sets the resection type: whether to calculate the height (3-D) or just the horizontal coordinates (2-D).

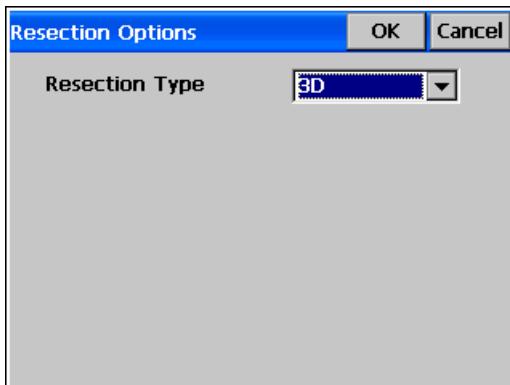


Figure 8-16. Resection Options

The 2D/3D option is retained between sessions.
When doing a resection the next time, the resection will start up with the previous used setting.

Remote Benchmarks

The method of Remote Benchmarks computes the elevation of an occupation point, where the instrument is set up, using measurements to two (or more) points with known elevations.

To access the **Remote BM** option, tap the **Remote BM** icon (Figure 8-2). The **Elevation** screen displays first to set the occupation point (Figure 8-11 on page 8-12).

To perform Remote BM for the occupation point selected in the *Backsight Survey* screen, press the menu icon next to the *Map* icon in the *Occu Point* field of this screen and select the Elevation option (Figure 8-17 on page 8-17).

Computation or estimation of elevation (vertical coordinate) typically uses measurements from two or more points with known coordinates

- **Next** – opens the **Known Elev** screen (Figure 8-18 on page 8-16).

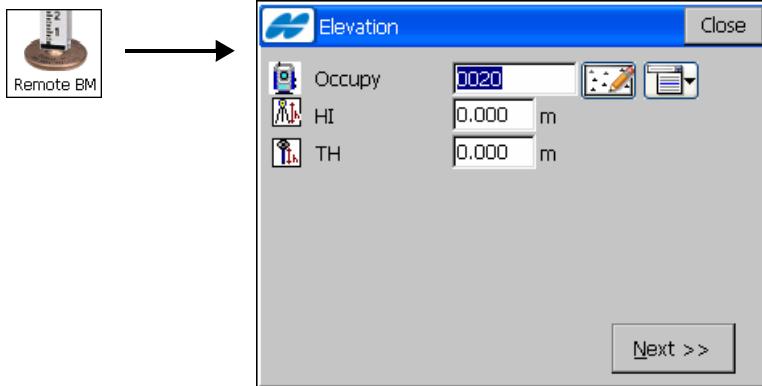


Figure 8-17. Elevation

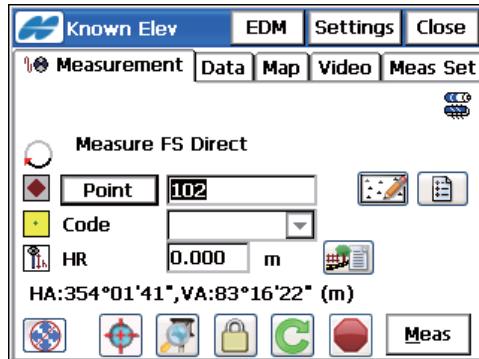


Figure 8-18. Known Elev

- *Point / Elevation*: the known point name (select either from the map or from the list) / the known elevation.
- *Code* – the known point code.
- *HR* – the height of the target.
- **Measure FS Direct** – press **Meas** to take the sideshot to the point.
- **Settings** – opens the **Mode** screen (see “Set Measurement Mode” on page 8-10).
- The Help Icon on the upper-left corner displays the same pop-up menu as for the Resection task, except the *Options* item.

The *Data* tab shows the results of the current measurement and the scale factor and standard deviations of the coordinates.

The *Map* tab shows all points in a graphic mode. For details on map properties and customizing, see “Viewing Map” on page 12-1.

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

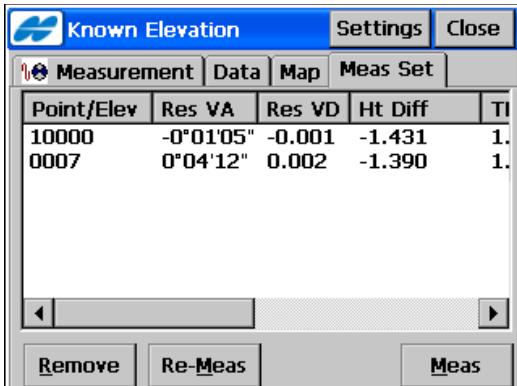


Figure 8-19. Elevation – Meas Set Tab

The table (Figure 8-19) represents the result list of the measurements being made: the residuals of the vertical and horizontal angles, the measured and initial parameters (*TH*, *HA*, *VA*, and so forth). The *Ht Diff* column represents the difference between the calculated height and the height of that measurement.

- **Remove** – deletes highlighted measurements in the elevation.
- **Re-Meas** – replaces the current measurement with a new measurement.
- **Accept** – stores the new coordinates in the database.
- **Settings** – opens the **Mode** screen (see “Set Measurement Mode” on page 8-10).
- **Close** – closes the screen.

Remote Control

To set up a survey with remote control, tap the **Remote Control** icon.

The **Remote Cntrl** screen (Figure 8-20) controls the total station.

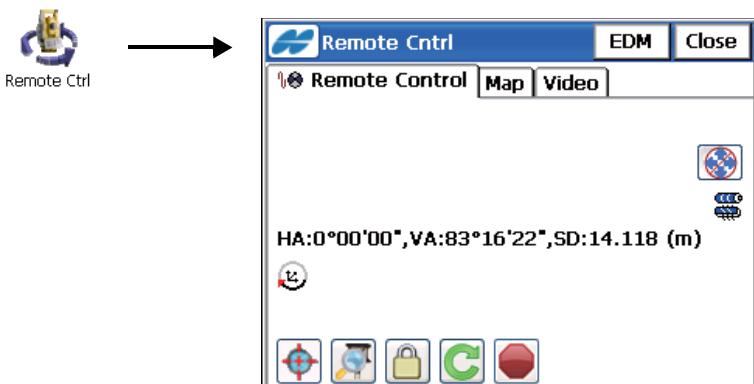


Figure 8-20. Remote Control o the Total Station

The *Remote* tab shows the current values of the total station measurements and provides a set of tools for control:

- – shows memory status.

The following functions except are for the 9000Series only.

- – switches the keyboard control on/off; shows the current status of the switch. The Arrow keys can be used to rotate a total station through both the vertical and horizontal axes. For example, pressing the UP arrow will initiate upward rotation of the telescope. Pressing any Arrow key once more or pressing the central stop key will stop this upward rotation.
- – Start auto aimig to prism.
- – makes the instrument search for the prism.
- – locks onto the prism or “tracks” it.
- – opens the **Rotate** screen (Figure 8-21 on page 8-22) which allows the total station to turn to various angles or points.

-  – makes the total station stop tracking the prism and go into “Standby” mode.
- The Data Indicator above  shows the current status of the total station. There are four status types: no data, querying status, turning, and receiving data.
- The Help Icon in the upper-left corner of the screen displays the pop-up menu containing seven items:
 - *Edit Points*: opens the **Points** list.
 - *Inverse*: opens the **Two-Point Inverse** COGO screen.
 - *Notes*: opens the **Note** screen.
 - *PTL Mode*: opens the **PTL Mode** screen (see “PTL Mode” on page 9-6).
 - *Display Coords*: if selected, the coordinates of the previous point measured displays below the HRdata.
 - *Help*: accesses the Help files.

The **Map** tab shows all points in a graphic mode. For details, on map properties and customizing, see “Viewing Map” on page 12-1.

Rotate

The **Rotate** screen (Figure 8-21 on page 8-22) contains settings for rotation of the total station.

- **Rotation Angles** – sets the values of the horizontal and vertical rotation angles.
- **Turn** – sends the data to the total station. The corresponding icon shows the rotation process.
- **Rotate to Point** – selects a point by typing its name, selecting it from the map or a list, or inserting the HRvalue (height of target). Press the **Turn** button.
- **Plunge TS** – press to plunge the instrument (rotate the telescope and the body by 180 degrees).

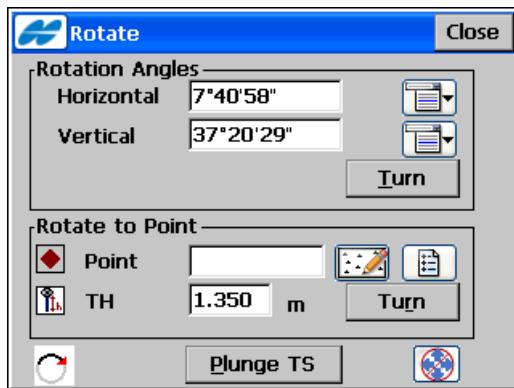
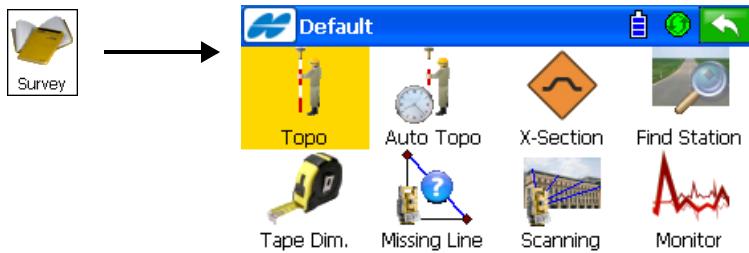


Figure 8-21. Rotate the Total Station

Total Station Survey

The Survey menu (Figure 9-1) is accessed by tapping the **Survey** icon in the main menu and allows the following total station surveys:

- Topo
- Auto Topo
- X-Section
- Find Station
- Tape Dimension
- Missing Line
- Scanning
- Monitor



Topo

Figure 9-1. TS Survey



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

The Help Icon  opens a pop-up menu giving access to the help files, menu interface selection, keyboard activation and information about TopSURV. (for detail see “Help Icon’s Pop-up Menu” on page 1-7).

Topo

To toggle between sideshot modes (Figure 9-2), press the **Settings** button on any Survey screen. Select one of three measurement methods from the *Meas Method* drop-down list, *Sideshot-Direct*, *Sideshot-Direct/Reverse*, or *Angle/Dist Sets-Dir/Rev*. For a description of other parameters on this screen, see “Survey Parameters: First Screen” on page 3-2 for more information).

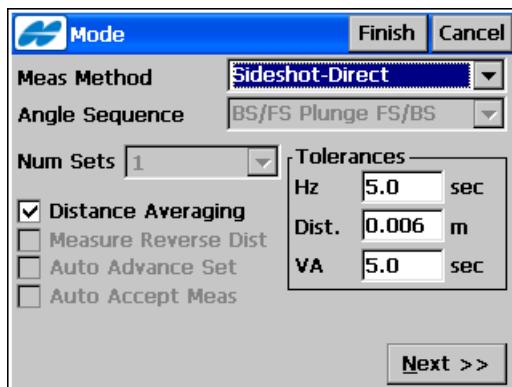


Figure 9-2. Mode

- *Sideshot-Direct* – defines that the measurement to a single point is taken using the Direct position of the Total Station.
- *Sideshot-Direct/Reverse* – defines the measurement to a single point that is taken using the Direct Position and the Reverse Position of the Total Station (that is, Plunge – Flip and Rotate the Total station by 180 degrees to get the reverse measurement). This measurement method is known as *Multiple*, in which case the *Set* tab displays in the *Sideshot-Direct /Reverse* screen. One set consists of one direct and one reverse measurement. These

measurements are used to eliminate the *Vertical* and *Horizontal* circle centering errors.

- *Angle/Dist Sets-Dir/Rev* – defines that during the measurement, the instrument uses the specified Angle sequence to perform repeated measurements. In this case the *Sideshot-Direct/Reverse* screen also has the *Meas Set* tab. The sequence of four measurements constitutes one set. One measurement is the backsight in Direct face or the Foresight in Reverse face in two positions of the Total Station. These measurements are used to eliminate the Vertical and Horizontal circle centering errors.
- **Next** – opens the next **Mode** screen to set the order and the type of the measurements in one set.

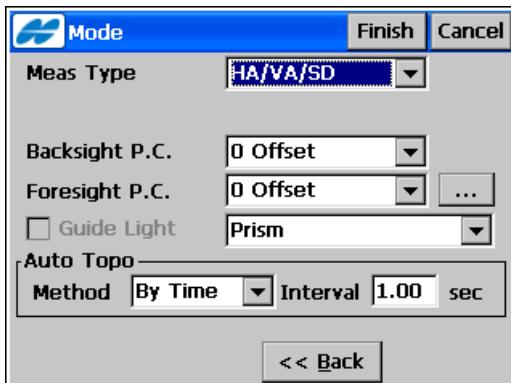


Figure 9-3. Mode - Type of Measurements

For a description of other parameters on the **Mode** screens, see “Mode - Measurement Method” on page 8-11 for more information).

Sideshot-Direct

The *Measurement* tab on the ***Sideshot-Direct*** screen (Figure 9-4) contains the initial data for performing single sideshots and displays the following information during a survey.

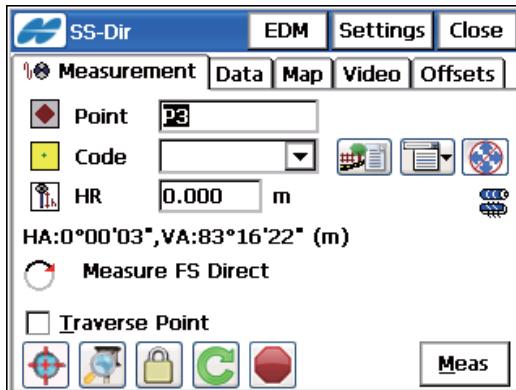


Figure 9-4. Sideshot-Direct – Measurement Tab

- *Point* – sets the current point name. During the survey, the numerical part of the name increments automatically by one.
- *Code* – sets the Code for the current point: enter either manually or select a code from the drop-down list.
- – accesses the attributes of the selected code and opens the ***Point Attributes*** screen (for details see “On the Point Attributes” on page 6-7).
- – shows memory status.
- The menu icon next to the *Attributes List* icon displays a pop-up menu containing three items:
 - *Layer*: opens the ***Select Layer*** screen (see “On the Select Layer” on page 6-10).
 - *Note*: opens the ***Note*** screen.
- *HR* – sets the height of the target above the mark.

- The Help Icon in the upper-left corner of the screen displays a pop-up menu containing seven items:
 - *Adv*: opens the **Backsight Survey** screen for setting the next traverse point as the next occupation point. The current occupation point becomes the next backsight point.
 - *Edit Points*: opens the **Points** list.
 - *Inverse*: opens the **Two Point Inverse** COGO screen.
 - *Notes*: opens the **Note** screen.
 - *PTL Mode*: opens the **PTL Mode** screen (see “PTL Mode” on page 9-6).
 - *BS Setup* – opens the **Backsight Survey** screen to set the backsight point. The information displays on screen.
 - *Display Coords*: if chosen, the coordinates of the previous point measured displays below the HRdata. (Figure 9-4 on page 9-4).
 - *Help*: accesses the Help files.
- **Measure FS Direct** – Check and enable *Traverse Point* to open the screen to set the coordinates of the point manually.



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. Select OK, to display the Backsight Survey screen, which automatically updates, as is the case when one TP point is available.

- **Meas** – takes the sideshot to the point. The results display in the information window.
- **Settings** – opens the **Mode** screen (for a description of parameters on this screen, see “Survey Parameters: First Screen” on page 3-2).

PTL Mode

Select **PTL Mode** from the Help Icon  in the upper-left corner.

On the (Point-To-Line) **PTL Mode** screen, the coordinates are defined through two reference points (Figure 9-5). The line traced through these points is set as one axis and is as perpendicular as another.

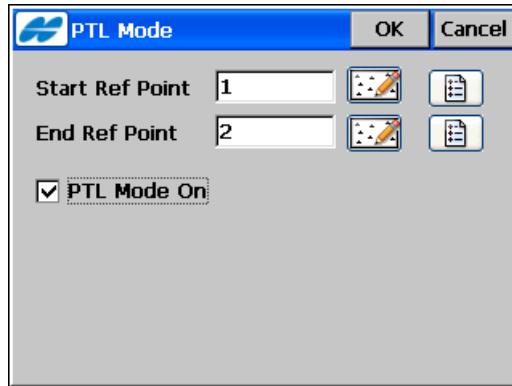


Figure 9-5. PTL Mode

- *Start Ref Point/End Ref Point* – the start number and the end number of the reference points: select from either the map or 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 on the *Sideshot-Direct* screen (Figure 9-6) contains the results of the measurements, along with the initial data.

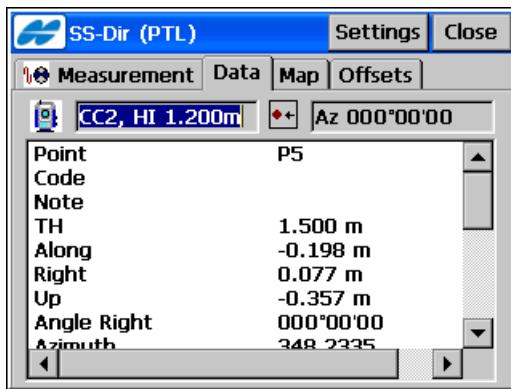


Figure 9-6. Sideshot-Direct – Data Tab

The *Map* tab (Figure 9-7) on the second *Sideshot-Direct* screen performs sideshots in the graphic mode. The buttons on the right duplicate the controls on the first *Sideshot-Direct* screen (Figure 9-4 on page 9-4).

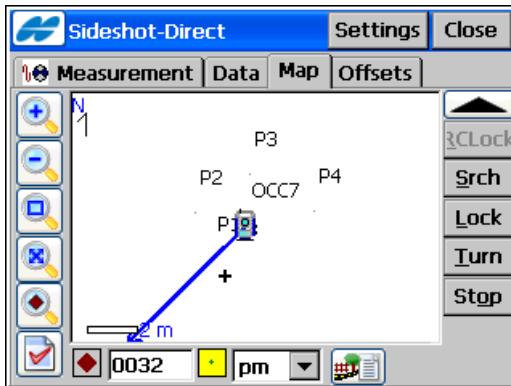


Figure 9-7. Sideshot-Direct – Map Tab

For details on map properties and customizing, see “Viewing Map” on page 12-1.

In the *Sideshot-Direct/Reverse* and *Angle/Dist Sets-Dir/Rev* mode, the *Meas Set* tab displays (Figure 9-8 on page 9-8).

The **Sideshot-Direct/Reverse** screen (Figure 9-8) contains the data collected during the measurements, grouped by sets: the set for Multiple mode contains two measurements; the set of the Repeat mode contains four measurements).

The screenshot shows a software window titled "Sideshot-Direc...". At the top right are "Settings" and "Close" buttons. Below the title bar are tabs: "Measurement" (which is selected and highlighted in blue), "Data", "Map", and "Meas Set". The main area contains a table with the following data:

Point	Res HA	Res VA	Res SD	TH
P7	-0°00'02"	-0.0000	0.000	1.50
100	0°00'02"	0.0001	0.000	1.50
100	-0°00'02"	0.0001	0.000	1.50
P7	0°00'02"	-0.0000	0.000	1.50

At the bottom of the table area are navigation arrows (left and right). Below the table are three buttons: "Remove", "Re-Meas", and "Meas".

Figure 9-8. Ang/Dist Sets-Dir/Rev – Meas Set Tab

- The columns on the *Meas Set* tab displays the following parameters:
 - *Point*: the name of the point.
 - *Res HA*: Difference of each HA measurement within the set from the average of all the HAs in the set.
 - *Res VA*: Difference of each VA measurement within the set from the average of all the VAs in the set.
 - *Res SD*: Difference of each SD measurement within the set from the average of all the SDs in the set.
 - *TH*: the height of the target.
 - *HA*: Horizontal Angle measurement in the corresponding set.
 - *VA*: Vertical Angle measurement in the corresponding set.
 - *SD*: Slope Distance measurement in the corresponding set.
- **Remove** – deletes all measurements from the set.
- **Re-Meas** – displays the sideshot page to measure a new angle set.
- **Accept** – saves the measured point.

- **Settings** – opens the **Mode** screen (see Figure 9-2 on page 9-2).

Offsets

The *Offsets* tab (Figure 9-9) on the **Sideshot-Direct** screen contains a set of tools to define the offsets.

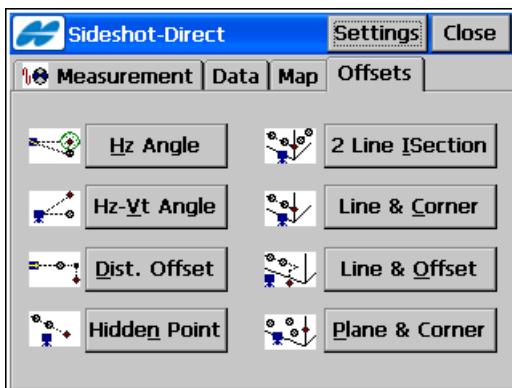


Figure 9-9. Offsets

- *H_z Angle* – defines a point using the horizontal angle from one point and the distance to another (see “Horizontal Angle Offset” on page 9-10).
- *H_z-V_t Angle* – defines a point using horizontal and vertical angles (see “Horizontal/Vertical Angle” on page 9-13).
- *Dist. Offset* – defines a point giving the ability to add or subtract distances, horizontally and vertically (see “Distance Offset” on page 9-14).
- *Hidden Point* – defines a point on the ground surface, with a slanted rod touching the ground point (see page 9-16).
- *2 Line ISection* – determines a point by the intersection of the two lines. Each line is defined by two points or two measurements (see “Two Line Intersection” on page 9-17).
- *Line & Corner* – determines a point on the corner using one line defined by two points and a horizontal angle measurement.
- *Line & Offset* – determines a point distant from a line defined by two points.

- *Plane & Corner* – determines a point (Corner) by a plane, which is defined by three points and horizontal/vertical angle measurements.

Horizontal Angle Offset

The *Measurement* tab of the **Horizontal Angle Ofst** screen (Figure 9-10) contains data for definition of a point using the horizontal angle from one point and the distance to another.

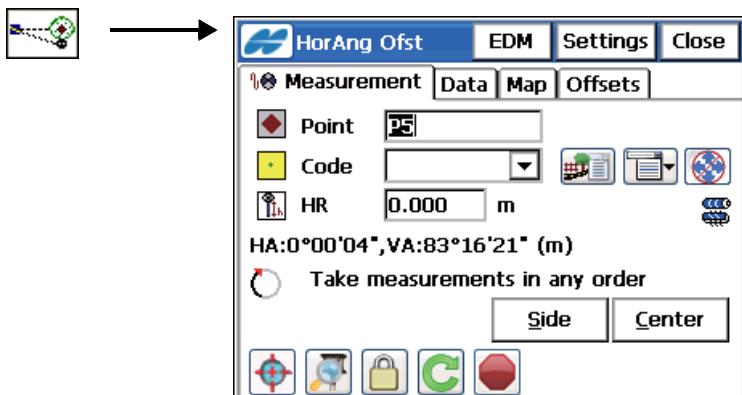


Figure 9-10. Horizontal Angle Offset – Measurement Tab

- *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* icon opens the list of available attributes (for details see “On the Point Attributes” on page 6-7).
- The menu icon close to the *Attributes List* icon displays a pop-up menu containing two items:
 - *Layer*: opens the **Select Layer** screen (see “On the Select Layer” on page 6-10).
 - *Note*: opens the **Note** screen.
- *HR* – sets the target height above the mark (target height).
- **Settings** – opens the **Mode** screen for setting the sideshot mode.

- **Side and Center** – on the Take measurements in any order panel, press **Center**, then **Side**. Take measurements to *Center* and obtain vertical angle and horizontal angle measurements; a *Side* measurement then provides VA, HA, and distance measurements. With these two sets of measurements, the computation can be made for a point at the center of a tree; for example, when taking measurements, a comment displays on the screen.
- The Help Icon on the upper-left corner of the screen displays the pop-up menu containing nine items:
 - *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.
 - *Edit Raw*: opens the **Raw TS** screen (see “Edit Raw Data” on page 6-35).
 - *Inverse*: opens the **Two-Point Inverse COGO** screen (see “Inverse” on page 11-3).
 - *Notes*: opens the **Note** screen.
 - *PTL Mode*: opens the **PTL Mode** screen (see “PTL Mode” on page 9-6).
 - *BS Setup* – opens the **Backsight Survey** screen (see “Backsight Survey” on page 8-2).
 - *Display Coords*: if selected, the coordinates of the previous point measured displays below the HRdata (see Figure 9-4 on page 9-4).
 - *Help*: accesses the Help files.

The following three tabs are similar to the *Offset* options:

- The *Data* tab (Figure 9-11) on the ***Hor Ang Ofst*** screen contains the data collected during the offset measurement.

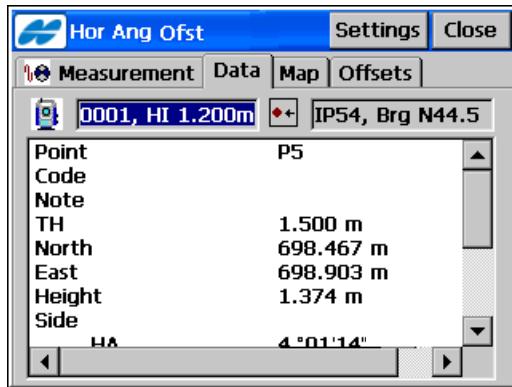


Figure 9-11. Horizontal Angle Offset – Data Tab

- The *Map* tab (Figure 9-12) on the ***Hor Ang Ofst*** screen contains the graphic view and duplicated controls from the *Measurement* tab. For the details on viewing and customizing properties, see “Viewing Map” on page 12-1.

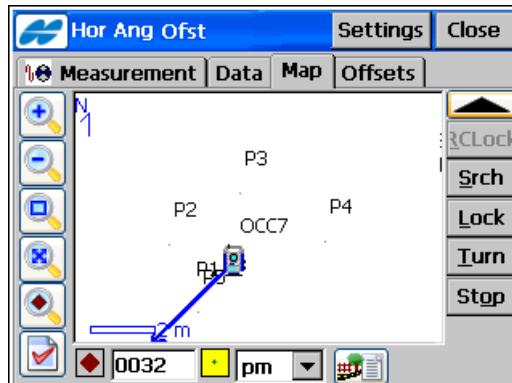


Figure 9-12. Horizontal Angle Offset – Map Tab

- The *Offsets* tab toggles to another offset option.

Horizontal/Vertical Angle

The *Measurement* tab (Figure 9-13) on the **H/VAng Ofst** screen contains data for definition of a point using horizontal and vertical angles.

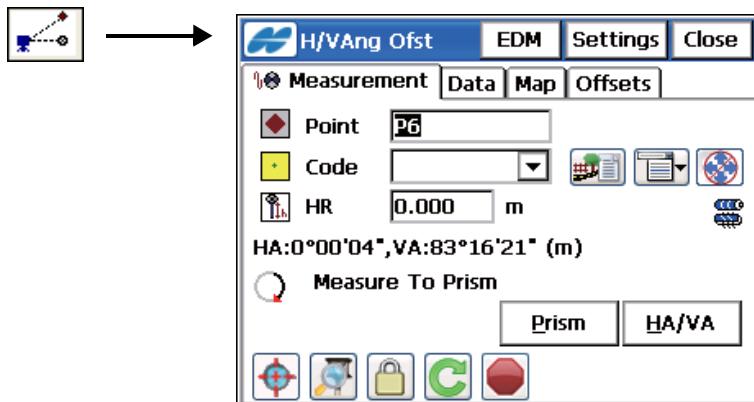


Figure 9-13. Horizontal/Vertical Angle – Measurement Tab

- *Point* – name for the offset point to be stored.
- *Code* – code for the offset point to be stored, which can be entered manually or selected from the drop-down list.
- – the *Attributes List* icon lists available attributes (see “On the Point Attributes” on page 6-7).
- The menu icon next to the *Attributes List* icon and in the upper-left corner of the screen displays the same lists as for the **H/VAng Ofst** screen.
- *HR* – sets the target height.
- *Prism* – stores horizontal distance and horizontal angle measurements (to prism).
- *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 sideshot mode.

See the **Horizontal Angle Offset** measurement for other tabs.

Distance Offset

The *Measurement* tab (Figure 9-14) on the *Distance Offset* screen contains the parameters for definition of a point. You can add or subtract distances, horizontally and vertically.

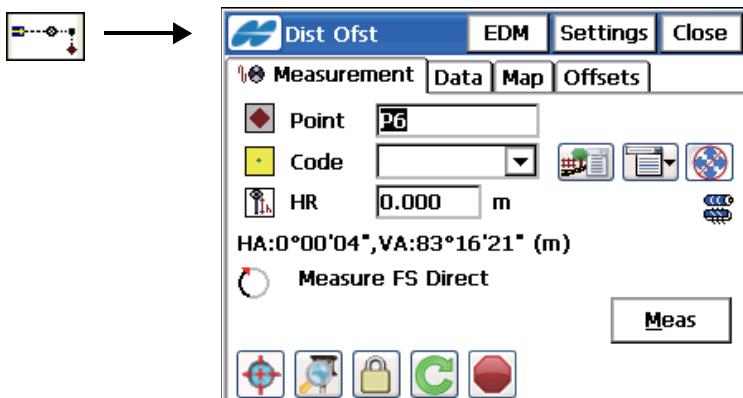


Figure 9-14. Distance Offset – Measurement Tab

- *Point* – name for the offset point to be stored.
- *Code* – code for the offset point to be stored: enter either manually or select from the drop-down list.
- – The *Attributes List* icon opens the list of available attributes.
- The menu icons next to the *Attributes List* icon, located in the upper-left corner of the screen, displays the same lists as those shown on the *H/VAng Ofst* screen.
- *HR* – sets the target height above the mark (target height).
- – shows the memory status.

After the sideshot is taken, the **Enter Distance Offsets** screen (Figure 9-15) displays to enter 3 distance offsets:

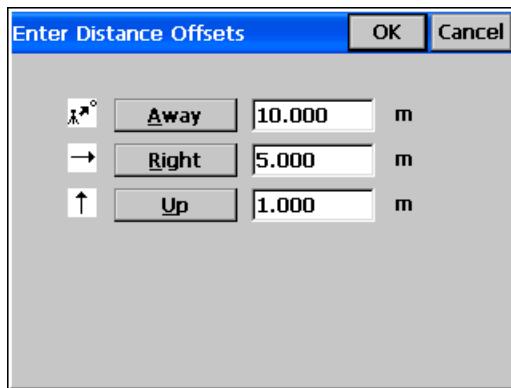


Figure 9-15. Distance Offset Screen

- **Away/(Toward)**: sets the distance between the current point and the projection of the offset point on the line of sight.
- **Right/(Left)**: sets the distance between the offset point and its projection, taking into consideration the location relative to the line of sight.
- **Up/(Down)**: sets the height of the point, relative to the current position.
- **Meas** – performs the measurement (Figure 9-14 on page 9-14).
- **Settings** – opens the **Mode** screen for setting the sideshot mode. (Figure 9-14 on page 9-14)

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

Hidden Point

The *Measurement* tab (Figure 9-16) of the **Hidden Pt** screen defines a point on the ground surface, with a slanted rod touching the ground point. The rod has two targets. The rod has two targets.

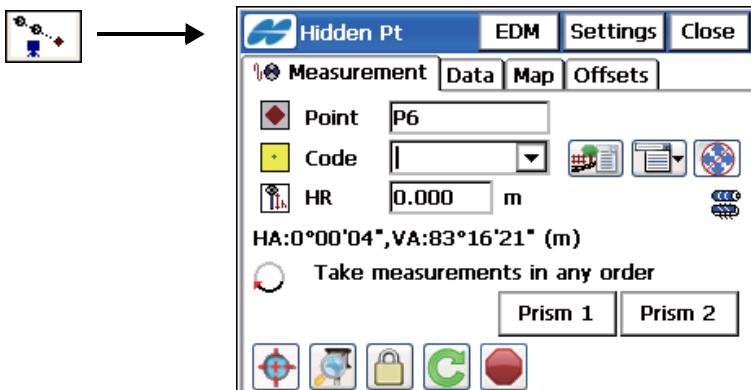


Figure 9-16. Hidden Point – Measurement Tab

- *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.
- – the *Attributes List* bitmap, opens a list of available attributes.
- The menu icons next to the *Attributes List* icon and the Help Icon in the upper-left corner of the screen display the same lists as for the *H/VAng Ofst* screen.
- *HR* – sets the target height (Rod Height).
- **Prism 1**: measures the first target on the rod.
- **Prism 2**: measures the second target on the rod.
- **Settings** – opens the *Mode* screen for setting the sideshot mode.

Two Line Intersection

The *Measurement* tab (Figure 9-17) on the **2Line Inters** screen contains data for determination of a point by the intersection of two lines. Each line is defined by two points or by two measurements.

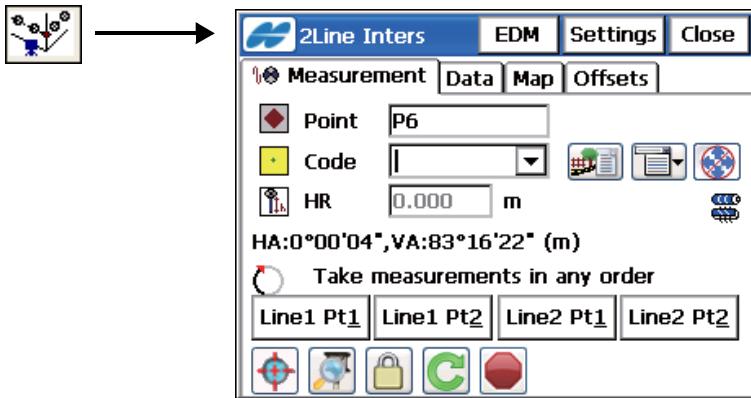


Figure 9-17. Two Line Intersection – Measurement Tab

- *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.
- – the *Attributes List* icon, opens the list of available attributes.
- The menu icons next to the *Attributes List* icon and the Help Icon in the upper-left corner of the screen display the same lists as for the *H/VAng Ofst* screen.
- *HR* – sets the target height above the mark (target height).
- **Line 1 Pt1** and **Line 1 Pt2** – obtains measurements to determine the first and second points defining the first line.
- **Line 2 Pt 1** and **Line 2 Pt 2** – obtains measurements to determine the first and second points defining the second line.
- **Settings** – opens the *Mode* screen for setting the sideshot mode.

See the *Horizontal Angle Offset* measurement for other tabs.

Line and Corner

The *Measurement* tab (Figure 9-18) on the ***Line&Corner*** screen contains data for determination of a point on the corner using one line defined by two points.

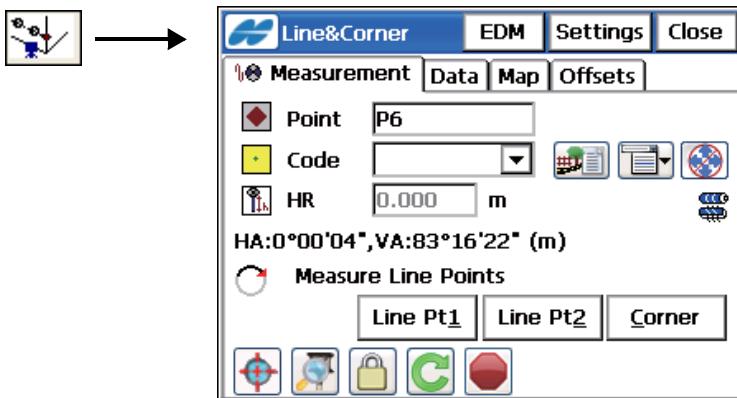


Figure 9-18. Line and Corner – Measurement Tab

- *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* icon, opens a list of available attributes.
- The menu icons next to the *Attributes List* icon and the Help Icon in the upper-left corner of the screen display the same lists as for the *H/VAng Ofst* screen.
- *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 second point defining a line.
- **Corner** – obtain the horizontal angle to locate a point on line at the corner.
- **Settings** – opens the *Mode* screen for setting the sideshot mode.

Line and Offset

The *Measurement* tab (Figure 9-19) on the ***Line&Ofst*** screen contains data for determination of a point distant from a line defined by two points.

