

Stake

The Stake menu includes the following menu items:

- Points
- Point in Direction
- Point List
- Lines
- Offsets
- Roads
- DTM
- CodeStrings

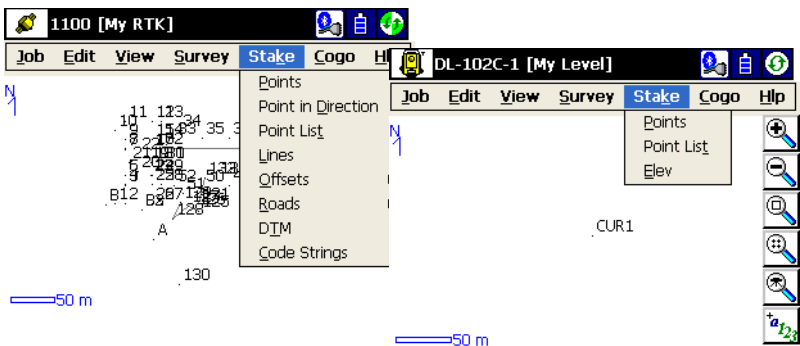


Figure 8-1. Stake Menu

For stake out with digital levels, the Stake menu includes three options:

- Points
- Point List
- Elevation

Points

To stakeout a point, tap **Stake ▶ Points**.

Stakeout Point

The *Stakeout Point* screen contains initial data for the stakeout point.

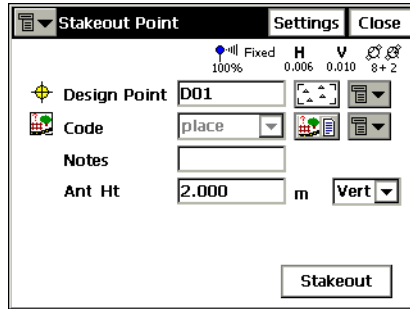


Figure 8-2. Stakeout Point

- For GPS stakeouts, the bitmap in the upper-left corner displays the following pop-up menu:
 - *Status*: opens the **Status** screen (see “Status” on page 5-2).
 - *Rover Antenna Setup*: opens the **Antenna Setup** screen (see “Config: Rover Antenna” on page 2-45).
 - *Config Radio*: opens the **Configure Radio** screen (see “Config: Rover Radio” on page 2-37).
 - *Edit Points*: opens the **Points** screen (see “Points” on page 3-2).
 - *PTL Mode*: switches on the PTL (Point-To-Line) Mode. (The screen changes its appearance to **Stakeout Point (PTL)**.) For details, see “PTL Mode” on page 6-16.
- For Total Station stakeouts, the bitmap in the upper-left corner displays the following pop-up menu:
 - *BS Setup*: opens the **BS Setup** screen (see “Backsight Survey” on page 6-2).
 - *Config Link* (for Robotic mode only): opens the **Configure Link** screen.

- *Remote Control* (for Robotic mode only): opens the **Remote Control** screen (see “Remote Control” on page 6-52).
- *Edit Points*: opens the **Points** screen (see “Points” on page 3-2).
- *PTL Mode*: switches on the PTL (Point-To-Line) Mode. (The screen changes its appearance to **Stakeout Point (PTL)**.) For details, see “PTL Mode” on page 6-16.
- *Design Point*: sets the identifier of the design point. Choose it from a map, from the list, or add a new point.
- *Antenna Ht* (for GPS mode): sets the height of the antenna reference point (ARP) above the mark. Also the measurement type for the height needs to be specified: slant or vertical.
- *HR* (for TS mode): the height of the rod (target).
- **Settings**: opens the **Stakeout Parameters** screen (see “Config: Stakeout Parameters” on page 2-51).
- **Stakeout**: opens the **Stakeout** screen.

GPS+ Stakeout

The **Stakeout** screen assists in the stakeout process.

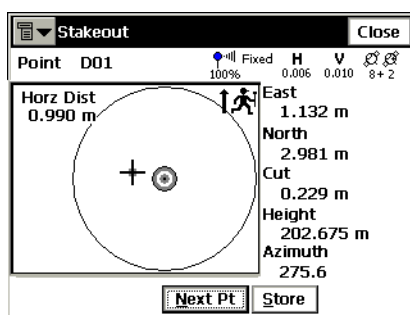


Figure 8-3. Stakeout

The graphic shows the north direction, the reference direction, and the target point, if the distance to the target is less than horizontal distance tolerance. If the distance is greater than three meters, the arrow will point to the target, showing the direction of movement. When the target is closer than the Horizon Distance Tolerance value,

the graphic shows a bull's-eye target point on the screen. The panel on the right displays the parameters of the target.

- **Store**: saves the location. Check the parameters of the stored point in the **Store Point** screen, if available.
- **Next Pt**: moves to the next point in the list.
- **Close**: closes the screen and returns to the **Stakeout Point** screen.
- The bitmap at the upper-left corner displays the following pop-up menu:
 - *Status*: opens the **Status** screen (see “Status” on page 5-2).
 - *Rover Antenna Setup*: opens the **Antenna Setup** screen (see “Config: Rover Antenna” on page 2-45).
 - *Config Radio*: opens the **Configure Radio** screen (see “Configure Radio” on page 8-4).
 - *mmGPS+ Options*: available if mmGPS is used, opens the **mmGPS+ Options** screen (see “mmGPS+ Options” on page 5-11).
 - *Topo*: opens the **Topo** screen (“Topo” on page 5-24).
 - *Auto Advance Pt*: if checked, after storing a staked point opens automatically the Stakeout screen for the next point.
 - *Store Design Pt / Layer*: opens the **Design Pt / Layer** screen to select options to store the points (see “Design Pt/Layer” on page 8-7).
 - *Display Coords*: if checked, coordinates are displayed instead of directions.
 - *Help*: opens the help files.

Configure Radio

The **Configure Radio** screen contains parameters for the radio modem (Figure 8-4 on page 8-5).

- *Radio Connected to*: selects the type of the receiver where the radio is connected, *Rover* or *Base*.
- *Type*: shows the current modem type set for the current survey configuration. To change the modem, use the **Job ▶ Config ▶ Survey** menu.

- *Radio Port, Channel, Sensitivity*: parameters for the radio connection.

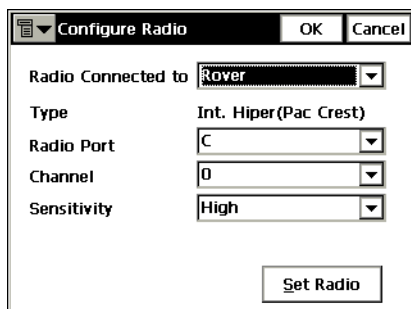


Figure 8-4. Configure Radio

TS Stakeout

The *Stakeout* screen reflects the progress of the stakeout.

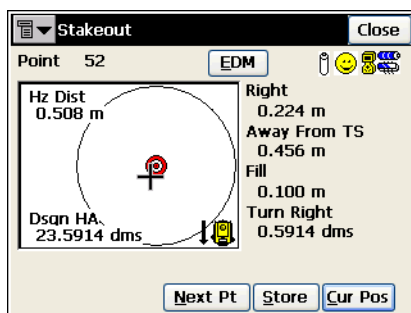


Figure 8-5. Stakeout

The *Stakeout* screen displays the current point name (in the upper-left corner of the screen), the layout of the target and current position, the direction, and the values of the distances to the target.

- **EDM**: selects the distance measurement mode: Coarse, Fine, or Coarse Tracking.
- **Next Pt**: switches to the next target.
- **Meas**: takes a measurement and stores the current position as a point.
- **Cur Pos**: causes a measurement to be made and displays the result on the screen.

- **Store:** performs the measurement, then displays and stores the point.
- **Search:** for robotic Total Stations, starts autotracking and instructs the TS to search for the prism. This function is useful for setting the stake and measuring the final position.
- **Stop:** for robotic Total Stations, stops autotracking. This function is useful for moving the pole to set the stake in the ground.
- **Close:** closes the screen.
- The bitmap at the upper-left corner displays the following pop-up menu:
 - *Rod Height:* opens the **Enter Rod Height** screen to change the rod height during a stakeout.
 - *Remote Control* (Robotic mode only): opens the **Remote Control** screen (see “Remote Control” on page 6-52).
 - *Config Link* (Robotic mode only): opens the **Configure Link** screen.
 - *Auto Advance Pt:* if checked, after storing a staked point, automatically opens the Stakeout screen for the next point.
 - *Store Design Pt / Layer:* opens the **Design Pt /Layer** screen to select options to store the points.
 - *Display Coords:* if checked, coordinates are displayed instead of directions (Figure 8-6 on page 8-6).
 - *Help:* opens the help files.

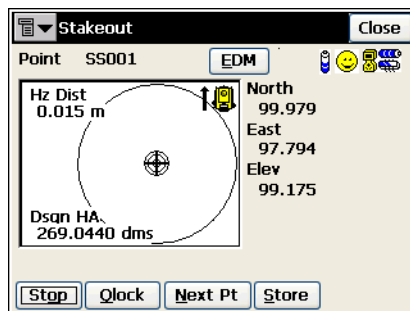


Figure 8-6. Display Coordinates

Configure Link

The *Configure Link* screen contains parameters for the radio modem.

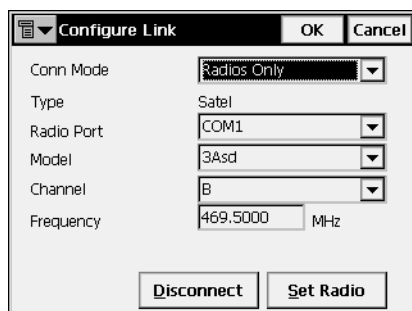


Figure 8-7. Configure Link

- *Conn Mode*: the connection mode, *Cable* or *Radios Only*.
- *Type*: shows the current modem type set for the current survey configuration. To change the modem, use the **Job ▶ Config ▶ Survey** menu.
- *Radio Port, Model, Channel, Frequency*: parameters for the radio connection.

Design Pt/Layer

The *Design Pt /Layer* screen selects parameters for storing staked points.

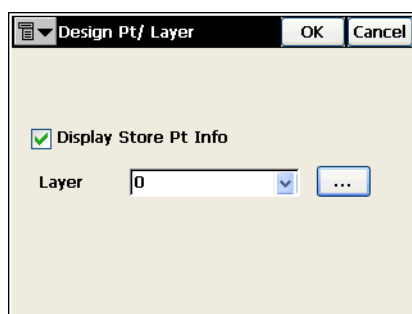



Figure 8-8. Design Pt/Layer

- *Display Store Pt Info*: if checked, the *Store Point* screen will appear before storing a staked point.

- *Layer*: selects the layer from the drop down list.
-  : opens the *Layers* screen to edit layers (see “Layers” on page 3-18).

Store Point

The *Store Point* screen displays information on the staked point before storing.

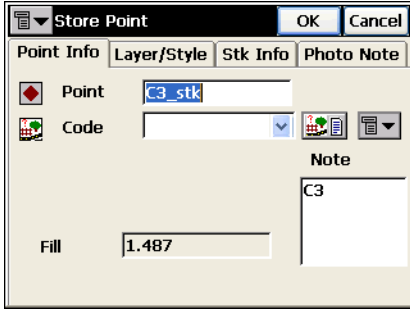




Figure 8-9. Staked Point Information

The *Point Info* tab contains the following fields (Figure 8-9):

- *Point*: sets the name of the point.
- *Code*: sets the code for the point. Can be entered manually or chosen from the drop-down list.
-  : the *Attributes List* bitmap, opens the *Code-Attributes* screen to set the values for the attributes available for the code chosen (“Code-Attributes” on page 3-10).
- *Note*: the name of the previous point.
- *Cut/Fill*: shows cut and fill information if it is displayed before getting stored.
- The bitmap next to the *Attributes List* bitmap displays the following list:
 - *String*: toggles on the *String* field. Also, the  sign appears. For details, see “Topo” on page 5-24.

- *Layer*: opens the **Select Layer** screen to put the point. For details, see “Topo” on page 5-24.
- *Note*: opens the **Note** screen. For details, see “Topo” on page 5-24.

The *Layer/Style* tab contains the following fields.

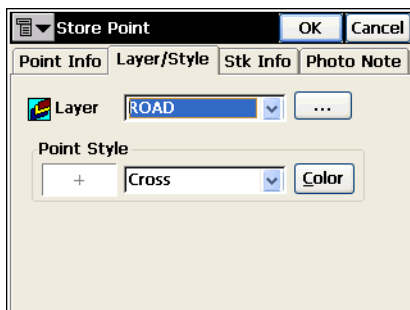


Figure 8-10. Store Point – Layer/Style Tab

- *Layer*: selects the layer to locate the point.
- *Point Style*: sets and shows the style to designate the point on the map.
 - The drop down list contains the point symbols to select.
 - **Color**: opens the **Select Color** screen.

The *Stk Info* tab displays results of staking.

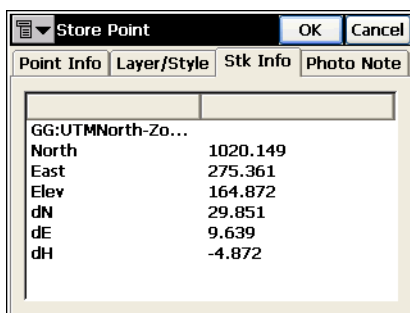


Figure 8-11. Store Point – Stk Info

The *Photo Note* tab adds a photo note to the stakeout point. Initially the screen is empty.



Figure 8-12. Store Point – Photo Note

- **Add:** opens the Select Image File dialog to browse for the necessary file in the controller.
- **Delete:** erases the image from the screen.

DL stakeout

DL Stakeout of design points can be accessed from the main menu or top left menu in the Level Run screen (for details, see page 7-3).

Stake Point

The *Stake Point* screen selects a design point to determine the elevation and compute a cut/fill value.

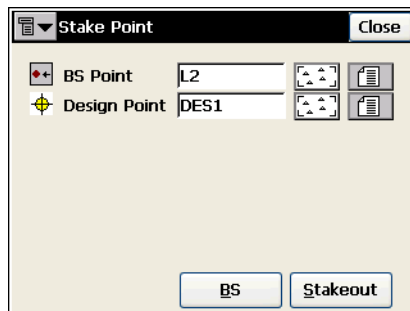


Figure 8-13. DL Stake Point

- *BS Point:* selects the backsight point for the stake measurement (entered manually or selected from the map or list).

- **Design Point:** selects the point to stake (entered manually or selected from the map or list).
- **BS:** if not already measured, takes a BS measurement before staking.
- **Stakeout:** opens the level *Stakeout* screen.

Stakeout

The level *Stakeout* screen displays the design point, the BS point. For every measurement taken, updates the Elevation and Cut/Fill values.

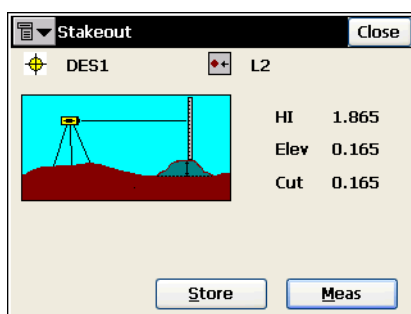


Figure 8-14. DL Stakeout

- **Meas:** measures the elevation and computes a cut/fill value.
- **Store:** opens the *Code-Attributes* screen to set a code for the staked out point (see “Codes and Attributes” on page 3-12), and then the *Edit Point* screen (see “Add (Edit) Point” on page 3-5).

Staked points are not added to the Level Run, they are independent. Staked out points are listed as observed points on the *Points* screen.

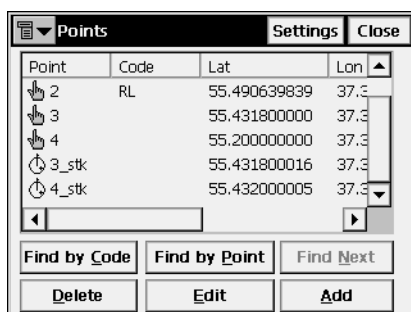


Figure 8-15. Points – Staked out

Point in Direction

To perform the Point and Direction stakeout, select **Stake ▶ Point in Direction**.

Point in Direction

The *Point in Direction* screen performs the stakeout of a point, using known point, the azimuth, and the offsets from the azimuth line.

Field	Value	Unit
From Point	2	
Az to Pt	1	
Angle Offset	60.0000	dms
Hz Dist	50.000	m
Vert Dist	-8.000	m
Store Pt	3	
Ant Ht	2.000	m

Figure 8-16. Stakeout Point & Direction

- *From Point*: the starting point. Type the name manually or select it from the list or from the map.
- *Azimuth/Az to Pt*: the azimuth can be set by value, or as the direction to another known point.
- *Angle Offset*: the angle offset from the azimuth line.
- *Hz Dist*: the distance offset along the angle offset line.
- *Vert Dist*: the height offset.
- *Store Pt*: check this field if it is desired to store the computed point to the data set.
- *Antenna Ht* (for the GPS mode): sets the height of the antenna reference point (ARP) above the mark. Also, specify the measurement type: slant or vertical.
- *HR* (for the TS mode): the height of the rod (target).
- **Stakeout**: opens the *Stakeout* screen to perform the stakeout.

- **Settings:** opens the *Stakeout Parameters* screen. See “Configuration” on page 2-10.
- For a GPS stakeout, the bitmap at the upper-left corner displays the following pop-up menu:
 - *Status:* opens the *Status* screen (see “Status” on page 5-2).
 - *Rover Antenna Setup:* opens the *Antenna Setup* screen (see “Config: Rover Antenna” on page 2-45).
 - *Config Radio:* opens the *Configure Radio* screen (see “Configure Radio” on page 8-4).
 - *Edit Points:* opens the *Points* screen (see “Points” on page 3-2).
 - *Help:* opens the help files.
- For a Total Station stakeout, the bitmap on the upper-left corner displays the following pop-up menu:
 - *BS Setup:* opens the *BS Setup* screen (see “Backsight Survey” on page 6-2).
 - *Config Link* (for Robotic mode only): opens the *Configure Link* screen.
 - *Remote Control* (for Robotic mode only): opens the *Remote Control* screen (see “Remote Control” on page 6-52).
 - *Edit Points:* opens the *Points* screen (see “Points” on page 3-2).

GPS+ Stakeout

The *Stakeout* screen 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 desired direction, and the values of the distances to the target.

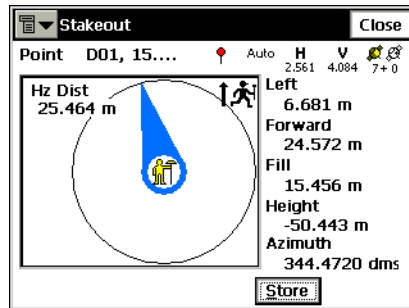


Figure 8-17. Point in Direction – Stakeout

- **Store:** performs the measurement and opens the *Store Point* screen.
- **Close:** saves the changes and closes the screen.

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

- *Status:* opens the *Status* screen (see “Status” on page 5-2).
- *Rover Antenna Setup:* opens the *Antenna Setup* screen (see “Config: Rover Antenna” on page 2-45).
- *Config Radio:* opens the *Configure Radio* screen (see “Configure Radio” on page 8-4).
- *mmGPS+ Options:* available if mmGPS is used, opens the *mmGPS+ Options* screen (see “mmGPS+ Options” on page 5-11).
- *Store Design Pt / Layer:* opens the *Design Pt /Layer* screen to select options to store the points (see “Design Pt/Layer” on page 8-7).
- *Display Coords:* if checked, coordinates are displayed instead of directions.
- *Help:* opens the help files.

