

ForeSight Processing Guide

CHaMP Field Season 2013

Survey data from the Total Station (.job and .raw files) are not immediately readable in ArcGIS (software used for most of the topographic and RBT processing). ForeSight is CAD-style software used for processing raw survey files used to convert raw total station data into a GIS-readable format. You must open .job and/or .raw files in ForeSight before continuing to process topographic data in GIS.



NOTE: Make sure to connect the ForeSight Hardware Key (i.e. USB dongle) before starting ForeSight. Do not remove the Hardware Key while ForeSight is open.

Contents

ForeSight Basics	3
General CHaMP Workflow for ForeSight	3
Start New ForeSight Project.....	3
Navigating Foresight 2.2.5	4
Map (Plan) View	4
Coordinate List View	5
Terrain View	5
Common Editing Tasks in ForeSight	6
Point YX Locations.....	6
Moving Points (and Line Vertices)	6
Deleting Points (and Line Vertices)	6
Point Elevations	6
Check/Change Point Elevation Values	6
Point Descriptions.....	7
Checking/Changing Point Descriptions in Coordinate List View	7
Changing a Group of Point Descriptions	7
Changing Point Descriptions by Specific Point(s).....	8
Adding New Lines.....	8
Draw Lines Method.....	9
List of Points Method	10
Edit Existing Lines.....	10
Connecting Line Segments	10
Deleting Line Segments.....	11
Exporting Data from ForeSight	12
Advanced Tasks in ForeSight	13
Repairing Alpha-Numeric Point Names in ForeSight	13
Background	13
Steps.....	13
Adjusting Prism-Rod Height Post-Survey in ForeSight 2.2.5.....	16
Background	16
Steps.....	16

ForeSight Basics

General CHaMP Workflow for ForeSight

The general workflow used in CHaMP is as follows:

1. Import Survey Data from Total Station (.job/.raw files).
2. Preliminary Data Evaluation
 - a. Shifts in Survey Data
 - b. 3D Terrain/TIN
3. Point/Object Editing
 - a. Point XY and Z
 - b. Description Codes
4. Linework editing
 - a. Auto Linework - used to create and edit sets of lines
 - b. Edit Sets/Lines
5. Export Survey Data (as DXF file)

Start New ForeSight Project

A ForeSight Project is similar to an ArcGIS Map Document. It is used to keep track of edits and layout changes made in ForeSight.