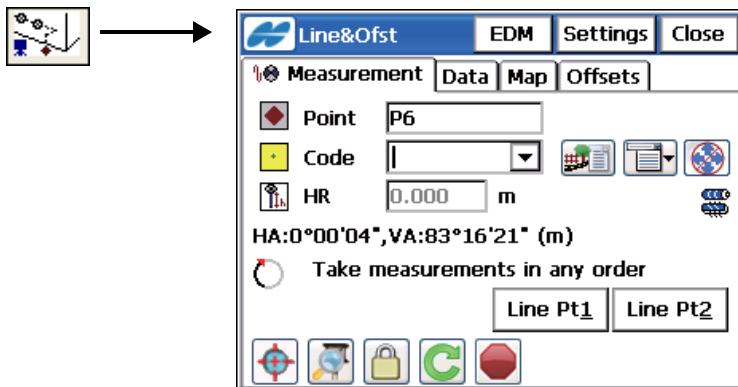


Figure 9-19. Line and Offset – Measurement Tab

- *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* icon, opens a list of available attributes.
- The menu icon next to the *Attributes List* icon and the Help Icon in the upper-left corner of the screen display the same lists as for the **H/VAng Ofst** screen.
- *HR* – sets the target height above the mark (target 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 sideshot mode.

After the lines are measured, the ***Enter Distance Offsets*** screen displays to enter offsets (see Figure 9-15 on page 9-15):

- **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 (Figure 9-20) on the **Pln&Corner** screen helps determine a point (Corner), using a plane defined with three points and an angle measurement.

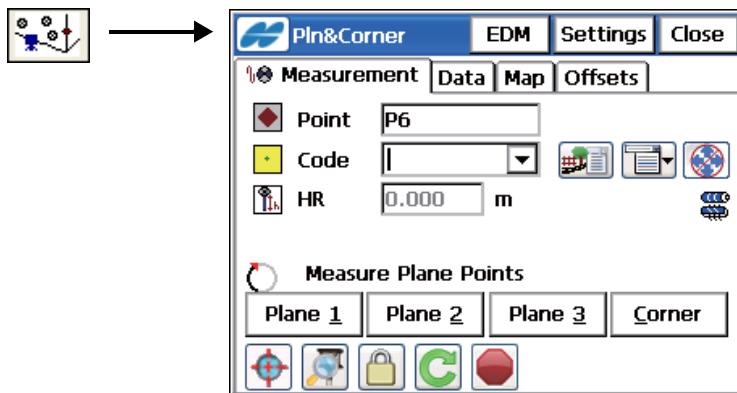


Figure 9-20. Plane (Point) and Corner – Measurement Tab

- *Point* – name for the offset point to be stored.
- *Code* – code for the offset point to be stored: enter either manually or select from the drop-down list.
- – the *Attributes List* icon opens a list of available attributes for the selected code.
- The menu icons next to the *Attributes List* icon and the Help Icon in the upper-left corner of the screen display the same lists as for the **H/VAng Ofst** screen.
- *HR* – sets the target height above the mark.

- **Plane 1** – obtains measurements to determine the first point in a plane.
 - **Plane 2** – obtains measurements to determine the second point in a plane.
 - **Plane 3** – obtains measurements to determine the third point in a plane.
 - **Corner** – obtains horizontal and vertical angle measurements to determine corner point in a plane.
-



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

- **Settings** – opens the *Mode* screen to set the sideshot mode.

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

Auto Topo

This function is activated only with the 9000Series, and collects points by Time and Distance. To open the *Auto Topo* screen (Figure 9-21), select the **Auto Topo** icon.

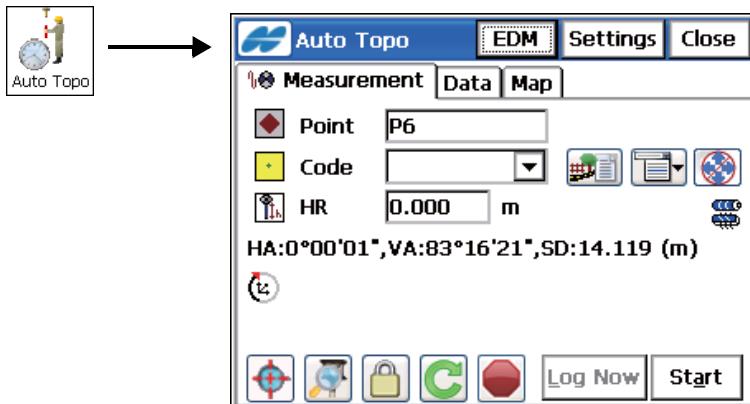


Figure 9-21. Auto Topo

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing nine items:

- *Edit Points* – opens the **Points** list.
- *Inverse* – opens the **Inverse COGO** screen.
- *Notes* – opens the **Notes** screen.
- *PTL Mode* – opens the **PTL Mode** screen (see “PTL Mode” on page 9-6).
- *BS Setup* – opens the **Backsight Survey** screen (see “Backsight Survey” on page 8-2).
- *Display Coords* – if selected, the coordinates of the previous point measured displays below the HRdata (see Figure 9-4 on page 9-4).
- *Help* – accesses the Help files.

The *Measurement* tab on the *Auto Topo* screen (Figure 9-21 on page 9-22) contains the initial data for the survey:

- **Point** – displays the current point name.
- **Code** – displays the current point code: either enter manually or select from the drop-down list.
-  – selects attributes for the selected code.
- The menu icon next to the *Attributes List* icon displays a pop-up menu containing two items:
 - **Layer**: opens the **Select Layer** screen (see “On the Select Layer” on page 6-10).
 - **Note**: opens the **Note** screen.
- **HR** – the height of the target.
- **Log Now** – immediately stores the current position.
- **Start** – starts the survey process. After pressing, the button changes (toggles) to **Stop**. Press again to stop the survey process.
- **Settings** – opens the **Mode** screen (see Figure 9-2 on page 9-2). Press **Next** to access the Auto Topo settings (Figure 9-22 on page 9-24):
 - Method: sets the method of data collection; either *By Time*, *By Horizontal Distance*, or *By Slope Distance*.
 - Interval: the time interval for the data collection.

- Press **Finish** to save the changes and return to the *Auto Topo* screen.

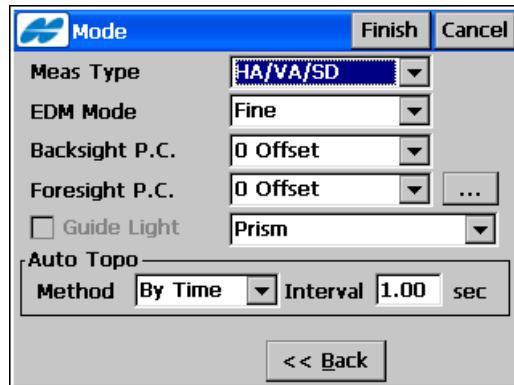


Figure 9-22. Mode Screen – Auto Topo Settings

The *Data* tab displays the data being surveyed.

The *Map* tab shows the surveyed data graphically and duplicates the controls from the *Measurement* tab to perform the survey to work in map mode.

Cross-Section

To perform a cross-section survey of the selected road, select the **X-Section** icon. The *Cross Section* screen displays.

The **Cross Section** screen contains station settings for a selected road, where the cross section survey is to be performed.

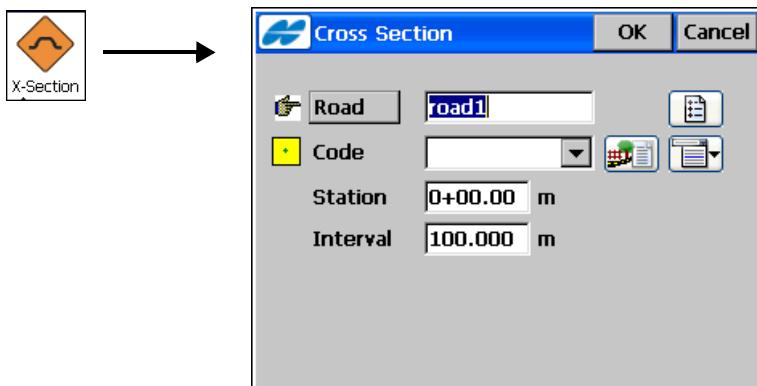


Figure 9-23. Cross Section

- **Road** – select the road from the **Roads** list.
- **Code** – the code of the center line points: manually enter a road or either select one from the drop-down list.
-  – the *Attributes List* icon opens the list of available attributes (for details see “On the Point Attributes” on page 6-7).
- The icon next to the *Attributes List* icon displays the pop-up menu of the following items:
 - *Add to End/Start*: for Line and Area codes.
 - *Insert*: for Line and Area codes. This allows the user to insert a point to a line out of sequence.
 - *Layer*: opens the **Select Layer** screen (see Figure 6-10 on page 6-10).
 - *Note*: opens the **Note** screen. For details, see “Note: opens the Note screen.” on page 9-4.
- **Station/Chainage**: sets the station/distance where the cross section is surveyed.

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



The Station/Chainage and Interval fields display ONLY if the road is selected.

- The Help Icon in the upper-left corner of the screen displays a pop-up menu containing two items:
 - *Edit Roads*: enables the **Roads** screen. See “Roads” on page 7-2.
 - *Help*: accesses the Help files.
- **OK** – saves the changes and opens a screen to perform sideshot measurements. Toggling between the sideshot modes is performed from the *Measurement Method* field in the two **Mode** screens opened by the **Settings** button in the **XSect-Direct** (**XSect-Direct/Reverse**) screen.

XSection - Direct

The **XSect-Direct** screen (Figure 9-24) performs the usual observation work, relative to the cross-section.

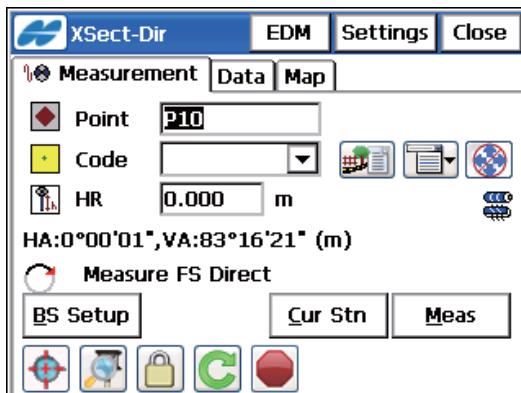


Figure 9-24. Cross Section - Direct

The survey is performed from one side of the road to another in a plane perpendicular to the center line. If the road has not been set,

define the plane. On the first station, the survey is performed so that the next point has a different code, for example *A, B, C, cl, D, E, F*. Press the **Close** button to automatically change the station number. The application suggests that the survey on the next station uses the same codes in the opposite order: *F, E, D, cl, C, B, A*. The line is created along the points with the “cl” code.

For a detailed description of the survey process, see “Topo” on page 9-2. The only difference lies in the presence of the **Cur Stn/Cur Chn** 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 the **Find Station** icon.

The *Meas* tab (Figure 9-25) on the **Find Station** screen identifies the station by computing the distance from the beginning of the road to the projection of the station to the road, and the offset of the station from the center line of the road.

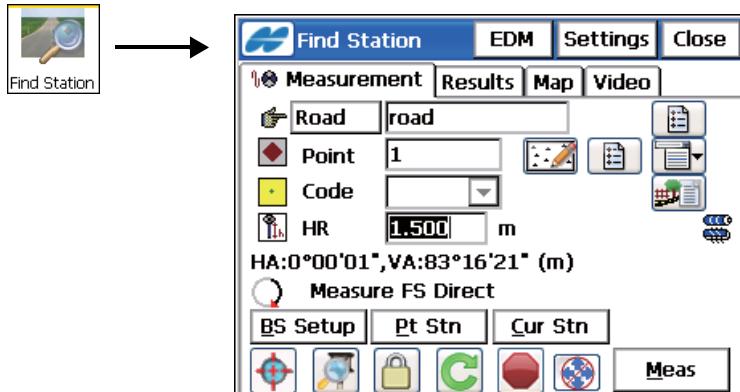


Figure 9-25. Find Station – Measurement Tab

- *Road* – enter the name of the road or select it from the list.
- *Point* – select the name of the point from the map or the list.
- *Code* – enter either manually or select from the drop-down list.

-  – the *Attributes List* icon opens a list of available attributes (for details, see “On the Point Attributes” on page 6-7).
-  – shows the memory status.
- The menu icon next to the *Attributes List* icon displays the pop-up menu containing two items:
 - *Layer*: opens the **Select Layer** screen (see “On the Select Layer” on page 6-10).
 - *Note*: opens the **Note** screen.
- **HR** – sets the target height above the mark (target height).
- **BS Setup** – opens the **Backsight Survey** screen to set the backsight point. The information displayed is the same as has been entered.
- **Pt Stn** – computes the result of the point station.
- **Cur Stn** – computes the result of the current station, 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 (Figure 9-25 on page 9-27).
- **Settings** – opens the **Mode** screen to set the sideshot mode.
- The Help Icon in the upper-left corner of the screen displays a pop-up menu containing six items:
 - *Edit Points*: opens the **Points** list.
 - *Inverse*: opens the **Inverse COGO** screen.
 - *Notes*: opens the **Notes** screen.
 - *PTL Mode*: opens the **PTL Mode** screen (see “PTL Mode” on page 9-6).
 - *Display Coords*: if selected, the coordinates of the previous point measured displays below the HRdata (see Figure 9-4 on page 9-4).
 - *Help*: accesses the Help files.

The *Results* tab shows the results of the computation.

The *Map* tab shows all points in a graphic mode and duplicates the button controls from the first tab.

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

Tape Dimension

To start working, select the **Tape Dimension** icon. The **Tape Dimension** screen displays.

The **Tape Dimension** screen calculates the periphery of structures such as buildings that have features perpendicular to each other. This is done using tape measurements, relative to the two known points that belong to one side of the structure (wall of the building), forming a so called *reference line*.

Reference Line

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

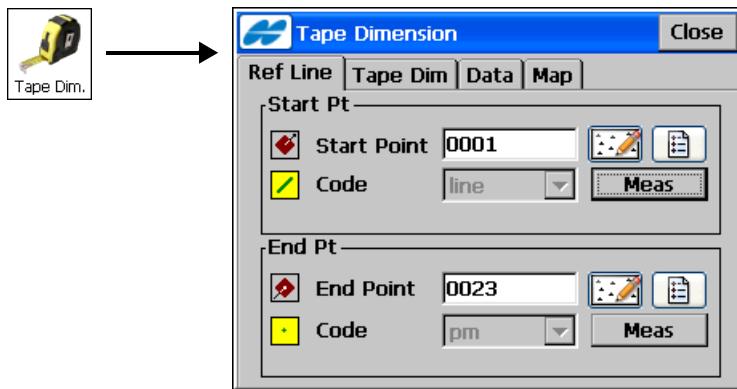


Figure 9-26. Tape Dimension - Ref Line Tab

- *Start Point/End Point* – contains properties of the starting and ending point: the name (can be entered manually or selected from

the map or list) and code. Also, the point can be measured by pressing the **Meas** button.

Tape Dimension Points

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

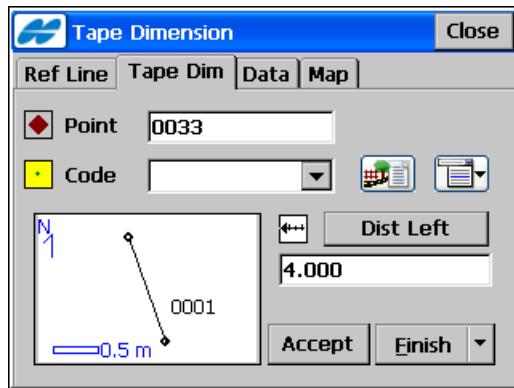


Figure 9-27. Tape Dimension – Tape Dim Tab

- *Point* – the name of the next point in the survey.
- *Code* – the code of the point: either enter manually or select from the drop-down list.
- – the *Attributes List* icon, opens the list of available attributes (see “On the Point Attributes” on page 6-7 for more details).
- The *menu* icon next to the *Attributes List* icon opens the following options:
 - *Layer*: opens the *Select Layer* screen to place the point. For details.
 - *Note*: opens the *Note* 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 icon in the lower-left corner of the screen shows the plot of the already taped perimeter.

The *Data* tab shows the initial data and current results of the measurements.

The *Map* tab displays the plot of the already made measurements.

Missing Line

To start working, select the **Missing Line** icon. The ***Missing Line*** screen displays (Figure 9-28).

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

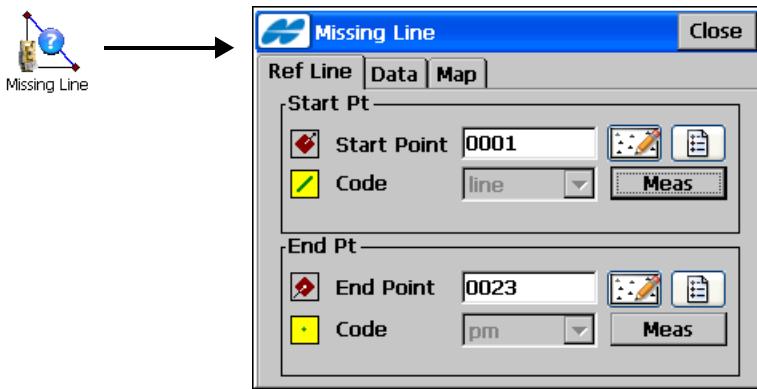


Figure 9-28. Missing Line – Ref Line Tab

- The *Start* and *End Points* can be entered manually, chosen from the map or from the list, or measured through the **Meas** button.

The *Data* tab displays the results of the measurements.

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

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

Scanning

This function is activated only with the 9000Series. Make sure that the *Show Scan Point* option is selected in the Help Icon menu in the upper-left corner of the ***Points*** screen (see “*Points*” on page 6-2).

To open the ***Scanning*** screen, select the **Scanning** icon. On the ***Scanning*** screen (Figure 9-42) select either, *Scan w/o Image* or *Scan with Image* mode.

Scanning with an Image

To scanning with an image, tap **Next** to follow a scan wizard.

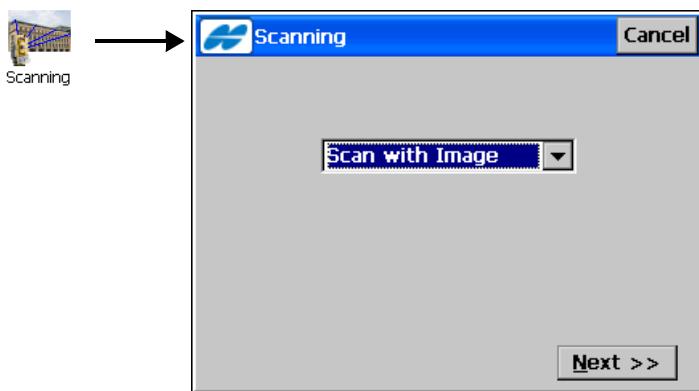


Figure 9-29. Scan with Image

Enter the following parameters on the *Scanning* screen (Figure 9-30 on page 9-34).

- *Session* – sets a name for the session.
- *Image* – sets an Image file. Select a previous Image or browse for a new one (Images are stored as a JPEG file with the *.jpg file extension).

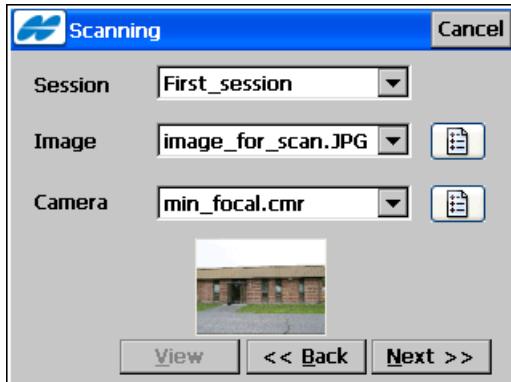


Figure 9-30. Enter Scan Session Information

- **View** – when available, opens the ***View Scan*** screen.
- **Back** – returns to the previous screen.
- **Next** – click to open the ***Orient*** screen (Figure 9-32 on page 9-35) to complete.

View Scan

The ***View Scan*** screen (when available) displays the image, along with orientation and scanned points for completed scan sessions.



Figure 9-31. View Scan

Orientation

The **Orientation** screen (Figure 9-32) associates a position on the image (x,y) with known NEZ coordinates.



Figure 9-32. Orientation

- – zooms in the image
- – zooms out the image
- – displays the whole image

- / – enables/disables a pan drag control of the image. When the **Pan** button is disabled, tap on the image to choose the orientation point. The image zooms to this point and displays a crosshair. The position of the crosshair can be adjusted (Figure 9-33)

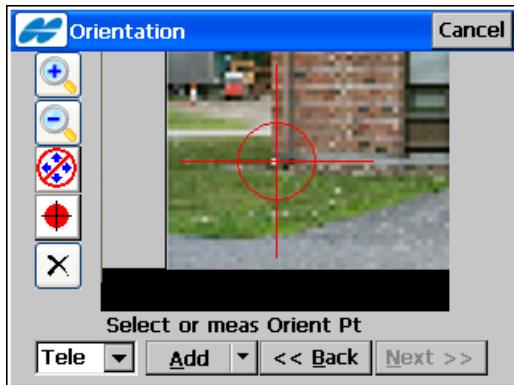


Figure 9-33. Select Orientation Point

- / – switches on/off the arrow keys on the keypad to adjust the crosshair position. When the **Arrow** button is enabled, the arrow keys on the keypad can move the crosshair up, down, left, or right.
- – attempts to move the crosshair to the center of a circular object on the image. First, tap somewhere inside the circular object. The object should be a well-defined circle with high contrast between the inside and outside of the circle.
- The drop-down list in the bottom-left corner of the screen (next to the **Add** button) contains two options to view the image (Figure 9-34 on page 9-37):
 - *Tele* (telescope): the default zoomed-in view of the crosshair.
 - *Wide View*: zooms out and shows the area of the image which contains the orientation point.

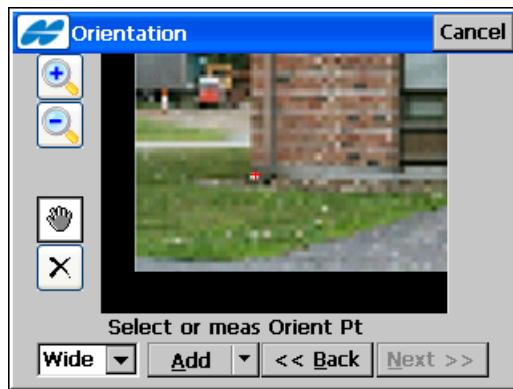


Figure 9-34. Select Orientation Point – Wide View

- **Add** – measures the orientation point. The bitmap menu options (*Meas, From Map, From List*) are used to take a measurement or to select an existing point from a map or list (Figure 9-35).
- **X** – opens the **Orientation Results** screen (Figure 9-35 on page 9-37) to delete the selected orientation points.

Name	dX(pixel)	dY(pixel)	
<input type="checkbox"/> ori01	78.6	-5.7	BAD
<input checked="" type="checkbox"/> ori02	-75.5	-0.3	GOOD
<input type="checkbox"/> ori03	-31.1	9.2	BAD
<input type="checkbox"/> ori04	28.0	-5.5	BAD

MAX dX:78.6 dY:9.2 BAD
RMS dX:58.4 dY:6.1 BAD

Delete **<< Back** **Next >>**

Figure 9-35. Delete Orientation Points

- **Next** – when four or more orientation points have been established, click to display the orientation results (Figure 9-37 on page 9-38).

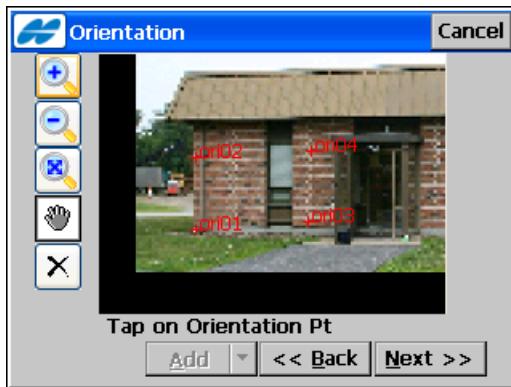


Figure 9-36. Calculate Image Orientation

Orientation Results

The **Orientation Results** screen displays the results of the image orientation (Figure 9-37). The results for each orientation point is displayed as *dX* and *dY* in image pixels.

Name	dX(pixel)	dY(pixel)	
ori01	78.6	-5.7	BAD
ori02	-75.5	-0.3	GOOD
ori03	-31.1	9.2	BAD
ori04	28.0	-5.5	BAD

MAX dX:78.6 dY:9.2 BAD
RMS dX:58.4 dY:6.1 BAD

Delete **<< Back** **Next >>**

Figure 9-37. Orientation Results

- **Delete** – removes the selected point to adjust the orientation calculation. If four points still remain, the new results are displayed. If less than four orientation points display, the **Orientation Results** screen closes automatically to continue the orientation procedure.

- **Back** – continues to the *Scanning* screen (Figure 9-38) to select areas for scanning.

Selecting Scan Area

Use one of the following methods to select one or more areas for scanning:

Select Area Method 1. Draw a rectangle by pressing the stylus on the screen for the start point and dragging to the end point. When the stylus is lifted, the area is set (Figure 9-38).

Select Area Method 2. Draw a polygon by pressing the stylus down at each vertex. Lines will be drawn connecting each vertex to the previous one. Press the stylus near the first vertex to close the area.

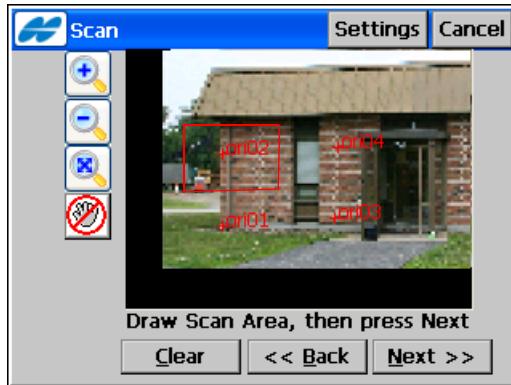


Figure 9-38. Select Scan Area

- **Next** – press to begin the scan when the areas are set; the *Interval* screen (Figure 9-39 on page 9-40) opens first to set the scanning settings.
- **Clear** – erases all drawn areas.
- **Settings** – opens the *Mode* screen (for a description of parameters on this screen, see “Survey Parameters: First Screen” on page 3-2). This is the same screen that opens if you press the **Settings** button in the *Observation and Occ/BS Setup* screens. The main objective is to set the instrument to “Non-Prism” mode, which is

required for scanning and also, to change the measurement mode (*Fine*, or *Coarse*).

Interval

The ***Interval*** screen (Figure 9-39) sets the starting point and the horizontal and vertical intervals for scanning.

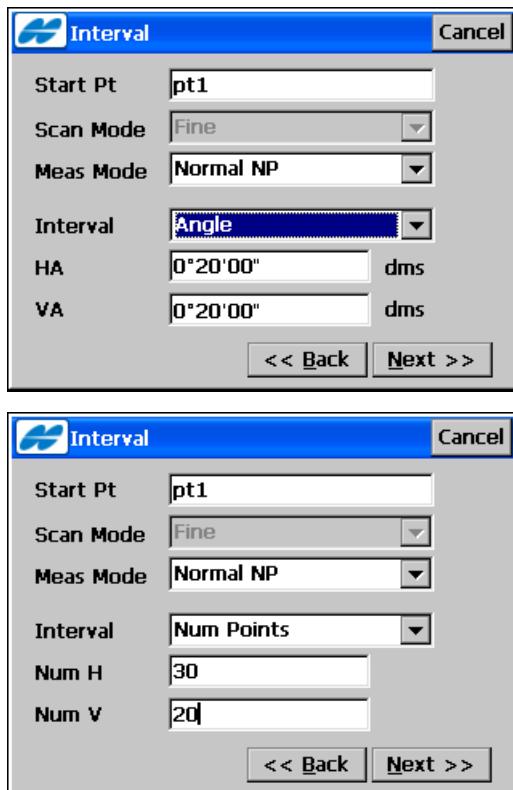


Figure 9-39. Scanning Interval

- *Start Pt* – enter a name for starting point the scanned points.
- *Scan Mode* – select the scanning mode: either *Fine* or *Coarse*.
- *Meas Mode* – select the measuring mode:
 - *Normal NP*: normal Non-Prism measurements.

- **Interval** – select the scanning intervals either as *Angle values* or *Numbers of points*.
- **HA/Num H** – enter the interval in the horizontal direction.
- **VA/Num V** – enter the interval in the vertical direction.
- **Next** – saves the settings and opens the **Estimate Time** screen (Figure 9-40).

Time Estimate

Before scanning begins, the **Estimate Time** screen (Figure 9-40) displays the scanning information, including the total number of points to be scanned and an estimate of the time it takes to complete the scan. If the estimated time is too long, click **Cancel** and enter larger intervals.

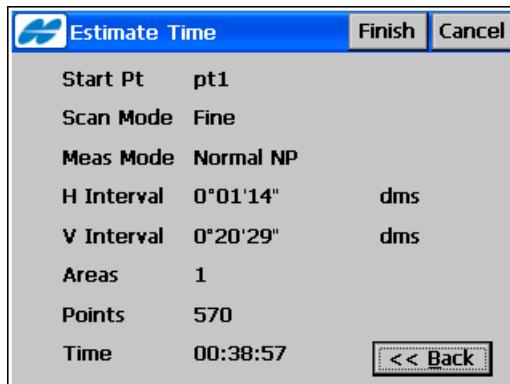


Figure 9-40. Estimate Time

- **Stop** – immediately stops the scan.
- **Finish** – begins scanning points.

As the total station measures points within a predefined area, each point displays on the image.

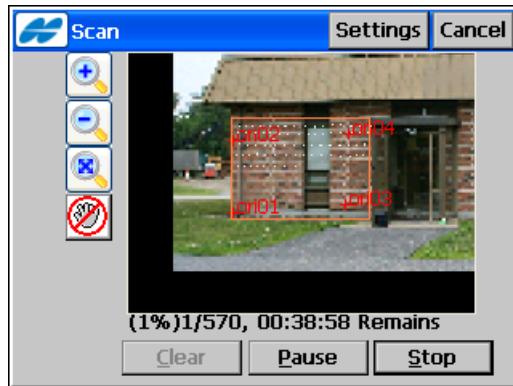


Figure 9-41. Scanning in Progress

Scanning without an Image

To start working, select the *Scanning* icon. The *Scanning* screen displays.

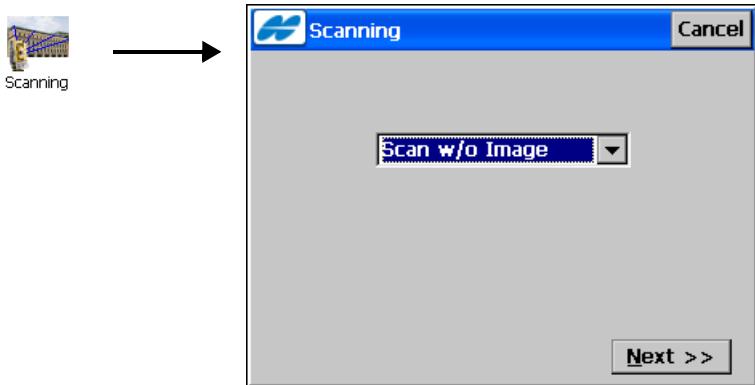


Figure 9-42. Scan without Image

- Next – opens the *Area* screen (Figure 9-43 on page 9-43).

Area

The *Area* screen (Figure 9-43) selects the starting and ending points for the scanning area.

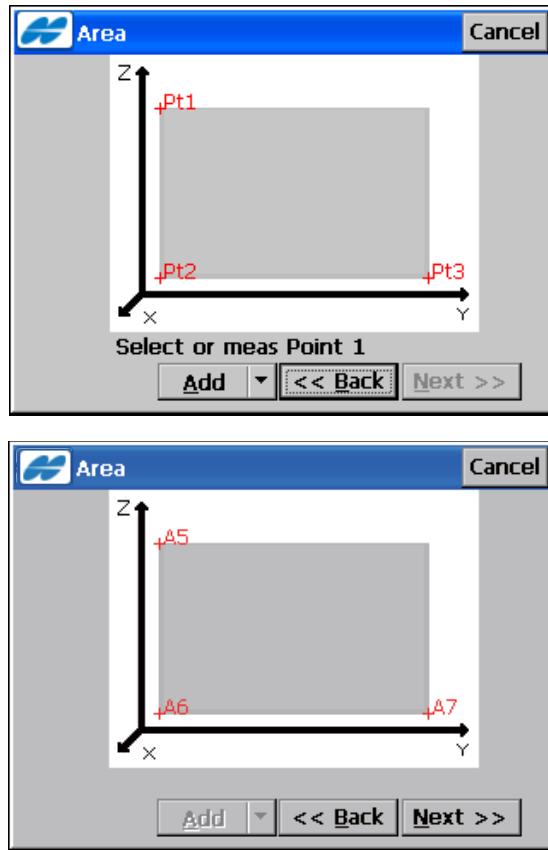


Figure 9-43. Select Area

- **Add** – measures the orientation point. The menu icon opens the menu options (*Meas*, *From Map*, *From List*) used to take a measurement or to select an existing point from a map or list.

- Next – displays the same **Interval** and **Estimate Time** screens as for Scanning with Image mode (Figure 9-44).

The image shows two software dialog boxes side-by-side. The top dialog is titled "Interval" and the bottom one is titled "Estimate Time". Both dialogs have a blue header bar with a logo on the left, and buttons for "Cancel" or "Finish" on the right.

Interval Dialog:

Start Pt	point1
Scan Mode	Fine
Meas Mode	Normal NP
Interval	Distance
H Dist	0.0500 m
V Dist	0.0500 m

Estimate Time Dialog:

Start Pt	point1
Scan Mode	Fine
Meas Mode	Normal NP
H Interval	4°01'14"
V Interval	0°20'29"
Areas	1
Points	15
Time	00:01:01

Figure 9-44. Interval and Estimate Time

Scan

Press the **Finish** button on the ***Estimate Time*** screen (Figure 9-44 on page 9-44) to start scanning (Figure 9-45).

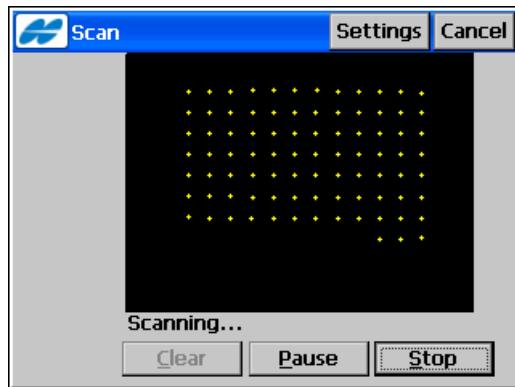


Figure 9-45. Scanning in Progress

As the total station measures points within the predefined area, each point displays on the screen.

- **Stop** – immediately stops the scan and returns to the ***Area*** screen.

After scanning is completed, the screen returns to the Area screen to set a new area for scanning. The *points* icon denotes the scanned points in the list of points (Figure 9-46 on page 9-46).

Points			Settings	Close
Point	Code	North(m)	▲	
ori03		0.557		
point1		0.581		
point2		0.581		
point3		0.581		
point4		0.581		

Find by Code **Find by Point** **Find Next**

Delete **Edit** **Add**

Figure 9-46. Scanned Points

Monitor

This function is activated only with the 9000Series. To enable the monitor survey, select the **Monitor** icon. The **Monitor Pointlist** screen displays (Figure 9-47 on page 9-47).

Monitor PointList

The points to be measured are added to a point list which is then loaded using the **Monitor Pointlist** screen (Figure 9-47 on page 9-47) displays.

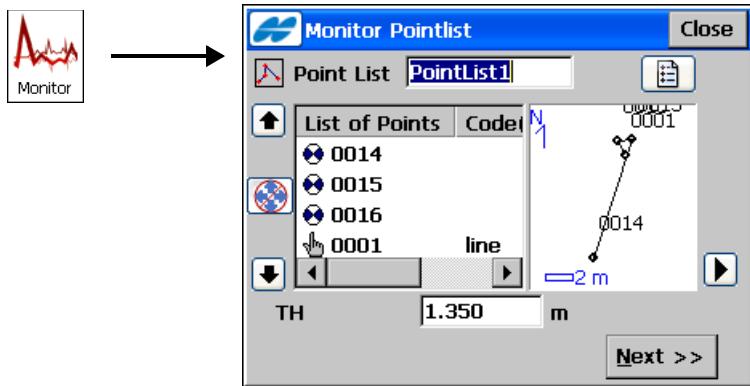


Figure 9-47. Monitor Point List

After the point list is selected, the **Next** button opens the **Monitor** screen.