TS Stakeout

The *Stakeout* screen 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.

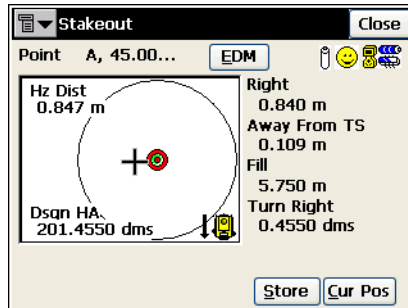


Figure 8-18. Point in Direction – Stakeout

- **EDM:** selects distance measurement mode: Coarse, Fine, or Coarse Tracking.
- **Store:** takes a measurement and opens the *Store Point* screen.
- **Cur Pos:** causes a measurement to be made and displays the result on the screen.
- **Close:** saves the changes and closes the screen.
- The bitmap at the upper-left corner displays the following pop-up menu:
 - *Auto Advance Pt:* if checked, after storing a staked point opens automatically the Stakeout screen for the next point.
 - *Store Design Pt / Layer:* opens the *Design Pt / Layer* screen to select options to store points.
 - *Display Coords:* if checked, coordinates are displayed instead of directions.
 - *Help:* opens the help files.

Point List

To stakeout points from a list, select **Stake ► Point List**.

The stakeout of points from the list can be enabled from the Main View (see Figure 4-2 on page 4-2). Press **Alt** on the controller's keyboard and tap the linework. Select the Stakeout Vertices item from the pop-up menu appear to open the *Stakeout Point List* screen.

Stakeout Point List

The *Stakeout Point List* screen performs a stakeout of existing points, creates a pointlist to stakeout, selects the starting stakeout point, and stakeouts in direct or reverse order.

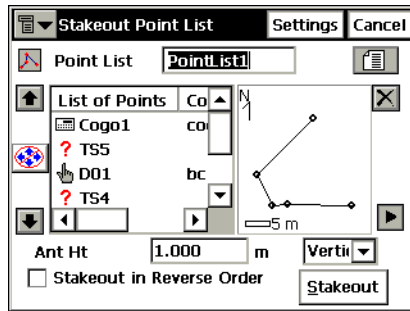





Figure 8-19. Stakeout Point List

- *Point List*: the preexisting points list. Can be chosen from the list or entered manually.
- *List of Points*: the list of currently selected points.
- Up and down arrows moves the highlighted point up and down in the order of the points.
-  : if activated, uses the up/down arrows on the keyboard to move the highlighted point up and down.
-  : deletes the highlighted point from the list.
-  : closes the scheme of the polygon. Only the list of points will be available.

- *Ant Ht* (for GPS mode): sets the height of the antenna reference point (ARP) above the mark. Also, specify the measurement type for the height: slant or vertical.
- *HR* (for the TS mode): the height of the rod (target).
- *Stakeout in Reverse Order*: check to perform stakeout starting from the end of the Point List.
- **Stakeout**: opens the *Stakeout* screen.
- For GPS stakeouts, the bitmap at the upper-left corner displays the following pop-up menu:
 - *Status*: opens the **Status** screen (see “Status” on page 5-2).
 - *Rover Antenna Setup*: opens the **Antenna Setup** Screen (see “Config: Rover Antenna” on page 2-45).
 - *Config Radio*: opens the **Configure Radio** screen (see “Config: Rover Radio” on page 2-37).
 - *Edit Point Lists*: opens the **Point Lists** screen (see “Point Lists” on page 3-15).
- For Total Station stakeouts, the bitmap on the upper-left corner displays the following pop-up menu:
 - *BS Setup*: opens the **BS Setup** screen (see “Backsight Survey” on page 6-2).
 - *Config Link* (for Robotic mode only): opens the **Configure Link** screen.
 - *Remote Control* (for Robotic mode only): opens the **Remote Control** screen (see “Remote Control” on page 6-52).
 - *Edit Point Lists*: opens the **Point Lists** screen (see “Point Lists” on page 3-15).

Stakeout (GPS and TS)

GPS and TS stakeouts are performed in the same way as described in “Stakeout Point” on page 8-2. Here, points can be staked out in any order by selecting the next stakeout point using an additional option from the bitmap menu in the upper left corner:

- *Select Stakeout Point*: opens the **Select Point** screen to select a stakeout point from the list.

Select Point

The **Select Point** screen displays the Point List being staked, from which points can be randomly chosen to continue the stakeout.

The new starting point can be selected from the list, or by double-taping a point on the map to the right of the list.

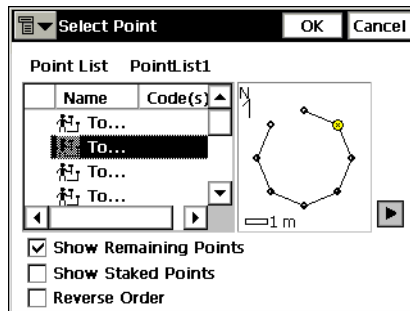


Figure 8-20. Select Point

- **Show Remaining Points**: check to show all the points that have not yet been staked out.
- **Show Staked Points**: check/uncheck to display the points in the list that have already been staked out.
- **Reverse Order**: check to stakeout the points from last point in the list to first.
- **OK**: saves changes and closes the screen.

DL Stakeout

DL Stakeout of point lists can be accessed from the main menu or top left menu in the Level Run screen (for details, see page 7-3).

The level ***Stake Point List*** screen selects a list of design points to determine the elevation and compute a cut/fill value at every point of the list.

- ***BS Point***: selects the backsight point for the stake measurement (entered manually or selected from the map or list).
- ***Point List***: selects the point list point to stake (entered manually or selected from the list). When selected, it will be displayed in the tab and in the plot.
- ***Stk in Reverse Order***: stakes in reverse order of the point list.
- ***BS***: if not already measured, takes a BS measurement before staking.
- ***Stakeout***: opens the level ***Stakeout*** screen for every point of the list (see Figure 8-14 on page 8-11).

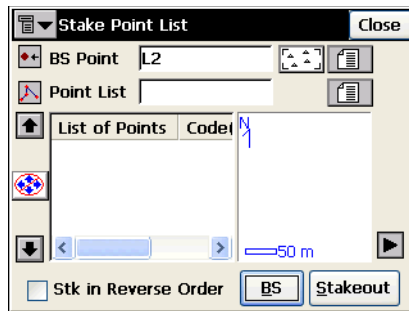


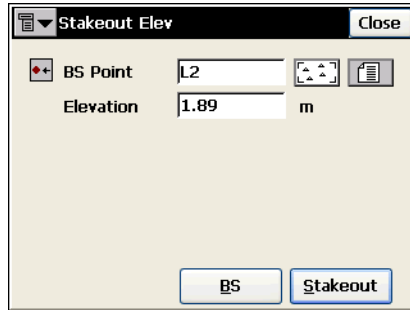
Figure 8-21. DL Stake Point List

Elevation

DL Stakeout of elevations can be accessed from the main menu or top left menu in the Level Run screen (for details, see page 7-3).

Stakeout Elevation

The *Stakeout Elevation* screen selects a backsight point and the elevation to determine the elevation.



The screenshot shows a software dialog box titled "Stakeout Elev" with a "Close" button in the top right corner. Inside the dialog, there are two input fields. The first is labeled "BS Point" and contains the text "L2". To its right are two small icons: a square with four arrows pointing outwards, and a document icon. The second input field is labeled "Elevation" and contains the text "1.89 m". At the bottom of the dialog, there are two buttons: "BS" and "Stakeout".

Figure 8-22. Stakeout Elevation

- **BS:** if not already measured, takes a BS measurement before staking.
- **Stakeout:** opens the level *Stakeout* screen for the desired elevation. This screen is identical to that shown in Figure 8-14 on page 8-11.

Lines

To stakeout a line, select **Stake ▸ Lines**.

Stakeout Line

The *Stakeout Line* screen contains the initial data for the line stakeout.

- The bitmap on the upper-left corner displays the same pop-up menu as for the *Stakeout Points&Direction* screen (see “Point in Direction” on page 8-12).

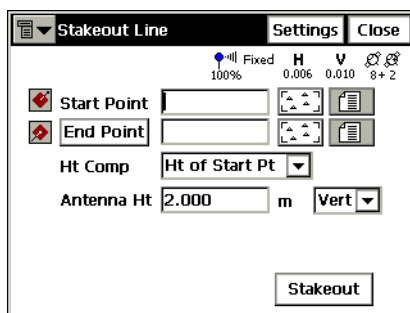


Figure 8-23. Stakeout Line

- *Start Point*: sets the starting point of the reference line.
- **End Point/Azimuth**: sets the direction of the reference line thorough another point, or azimuth.
- *Ht Comp*: the type of height computations for the stakeout point. Can be one of the following:
 - *Ht of Start Pt* (height of starting point): the stakeout point will have the same height as the starting point of the line.
 - *Interpolate Ht*: the height of the stakeout point will be computed through linear interpolation using the height of the starting and ending points of the line.
- *Antenna Ht* (for GPS mode): sets the height of the antenna reference point (ARP) above the mark. Also, specify the measurement type for the height: slant or vertical.
- *HR* (for TS mode): the height of the rod (target).

- **Stakeout:** opens the second *Stakeout Line* screen.
- **Settings:** opens the *Stakeout Parameters* screen. For details, see “Stakeout Point” on page 8-2.

GPS+ Stakeout

The graphics on the *Stakeout Line* screen shows the north direction, the reference direction, the movement direction, the target line. The panel on the right displays the parameters of the target.

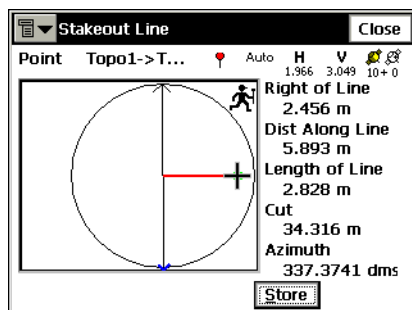


Figure 8-24. Stakeout Line

- **Store:** saves the location. Check the parameters of the stored point in the *Add/Edit point* screen.
- **Close:** closes the screen and returns to the *Stakeout Line* screen.
- The bitmap at the upper-left corner displays the following pop-up menu:
 - *Status*: opens the *Status* screen (see “Status” on page 5-2).
 - *Rover Antenna Setup*: opens the *Antenna Setup* screen (see “Config: Rover Antenna” on page 2-45).
 - *Config Radio*: opens the *Configure Radio* screen (see “Configure Radio” on page 8-4).
 - *mmGPS+ Options*: available if mmGPS is used, opens the *mmGPS+ Options* screen (see “mmGPS+ Options” on page 5-11).
 - *Store Design Pt / Layer*: opens the *Design Pt / Layer* screen to select options to store the points (see “Design Pt/Layer” on page 8-7).

- *Display Coords*: if checked, coordinates are displayed instead of directions.
- *Help*: opens the help files.

TS Stakeout

The **Stakeout** screen displays the stakeout process, displaying the current point name (in the upper-left corner of the screen), the layout of the target and current position, the direction, and the values of the distances to the target.

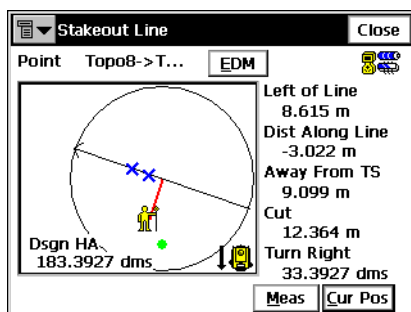


Figure 8-25. Stakeout Line

- **EDM**: selects distance measurement mode: Coarse, Fine, or Coarse Tracking.
- **Turn TS**: opens the *Turn TS* screen that shows the horizontal angle of the total station turn.
- **Meas**: takes a measurement and stores the current position as a point.
- **Cur Pos**: causes a measurement to be made and displays the result on the screen.
- **Close**: returns to the line screen.
- The bitmap at the upper-left corner displays the following pop-up menu:
 - *Rod Height*: opens the *Enter Rod Height* screen to change the rod height during stakeout.
 - *Remote Control* (Robotic mode only): opens the *Remote Control* screen (see “Remote Control” on page 6-52).

- *Config Link* (Robotic mode only): opens the **Configure Link** screen.
- *Store Design Pt / Layer*: opens the **Design Pt / Layer** screen to select options to store the points.
- *Display Coords*: if checked, coordinates are displayed instead of directions (see Figure 8-6 on page 8-6).
- *Help*: opens the help files.

Offsets

The Offsets submenu contains four items:

- Line & Offsets
- Intersection & Offsets
- 3 Pt Curve & Offsets
- Curve & Offsets
- Spiral & Offsets

Line & Offset

To stakeout Line & Offset, select **Stake ► Offsets ► Line & Offsets**.

Stakeout Line & Offset

The **Stakeout Line & Offset** screen performs a stakeout of a line with offsets in the Horizontal and Vertical directions.

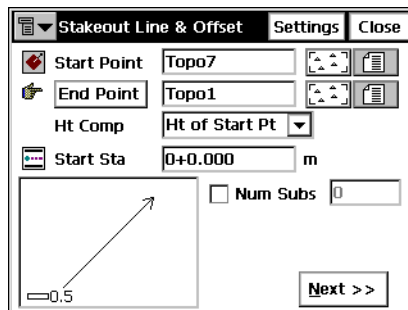


Figure 8-26. Stakeout Line & Offset


- *Start Point*: the starting point of the line. The line is defined, by its azimuth, azimuth to another point, or the End point of the line.
- **End Point/Azimuth**: the direction of the line set through either the azimuth of the line or the ending point of the line.
- *Ht Comp*: the type of height computations for the stakeout point. Can be one of the following:
 - *Ht of Start Pt* (height of starting point): the stakeout point will have the same height as the starting point of the line.
 - *Interpolate Ht*: the height of the stakeout point will be computed through linear interpolation using the height of the starting and ending points of the line.
- *Num Subs*: designates the number of subdivisions if it is desired to subdivide the line. For instance a value of 3, indicates that the user wants to stakeout four points by subdividing the line in three equal segments.
- *Start Stn*: The starting station (chainage) of the line.
- **Next**: opens the *Station & Offsets* screen.
- **Settings**: opens the *Stakeout Parameters* screen. See “Configuration” on page 2-10.
- For GPS stakeouts, the bitmap at the upper-left corner displays the following pop-up menu:
 - *Status*: opens the *Status* screen (see “Status” on page 5-2).
 - *Rover Antenna Setup*: opens the *Antenna Setup* screen (see “Config: Rover Antenna” on page 2-45).
 - *Config Radio*: opens the *Configure Radio* screen (see “Config: Rover Radio” on page 2-37).
 - *Edit Points*: opens the *Points* screen (see “Points” on page 3-2).
 - *Help*: accesses Help files.
- For Total Station stakeouts, the bitmap on the upper-left corner displays the following pop-up menu:
 - *BS Setup*: opens the *BS Setup* screen (see “Backsight Survey” on page 6-2).

- *Config Link* (for Robotic mode only): opens the **Configure Link** screen.
- *Remote Control* (for Robotic mode only): opens the **Remote Control** screen (see “Remote Control” on page 6-52).
- *Edit Points*: opens the **Points** screen (see “Points” on page 3-2).
- *Help*: accesses Help files.

Station & Offsets

The *Station & Offsets* screen contains the settings for the stakeout session.

Figure 8-27. Stakeout

- *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 *Stn Interval* shown in the next line.
- : uses the right/left arrow keys of the keyboard to increase or decrease the station.
- *Stn 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 on the *Station* field.
- **Up/Down**: the Up or Down Height offset with respect to the height of the line at the station.

- *Antenna Ht* (for GPS mode): sets the height of the antenna reference point (ARP) above the mark. Also the measurement type for the height needs to be specified: slant or vertical.
- *HR* (for TS mode): the height of the rod (target).
- **Back**: returns to the previous screen.
- **Stakeout**: opens the *Initial Point Name* screen.

Initial Point Name

The *Initial Point Name* screen specifies the starting name for the points calculated for the stakeout task.

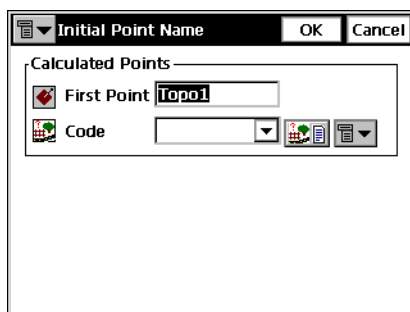




Figure 8-28. Calc Point Names

- *First Point*: the name of the first point.
- *Code*: the code of the points; selected from the list or entered manually.
-  : accesses the attributes of the chosen code, opens the *Code-Attributes* screen (see “Code-Attributes” on page 3-10).
- The bitmap next to the *Attributes List* bitmap displays the following list:
 - *String*: toggles on the *String* field. Also, the  sign appears. For details, see “Topo” on page 5-24.
 - *Note*: opens the *Notes* screen. For details, see “Topo” on page 5-24.
- **OK**: saves the changes and opens the *Stakeout* screen.

GPS+ Stakeout

The graphics on the *Stakeout* screen show the north direction, and the relative position of the antenna and target. The panel on the right displays the parameters of the target.

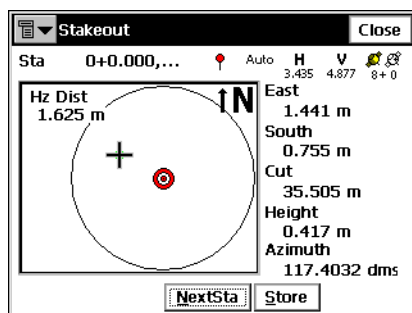


Figure 8-29. Stakeout

- **NextSta**: advances the station by the specified Station Interval for staking out points at the Next station.
- **Store**: saves the location. Check the parameters of the stored point in the *Add/Edit point* screen.
- **Close**: closes the screen and returns to the *Stakeout Line* screen.
- The bitmap at the upper-left corner displays the following pop-up menu:
 - *Status*: opens the *Status* screen (see “Status” on page 5-2).
 - *Rover Antenna Setup*: opens the *Antenna Setup* screen (see “Config: Rover Antenna” on page 2-45).
 - *Config Radio*: opens the *Configure Radio* screen (see “Configure Radio” on page 8-4).
 - *mmGPS+ Options*: available if mmGPS is used, opens the *mmGPS+ Options* screen (see “mmGPS+ Options” on page 5-11).
 - *Auto Advance Sta*: if checked, after storing a staked point, automatically opens the *Stakeout* screen for the next point.
 - *Design Offsets*: opens the Design Ell ht screen, which allows changing the design point elevation height, road and DTM offsets (identical to “Design Elevation” on page 8-29).

- *Store Design Pt / Layer*: opens the **Design Pt /Layer** screen to select options to store the points (see “Design Pt/Layer” on page 8-7).
- *Display Coords*: if checked, coordinates are displayed instead of directions.
- *Help*: opens the help files.

Design Elevation

The **Design Elev** screen contains an option to change the elevation of the design point.

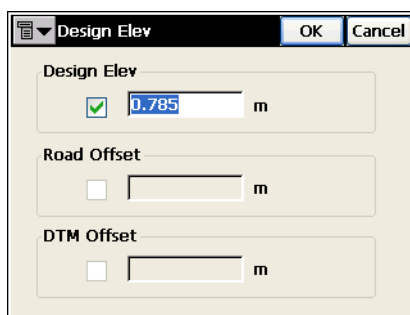


Figure 8-30. Design Elevation

- *Design Elev*: check this box to enable the entry field for editing the elevation value manually.
- *Road Offset*: check this box to enable the entry field for editing the road offset value manually.
 - *DTM Offset*: check this box to enable the entry field for editing the DTM offset value manually.