1. Open ForeSight and use the Wizard to **Create a new Project**:

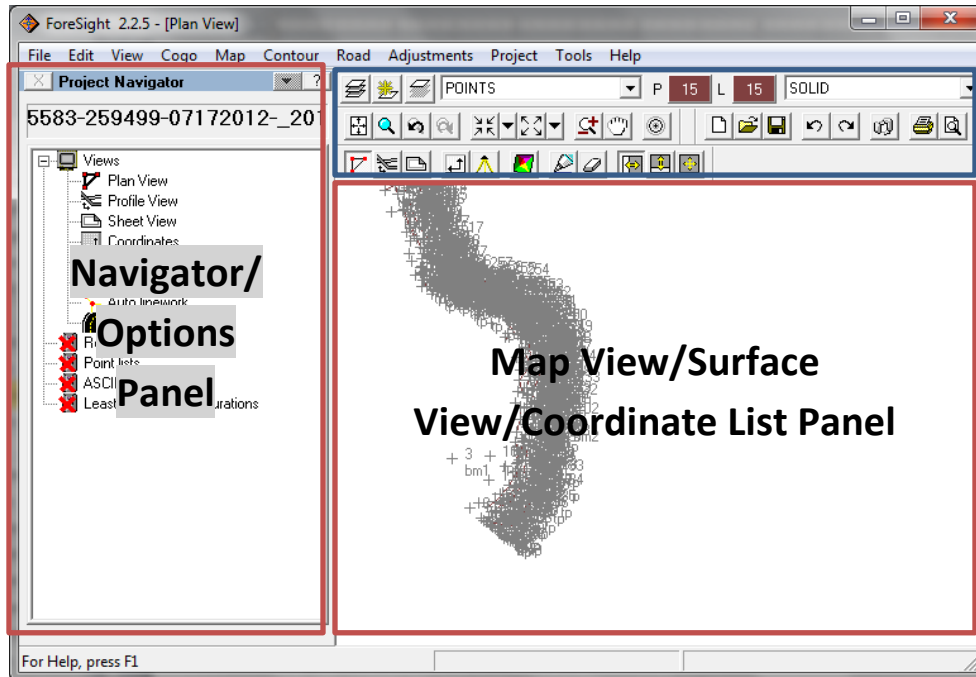


2. Set the Data Source to **TDS JOB and RAW files (from Survey Pro CE)**. Click Next.
3. Select the .job file for the survey. The raw file should automatically populate when the .job file is selected. Ignore Control file (should remain blank). Click Next.
4. Enter the project name: *SiteName_YYYYMMDD*. The project folder should be set to the *Topo* folder for the site visit. Ignore Project Template. Click Next.
5. Click Finish. You may uncheck the New Project Task List (this does not apply for CHaMP Surveys).

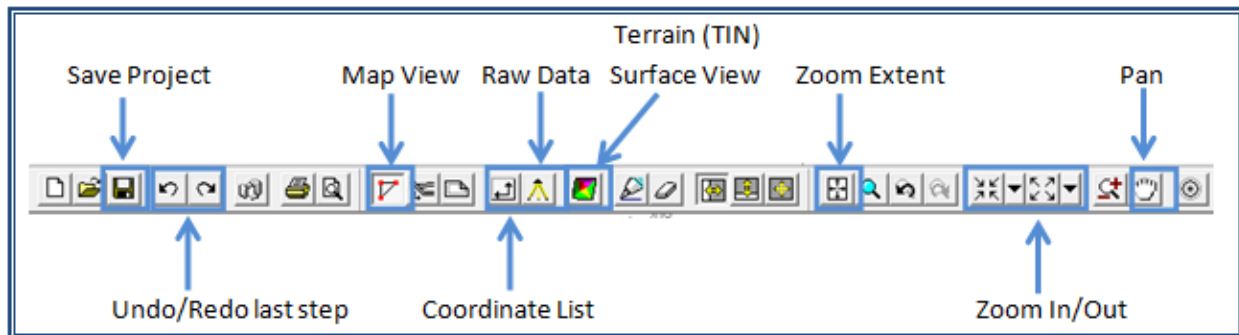
Your survey should now be displayed on the screen.

Navigating Foresight 2.2.5

ForeSight Window:



Buttons and Tools:



Map (Plan) View

Map view provides a 2-D view of the survey area.

- To change the color of the background, points or lines:
 - Open the File->User Options and select the Graphic type you wish to update the color.
- To temporarily hide the point Descriptions/Point Numbers:
 - Open View and select *Non Plotting Point Labels* to uncheck it. Select *Non Plotting Point Labels* again to return the point description codes and numbers.
- You can use the scroll wheel on the mouse to zoom in and out of the map.
- Use the Zoom Extent button to view the entire survey area.

Coordinate List View

This view provides a spreadsheet list of the points and their attributes in the survey.

- Clicking on a column heading will sort the list by the values in that column. Clicking on the column heading a second time will reverse the sorting of the list by the values in that column.

Terrain View

The Terrain view provides a 3D representation of the survey surface. This is helpful for getting a feel of the 3D aspects of the data, but is not the actual surface that will be used in GIS.

- To zoom in and out in Surface View, click both mouse buttons and move mouse towards you to zoom out and away from you to zoom in.
- Left mouse button pivots the surface.
- Right mouse button moves it up or down on the screen.
- You can change the color, shading and vertical exaggeration of the surface.

Common Editing Tasks in ForeSight

Point YX Locations

If you find a point or line vertex that is in the incorrect location, you can move or delete the point.

IMPORTANT – Moving Survey Points

In general, moving survey points is discouraged, as they represent a sampled location of the topography, however, in the case where a line vertex crosses a breakline (within ~5cm), it is acceptable to move the point to the correct side of the breakline.

In all other cases, you should delete the point from the survey, as it should be considered an erroneous point.