Monitor

The Monitor function measures one or more prisms repeatedly and uses the measurements to detect changes in the position of the prisms. The measurements are recorded into the raw data file.

The **Monitor** screen is used to control the monitor survey (Figure 9-48).

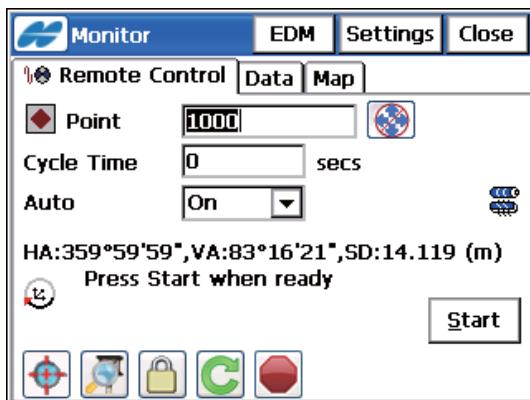


Figure 9-48. Monitor

- **Point** – the point name.
- **Interval** – interval listed as the Cycle Time. If a prism cannot be found after a period of 15 seconds, the total station rotates to the next point in the sequence.
- **Auto** – If the Auto combo box is set to On, the total station automatically rotates to the next point in the sequence and records a measurement. If it is set to Off, the total station rotates to the point, but allows the user to verify or correct the centering to the prism prior to taking a measurement. The monitor function always completes the entire sequence, even if the measurements take longer than cycle time.
- **Start** – initiates the sequence of measurements, which repeats at the interval you want.

The Data Indicator above shows the current state of the 9000Series with one of the following icons listed below:

– no data

– turning

– querying status

– receiving data

The *Data* tab lists the differences between the coordinates of the reference point and the measured point.

The *Map* tab shows all points in graphic mode. For details, on map properties and customizing. See “Viewing Map” on page 12-1.

Staking out

To stake out points, tap the **Stake** icon in the main menu.

The Stake function is used to stake out Points, Lines, Offsets, DTM, Point in Direction, Point List, Curve, Road, Real Time Road, Slope, and Linework (Figure 10-1).

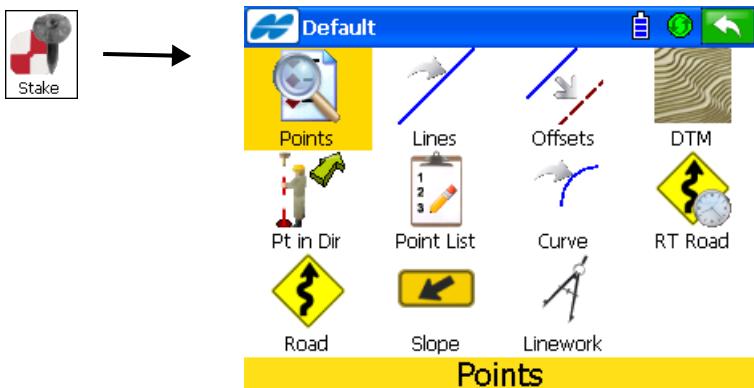


Figure 10-1. Stake Menu



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

The Help Icon

opens a pop-up menu giving access to the help files, menu interface selection, keyboard activation and information about TopSURV. (for details see “Help Icon’s Pop-up Menu” on page 1-7).

Points

To stakeout a point, tap the **Points** icon. The ***Stake Point*** screen (Figure 10-2) displays.

Stakeout Point

The ***Stake Point*** screen (Figure 10-2) contains initial data for the stakeout point.

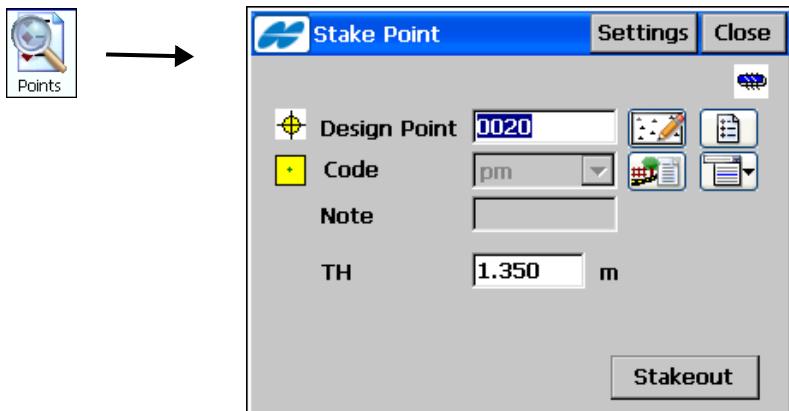


Figure 10-2. Stakeout Point

- **Design Point** – sets the identifier of the design point: enter either manual or select from the map or from the list.
- **HR** – the height of the target.
- **Settings** – opens the ***Stake Params*** screen (see “*Stake Params - First Screen*” on page 3-7).
- **Stakeout** – opens the ***Stake*** screen.

The Help Icon in the upper-left corner of stakeout screen displays a pop-up menu with the following options:

- **BS Setup** – opens the ***Backsight Survey*** screen (see “*Backsight Survey*” on page 8-2).
- **Remote Control** – opens the ***Remote Control*** screen (see “*Remote Control*” on page 8-19).

- *Edit Points* – opens the **Points** screen (see “Points” on page 6-2).
- *PTL Mode* – switches on the PTL (Point-To-Line) Mode. (The screen changes its appearance to **Stake Point (PTL)**.) For details, see “PTL Mode” on page 9-6.
- *Inverse* – opens the *Two-Point Inverse COGO* task screen. For details see “Inverse” on page 11-3.
- *Help* – accesses the Help files.

Stakeout

The **Stake** screen reflects the status of the stakeout. On the **Stake** screen (Figure 10-3 on page 10-4), shows the current point name (in the upper-left corner of the screen), the layout of the target, and the current position, the direction, and the values of the distances to the target display.

-  – opens the map of the target layout and the current position.
-   – switches to the previous/next target.

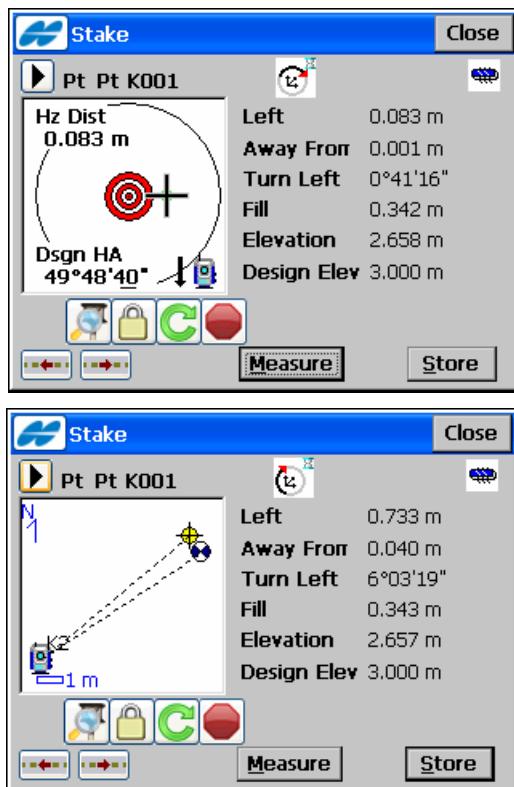


Figure 10-3. Stakeout Map

- **Store** – opens the **Store Pt Info** screen to store the current position as a point (see “Store Point” on page 10-7).
- **Measure** – causes a measurement to be made and displays the result on screen.
- **Close** – closes the screen.
- The Help Icon in the upper-left corner of the screen displays a pop-up menu with the following options:
 - *Target Height*: opens the **Enter Target Height** screen to change the target height during stakeout.

- Remote Control: opens the **Remote Control** screen (see "Remote Control" on page 8-19).

Store Design Pt/Layer

The **Design Pt/Layer** screen (Figure 10-4 on page 10-5) selects parameters for storing staked points.

- *Display Store Pt Info* – check mark this box to display the **Store Point** screen before storing a staked point.
- *Layer* – selects a layer from the drop-down list.
- – opens the **Layers** screen to edit layers (see “Edit Layers” on page 6-21).



Figure 10-4. Design Pt/Layer

Design Offsets

The **Design Elev** screen (Figure 10-5) sets an offset to add to the elevation of the point when staking points, roads, or DTM's.

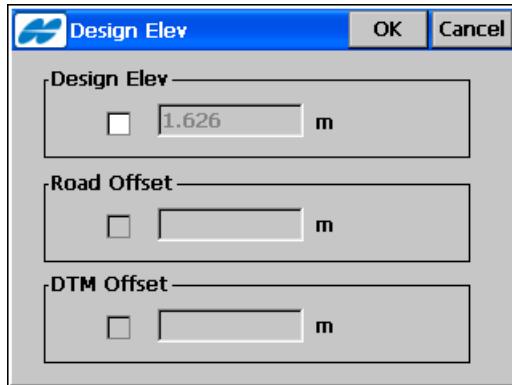


Figure 10-5. Design Elevation

Initially, the point height is shown. To set the elevation offset, check mark the appropriate box and enter the offset you want. Click **OK** to save the setting.

Store Point

The **Store Pt Info** screen (Figure 10-6) displays stakeout results before the point is stored.



Figure 10-6. Store Point Information

- **Edit** – opens the **Store Point** screen (Figure 10-7) to edit point properties.
- **Next Pt** – selects the next point to stake.



Figure 10-7. Staked Point Information

The *Point* tab (Figure 10-7 on page 10-7) on the **Store Point** screen contains the following fields:

- *Point* – sets the name of the point.
- *Code* – sets the code for the point: either enter manually or select a code from the drop-down list.
-  – the *Attributes List* icon opens the **Point Attributes** screen to set the values for the attributes available for the code chosen (see “On the Select Layer” on page 6-10).
- *Note* – the name of the previous point.
- *Cut/Fill* – shows cut/fill information for the point if displayed before the point is stored.
- The menu  icon next to the *Attributes List* icon opens the following options:
 - *Layer*: opens the **Select Layer** screen to place the point.
 - *Note*: opens the **Note** screen.

The *Layer/Style* tab (Figure 10-8 on page 10-8) on the **Store Point** screen contains the following fields:



Figure 10-8. Store Point – Layer/Style Tab

- **Layer/Style** – select the layer to locate the point and the point style from the drop-down list. The field to the left shows the symbol for the selected point.
- **Color** – opens the **Select Color** screen.

The **Photo Note** tab on the **Store Point** screen (Figure 10-9) adds a photo note to the stakeout point. Initially the screen is empty.

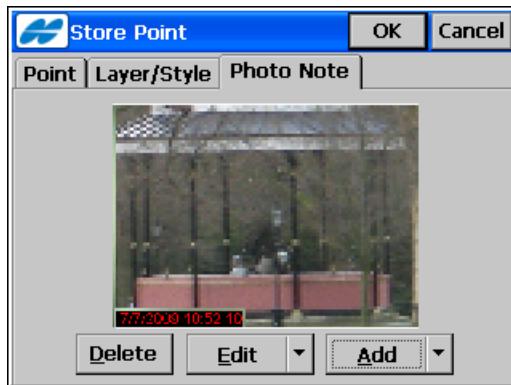


Figure 10-9. Store Point – Photo Note

- **Delete** – erases the image from the screen.
- **Add** – opens the **Select Image File** screen to browse for the necessary file.

Lines

To stakeout a line, select the **Lines** icon. The **Line** screen (Figure 10-10) contains the initial data for the line stakeout.

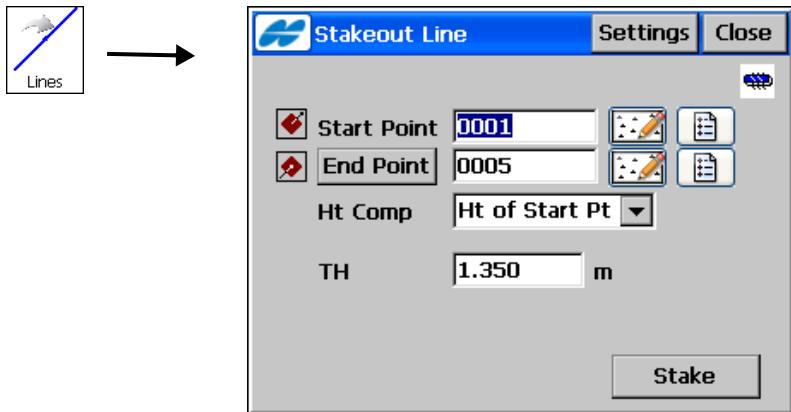


Figure 10-10. Stakeout Line

- **Start Point** – sets the starting point of the reference line.
- **End Point/Azimuth** – sets the direction of the reference line through another point or azimuth.
- **Ht Comp** – the type of height computations for the stakeout point.
 - *Ht of Start Pt* (height of starting point): the stakeout point has the same height as the starting point of the line.
 - *Interpolate Ht*: the height of the stakeout point will be computed through linear interpolation, using the height of the starting and ending points of the line.
- **HR** – the height of the target.
- **Stake** – opens the second **Stake Line** screen.
- **Settings** – opens the **Stake Params** screen. For details, see “Stakeout Point” on page 10-2.

Stakeout

The **Stake Line** screen (Figure 10-11) displays the stakeout process, displaying the current point name (in the upper-left corner of the

screen), the layout of the target and the current position, the direction, and the values of the distances to the target.

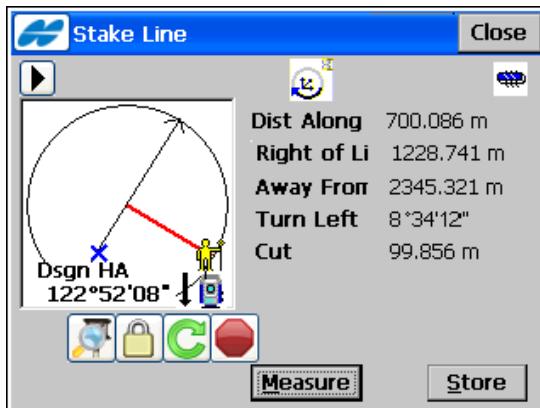


Figure 10-11. Stake Line

- – toggles between the scheme and the map of the target layout and the current position.
- **Measure** – causes a measurement to be made and displays the result on the screen.
- **Store** – takes a measurement and opens the *Store Pt Info* screen to store the current position as a point.
- **Close** – returns to the *Stake Line* screen (Figure 10-10 on page 10-10).

For details on the Help Icon in the upper-left corner of the screen, see “Points” on page 10-2.

Offsets

To stake Line, Intersection, Curve, 3 Pt Curves, or Spiral with Offsets, tap the **Offsets** icon.

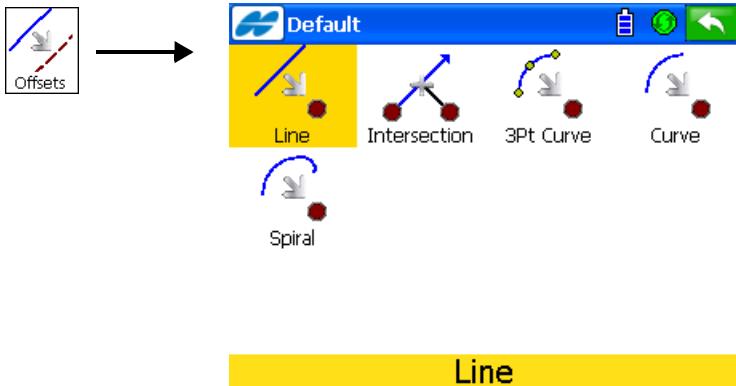


Figure 10-12. Offsets Menu

Line & Offsets

To stakeout lines and offsets, tap the **Line** icon. The ***Stakeout Line & Offset*** screen displays.

The ***Stakeout Line & Offset*** screen (Figure 10-13 on page 10-13) performs a stakeout of a line with offsets in the Horizontal and Vertical directions.

- **Start Point** – the starting point of the line. The line is defined by the azimuth, the azimuth to another point, or the the **End Point** of the line.
- **End Point/Azimuth** – the direction of the line set through either the azimuth of the line or the ending point of the line.
- **Ht Comp** – the type of height computations for the stakeout point.
 - **Ht of Start Pt** (height of starting point): the stakeout point has the same height as the starting point of the line.

- *Interpolate Ht*: the height of the stakeout point will be computed through linear interpolation using the height of the starting and ending points of the line
- **Num Subs** – designates the number of subdivisions you want to subdivide the line. For instance, a value of 3 indicates the stakeout of four points by subdividing the line into three equal segments.
- **SS** – the starting station (chainage) of the line.
- **Next** – opens the *Station & Offsets* screen (Figure 10-14 on page 10-14) (see “Station & Offsets” on page 10-14).
- **Settings** – opens the *Stake Params* screen (see “Stake Params - First Screen” on page 3-7).

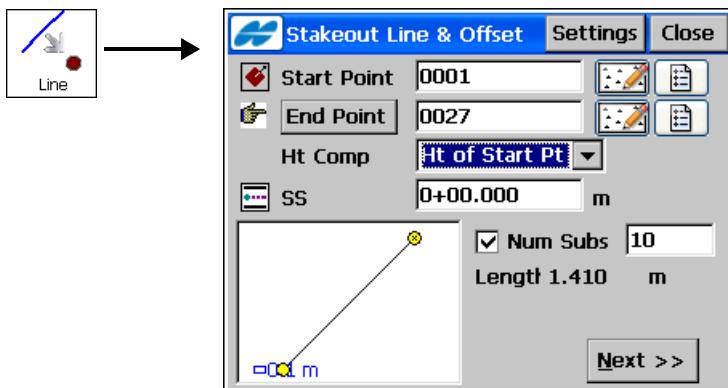


Figure 10-13. Stakeout Line & Offset

For details on the Help Icon in the upper-left corner of the screen, see “Points” on page 10-2.

Station & Offsets

The **Station & Offsets** screen (Figure 10-14) contains the settings for the stakeout stations with offsets from the line.

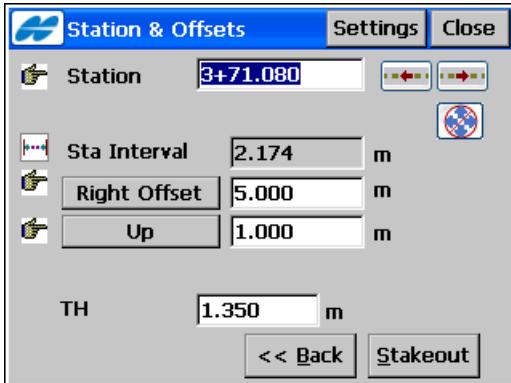


Figure 10-14. Station & Offsets

- **Station** – the station along the line being staked. The two arrows to the right decrease or increase the station by the interval specified in the *Sta Interval* shown in the next line.
- – left/right arrows decreases/increases the distance by the station staking interval.
- – uses the right/left arrow keys of the keyboard to increase or decrease the station.
- **Sta Interval** – the station staking interval.
- **Right Offset/Left Offset** – the right or left offset of the stakeout point, with respect to the line at the station shown in the *Station* field.
- **Up/Down** – the *Up* or *Down Height* offset, with respect to the height of the line at the station.
- **HR** – the height of the target.
- **Back** – returns to the previous screen.
- **Stakeout** – starts stakeout process.

Initial Point Name

The **Initial Point Name** screen (Figure 10-15) specifies the starting name for the points calculated for the stakeout task.

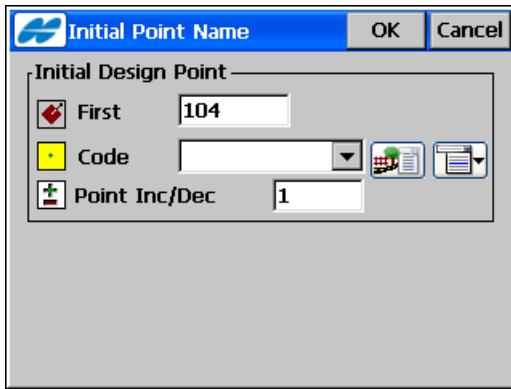


Figure 10-15. Initial Point Name

- *First* – the name of the first point.
- *Code* – the code of the points; either select from the list or enter manually.
- – accesses the attributes of the chosen code, opens the **Point Attributes** screen (see “On the Point Attributes” on page 6-7).
- The menu icon next to the *Attributes List* icon displays the pop-up menu containing three items:
 - *Layer*: opens the **Select Layer** screen to put the point. For details, see “Select Layer” on page 6-10.
 - *Note*: opens the **Notes** screen.
- **OK** – saves the changes and opens the **Stake** screen (Figure 10-16).

Stakeout

The **Stake** screen (Figure 10-16) reflects the progress of the stakeout, displaying the current station (in the upper-left corner of the screen),

the layout of the target, and the current position, the necessary direction, and the values of the distances to the target.

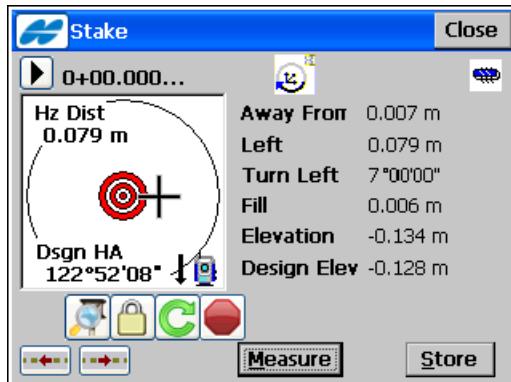


Figure 10-16. Stake

- – instructs the 9000Series to start searching for the prism.
- – instructs the 9000Series Total Station to stop tracking and go into “Stand By” mode.
- – advances the station by the specified Station Interval for staking out points at the Next station.
- **Store** – takes a measurement and opens the **Store Point** screen to store the current position as a point (see “Store Point” on page 10-7).
- **Measure** – causes a measurement to be made and displays the result on the screen.
- **Close** – saves the changes and closes the screen.



Tapping in the current station string enables the floating information screen to display the point name, the code, the note, design elevation (if enabled), the station number and the offset value of the current point. (Figure 10-17 on page 10-17).

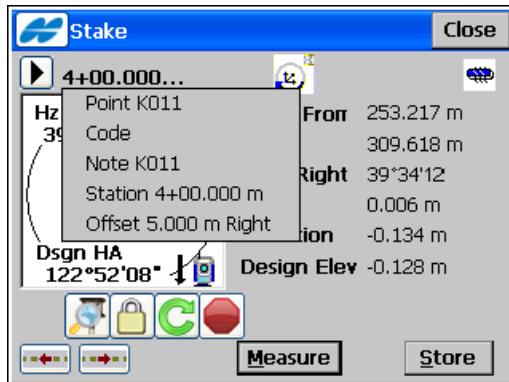


Figure 10-17. General Stakeout information

- The Help Icon in the upper-left corner of the screen displays the pop-up menu of options. For details, see “Points” on page 10-2.

Stakeout Intersections & Offsets

To stakeout Intersection & Offsets, tap the **Intersection** icon.

The **Intersections & Offsets** screen (Figure 10-18 on page 10-18) stakes 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 (Figure 10-19 on page 10-19) defines another line (Line 2) and the offset of the second parallel line. The intersection point of these two parallel lines defines the stakeout point.

The first screen contains parameters for Line 1.

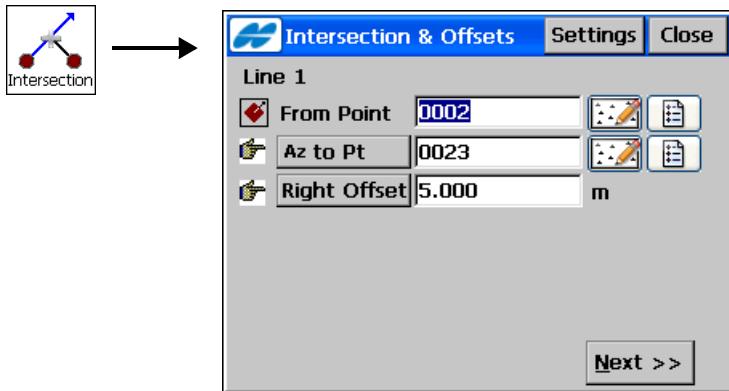


Figure 10-18. Intersection & Offsets – Line 1

- **From Point** – starting point of Line 1.
- **Az to Pt/Azimuth** – the direction of the line; set through the azimuth of the line, the azimuth from the start point to the point selected.
- **Right Offset/Left Offset** – the right or left offset of the stakeout point, with respect to the line.
- **Next** – opens the second **Intersections & Offsets** screen (Figure 10-19 on page 10-19).
- **Settings** – opens the **Stake Parms** screen (see “Stake Parms - First Screen” on page 3-7).

The Help Icon in the upper-left corner of the screen displays the same options as for the **Line & Offsets** screens.

The second screen contains the parameters of Line 2 (Figure 10-19 on page 10-19).

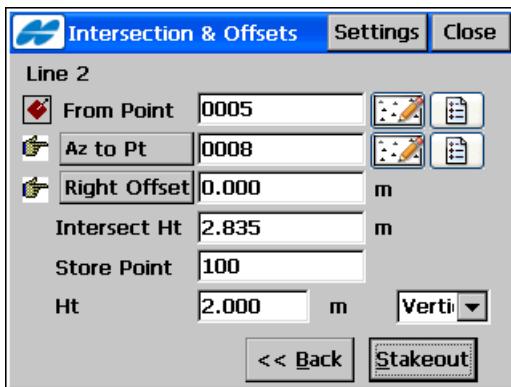


Figure 10-19. Intersection & Offsets – Line 2

- **From Point** – starting point of Line 2.
- **Az to Pt/Azimuth** – the direction of the line; set through the azimuth of the line, the azimuth from the start point to the point selected.
- **Right Offset/Left Offset** – the right or left offset of the stakeout point, with respect to the corresponding line.
- **Intersect Ht** – the height of the intersection point.
- **Store Point** – the name of the intersection point.
- **HR** – the height of the target.
- **Stakeout** – opens the **Stake** screen.
- **Settings** – opens the **StakeParms** screen. See “StakeParms - First Screen” on page 3-7.

Stakeout

The **Stake** screen (Figure 10-20) reflects the progress of the stakeout, displaying the current station (in the upper-left corner of the screen), the necessary direction, and the value of the distance to the targets.

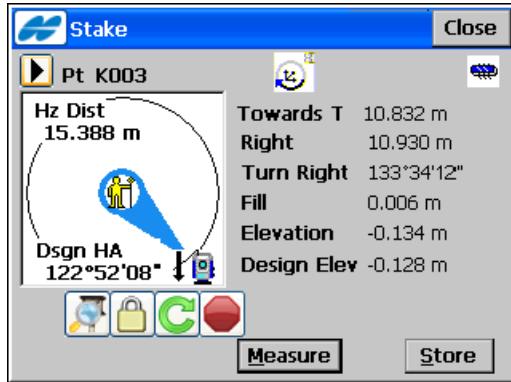


Figure 10-20. Stakeout

- **Store** – opens the **Store Pt Info** screen to store the current position as a point.
- **Measure** – causes a measurement to be made and displays the result on the screen.
- **Close** – saves the changes and closes the screen.

The Help Icon in the upper-left corner of the screen displays the same option as for the Line & Offsets.

Three Point Curve & Offsets

To stakeout a Three Point Curve and Offset, select the **3Pt Curve** icon (Figure 10-21).

The **3 Pt Curve** screen (Figure 10-21) creates a curve by selecting three points: PC point, PT point and either any curve point or the RP point.

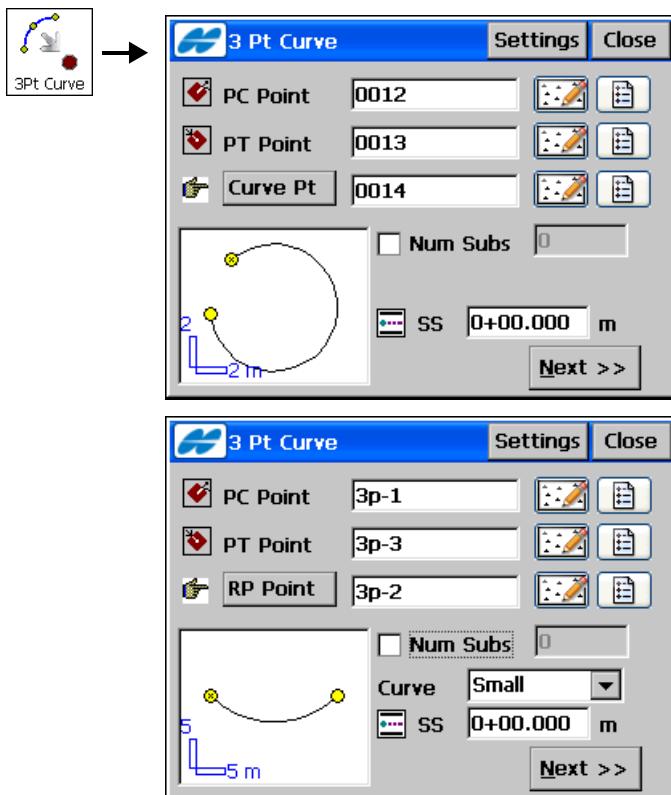


Figure 10-21. Three Point Curve

The screen displays changes, depending on the first point chosen. Enter either manually or select from the list or map the following sets of points:

- *PC Point, PT Point, Curve Pt* – the starting PC (Point of Curvature) and ending PT (Point of Tangency) points on the circle, and a third point on the curve.

- *PC Point, PT Point, RP Point* – the starting PC (Point of Curvature) and ending PT (Point of Tangency) points on the circle, and the center point (also called as Radius Point).

For this set of points, the distance between the RP and PC should be equal to the distance between the RP and PT. The radius, and the PC/PT points, define two curves: one with delta less than or equal to 180° (small curve), the other with delta greater than or equal to 180° (large curve). The value of *Small* or *Large* can be selected from the **Curve** drop-down box to indicate which of these two curves should be used for staking.

- **SS** – the starting station (chainage) of the line.
- **Next** – opens the **Station & Offsets** screen (see “Station & Offsets” on page 10-14).
- **Settings** – opens the **StakeParms** screen (see “StakeParms - First Screen” on page 3-7).

The Help Icon in the upper-left hand corner displays the same pop-up menu as for the **Line & Offset** screen (see “Line & Offsets” on page 10-12).

Stakeout is performed in the same way described in “Line & Offsets” on page 10-12.

Curves & Offsets

To stakeout Curves & Offsets, select the **Curve** icon (Figure 10-22).

The **Stakeout Curve & Offset** screen (Figure 10-22) function performs a stakeout of a curve (section of an arc) at a specified horizontal and vertical offset from the curve.

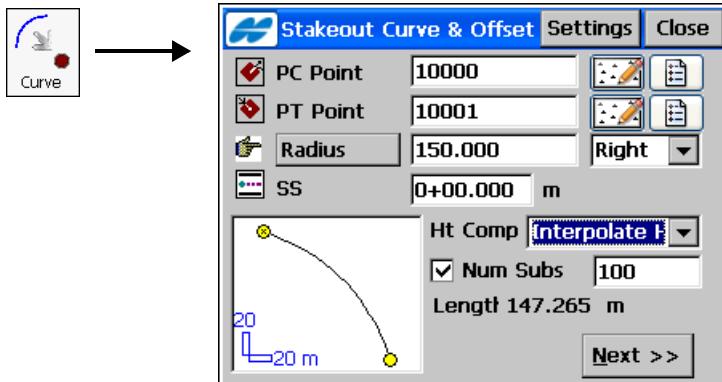


Figure 10-22. Stakeout Curve & Offset

- **PC Point** – the Point of Curve, the starting point of the arc.
- **PT Point** (Tangent Azi) – the azimuth of the *Tangent* of the curve (arc) at the PC point.
- **Radius/Deg Curve/Deg Chord** – the radius parameters of the curve and the direction of turn, relative to the PC Point.
- **Ht Comp** – the type of height computations for the stakeout point.
 - *Ht of Start Pt* (height of starting point): the stakeout point has the same height as the starting point of the line.
 - *Interpolate Ht*: the height of the stakeout point will be computed through linear interpolation using the height of the starting and ending points of the line
- **Num Subs** – check and enable to designate the number of subdivisions you want to subdivide the line. For instance, a value of 3 indicates a calculation of four points by subdividing the line into three equal segments.
- **SS** – the starting station (chainage) of the line.

- **Next** – opens the **Station & Offsets** screen (see “Station & Offsets” on page 10-14).
- **Settings** – opens the **Stake Params** screen (see “Stake Params - First Screen” on page 3-7).

The Help Icon in the upper-left hand corner displays the same pop-up menu as for the **Stakeout Line & Offset** screen (see “Line & Offsets” on page 10-12).

Spiral & Offset

To stakeout Spirals & Offset, select the **Spiral** icon (Figure 10-23).

On the **Stakeout Line & Offset** screen (Figure 10-23) you can stake points at specified *Horizontal* and *Vertical* offsets with respect to a specified spiral.

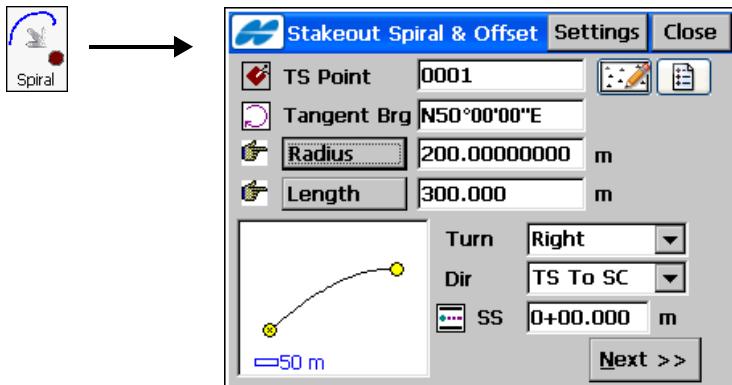


Figure 10-23. Stakeout Spiral & Offset

- **TS Point** – enter a *Tangent* to the *Spiral* point (the starting point of the spiral).
- **Tangent Azi** – the azimuth of the tangent to the spiral at the point TS.
- **Radius/Deg Chord/Deg Curve** – the radius parameter of the spiral at the ending point.

- **Length/Sp Const** – the length of the spiral at the ending point, or the *Spiral Constant* (the constant of the spiral).

For any spiral point $R \times Length = (SpiralConst)^2$, where *R* is the *Radius*, and *Length* is the length of the spiral, both at the same specified point.

- **SS** – the starting station (chainage) of the line.
- **Turn** – specifies whether the spiral turns right or left.
- **Dir** – the direction of “moving”:
 - *TS* -> *SC*: Tangent Spiral->Spiral Circle. The incoming spiral to the internal circle.
 - *CS* -> *ST*: Circle Spiral->Spiral Tangent. The outgoing spiral from the circle to the Tangent.
- **Next** – opens the *Station & Offsets* screen (see “Station & Offsets” on page 10-14).
- **Settings** – opens the *Stake Params* screen (see “Stake Params - First Screen” on page 3-7).
- **Close** – closes the screen without any settings being made.

The Help Icon in the upper-left hand corner displays the same pop-up menu as for the *Stakeout Line & Offset* screen (see “Line & Offsets” on page 10-12).

Stakeout is performed in the same way as described in “Line & Offsets” on page 10-12.

Digital Terrain Model Stakeout

To start the DTM (Digital Terrain Model) stakeout, select the **DTM** icon. The **DTM Stakeout** screen displays (Figure 10-24).