TS Stakeout

The *Stakeout* screen reflects the progress of the stakeout, displaying the current station (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.

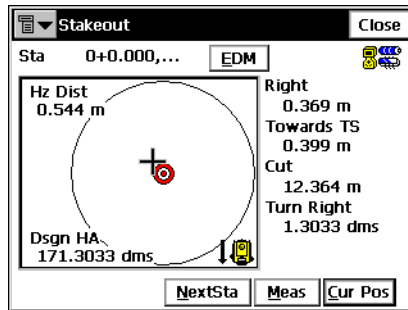


Figure 8-31. Stakeout

- **Stn**: displays the current station. taping in the field toggles between Station and Offset.
- **EDM**: selects distance measurement mode: Coarse, Fine, or Coarse Tracking.
- **Stop**: instructs the Robotic Total Station to stop tracking and go into “Stand By” mode.
- **Search**: instructs the Robotic Total Station to start searching for the prism.
- **NextSta**: advances the station by the specified Station Interval for staking out points at the Next station.
- **Meas**: takes a measurement and stores the current position as a point.
- **Cur Pos**: causes a measurement to be made and displays the result on the screen.
- **Close**: saves the changes and closes the screen.

- The bitmap at the upper-left corner displays the following pop-up menu:
 - *Rod Height*: opens the **Enter Rod Height** screen to change the rod height during stakeout.
 - *Remote Control* (for Robotic mode only): opens the **Remote Control** screen (see “Remote Control” on page 6-52).
 - *Config Link* (for Robotic mode only): opens the **Configure Link** screen.
 - *Auto Advance Pt*: if checked, after storing a staked point opens automatically the Stakeout screen for the next point.
 - *Design Offsets*: opens the Design Ell ht screen, which allows changing the design point elevation height, road and DTM offsets (identical to “Design Elevation” on page 8-29).
 - *Store Design Pt / Layer*: opens the **Design Pt /Layer** screen to select options to store the points.
 - *Display Coords*: if checked, coordinates are displayed instead of directions (Figure 8-6 on page 8-6).
 - *Help*: opens the help files.

Intersection & Offsets

To stakeout Intersection & Offsets, select **Stake ► Offsets ► Intersection & Offsets**.

Intersection & Offsets

The *Intersection & Offsets* screen stakeouts out the intersection point of two lines parallel to two other lines at specified offsets. The first screen defines one line (Line 1) and the offset of the first parallel line. The second screen field defines another line (Line 2) and the offset of the second parallel line. The intersection point of these two parallel lines defines the stakeout point.

The first screen contains parameters for the first line.

Figure 8-32. Intersection & Offsets – Line 1

- **From Point:** starting point of the Line 1.
- **Az to Pt/Azimuth:** the direction of the line set through the azimuth of the line, azimuth from the start point to the point selected.
- **Right Offset/Left Offset:** the right or left offset of the stakeout point with respect to the line.
- **Next:** opens the second *Intersection&Offsets* screen.
- **Settings:** opens the *Stakeout Parameters* screen (see “Configuration” on page 2-10).
- The bitmap on the upper-left corner displays the same pop-up menu as the *Points in Direction* screen (see “Point in Direction” on page 8-12).

The second screen contains the parameters of the second line.

Figure 8-33. Intersection & Offsets – Line 2

- *From Point*: starting point of the Line 2.
- **Az to Pt/Azimuth**: the direction of the line; set through the azimuth of the line, azimuth from the start point to the point selected.
- **Right Offset/Left Offset**: the right or left offset of the stakeout point with respect to the corresponding line.
- *Intersect Ht*: the height of the intersection point.
- *Store Point*: the name of the intersection point.
- *Ant Ht* (for GPS mode): the height of the antenna.
- *HR* (for TS mode): the height of the rod (target).
- **Stakeout**: opens the *Stakeout* screen.
- **Settings**: opens the *Stakeout Parameters* screen. See “Configuration” on page 2-10.

GPS+ Stakeout

The *Stakeout* screen 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 desired direction, and the values of the distances to the target.

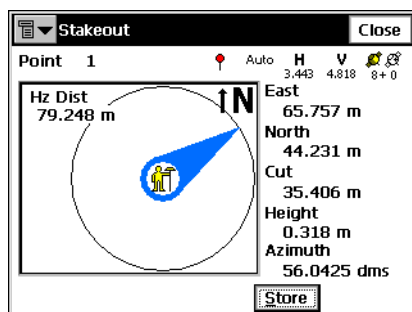


Figure 8-34. Stakeout

- **Store:** saves the location. Check the parameters of the stored point in the *Add/Edit point* screen.
- **Close:** closes the screen and returns to the *Stakeout Line* screen.
- The bitmap at the upper-left corner displays the following pop-up menu:
 - *Status:* opens the *Status* screen (see “Status” on page 5-2).
 - *Rover Antenna Setup:* opens the *Antenna Setup* screen (see “Config: Rover Antenna” on page 2-45).
 - *Config Radio:* opens the *Configure Radio* screen (see “Configure Radio” on page 8-4).
 - *mmGPS+ Options:* available if mmGPS is used, opens the *mmGPS+ Options* screen (see “mmGPS+ Options” on page 5-11).
 - *Store Design Pt / Layer:* opens the *Design Pt / Layer* screen to select options to store the points (see “Design Pt/Layer” on page 8-7).
 - *Display Coords:* if checked, coordinates are displayed instead of directions.
 - *Help:* opens the help files.

TS Stakeout

The *Stakeout* screen reflects the progress of the stakeout, displaying the current station (in the upper-left corner of the screen), the necessary direction, and the values of the distances to the target.

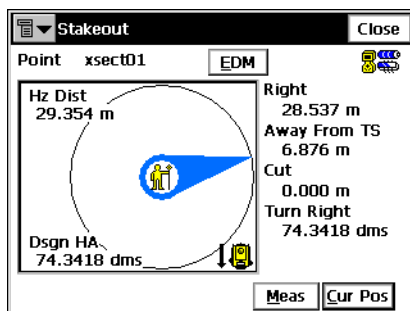


Figure 8-35. Stakeout

- **EDM:** selects distance measurement mode: Coarse, Fine, or Coarse Tracking.
- **Meas:** takes a measurement and stores the current position as a point.
- **Cur Pos:** causes a measurement to be made and displays the result on the screen.
- **Close:** saves the changes and closes the screen.
- The bitmap at the upper-left corner displays the following pop-up menu:
 - *Rod Height:* opens the **Enter Rod Height** screen to change the rod height during stakeout.
 - *Remote Control* (Robotic mode only): opens the **Remote Control** screen (see “Remote Control” on page 6-52).
 - *Config Link* (Robotic mode only): opens the **Configure Link** screen.
 - *Store Design Pt / Layer:* opens the **Design Pt /Layer** screen to select options to store the points.
 - *Display Coords:* if checked, coordinates are displayed instead of directions (Figure 8-6 on page 8-6).
 - *Help:* opens the help files.

Three Point Curve & Offset

To stakeout Three Point Curve & Offset, select **Stake ► Offsets ► 3Pt Curve & Offsets**.

3 Pt Curve

The *3 Pt Curve* screen creates a curve by selecting three points: PC point, any curve point and PT point; or the RP, PC and PT points.

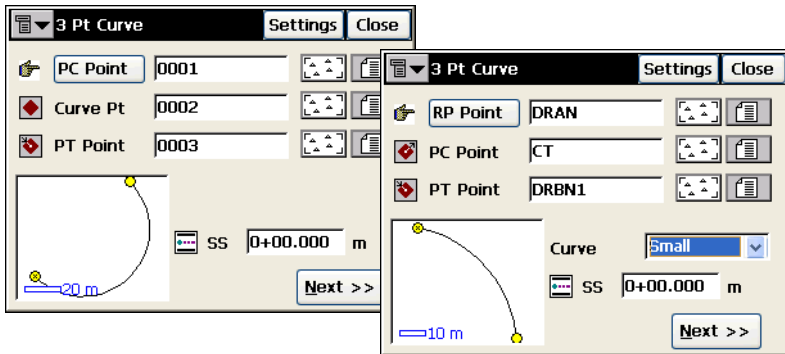


Figure 8-36. Three Point Curve

The screen changes its appearance depending on the first point chosen. Manually enter, or select from the list or map, the following sets of points:

- *PC Point, Curve Point, PT Point* – the starting PC (Point of Curvature) and ending PT (Point of Tangency) points on the circle, and a third point on the curve.
- *RP Point, PC Point, PT 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 and 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). Values of *Small* or *Large* can be selected from the **Curve** drop-down box to indicate which of these two curves should be used for staking.

- **SS:** The starting station (chainage) of the line.
- **Next:** opens the *Station and Offsets* screen (see “Station & Offsets” on page 8-26).
- **Settings:** opens the *Stakeout Parameters* screen (see “Configuration” on page 2-10).
- The bitmap on the upper-left corner displays the same pop-up menu as for the *Line & Offsets* screen (see “Line & Offset” on page 8-24).

Stakeout (GPS and TS)

GPS and TS stakeouts are performed in the same way described in “Line & Offset” on page 8-24.

Curve & Offsets

To stakeout Curve & Offsets, select **Stake ▶ Offsets ▶ Curve & Offsets**.

Curve & Offsets

The **Curve & Offsets** screen function performs a stakeout of a curve (section of an arc) at a specified horizontal and vertical offset from the curve.

Figure 8-37. Stakeout Curve & Offset

- *PC Point*: the Point of Curve, the starting point of the arc.
- *Tangent Azi*: the azimuth of the Tangent of the curve (arc) at the PC point.

- **Radius/ Deg Curve/ Deg Chord:** the radius parameters of the curve.
- **Length/Chord/Tangent/Mid Ord/Extern/Delta:** the length parameter of the curve. For the description of the curve (arc) parameters, see “Curve Solution” on page 9-17.
- **SS:** The starting station (chainage) of the line.
- **Next:** opens the *Station and Offsets* screen (see “Station & Offsets” on page 8-26).
- **Settings:** opens the *Stakeout Parameters* screen (see “Configuration” on page 2-10).
- The bitmap on the upper-left corner displays the same pop-up menu as for the *Line & Offsets* screen (see “Line & Offset” on page 8-24).

Stakeout (GPS and TS)

GPS and TS stakeouts are performed in the same way described in “Line & Offset” on page 8-24.

Spiral & Offset

To stakeout Spiral & Offset, select **Stake ▶ Offsets ▶ Spiral & Offset**.

Stakeout Spiral & Offset

The *Stakeout Spiral & Offset* screen is used to stakeout points at specified Horizontal and Vertical offsets with respect to a specified spiral.

Figure 8-38. Stakeout Spiral & Offset

- **TS Point:** Tangent to Spiral point. This is the starting point of the spiral.
- **Tangent Azi:** the azimuth of the tangent to the spiral at the point TS.
- **Radius/Deg Chord/Deg Curve:** the radius parameter of the spiral at the ending point.
- **Length/Sp Const:** the length of the spiral at the ending point, or the *Spiral Constant*, the constant of the spiral.

For any spiral point $R \times Length = (SpiralConst)^2$, where *R* is the *Radius*, and *Length* is the length of the spiral, both at the same specified point.

- **Turn:** specifies whether the spiral turns right or left:
- **Dir:** the direction of “moving”:
 - TS -> SC* = Tangent Spiral->Spiral Circle. This is the incoming spiral to the internal circle.
 - CS -> ST* = Circle Spiral->Spiral Tangent. The outgoing spiral from the circle to the Tangent.
- **SS:** the starting station (chainage) of the line.

- **Next:** opens the *Station & Offsets* screen (see “Station & Offsets” on page 8-26).
- **Settings:** opens the *Stakeout Parameters* screen (see “Configuration” on page 2-10).
- The bitmap on the upper-left corner displays the same pop-up menu as for the *Line & Offsets* screen (see “Line & Offset” on page 8-24).

Stakeout (GPS and TS)

GPS and TS stakeouts are performed in the same way described in “Line & Offset” on page 8-24.

Roads

The Roads submenu contains three items:

- Road
- Slope
- Real Time Road

The same menu can display in the Main View to enable the stakeout from the graphics interface (see Figure 4-2 on page 4-2 in Chapter 4). To open the menu, press **Alt** on the controller’s keyboard and tap the road to be staked.

Stakeout Road

To start the Road stakeout, select **Stake ▶ Roads ▶ Road**.

The *Stakeout Road* screen selects the road for stakeout and displays the plan of the chosen road (Figure 8-39 on page 8-41).

The bitmap in the upper-left corner displays the same pop-up menu as the *Line & Offsets* screen (see “Line & Offset” on page 8-24).

- *Road:* the road to be staked-out. Can be entered manually or chosen from the list.

- *Start Stn*: the starting point of the stakeout, the distance from the beginning of the road.
- *Antenna* (for GPS+): the antenna height.
- *HR* (for TS): the rod (target) height.
- *Include transition point*: set a check mark if the transition point should be included in spite of the station distance.
- **Settings**: opens the *Stakeout Parameters* screen (see “Config: Stakeout Parameters” on page 2-51).
- **Next**: opens the second *Stakeout Road* screen.

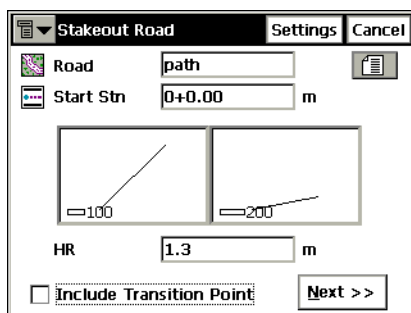


Figure 8-39. Stakeout Road

The second *Stakeout Road* screen is used to set the offsets from CL for the stakeout points and to select staking of Curb/Ditch with the desired offsets.

- **Next**: opens the third *Stakeout Road* screen.

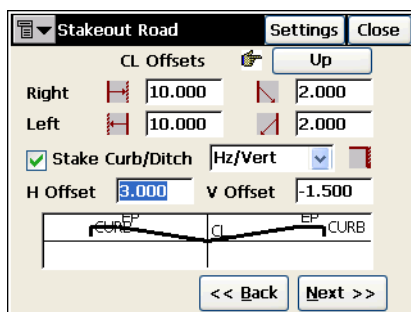



Figure 8-40. Stakeout Road

The third **Stakeout Road** screen displays the properties of the cross section on the stakeout station and performs the stakeout of all the desired points (Figure 8-41 on page 8-43).

- **Station:** the station where the stakeout is performed. The arrow buttons change the station number by the value of Station Interval.
- **Stn Interval:** the interval of the station increment.
- **Segment Pt:** the point code of the current segment. The arrow buttons in this field move the current segment point along the cross section. This will reflect on the scheme in the bottom of this screen.
- **Right/Left Offset:** the horizontal offset from the current segment point.
- **Up/Down Offset:** the vertical offset from the current segment point.
- **Centerline/Segment/Surface:** sets the type of template offsets:
 - **Centerline:** the horizontal offset starts at the centerline; the vertical offset also 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 keyboard arrow keys. The upper button stands for the station increment/decrement, the lower button for the current segment point location. Only one button can be enabled at a time.
- **Back:** returns to the first **Stakeout Road** screen.
- **Stakeout:** opens the **Initial Point Name** screen.
- **Settings:** opens the **Stakeout Parameters** screen (see “Config: Stakeout Parameters” on page 2-51).

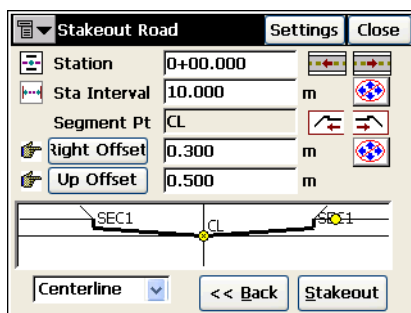


Figure 8-41. Stakeout Road

Initial Point Name

The *Initial Point Name* screen specifies the starting name for the points calculated for the stakeout task.

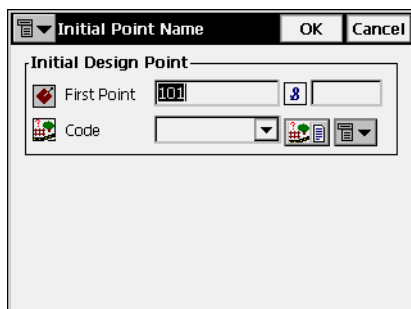


Figure 8-42. Initial Point Name

- **OK:** opens the *Stakeout* screen.

GPS+ Stakeout

The graphics on the *Stakeout* screen show the relative position of the antenna and target. The panel on the right displays the parameters of the target.

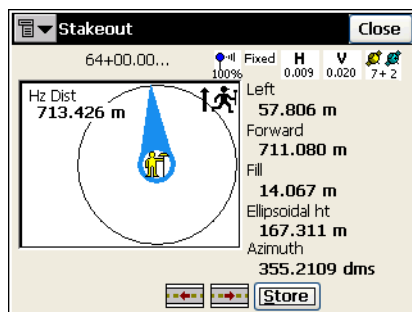




Figure 8-43. Stakeout



-  and  : advances the station by the specified Station Interval for staking out points at the Next station.
- **Store**: saves the location. Check the parameters of the stored point in the *Add/Edit Point* screen.
- **Close**: closes the screen and returns to the *Stakeout Roads* screen.
- For GPS stakeouts, the bitmap at the upper-left corner displays the following pop-up menu:
 - *Status*: opens the *Status* screen (see “Status” on page 5-2).
 - *Rover Antenna Setup*: opens the *Antenna Setup* Screen (see “Config: Rover Antenna” on page 2-45).
 - *Config Radio*: opens the *Configure Radio* screen (see “Config: Rover Radio” on page 2-37).
 - *Auto Advance Sta*: if checked, after storing a staked point, automatically opens the Stakeout screen for the next point.
 - *Design Offsets*: opens the Design Ell ht screen, to change the design point elevation height, road and DTM offsets (identical to “Design Elevation” on page 8-29).

- *Store Design Pt / Layer*: opens the **Design Pt /Layer** screen to select options to store the points (see “Design Pt/Layer” on page 8-7).
- *Display Coords*: if checked, coordinates are displayed instead of directions (Figure 8-6 on page 8-6).
- *Help*: opens the help files.

TS Stakeout

The **Stakeout** screen 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 8-44 on page 8-45).

Tapping in the *Stn* string enables the floating information screen to display the station number and the offset value of the current point.

- **EDM**: selects distance measurement mode: Coarse, Fine, or Coarse Tracking.
-  and  : 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.
- **Cur Pos**: causes a measurement to be made and displays the result on the screen.
- **Close**: saves the changes and closes the screen.

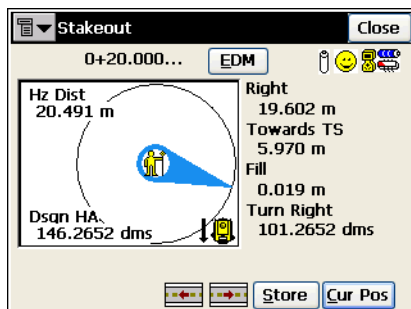


Figure 8-44. Stakeout Road – Stakeout

- The bitmap at the upper-left corner displays the following pop-up menu:
 - *Rod Height*: opens the **Enter Rod Height** screen to change the rod height during stakeout.
 - *Remote Control* (Robotic mode only): opens the **Remote Control** screen (see “Remote Control” on page 6-52).
 - *Config Link* (Robotic mode only): opens the **Configure Link** screen.
 - *Auto Advance Sta*: if checked, after storing a staked point, automatically opens the Stakeout screen for the next point.
 - *Design Offsets*: opens the Design Ell ht screen to change the design point elevation height, road and DTM offsets (identical to “Design Elevation” on page 8-29).
 - *Store Design Pt / Layer*: opens the **Design Pt /Layer** screen to select options to store the points.
 - *Display Coords*: if checked, coordinates are displayed instead of directions (Figure 8-6 on page 8-6).
 - *Help*: opens the help files.