Moving Points (and Line Vertices)

1. Go to *Map -> Edit Points*.
2. Click on the point you want to move.
3. Under the **Location** tab, check the “Change Location of this Point” box.
4. Copy the value in the **Elevation Box** (Highlight the value and press control+C).
5. Click in the **Northing** Box. The Coordinate boxes will become “active”.
6. Now click on a location on the map where you want to move the point. The coordinate boxes will update their values accordingly.
7. Paste the Elevation value back into the **Elevation Box**.
8. Click Apply to move the point. Any linework attached to the point will move after the map is refreshed.

Deleting Points (and Line Vertices)

1. Go to *Edit -> Delete Objects...*
2. Click on the point(s) (or entire line) you want to delete.
3. Click the Delete Button to delete the Features.

Point Elevations

Check/Change Point Elevation Values

1. Click on the Coordinate View button
2. Click on the Elevations Column to sort numerically.
3. Scan through the list of elevation values. Make sure that all elevations are within a reasonable range of values.
 - a. Make sure there are not any negative, zero (0.000) or null values present. Delete these points from the survey
 - b. To change an Elevation Value, double click on the value in the spreadsheet. A popup box will appear. Change the values and click ok to save the change.

Point Descriptions

Checking/Changing Point Descriptions in Coordinate List View

4. Click on the Coordinate View button
5. Click on the Description Column to sort alphabetically.
6. Scan through the list of code values. Make sure that all codes conform to the current version of the protocol.
7. To change a Description Code, double click on the value in the spreadsheet. A popup box will appear. Change the values and click ok to save the change.

Changing a Group of Point Descriptions

To change the descriptions of multiple points that share a description, use this option.

1. Click the **Edit** menu in the top left of screen
2. Select **Edit Objects**.
3. **Check** the box next to the *Change descriptions of the points* option shown (red circle) in the illustration below (Figure 1).
4. To select which descriptions to edit, click the **Select** button next to the *Select objects to edit* icon. The next window will contain tabs which represent different methods of selecting which points are to be edited as illustrated below (Figure 2).

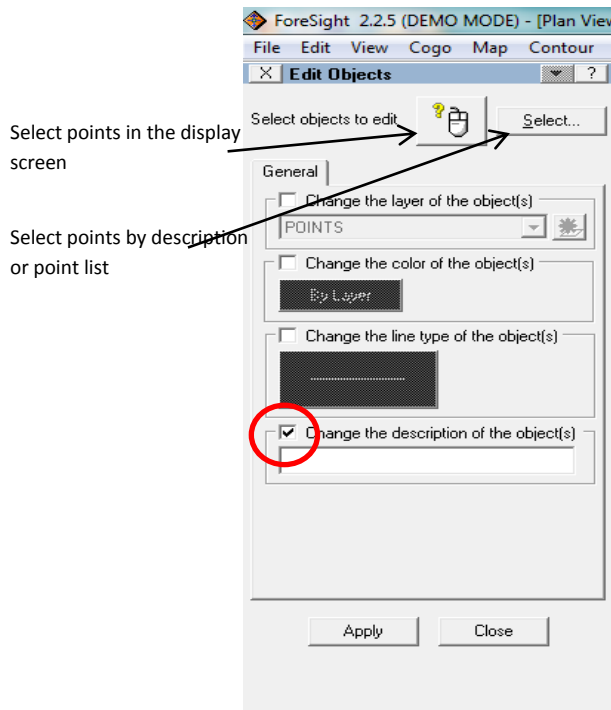


Figure 1.

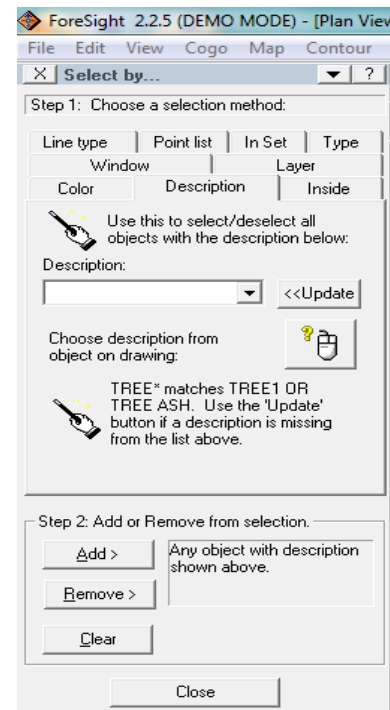


Figure 2.