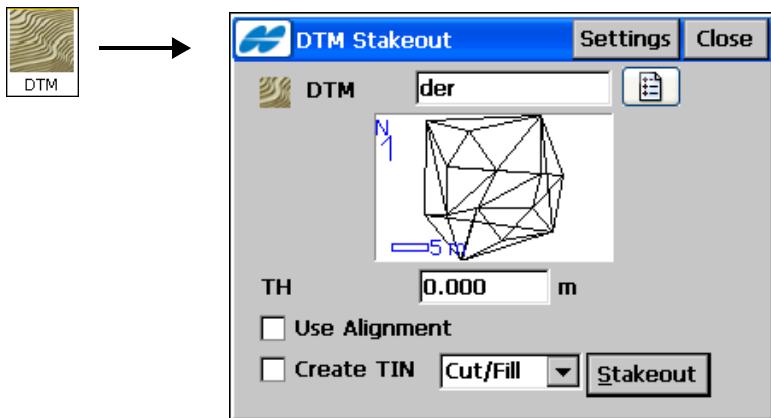


Figure 10-24. DTM Stakeout

- **DTM** – the name of the TN3 file, which is stored on disk.
- **HR** – the height of the target.
- **Use Alignment** – check mark and enable to report stations and offsets.
- **Create TIN** – check mark and enable to generate a TIN (TN3 file) cut/sheet model.
- **Stakeout** – opens the **Initial Point Name** screen (see “Initial Point Name” on page 10-15) and then the **Stake** screen by pressing **OK**.
- **Close** – closes the screen without any settings being made.

Open DTM

On the **Open DTM** screen (Figure 10-25), select a surface file to open.

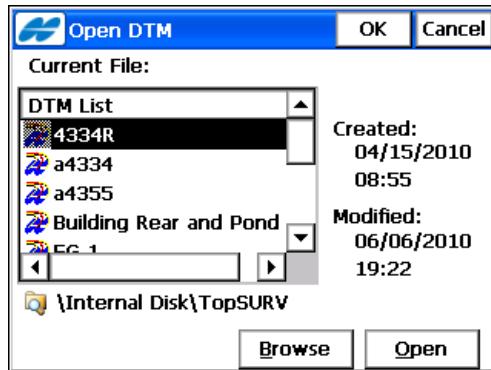


Figure 10-25. Open DTM

- **Current File** – displays the file that is currently open.
- **DTM List** – lists all surface files in the DTM directory .
- **Browse** – searches for the file on disk.
- **Open** – opens the selected file in the **DTM Stake** screen (Figure 10-24 on page 10-26).

Stakeout

The **Stake** screen (Figure 10-26) reflects the relative position of the target. The current point name displays at the top of the screen.

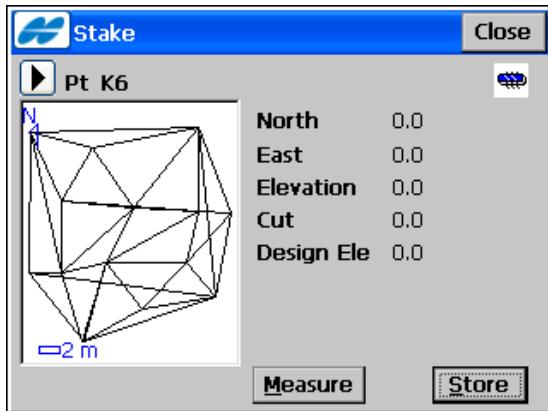


Figure 10-26. Stake (TS)



If a stakeout point is located on the outside of the DTM for the job, TopSURV neither calculates nor writes the coordinates of this point.

- **Store** – saves the location. Check the parameters of the stored point in the *Add/Edit point* screen.
- **Measure** – causes a measurement to be made and displays the result on the screen.
- **Close** – saves the changes and closes the screen.

The Help Icon in the upper-left corner displays the pop-up menu that contains the same options as in the **Offsets** stakeout.

Point in Direction

To perform the Point and Direction stakeout, select the **Point in Direction** icon (Figure 10-27).

On the **Point in Direction** screen (Figure 10-27) you can stakeout a point using a known point, the azimuth, and the offsets from the azimuth line.

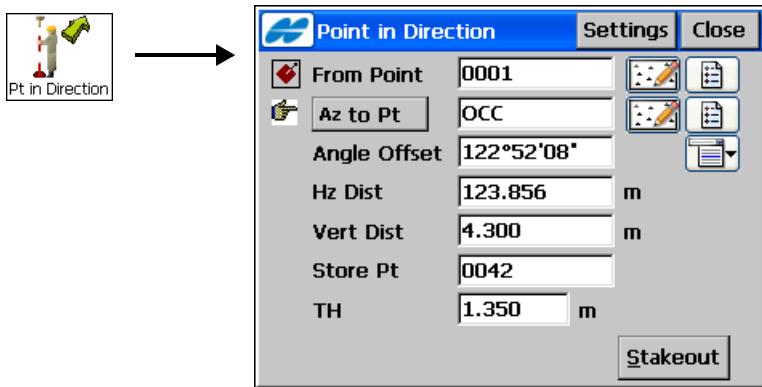


Figure 10-27. Stakeout Point & Direction

- *From Point* – the starting point. Enter the name manually or select a name either from the list or from the map.
- *Az to Pt* – the azimuth can be set by value or as the direction to another known point.
- *Angle Offset* – the angle offset from the azimuth line.
- *Hz Dist* – the distance offset along the angle offset line.
- *Vert Dist* – the height offset.
- *Store Pt* – enter a point in this field to store the computed point to the data set.
- *HR* – the height of the target.
- **Stakeout** – opens the **Stake** screen to perform the stakeout.
- **Settings** – opens the **Stake Params** screen (see “Stakeout Parameters” on page 3-6).

- **Close** – saves the changes and closes the screen.

See the Points stakeout for a description on the options that display by the Help Icon in the upper-left corner of the screen.

Stakeout

The **Stakeout** screen (Figure 10-28 on page 10-30) reflects the progress of the stakeout, displaying the current point name (in the upper-left corner of the screen), the layout of the target and current position, the necessary direction, and the values of the distances to the target.

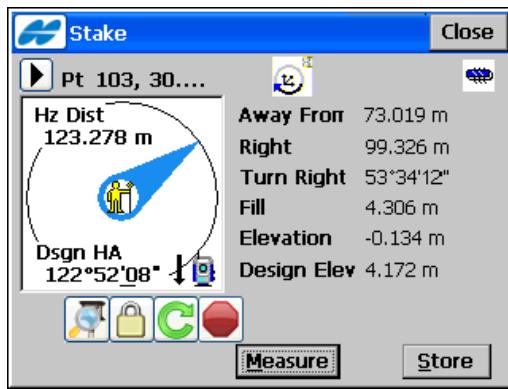


Figure 10-28. Point in Direction – Stakeout

- – toggles between the scheme and the map of the layout of the target and of the current position.
- **Store** – opens the **Store Pt Info** screen to store the current position as a point.
- **Measure** – causes a measurement to be made and displays the result on the screen.
- **Close** – saves the changes and closes the screen.

The Help Icon in the upper-left corner displays the pop-up menu that contains the same options as in the Offsets stakeout.

Point List

To stakeout points from a list, select the **Point List** icon (Figure 10-29 on page 10-31).

The stakeout of points from the list can be enabled from the Main View (see “Actions on the Map” on page 12-4). Press and hold the stylus on the selected linework. The *Stakeout Vertices* item from the pop-up menu appears.

The **Stakeout Point List** screen (Figure 10-29) performs a stakeout of existing points from a point list, selects the starting stakeout point, and lists stakeouts in direct or reverse order.

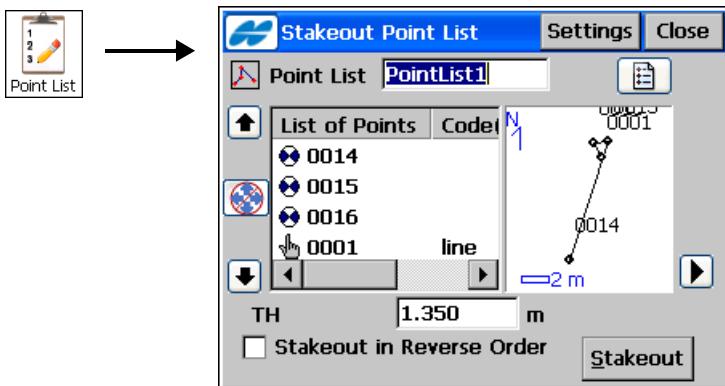


Figure 10-29. Stakeout Point List

- *Point List* – the preexisting points list: either select from the list or enter manually.
- *List of Points* – the list of currently selected points.
- Up and down arrows moves the highlighted point(s) up and down in the order of the points.
- – if activated, uses the up/down arrows on the keyboard to move the highlighted point up and down.
- – closes the scheme of the polygon. Only the list of points are available.
- *HR* – the height of the target.

- *Stakeout in Reverse Order* – check mark and enable to start a stakeout from the end of the Point List.
- **Stakeout** – opens the **Stake** screen.

See the Points stakeout for a description of the options on the Help Icon in the upper-left corner of the screen.

Stakeout

Stakeout is performed in the same way as described in “Stakeout Point” on page 10-2.

The Help Icon in the upper-left corner displays the pop-up menu that contains the same options as in the Offsets stakeout.

Here, points can be staked out in any order by selecting the next stakeout point using an additional option from the Help Icon menu in the upper-left corner: *Select Stakeout Point* opens the **Select Point** screen to select a stakeout point from the list.

Select Point for the Stakeout

The **Select Point** screen (Figure 10-30 on page 10-33) displays the Point List being staked, from which points can be randomly selected to continue the stakeout.

The new starting point can be selected from the list or by double-tapping a point on the map to the right of the list.

- *Show Remaining Points* – check mark and enable to show all the points that have not yet been staked out.
- *Show Staked Points* – check mark and enable to display points in the list that have already been staked out.
- *Reverse Order* – check mark and enable to stakeout points from the last point in the list to the first.

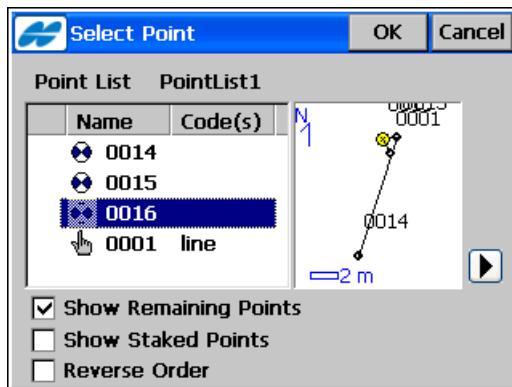


Figure 10-30. Select Point

Curve

To stakeout along a horizontal curve, select the **Curve** icon (Figure 10-31). The **Curve** screen displays to select two points of the curve.

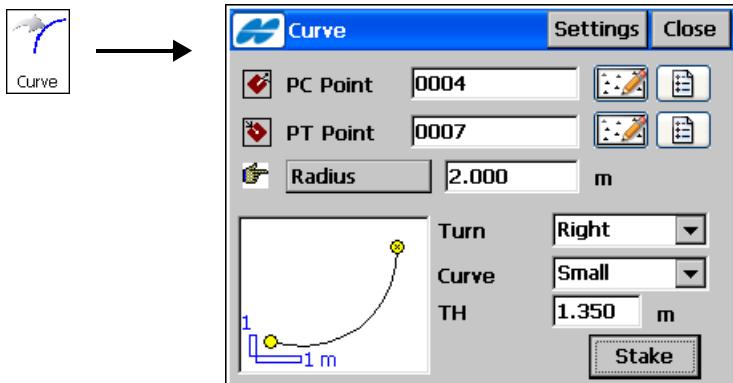


Figure 10-31. Curve

- *PC Point, PT Point* – manually enter or select from the list or the map the starting PC (*Point of Curvature*) and ending PT (*Point of Tangency*) points on the circle.

- **Radius/Deg Chord/Deg Curve** – the radius parameter of the curve at the ending point.

- **Turn** – specifies whether the curve turns right or left.

The radius, and the PC/PT points, define two curves: one with delta less than or equal to 180° (small curve), the other with delta greater than or equal to 180° (large curve). The value of *Small* or *Large* can be selected from the **Curve** drop-down box to indicate which of these two curves should be used for staking.

- **HR** – the target height.

- **Stake** – opens the *Stake Curve* screen.

- **Settings** – opens the *Stake Params* screen (see “*Stake Params - First Screen*” on page 3-7).

The Help Icon in the upper-left hand corner displays the same pop-up menu as for the *Stakeout Line & Offset* screen (see “*Line & Offsets*” on page 10-12).

Stakeout

The *Stake Curve* screen (Figure 10-32) displays the target position graphically and reports the necessary direction, and the values of the distances to the curve.

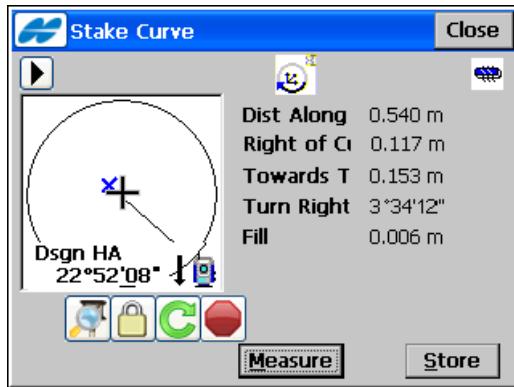


Figure 10-32. Stakeout

- – instructs the 9000Series to start searching for the prism.

- – instructs the 9000Series to stop tracking and go into “Stand By” mode.
- **Measure** – causes a measurement to be made and displays the result on the screen.
- **Store** – takes a measurement and opens the **Store Pt Info** screen to store the current position as a point.
- **Close** – saves the changes and closes the screen.

The Help Icon in the upper-left corner displays the pop-up menu that contains the same options as in the Offsets stakeout.

Real Time Road

To start the road stakeout in real time, select the **Real Time Rd** icon (Figure 10-33). The **Stake Road** screen displays.

The **Stake Road** screen (Figure 10-33) selects a road for stakeout and displays the plan of the chosen road.

The Help Icon in the upper-left hand corner displays the same pop-up menu as the **Stakeout Line & Offset** screen.

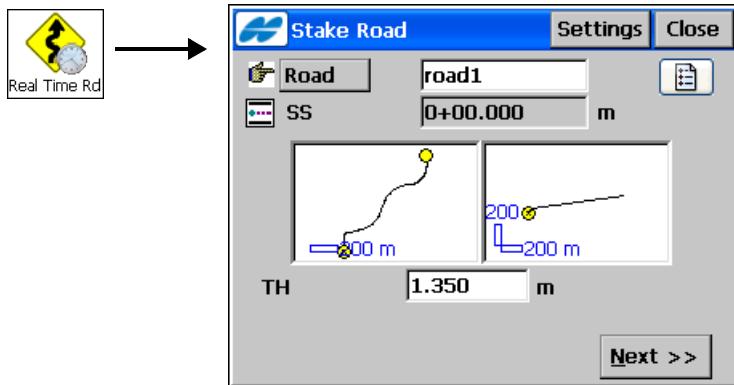


Figure 10-33. Stakeout Road

- **Road/H Alnt/HV Alnt** – the road, horizontal alignment, and horizontal/vertical alignments to be staked-out. Can be entered manually or chosen from the list.
- **SS (Start Stn)** – the starting point of the stakeout, the distance from the beginning of the road.
- **HR** – the target height.
- **Settings** – opens the *Stake Params* screen (see “Stakeout Parameters” on page 3-6).
- **Close** – saves the changes and closes the screen.
- **Next** – opens another *Stake Road* screen (Figure 10-34) to enter *Cut/Fill Slope* parameters.



Figure 10-34. Stakeout Road – Cut/Fill

- **Back** – returns to the previous screen.
- **Stakeout** – opens the *Stake* screen.

The *Stake* screen reports the cut/fill values computed for the current observed point. The design elevation of the road is automatically calculated for the observed point, using the alignment and the templates.

Stakeout

The **Stakeout** screen (Figure 10-35) reflects the relative position of CL and target. The screen displays the current point name (in the upper-left corner of the screen) and the parameters of the target.

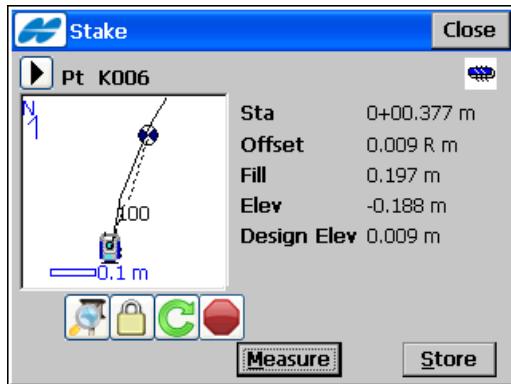


Figure 10-35. Stakeout Real Time Road

- **Store** – stores the current position as a point.
- **Measure** – measures the target.

Road

To start the Road stakeout, select the **Road** icon (Figure 10-36). The **Stake Road** screen displays.

The **Stake Road** screen (Figure 10-36) selects the road for stakeout and displays the plan of the chosen road.

The Help Icon in the upper-left corner displays the same pop-up menu as the **Stakeout Line & Offset** screen (see “Line & Offsets” on page 10-12).

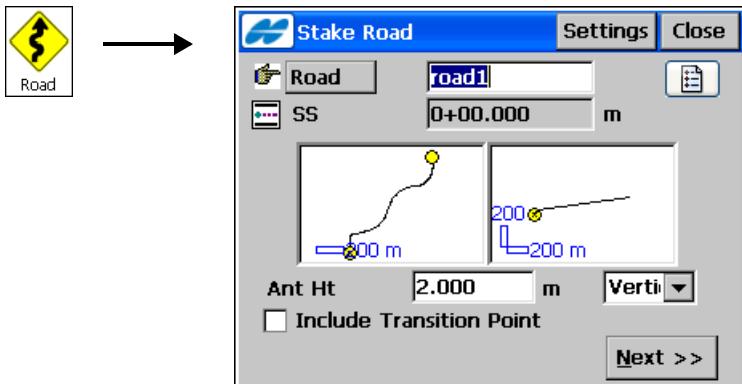


Figure 10-36. Stake Road

- **Road/H Alnt/HV Alnt** – the road, horizontal alignment, and horizontal/vertical alignments to be staked-out. Can be entered manually or chosen from the list.
- **SS (Start Stn)** – the starting point of the stakeout, the distance from the beginning of the road.
- **HR** – the target height.
- **Include Transition Point** – check mark and enable if the transition point should be included, in spite of the station distance.
- **Settings** – opens the ***Stake Parm*** screen (see “*Stake Parm* - First Screen” on page 3-7).
- **Next** – opens the second ***Stake Road*** screen.
- **Close** – saves the settings and closes the screen.

The second **Stake Road** screen (Figure 10-37) displays the properties of the cross section on the stakeout station and performs the stakeout of all selected points.

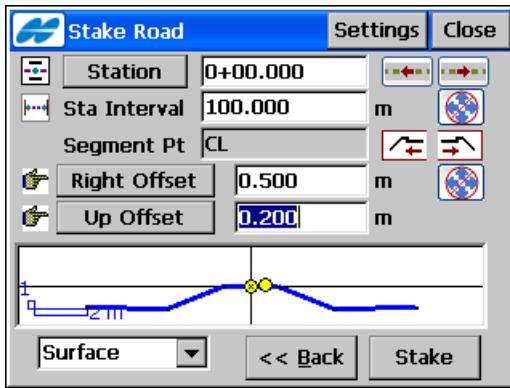


Figure 10-37. Stakeout Road

- *Station* – the station where the stakeout is performed.
- – advances the station by the specified Station Interval for staking out points at the Next station.
- *Sta Interval* – the interval of the station increment.
- *Segment Pt* – the point code of the current segment. The arrow icons next to this field moves the current segment point along the cross-section. The result displays on the scheme at the bottom of the screen.
- *Right/Left Offset* – the horizontal offset from the current segment point.
- *Up/Down Offset* – the vertical offset from the current segment point.
- Select the type of template offsets:
 - *Centerline*: both the horizontal and vertical offset starts at the centerline.
 - *Segment*: the horizontal offset starts at the beginning of the segment; the vertical offset starts at the centerline.

- *Surface*: the horizontal offset starts at the beginning of the segment; the vertical offset starts at the point on the surface of the segment that corresponds with the horizontal offset.
-  – switches on/off the arrow keys on the keyboard. The upper button stands for the station increment/decrement, the lower button stands for the current segment point location. Only one button can be enabled at a time.
- **Back** – returns to the previous *Stake Road* screen.
- **Stake** – opens the *Initial Point Name* screen.
- **Settings** – opens the *Stake Params* screen (see “*Stake Params - First Screen*” on page 3-7).
- **Close** – saves the settings and closes the screen.

Stakeout

The *Stake Slope* screen (Figure 10-40 on page 10-42) reflects the progress of the stakeout, displaying the current station (at the top of the screen), the layout of the target and the current position, the necessary direction, and the value of the distance to the targets (see Figure 10-38 on page 10-41).

Tapping in the current station string enables the bitmap menu to display the station number and the offset value of the current point.

-  – advances the station by the specified Station Interval for staking out points at the Next station.
- **Store** – takes a measurement and opens the *Store Point* screen (see “*Store Point*” on page 10-7) to store the current position as a point.
- **Measure** – causes a measurement to be made and displays the result on the screen.
- **Close** – saves the changes and closes the screen.

The Help Icon in the upper-left corner displays a pop-up menu that contains the same options as in the Offsets stakeout.

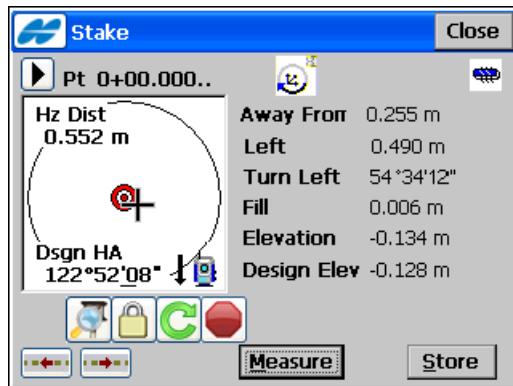


Figure 10-38. Stake Road – Stake

Slope

To start the slope stakeout, select the **Slope** icon (Figure 10-40 on page 10-42). The **Stake Slope** screen displays.

The **Stake Slope** screen selects which slope should be staked out (see Figure 10-40 on page 10-42).

The Help Icon in the upper-left corner displays the same pop-up menu as for the **Stakeout Line & Offset** screen.

- **Road/H Alnt/HV Alnt** – the road, horizontal alignment, horizontal/vertical alignments to be staked-out. Can be entered manually or chosen from the list.
- **SS (Start Stn)** – the starting point of the stakeout, the distance from the beginning of the road.
- **HR** – the target height.
- **Include Transition Point** – check mark and enable if the transition point should be included in spite of the station distance.

Settings – opens the **Stake Params** screen (see “Stake Params - First Screen” on page 3-7).

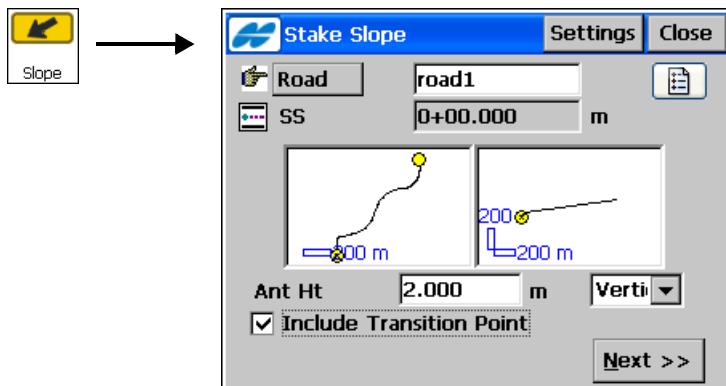


Figure 10-39. Stake Slope

- **Next** – opens another *Stake Slope* screen.
- **Close** – saves the settings and closes the screen.

This second *Stake Slope* screen (Figure 10-40) displays the properties of the cross-section at the stakeout station and helps to perform the stakeout of the hinge point.

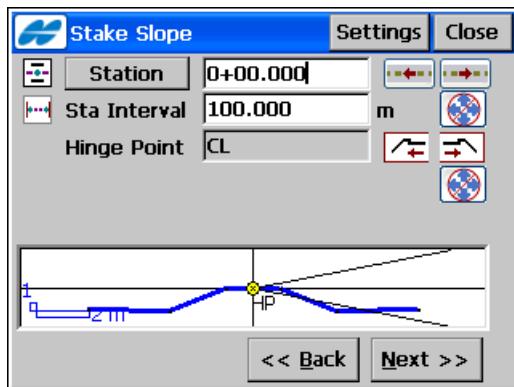


Figure 10-40. Stake Slope

- *Station* – the station where the stakeout is performed. The arrow buttons change the station number on the value of the *Sta Interval*.
- *Sta 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 in this field moves the hinge point along the cross section. This is reflected on the scheme in the bottom of this screen.
-  – switches the keyboard arrow keys on/off. The upper arrows stands for the station increment/decrement, the lower arrows stands for the current hinge point location. Only one set of arrows can be enabled at a time.
- **Back** – returns to the *Stake Slope* screen.
- **Next** – opens the *Stake Road* screen.
- **Settings** – opens the *Stakeout Params* screen (see “Stakeout Parameters” on page 3-6).
- **Close** – saves the settings and closes the screen.

This third *Stake Slope* screen (Figure 10-41) displays the cut and fill properties of the cross-section at the stakeout station.



Figure 10-41. Stake Slope

- *Template Slope/Enter Slopes*– use cut/fill values set for the relevant template or set manually.
- **Back** – returns to the second *Stake Slope* screen.

- **Stakeout** – opens the *Stake Catch Point* screen.
- **Settings** – opens the *Stake Params* screen (see “Stakeout Parameters” on page 3-6).
- Close – saves the settings and closes the screen.

Stakeout

The *Stake Catch Point* screen (Figure 10-42) reflects the progress of the stakeout, displaying the current station (in the upper-left hand corner), the layout of the target and the current position, and the parameters of the stakeout. *Cut/Fill* values are computed from *Cut/Fill Slope*; other offsets are computed using the *Catch Point*.

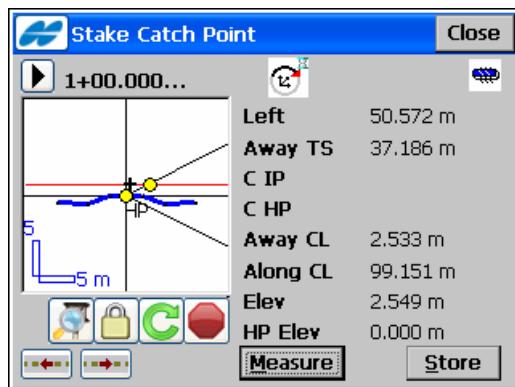


Figure 10-42. Stake Catch Point

- **Measure** – causes a measurement to be made and displays the result on the screen.
- **Store** – takes a measurement and opens the *Store Point* screen (see “Store Point” on page 10-7) to store the current position as a point.
- **Turn L/R** – the horizontal angle to the left/right on which to turn the total station.
- **To/Away TS** – the distance to move.
- **F CP** – cut/fill computed from cut/fill slope.
- **To/Away CL** – distance away from the center line.

- *Along CL* – distance along the center line.
- *Elev* – the fill with respect to the Hinge Point.
- – advances the station by the specified *Station Interval* for staking out points at the Next station.
- **Close** – saves the changes and closes the screen.

Linework

To start a Linework stakeout, select the **Linework** icon (Figure 10-43). The **Linework** screen displays (Figure 10-43). Select a desired code and string available for this code.

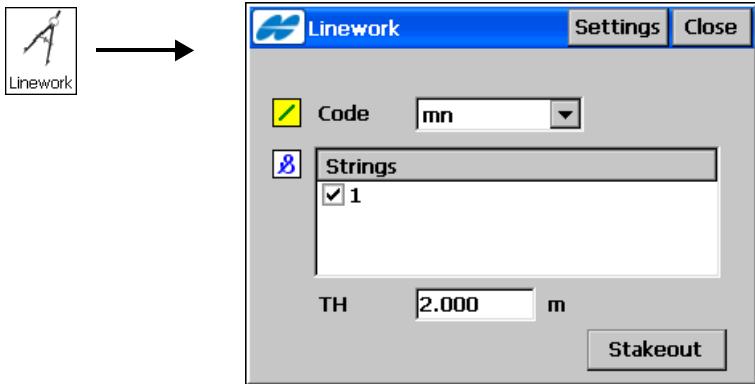


Figure 10-43. Limework

- **Stakeout** – opens the *Stake* screen.
- **Settings** – opens the *Stake Params* screen (see “Stake Params - First Screen” on page 3-7).
- **Close** – saves the changes and closes the screen.

Stakeouts are performed in the same way as described in “Point List” on page 10-31.

The Help Icon in the upper-left corner displays a pop-up menu that contains the same options as in the Offsets stakeout.

COGO

Calculations

To calculate a COGO task, tap on the COGO icon in the main menu.

The COGO menu (Figure 11-1 on page 11-2) allows calculation of the following tasks:

- Inverse
- Point in Direction
- Intersection
- Calculator
- Curves
- Area
- Corner Angle
- Line Offset
- Curve Offset
- Road Offset
- Adjust
- Traverse

Also, it provides a Calculator for various calculations and conversions.

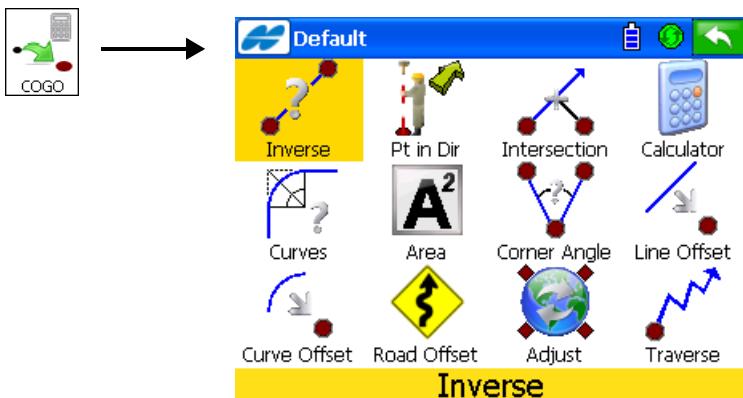


Figure 11-1. Cogo Menu



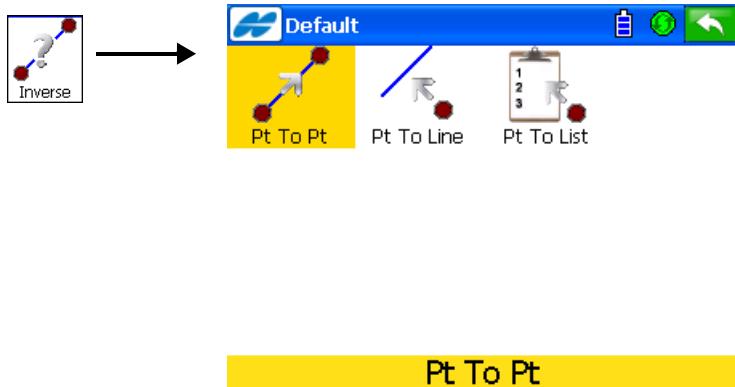
If the menu options you need are not visible (available), tap on the **Configure/Menus** icons to enable these options in the **Config Menus** screen.

The Help Icon opens a pop-up menu giving access to the help files, menu interface selection, keyboard activation and information about TopSURV. (for detail see “Help Icon’s Pop-up Menu” on page 1-7).

The thumbnail image (icons) 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 (see Figure 11-4 on page 11-5). Tap the large image to hide it.

Inverse

To perform an Inverse task, tap the **Inverse** icon (Figure 11-2). The following screen displays.



Pt To Pt

Figure 11-2. Inverse Menu

Point to Point

To calculate the Point-to-Point Inverse, tap the **Pt To Pt** icon (Figure 11-2). The **Two-Point Inverse** screen displays (Figure 11-3 on page 11-4).

On the **Two-Point Inverse** screen, compute the inverse between two known points. Inverse is comprised of the azimuth from one point to the other and the distance between these points.

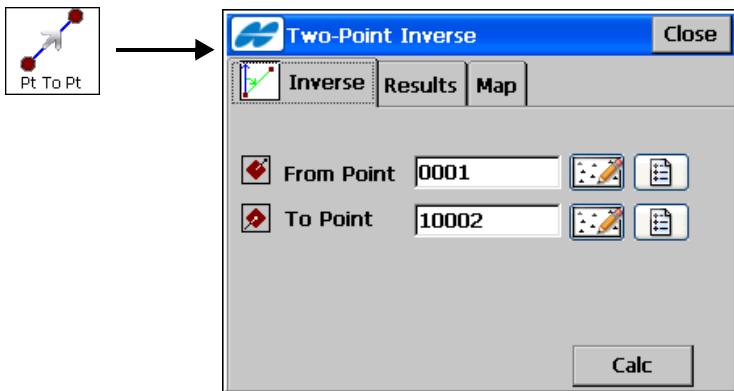


Figure 11-3. Two-Point Inverse

The *Inverse* tab contains initial data for the following parameters:

- *From Point* – the first point name; either enter manually or select from the map or from the list.
- *To Point* – the second point name; either enter manually or select from the map or from the list.
- **Calc** – calculates the inverse.

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing two items:

- *Edit Points* – opens the **Points** screen (see “Points” on page 6-2).
- *Help* – accesses the Help files.

Tap the icon to the left of the tabs to open a larger map of the task being performed (Figure 11-4 on page 11-5). Tap again to hide it.

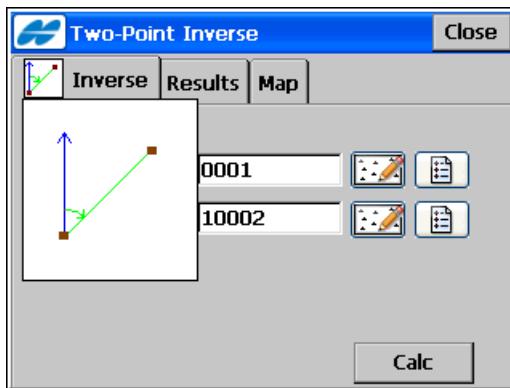


Figure 11-4. Large Image of COGO Task

The *Results* tab shows the initial data (*From Point, To Point*) and the results of the calculation (Figure 11-5). The results can vary, based on whether a geodesic display system is selected or not.

When *Grid* or *Ground* is the selected display system, the results tab lists the following parameters (Figure 11-5).

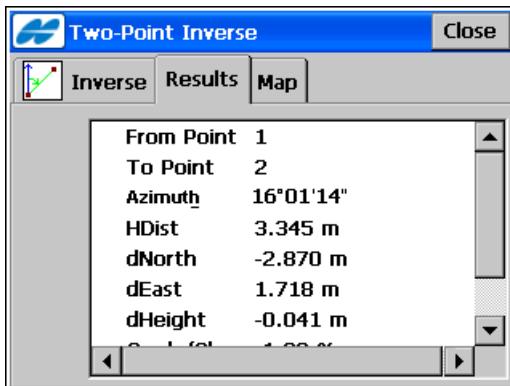


Figure 11-5. Two-Point Inverse – Results in Non-Geodesic Display System

- *Azimuth* (or *Bearing*) – to the second point from the first point.
- *HDist* (Horizontal Distance)/*VDist* (Vertical distance) – from one point to another (Horiz). The “-” sign means that the height of the second point is lower than the height of the first point (Vert).

- $dNorth$ – the increment of the North coordinate.
- $dEast$ – the increment of the East coordinate.
- $dHeight$ – the increment of the height.
- $Grade(Slope)$ – the increment of the height in percent.
- $Slope\ distance$ – the computed distance between two points.

When selecting a geodesic display system, the following parameters display (Figure 11-6):

- *Forward Azimuth* – the forward geodesic azimuth.
- *Backward Azimuth* – the backward geodesic azimuth.
- *Geodesic Dist* – the shortest distance between two points on an ellipsoid.
- *Ground Dist From* – the horizontal distance on the geodetic horizon plane, at the height of the *From Point*.
- *Ground Dist To* – the horizontal distance on the geodetic horizon plane, at the height of the *To Point*.
- *Delta Ell ht* – the difference in ellipsoidal heights.