Stakeout Slope

To start the slope stakeout, select **Stake ▶ Roads ▶ Slope**.

The **Stakeout Slope** screen selects a road, which slope should be staked-out (Figure 8-45 on page 8-47).

The bitmap on the upper-left corner displays the same pop-up menu as for the **Line & Offsets** screen (see “Line & Offset” on page 8-24).

- *Road*: the road to be staked-out. Can be entered manually, or chosen from the list.
- *Start Stn*: the starting point of the stakeout, the distance from the beginning of the road.
- *Antenna* (for GPS+): the antenna height.
- *HR* (for TS): the rod height.
- *Include transition point*: set the check mark if the transition point should be included in spite of the station distance.

- **Settings:** opens the *Stakeout Parameters* screen (see “Configuration” on page 2-10).
- **Next:** opens another *Stakeout Slope* screen.

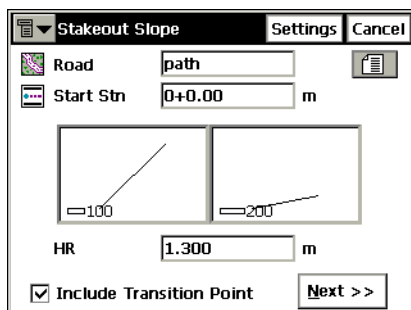


Figure 8-45. Stakeout Slope

This screen displays the properties of the cross section at the stakeout station and helps to perform the stakeout of the catch point (the point where the slope crosses the surface of the terrain) and/or the offset of the catch point.

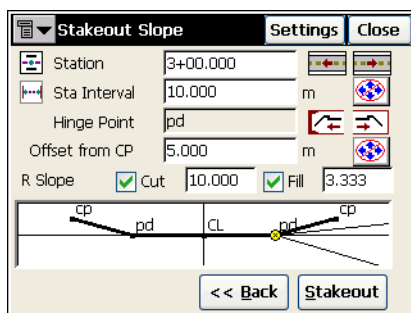



Figure 8-46. Stakeout Alignment

- **Station:** the station where the stakeout is performed. The arrow buttons change the station number on the value of Station Interval.
- **Stn Interval:** the interval of the station increment.
- **Hinge Point:** the hinge point code. The hinge point is a point of rotation of the Cut/Fill Slopes. The arrow buttons in this field move the hinge point along the cross section. This will reflect on the scheme in the bottom of this screen.

- *Offset from CP*: the offset from the catch point.
- *Right/Left Slope Cut/Fill*: the values of the Cut and Fill Slope parameters, applied to the hinge point.
-  : switches on/off the keyboard arrow keys. The upper button stands for the station increment/decrement, the lower button stands for the current hinge point location. Only one button can be enabled at a time.
- **Back**: returns to the *Slope Stakeout* screen.
- **Stakeout**: opens the *Stakeout* screen.
- **Settings**: opens the *Stakeout Parameters* screen (see “Configuration” on page 2-10).

GPS+ Stakeout

The graphics on the *Stakeout Catch Point* screen shows the direction to target. The panel on the right displays the parameters of the target.

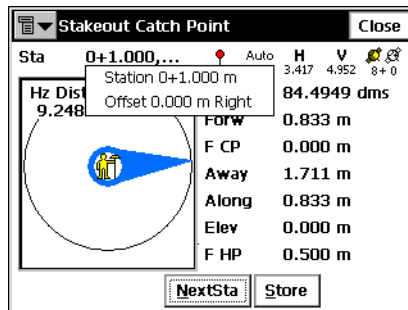


Figure 8-47. Stakeout Catch Point

- **NextSta**: advances the station by the specified Station Interval for staking out points at the Next station.
- **Store**: saves the location. Check the parameters of the stored point in the *Add/Edit Point* screen.
- **Close**: closes the screen and returns to the *Stakeout Roads* screen.

- For GPS stakeouts, the bitmap at the upper-left corner displays the following pop-up menu:
 - *Status*: opens the **Status** screen (see “Status” on page 5-2).
 - *Rover Antenna Setup*: opens the **Antenna Setup** Screen (see “Config: Rover Antenna” on page 2-45).
 - *Config Radio*: opens the **Configure Radio** screen (see “Config: Rover Radio” on page 2-37).
 - *Auto Advance Sta*: if checked, after storing a staked point, automatically opens the **Stakeout** screen for the next point.
 - *Design Offsets*: opens the **Design Ell ht** screen to change the design point elevation height, road and DTM offsets (identical to “Design Elevation” on page 8-29).
 - *Store Design Pt / Layer*: opens the **Design Pt /Layer** screen to select options to store the points (see “Design Pt/Layer” on page 8-7).
 - *Display Coords*: if checked, coordinates are displayed instead of directions (Figure 8-6 on page 8-6).
 - *Help*: opens the help files.

TS Stakeout

The **Stakeout** screen reflects the progress of the stakeout, displaying the current station (in the upper-left corner of the screen), the layout of the target and current position, and the parameters of the stakeout.

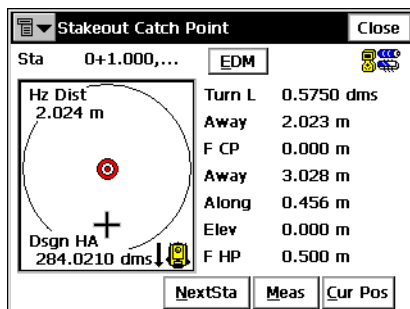


Figure 8-48. Stakeout Slope – Stakeout Catch Point

Tapping in the *Stn* string enables the floating information screen to display the station number and the offset value and side (right or left) of the current point.

- *HA*: Horizontal Angle.
- *To*: the direction of movement.
- *C/F CP*: Cut/Fill with respect to the Catch Point.
- *Away*: distance away from the catch point.
- *Along*: distance along the center line.
- **EDM**: selects distance measurement mode: Coarse, Fine or Coarse Tracking.
- **Next Sta**: moves to the next station.
- **Meas**: takes a measurement and stores the current position as a point.
- **Cur Pos**: causes a measurement to be made and displays the result on the screen.
- **Close**: saves the changes and closes the screen.
- The bitmap at the upper-left corner displays the following pop-up menu:
 - *Rod Height*: opens the **Enter Rod Height** screen to change the rod height during stakeout.
 - *Remote Control* (Robotic mode only): opens the **Remote Control** screen (see “Remote Control” on page 6-52).
 - *Config Link* (Robotic mode only): opens the **Configure Link** screen.
 - *Auto Advance Sta*: if checked, after storing a staked point, automatically opens the Stakeout screen for the next point.
 - *Design Offsets*: opens the Design Ell ht screen to change the design point elevation height, road and DTM offsets (identical to “Design Elevation” on page 8-29).
 - *Store Design Pt / Layer*: opens the **Design Pt /Layer** screen to select options to store the points.

- *Display Coords*: if checked, coordinates are displayed instead of directions (Figure 8-6 on page 8-6).
- *Help*: opens the help files.

Stakeout Real Time Road

To start the road stakeout in real time, select **Stake ► Roads ► Real Time Road**.

The **Stakeout Road** screen selects a road for stakeout and displays the plan of the chosen road.

The bitmap on the upper-left corner displays the same pop-up menu as for the **Line & Offsets** screen (see “Line & Offset” on page 8-24).

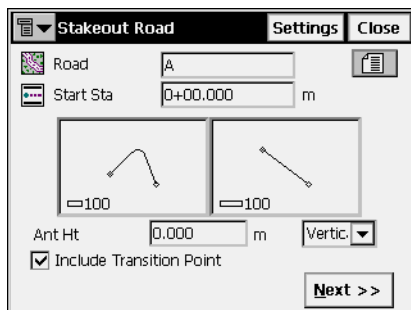


Figure 8-49. Stakeout Road

- *Road*: the road to be staked-out. Can be entered manually or chosen from the list.
- *Start Stn*: the starting point of the stakeout, the distance from the beginning of the road.
- *Antenna* (for GPS+): the antenna height.
- *HR* (for TS): the rod (target) height.
- *Include transition point*: set a check mark if the transition point should be included in spite of the station distance.
- **Settings**: opens the **Stakeout Parameters** screen (see “Config: Stakeout Parameters” on page 2-51).

- **Next:** opens the second *Stakeout Road* screen to set the offsets from CL for the stakeout points and to select staking of Curb/Ditch with the desired offsets.

The screenshot shows the 'Stakeout Road' dialog box with the following settings:

- CL Offsets:** Right = 10.000, Left = 10.000
- Stake Curb/Ditch:** Checked (green checkmark)
- H Offset:** 3.000
- V Offset:** -1.500
- Diagram:** A cross-section diagram showing the road centerline (CL) and the curb/ditch (CURB) with the specified offsets.

Figure 8-50. Stakeout Road

- **Next:** opens the third *Stakeout Road* screen to set *Cut/Fill Slope* parameters.

The screenshot shows the 'Stakeout Road' dialog box with the following settings:

- Cut Slope:** 10.000
- Fill Slope:** 15.000

Figure 8-51. Stakeout Road – Cut/Fill

- **Stakeout:** opens the *Initial Point Name* screen.

Initial Point Name

The *Initial Point Name* screen specifies the starting name for the points calculated for the stakeout task.

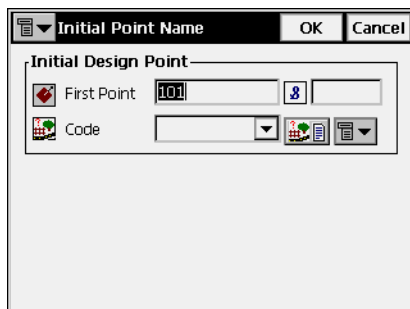


Figure 8-52. Initial Point Name

- **OK:** opens the *Stakeout* screen.

The *Stakeout* 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.

GPS+ Stakeout

The graphics on the *Stakeout* screen show the relative position of CL and antenna. The panel on the right displays the parameters of the antenna.

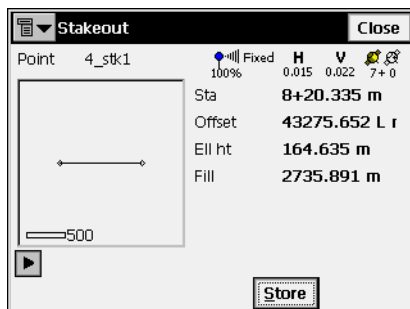


Figure 8-53. Stakeout

- **Store:** saves the location. Check the parameters of the stored point in the *Add/Edit Point* screen.

- For GPS stakeouts, the bitmap at the upper-left corner displays the following pop-up menu:
 - *Status*: opens the **Status** screen (see “Status” on page 5-2).
 - *Rover Antenna Setup*: opens the **Antenna Setup** Screen (see “Config: Rover Antenna” on page 2-45).
 - *Config Radio*: opens the **Configure Radio** screen (see “Config: Rover Radio” on page 2-37).
 - *Store Design Pt / Layer*: opens the **Design Pt /Layer** screen to select options to store the points (see “Design Pt/Layer” on page 8-7).
 - *Display Coords*: if checked, coordinates are displayed instead of directions (Figure 8-6 on page 8-6).
 - *Help*: opens the help files.

TS Stakeout

The **Stakeout** screen reflects the relative position of CL and target. The panel on the right displays the current point name (in the upper-left corner of the screen) and the parameters of the target.

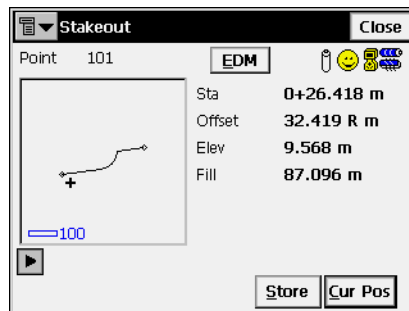


Figure 8-54. Stakeout Real Time Road

- **Cur Pos**: measures the target.
- The bitmap at the upper-left corner displays the following pop-up menu:
 - *Rod Height*: opens the **Enter Rod Height** screen to change the rod height during stakeout.

- *Remote Control* (Robotic mode only): opens the **Remote Control** screen (see “Remote Control” on page 6-52).
- *Config Link* (Robotic mode only): opens the **Configure Link** screen.
- *Store Design Pt / Layer*: opens the **Design Pt / Layer** screen to select options to store the points.
- *Display Coords*: if checked, coordinates are displayed instead of directions (Figure 8-6 on page 8-6).
- *Help*: opens the help files.

DTM

To start the DTM (Digital Terrain Model) stakeout, select **Stake ▶ DTM**.

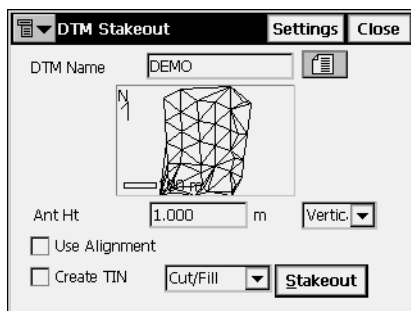


Figure 8-55. DTM Stakeout

- *DTM name*: the name of the TN3 file, which is stored at the disk.
- *Ant Ht* and *m*: for GPS+ stakeout, the antenna height and method of height measurement.
- *HR*: for TS stakeout, the height of reflector.
- *Use Alignment*: if checked, stations and offsets will be reported.
- *Create TIN*: if checked, a TIN (TN3 file) cut/sheet model can be generated.
- **Stakeout**: opens the **Initial Point Name** screen (see Figure 8-28 on page 8-27) and then the **Stakeout** screen by pressing **OK**.

**NOTICE**

If a stakeout point is located on the outside of the DTM for the job, TopSURV will neither calculate nor write the coordinates of this point.

Open DTM

The *Open DTM* screen opens the selected surface file.

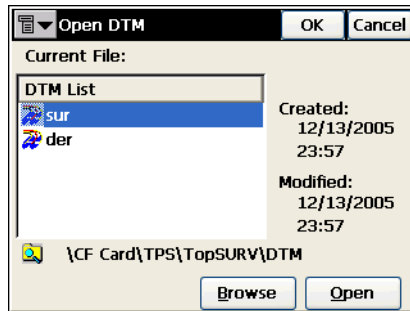


Figure 8-56. Open DTM

- *Current File:* displays currently open file.
- *DTM List:* lists all surface files in the DTM directory on the controller.
- **Browse:** searches for the file on the disk.
- **Open:** opens the selected file in the *DTM Stakeout* screen.

GPS+ Stakeout

The graphics on the *Stakeout* screen show the relative position of antenna. The panel on the right displays the parameters of the antenna.

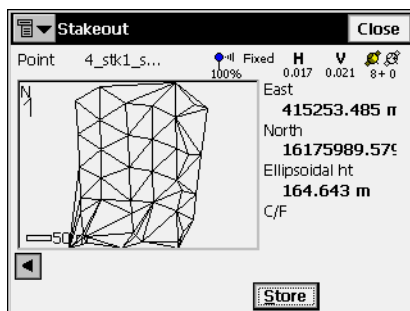


Figure 8-57. Stakeout -DTM

- **Store:** saves the location.
- For GPS stakeouts, the bitmap at the upper-left corner displays the following pop-up menu:
 - *Status*: opens the *Status* screen (see “Status” on page 5-2).
 - *Rover Antenna Setup*: opens the *Antenna Setup* Screen (see “Config: Rover Antenna” on page 2-45).
 - *Config Radio*: opens the *Configure Radio* screen (see “Config: Rover Radio” on page 2-37).
 - *Auto Advance Pt*: if checked, after storing a staked point, automatically opens the Stakeout screen for the next point.
 - *Design Offsets*: opens the Design Ell ht screen to change the design point elevation height, road and DTM offsets (identical to “Design Elevation” on page 8-29).
 - *Store Design Pt / Layer*: opens the *Design Pt /Layer* screen to select options to store the points (see “Design Pt/Layer” on page 8-7).
 - *Display Coords*: if checked, coordinates are displayed instead of directions (Figure 8-6 on page 8-6).
 - *Help*: opens the help files.

TS Stakeout

The *Stakeout* screen reflects the relative position of the target. The current point name and the parameters of the target display on the right of the screen.

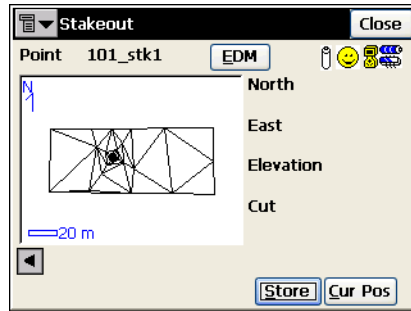


Figure 8-58. Stakeout (TS)

- **EDM:** selects distance measurement mode: Coarse, Fine, or Coarse Tracking.
- **Cur Pos:** causes a measurement to be made and displays the result on the screen.
- **Close:** saves the changes and closes the screen.
- The bitmap at the upper-left corner displays the following pop-up menu:
 - *Rod Height:* opens the **Enter Rod Height** screen to change the rod height during stakeout.
 - *Remote Control* (Robotic mode only): opens the **Remote Control** screen (see “Remote Control” on page 6-52).
 - *Config Link* (Robotic mode only): opens the **Configure Link** screen.
 - *Auto Advance Pt:* if checked, after storing a staked point, automatically opens the Stakeout screen for the next point.
 - *Design Offsets:* opens the Design Ell ht screen to change the design point elevation height, road and DTM offsets (identical to “Design Elevation” on page 8-29).
 - *Store Design Pt / Layer:* opens the **Design Pt /Layer** screen to select options to store the points.

- *Display Coords*: if checked, coordinates are displayed instead of directions (Figure 8-6 on page 8-6).

CodeStrings

To start a CodeString stakeout, select **Stake ▶ CodeStrings**.

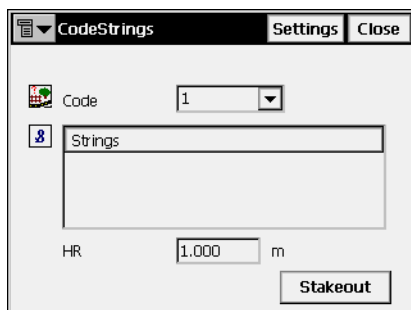


Figure 8-59. CodeStrings

- For GPS stakeouts, the bitmap at the upper-left corner displays the following pop-up menu:
 - *Status*: opens the **Status** screen (see “Status” on page 5-2).
 - *Rover Antenna Setup*: opens the **Antenna Setup** Screen (see “Config: Rover Antenna” on page 2-45).
 - *Config Radio*: opens the **Configure Radio** screen (see “Config: Rover Radio” on page 2-37).
- For Total Station stakeouts, the bitmap on the upper-left corner displays the following pop-up menu:
 - *BS Setup*: opens the **BS Setup** screen (see “Backsight Survey” on page 6-2).
 - *Config Link* (for Robotic mode only): opens the **Configure Link** screen.
 - *Remote Control* (for Robotic mode only): opens the **Remote Control** screen (see “Remote Control” on page 6-52).
- *Antenna Ht* (for GPS mode): sets the height of the antenna reference point (ARP) above the mark. Also, specifies the measurement type for the height: slant or vertical.