5. In Figure 2, the *Description* tab is selected. This tab is very useful if a number of the same codes were recorded incorrectly and thus every point with that code is mislabeled. To change the description of every point labeled with a specific description:
 - Click the drop down menu labeled **Description** and **Select** the desired description.
 - At bottom of window Click the **Add** button, this will select all points with the above description. They will be highlighted yellow in display screen.
 - Click **Close** button at bottom of screen.
 - Once closed, the **Edit Objects** window will reappear as shown in Figure 1. In the field under the checked *Change the description* box, **Enter** in the new description and click **Apply**. All selected point descriptions will be changed accordingly.

Changing Point Descriptions by Specific Point(s)

If there are specific points that need descriptions changed, use this option.

1. Click the **Edit** menu in the top left of screen (Figure 3)
2. Select **Edit Objects**.
3. Click the **Select by...** Button.
4. Click on the **Point List** Tab
5. Input the point numbers separated by commas in the *List of points:* field
 - o Click **Add**. The points designated will be selected.
 - o Click **Close** button at bottom of screen.
 - o Once closed, the **Edit Objects** window will reappear as shown in Figure 1. In the field under the checked *Change the description* box, **Enter** in the new description and click **Apply**. All selected point descriptions will be changed accordingly.
6. One can also manually select individual points in the display screen by clicking the **Select objects to edit** icon at top of Edit Objects window (Figure 1).

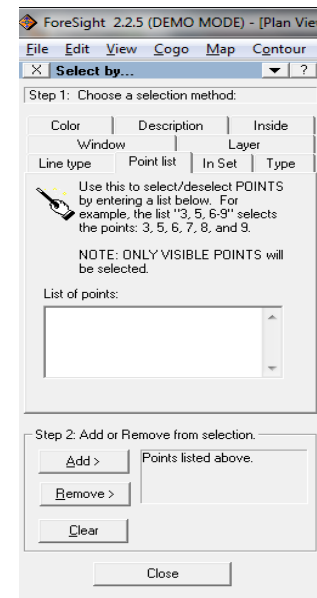


Figure 3.

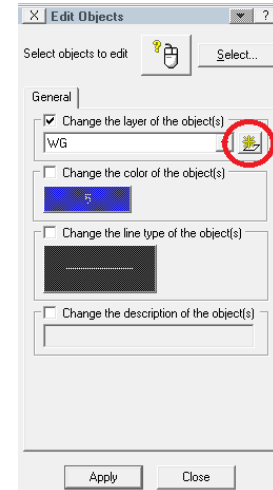
Adding New Lines

Lines are an important part of the topographic data. They are used to represent breaks in grade and have a significant influence in the topographic surfaces generated during the GIS processing. It is generally easier to add or modify 3-D linework in ForeSight than in GIS.

TIP: Isolating Points

To more efficiently view points by descriptions in order to create/edit lines, it is helpful to isolate the points that are intended to be part of a new line or existing line.

- 1) Go to **Edit** and select **Edit Objects**.
- 2) **Check** the box next to **Change the layer of the object(s)**.
- 3) Click the **Select** button to open selection options.
- 4) Select **Description** tab and input the desired description, click **Add**. All points matching that description should be highlighted.
- 5) Close **Select By** window and click on the Create new layer button (Figure 4). Name the layer based on the description of the selected points.
- 6) Click **Apply** at the bottom of the **Edit Objects** window.
- 7) **Change the Active Layer** to the layer you just created using the drop down menu on the layer toolbar (Figure 5).
- 8) Click the **Isolate Active Layer** icon on the toolbar (Figure 5).



Now the polyline can be created and edited without the other point types disrupting the view.



Isolate Active Layer
Figure 5.

Active Layer

In some cases, not all lines are collected as lines in the field. Therefore it may be necessary to create new lines using Foresight. Keep in mind, when you are creating lines, you are only doing so by connecting existing survey points. **You cannot create new line vertices from scratch.**

IMPORTANT

The creation of new lines MUST be done in on the Total Station or in Foresight. If lines are incorrect when displaying the survey in ArcGIS, go back to the survey data in Foresight, make the appropriate corrections, and reimport into ArcGIS.

It is highly recommended to collect line features in the field whenever possible, since this is the best place to make judgments on where lines should go.