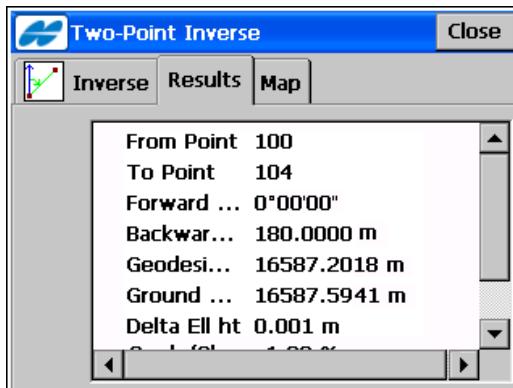


Figure 11-6. Two-Point Inverse – Results in Geodesic Display System

The *Map* tab shows the illustration for the results (Figure 11-7).

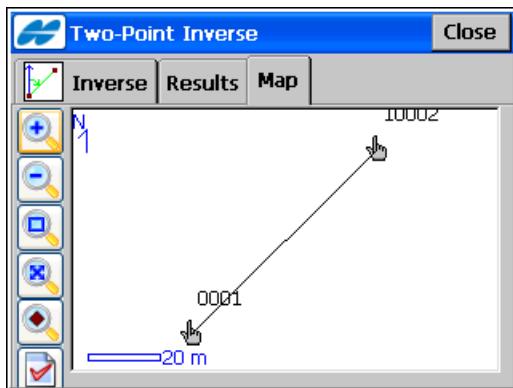


Figure 11-7. Two-Point Inverse – Map

For a description of the icons to the left, see “Toolbar” on page 12-2.

Point to Line

To calculate the station of the known point inverse to the known line, select the **Point to Line** icon. The **Inverse Point to Line** screen displays (Figure 11-8).

On the *Inverse Point to Line* tab, enter the following parameters.

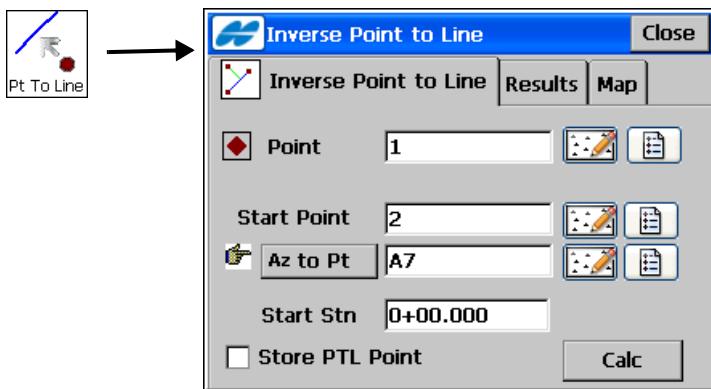


Figure 11-8. Inverse Point to Line

- *Point* – sets the current point name: either enter manually, or select from the map or from the list.
- *Start Point* – the starting point of the reference line.
- **Azimuth/Az to Pt** – sets the azimuth of the reference line. Rotates through selections when tapped.
 - **Azimuth:** sets the azimuth from the starting point by value.
 - **Az to Pt:** sets another known point to which the direction is calculated and input as azimuth.
- *Start Stn* – the starting station of the reference line.
- *Store PTL Point* – store the point as PTL point (see “PTL Mode” on page 9-6).
- **Calc** – calculates the inverse and displays the results on the *Results* tab.

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing two items:

- *Edit Points* – opens the **Points** screen to edit the points (see “Points” on page 6-2).
- *Help* – accesses the Help files.

The *Results* tab (Figure 11-9) shows the initial data and the results of the calculation: *Station*, *Offset*, and *Height* parameters.

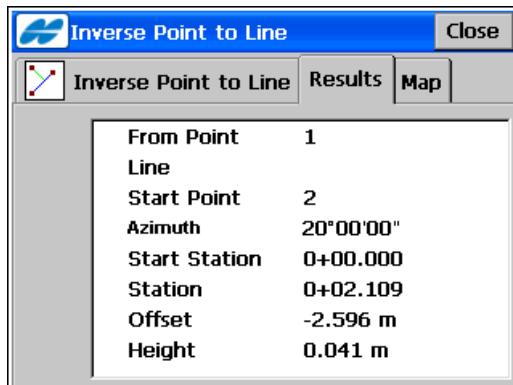


Figure 11-9. Inverse Point to Line – Results Tab

The *Map* tab (Figure 11-10) shows the results graphically.

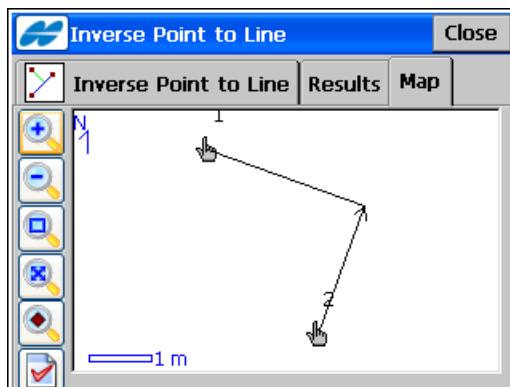


Figure 11-10. Inverse Point to Line – Map Tab

Point to Points List

To calculate the inverse for all the points in the Points list with respect to a known point, tap the **Point to List** icon. The **Inverse Point to Point List** screen displays (Figure 11-11).

The *Inverse Pt to Pt List* tab illustrates the point inverse operation.

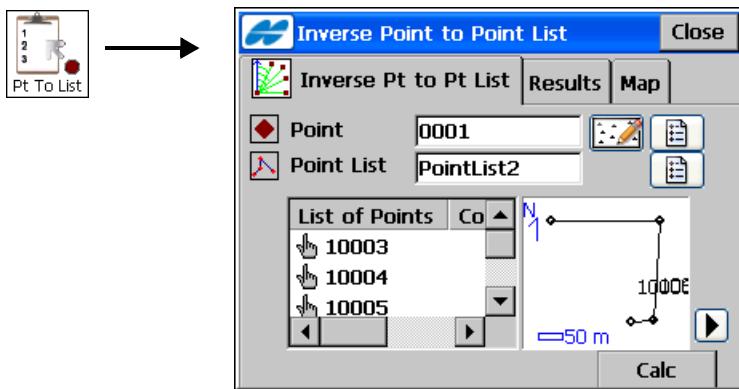


Figure 11-11. Inverse Point to Point List

- *Point* – sets the known point name: either enter manually or select from the map or from the list.

- *Point List* – the Point List name: either enter manually or from the list of Point Lists.
- *List of Points* – the list of currently selected points. For details see “Point Lists” on page 6-31.
-  – closes the plot of the polygon. Only the list of points is available.
- **Calc** – calculates the inverse and displays the results on the *Results* tab.

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing three items:

- *Edit Points* – opens the **Points** screen to edit the points (see “Points” on page 6-2).
- *Edit Point Lists* – opens the **List of Point Lists** screen to edit the point lists (see “Point Lists” on page 6-31).
- *Help* – accesses the Help files.

The *Results* tab (Figure 11-12) shows the initial data and the results of the calculation: *closest point*, *azimuth*, *distance*, *height*, *slope* and *grade* parameters.

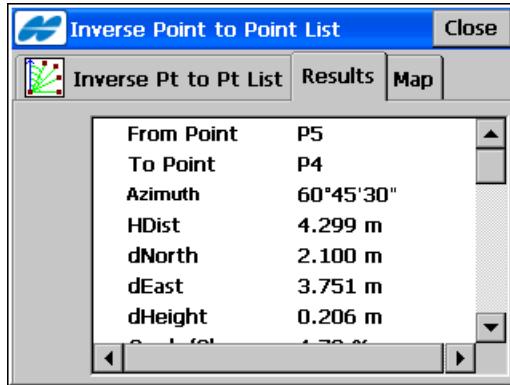


Figure 11-12. Inverse Point to Point List – Results Tab

The *Map* tab shows the inverse point to point operation results graphically.

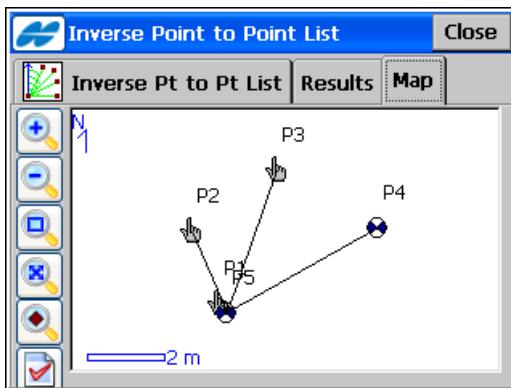


Figure 11-13. Inverse Point to Point List – Map Tab

Point in Direction

To calculate the coordinates of a point, using a known point, the azimuth, the angle offset from the azimuth line, and the distance offsets from the From Point, tap the **Point in Direction** icon. The *Point in Direction* screen displays (Figure 11-14).

On the *Point in Direction* tab, enter the following parameters.

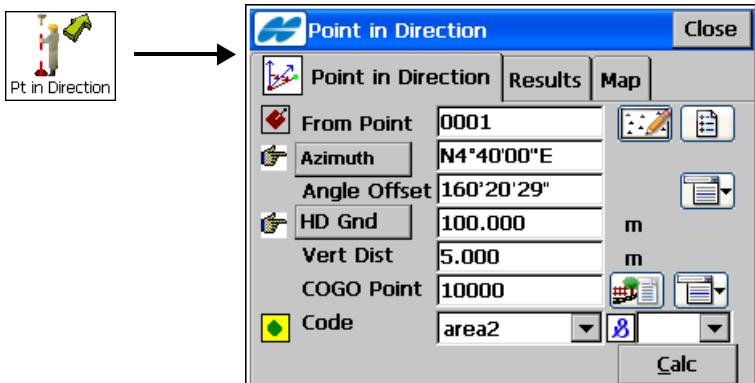


Figure 11-14. Point in Direction

- **From Point** – the starting point: either enter manually or select from the list or from the map.
- **Azimuth/Az to Pt** – sets the azimuth of the line from the From Point. Rotates through selections when tapped.
 - **Azimuth:** sets the azimuth by value.
 - **Az to Pt:** sets another known point to which the direction is calculated and input as azimuth.
- **Angle Offset** – the angle offset from the azimuth line.
- **HD Grnd** – the distance offset along the angle offset line.
- **Vert Dist** – the height offset.
- **COGO Point** – the computed point name.
- **Code** – the computed point code.
- **Calc** – calculates the coordinates and displays the results on the *Results* tab.

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing two items:

- **Edit Points** – opens the **Points** screen to edit the points (see “Points” on page 6-2).
- **Help** – accesses the Help files.

The *Results* tab (Figure 11-15) on the **Point in Direction** screen (Figure 11-15 on page 11-13) shows the initial data and results of the calculation.

Tap **Save** to save the results of the calculation

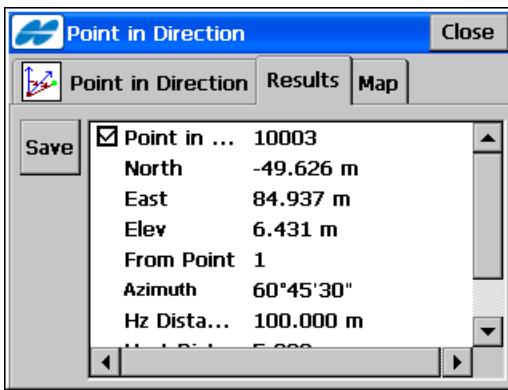


Figure 11-15. Point in Direction – Results Tab

The *Map* tab (Figure 11-16) shows the results graphically.

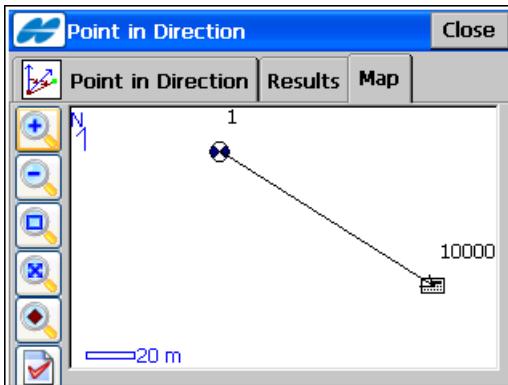


Figure 11-16. Point in Direction – Map Tab

Compute the Intersection Point

To compute the intersection point or points when given two known points and either the directions or distances from the known points, tap the **Intersection** icon. The **Intersection** screen displays (Figure 11-17).

The *Intersection* tab contains initial data for the intersection task (Figure 11-17).

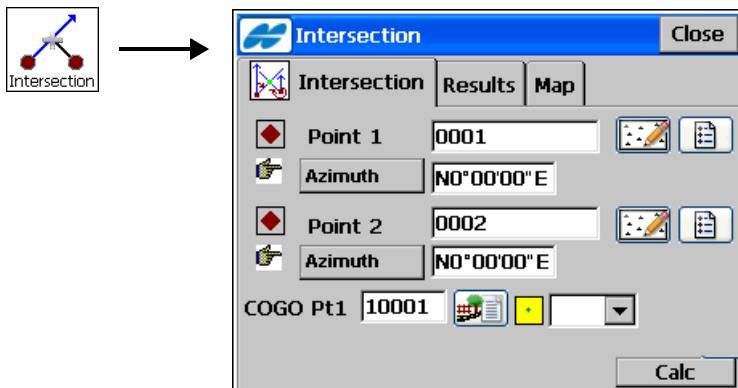


Figure 11-17. Intersection

- *Point 1* – the first point; either enter manually or select from the map or the list.
- **Azimuth/Distance/Az to Pt:** rotates through selections.
 - **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; either enter manually or select from the map or the list.

- **COGO Pt** – enter 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 remembers and displays the last user-saved code/string.
- **Calc** – starts the calculation process.



To edit angles, azimuths, distances, and so forth, use the entry fields to add/subtract angle and linear values directly or by using the Calculator.

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing two items:

- *Edit Points* – opens the **Points** screen to edit the points (see “Points” on page 6-2).
- *Help* – accesses the help files.

The *Results* tab shows the results of the calculation (Figure 11-18).

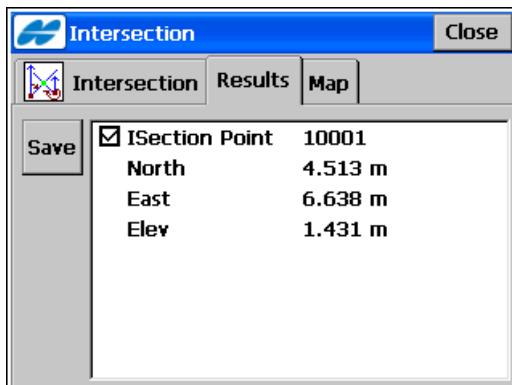


Figure 11-18. Intersection – Results Tab

- *North* – the North local coordinate of the corresponding point.
- *East* – the East local coordinate of the corresponding point.
- *Elev* (Height) – the height of the first corresponding point.
- **Save** – saves the result of the calculation.

The *Map* tab (Figure 11-19) shows the solution of the task graphically. In the example below, there are two solutions for the *Intersection* calculation.

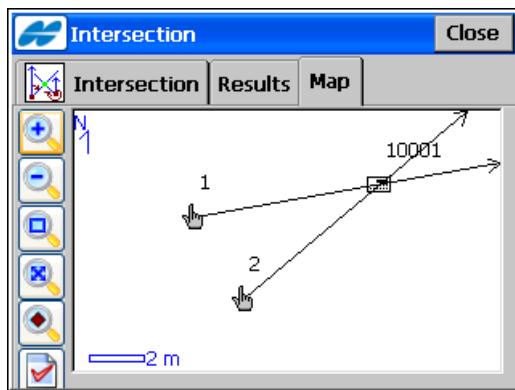


Figure 11-19. Intersection – Map Tab

For a detailed description of the Map view, see “Viewing Map” on page 12-1.

If Distances instead of Azimuths are specified between the known points to the unknown points in the *Intersection* tab (see Figure 11-17 on page 11-14), then there can be two points of intersection to save (Figure 11-20).

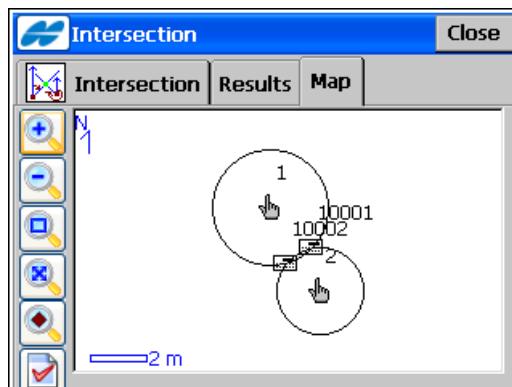


Figure 11-20. Two Points of Intersection

Calculator

A built-in calculator in TopSURV performs calculations and conversions. To access the calculator, tap the **Calculator** icon. The **Calculator** screen displays (Figure 11-21).

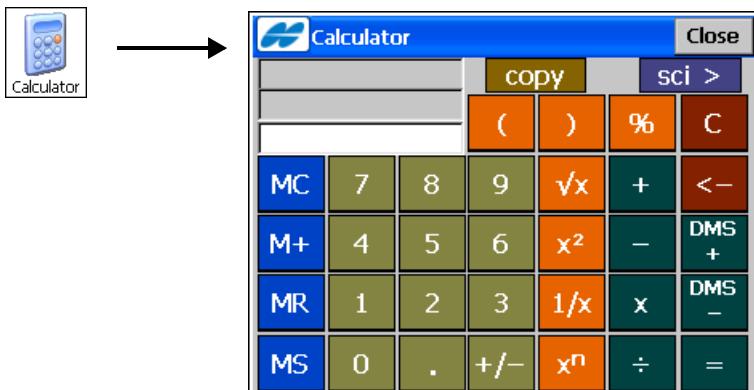


Figure 11-21. Calculator



To enter a calculated value to any entry field in TopSURV, start the calculator from this field by tapping the button on the pop-up keyboard.

- *Input* field – enter the entire equation here, then press the **equals** [=] button to calculate the result.
- *Result* field – shows calculation results. This field is also used as the ‘y’ or ‘theta’ values for rectangular/polar conversions.
- *Previous Result* field – once equals is pressed, the previous result is moved up to this field. This field is also used as the ‘x’ or ‘r’ values for rectangular/polar conversions.
- **MC** – clears the memory.
- **MR** – recalls the memory value, indicated by M in the Input field.
- **MS** – saves the already computed result into memory.
- **M+** – adds the already computed result to the value in memory.

- **C** – clears all the fields.
- **backspace (<-)** – removes the last entry.
- **copy** – if the calculator was started from a field in TopSURV, copies calculation results to that field; closes the calculator in case it was started from the COGO menu.
- **sci** – brings up the scientific calculator.

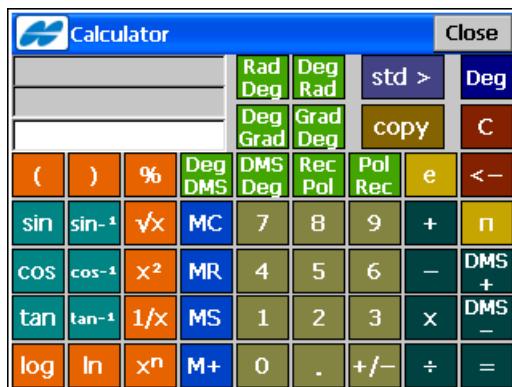


Figure 11-22. Scientific Calculator

Curve Solutions

A Curve is part of a circle and can thus be described through the center point (also called a Radius Point), the radius value and the starting and ending points on the circle, also called a PC (Point of Curvature) and PT (Point of Tangency). Using these values, the Curve Solutions finds other Curve parameters.

Tap the **Curve** icon to access the Curve menu for various curve solutions: Curve, Three-Points Curve, PI & Tangents, and Radius & Points.

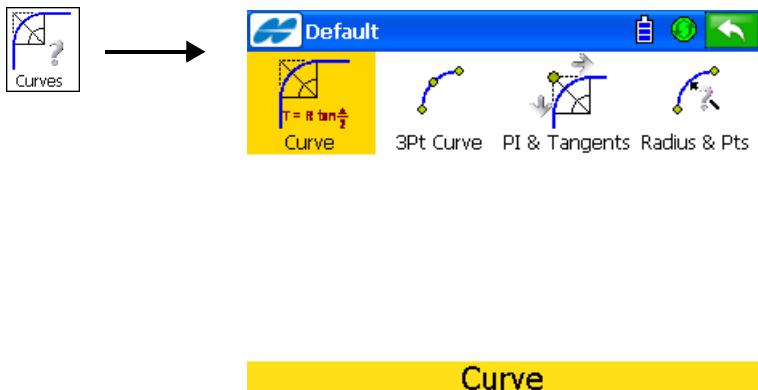


Figure 11-23. Curve Menu

Calculating the Parameters of a Curve

To calculate the full set of parameters for any curve, given one for each of the curvature parameter and the length parameter of the curve, tap the **Curve** icon. The **Curve Solution** screen displays (Figure 11-24).

The *Curve Solution* tab (Figure 11-24) contains the initial data and a window for the curve plan.

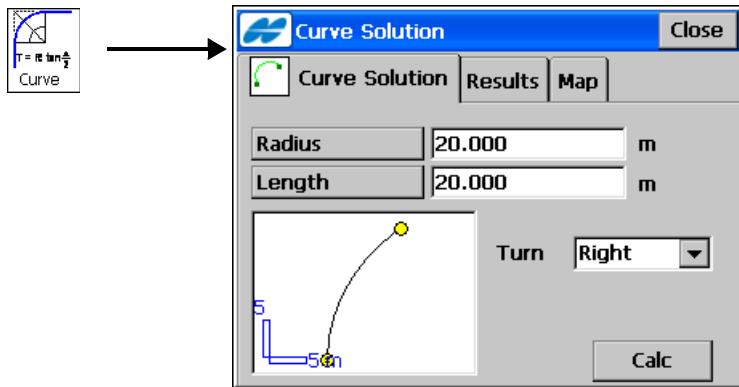


Figure 11-24. Curve Solution

- **Radius/Deg Chord/Deg Curve** – the curvature parameters of the curve.
- **Length/Chord/Tangent/Mid Ord/External/Delta** – the length parameters of the curve.
- **Turn** – the direction of turn relative to the starting point.
- **Calc** – press to calculate the parameters of the curve.

The *Results* tab shows the calculated parameters (Figure 11-25).

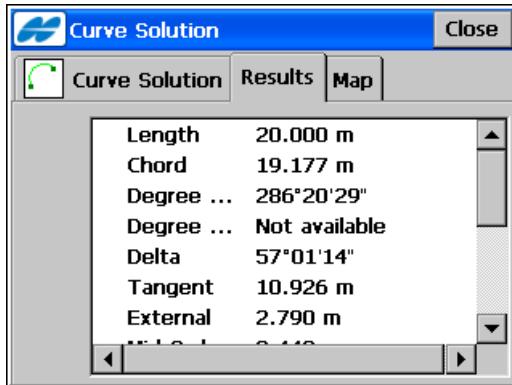


Figure 11-25. Curve Solution – Results Tab

The first three parameters display the radius and the length of the curve and the length of the chord connecting the PC and PT points.

- *Chord* – PC-PT length. If the Chord is defined, then taking into account, that

$$\sin \frac{\text{Delta}}{2} = \frac{\text{Chord}}{2} / (R)$$

the Length can be calculated as $\text{Length} = R \times \text{Delta}$

(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:

$$\frac{\text{DegreeCurve} \times \pi}{180} = \frac{100}{R}$$

where R is *Radius*.

The *Degree Chord* defines the angle in degrees, which is used to compute the radius of a curve whose chord is 100 units long. So

$$\sin \frac{\text{DegreeChord} \times \pi}{180} / 2 = \left(\frac{100}{2 \times R} \right) / R$$

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:

$$\tan \frac{\text{Delta}}{2} = \frac{\text{Tangent}}{R}$$

where R is the *Radius*, the Length is *Length* = $R \times \text{Delta}$.

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:

$$\cos \frac{\text{Delta}}{2} = \frac{R - \text{MidOrd}}{R}$$

where R is the *Radius*, the Length is *Length* = $R \times \text{Delta}$.

- *External* – the piece of PI-RP section from PI to the curve. If the External is defined, then assuming that:

$$\cos \frac{\text{Delta}}{2} = \frac{R + \text{External}}{R}$$

where R is the *Radius*, the Length is *Length* = $R \times \text{Delta}$.

- *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 (Figure 11-26 on page 11-22) shows graphically the results of the calculation.

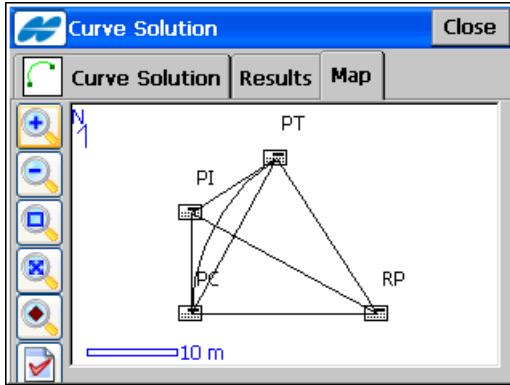


Figure 11-26. Curve Solution – Map Tab

Three-Points Curve

To define the curve using three points: PC point, any curve point, and PT point or the RP, PC, and PT points, tap the **Three Pt Curve** icon. The **Three Pt Curve** screen displays (Figure 11-27). The screen display changes, depending upon the first point selected.

The *Three Points Curve* tab displays the initial data.

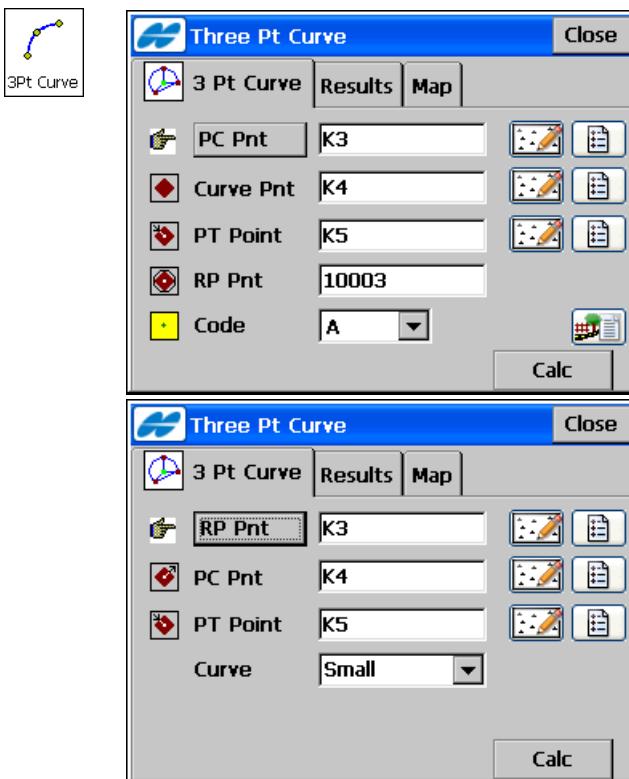


Figure 11-27. Three Pt Curve

Either enter manually or select from the list or from the map, the following sets of points.

- *RP Point, PC Pnt, PT Pnt* – for these set of points, the distance between the RP Point and the PC point should be an equal distance between the RP Point and the PT point. The radius and the PC and PT points define two curves, one with delta, less than or equal to 180 degrees (Small curve), and the other with delta greater than or equal to 180 degrees (Large curve). Select either *Small* value or *Large* value from the **Curve** drop-down list to indicate which of these two curves should be used for computations.

- *PC Pnt, Curve Pnt, PT Pnt* – for these set of points, the coordinates for the RP Point are calculated, along with curve parameters. The name and the code for this calculated point can be set.

- **Calc** – press to calculate the curve parameters.

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing two items:

- *Edit Points* – opens the **Points** screen to edit the points (see “Points” on page 6-2).
- *Help* – accesses the Help files.

The *Results* tab (Figure 11-28) displays the results of the calculation.

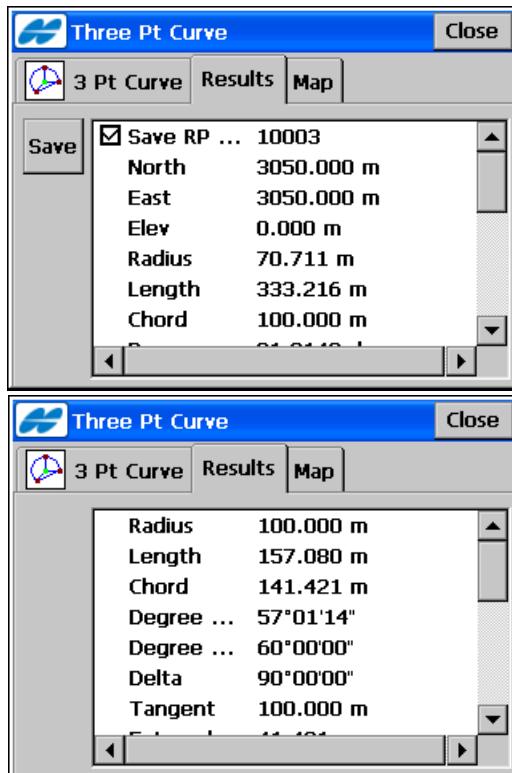


Figure 11-28. Three Pt Curve – Results Tab

For a description of curve parameters, see “Calculating the Parameters of a Curve” on page 11-19.

- **Save** – press to store the point being found.

The *Map* tab (Figure 11-29) displays the results of the calculation graphically.

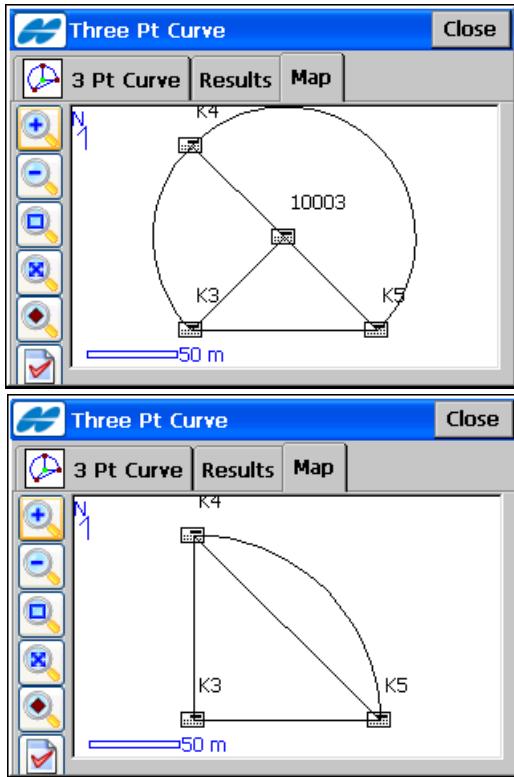


Figure 11-29. Three Pt Curve – Map Tab

PI & Tangents

To compute the the PC point, the PT point and the center (Radius Point) of a Curve, given the Point of Intersection (PI), the radius, and the azimuths from the PI point to the PC, and PT points respectively, tap the **PI & Tangents** icon. The **PI & Tangents** screen displays (Figure 11-30 on page 11-26).

The *PI & Tangents* tab contains the initial data.

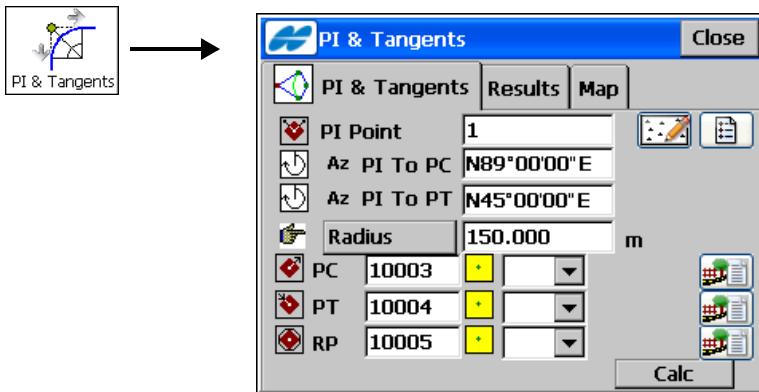


Figure 11-30. PI & Tangents

- **PI Point** – the Point of Intersection. Can be manually entered, or chosen from the map or from the list.
- **Az PI To PC/Brg PI To PC** – the azimuth from the PI point to the starting curve point.
- **Az PI To PT/Brg PI To PT** – the azimuth from the PI point to the ending curve point.
- **Radius/ Deg Curve/Deg Chord/Tangent** – the radius parameters of the curve.
- **PC** – the name and the code for the calculated starting curve point.
- **PT** – the name and the code for the calculated ending curve point.
- **RP** – 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 *Results* tab (Figure 11-31 on page 11-27) shows the results of the calculation.

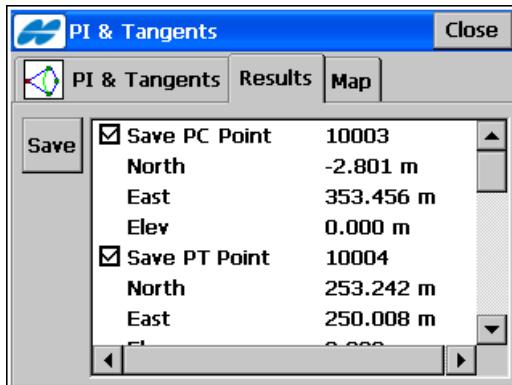


Figure 11-31. PI & Tangents – Results Tab

Put a check mark next to the points you want to save, then press the **Save** button.

The *Map* tab shows graphically the results of the calculation.

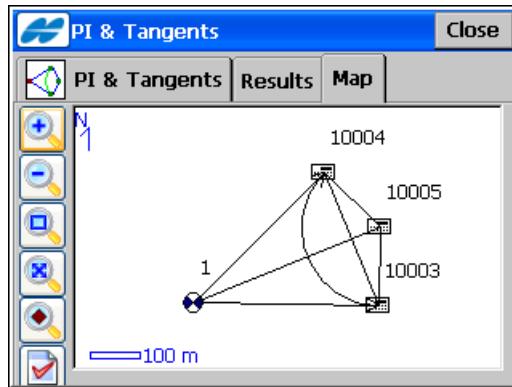


Figure 11-32. PI & Tangents – Map Tab

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing two options: *Edit Points* (see “Points” on page 6-2) and *Help* to access the help files.

Radius & Points

To define a curve using the PC and PT points, and a radius parameter, tap the **Radius & Points** icon. The **Radius & Points** screen displays (Figure 11-33).

The *Radius Point* tab contains the initial data for the task.

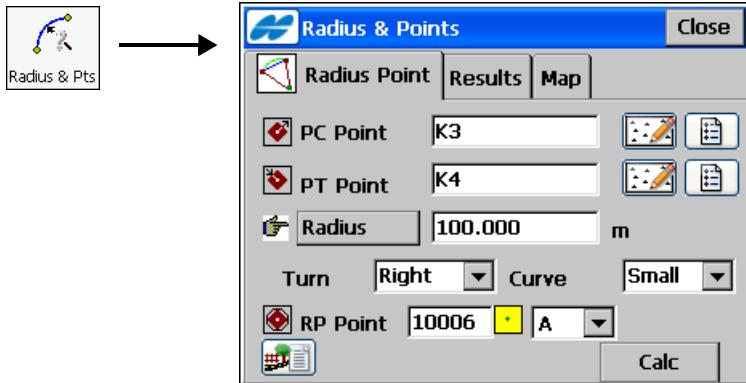


Figure 11-33. Radius & Points

- **PC Point** – the Point of Curvature: either enter manually or select from the map or from the list of points.
- **PT Point** – the Point of Tangency: either enter manually or select from the map or from the list of points.
- **Radius/Deg Curve/Deg Chord** – the radius parameters of the curve.
- **Turn** – the direction of turn, relative to the PC Point.
- **Curve** – defines the curve in the circle that should be considered. The radius and the PC and PT points define two curves, one with delta less than or equal to 180 degrees (Small curve), and the other with delta greater than or equal to 180 degrees (Large curve).
- **RP Point** – the point to be defined. Enter the name and select the code, if necessary.
- **Calc** – press to calculate the curve parameters.

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing two options: *Edit Points* (see “Points” on page 6-2) and *Help* to access the help files.

The *Results* tab (Figure 11-34) displays the results of the calculation.