- *HR* (for TS mode): the height of the rod (target).
- **Settings**: opens the *Stakeout Parameters* screen. For details see “Config: Stakeout Parameters” on page 2-51.
- **Stakeout**: opens the *Stakeout* screen, assisting in the stakeout process. The Stakeout screen for CodeStrings is similar to the Stakeout screen for Points (see Figure 8-3 on page 8-3).

COGO

The COGO menu includes the following menu items:

- Inverse
- Inverse Pt to Pts List
- Intersection
- Inverse Pt to Line
- Point in Direction (optional)
- Traverse
- Curve Solutions (optional)
- Area
- Known Area (optional)
- Transformations (optional)

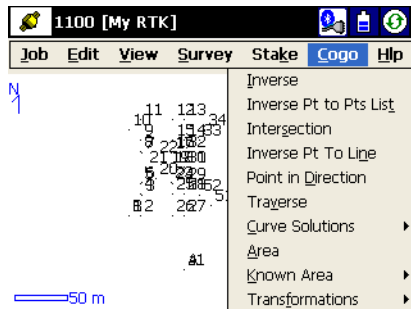


Figure 9-1. Cogo Menu

Inverse

To open the Inverse screen, tap **COGO ► Inverse**.

The **Two-Point Inverse** task computes the inverse between two known points. Inverse comprises the azimuth from one point to the other, and the distance between these points.

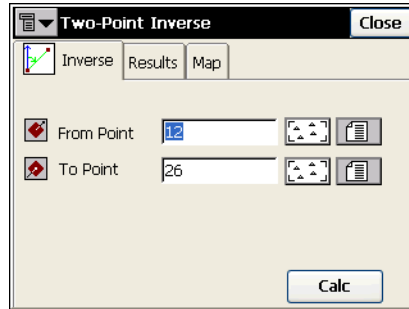


Figure 9-2. Two-Point Inverse

The *Inverse* tab contains initial data for the task:

- *From Point*: the first point name; entered manually or chosen from the map or from the list.
- *To Point*: the second point name; entered manually or chosen from the map or from the list.
- **Calc**: calculates the inverse.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Points*: opens the **Points** screen (see “Points” on page 3-2).
- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map (Figure 9-3). Tap the large image to hide it.

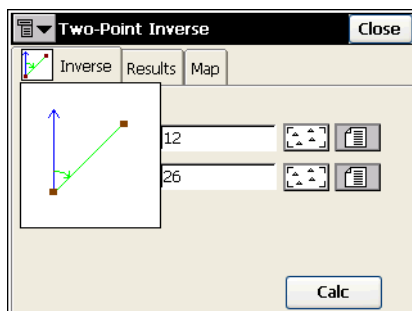


Figure 9-3. Large Image of COGO Task

The *Results* tab shows the initial data (From Point, To Point) and results of the calculation (Figure 9-4). The display of the results can vary, based on whether a geodesic display system is selected or not.

When *Grid* or *Ground* is the selected display system, the results tab has the below described fields (Figure 9-4).

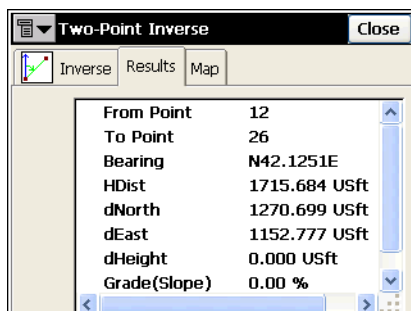


Figure 9-4. Two-Point Inverse – Results in Non-Geodesic Display System

- *Azimuth* or *Bearing*: to the second point from the first point.
- *Horizontal Distance* (HDist): from one point to another.
- *Vertical distance* (VDist): the “-” sign means that the height of the second point is lower than the height of the first point.
- *dNorth*: the increment of the North coordinate.
- *dEast*: the increment of the East coordinate.

- *dHeight*: the increment of the height.
- *Grade(Slope)*: the increment of the height in percent.
- *Slope distance*: the computed distance between two points.

When selecting a geodesic display system, the following fields display (Figure 9-5):

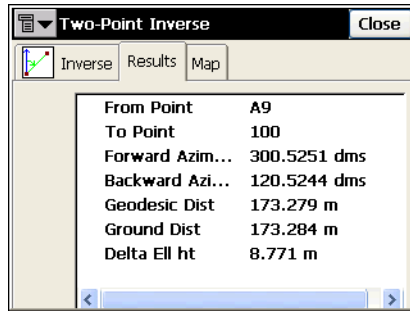


Figure 9-5. Two-Point Inverse – Results in Geodesic Display System

- *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.

The *Map* tab shows the illustration for the results.

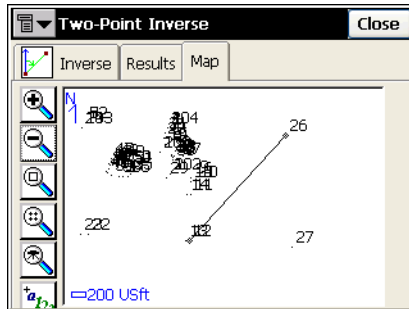


Figure 9-6. Two-Point Inverse – Map

For a description of the buttons, see “Toolbar” on page 4-4.

Inverse Point to Points List

To perform the Inverse Point to Point List task, select **COGO ▸ Inverse Pt to Pts List**.

The *Inverse Point to Point List* tab calculates the inverse for all the points in the Points list with respect to a known point.

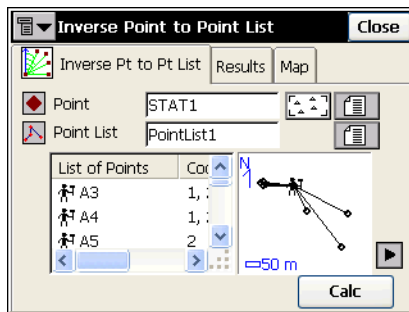



Figure 9-7. Inverse Point to Point List

- *Point*: sets the known point name; entered manually or selected from the map or from the list.
- *Point List*: the Point List name. Can be selected from the list of Point Lists or entered manually.

- *List of Points*: the list of currently selected points. For details see “Point Lists” on page 3-15.
- : closes the plot of the polygon. Only the list of points will be available.
- **Calc**: calculate the inverse and displays the results on the *Results* tab.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Points*: opens the **Points** screen to edit the points (see “Points” on page 3-2).
- *Edit Point Lists*: opens the **List of Point Lists** screen to edit the point lists (see “Point Lists” on page 3-15).
- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

The *Results* tab shows the initial data and the results of the calculation: closest point, azimuth, distance, height, slope and grade.

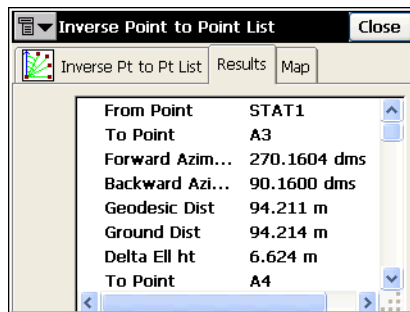


Figure 9-8. Inverse Point to Point List – Results Tab

The *Map* tab shows the results graphically.

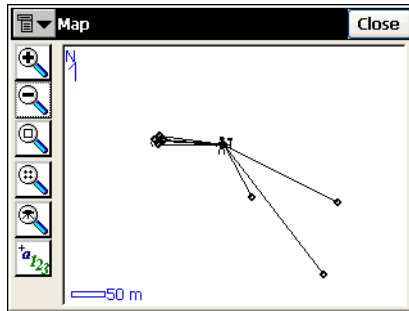


Figure 9-9. Inverse Point to Point List – Map Tab

Intersection

To perform the Intersection task, tap **COGO ► Intersection**.

The *Intersection* screen computes the intersection point or points when given two known points and either the directions or distances from the known points.

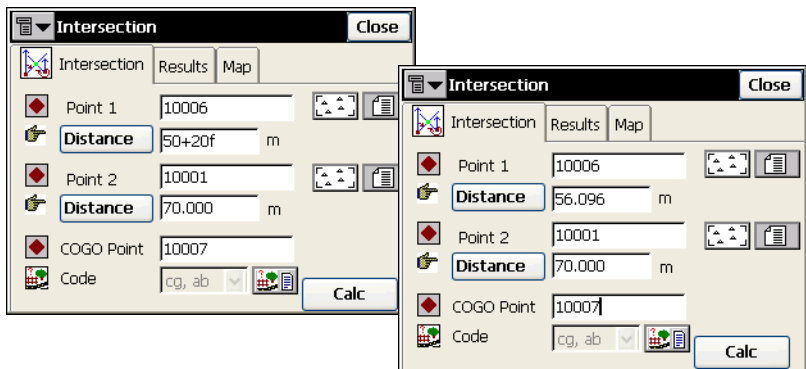


Figure 9-10. Intersection

The *Intersection* tab contains initial data for the intersection task.

- *Point 1*: the first point; entered manually, chosen from the map, or chosen from the list.

- **Azimuth/Distance/Az to Pt:** rotates through selections when tapped.
 - **Azimuth:** sets the azimuth from the first point to the unknown point.
 - **Distance:** sets the distance between the first point to the unknown point.
 - **Az to Pt:** sets another known point to which the direction will be calculated and input as azimuth.
- **Point 2:** the second point; entered manually, chosen from the map, or chosen from the list.
- **COGO Pt:** sets the name and code for the resulting point of the calculation. The code can be selected from the menu or entered manually. Also, the Attributes can be selected through the *Attribute List* bitmap. Note that the Code/String field will remember and display the last user-saved code/string.
- **Calc:** starts calculation process.

**TIP**

To edit angles, azimuths and distances etc, use the entry fields to add/subtract angle and linear values, applying units as needed (for example, +20ft in Figure 9-10 on page 9-7).

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- **Edit Points:** opens the **Points** screen to edit the points (see “Points” on page 3-2).
- **Help:** opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

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

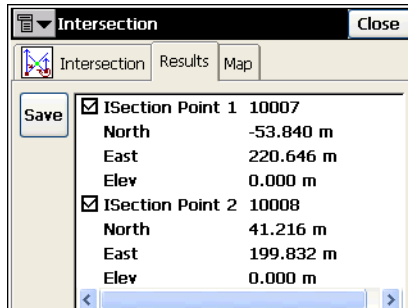


Figure 9-11. Intersection – Results Tab

- *North*: the North local coordinate of the corresponding point.
- *East*: the East local coordinate of the corresponding point.
- *Height*: the height of the first corresponding point.
- **Save**: saves the result of the calculation.

The *Map* tab shows the graphic solution of the task. In the example below, there are two solutions for the Intersection calculation.

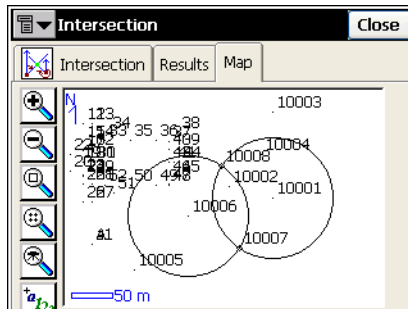


Figure 9-12. Intersection – Map Tab

For a detailed description of the Map view, see Chapter 4.

Inverse Point to Line

To perform the Inverse Point to Line task, select **COGO ► Inverse Point to Line**.

The *Inverse Point to Line* screen calculates the station of the known point inverse to the known line.

Figure 9-13. Inverse Point to Line

- **Point:** sets the current point name. Can be entered manually, or selected from the map or from the list.
- **Start Point:** the starting point of the reference line.
- **Azimuth/Az to Pt:** sets the azimuth of the reference line. Rotates through selections when tapped.
 - **Azimuth:** sets the azimuth from the starting point by value.
 - **Az to Pt:** sets another known point to which the direction will be calculated and input as azimuth.
- **Start Stn:** the starting station of the reference line.
- **Store PTL Point:** store the point as PTL point (see “PTL Mode” on page 6-16).
- **Calc:** calculates the inverse and displays the results on the *Results* tab.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- **Edit Points:** opens the *Points* screen to edit the points (see “Points” on page 3-2).

- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

The *Results* tab shows the initial data and the results of the calculation: station, offset and height.

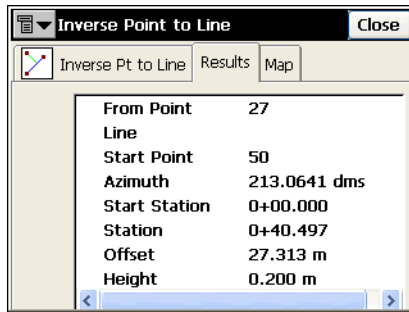


Figure 9-14. Inverse Point to Line – Results Tab

The *Map* tab shows the results graphically.

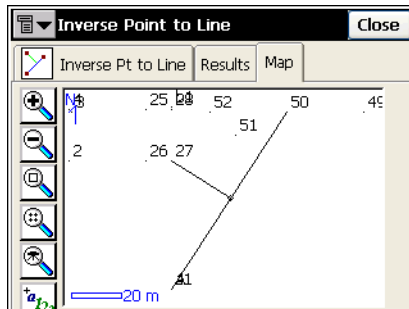


Figure 9-15. Inverse Point to Line – Map Tab

Point in Direction

To perform the Point in Direction task, select **COGO ► Point in Direction**.

The *Point in Direction* tab calculates the coordinates of a point, using known point, the azimuth, the angle offset from the azimuth line and the distance offsets from the From Point.

The screenshot shows the 'Point in Direction' dialog box with the following fields and values:

Field	Value	Unit
From Point	50	
Az to Pt	49	
Angle Offset	30.0000	dms
Hz Dist	20.000	m
Vert Dist	2.000	m
COGO Point	10001	
Code		

Figure 9-16. Point in Direction

- *From Point*: the starting point. Type the name manually or select it from the list or from the map.
- **Azimuth/Az to Pt**: sets the azimuth of the line from the From Point. Rotates through selections when tapped.
 - **Azimuth**: sets the azimuth by value.
 - **Az to Pt**: sets another known point to which the direction will be calculated and input as azimuth.
- *Angle Offset*: the angle offset from the azimuth line.
- *Hz Dist*: the distance offset along the angle offset line.
- *Vert Dist*: the height offset.
- *Cogo Pt*: the computed point name.
- *Code*: the computed point code.
- **Calc**: calculates the coordinates and displays the results on the *Results* tab.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- **Edit Points:** opens the **Points** screen to edit the points (see “Points” on page 3-2).
- **Help:** opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

The **Results** tab shows the initial data and results of the calculation.

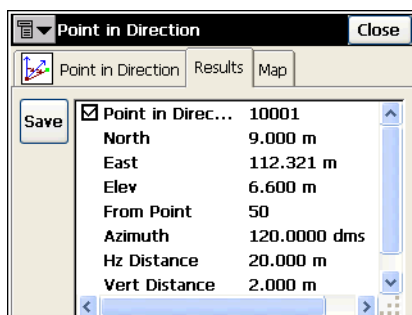


Figure 9-17. Point & Direction – Results Tab

- **Save:** saves the results of the calculation.

The **Map** tab shows the results graphically.

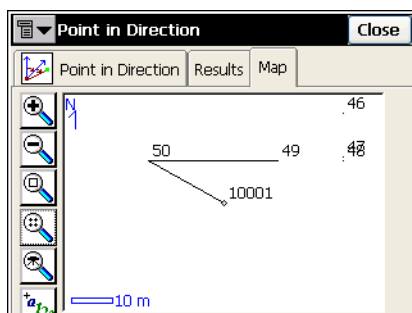


Figure 9-18. Point & Direction – Map Tab

Traverse

This function is used to calculate Traverse, and Sideshot points, based Horizontal, and Vertical Offsets along a direction which is defined by an azimuth, or right, left or deflection angles. To start a Traverse task, select **COGO ► Traverse**.

The *Traverse Calc* tab displays the initial data for the traverse task.

Figure 9-19. Traverse Calc

- **From Point:** indicates the occupation (the traverse point), and can be manually entered, or chosen from the map or list.
- **Azimuth/Angle Right/Angle Left/Deflection:** determines the azimuth from the known point to the calculated point (To Point). The azimuth can be entered as is, or can be computed from the right or left angles, or deflection entered in this field and Backsight information.
 - **Azimuth:** sets the azimuth by value.
 - **Angle Right:** angle to the right is the angle at the known point from the backsight point to the calculated point in a clockwise direction.
 - **Angle Left:** angle to the left is the angle at the known point from the backsight point to the calculated point in an counter clockwise direction.
 - **Deflection:** the angle at the known point between the prolongation of the line from the backsight point and the line to the calculated point
- **Hz Dist:** the Horizontal Distance along the azimuth line.

- *Vert Dist*: the Vertical Distance along the azimuth line.
- *To Point*: the name of the calculated point.
- *Code*: the code associated with the calculated point.
- **BS Point**: displays the **BS Point** screen for entering the Backsight Point or Backsight Azimuth (Figure 9-21 on page 9-16). If a BS point has not been entered, an Azimuth is required. In this case, if an angle value is entered as *Angle Right*, *Angle Left*, or *Deflection*, this value will be considered as azimuth.
- **SideShot**: if pressed, the coordinates of the To Point will be calculated based on the entered values for Azimuth/Angle Right/Angle Left/Deflection, Horizontal and Vertical distances. The From Point does not change, and To Point is incremented to the next new Point in the database.
- **Traverse**: if pressed, the coordinates of the To Point will be calculated based on the entered values for (Azimuth/Angle Right/Angle Left/Deflection), Horizontal and Vertical distances. The From Point changes to the To Point, and the To Point changes to the next new name in the database.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Points*: opens the **Points** screen to edit the points (see “Points” on page 3-2).
- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

The *Results* tab shows the initial data and results of the calculation.

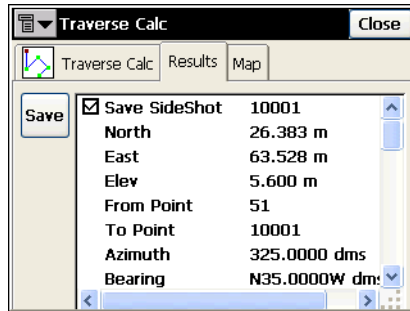


Figure 9-20. Traverse Calc – Results Tab

The *Map* tab shows the results graphically.

BS Point

The *BS Point* screen enters the parameters for the Backsight Point or Backsight Azimuth. Tapping the **BS Point/BS Azimuth** button determines which parameters will display.

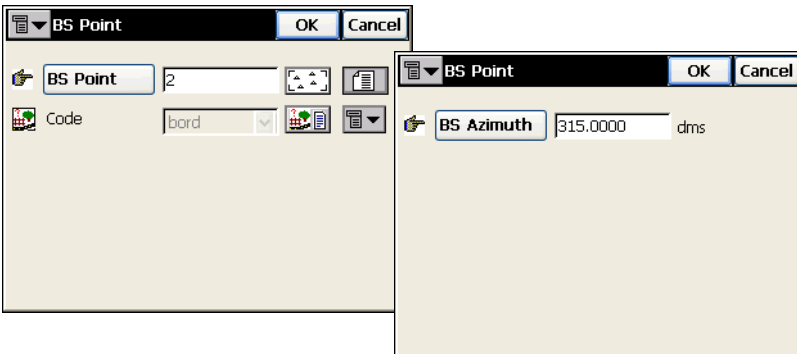


Figure 9-21. BS Point

- In **BS Azimuth** mode, the azimuth is set directly.
- In **BS Point** mode, a point can be chosen from the list or map, then the azimuth to this point will be calculated and input as the BS Azimuth.
- The point code is not available for changing.

- Press **OK** to return to the *Traverse Calc* screen.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Points*: opens the *Points* screen to edit the points (see “Points” on page 3-2).
- *Help*: opens the help files.