Draw Lines Method

1. Go to **Map** menu at top of screen and select **Add sets/Draw lines**.
2. With **Draw Lines** window open, use mouse to select points on the display screen.
 - You will see that when a point is selected, a line will be attached to the mouse indicator.
 - Click on desired points to connect lines in succession to create a polyline.
3. Click the **Close** button at the bottom to finalize the line.

List of Points Method

New lines can also be created using a list of points.

- In the **Enter a list of points** field, list your points in the proper succession you want your line to follow. Points can either be entered as individual points (33, 34, 39), as a range of points (33-42) or a combination of both (33,39,40-42).
- Click **Create**.

TIP

Always check to see that your line was drawn correctly after completing a step. ForeSight generally will draw the points by the order of the Points (by Point Number). You may need to edit or adjust the auto-linework.

Edit Existing Lines

Connecting Line Segments

To connect two line sets to form a continuous line:

1. Go to the **Map** menu and select **Edit Sets/Lines**. The line editing **Edit Set** window will open (Figure 6).

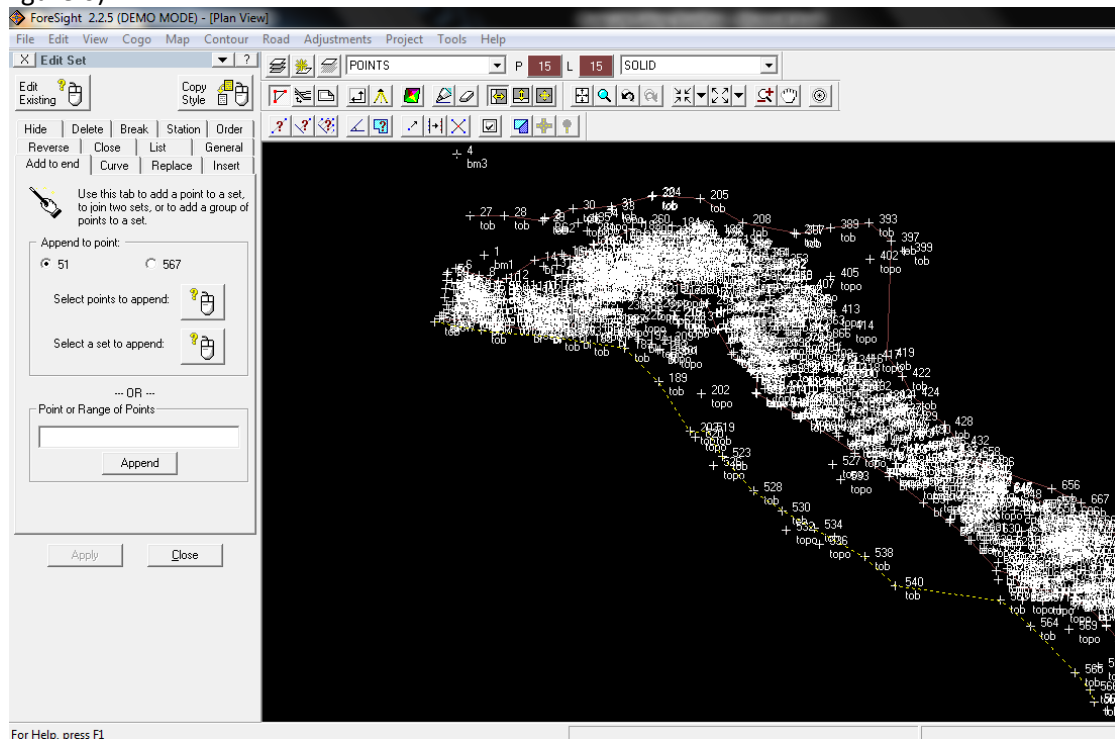


Figure 6.

2. Select the **Add to End** tab (Figure 6). Select the **Edit Existing** icon and move mouse over desired line and select it.
3. In the **Append to point:** box there are two point number options of where to append a line to the one you just highlighted. These point numbers represent each end of selected line.
4. Make sure **Select points to append:** icon is selected and choose the point that represents the end of the line that needs to be appended to the highlighted line
5. Click **Close**.