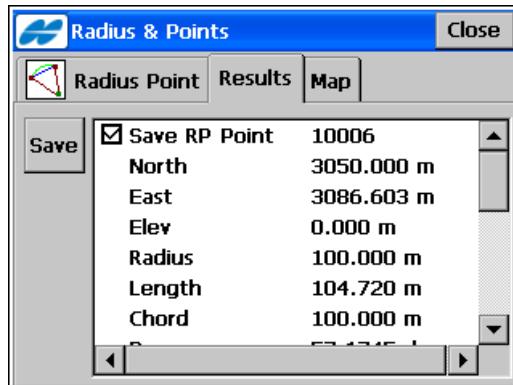


Figure 11-34. Radius & Points – Results Tab

For a description of curve parameters, see “Calculating the Parameters of a Curve” on page 11-19.

- **Save** – press to store the point being found.

The *Map* tab (Figure 11-35) displays the results of the calculation graphically.

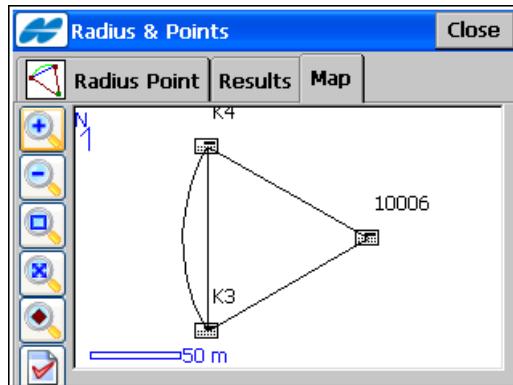


Figure 11-35. Radius & Points – Map Tab

Area

Tap the **Area** icon to access the Area menu to calculate the area of a polygon formed by any points or the coordinates of a point/points that forms a polygon of the desired area

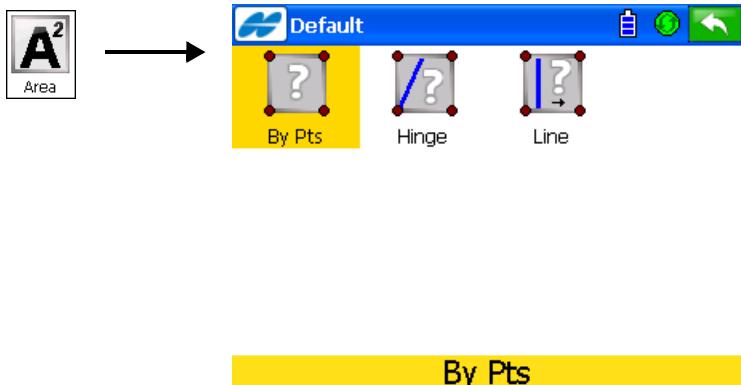


Figure 11-36. Area Menu

By Points

To calculate the area of a polygon formed by any points, tap the **By Points** icon. The **Comp Area** screen displays (Figure 11-37).

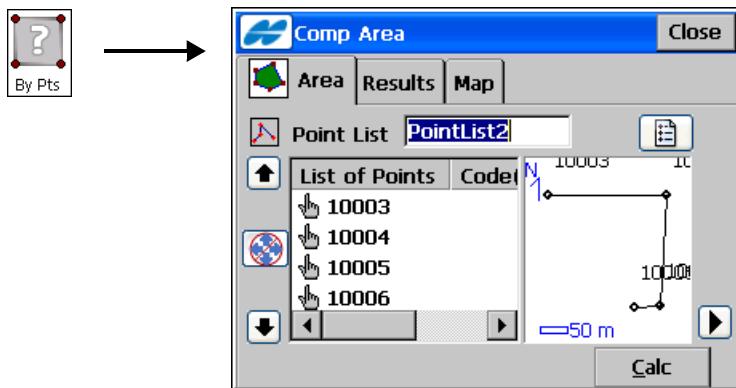


Figure 11-37. Area by Points

The *Area* tab contains the list of points, vertices of the polygon, and the plot of the polygon.

- *Point List* – the Point List name, either enter manually or select from the Point Lists drop-down box.
- *List of Points* – the list of currently selected vertices for the polygon.
- Up and down arrows move the highlighted point up and down in the order of the points.



For the correct operation of the application, the sides of the polygon should not cross each other.

- – switches the keyboard arrow keys on/off (duplicates the operation of the arrows on the screen).
- – closes the plot of the polygon. Only the list of points is available.
- **Calc** – calculates the area of the polygon and displays it on the *Results* tab.

The *Results* tab (Figure 11-38) shows the results of the calculation.

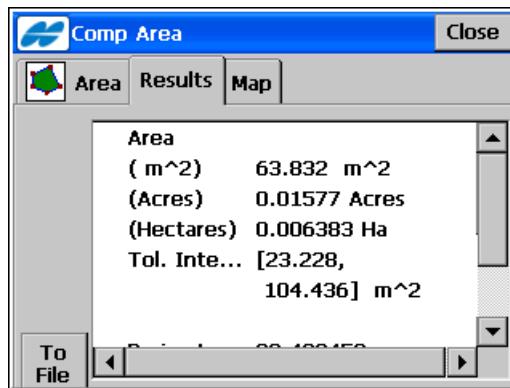


Figure 11-38. Area – Results Tab

Press **To File** to export Results to the file.

The *Map* tab (Figure 11-39) shows a view of the polygon.

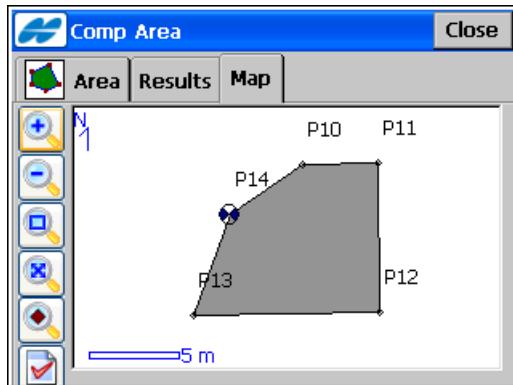


Figure 11-39. Area – Map Tab

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing two options: *Edit Points* (see “Points” on page 6-2) and *Help* to access the help files.

The Hinge Method

The Hinge method generates a polygon of the desired area by rotating a ray from a fixed rotation point. This method calculates the coordinates of a point of intersection of the ray with the boundary formed by selected points in a list.



For the correct operation of the application, the sides of the polygon should not cross each other, that is, the polygon should be simple and convex.

To start the Hinge task, select the **Hinge** icon. The **Known Area - Hinge** screen displays (Figure 11-40 on page 11-33).

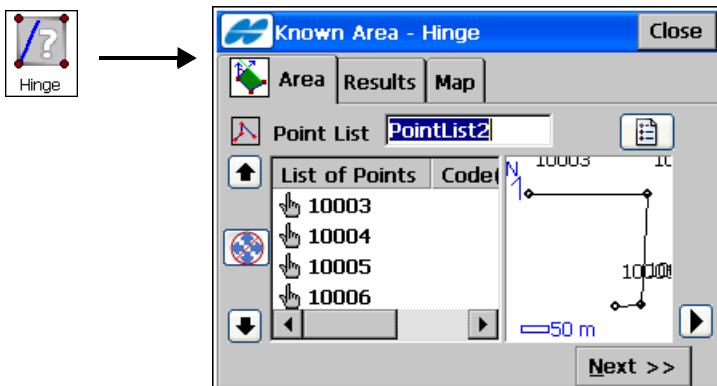


Figure 11-40. Hinge – Area Tab 1

The *Area* tab contains the initial data of the Hinge task.

- *Point List* – the Point List name: either enter manually or from the *Point List* drop-down box.
- – closes the plot of the polygon. Only the list of points is available.
- *List of Points* – the list of currently selected vertices of the polygon.
- Up and down arrows move the highlighted point up and down to change the order of the points.
- – switches the keyboard arrow keys on/off (duplicates the arrows on the screen).
- **Next** – opens the second screen of the *Area* tab (Figure 11-41 on page 11-34).

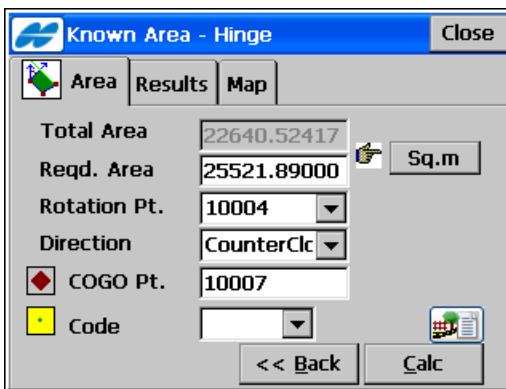


Figure 11-41. Known Area Hinge – Area Tab 2

- *Total Area* – the calculated area of a polygon formed with the currently selected points of the point list.
- *Reqd. Area* – the requested known area.
- **Sq.m** (Current Units)/**Acres**: press to set the area units.
- *Rotation Pt.* – the point in the list that fixed for rotation of a ray to the new point to form a polygon of the requested area.
- *Direction* – the direction of rotation.
- *COGO Point* – the name of the new point calculated.
- *Code* – select the code from the drop-down list, or press the *attributes list* icon to open the list of available attributes.
- **Back** – returns to the previous screen.
- **Calc** – calculates the coordinates of the new point and displays it on the *Results* tab.

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing two items: *Edit Point Lists* (see “Edit Point List” on page 6-32) and *Help* to access the help files.

The *Results* tab (Figure 11-42 on page 11-35) shows the results of the calculation.

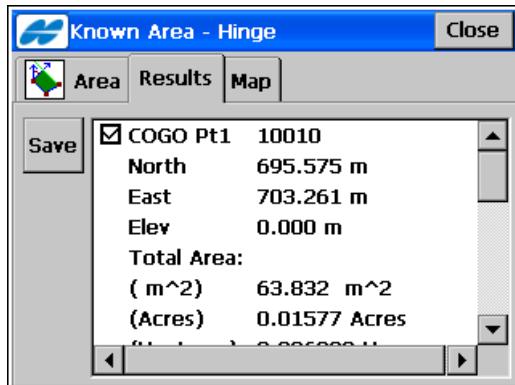


Figure 11-42. Hinge – Results Tab

The *Map* tab (Figure 11-43) shows the view of the polygon.

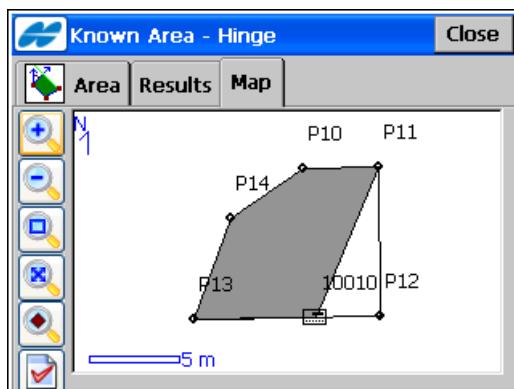


Figure 11-43. Hinge – Map Tab

The Line Method

The Line method computes the coordinates of two points that, along with two other known points, form a quadrilateral of the known area.

To start the Line task, select the **Line** icon. The **Known Area - Line** screen (Figure 11-44 on page 11-36) displays.

The *Area* tab (Figure 11-44) contains the initial data of the *Line* task.

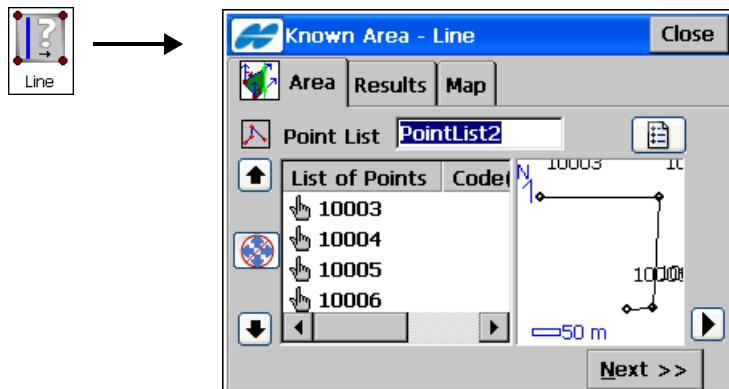


Figure 11-44. Line – Area Tab 1

For details on description of this screen, see “The Hinge Method” on page 11-32.

- *Next* – opens the second screen of the *Area* tab (Figure 11-45).



Figure 11-45. Line – Area Tab 2

- *Total Area* – the calculated area of a polygon formed with the currently selected points of the point list.
- *Reqd. Area* – the requested known area.
- *Edge Pt1*, *Edge Pt2* – the known points of the quadrilateral.

- *COGO Pt 1, COGO Pt 2* – the calculated points on the lines emanating from the *Pt1 of Edge* and *Pt2 of Edge*, respectively.
- **Sq.m (Current Units)/Acres** – press to set the area units.
-  – press to enter a code, select a code from the drop-down list, or press the  icon to open the list of available attributes.
- **Calc** – calculates the coordinates of the line points and displays it on the *Results* tab.



For the correct operation of the application, the sides of the polygon should not cross each other, that is, the polygon should be simple and convex.

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing two items: *Edit Points* (see “Points” on page 6-2) and *Help* to access the help files.

The *Results* tab (Figure 11-46) shows the results of the calculation.

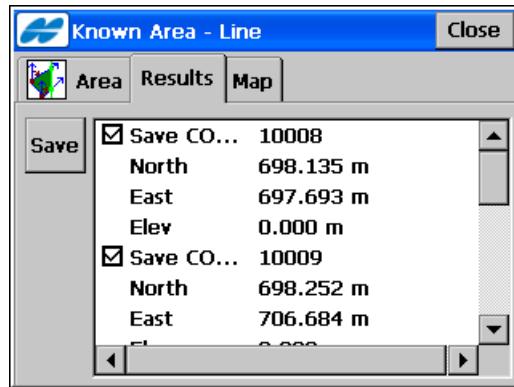


Figure 11-46. Line – Results Tab

The *Map* tab (Figure 11-47 on page 11-38) shows the view of the quadrilateral.

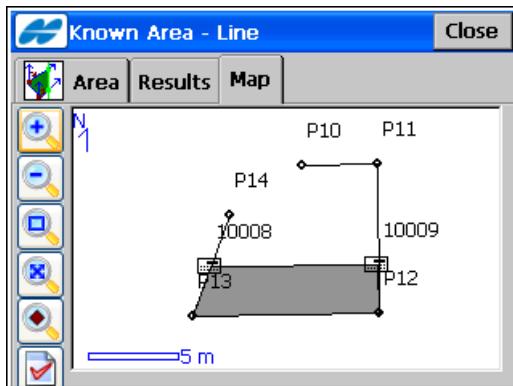


Figure 11-47. Line – Map Tab

Corner Angle

To calculate a corner angle, tap the **Corner Angle** icon (Figure 11-48). The **Corner Angle** screen displays.

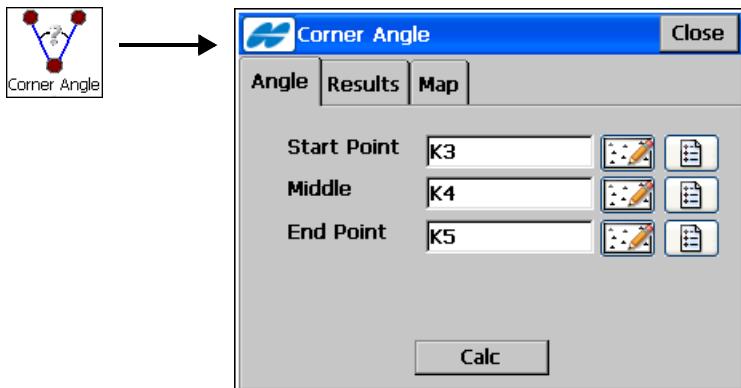


Figure 11-48. Corner Angle

The *Angle* tab contains initial data for the angle creation and calculates the angle:

- *Start Point* – the point that defines the first side of the angle; either enter manually or select from the map or from the list.

- *Middle Point* – the point that defines the corner of the angle; either enter manually or select from the map or from the list.
- *End Point* – the point that defines the second side of the angle; either enter manually or select from the map or from the list.
- **Calc** – calculates the corner angle.

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing three items:

- *Edit Points* – opens the **Points** screen (see “Points” on page 6-2).
- *Calculator* – accesses the calculator (see “Calculator” on page 11-17).
- *Help* – accesses the Help files.

The *Results* tab shows the results of the calculation: calculation of various angles, distances, and azimuths to the start and end points.

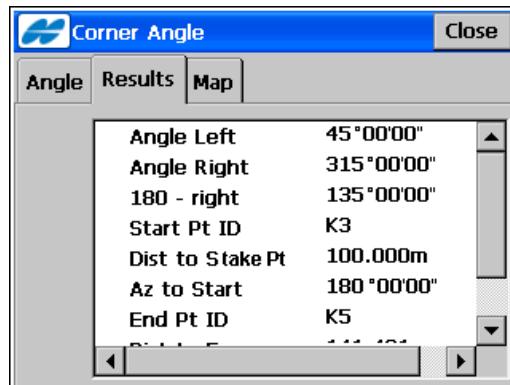


Figure 11-49. Corner Angle – Results Tab

The *Map* tab (Figure 11-50 on page 11-40) shows the view of the angle.

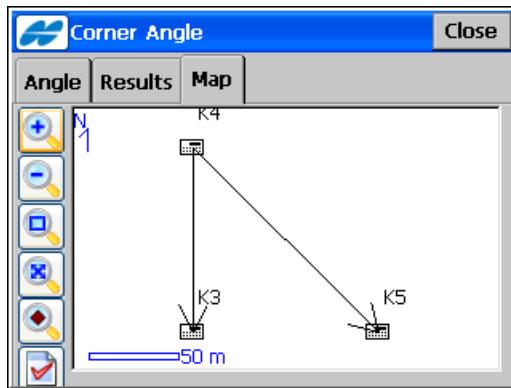


Figure 11-50. Corner Angle – Map Tab

Line Offset

To calculate the coordinates of points along a line, tap the **Line Offset** icon (Figure 11-51). The **Line Offset** screen displays.

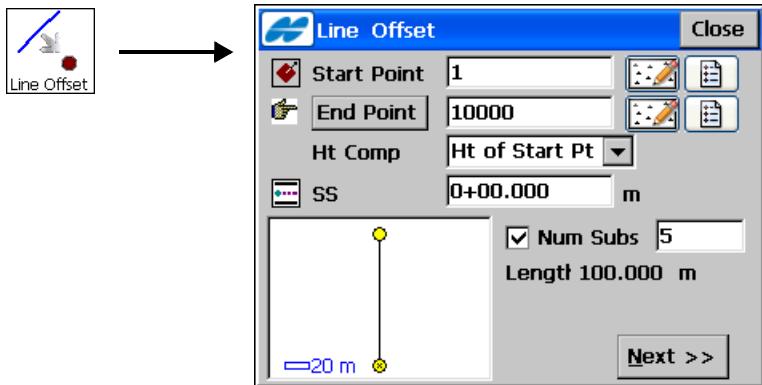


Figure 11-51. Line & Offset

- **Start Point** – the starting point of the line. The line is defined by the End point of the line or the azimuth to another point: either enter manually or select from the map or from the list.

- **End Point/Azimuth** – the ending point of the line / the azimuth to another point: either enter manually or select from the map or from the list.
- **Ht Comp** – select the type of height computations for the calculated points from one of the following:
 - *Interpolate Ht*: the height of the calculated point will be computed through linear interpolation using the height of the starting and ending points of the line.
 - *Ht of Start Pt* (height of starting point): the calculated point will have the same height as the starting point of the line.
- **Num Subs** – check and enable to designate the number of subdivisions you want to subdivide the line. For instance, a value of 3 indicates a calculation of four points by subdividing the line into three equal segments.
- **SS (Start Sta)** – enter the starting station (chainage) of the line.
- **Next** – opens the *Station & Offsets* screen.

Station & Offset

The *Station & Offsets* screen (Figure 11-52) contains the settings for the calculated stations with offsets from the line.



Figure 11-52. Station & Offsets

- *Station* – enter the station along the line. The two arrows to the right decrease or increase the station by the interval specified in the *Sta Interval* shown in the next field.
- – left/right arrows decreases/increases the distance by the station interval.
- – uses the right/left arrow keys of the keyboard to increase or decrease the station.
- *Sta Interval* – the station interval calculated.
- **Right Offset/Left Offset** – the right or left offset of the calculated point with respect to the line at the station shown on the *Station* field above.
- **Up/Down/Grade** – the Up/Down Height or grade offset, with respect to the height of the line at the station.
- *COGO Point* – sets the starting name for the points calculated.
- *Code* – the code of the point.
- **Back** – returns to the previous screen.
- **Calc** – calculates the points along the line. A successful message displays.



Figure 11-53. Successful Message

Curve Offset

To calculate the coordinates of points along a curve, tap the **Curve Offset** icon. The **Curve Offset** screen (Figure 11-54) displays.

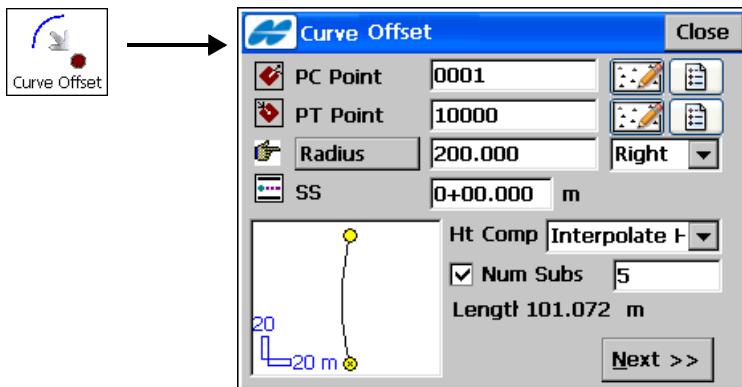


Figure 11-54. Curve & Offset

- **PC Point** – the Point of Curve, the starting point of the arc; either enter manually or select from the map or from the list of points.
- **PT Point** – the Point of Tangency; either enter manually or select from the map or from the list of points.
- **Radius/Deg Curve/Deg Chord** – the radius parameters of the curve and the direction of turn, relative to the PC Point.
- **SS** – the starting station (chainage) of the curve.
- **Num Subs** – check and enable to designate the number of subdivisions you want to subdivide the curve. For instance, a value of 3 indicates a calculation of four points by subdividing the curve into three equal segments.
- **Next** – opens the **Station & Offsets** screen.
- **Close** – saves the changes and closes the screen.

The **Station & Offsets** screen (Figure 11-55) contains the settings for the calculated stations with offsets from the curve.

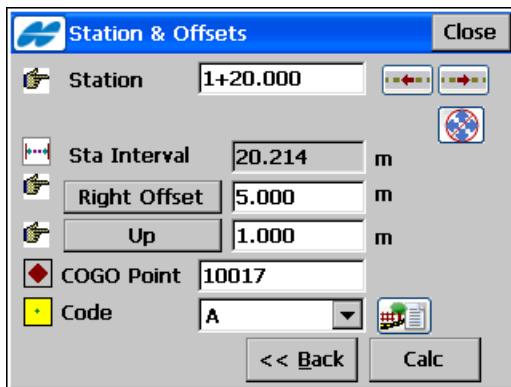


Figure 11-55. Station & Offsets

- **Station** – the station along the curve. The two arrows to the right decrease or increase the station by the interval specified in the *Sta Interval* shown in the next field.
- – left/right arrows decreases/increases the distance by the station interval.
- – uses the right/left arrow keys of the keyboard to increase or decrease the station.
- **Sta Interval** – the station interval calculated.
- **Right Offset/Left Offset/Grade** – the right or left offset of the computed point with respect to the curve at the station shown on the *Station* field.
- **Up/Down/Grade** – the Up or Down Height offset, or the vertical Grade (in percentage) with respect to the height of the road at the station. If the grade is falling, the value is set negative.
- **COGO Point** – sets the starting name for the points calculated.
- **Code** – the code of the point.
- **Back** – returns to the previous screen.

- **Calc** – calculates the points along the curve. A successful message displays.

Calculating a Road Offset

To calculate the coordinates of points along a road, tap the **Road Offset** icon (Figure 11-56). The **Road Offset** screen displays.

The **Road Offset** screen selects the road to calculate the offset points and displays the plan of the chosen road.

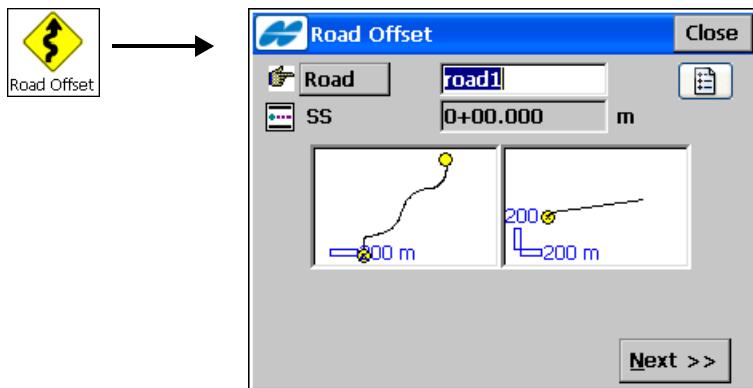


Figure 11-56. Road Offset

- **Road/H Alnt/HV Alnt** – the road/horizontal/horizontal and vertical alignments to calculate the offset points; either enter manually or select from the map or from the list of points.
- **SS (Start Stn)** – the starting point of the calculated points, the distance from the beginning of the road.
- **Next** – opens the **Station & Offsets** screen (Figure 11-57 on page 11-46).

The **Station & Offsets** screen contains the settings for the calculated stations with offsets from the road.

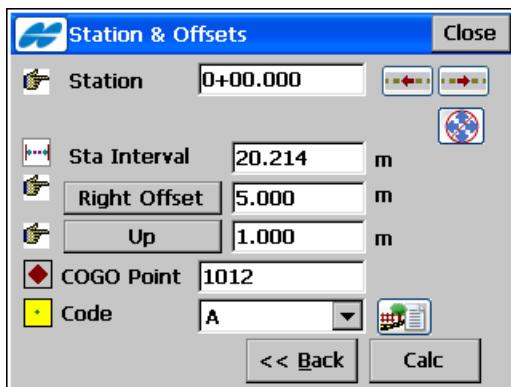


Figure 11-57. Station & Offsets

- **Station** – the station along the road. The two arrows to the right decrease or increase the station by the interval specified in the *Sta Interval* shown in the next field.
- – left/right arrows decreases/increases the distance by the station interval.
- – uses the right/left arrow keys of the keyboard to increase or decrease the station.
- **Sta Interval** – the station interval.
- **Right Offset/Left Offset** – the right or left offset of the stakeout point with respect to the road at the station shown on the *Station* field.
- **Up/Down/Grade** – the Up/Down Height or grade offset with respect to the height of the road at the station.
- **COGO Point** – sets the starting name for the points calculated.
- **Code** – the code of the point.
- **Back** – returns to the previous screen.
- **Calc** – calculates the points along the road. A successful message displays.

Adjusting Points

To transform points or perform traverse adjustment, tap the **Adjust** icon (Figure 11-58). The Adjust menu opens to access the *Rotate*, *Translate*, *Scale*, *2D Transform*, and *Traverse* options.

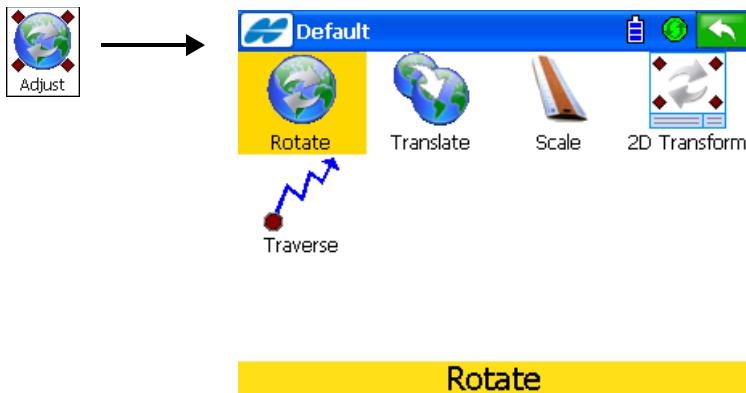


Figure 11-58. Adjust Menu

Rotate

To rotate points, tap the **Rotate** icon. The **Rotate** screen displays (Figure 11-59 on page 11-48).

To rotate the selected points around a specific point, select a rotation method: either *Rotation Angle* or *Azimuth*.

- *Select points* – select the point/points to be rotated by one of the following methods:
 - **By Range:** press to display the *Select Points by Range* screen. For a description of the *Select Points by Range* screen, see “Select Points by Range” on page 11-49.
 - Select points for rotation from the map or the list using the icons to the right.
 - Tap the **Layer** icon to rotate all points on a layer selected in the Layers screen.

- *Rotation Point* – sets the center of rotation: either enter manually or select from the map or the list.
- *Rotation Method* – select either *Rot. Angle* (if the rotation angle is input directly) or *Azimuth* (as a difference between the new and old azimuths/bearings).
- *Rotation Angle* – enter the value of the rotation right angle.
- *Old Azimuth/Old Bearing* – enter the value of the old azimuth.
- *New Azimuth/New Bearing* – enter the value of the new azimuth.

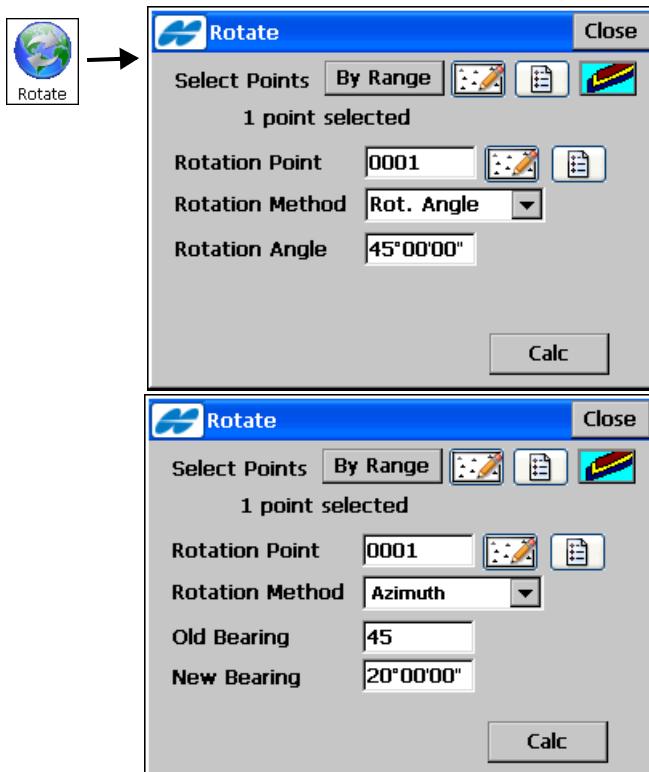


Figure 11-59. Rotate

- **Calc** – press to rotate the selected points. A successful message displays.

The Help Icon in the upper-left corner of the screen displays a pop-up menu containing two items:

- *Edit Points* – opens the **Points** screen (see “Points” on page 6-2).
- *Help* – accesses the Help files.

Select Points by Range

In the **Range of Points** field on the **Select Points by Range** screen (Figure 11-60 on page 11-49), the range can be set by enumeration of the points separated by commas, or by specifying the first and the last point included in the range. Press the **OK** button to save the specified range. The number of points selected display on the corresponding task screen in the **Select Points** field.

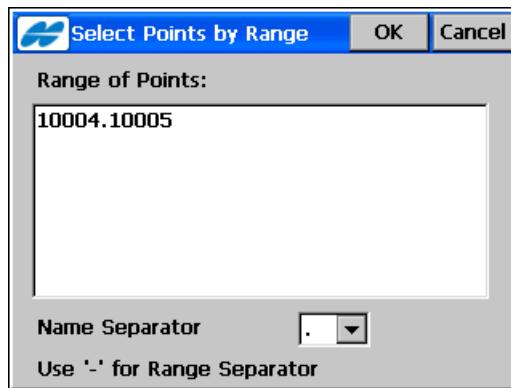


Figure 11-60. Select Points by Range

Translate

To translate a set of points, tap the **Translate** icon. The Translate screen (Figure 11-61 on page 11-50) displays.

To move a group of points selected on the **Translate** screen, select a translation method: select either *Coords/Pts* or *Az, Dist, Ht*.

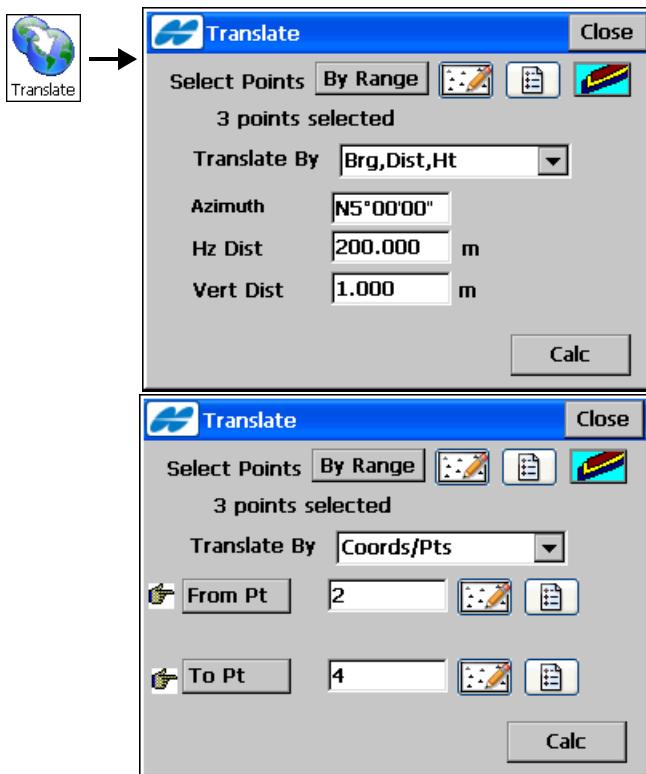


Figure 11-61. Translate

- **Select Points** – select the points for translation from one of the following methods:
 - **By Range:** press to display the *Select Points by Range* screen. For a description of the *Select Points by Range* screen, see “Select Points by Range” on page 11-49.
 - Select points for rotation from the map or the list using the icons to the right.
 - Tap the **Layer** icon to rotate all points on a layer selected in the Layers screen.
- **Translate By** – select either *Coords/Pts* or *Az, Dist, Ht* as the translating method.

- *Coords/Pts*: all the selected points are moved in the same direction and distance as between the points (locations), set by the next two fields: **From Pt (From Crd)** and **To Pt (To Crd)**.

In the first case, define only the point name; in the second case, define the local coordinates and the height of the location.

- *Az, Dist, Ht*: all the selected points are moved in the specified direction by a specified distance. These parameters are set through the *Azimuth* field, *Ht Dist* and *Vert Dist* fields.

- **Calc** – press to translate the selected points. A successful message displays.



The limit for translation of points is 20,000 meters.

Scale

To scale a set of points, tap the **Scale** icon. The **Scale** screen displays. To scale the distance of a range of points relative to a Base Point on the Scale screen, set the following parameters.

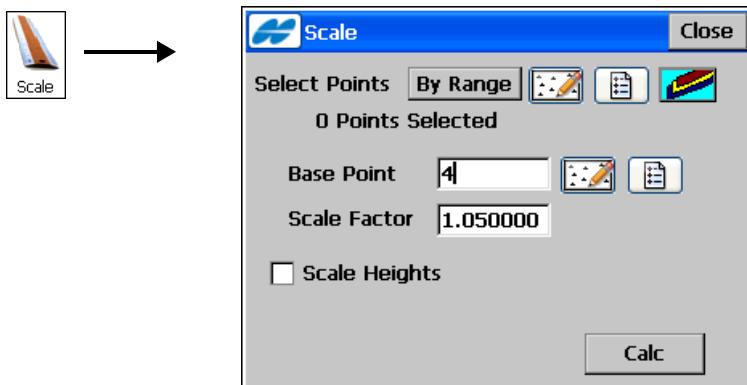


Figure 11-62. Scale

- *Select Points* – select the points to scale using one of the following methods:
 - **By Range:** press to display the *Select Points by Range* screen. For a description of the *Select Points by Range* screen, see “Select Points by Range” on page 11-49.
 - Select points for rotation from the map or the list using the icons to the right.
 - Tap the Layer icon to rotate all points on a layer selected in the Layers screen.
- *Base Point* – sets the reference point for the scale transformation: either enter manually or select from the map or from the list.
- *Scale Factor* – the scale factor for the coordinate transformation.
- *Scale Heights* – check mark and enable this box if the height values should be scaled also.
- **Calc** – press to scale the selected points. A successful message displays.