Curve Solutions

A Curve is a part of a circle and thus can be described through the center point (also called as Radius Point), the radius value and the starting and ending points on the circle, also called as PC (Point of Curvature) and PT (Point of Tangency). Using these values, the Curve Solutions find other Curve parameters.

Curve Solution

The Curve Solution COGO task calculates the full set of parameters for any curve, given one of each of the curvature parameter and the length parameter of the curve. To start the Curve Solution task, select **COGO ► Curve Solutions ► Curve Solution**.

The *Curve Solution* tab screen contains the initial data and a window for the curve plan.

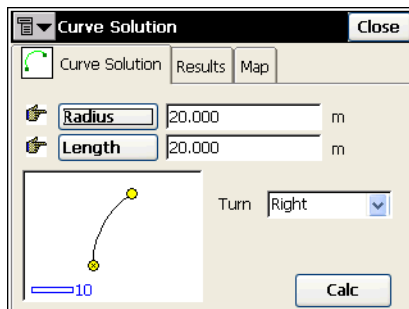


Figure 9-22. Curve Solution

- **Radius/Deg Chord/Deg Curve**: the curvature parameter of the curve.

- **Length/Chord/Tangent/Mid Ord:** the length parameter of the curve.
- **Turn:** the direction of turn relative to the starting point.
- **Calc:** press to calculate the parameters of the curve.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the *Help* item to open the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

The *Results* tab shows the calculated parameters.

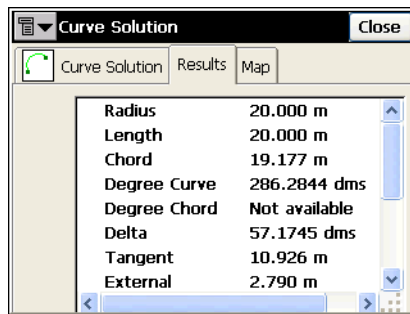


Figure 9-23. Curve Solution – Results Tab

The first three parameters displayed are the radius and length of the curve and the length of the chord connecting the PC and PT points.

- **Chord:** PC-PT length. If the Chord is defined, then taking into account, that

$$\sin \frac{\Delta}{2} = \frac{\text{Chord}}{2} / (R)$$

the Length can be calculated as $\text{Length} = R \times \Delta$ (note that delta is the angle subtended at the center).

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 curve whose chord is 100 units long. So

$$\sin \frac{\text{DegreeChord} \times \pi}{180} / 2 = \left(\frac{100}{2 \times R} \right) /$$

where R is Radius.

- *Delta*: internal angle from center to tangent points (PC-RP-PT).
- *Tangent*: the PI-PT length, where PI is the Point of Intersection. If the Tangent is defined, then taking into account, that:

$$\tan \frac{\text{Delta}}{2} = \frac{\text{Tangent}}{R}$$

where R is Radius, the Length is $\text{Length} = R \times \text{Delta}$.

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 Radius, the Length is $\text{Length} = R \times \text{Delta}$.

- *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 Radius, the Length is $\text{Length} = R \times \text{Delta}$.

- *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 shows graphically the results of the calculation.

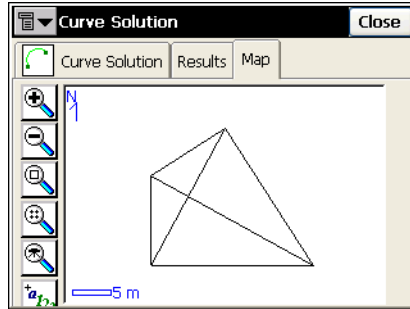


Figure 9-24. Curve Solution – Map Tab

PI & Tangents

The PI & Tangents task computes the PC point, the PT point, and the center (Radius Point) of a Curve, given the Point of Intersection (PI), the radius, and the azimuths from the PI point to the PC, and PT points respectively. To start the PI & Tangents task, select **COGO ► Curve Solutions ► PT & Tangents**.

The *PI & Tangents* tab contains the initial data.

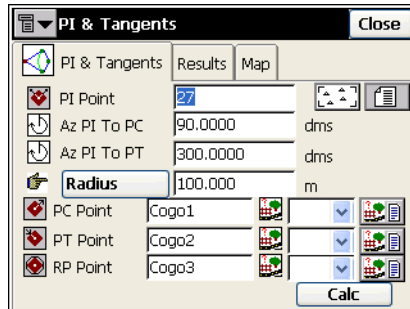


Figure 9-25. PI & Tangents

- *PI Point*: the Point of Intersection. Can be manually entered, or chosen from the map or from the list.
- *Az PI to PC*: the azimuth from the PI point to the starting curve point.

- *Az PI to PT*: the azimuth from the PI point to the ending curve point.
- **Radius/ Deg Curve/Deg Chord/Tangent**: the radius parameter of the curve.
- *PC Point*: the name and the code for the calculated starting curve point.
- *PT Point*: the name and the code for the calculated ending curve point.
- *RP Point*: the name and the code for the calculated radius point.
- **Calc**: calculates the parameters of the curve and the coordinates of the PC, PT and RP points.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Points*: opens the **Points** screen to edit the points (see “Points” on page 3-2).
- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

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

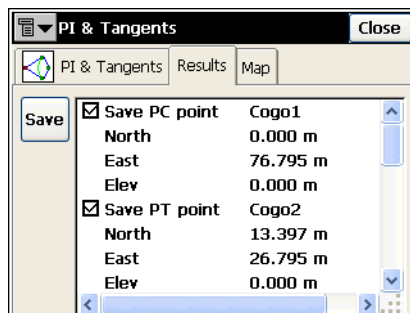


Figure 9-26. PI & Tangents – Results Tab

Check the points that are needed to be saved and press the **Save** button.

The *Map* tab shows graphically the results of the calculation.

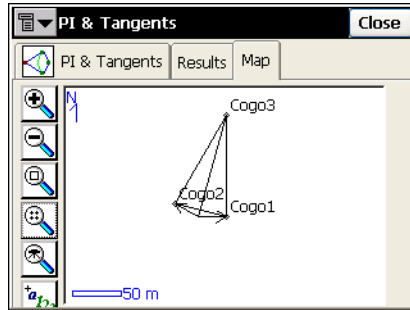


Figure 9-27. PI & Tangents – Map Tab

Three Pt Curve

The *Three Pt Curve* task defines the curve using three points: PC point, any curve point and PT point; or the RP, PC and PT points. To start the Three PT curve task, select **COGO ► Curve Solutions ► Three Pt Curve**.

The *Three Points Curve* tab displays the initial data.

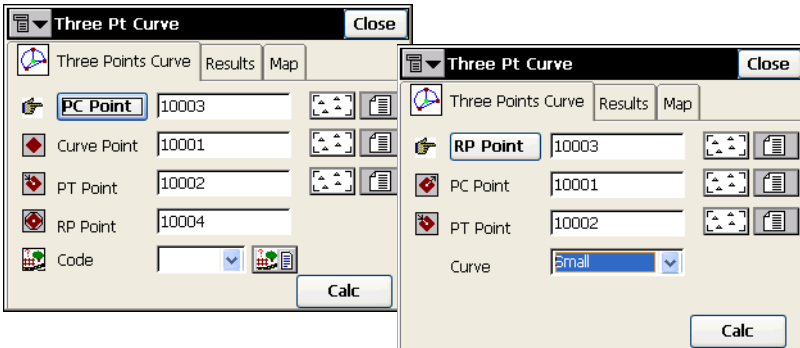


Figure 9-28. Three Pt Curve

The screen changes its appearance depending upon the first point chosen. Manually enter, or select from the list or from the map, the following sets of points.

- *PC Point, Curve Point, PT Point* – for this sets of points, the coordinates for the RP Point will be calculated along with curve

parameters. The name and the code for this calculated point can be set.

- **RP Point, PC Point, PT Point** – for this sets of points, the distance between RP Point and PC point should be equal to distance between RP Point and PT point. The radius, and the PC and PT points define two curves, one with delta less than or equal to 180 degrees (Small curve), and the other with delta greater than or equal to 180 degrees (Large curve). Values of *Small* or *Large* can be selected from the **Curve** drop-down box to indicate which of these two curves should be used for computations.
- **Calc**: press to calculate the curve parameters.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- **Edit Points**: opens the **Points** screen to edit the points (see “Points” on page 3-2).
- **Help**: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

The **Results** tab displays the results of the calculation.

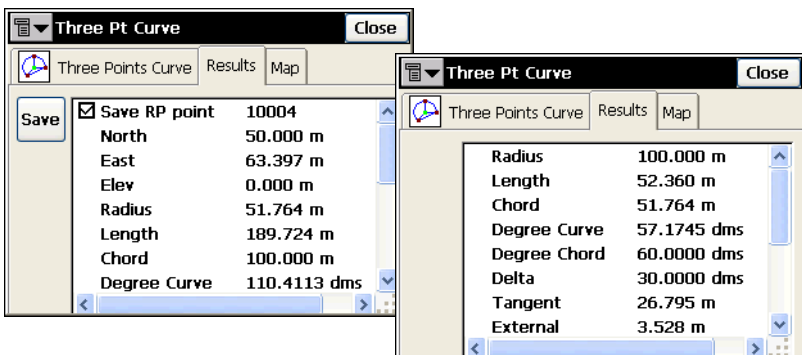


Figure 9-29. Three Pt Curve – Results Tab

For the description of curve parameters, see “Curve Solution” on page 9-17.

- **Save**: press to store the point being found.

The *Map* tab displays the results of the calculation graphically.

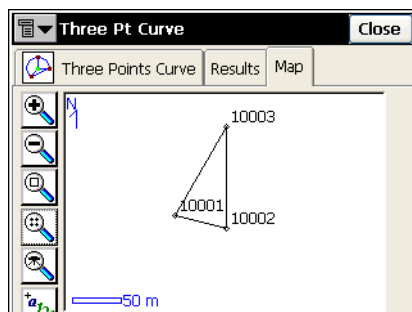


Figure 9-30. Three Pt Curve – Map Tab

Radius & Points

The Radius & Points task defines a curve using the PC and PT points, and a radius parameter. To start the Radius & Points task, select **COGO ► Curve Solutions ► Radius & Points**.

The *Radius & Point* tab contains the initial data for the task.

Figure 9-31. Radius & Points

- *PC Point*: the Point of Curvature. Can be manually entered, or selected from the map or from the list of points.
- *PT Point*: the Point of Tangency. Can be manually entered, or selected from the map or from the list of points.
- **Radius/Deg Curve/Deg Chord**: the radius parameter of the curve.
- *Turn*: the direction of turn, relative to the PC Point.

- **Curve:** defines the curve in circle that should be considered. The radius, and the PC and PT points define two curves, one with delta less than or equal to 180 degrees (Small curve), and the other with delta greater than or equal to 180 degrees (Large curve).
- **RP Point:** the point to be defined. Type the name and select the code, if necessary.
- **Calc:** press to calculate the curve parameters.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- **Edit Points:** opens the **Points** screen to edit the points (see “Points” on page 3-2).
- **Help:** opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

The **Results** tab displays the results of the calculation.

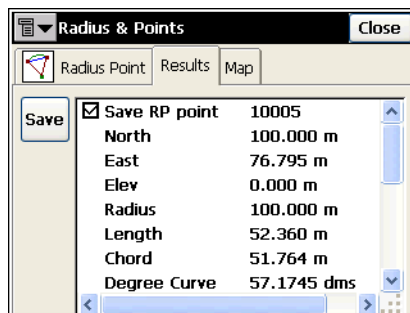


Figure 9-32. Radius & Points – Results Tab

For the description of curve parameters, see “Curve Solution” on page 9-17.

- **Save:** press to store the point being found.

The *Map* tab displays the results of the calculation graphically.

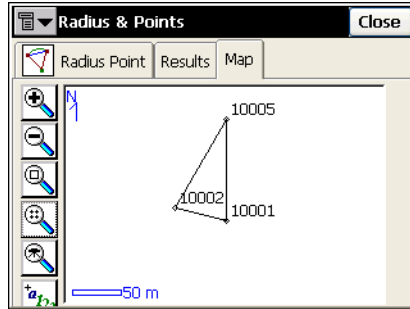


Figure 9-33. Radius & Points – Map Tab

Area

To calculate the area of a polygon, select **COGO ▶ Area**.

The *Area* tab contains the list of points, vertices of the polygon, and the plot of the polygon.

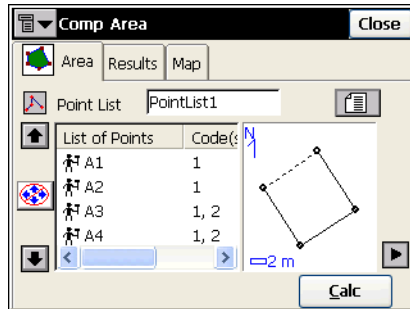




Figure 9-34. Area

- *Point List*: the Point List name. Can be selected from the list of Point Lists or entered manually.
- *List of Points*: the list of currently selected vertices of the polygon.
- Up and down arrows move the highlighted point up and down in the order of the points.

NOTICE

For the correct operation of the application, the sides of the polygon should not cross each other.

-  : switches on/off the keyboard arrow keys that duplicate the operation of the arrows on the screen.
-  : closes the plot of the polygon. Only the list of points will be available.
- **Calc**: calculates the area of the polygon and displays it on the *Results* tab.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Point Lists*: opens the **List of Point Lists** screen to edit the point lists (see “Point Lists” on page 3-15).
- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

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

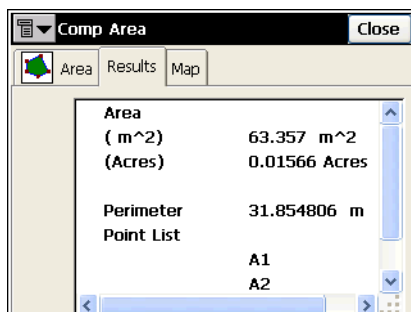


Figure 9-35. Area – Results Tab

The *Map* tab shows a view of the polygon.

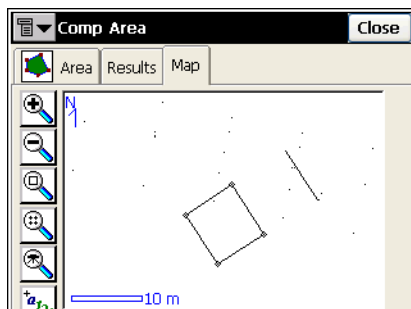


Figure 9-36. Area – Map Tab

Known Area

The Known Area task calculates the coordinate of a point/points that after being added to Point List form a polygon of known area. There are two methods: *Hinge* and *Line*.

Hinge

The Hinge method calculates the coordinates of a point, that meets the following conditions:

- it is located on a known azimuth taken from the first point of Point List;
- being added to the Point List between the first and the last points, forms a polygon of a known area.

To start the Hinge task, select **COGO ► Known Area ► Hinge**.

Known Area - Hinge

The *Area* tab contains the initial data of the Hinge task.

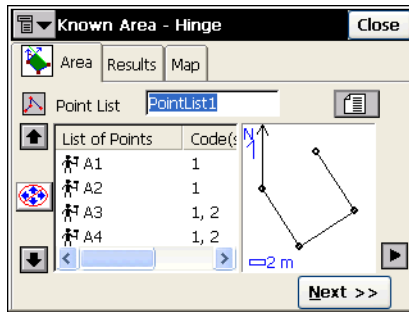




Figure 9-37. Known Area - Hinge – Area Tab 1

- *Point List*: the Point List name. Can be selected from the list of Point Lists or entered manually.
- *List of Points*: the list of currently selected vertices of the polygon.
- Up and down arrows move the highlighted point up and down in the order of the points.



NOTICE

For the correct operation of the application, the sides of the polygon should not cross each other.

-  : switches on/off the keyboard arrow keys that duplicate the arrows on the screen.
-  : closes the plot of the polygon. Only the list of points will be available.
- **Next**: opens the second screen under *Area* tab (Figure 9-38 on page 9-30).

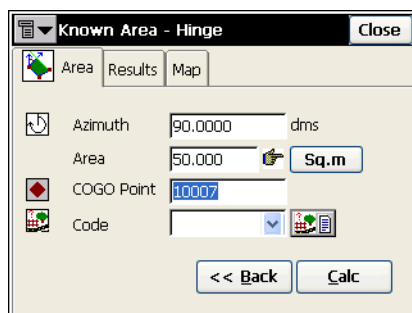



Figure 9-38. Known Area - Hinge – Area Tab 2

- *Azimuth*: the known azimuth from the first point in the list, where the hinge point is located.
- *Area*: the known area.
- **Sq. (Job Units)/Acres**: press to set the area units.
- *Cogo Point*: the name of the new point.
- *Code*: select the code from the drop-down menu, or press the  button to open the list of available attributes.
- **Back**: returns to the first *Area* tab.
- **Calc**: calculates the coordinates of the hinge point and displays it on the *Results* tab.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Point Lists*: opens the **List of Point Lists** screen to edit the point lists (see “Point Lists” on page 3-15).
- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

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

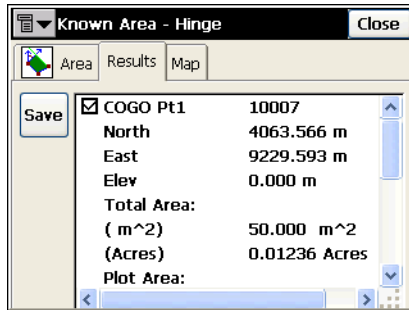


Figure 9-39. Known Area - Hinge – Results Tab

The *Map* tab shows the view of the polygon.

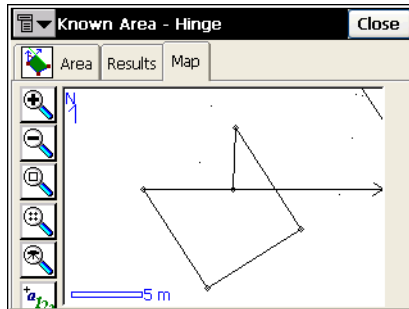


Figure 9-40. Known Area - Hinge – Map Tab

Line

The Line method computes the coordinates of two points that along with two other known points form a quadrilateral of known area.

To start the Line task, select **COGO ► Known Area ► Line**.

Known Area - Line



The *Area* tab contains the initial data of the *Line* task.

The screenshot shows the 'Known Area - Line' dialog box with the 'Area' tab selected. The fields are as follows:

Field	Value
Start Pt	A1
End Pt	49
Az1	120.0000
Az2	135.0000
Area	5001.915
Azimuth	45.0000
COGO Pt1	10005
COGO Pt2	10006

Buttons include 'Sq.m' for units, 'Calc' for calculation, and 'Close' at the top right.

Figure 9-41. Known Area - Line – Area Tab

- *Start Pt, End Pt*: the known starting and the ending points of the quadrilateral.
- *Az1, Az2*: the azimuths of the lines emanating from the Start and the End points (Line 1 and Line 2), to the calculated points, *COGO Pt 1* and *COGO Pt 2*, respectively.
- *Area*: the known area.
- **Sq. (Job Units)/Acres**: press to set the area units.
- **Azimuth/Parallel**: the azimuth of a line that will intersect Line1 at *COGO Pt 1* and Line2 at *COGO Pt 2* with an area of the quadrilateral equal to the known area. If **Parallel** is set, the line *COGO Pt 1*->*COGO Pt 2* will be parallel to the line defined by the Start and End Points.
- *COGO Pt1, COGO Pt2*: the names of the points.
- : the *Code* field. Select the code from the drop-down menu, or press the  button to open the list of available attributes.