Deleting Line Segments

To correct a line segment that has been connected to an incorrect point in the field or when editing in Foresight:

1. Go to the **Map** menu and select **Edit Sets/Lines**. The line editing **Edit Set** window will open (Figure 6).
2. Select the **Break** tab in the **Edit Set** window (Figure 7).

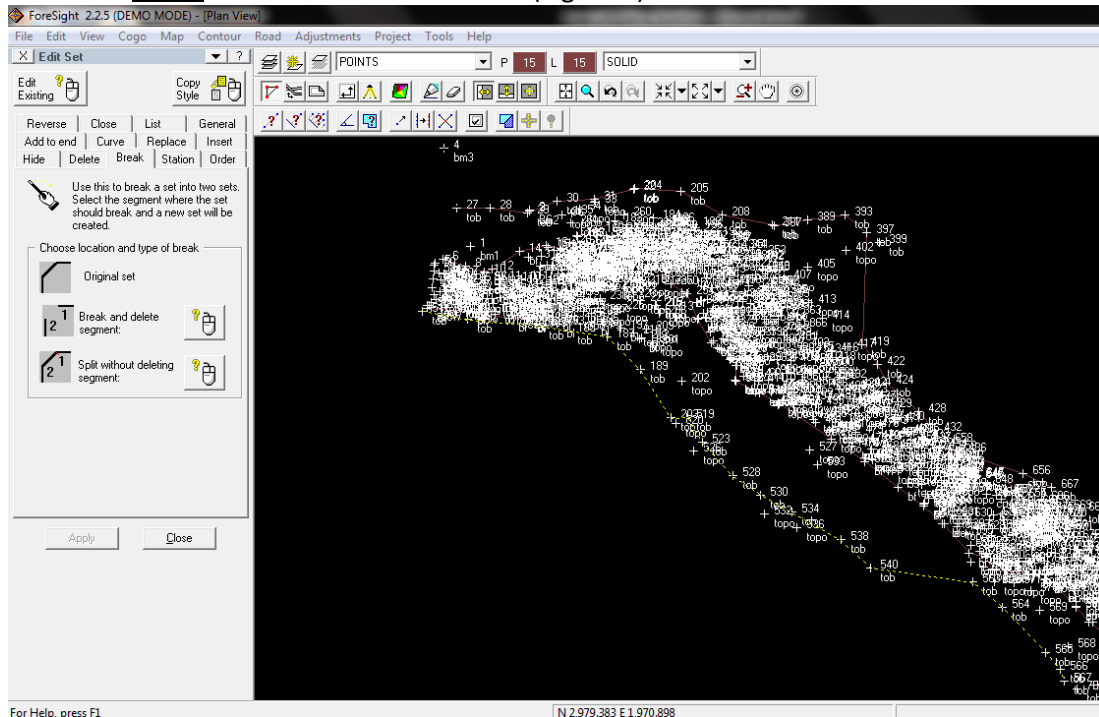


Figure 7.

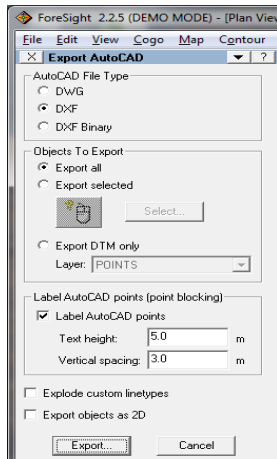
3. Select the **Edit Existing** icon.
4. Use the mouse to select the line that needs editing.
5. Next, select the **Break and delete segment**: icon located under *Choose location and type of break*.
6. Move the mouse to line segment (between points) that needs to be deleted and click on it. The line segment should be removed.
7. Click **Close**.

Exporting Data from ForeSight

Once all point descriptions and lines have been edited in Foresight. Files will need to be exported for further editing and TIN/DEM creation in ArcGIS.

To export the Survey data:

1. Select **Edit** → **Export** → **AutoCAD (.DXF & .DWG)...**
2. The *Export AutoCAD* window will appear:



3. Select **DXF** under *AutoCAD File Type* (Figure 8).
4. Make sure that **Export all** is selected under *Objects To Export*.
5. Leave all other default settings including Label AutoCAD points.
6. Click **Export**.
7. Save Project in the appropriate file location and name accordingly.

The survey data is now ready to be used in ArcGIS to create TINs and DEMs.