2D Transform

To perform a linear two dimensional transformation of a set of points, tap the **2D Transform** icon. The **2D Transform** screen (Figure 11-63) displays.

The **2D Transform** screen contains a list of point pairs used for getting the transformation parameters. Initially this screen is empty.

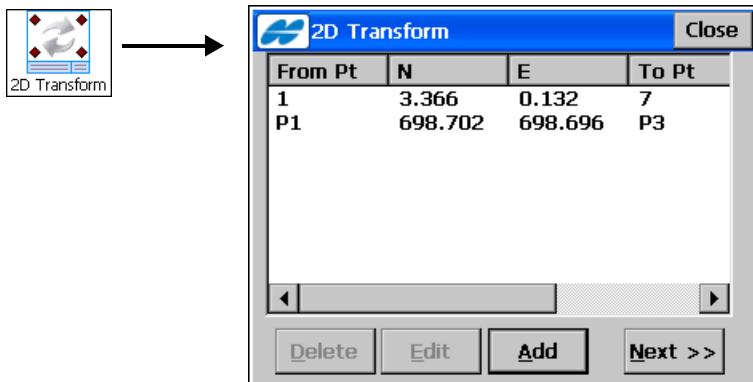


Figure 11-63. 2D Transform

- **Add** – press to enter pairs of points or coordinates in the **Point Pair Info** screen (Figure 11-65 on page 11-55).
- **Edit** – press to change the information about the point pair highlighted.
- **Delete** – press to erase the point pair selected.
- **Close** – closes the screen.
- **Next** – opens another **2D Transform** screen with the transformation parameters calculated (Figure 11-64).

The second **2D Transform** screen displays the transformation parameters which will be applied to the set of points needing transformation.

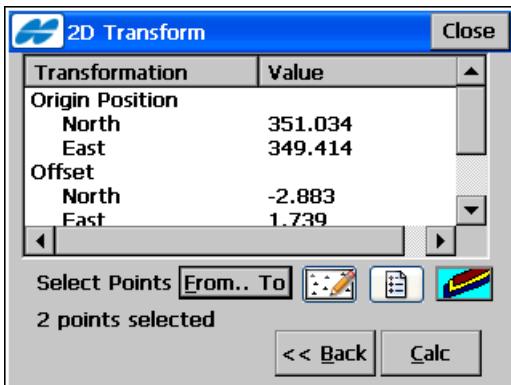


Figure 11-64. 2D Transformation Parameters

- **Select points** – select the points to convert using one of the following methods:
 - **From.. To:** press to display the *Select Points by Range* screen. For a description of the *Select Points by Range* screen, see “Select Points by Range” on page 11-49.
 - Select points for transform from the map or the list using the icons to the right.
 - Tap the Layer icon to transform all points on a layer selected in the Layers screen.

Once the set of desired points is specified, the number of points selected will display on the *2D Transform* screen.

- **Back** – returns to the previous screen.
- **Calc** – performs the two dimensional transform and displays a successful message.
- **Close** – returns to the *2D Transform* screen.

Point Pair Info

The **Point Pair Info** screen (Figure 11-65) selects the pairs of points or coordinates to obtain transformation parameters.

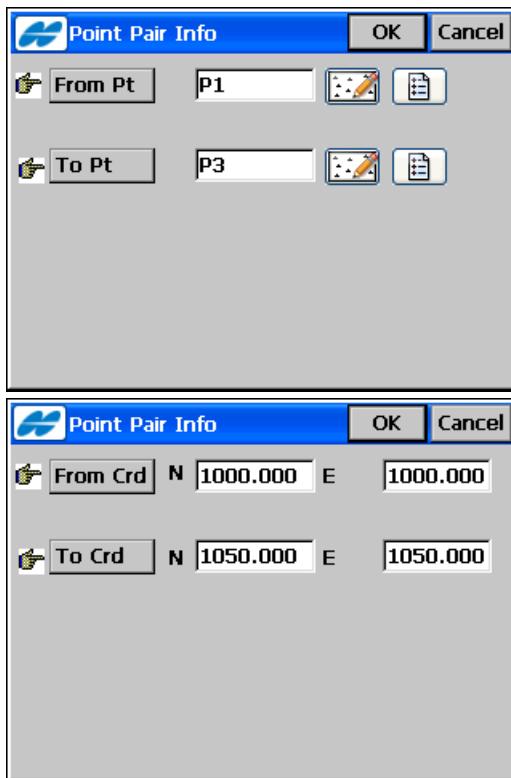


Figure 11-65. Point Pair Information

- **From Pt/From Crd** – changes the field to enter either the point or coordinates from which the parameters will be calculated.
- **To Pt/To Crd** – changes the field to enter either the point or coordinates to which the parameters will be calculated.
- **OK** – returns to the *2D Transform* screen with the pair added.
- **Cancel** – returns to the *2D Transform* screen without changes made.

Traverse Adjustment

Traverse adjustment is performed to provide a mathematically closed figure and at the same time, to get the best estimates for positions of all the traverse stations.

To perform an adjustment of a surveyed traverse, tap the **Traverse** icon. The **Adjustment** screen displays (Figure 11-66).

Adjustment Parameters

The first **Adjustment** screen contains general settings for adjustment:

- *Start Point* – the station on which the traverse originates; either enter manually or select from the map or from the list of points.
- *End Point* – the station on which the traverse closes; either enter manually or select from the map or from the list of points.
- *Adjust Elevations* – check mark and enable this box to include adjusting elevations if elevations were determined in the traverse.
- *Adjust Sideshots* – check mark and enable this box to include adjusting side shots.
- *Curvature refraction* – if needed select an Earth curvature refraction value from 0.14 and 0.2
- *Job to store the results* – the **New** button opens the **New Job** screen to create a new job to store the adjusted traverse stations.

- Next – opens the next *Adjustment* screen to perform adjustment.

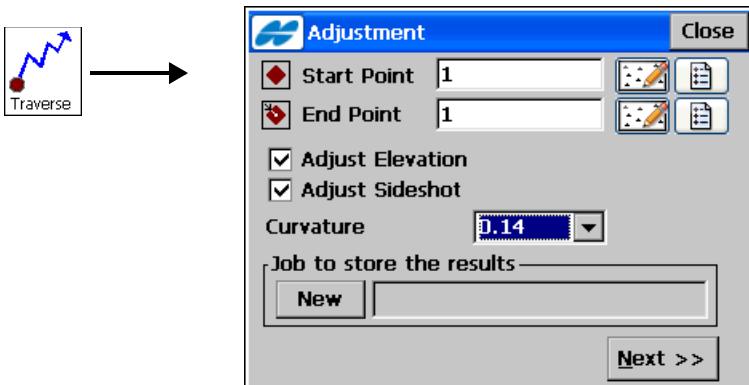


Figure 11-66. Adjustment Settings

Adjustment

The next *Adjustment* screen (Figure 11-67) selects the method of traverse adjustment to use and a technique to close the traverse if it is unclosed.

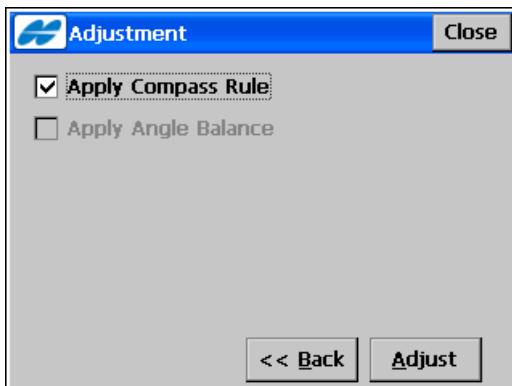


Figure 11-67. Adjustment

- *Apply Compass Rule* – check mark and enable this box to adjust the traverse by the compass rule.
- *Apply Angle Balance* – check mark and enable this box to adjust the traverse by the angle balance.

- **Closing Angle** – shows the closing angle for the traverse adjustment.
- **Adjust** – press to adjust the traverse. The **Adjustment Results** screen opens to display results. The traverse points adjusted will be saved in the new job as calculated points.

Traverse

This function is used to calculate Traverse and Sideshot points, based on horizontal and vertical offsets along a direction, which is defined by an azimuth, or right, left, or deflection angles.

To start a Traverse task, tap the **Traverse** icon (Figure 11-68). The **Traverse Calc** screen displays.

The **Traverse Calc** (Figure 11-68) tab displays the initial data for the traverse task.

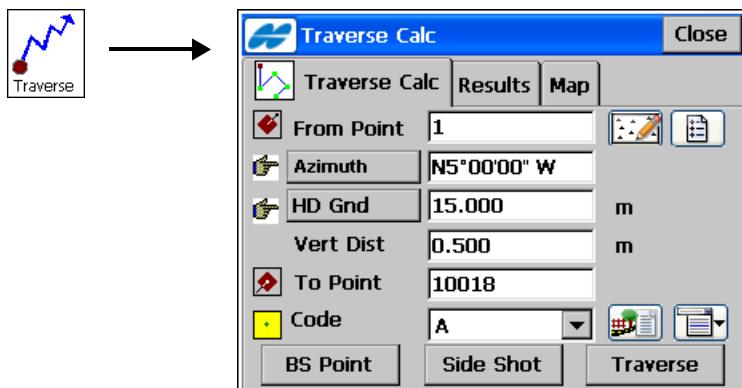


Figure 11-68. Traverse Calc

- **From Point** – indicates the occupation (the traverse point): either enter manually or select from the map or list.
- **Azimuth/Angle R/Angle L/Defl R/Defl L** – 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 R:** angle to the right is the angle at the known point from the backsight point to the calculated point in a clockwise direction.
- **Angle L:** angle to the left is the angle at the known point from the backsight point to the calculated point in an counter clockwise direction.
- **Defl R:** the angle to the right at the known point between the prolongation of the line from the backsight point and the line to the calculated point
- **Defl L:** the angle to the left at the known point between the prolongation of the line from the backsight point and the line to the calculated point
- **HD Gnd/HD Grd** – 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 11-70 on page 11-61). If a BS point has not been entered, an Azimuth is required. In this case, if an angle value is entered as *Angle Right*, *Angle Left*, or *Deflection*, this value is considered to be azimuth.
- **SideShot** – if pressed, the coordinates of the *To Point* are calculated based on the entered values for *Azimuth/Angle Right/Angle Left/Deflection Right/Deflection Left*, *Horizontal* and *Vertical* distances. The *From Point* parameter does not change and the *To Point* parameter is incremented to the next new Point in the database.
- **Traverse:** if pressed, the coordinates of the To Point are calculated based on the entered values for (*Azimuth/Angle Right/Angle Left/Deflection Right/Deflection Left*), *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 Help Icon in the upper-left corner of the screen displays a pop-up menu containing two items:

- *Edit Points* – opens the **Points** screen to edit the points (see “Points” on page 6-2).
- *Help* accesses the Help files.

The *Results* tab (Figure 11-69) shows the initial data and results of the calculation. The *Map* tab shows the results graphically.

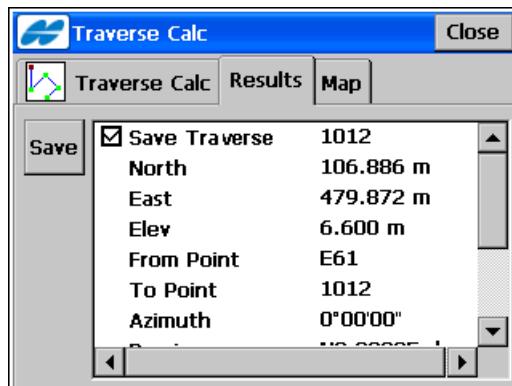


Figure 11-69. Traverse Calc – Results Tab

BS Point

The **BS Point** screen (Figure 11-70) enters the parameters for the *Backsight Point* or *Backsight Azimuth*. Tap the **BS Point/BS Azimuth** button to determine which parameters will display.

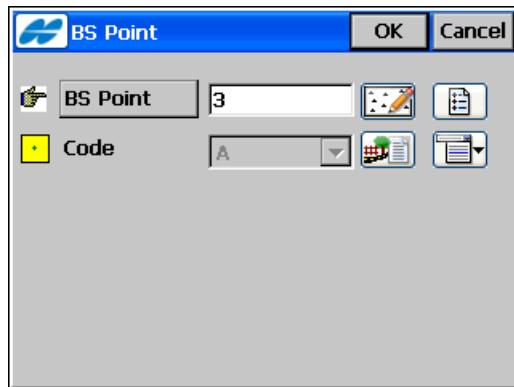


Figure 11-70. BS Point

Viewing Map

The **Map** Icon in the main menu opens a map on the main screen for the current job.

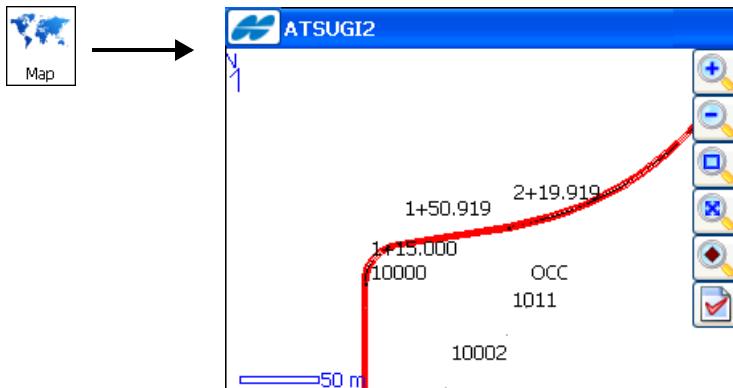


Figure 12-1. Job Map

The Map screen displays the plot of the current job, the toolbar and the scale bar. The Map maintains the scale after changing the status of the main map.

The Help Icon opens a pop-up menu giving access to the help files, menu interface selection, keyboard activation and information about TopSURV. (for detail see “Help Icon’s Pop-up Menu” on page 1-7).

Toolbar

The Toolbar of the Map screen contains icons of the viewing options.



Figure 12-2. Toolbar Viewing Options

Table 12-1 describes the toolbar icons.

Table 12-1. View Menu Toolbar Options

Toolbar Icon	Icon Description
A magnifying glass with a plus sign inside.	Zooms the plot inwards
A magnifying glass with a minus sign inside.	Zooms the plot outwards
A magnifying glass with a square selection box inside.	Selects a frame of objects for zoom-in display; draw from left to right to get the object you want.
A magnifying glass with a crosshair inside.	Displays all points in the job
A magnifying glass with a diamond shape inside.	Opens the Select Point screen to select a point to center the plot
A magnifying glass with a checkmark inside.	Opens the Map Properties screen

Select Point

The **Select Point** screen selects a point from the list to center the plot.



Figure 12-3. Select Point

Properties

The **Map Properties** screen (Figure 12-4) customizes the map view by adding properties to the points or setting the application to adjust the scale automatically.

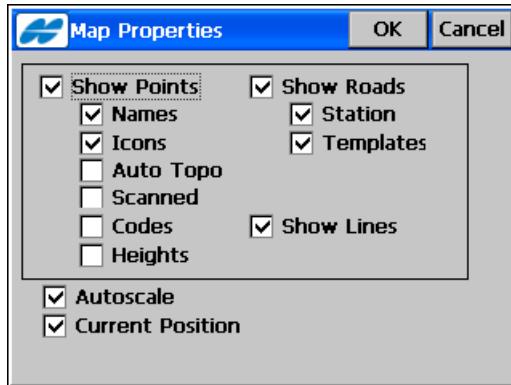


Figure 12-4. Map Properties

Place the check mark in the corresponding boxes to:

- Display, along with the points, their names, codes, icons and heights.

- Show Auto topo and scanned points.
- Display roads, turn on the linework on the map.
- Perform autoscaling (the *Autoscale* field). Autoscaling works to display the 30 most recent points of a survey on the map screen.
- Start each time from the current position. If the current position moves off the edge of the map, it will automatically snap back to the center if you place a check mark in the Current Position box.

Actions on the Map

The main Map screen not only displays spatial job overview but also provides access the job database by actions on the map view. It is realized by pop-up menus which offer the relevant actions on particular objects.

On the main **Map** screen, you can:

- Tap on the desired object (point, line, road) to select/deselect objects on the map.
- Press the  button and draw a frame from right to left to zoom in on selected objects.
- Press and hold the stylus on the selected object to display map options. A pop-up menu displays the options available for the selected object (Figure 12-5 on page 12-5):
 - *Stakeout*: performs stakeout of the selected point, point in direction, line vertices and road.
 - *Edit*: changes properties of a single selected object (point, line, road).
 - *Delete*: deletes selected objects.
 - *Add to Layer*: places selected objects on a selected layer.
 - *Create a Road*: creates a new road.

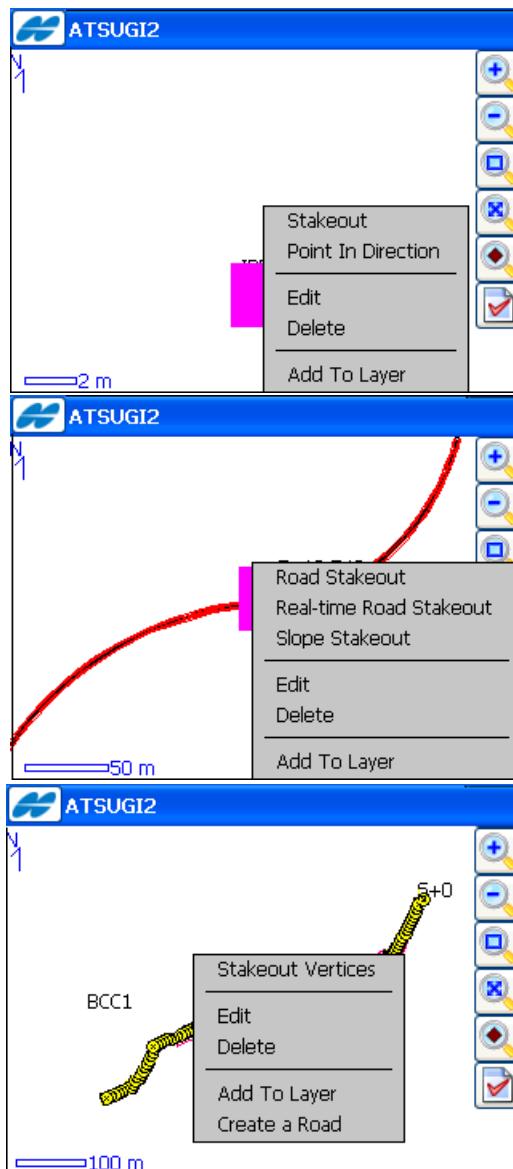


Figure 12-5. Map Options

Most TopSURV functions can be performed on the Map opened in a TopSURV task (for example, see Figure 12-6 for a Topo survey).

Depending upon the task, the appearance of the view changes. Mostly the controls located on the main task page are duplicated. There are also some controls that are independent of the function being performed. These controls correspond to the viewing options and customized display options.

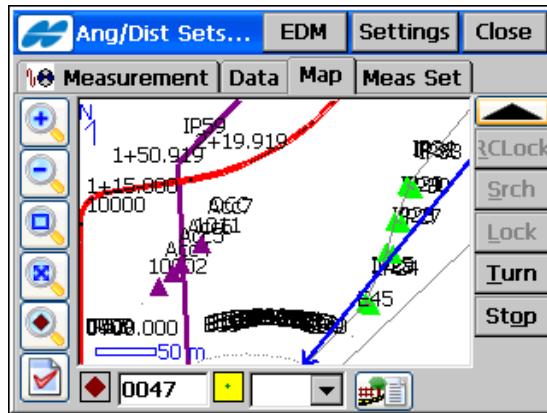


Figure 12-6. Topo – Map

File Formats

The following sections describe the formats used to import/export different file types.

Point Coordinate Formats

The files used to import/export point data can be in different formats: text formats such as DXF, MOSS and many others, or binary formats such as DWG and CR5.

Text (Custom Format)

This format contains a set of user-defined fields in the user-defined order. This format can contain points and lines. Lines are defined by continuous list of the points with the same name.

The following fields are available:

- Name
- N(Lat)
- E(Lon)
- Elev
- Ell ht
- Notes
- Codes
- Codes&Strings
- Codes&Attributes
- FullCodes

Four variants of code fields are available to support all code features in TopSURV:

1. Codes - includes only codes: Code1, Code2,..., CodeN...
2. Codes&Strings - includes only code names and strings:
Code1&"code string1",..., CodeN&"code stringM"...
3. Codes&Attributes - includes only code names and attributes:
Code1:[attribute name1].[type of the attribute]="value of the attribute"... \$Code1:[attribute nameN].[type of the attribute]="value of the attribute"...
4. FullCodes - includes code names, attributes, code strings and control codes:
Code1:[attribute name1].[type of the attribute]="value of the attribute"&"code string"@ "control code" ...
\$Code1:[attribute nameN].[type of the attribute]="value of the attribute"&"code stringM"@ "control codeK" ...



Select only one type of the code output to one file.
Selection of several Codes fields for export is not supported

FC-4

The FC-4 format is as follows:

Name, Northing, Easting, Elevation, Code

Example:

101
12.32000
45.10000
23.12000
a
102

34.20000

9.40000

3.22000

103

2.33400

8.45000

45.00000

b

104

78.60000

45.00000

56.60000

FC-5

Example:

OutPut

```
_+BS_ f+012500000m_ g+011500000m_
h+000050000m_ +PJ1_ f+012000000m_ g+011002106m_
h+000049970m_ +PJ11_ f+012000000m_ g+011002106m_0063
h+000049970m_ +PJ12_ f+011994478m_ g+011004703m_
h+000050025m_ +PJ13_ f+011990588m_ g+011003698m_
h+000049863m_ +PJ2_ f+011994476m1051
```

InPut

```
_+BS_ x+012500000m_ y+011500000m_
z+000050000m_ +PJ1_ f+012000000m_ g+011002106m_
h+000049970m_ +PJ11_ f+012000000m_ g+011002106m_0063
h+000049970m_ +PJ12_ f+011994478m_ g+011004703m_
h+000050025m_ +PJ13_ f+011990588m_ g+011003698m_
h+000049863m_ +PJ2_ f+011994476m1051
```

GTS-6

GTS-6 coordinate input and output is the same format. Refer to the GTS-6 interface manual to confirm details.

The format of GTS-6 is the same as FC-5 coordinate input.

FC-6/GTS-7

The format of FC-6 is the same as GTS-7 coordinate format. The GTS-7 format is as follows:

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

Example:

```
1,1000.0000,1000.0000,100.0000
2,990.0000,1010.0000,100.0000
101,994.8159,1000.9684,100.1130
102,993.9304,1007.7991,100.8000
103,998.5150,1009.6329,100.4026
104,1002.0648,1002.5682,100.3421
1001,1004.7210,997.6496,100.1153
1002,1003.7027,990.8382,100.7989
1003,998.7911,990.3286,100.4033
1004,997.3111,998.0951,100.3421
```

GTS-7 with strings

The GTS-7 with strings format is as follows:

ptno, X(easting), Y(northing), Z(elevation), pt code, string

Example:

1,1000.0000,1000.0000,100.0000,STN,001
2,990.0000,1010.0000,100.0000,STN,001
101,994.8159,1000.9684,100.1130,STN,002
102,993.9304,1007.7991,100.8000,STN,001
103,998.5150,1009.6329,100.4026,STN,002
104,1002.0648,1002.5682,100.3421,STN,001
1001,1004.7210,997.6496,100.1153,PT,09
1002,1003.7027,990.8382,100.7989,PT,05
1003,998.7911,990.3286,100.4033,PT,09
1004,997.3111,998.0951,100.3421,PT,05

GT

The GT Format is as follows:

0 Code Name North East Elev 0 0

Example:

0	a	101	12.320	45.100	23.120	0 0
0		102	34.200	9.400	3.220	0 0
0	b	103	2.334	8.450	45.000	0 0
0		104	78.600	45.000	56.600	0 0

GT-FIN

The File Extension for this format is *.GT

Format is 8,8,8,8,14,14,14:

- 1: Surface (Eight marks)
- 2: Line (Eight marks)
- 3: Code (Eight Marks)
- 4: Point (Eight marks)
- 5: X-coordinate (N) (fourteen marks)

6: Y-Coordinate (E) (fourteen marks)

7: Z-Coordinate (H) (fourteen marks)

Example:

9 1 0 1 44318.541 72090.844 0.000

where

9 = Surface Code (ctrl code)

1 = Line Code (String code)

0 = Code

1 = Point number

44318.541 = North

72090.844 = East

0.000 = Height

MMH360

The File Extension for this format is *.360

MMH360-format is as follows:

1: Empty (Four marks)

2: Control Code (three marks)

3: String (Four Marks)

4: Point (pointnumber: seven marks)

5: Empty (four marks)

6: Code (Three marks)

7: Control Code 2 (two marks)

8: Empty mark (One mark)

9: X-coordinate (N) (11 marks, three after comma)

10: Empty mark (One mark)

11: Y-coordinate (E) (11 marks, three after comma)

12: Empty (Eight marks)

13: Z-coordinate (H)(8 marks, three after comma)

Example:

25 4 10 60101 7062800.100 3513639.300 17.800

where

25 = Control code

4 = String

10 = Point Number

601 = Code

01 = Control Code 2

7062800.100 = North

3513639.300 = East

17.800 = Height

DXF

AutoCAD® DXF (Drawing eXchange Format) is the native vector file format of Autodesk's AutoCAD application.

KOF

KOF is a Norwegian format that consists of a set of data blocks.

Example:

00 Starting off with total station:

02 P10 1.690 31

09 40

03 100 45 100.1230 100.1230 100.123 1.670

03 101 45 200.3210 100.3210 200.321 1.670

03 101 45 .3215 299.6786 200.322 1.670

03 100 45 300.1236 299.8770 100.134 1.670

09 40

03 100 45 200.1260 299.8770 100.126 1.670

03 101 45 300.3350 299.6791 200.345 1.670

03 101 45 100.3206 100.3215 200.256 1.670

03 100 45 .1247 100.1234 100.139 1.670

09 39
03 2 7002 110.0000 101.3955 50.002 1.350
03 3 7002 125.3600 100.2500 48.369 1.350
03 4 7002 136.2300 100.2500 48.369 1.350
09 91
03 5 7002 148.0000 100.2500 48.369 1.350
03 6 7002 150.0000 100.2500 48.369 1.350
03 7 7002 158.0000 100.2500 48.369 1.350
03 8 7002 168.0000 100.2500 48.369 1.350
03 9 7002 170.0000 100.2500 48.369 1.350
03 10 7002 180.0000 100.2500 48.369 1.350
09 99

00 Then a couple of coordinates:

05 100 1000 134721.459 9867.343 21.633
05 101 1000 134741.349 9881.834 21.514

00 And some GNSS-vectors:

42 Bauta 2210658.5530 618726.6390 5930812.0680 1.341
43 D1 4.5619 230.4119 -47.0982 2.054
44 1.4314 0.6481 4.5640 1.0000 0.4382 0.8757 1.0000 0.4811 1.0000
42 Bauta 2210658.5530 618726.6390 5930812.0680 1.341
43 D2 -0.6466 176.7444 -33.8989 2.054
44 0.2134 0.1012 0.5657 1.0000 -0.0395 0.8015 1.0000 -0.1045 1.0000

The examples shown are not complete blocks, but show typical use of the blocks. Several of the blocks have a two-digit code that describes the kind of measurement being done.

The relevant values are:

30 = TS, Traverse

31 = TS, Free station / eccentric station

32 = TS, Known station

33 = TS, Other

91 = GPS, code differential (DGPS)

92 = GPS, autonomous

96 = GPS, RTK fixed

97 = GPS, RTK float

Block 00 - Header

DB FreeText

^I2 ^ A64

Example:

00 This is just a comment!!

Block 02 - Station

DB Station Feat.Code NR Press Temp Ih Type Comm

^I2 ^ A10 ^ A8 ^ I8 ^ I8 ^ I8 ^ F6.3 ^ I2 ^ A7

Example:

02 P100 1000 1.723

DB is the data bloc-number (02), Station is name of station (point where total station is situated), Feat. Code is feature code, NR could be left blank. Pressure in mmHg and temperature in C. Ih=instrument height, Type is type of measurement, and Comm is comment.

Block 03 - Total Station observations 1

DB AimPoint Feat.Code Hor Vert Dist Ph Type Comm

^I2 ^ A10 ^ A8 ^ F8.4 ^ F8.4 ^ F8.3 ^ F6.3 ^ I2 ^ A7

Example:

03 PP230 7002 100.1230 100.1230 100.123 1.670

DB is data block-number (03). Aim Point is point name of point at which the total station is aimed. Feature code is feature code of Aim Point. Hor is horizontal angle (gon). Vert is vertical angle (gon). Dist is slope distance. Ph is pole height / prism height. Type is type of observation, and Comm is comment.

Block 04 - Total Station observations 2

DB AimPoint Feat.Code Hor Dh DistH Ph Type Comm

^I2 ^ A10 ^ A8 ^ F8.4 ^ F8.3 ^ F8.3 ^ F6.3 ^ I2 ^ A7

Example:

04 PP231 7002 100.1230 2.113 144.341 1.670

DB is data block (04). Aim Point is the point at which the total station is aimed. Feat.Code is feature code for Aim.Point. Hor is horizontal angle (gon). Dh is height difference. DistH is horizontal distance. Ph is pole height / prism height. Type is type of observation, and comm is comment.

Block 05 - Coordinates

DB Pointname Feat.Code North East Height Type Comment
^I2 ^ A10 ^ A8 ^ F12.3 ^ F11.3 ^ F8.3 ^ I2 ^ A7

Example:

05 P101 1000 134741.349 9881.834 21.514

DB is datablock (05). Pointname is occupation name (point name). Feat.Code is feature code. North, East, Height is coordinate in selected system. Type is type of calculation/measurement, and comment is a free-text comment.

Block 09 - Program information

DB PI Connection Free text
^I2 ^ I2 ^ A10 ^ A50

Example (line coding):

09 91
05 P100 1000 134654.123 9800.123 21.000
05 P101 1000 134741.349 9881.834 21.514
09 99

DB is datablock (09). PI is program information, which is a code that can give extra information to the program reading the KOF file, and can be used to start/end lines in a coordinate export. Connection is sometimes used and is a point number of an existing point.

Block 41 - GNSS base, no coordinate

DB BaseName Feat.Code Bk Spaces Ant.H. Type Comm.
^I2 ^ A10 ^ A8 ^ I8 x31 F6.3 ^ I2 ^ A7

Example::

41 Bauta 1.341

This block brings on base point name and antenna height. It has the same layout as block 42 (fields are described there), except that the coordinates are replaced by spaces.

Block 42 - GNSS base, with coordinate

DB BaseName Feat.Code X Y Z Nr Ant.H. Bk Comm.
^I2 ^A10 ^ A8 ^F12.4^F12.4^F12.4^I8^F6.3 ^I2 ^ A7

Example:

42 Bauta 2210658.5530 618726.6390 5930812.0680 1.341

DB is data-block (42). BaseName is the point name of the base. Feat.Code is feature code. X, Y, and Z is coordinate of base in WGS84 geocentric coordinates. Nr should be left blank. Ant.H is antenna height. Bk should be left blank, and Comm. is a freetext comment.

Block 43 - GNSS vector

DB PointName Feat.Code dX dY dZ Ant.H Bk Comm
^I2 ^ A10 ^ A8 ^F12.4^F12.4^F12.4^ F6.3 ^I2 ^A7

Example:

43 P1 4.5619 230.4119 -47.0982 2.054

This is the vector. DB is data-block (43). PointName is the (rover) occupation name (point name). Feat.Code is feature code. dX, dY, and dZ is the vector components in WGS84 geocentric coordinates. Ant.H is antenna height of the rover. Bk is not used, and Comm. is a freetext comment.

Block 44 - GNSS RMS and correlation coefficients, geocentric

DB sX sY sZ rXX rXY rXZ rYY rYZ rZZ Comm
^I2 ^ F8.4 ^F8.4^ F8.4^ F7.4^ F7.4^ F7.4^ F7.4^ F7.4^ A7

Example:

44 1.4314 0.6481 4.5640 1.0000 0.4382 0.8757 1.0000 0.4811 1.0000

This block follows block 43 with additional data on the vector. DB is data-block (44). sX, sY, sZ is the vector components standard deviation (or RMS-values). The r-fields are correlation coefficients between the vector components. rXX, rYY, rZZ are all equal to 1.

Block 45 - Coordinates in geocentric system (WGS84)

DB PointName Feat.Code X Y Z Ant.H. Bk Comm.

^I2 ^A10 ^ A8 ^F12.4^F12.4^F6.3 ^I2 ^ A7

Example:

42 P1048 1234 2210658.5530 618726.6390 5930812.0680

DB is data-block (45), PointName is occupation name (pointname), and Feat.Code is feature code. X, Y, and Z is the coordinate in WGS84 geocentric coordinates. Ant.H is antenna height. NB be left blank if coordinate is already adjusted for antenna height. Bk is left blank, and Comm. is a freetext comment.

Block 46 - Additional GNSS information

DB Date Time(UTC) #SVs PDOP Ant.Height Epochs Type

^I2 ^ I8 ^ I2:I2:I2 ^ I2 ^ F5.2 ^ F6.3 ^ I3 ^ I3

Example:

46 31122004 23:59:59 13 1.45 001 96

DB is data-block (46), Date is date in format DDMMYYYY, Time is UTC-time in format HH:MM:SS (24h notation), #SVs is number of satellites included in position calculation, PDOP is PDOP, Ant height is antenna height. NB should be left blank if coordinate (or vector) is already adjusted for antenna height. Epochs is number of epochs measured, and type is type of solution, from this list:

Block 50 - coordinate in selected system, with ellipsoidal height

DB Pointname Feat.Code North East Ell.H Type Comm.

^I2 ^ A10 ^ A8 ^ F12.3 ^ F11.3 ^ F8.3 ^ I2 ^ A7

Example:

50 Point2345 1000 134741.349 9881.834 62.643

DB is data-block (50), PointName is the name of the occupation (point), and Feat.Code is feature code. North, East is coordinate from the measurement in selected system. Ell.H is ellipsoidal height in WGS84. Type is left blank. Comm. is a free text comment.

Block 51 - GNSS RMS and correlation coefficients, NEU (North,East,Up)

DB sN sE sU rNN rNE rNU rEE rEU rUU Comm
^I2 ^F8.4 ^F8.4^ F7.4^ F7.4^ F7.4^ F7.4^ F7.4^ A7

Example:

50 Point2345 1000 134741.349 9881.834 21.514 62.643 2.054

This block follows block 05 or 50 (coordinate) with additional data on the measurement. DB is data-block (51). sN, sE, sU is the coordinate components' standard deviation (RMS-values), and the r-fields are correlation coefficients between the coordinate components. rNN, rEE, rUU are all equal to 1.

SHP

SHP is an ArcView® GIS data format used to represent a set of geographic features.

Refer to the following website for details:

<http://dl1.maptools.org/dl/shapelib/shapefile.pdf>

Cut Sheet Standard

Cut Sheet Standard format is as follows:

Header:

Date

Time

Job Name

Dist Units (Meter, US. Feet, Int. Feet, US. Inches, Int. Inches)

Design Point Record:

Point Name

Code

North East Elev

Stakeout Station Record:

Station Name

North East Elev

deltaNorth deltaEast deltaElev Cut

Cut Sheet User Defined

This format contains a set of user-defined fields in the user-defined order.

The following fields are available:

Design Point

Code

Staked Point

Cut

Fill

Cut(Fill)

Time Stamp

Station

Offset Direction

Offset Distance

Design North

Design East

Design Elevation

Station North

Station East

Station Elevation

Delta North

Delta East

Delta Elevation

Check Sheet

Check Sheet format is as follows:

Header:

Date

Time

Job Name

Dist Units (Meter, US. Feet, Int. Feet, US. Inches, Int. Inches)

Observed Point Record:

Point Name

Code

North East Elev

Check Station Record:

Station Name

North East Elev

deltaNorth deltaEast deltaElev

PTL Sheet

PTL Sheet format is as follows:

Header:

Date

Time

Job Name

Dist Units (Meter, US. Feet, Int. Feet, US. Inches, Int. Inches)

Point Record:

PointName North East Elev Code FirstReferencePointName
SecondReferencePointName

CMM

The ASCII format file that consists of two files with extenstions *.cor and *.lev containing coordinates and heights, respectively.