- **Calc:** calculates the coordinates of the line points and displays it on the *Results* tab.

The menu bitmap in the upper-left corner of the screen displays a floating menu of the following items:

- *Edit Points:* opens the **Points** screen to edit the points (see “Points” on page 3-2).
- *Help:* opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

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

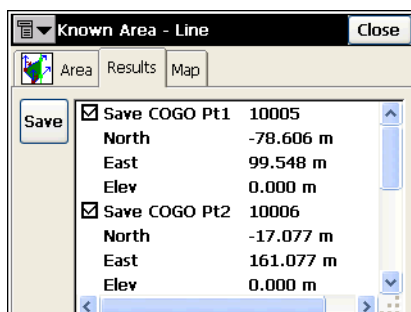


Figure 9-42. Known Area - Line – Results Tab

The *Map* tab shows the view of the quadrilateral.

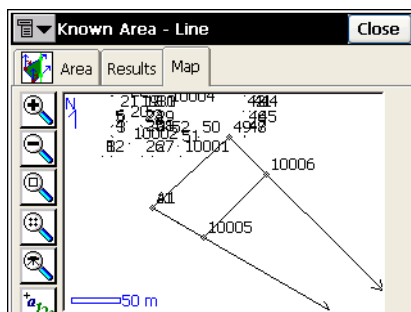


Figure 9-43. Known Area - Line – Map Tab

Transformations

The transformations include the three tasks: *Rotate*, *Translate* and *Scale*.

The menu bitmap in the upper-left corner of the screens displays a floating menu of the following items:

- *Edit Points*: opens the **Points** screen to edit the points (see “Points” on page 3-2).
- *Help*: opens the help files.

The thumbnail image to the left of the tabs for every COGO screen displays the type of task being performed. Tap this image to open a larger map image. Tap the large image to hide it.

Rotate

To rotate points, tap **COGO ▶ Transformations ▶ Rotate**.

The *Rotate* task rotates the selected points around a specific point.

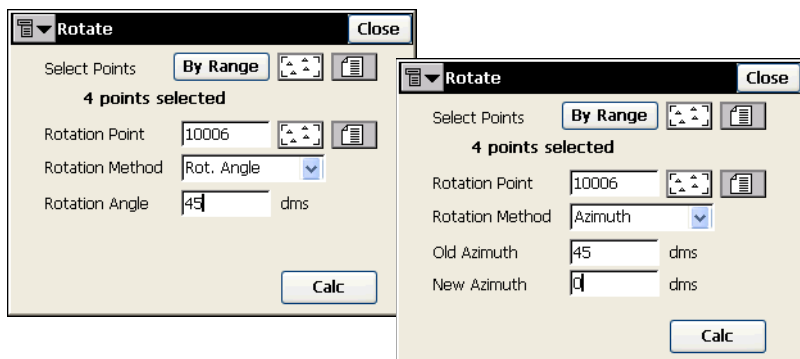


Figure 9-44. Rotate

- *Select points*: select points for Rotation from the map or the list, or by setting the point range. The point range can be set in the *Select Points by Range* screen opened by the **By Range** button. For a description of the *Select Points by Range* screen, see “Select Points by Range” on page 9-37.
- *Rotation Point*: sets the center of rotation.

- *Rotation Method*: sets if the rotation angle will be input directly (the Rot. Angle entry), or as a difference between the new and old azimuths/bearings.
- *Rotation Angle*: sets the value of the rotation angle.
- *Old Azimuth*: sets the value of the old azimuth.
- *New Azimuth*: sets the value of the new azimuth.
- **Calc**: press to rotate the selected points.

Translate

To translate a set of points, tap **COGO** ▶ **Transformations** ▶ **Translate**.

The *Translate* task moves a group of points.

The image shows two versions of the 'Translate' dialog box. Both have a 'Close' button in the top right and 'Select Points' controls (a dropdown and 'By Range' button) in the top left. Both indicate '4 points selected'.

Left Dialog:

- Translate By: *Az,Dist,Ht* (dropdown)
- Azimuth: 90.0000 dms
- Hz Dist: 100.000 m
- Vert Dist: 0.200 m
- Calc button

Right Dialog:

- Translate By: *Coords/Pts* (dropdown)
- From Pt: 10005
- To Crd: N -17.077 E 161.077
- Height: 0.2 m
- Calc button

Figure 9-45. Translate

- *Select points*: select points for the translation from the map or the list or by setting the point range. The point range can be set in the *Select Points by Range* screen, opened by the **By Range** button. Description of the *Select Points by Range* screen see “Select Points by Range” on page 9-37.
- *Translate By*: sets the method of translating, either *Coords/Pts* or *Az/Brg, Dist, Ht*.
- *Coords/Pts*: all the selected points will be moved in the same direction and distance as between the points (locations), set by the next two fields: **From Pt (From Crd)** and **To Pt (To Crd)**.

In the first case, define only the point name; in the second case, the local coordinates and the height of the location.

- *Az/Brg, Dist, Ht*: all the selected points will be moved in the specified direction by a specified distance. These parameters are set through the *Azimuth(Bearing)* field, *H_z Dist* and *Vert Dist* fields.
- **Calc**: press to translate the selected points.

Scale

To scale a set of points, tap **COGO ▶ Transformations ▶ Scale**.

The **Scale** task scales the distances of a range of points relative to a Base Point.

Figure 9-46. Scale

- *Select points*: select points for scaling from the map or the list, or by setting the point range. The point range can be set in the **Select Points by Range** screen opened by the **By Range** button. Description of the **Select Points by Range** screen see “Select Points by Range” on page 9-37.
- *Base Point*: sets the reference point for the scale transformation. Can be manually entered or, chosen from the map or from the list.
- *Scale Factor*: the scale factor for the coordinate transformation.
- *Scale Heights*: check this field if the height values should be scaled also.
- **Calc**: press to scale the selected points.

Select Points by Range

In the *Range of Points* field, the range can be set by enumeration of the points separated by commas, or by specifying the first and the last included point in the range. Press the **OK** button to save the specified range. The number of the selected points display on the corresponding task screen under the *Select Points* field.

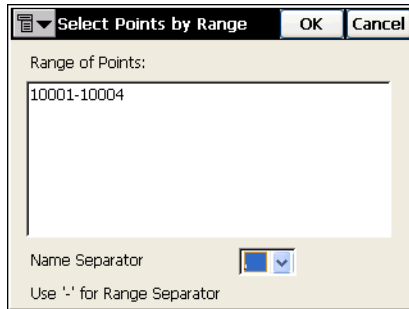


Figure 9-47. Select Points

Notes:

[illegible]

Help

The Help menu includes the following menu items:

- Contents
- Activate Modules
- About TopSURV

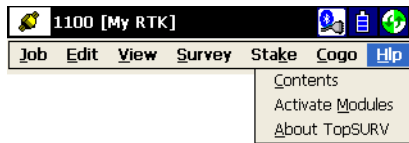


Figure 10-1. Help Menu

Contents

To open the TopSURV Help Contents screen, tap **Help ► Contents**.

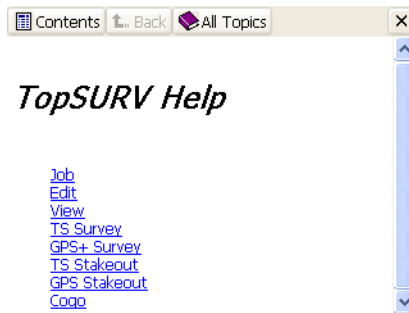


Figure 10-2. TopSURV Help Contents

All Topics opens the contents of help for other software embedded in the controller.

Activate Modules

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

The *Security* screen displays the device's numbers and the IDs which had been entered.

Security		OK	Cancel
Key Value 1	1455332323		
Key Value 2	1671415899		
Activation IDs			
TS	1400892398		
Robotic	1395392511		
GPS+	1396571135		
GIS	1400630270		
Roads	1404809214		
mmGPS	1400749053		

Figure 10-3. Security

- *Key Value 1,2*: the default key values of the controller
- *Activation IDs*: the codes needed to enable observation modes and usage of roads in TopSURV.
- **OK**: saves the ID values, and if allowed, provides access to the observation modes and creating and using roads (through the following submenus: **Edit ▶ X-Sect Templates**, **Edit ▶ Roads**, **Stakeout ▶ Roads**, and **Stakeout ▶ Slope**).

About TopSURV

To view basic information about TopSURV, click **Help ► About TopSURV**. The *About TopSURV* screen displays the software name, version, copyright and build date.



Figure 10-4. About TopSURV

Notes:

[illegible]

File Formats

The following sections describe the formats used in the import/export of files.

Point Coordinate Formats

The files used to import/export point data can be in different formats: text formats such as DXF, MOSS and many others, or binary formats such as DWG and CR5.

FC-4

The FC-4 format is as follows:

Name, Northing, Easting, Elevation, Code

Example:

```
101
12.32000
45.10000
23.12000
a
102
34.20000
9.40000
3.22000
```

```
103
2.33400
8.45000
45.00000
```

b
104
78.60000
45.00000
56.60000

FC-5

Example:

OutPut

```
_+BS_ f+012500000m_ g+011500000m_ h+000050000m_+PJ1_  
f+012000000m_ g+011002106m_ h+000049970m_+PJ11_ f+012000000m_  
g+011002106m_0063  
  
h+000049970m_+PJ12_ f+011994478m_ g+011004703m_  
h+000050025m_+PJ13_ f+011990588m_ g+011003698m_  
h+000049863m_+PJ2_ f+011994476m1051
```

InPut

```
_+BS_ x+012500000m_ y+011500000m_ z+000050000m_+PJ1_  
f+012000000m_ g+011002106m_ h+000049970m_+PJ11_ f+012000000m_  
g+011002106m_0063  
  
h+000049970m_+PJ12_ f+011994478m_ g+011004703m_  
h+000050025m_+PJ13_ f+011990588m_ g+011003698m_  
h+000049863m_+PJ2_ f+011994476m1051
```

GTS-6

GTS-6 coordinate input and output is the same format. Refer to the GTS-6 interface manual to confirm details.

The format of GTS-6 is the same as FC-5 coordinate input.

FC-6/GTS-7

The format of FC-6 is the same as GTS-7 coordinate format. The GTS-7 format is as follows:

ptno, X(easting), Y(northing), Z(elevation)

Example:

```
1,1000.0000,1000.0000,100.0000
2,990.0000,1010.0000,100.0000
101,994.8159,1000.9684,100.1130
102,993.9304,1007.7991,100.8000
103,998.5150,1009.6329,100.4026
104,1002.0648,1002.5682,100.3421
1001,1004.7210,997.6496,100.1153
1002,1003.7027,990.8382,100.7989
1003,998.7911,990.3286,100.4033
1004,997.3111,998.0951,100.3421
```

GTS-7 with strings

The GTS-7 with strings format is as follows:

ptno, X(easting), Y(northing), Z(elevation), pt code, string

Example:

```
1,1000.0000,1000.0000,100.0000,STN,001
2,990.0000,1010.0000,100.0000,STN,001
101,994.8159,1000.9684,100.1130,STN,002
102,993.9304,1007.7991,100.8000,STN,001
103,998.5150,1009.6329,100.4026,STN,002
104,1002.0648,1002.5682,100.3421,STN,001
1001,1004.7210,997.6496,100.1153,PT,09
1002,1003.7027,990.8382,100.7989,PT,05
1003,998.7911,990.3286,100.4033,PT,09
1004,997.3111,998.0951,100.3421,PT,05
```

GT

The GT Format is as follows:

0 Code Name North East Elev 0 0

Example:

0	a	101	12.320	45.100	23.120	0 0
0		102	34.200	9.400	3.220	0 0
0	b	103	2.334	8.450	45.000	0 0
0		104	78.600	45.000	56.600	0 0

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. Refer to Autodesk's Website for details:

<http://usa.autodesk.com/adsk/servlet/item?id=752569&siteID=123112>

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^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.

SHP

SHP is an ArcView® GIS data format used to represent a set of geographic features.

Refer to the following website for details:

<http://dl1.maptools.org/dl/shapelib/shapefile.pdf>

CMM

The ASCII format file that consists of two files with extensions *.cor and *.lev containing coordinates and heights, respectively.

Land XML

LandXML is a standard data exchange format.

Refer to LandXML Website for details:

<http://www.landxml.org/schema/landxml-1.0/Documentation/LandXMLDoc.htm>

CR5

This is a file format of TDS-48 Coordinate file. The TDS Coordinate File is a binary file consisting of a 38 byte header,

followed by coordinate point records 45 bytes in length.

CR-5 format is as follows:

Header:

Bytes 1- 10 is the file name in ASCII

Bytes 11- 20 are not used

Bytes 21- 34 is the starting point number in MS long integer format. This record is -1 if the file is non-sequential

Bytes 35- 38 is the last point number in MS long integer format

Coordinate Point Records:

Bytes 1- 4 is the point number in MS long integer format.

This record is -1 if the point is unused (sequential files only)

Bytes 5- 12 is the northing of the point in MS double precision real

Bytes 13- 20 is the easting of the point in MS double precision real

Bytes 21- 28 is the elevation of the point in MS double precision real

Bytes 29- 45 is the point descriptor in ASCII

MOSS GENIO

Example:

```

GENIO D:J0119A
001,FORMAT(3F14.4)
003,ORDR,4=1,1,2,3
080,PT01,7=3
    1002.6092    1013.9337    2.3165
    1007.5266    992.8522    1.9564
    0.0000    0.0000    0.0000
080,PT02,7=3
    991.2378    1002.7609    1.5545
    993.2974    1014.3845    2.3475
    0.0000    0.0000    0.0000
080,CD02,7=3
    1002.6079    1013.9361    2.3148
    0.0000    0.0000    0.0000
080,CD03,7=3
    1007.5318    992.8488    1.9562
    0.0000    0.0000    0.0000
080,OCC,7=3
    1000.0000    1000.0000    0.0000
    0.0000    0.0000    0.0000
080,PT01,7=3
    1002.6079    1013.9361    2.3148
  
```

1007.5318	992.8488	1.9562
991.2376	1002.7602	1.5557
993.2994	1014.3841	2.3509
0.0000	0.0000	0.0000

999

FINISH

NEZ

NEZ format is as follows:

Name, North, East, Elev, Code

Example:

101,12.3200,45.1000,23.1200,a
 102,34.2000,9.4000,3.2200,
 103,2.3340,8.4500,45.0000,b
 104,78.6000,45.0000,56.6000,

This format is also used for PTL coordinate system. In this case the NEZ format is:

Name, North, East, Elev, Code, First Reference Point Name, Second Reference Point Name

NEZ with strings

The NEZ with strings coordinate format is as follows:

Name, North, East, Elev, Code, String

Example:

101,12.3200,45.1000,23.1200,a,123
 102,34.2000,9.4000,3.2200,,
 103,2.3340,8.4500,45.0000,b,
 104,78.6000,45.0000,56.6000,,

This format is also used for PTL coordinate system. In this case the format is:

Name, North, East, Elev, Code, String, First Reference Point Name, Second Reference Point Name

Custom Format with Quality Control information

This format contains a set of user-defined fields in the user-defined order.

The following fields are available:

- Name
- E(Lon)
- N(Lat)
- Ell ht
- Elevation
- Notes
- Codes
- Codes&Strings
- Codes&Attributes
- FullCodes
- Date
- Solution Type
- VRMS
- HRMS
- Time
- PDOP
- HDOP
- VDOP
- Num. of GPS
- Num. of GLONASS
- Design Elevation
- Station North
- Station East
- Station Elevation
- Delta North
- Delta East
- Delta Elevation

Code Libraries

The following sections describe the code formats used in the import/export code libraries.

Topcon Data Dictionary Format (TDD)

Topcon's Data Dictionary Format supports String, Integer, Float and List types as fields of the codes. The Draw properties is also supported. All exported codes are stored in the one file. Each code is placed on a new line.

The format is as follows:

```
CodeName#1<Point?R*G*B?MStyle|Line?R*G*B?DashStyle?
Width> (field#1(FIELD_TYPE),... field#N(FIELD_TYPE))
```

```
CodeName#2<Point?R*G*B?MStyle|Line?R*G*B?DashStyle?
Width> (field#1(FIELD_TYPE),... field#N(FIELD_TYPE))
```

Comments:

Point, Line – types of the supported objects

R,G,B – color of the objects with such code

MStyle – mark style of the points with such code:

0 = Dot

1 = Filled Rectangle

2 = Filled Diamond

3 = Filled Circle

4 = Filled Triangle

5 = Rectangle

6 = Diamond

7 = Circle

8 = Triangle

9 = Cross

DashStyle – dash style of the lines with such code:

0 = Solid

1 = Dash

2 = Dot

3 = Dash Dot

4 = Dash Dot Dot

Width – width of the lines with such code

FIELD_TYPE can be: String, Integer, Float, List.

For FIELD_TYPE List we use next format:

List(item#1,...,item#N).

Example:

```
test_code(menu_item<Point?255*128*255?3|Line?255*255*128?3?1>(List(blue,
green,red)), text_item(String), int_item(Integer), real_item(Float))
```

XML File as Storage of the Code Library (XML)

The XML Code Library format supports String, Integer, Float and List types as fields of the codes. The format also supports Layers dictionary and draw information for each code. All exported codes are stored in one file. The format uses the XML syntax and is as follows:

Example:

```
<?xml version="1.0"?>
<CodeDictionary version="1.1">
  <Layers>
    <Layer name="lay1" active="1" plot="1" notes="first">
      <Params type="Line">
        <DrawParams colorRValue="87" colorGValue="65" colorBValue="189"
          dashStyle="1" width="2"/>
      </Params>
    </Layer>
    <Layer name="lay2" active="1" plot="1" notes="second">
      <Params type="Line">
        <DrawParams colorRValue="153" colorGValue="98" colorBValue="156"
          dashStyle="2" width="3"/>
      </Params>
    </Layer>
    <Layer name="0" active="1" plot="1">
```

```
<Params type="Line">
  <DrawParams colorRValue="128" colorGValue="128" colorBValue="128"
    dashStyle="0" width="1"/>
</Params>
</Layer>
</Layers>
<Code name="code1" layer="0">
  <Params type="Point">
    <DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
      markStyle="-1"/>
  </Params>
  <Params type="Line">
    <DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
      dashStyle="-1" width="1"/>
  </Params>
  <Attributes/>
</Code>
<Code name="code2" layer="0">
  <Params type="Point">
    <DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
      markStyle="-1"/>
  </Params>
  <Params type="Line">
    <DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
      dashStyle="-1" width="1"/>
  </Params>
  <Attributes/>
</Code>
<Code name="code3" layer="0">
  <Params type="Point">
    <DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
      markStyle="-1"/>
  </Params>
  <Params type="Line">
    <DrawParams colorRValue="255" colorGValue="255" colorBValue="255"
      dashStyle="-1" width="1"/>
```



```

    </Params>
    <Attributes/>
  </Code>
</CodeDictionary>

```

Data Base Format as Storage of the Code Library (DBF)

This format supports String, Integer, Float types as fields of the codes. The List type is unsupported. Each exported code is stored in a separate file. The format uses DBF syntax. This is a binary format.

Roads Formats

The following sections describe the road formats used in the import/export of road data.

SSS Road

Alignments are uploaded as elements, and start with the START definition which includes the starting chainage and a coordinate. The elements are: PT, STRAIGHT, ARC or TRANSITION.