Advanced Tasks in ForeSight

These tasks are not required for part of the general workflow and


Repairing Alpha-Numeric Point Names in ForeSight

Background

Alphanumeric point names are an optional setting on the Total Station when collecting points during a survey. ForeSight, however, cannot generate points from raw data when alphanumeric points are used. It is best to avoid using alphanumeric point names when conducting surveys.

This tutorial describes how to change invalid point names (i.e. Alphanumeric) to numbers in the .raw file using ForeSight.

Steps

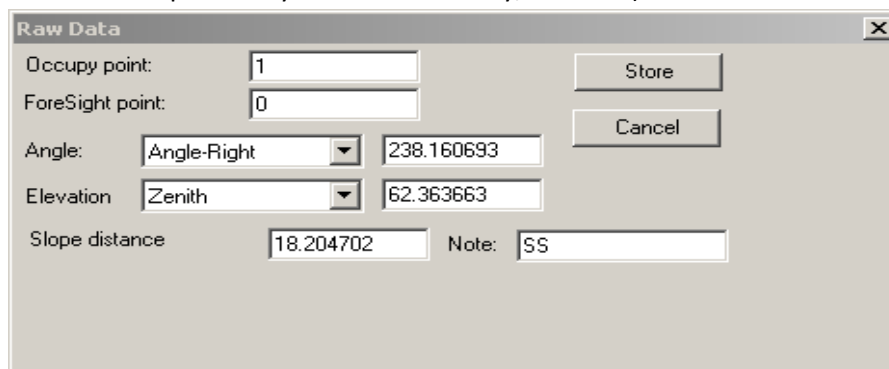
1. Back up your original data files.
2. Start a new project in ForeSight with your .job and .raw file (as normal).
3. Click the **Raw Data View** button. 
4. Scroll through the entries until you find the entry where the problem point name was created.

Example "bm3":

87	Note:	HR:2.9 (2.9 + 0.0 Offset)			
88	HI/HR:	H Inst: 1.44	H Rod: 2.90		
89	Sd Shot:1-bm3	Ang R: 238°16'07"	Zen: 62°36'37"	S Dst: 18.20	SS
90	Store:Point: 3	Northing 2,981.39	Easting 2,000.87	Elevation 1,000.24	BM1
91	Store:Point: bm3	Northing 3,013.75	Easting 1,991.50	Elevation 1,006.91	BM3
92	Invalid:	DP,PNbm3			
93	Sd Shot:1-4	Ang R: 238°16'18"	Zen: 62°36'30"	S Dst: 18.21	BM3
94	Note:	Foresight Target:My Prism. HR...			

Figure 9.

5. Double click on the entry (or entries) and change **ForeSight Point** to a new number (make sure it has not been previously used in the survey, i.e. 9999).



Raw Data

Occupy point: 1

ForeSight point: 0

Angle: Angle-Right 238.160693

Elevation: Zenith 62.363663

Slope distance: 18.204702 Note: SS

Store

Cancel

Figure 10.

Click **Store**.

- For **Store:Point:** entries, change the Point name to a new number (you can use the same 9999 as before):

Figure 11.

Click **Store**.

- The changed values should be reflected in the entry log:

89	Sd Shot:1-9999	Ang R: 238°16'07"	Zen: 62°36'37"	S Dst: 18.20	SS
90	Store:Point: 3	Northing 2,981.39	Easting 2,000.87	Elevation 1,000.24	BM1
91	Store:Point: 9999	Northing 3,013.75	Easting 1,991.50	Elevation 1,006.91	BM3
92	Invalid:	DP,PNbm3			

Figure 12.

- Click **Tools / Generate Points from Raw Data**. Uncheck the three boxes:

Figure 13.

Click **View Report**

Note: If you get an error message, then you have not found all of the alphanumeric point names in the data. Go back to the raw data and make additional edits.

9. Make sure the report reflects the changes you want to make:

If you press 'Generate'...
Point 9999 will be added.

Summary:
1 points will be added
0 points will be moved
0 warnings
1. End of Report

If there are errors in the report, then go back to the raw data to make additional edits.

Note: There might be some additional changes reflected in the report than move a point somewhere and then back again. These are caused by the order of entries in the raw data log and do not reflect “true” changes to the point data.