Land XML

LandXML is a standard data exchange format.

Refer to LandXML Website for details:

<http://www.landxml.org/schema/landxml-1.0/Documentation/LandXMLDoc.htm>

CR5

This is a file format of TDS-48 Coordinate file. The TDS Coordinate File is a binary file consisting of a 38 byte header, followed by coordinate point records 45 bytes in length.

CR-5 format is as follows:

Header:

Bytes 1- 10 is the file name in ASCII

Bytes 11- 20 are not used

Bytes 21- 34 is the starting point number in MS long integer format. This record is -1 if the file is non-sequential

Bytes 35- 38 is the last point number in MS long integer format

Coordinate Point Records:

Bytes 1- 4 is the point number in MS long integer format.
This record is -1 if the point is unused (sequential files only)

Bytes 5- 12 is the northing of the point in MS double precision real

Bytes 13- 20 is the easting of the point in MS double precision real

Bytes 21- 28 is the elevation of the point in MS double precision real

Bytes 29- 45 is the point descriptor in ASCII

MOSS GENIO

Example:

GENIO D:\J0119A

001,FORMAT(3F14.4)

003,ORDR,4=1,1,2,3

080,PT01,7=3

1002.6092 1013.9337 2.3165

1007.5266 992.8522 1.9564

0.0000 0.0000 0.0000

080,PT02,7=3

991.2378 1002.7609 1.5545

993.2974 1014.3845 2.3475

0.0000 0.0000 0.0000

080,CD02,7=3

1002.6079 1013.9361 2.3148

0.0000 0.0000 0.0000

080,CD03,7=3

1007.5318 992.8488 1.9562

0.0000 0.0000 0.0000

080,OCC,7=3

1000.0000 1000.0000 0.0000

0.0000 0.0000 0.0000

080,PT01,7=3

1002.6079 1013.9361 2.3148

1007.5318 992.8488 1.9562

991.2376 1002.7602 1.5557

993.2994 1014.3841 2.3509
0.0000 0.0000 0.0000
999
FINISH

NEZ

NEZ format is as follows:

Name, North, East, Elev, Code

Example:

101,12.3200,45.1000,23.1200,a
102,34.2000,9.4000,3.2200,
103,2.3340,8.4500,45.0000,b
104,78.6000,45.0000,56.6000,

This format is also used for PTL coordinate system. In this case the NEZ format is:

Name, North, East, Elev, Code, First Reference Point Name, Second Reference Point Name

NEZ with strings

The NEZ with strings coordinate format is as follows:

Name, North, East, Elev, Code, String

Example:

101,12.3200,45.1000,23.1200,a,123
102,34.2000,9.4000,3.2200,,
103,2.3340,8.4500,45.0000,b,
104,78.6000,45.0000,56.6000,,

This format is also used for PTL coordinate system. In this case the format is:

Name, North, East, Elev, Code, String, First Reference Point Name,
Second Reference Point Name

Custom Format with Quality Control information

This format contains a set of user-defined fields in the user-defined order.

The following fields are available:

Name
E(Lon)
N(Lat)
Ell ht
Elevation
Notes
Codes
Codes&Strings
Codes&Attributes
FullCodes
Date
Solution Type
VRMS
HRMS
Time
PDOP
HDOP
VDOP
Num. of GPS
Num. of GLONASS

Design Elevation

Station North

Station East

Station Elevation

Delta North

Delta East

Delta Elevation

Code Libraries

The following sections describe the code formats used in the import/export code libraries.

Topcon Data Dictionary Format (TDD)

Topcon's Data Dictionary Format supports String, Integer, Float and List types as fields of the codes. The Draw properties is also supported. All exported codes are stored in the one file. Each code is placed on a new line.

The format is as follows:

```
CodeName#1<Point?R*G*B?MStyle|Line?R*G*B?DashStyle?  
Width> (field#1(FIELD_TYPE),... field#N(FIELD_TYPE))  
CodeName#2<Point?R*G*B?MStyle|Line?R*G*B?DashStyle?  
Width> (field#1(FIELD_TYPE),... field#N(FIELD_TYPE))
```

Comments:

Point, Line – types of the supported objects

R,G,B – color of the objects with such code

MStyle – mark style of the points with such code:

0 = Dot

1 = Filled Rectangle

2 = Filled Diamond

3 = Filled Circle

4 =Filled Triangle

5 = Rectangle

6 = Diamond

7 = Circle

8 = Triangle

9 = Cross

DashStyle – dash style of the lines with such code:

0 = Solid

1 = Dash

2 = Dot

3 = Dash Dot

4 = Dash Dot Dot

Width – width of the lines with such code

FIELD_TYPE can be: String, Integer, Float, List.

For FIELD_TYPE List we use next format:

List(item#1,...,item#N).

Example:

```
test_code(menu_item<Point?255*128*255?3|Line?255*255*128?3?1>(List(blue,  
green,red)), text_item(String), int_item(Integer), real_item(Float))
```

XML File as Storage of the Code Library (XML)

The XML Code Library format supports String, Integer, Float and List types as fields of the codes. The format also supports Layers dictionary and draw information for each code. All exported codes are stored in one file. The format uses the XML syntax and is as follows:

Example:

```
<?xml version="1.0"?>  
<CodeDictionary version="1.1">  
  <Layers>  
    <Layer name="lay1" active="1" plot="1" notes="first">  
      <Params type="Line">
```

```
<DrawParams colorRValue="87" colorGValue="65" colorBValue="189"
dashStyle="1" width="2"/>
</Params>
</Layer>
<Layer name="lay2" active="1" plot="1" notes="second">
<Params type="Line">
<DrawParams colorRValue="153" colorGValue="98" colorBValue="156"
dashStyle="2" width="3"/>
</Params>
</Layer>
<Layer name="0" active="1" plot="1">
<Params type="Line">
<DrawParams colorRValue="128" colorGValue="128" colorBValue="128"
dashStyle="0" width="1"/>
</Params>
</Layer>
</Layers>
<Code name="code1" layer="0">
<Params type="Point">
<DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
markStyle="-1"/>
</Params>
<Params type="Line">
<DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
dashStyle="-1" width="1"/>
</Params>
<Attributes/>
</Code>
<Code name="code2" layer="0">
<Params type="Point">
<DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
markStyle="-1"/>
</Params>
<Params type="Line">
<DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
dashStyle="-1" width="1"/>
```

```
</Params>
<Attributes/>
</Code>
<Code name="code3" layer="0">
    <Params type="Point">
        <DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
markStyle="-1"/>
    </Params>
    <Params type="Line">
        <DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
dashStyle="-1" width="1"/>
    </Params>
    <Attributes/>
</Code>
</CodeDictionary>
```

Data Base Format as Storage of the Code Library (DBF)

This format supports String, Integer, Float types as fields of the codes. The List type is unsupported. Each exported code is stored in a separate file. The format uses DBF syntax. This is a binary format.

Roads Formats

The following sections describe the road formats used in the import/export of road data.

SSS Road

Alignments are uploaded as elements, and begins with the START definition which includes the starting chainage and a coordinate. The elements are: PT, STRAIGHT, ARC or TRANSITION.

The general format for each record is:

KEYWORD nnnn, nnnn [,nnnn]

where:

START	chainage, easting, northing
STRAIGHT	bearing, distance
ARC	radius, length
SPIRAL	radius, length
PT	easting, northing[, radius[, A1, A2: clothoid length]]

Example 1:

START 1000.000, 8.8888, 199.1200
STRAIGHT 25.0000, 48.420
SPIRAL 20.000, 20.000
ARC 20.000, 23.141
SPIRAL 20.000, 20.000
STRAIGHT 148.3000, 54.678

Example 2:

START 1000, 1050, 1100
PT 1750, 1300, 100, 80, 80
PT 1400, 1750, 200
PT 1800, 2000

TDS Road

TDS road file has a file extension of “.RD5”. This format is divided into eight sections. Each section is started with a line that has a two letter code and is followed by exactly 50 '+' characters. These section header lines have to be included in the file even if there is no definition under them. For example, super-elevation and widening are not required, but their header lines must exist. Each header line may be followed by component definitions of that section.

Section codes:

HR : Start Horizontal alignment

VR : Start Vertical alignment
XR : Start Right Template
XL : Start Left Template
SR : Start Right Super Elevation
SL : Start Left Super Elevation
WR : Start Right Widening
WL : Start Left Widening

Example:

```
HR++++++++++++++  
+++++  
HL,25.49380,630.000  
HS,-1.000000,1000.000,200.000,R,T  
HC,-1.000000,1000.000,895.900,R  
HS,-1.000000,1000.000,200.000,R,C  
HL,-1.00000,250.000  
VR++++++++++++++  
+++++  
VG,271.840,-2.000  
VC,500.000,-2.000,1.800  
VG,1254.060,1.800  
VG,150.000,1.800  
XR++++++++++++++  
+++++  
RT,100,0.000,NORMAL  
XL++++++++++++++  
+++++  
LT,100,0.000,NORMAL  
SR++++++++++++++  
+++++
```

RS,106,30.000,108,30.000,-2.000,-6.000,0,0,0.000,0.000
RS,117,25.900,119,25.900,-6.000,-2.000,0,0,0.000,0.000
SL+++++
+++++
LS,104,30.000,108,30.000,-2.000,6.000,0,0,0.000,0.000
LS,117,25.900,121,25.900,6.000,-2.000,0,0,0.000,0.000
WR+++++
+++++
RW,104,35.000,105,35.000,22.000,14.000,0
RW,106,35.000,107,35.000,14.000,22.000,0
WL+++++
+++++
LW,104,35.000,105,35.000,22.000,14.000,0
LW,106,35.000,107,35.000,14.000,22.000,0

Component definitions:

Horizontal Alignments

HL,.5lf,.3f Horizontal Line
 Azimuth of line (DMS) %.5lf
 (-1 if tangent to previous segment)

 Horiz distance of line (ft or meter) %.3f

HC,.1f,.3f,.3f,%c Horizontal Curve

 Tangent azimuth %1f

 (-1 if tangent to previous segment)

 Radius %.3f

 Arc length %.3f

 Turn (R-Right or L-Left) %c

HS,.1f,.3f,.3f,%c,%c Horizontal Spiral

 Tangent azimuth %1f

(-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,%c or

LW,%d,% .3f,%d,% .3f,% .3f,%c

Start Station number % d
Start Station offset % .3f
End Station number % d
End Station offset % .3f
Width at start of widening % .3f
Width at end of widening % .3f
End of widening flag % c

(0-End station number and End station offset are
in fields 3 and 4 1-length of widening interval is in field 4)

MC Road

MC road file has a file extension of “.RD3” and is a binary file.

LandXML Road

LandXML is a standard data exchange format.

Refer to LandXML website for details:

<http://www.landxml.org/schema/landxml-1.0/Documentation/LandXMLDoc.htm>

TopSURV Road format v.2.0

TopSURV road format consists of three files:

1. *.thl: contains a horizontal alignment and must start with the START definition which includes the starting chainage and coordinates.

The elements are: PT, STRAIGHT, ARC or SPIRAL.

The general format for each record is:

KEYWORD nnnn, nnnn [,nnnn]

where:

START chainage, easting, northing

STRAIGHT bearing, distance

ARC radius, length [, bearing]

SPIRAL first radius, second radius, length [, bearing]

PT easting, northing[, radius[, A1, A2]]

(A1, A2 : clothoid length)

- If the horizontal alignment starts with ARC or SPIRAL, the 'direction' field is used to define the start bearing of the horizontal alignment.
- If the spiral isn't a avoid clothoid, the corresponding not used radius equal zero.

Example1:

START 1000.000, 8.8888, 199.1200

STRAIGHT 25.0000, 48.420

SPIRAL 20.000, 20.000

ARC 20.000, 23.141

SPIRAL 20.000, 20.000

STRAIGHT 148.3000, 54.678

Example 2:

START 1000, 1050, 1100

PT 1750, 1300, 100, 80, 80

PT 1400, 1750, 200

PT 1800, 2000

2. *.tvl: contains a vertical alignment with long sections (LS). Every LS requires chainage, level and curve length.

Starting and ending curve lengths should be zero.

The format is:

chainage, level, length

Example:

1000.000, 100.000, 0.000

1100.000, 125.000, 50.000

1250.000, 100.000, 60.000

3. *.trd: contains cross sections set.

The format is:

Chainage, Template name, Turn (Left or Right), Cut, Fill,
Segment name, Horizontal Offset, Vertical Offset

CLIP

The CLIP file format is a europe road format.

Example:

*ALZ1

Calzada Derecha Ajustada

16512.029, 699.021C, 0.000T

18374.058, 749.296C, 10000.000R

19101.891, 785.687C,-15000.000R
19693.957, 807.105C,-25000.000R
20010.319, 815.960C, 25000.000R
20322.145, 829.250C, 22500.000R
21305.065, 878.500C,-12750.000R
21629.230, 888.160C, 14500.000R
21770.000, 894.966C, 0.000R
22000.000, 906.790C, 0.000T
22100.000, 911.900C, 25000.000R
22230.000, 918.790C,-10000.000R
22380.000, 4.975P, 50000.000R
22500.000, 932.525C,-20000.000R
22800.000, 947.100C, 50000.000R
22970.000, 955.547C,-25000.000R
23100.000, 961.800C,-10000.000R
23200.000, 966.370C, 22500.000R
23320.000, 972.200C, 45000.000R
23600.000, 986.660C,-100000.000R
23786.000, 5.000P,-10000.000R
23982.080, 1002.100C, -8250.000R
24258.306, 1005.121C, -9250.000R
24693.967, 991.888C, 15000.000R
25903.863, 985.839C, 9894.424R
27440.115, 997.484C, -0.968F
28690.632, 991.237C, -1.995F

ISPOL

The ISPOL file format is a europe road format.

Example:

```
#-----  
# FIchero : EJE1.RAS  
# FOrmato : ispol-V.7.04 29 Abr 2001 22:39 773  
# PRyecto : PRUEBAS PARA EJEMPLOS :
```

Eje : 1 : Eje con todas las clotoides. Al final una de vert
Comentario:
Comentario:
#-----
VERTICE | TG. ENTRADA | TG. SALIDA |
Pk Cota | Pk Cota | Pk Cota | Pendiente (%) K.V.
#-----

-19.4700 1070.9622 0.0000 0.0000 0.0000 0.0000 0.000000
0.0000
236.4537 1085.3733 146.4537 1080.3054 326.4537 1083.2497
5.631030 2252.6586
504.7339 1079.0432 452.9464 1080.2651 556.5214 1081.3971 -
2.359528 1500.0000
649.1019 1085.6054 649.1019 1085.6054 649.1019 1085.6054
4.545471 0.0000
705.1867 1082.4506 0.0000 0.0000 0.0000 0.0000 -5.625043
0.0000
fin de fichero -----

MX GENIO

MX GENIO format is a GENeralized Input/Output format that is used to import and export model information to and from Infrasoft's MX Professional. MX is a roadway design CADD application that uses a string-based modeling concept rather than a template-based approach used by civil design applications developed by other vendors.

MX GENIO format can be used to import a wide variety of string types into MX, including master alignment strings and geometry strings created from horizontal and vertical alignment definitions.

This is an example of a GENIO file that will create a 3D feature string in MX.

MOSS

GENIO,DESIGN

017,NORM

001FORMAT(3D23.17)

003,ORDR,4=1,1,2,3,
080,CECI,7=3
0.86278740486024506D+060.23557974062420847D+060.51777335135235114D+03
0.86278725732131349D+060.23558072925923113D+060.51778031070319832D+03
0.86278720921827410D+060.23558172768451227D+060.51778404785966120D+03
0.86278726103175664D+060.23558272592411647D+060.51778561243843410D+03
0.86278741224405798D+060.23558371400396363D+060.51778605405621181D+03
0.86278766134431469D+060.23558468205148648D+060.51778642232968866D+03
0.86279182182447857D+060.23559013383718926D+060.51787511440594790D+03
0.86281114482140180D+060.23559653051477592D+060.52051708265943284D+03
0.86281131684491527D+060.23559658416659472D+060.52054181820995780D+03
0.86281591805419116D+060.23559801922184543D+060.52113322369797083D+03
0.86281609007772699D+060.23559807287367119D+060.52115270941608628D+03
0.86281706168931420D+060.23559837590624942D+060.52126223300564516D+03
0.00000000000000000000000000000000D+000.00000000000000000000000000D+000.52126223300564516D+03
999

A detailed explanation of each of the lines in this file follow.

MOSS

MX files begin with this line to clear any previous errors

GENIO,DESIGN

Begin the GENIO option. Include the model name that the string(s) will be created in.

017,NORM

This command changes the Angular Input format for the file. 017,NORM will use the system default format for MX which is typically radians. Other alternatives for this are:

DEGR - Decimal Degrees

DMS - Degrees - Minutes - Seconds (in the format D23.17)

RADI - Radians

GRAD - Grads

QUAD - Quads

To specify angles in one of these other formats, substitute the appropriate Keyword for "NORM".

001FORMAT(3D23.17)

Formats The INPUT Information in the Data Block.

The format is described by a number of field descriptors separated by commas and is contained within parentheses.

A field descriptor in a format specification has the form:

[r]Cw[d]

where

r represents a repeat count which specifies the field descriptor is to be applied for ‘r’ successive fields. The default is 1 if omitted.

C is a format code: I - Integer, A - Alpha character, X - Space, F - Real number, D and E - Double precision.

w specifies the width of the field.

d specifies the number of decimal places.

Example: 3D23.17 specifies that each data line will consist of 3 double-precision records representing the X, Y, and Z coordinates of each point. Each field will be 23 columns wide, and each number will have 17 decimal places.

003,ORDR,4=1,1,2,3,

Change Order - This command changes the order of the items of information in a string element. The first two dimensions of a point on a string are always Cartesian Coordinates, but the other dimensions may describe different properties of the point. In this example, the first part of the line “003,ORDR” will always remain the same. The last part of the command line indicates how the data block is organized.

4=1 indicates that 1 row of data in the data block is used to define each point. (for 3D features this is pretty straight-forward, but MX had more complex string types such as Geometry Strings that have 12-dimensional points that may be described over a number of lines.)

,**1,2,3**, indicates the string point dimensions the data should be assigned to. (X,Y,Z for a 3D string.)

080,CECI,7=3

String Input - This command indicates what type of string is being created. The MX string label

being created in this example is **CECI**, and each point on this string will have 3 dimensions (**7=3**).

0.86278740486024506D+060.23557974062420847D+060.51777335135235114D+03

0.000000000000000000D+000.0000000000000000D+000.52126223300564516D+03

Data Block - These lines define the points for string CECI as defined in the 080 line above. Each is in the format specified in the 001Format line, 3D23.17, which is 3 fields of 23 columns in double-precision format, and 17 places to the right of the decimal point.

To end the data block defining this string’s points, a final data line is added with the X and Y coordinates set to **0.000**. The data in the 3rd column of this row is of no concern other than the fact an appropriate value of the specified type must

be provided. In most cases, it will suffice to provide the same Z coordinate as the preceding line (the last actual point on the string.)

In the example above, a string was created that consisted of a continuous series of points. In many cases, you may want to create strings that have gaps in them (i.e. discontinuities). To represent the point on the beginning of a discontinuity (gap), set the X value of that point to a negative value. The point representing the end of a discontinuity (gap) should have the Y value set to a negative value.

Add a new “080” command to specify the new string.

999

999 - Tell MX to end the GENIO command.

Tekla XRoad & XStreet (VGP)

This format has the extension *.vgp.

Horizontal Elements

Every line starts with feature information with element information following. Line's mark combines from three characters: Road's badge, alternative's badge, line's badge. KEYWORD is on every line and after that the parameters.

Parameters are: c = text, inf = integer, f = decimal number; with coordinates 4 decimals. Parameters are separated with spaces.

ROAD

Road's badge

TIE badge

c10

ROAD ALTERNATIVE

Alternative's badge

TIEVE badge

c10

LINE

Line's badge, description code (survey line, road's side etc), start sta

LINJA badge description start sta
 c10 int f

ELEMENT

Element's informations are: Element's number; description code (for drawing) if different than line's description code (if not, then 0), geometry (1 = straight, 2 = circle, 3 = circular arch, 13 = circular arch over half circle, 4 = clothoid), start radius, end radius, clothoid's parameter (a)

ELEM	number	description	geometry	r1	r2	a
	int	int	int	f	f	f

ELEMENT P1

Element's start sta information: Element's number, start sta, x1, y1

ELEMP1	number	start sta	x1	y1
	int	f	f	f

ELEMENT P2

Element's end sta information: Element's number, end sta, x1, y1

ELEMP2	number	end sta	x1	y1
	int	f	f	f

ELEMENT CP

Circle's centre point's information: Element's number, x, y

ELEMCP	number	x	y
	int	f	f

Vertical Elements

ROAD

Road's badge

TIE	badge
	c10

ROAD ALTERNATIVE

Alternative's badge

TIEVE	badge
	c10

LINEZ

CL's badge, horiz line badge (stations)

LINJAZ	badge	hl badge
	c10	c10

ELEMENTZ

Tangents intersections informations: point number, sta, z and radius between tangents. With first and last the radius = 0.

ELEMZ	number	sta	z	radius
	int	f	f	f

Example:

```
Horizontal Elements:
TIE      V9aito
TIEVE    b
LINJA   ml          6101005          0.000
ELEMZ    1      0   3      135.000      135.000      0.000
ELEMP1   1      0.000 6825003.0699 2497735.2184
ELEMP2   1      1.073 6825003.8922 2497734.5289
ELEMCP   1 6825090.2157 2497838.3233
123456789012345678901234567890123456789012345678901234567890123
```

```
Vertical Elements:
TIE      V9aito
TIEVE    b
LINJAZ   ml          ml
ELEMZ    1      20.0000     111.4300      0.000
ELEMZ    2      47.0000     110.4000      500.000
ELEMZ    3      120.0000    112.4000      0.000
123456789012345678901234567890123456789012345678901234567890123
```

X-sect Templates Formats

Cross section is defined by templates. Each template is stored in a file. A template file consists of a series of segments and each segment has a horizontal and a vertical component. The following sections describe the formats used in the import/export of X-section Template data.

SSS Template

SSS Template format is as follows:

Template Record:

Template Name, 0, Cut, Fill

Segment Record:

Template Name, 1, Offset, Height[, Code]

Example:

SIMP,0,6.000,6.000
SIMP,1,1.000,0.000,1
NAME,0,4.000,4.000
NAME,1,1.000,-0.250,EP
NAME,1,0.000,0.150,1
NAME,1,0.500,0.000,2
NAME,1,0.200,-1.000,3
NAME,1,0.300,0.000,4

TDS X-section Template

The following sample template file describes a cross section in two segments.

Number of segments: 2, Cut slope: 0.500 %, Fill slope: 1.000 %

First segment: hd: 22.000 ft slope: -2.000 %

Second segment: hd: 2.000 ft vd: -2.000 ft

Example:

TH,2,0.500,1.000
TS,22.000,-2.000,0,roadbed
TS,2.000,-2.000,1,ditch

Definition of components in template file:

HR : 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 %

field 2	Vertical flag	%c (0-Slope % is in 1-Vertical dist is in field 2)
	Segment name	%s

TopSurv Template

TopSURV Template format is as follows:

Template Name, Code, Offset, Height

Example:

```
SIMP, 1, 1.000, 0.000
NAME, EP, 1.000, -0.250
NAME, 1, 0.000, 0.150
NAME, 2, 0.500, 0.000
NAME, 3, 0.200, -1.000
NAME, 4, 0.300, 0.000
```

Localization Format

GC3

This is a binary file containing localization data.

Roads Survey Formats

The following sections describe the data formats used in the export of road raw data.

X-Section Surveys

The format is as follows:

chainage, offset, level [,code]

Example:

0.000,-4.501,18.527
0.000,-3.500,18.553
0.000,0.000,18.658,CL01
0.000,3.500,18.553
0.000,5.501,18.493
12.669,-4.501,18.029
12.669,-3.500,18.059
12.669,-0.000,18.164,CL01
12.669,3.500,18.059
12.669,5.501,17.999

Find Station Report

The format is as follows:

FindChainageReport:

 Reference road

FindChainage:

 PointName Chainage Offset North East Elev [Cut]

Raw Data Formats

The following sections describe the formats used in the export of raw data.

FC-5

Refer to the FC-5 interface manual to confirm details on FC-5 data format.

Example:

```
_!SAMPLE_"SOMEONE_#GX0021_$06/01/
95_%24C_&990HP_X1000_(_)1.200_+A001_a+2755858d_
b0881003d c+00010942m_*NS001_,1.200_+A002_a+0006
3265752d_b0952330d c+00003366m_*NS001_,1.200_+A003_
a+0420820d_b0894549d c+00006913m_*NS001_,1.200_
1002
```

GTS-6

The data is GTS-6 and FC-5 unformatted data.

Refer to the GTS-6 interface manual to confirm details.

Example:

```
_!SAMPLE_"SOMEONE_#GX0021_$06/01/
95_%24C_&990HP_X1000_(_)1.200_+A001_
?+00010942m0881003+2755858d+00010936***+**+**054_*
NS001_,0064
1.200_+A002_
?+00003366m0952330+3265752d+00003351***+**+**063_*
NS001_,1.200_+A003_
?+00006913m0894549+0420820d+00006912***+**+**1039
055_*NS001_,1.200_
2037
```

FC-6/GTS-7

The format of the GTS-7 data is the same as the FC-6 data format.

The general format of each record is as follows:

CONTROL WORD field1 . . . ,fieldn

Where:

CONTROL WORD is terminated by a space.

Fields 1 to n-1 are terminated by commas.

Field n is terminated by the end-of-line.

Each field may be preceded by a number of space characters which should be ignored but may contain spaces after the first non-space character.

GTS-600 v3.1

JOB	job name, description
DATE	date, time
NAME	surveyors name
INST	instrument id
UNITS	Meter/Feet, Degree/Gon
SCALE	grid factor, scale factor, elevation
ATMOS	temp, press
STN	ptno, ins ht, stn id
XYZ	X(easting), Y(northing), Z(elevation)
BKB	ptno, backsight bearing, backsight angle
BS	ptno[, target height]
FS	ptno, target height, pt code[,string number]
SS	ptno, target height, pt code[,string number]
CTL	control code[,pt code 2[,string no 2]](optional)
HV	HA, VA
SD	HA, VA, SD
OFFSET	radial offset, tangential offset, vertical offset
PTL_OFF	offset along ref. line, offset perpendicular to line, vertical offset
NOTE	comments
MLM	from point, to point, delta HD, delta VD, delta SD

RES_OBS ptno, target height, observation count
XYZ if present follows the STN record
BKB if present follows the BKB record or STN record
if no BKB.
CTL if present follows the FS or SS header record.
HV, SD or HD must follow a BS, FS or SS header and follows
the CTL if present.
OFFSET may follow any SD or HD record.

Example:

GTS-600 v3.1
JOB TEST1,TOPO COLLECTION
NAME FRED
INST GTS-7
UNITS M,D
STN 1,1.500,STN
SS 1001,1.500,BLDG,01
SD 0.0000,84.4650,9.746
SS 1002,1.500,BLDG,01
SD 0.0000,84.4650,9.746
SS 1003,1.500,BLDG,01
SD 0.0000,84.4650,9.747
SS 1004,1.500,BLDG,01
CTL CL
SD 359.1740,84.4650,9.747
SS 1005,1.500,NS
SD 359.1740,84.4650,9.747
SS 1006,1.500,NS
SD 359.1740,84.4650,9.747

FS 2,1.500,NS
SD 179.1740,84.4650,9.747
STN 2,1.500,STN

GTS-600 v3.1

JOB TEST2, SET COLLECTION
NAME FRED
INST GTS-7
UNITS M,D
STN 1,1.500,STN
XYZ 1000.000,1000.000,100.000
BKB 2,315.0000,0.0000
BS 2,1.500
HV 344.0620,86.3810
FS 101,1.500,STN
SD 325.3420,88.4750,5.275
FS 102,1.500,STN
SD 7.0610,85.2210,9.914
FS 103,1.500,STN
SD 36.1350,87.3800,9.755
FS 104,1.500,STN
SD 83.4730,84.0410,3.313
FS 104,1.500,STN
SD 263.4820,275.5530,3.313
FS 103,1.500,STN
SD 216.1430,272.2150,9.755
FS 102,1.500,STN
SD 187.0650,274.3730,9.916

FS 101,1.500,STN
SD 145.3520,271.1510,5.27

BS 2,1.500
HV 164.0640,273.2340

Land XML

LandXML is a standard data exchange format.

Refer to LandXML Website for details:

<http://www.landxml.org/schema/landxml-1.0/Documentation/LandXMLDoc.htm>

TDS RawData

Example:

JB,NMA_meas,DT03-15-02,TM15:17:53
MO,AD0,UN1,SF1.000000,EC0,EO0.0000
SP,PN1,N 90.0000,E 200.0000,EL 50.0000,--man
OC,OP1,N 90.0000,E 200.0000,EL 50.0000,--man
LS,HI1.0100,HR0.0000
--user has entered the following Azimuth
BK,OP1,BP2,BS0.0000,BC65.4618
--SS,OP1,FP2,AR65.4618,ZE102.0935,SD4.7720,--DOOR
LS,HI1.0100,HR2.5600
SS,OP1,FP3,AR61.1834,ZE84.2723,SD6.5740,--BEN



TopSURV can import/export localization data from/
to this file and can only export GPS and TS
observations.

MOSS Survey

Both traverse and detail raw data formats can be exported.

Example:

```
SURVEY D:J0119A  
017,DMS  
190,,,DECR,0900000  
180,,,9000,,1000.000,1000.000,0.000  
200,9000,9001,SDVA,3595958,,,1.600,,1.000000  
201,,,PT01,0103620,14.194,0870623,0.000,,,1001  
201,,,PT01,1333115,10.386,0880200,0.000,,,1002  
201,,,PT02,2872920,9.187,0901702,0.000,,,1003  
201,,,PT02,3350057,15.887,0871812,0.000,,,1004  
201,CD2,02,PP01,0103555,14.196,0870649,0.000,,,1005  
201,CD2,03,PP01,1333053,10.392,0880209,0.000,,,1006  
201,,,P101,2872902,9.187,0901634,0.000,,,1007  
201,,,P101,3350118,15.886,0871727,0.000,,,1008  
999  
FINISH
```

Field Book

Field Book files are text files that contain the observed point data. Data from a data collector can be exported to a Field Book file to import into a drawing and project.

Example (for GPS data):

```
!NOTE Start Survey Date/Time DT07-30-2007,TM19:08:23  
!NOTE End Survey Date/Time DT07-31-2007,TM18:35:21  
UNIT FOOT DMS  
HORIZ ANGLE RIGHT  
PRISM CONSTANT 0  
PRISM OFFSET 0
```

EDM OFFSET 0
CR OFF
TEMP 20 C
PRESSURE 1013.300 MM
COLLIMATION OFF
JOB gr3r
VERT ANGLE ZENITH
NEZ 999 9950.370 10012.484 1202.250 "BASE"
NEZ 1000 10000.000 10000.000 1200.000 "SSB"
NEZ 1001 10270.261 10001.970 1193.982 "SSB"
NEZ 1002 10330.897 10227.397 1193.548 "5/8"
NEZ 1003 10288.979 9594.926 1192.965 "SSB"
NEZ 1004 9998.380 9593.835 1193.349 "1/2"
NEZ 1005 7698.778 12840.197 1209.085 "5/8"
NEZ 1 10029.789 10076.702 1199.442 "TP"
NEZ 2 9756.259 10244.498 1199.587 "TP"

Example (for TS data):

!NOTE Start Survey Date/Time DT08-23-2005,TM02:40:28
!NOTE End Survey Date/Time DT08-24-2005,TM20:11:01
UNIT FOOT DMS
HORIZ ANGLE RIGHT
PRISM CONSTANT 0
PRISM OFFSET 0
EDM OFFSET 0
CR OFF
TEMP 68 F
PRESSURE 760.037 MM
COLLIMATION OFF
JOB OFFICE
VERT ANGLE ZENITH
NEZ 107 0.000 0.000 100.000
STN 107 0.000
NEZ 108 0.000 0.000 100.000
AZ 107 108 0.000000
BS 108
PRISM 0.000000
END
AD VA 108 359.594000 00.000 51.580000 "AZMK"

```
END
F1 VA 102 61.310500 10.740 60.515000
F1 VA 103 35.332500 7.800 65.022000
F1 VA 104 359.583000 8.440 51.573500
AZ 107 102 61.312500
BS 102
PRISM 0.000000
END
AD VA 102 61.323500 00.000 51.582000 "AZMK"
END
AZ 107 104 359.585000
BS 104
PRISM 0.000000
END
! BS Circle Check : angular err= 0.000
! BS Circle Check : angular err= 0.000
AD VA 104 61.323500 00.000 51.582000 "AZMK"
END
AZ 107 10001 359.585000
BS 10001
PRISM 0.000000
END
AD VA 103 93.430000 00.000 77.232500 "AZMK"
END
F1 VA 106 86.192000 12.240 86.512500
```

Berlin GNSS

This format is a German format that consists of two separate files of quality report: GNSS-Messprotokoll and GNSS-Mittelwerte.

Scanning Data Format

Scanning data includes an orientation file, control points for orientation and Camera calibration file for DI-3000.

DI-3000

Project:

Header(FIELD_SCAN_FSC_FILEVER1.0)

*Text Format

Orientation Information File:

Name of Image

Size of Image Width[pixel] Height[pixel]

Number of Image Coordinates of Orientation Points

Image coordinates of Orientation point:

: Point Name,X,Y

*Text Format

Control Point(Terrain) For Orientation File:

Point Name,X,Y,Z

*CSV Text Format

Results of Orientation Calculation(Single Orientation):

ERR MAX,X Maximum Error,Y Maximum Error, 0.000000

ERR RMS,X Standard Dev[Pixel],Y Standard Deviation[Pixel], 0.000000

Discrepancy of each orientation point[Pixel]

*Text Format

Camera Calibration For Digital Camera:

7.955772 // focal length [mm]

1.866217 // x of principal point [m]

1.375943 // y of principal point [m]

2 // distortion model

4 // number of distortion parameters

3.596956e-003 // distortion parameter 1

```
-1.414950e-004 // distortion parameter 2  
-1.786501e-004 // distortion parameter 3  
4.303863e-004 // distortion parameter 4  
0.005600 // x resolution [mm/pixel]  
0.005600 // y resolution [mm/pixel]  
0 // number of fiducial marks  
0 // number of radial distortion values
```

*Text Format

Setting Information:

Instrument Point,X,Y,Z
Backsight Point,X,Y,Z

mh 0.0000 0.0000 IH(Instrument Height)

*Text Format

Point Clouds(Scanning Data):

Header(SFILE_VER01)
point name,X,Y,Z,Wide Image name,Tele Image Name,,Layer Name,Point Attribute
*Binary Format(Fix)

Point Clouds(Scanning Data):

point name,X,Y,Z,Layer Name
*CSV Format

Job History

Job history can be exported to the CSV file or text report.

CSV

All job history data are represented in text format with comma separated values.

Report

In the current version only resection data are output.

The completed resection measurements prints out or writes to a file in the order of measuring. Also, all changes made when editing raw data are visible in the report file.

Example:

+++ Spectrum Survey Filed Version 7.5 +++ Date, Time

=====

Resection

=====

Job : Job-Name

Occ-point name : PPPPPPPP (E: EEEEEEE.EEEE[m], N:
NNNNNNNN.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[m] dN: dN[m] dZ: dZ[m]

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)

BKB1ppppppppppppp HHH.HHHH VVV.VVVV DDDD.DDDD dH.HHHH
dV.VVVV dS.SSS t.ttt

EEEEEEE.EEEE NNNNNNNN.NNNN ZZZZ.ZZZZ dE.EEE dN.NNN
dZ.ZZZ HVSD

BKB2ppppppppppppp HHH.HHHH VVV.VVVV DDDD.DDDD dH.HHHH
dV.VVVV dS.SSS t.ttt

EEEEEEE.EEEE NNNNNNNN.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 NNNNNNNN.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 NNNNNNNN.NNNN ZZZZ.ZZZZ dE.EEE dN.NNN
dZ.ZZZ HVSD

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