The general format for each record is:

KEYWORD nnnn, nnnn [,nnnn]

where:

START chainage, easting, northing

STRAIGHT bearing, distance

ARC radius, length

SPIRAL radius, length

PT easting, northing[, radius[, A1, A2: clothoid length]]

Example 1:

START 1000.000, 8.8888, 199.1200

STRAIGHT 25.0000, 48.420

SPIRAL 20.000, 20.000
 ARC 20.000, 23.141
 SPIRAL 20.000, 20.000
 STRAIGHT 148.3000, 54.678

Example 2:

START 1000, 1050, 1100
 PT 1750, 1300, 100, 80, 80
 PT 1400, 1750, 200
 PT 1800, 2000

TDS Road

TDS road file has a file extension of “.RD5”. This format is divided into eight sections. Each section is started with a line that has a two letter code and is followed by exactly 50 '+' characters. These section header lines have to be included in the file even if there is no definition under them. For example, super-elevation and widening are not required, but their header lines must exist. Each header line may be followed by component definitions of that section.

Section codes:

HR : Start Horizontal alignment
 VR : Start Vertical alignment
 XR : Start Right Template
 XL : Start Left Template
 SR : Start Right Super Elevation
 SL : Start Left Super Elevation
 WR : Start Right Widening
 WL : Start Left Widening

Example:

HR+++++
 HL,25.49380,630.000
 HS,-1.000000,1000.000,200.000,R,T

```

HC,-1.000000,1000.000,895.900,R
HS,-1.000000,1000.000,200.000,R,C
HL,-1.00000,250.000
VR+++++
VG,271.840,-2.000
VC,500.000,-2.000,1.800
VG,1254.060,1.800
VG,150.000,1.800
XR+++++
RT,100,0.000,NORMAL
XL+++++
LT,100,0.000,NORMAL
SR+++++
RS,106,30.000,108,30.000,-2.000,-6.000,0,0,0.000,0.000
RS,117,25.900,119,25.900,-6.000,-2.000,0,0,0.000,0.000
SL+++++
LS,104,30.000,108,30.000,-2.000,6.000,0,0,0.000,0.000
LS,117,25.900,121,25.900,6.000,-2.000,0,0,0.000,0.000
WR+++++
RW,104,35.000,105,35.000,22.000,14.000,0
RW,106,35.000,107,35.000,14.000,22.000,0
WL+++++
LW,104,35.000,105,35.000,22.000,14.000,0
LW,106,35.000,107,35.000,14.000,22.000,0

```

Component definitions:

Horizontal Alignments

HL,% .5lf,% .3f	Horizontal Line	
	Azimuth of line (DMS)	% .5lf
	(-1 if tangent to previous segment)	
	Horiz distance of line (ft or meter)	% .3f
HC,% lf,% .3f,% .3f,% c	Horizontal Curve	
	Tangent azimuth	% lf

(-1 if tangent to previous segment)

Radius %.3f

Arc length %.3f

Turn (R-Right or L-Left) %c

HS, %lf, %.3f, %.3f, %c, %c Horizontal Spiral

Tangent azimuth %lf

(-1 if tangent to previous segment)

Radius %.3f

Arc length %.3f

Turn %c (R-Right or L-Left)

Direction %c (T-Tangent or C-Curve)

Vertical Alignments

VG, %.3f, %.3f Vertical Grade

Horiz distance %.3f

Grade %.3f

VC, %.3f, %.3f, %.3f Vertical Parabolic Curve

Horiz distance %.3f

Begin grade %.3f

End grade %.3f

Cross section Templates

RT, %d, %.3f, %s Right or Left Cross Section Template

LT, %d, %.3f, %s

Station number %d

Station offset %.3f

Template name %s

Super Elevation

Right or Left Super Elevation

RS, %d, %.3f, %d, %.3f, %.3f, %.3f, %c, %c, %.3f, %.3f or

Start Station number	%d
----------------------	----

Start Station effect 07.2

End Station number	%d
--------------------	----

End Station effect 07.2

Start clone	0% 3f
-------------	-------

End slope $\sigma_c/3f$

End of SE flag	%c
0	0.00
1	0.00
2	0.00
3	0.00
4	0.00
5	0.00
6	0.00
7	0.00
8	0.00
9	0.00
10	0.00
11	0.00
12	0.00
13	0.00
14	0.00
15	0.00
16	0.00
17	0.00
18	0.00
19	0.00
20	0.00
21	0.00
22	0.00
23	0.00
24	0.00
25	0.00
26	0.00
27	0.00
28	0.00
29	0.00
30	0.00
31	0.00
32	0.00
33	0.00
34	0.00
35	0.00
36	0.00
37	0.00
38	0.00
39	0.00
40	0.00
41	0.00
42	0.00
43	0.00
44	0.00
45	0.00
46	0.00
47	0.00
48	0.00
49	0.00
50	0.00
51	0.00
52	0.00
53	0.00
54	0.00
55	0.00
56	0.00
57	0.00
58	0.00
59	0.00
60	0.00
61	0.00
62	0.00
63	0.00
64	0.00
65	0.00
66	0.00
67	0.00
68	0.00
69	0.00
70	0.00
71	0.00
72	0.00
73	0.00
74	0.00
75	0.00
76	0.00
77	0.00
78	0.00
79	0.00
80	0.00
81	0.00
82	0.00
83	0.00
84	0.00
85	0.00
86	0.00
87	0.00
88	0.00
89	0.00
90	0.00
91	0.00
92	0.00
93	0.00
94	0.00
95	0.00
96	0.00
97	0.00
98	0.00
99	0.00
100	0.00

(0 End station number and E

1. length of SE interval is in field 4)

Hinge on center or edge 9/20

of road (0 center 1 edge)

Parabolic transition length

at start of SE

Barbelic tren

at end of SE

0% 3f 0% 3f 0% 3f 0% or

LW % d % 3f % d % 3f % 3f % 3f %

Start Station number

Start Station effect 07.2

End Station number	Old
--------------------	-----

End Station effect 0% 2

Width at start of widening % 3f

Width at end of widening % 3f

End of widening flag 0%

(0-End station number and End station offset are in fields 3 and 4 1-length of widening interval is in field 4)

MC Road

MC road file has a file extension of “.RD3” and is a binary file.

LandXML Road

LandXML is a standard data exchange format.

Refer to LandXML website for details:

<http://www.landxml.org/schema/landxml-1.0/Documentation/LandXMLDoc.htm>

TopSURV Road

TopSURV road format consists of three files:

1. *.thl: contains horizontal elements of the road and must start with the START definition which includes the starting chainage and a coordinate.

The elements are: PT, STRAIGHT, ARC or TRANSITION.

The general format for each record is:

KEYWORD nnnn, nnnn [,nnnn]

where:

START chainage, easting, northing

STRAIGHT bearing, distance

ARC radius, length

SPIRAL radius, length

PT easting, northing[, radius[, A1, A2]]

(A1, A2 : clothoid length)

Example1:

START 1000.000, 8.8888, 199.1200

STRAIGHT 25.0000, 48.420

SPIRAL 20.000, 20.000
 ARC 20.000, 23.141
 SPIRAL 20.000, 20.000
 STRAIGHT 148.3000, 54.678

Example 2:

START 1000, 1050, 1100
 PT 1750, 1300, 100, 80, 80
 PT 1400, 1750, 200
 PT 1800, 2000

2. *.tvl: contains vertical elements of the road (vertical curves) and require chainage, level and curve length.

Starting and ending curve lengths should be zero.

The format is:

chainage, level, length

Example:

1000.000, 100.000, 0.000
 1100.000, 125.000, 50.000
 1250.000, 100.000, 60.000

3. *.trd: contains cross sections:

The format is:

Chainage, Template name, Turn (Left or Right), Cut, Fill,
 Segment name, Horizontal Offset, Vertical Offset

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
LINJAZ   ml      6101005      0.000
ELEM      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:

TH : Template Header format: TH,%d,%d,%d,%d

Number of segments %d

Slope cut %.3f

Slope fill %.3f

TS : Template Segment format: TS,%d,%d,%d,%d,%d,%d,%d,%d

Segment length %.3f

Vertical dist or %.3f

Slope %

Vertical flag %c (0-Slope % is in
field 2

1-Vertical dist is in field 2)

Segment name %s

TopSurv Template

TopSURV Template format is as follows:

Template Name, Code, Offset, Height

Example:

SIMP, 1, 1.000, 0.000

NAME, EP, 1.000, -0.250

NAME, 1, 0.000, 0.150

NAME, 2, 0.500, 0.000

NAME, 3, 0.200, -1.000

NAME, 4, 0.300, 0.000

Localization Format

GC3

This is a binary file containing localization data.

Roads Survey Formats

The following sections describe the data formats used in the export of road raw data.

X-Section Surveys

The format is as follows:

chainage, offset, level [,code]

Example:

0.000,-4.501,18.527

0.000,-3.500,18.553

0.000,0.000,18.658,CL01

0.000,3.500,18.553

0.000,5.501,18.493

12.669,-4.501,18.029

12.669,-3.500,18.059

12.669,-0.000,18.164,CL01

12.669,3.500,18.059

12.669,5.501,17.999

Find Station Report

The format is as follows:

FindChainageReport:

Reference road

FindChainage:

PointName Chainage Offset North East Elev [Cut]

Raw Data Formats

The following sections describe the formats used in the export of raw data.

FC-5

Refer to the FC-5 interface manual to confirm details on FC-5 data format.

Example:

```
_!SAMPLE_"SOMEONE_#GX0021_$06/01/
95_%24C_&990HP_'X1000_(_)1.200_+A001_ a+2755858d_ b0881003d
c+00010942m_*NS001_,1.200_+A002_ a+0006
3265752d_ b0952330d c+00003366m_*NS001_,1.200_+A003_ a+0420820d_
b0894549d c+00006913m_*NS001_,1.200_
1002
```

GTS-6

The data is GTS-6 and FC-5 unformatted data.

Refer to the GTS-6 interface manual to confirm details.

Example:

```
_!SAMPLE_"SOMEONE_#GX0021_$06/01/
95_%24C_&990HP_'X1000_(_)1.200_+A001_
?+00010942m0881003+2755858d+00010936***+***+**054_*NS001_,0064
1.200_+A002_
?+00003366m0952330+3265752d+00003351***+***+**063_*NS001_,1.200_
+A003_ ?+00006913m0894549+0420820d+00006912***+***+**1039
055_*NS001_,1.200_
2037
```

FC-6/GTS-7

The format of the GTS-7 data is the same as the FC-6 data format.

The general format of each record is as follows:

CONTROL WORD field1 ,fieldn

Where:

CONTROL WORD is terminated by a space.

Fields 1 to n-1 are terminated by commas.

Field n is terminated by the end-of-line.

Each field may be preceded by a number of space characters which should be ignored but may contain spaces after the first non-space character.

GTS-600 v3.1

JOB	job name, description
DATE	date, time
NAME	surveyors name
INST	instrument id
UNITS	Meter/Feet, Degree/Gon
SCALE	grid factor, scale factor, elevation
ATMOS	temp, press
STN	ptno, ins ht, stn id
XYZ	X(easting), Y(northing), Z(elevation)
BKB	ptno, backsight bearing, backsight angle
BS	ptno[, target height]
FS	ptno, target height, pt code[,string number]
SS	ptno, target height, pt code[,string number]
CTL	control code[,pt code 2[,string no 2]](optional)
HV	HA, VA
SD	HA, VA, SD

OFFSET	radial offset, tangential offset, vertical offset
PTL_OFF	offset along ref. line, offset perpendicular to line, vertical offset
NOTE	comments
MLM	from point, to point, delta HD, delta VD, delta SD
RES_OBS	ptno, target height, observation count
XYZ	if present follows the STN record
BKB	if present follows the BKB record or STN record if no BKB.
CTL	if present follows the FS or SS header record.
HV, SD or HD	must follow a BS, FS or SS header and follows the CTL if present.
OFFSET	may follow any SD or HD record.

Example:

```

GTS-600  v3.1
JOB      TEST1,TOPO COLLECTION
NAME     FRED
INST     GTS-7
UNITS    M,D
STN      1,1.500,STN
SS       1001,1.500,BLDG,01
SD       0.0000,84.4650,9.746
SS       1002,1.500,BLDG,01
SD       0.0000,84.4650,9.746
SS       1003,1.500,BLDG,01
SD       0.0000,84.4650,9.747
SS       1004,1.500,BLDG,01
CTL      CL
SD       359.1740,84.4650,9.747
SS       1005,1.500,NS

```

SD 359.1740,84.4650,9.747
SS 1006,1.500,NS
SD 359.1740,84.4650,9.747
FS 2,1.500,NS
SD 179.1740,84.4650,9.747
STN 2,1.500,STN

GTS-600 v3.1

JOB TEST2, SET COLLECTION

NAME FRED

INST GTS-7

UNITS M,D

STN 1,1.500,STN

XYZ 1000.000,1000.000,100.000

BKB 2,315.0000,0.0000

BS 2,1.500

HV 344.0620,86.3810

FS 101,1.500,STN

SD 325.3420,88.4750,5.275

FS 102,1.500,STN

SD 7.0610,85.2210,9.914

FS 103,1.500,STN

SD 36.1350,87.3800,9.755

FS 104,1.500,STN

SD 83.4730,84.0410,3.313

FS 104,1.500,STN

SD 263.4820,275.5530,3.313

FS 103,1.500,STN

SD 216.1430,272.2150,9.755

FS 102,1.500,STN

SD 187.0650,274.3730,9.916

FS 101,1.500,STN

SD 145.3520,271.1510,5.275

BS	2,1.500
HV	164.0640,273.2340

Land XML

LandXML is a standard data exchange format.

Refer to LandXML Website for details:

<http://www.landxml.org/schema/landxml-1.0/Documentation/LandXMLDoc.htm>

TDS RawData

Example:

```
JB,NMA_meas,DT03-15-02,TM15:17:53
MO,AD0,UN1,SF1.000000,EC0,EO0.0000
SP,PN1,N 90.0000,E 200.0000,EL 50.0000,--man
OC,OP1,N 90.0000,E 200.0000,EL 50.0000,--man
LS,HI1.0100,HR0.0000
--user has entered the following Azimuth
BK,OP1,BP2,BS0.0000,BC65.4618
--SS,OP1,FP2,AR65.4618,ZE102.0935,SD4.7720,--DOOR
LS,HI1.0100,HR2.5600
SS,OP1,FP3,AR61.1834,ZE84.2723,SD6.5740,--BEN
```

Refer to the GTS-600 Series, GTS-700 Series, GTS-800 Series, GMT-100 Series Reference Manual for details.

MOSS Survey

Both traverse and detail raw data formats can be exported.

Example:

```
SURVEY D:\J0119A
017,DMS
190,,,DECR,0900000
180,,,9000,,1000.000,1000.000,0.000
200,9000,9001,SDVA,3595958,,,1.600,,1.000000
201,,,PT01,0103620,14.194,0870623,0.000,,,1001
201,,,PT01,1333115,10.386,0880200,0.000,,,1002
201,,,PT02,2872920,9.187,0901702,0.000,,,1003
201,,,PT02,3350057,15.887,0871812,0.000,,,1004
201,CD2,02,PP01,0103555,14.196,0870649,0.000,,,1005
201,CD2,03,PP01,1333053,10.392,0880209,0.000,,,1006
201,,,P101,2872902,9.187,0901634,0.000,,,1007
201,,,P101,3350118,15.886,0871727,0.000,,,1008
999
FINISH
```

Berlin GNSS

This format is a German format that consists of two separate files of quality report: GNSS-Messprotokoll and GNSS-Mittelwerte.

Scanning Data Format

Scanning data includes an orientation file, control points for orientation and Camera calibration file for DI-3000.

DI-3000

Project:

Header(FIELD_SCAN_FSC_FILEVER1.0)

*Text Format

Orientation Information File:

Name of Image

Size of Image Width[pixel] Height[pixel]

Number of Image Coordinates of Orientation Points

Image coordinates of Orientation point:

: Point Name,X,Y

*Text Format

Control Point(Terrain) For Orientation File:

Point Name,X,Y,Z

*CSV Text Format

Results of Orientation Calculation(Single Orientation):

ERR MAX,X Maximum Error,Y Maximum Error, 0.000000

ERR RMS,X Standard Dev[Pixel],Y Standard Deviation[Pixel], 0.000000

Discrepancy of each orientation point[Pixel]

*Text Format

Camera Calibration For Digital Camera:

7.955772 // focal length [mm]

1.866217 // x of principal point [m]

1.375943 // y of principal point [m]

2 // distortion model

4 // number of distortion parameters

3.596956e-003 // distortion parameter 1

-1.414950e-004 // distortion parameter 2

-1.786501e-004 // distortion parameter 3

4.303863e-004 // distortion parameter 4

0.005600 // x resolution [mm/pixel]

0.005600 // y resolution [mm/pixel]

0 // number of fiducial marks

0 // number of radial distortion values

*Text Format

Setting Information:

Instrument Point,X,Y,Z

Backsight Point,X,Y,Z

mh 0.0000 0.0000 IH(Instrument Height)

*Text Format

Point Clouds(Scanning Data):

Header(SFILE_VER01)

point name,X,Y,Z,Wide Image name,Tele Image Name,,Layer Name,Point Attribute

*Binary Format(Fix)

Point Clouds(Scanning Data):

point name,X,Y,Z,Layer Name

*CSV Format

Job History

Job history can be exported to the CSV file or text report.

CSV

All job history data are represented in text format with comma separated values.

Report

In the current version only resection data are output.

The completed resection measurements prints out or writes to a file in the order of measuring. Also, all changes made when editing raw data are visible in the report file.

Example:

+++ TopSURV Version 5.04 +++ Date, Time

=====

Resection

=====

Job : Job-Name

Occ-point name : PPPPPPPPP (E: EEEEEEE.EEEE[m], N: NNNNNNN.NNNN[m], Z: ZZZZ.ZZZZ[m])

Instr. height : ii.iiii[m]

Surveyor : name

Temperature : TT.T[°C]

Pressure : xxx (mmHg)

Date/Time : JJJJ-MM-DD HH:MM:SS

Dim-Type : 2D or 3D

Orientation : ggg.gggg[gon] (Standarddev.: dg.gggg[mgon])

OCC.Std.deviation : dE: dE[mm] dN: dN[mm] dZ: dZ[mm]

Scale : fix/calculated 1.00000000

Backbearing-Name Hz [gon] V [gon] SD [m] dHz[mgon] dV[mgon] dS[m] tH[m]

East [m] North [m] Height [m] dE[m] dN[m] dZ[m]
USE(HVSD)

BKB1ppppppppppp HHH.HHHH VVV.VVVV DDDD.DDDD dH.HHHH
dV.VVVV dS.SSS t.ttt

EEEEEE.EEEE NNNNNNN.NNNN ZZZZ.ZZZZ dE.EEE dN.NNN
dZ.ZZZ HVSD

BKB2ppppppppppp HHH.HHHH VVV.VVVV DDDD.DDDD dH.HHHH
dV.VVVV dS.SSS t.ttt

EEEEEE.EEEE NNNNNNN.NNNN ZZZZ.ZZZZ dE.EEE dN.NNN
dZ.ZZZ HV-

BKB3ppppppppppp HHH.HHHH VVV.VVVV DDDD.DDDD dH.HHHH
dV.VVVV dS.SSS t.ttt

EEEEEE.EEEE NNNNNNN.NNNN ZZZZ.ZZZZ dE.EEE dN.NNN
dZ.ZZZ HVSD

BKB4ppppppppppp HHH.HHHH VVV.VVVV DDDD.DDDD dH.HHHH
dV.VVVV dS.SSS t.ttt

EEEEEE.EEEE NNNNNNN.NNNN ZZZZ.ZZZZ dE.EEE dN.NNN
dZ.ZZZ HVSD

Notes:

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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Notes:

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Notes:

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