Figure 14.

10. Click **OK** to close the report, and then click **Generate**.

Adjusting Prism-Rod Height Post-Survey in ForeSight 2.2.5


This section describes how to adjust the stored Prism-Rod height for a series of points collected in a survey. This process involves editing the .raw file and regenerating the coordinates (.job file).

Background

The total station produces two files during the course of a survey: a .raw and .job file. The .raw file contains a log of the actions performed on the instrument, including adjusting the settings (rod height, instrument height, bearing, etc.), moving the total station to a new point, and taking a point (recorded as a distance, azimuth, and bearing). The .job file is created from this log by converting the raw measurements into actual coordinates.

During the course of data processing, you may discover a series of points that seem higher (or lower) in elevation than they should be (i.e. relative to nearby points). This is often the result of forgetting to change the prism-rod height setting on the total station when the rod height is changed. Fortunately, this is a problem that can be easily fixed in ForeSight.

Steps

1. Make a note of the Points (ID number) that need to be edited. This will be a single point or a series of sequential points.
2. Click the **Raw Data View** button  (or Press "CTRL + 5").
3. The raw data view opens the .raw file and displays a log of the actions performed on the total station during the survey in sequential order.

16	Note:	BS check 1 - 2:ZE88.325106...			
17	Note:	BS Circle check : angular err...			
18	Occupy:Occ: 1	Northing 3,000.00	Easting 5,000.00	Elevation 100.00	cp1
19	Backst:Occ: 1	BS pt: 0	BS azm: 90°00'00"	BS crl: 0°00'00"	
20	Note:	Fixed HR at Backsight:1.524 ...			
21	Note:	HR:1.524 (1.524 + 0.0 Offset)			
22	HI/HR :	H Inst: 1.59	H Rod: 1.52		
23	Sd Shot:1-3	Ang R: 0°00'03"	Zen: 88°32'49"	S Dst: 6.19	cp2
24	Backst:Occ: 1	BS pt: 3	BS azm: 90°00'03"	BS crl: 0°00'00"	
25	Note:	Fixed HR at Backsight:1.524 ...			
26	Note:	BS check 1 - 3:ZE88.324656...			
27	Note:	BS Circle check : angular err...			
28	Invalid:	DP.PN2			
29	Note:	Foresight Target:Rover Prism...			
30	Note:	HR:2.65 (2.65 + 0.0 Offset)			
31	HI/HR :	H Inst: 1.59	H Rod: 2.65		
32	Sd Shot:1-4	Ang R: 155°06'39"	Zen: 87°44'26"	S Dst: 25.91	tp
33	Sd Shot:1-5	Ang R: 156°54'29"	Zen: 88°05'12"	S Dst: 25.87	tp
34	Sd Shot:1-6	Ang R: 157°20'08"	Zen: 88°43'30"	S Dst: 25.80	lw
35	Sd Shot:1-7	Ang R: 157°31'27"	Zen: 89°10'25"	S Dst: 25.84	tp
36	Sd Shot:1-8	Ang R: 159°30'21"	Zen: 89°24'50"	S Dst: 25.76	tp
37	Note:	Foresight Target:Rover Prism...			
38	Note:	HR:3.65 (3.65 + 0.0 Offset)			
39	HI/HR :	H Inst: 1.59	H Rod: 3.65		

Figure 15.

We are interested in rows labeled "HI/HR" (record of change in instrument or rod height) or "Sd Shot ##-##" (point collected).

- Look through the log file to find the series of points that you need to change. These will be labeled "Sd Shot [Point occupied by instrument]-[Point collected]".

127	HI/HR :	H Inst: 1.59	H Rod: 2.00		
128	Sd Shot:1-77	Ang R: 174°59'48"	Zen: 90°23'42"	S Dst: 25.40	to
129	Sd Shot:1-78	Ang R: 174°04'26"	Zen: 91°00'50"	S Dst: 25.50	to
130	Sd Shot:1-79	Ang R: 172°14'10"	Zen: 91°08'19"	S Dst: 27.02	to
131	Note:	Earsight Target Device Drive			

Figure 16.

For this example we will use points 77-79.

- Move up the list until you find the "HI/HR" row that precedes the series of points you wish to adjust. This will be the recorded instrument and rod heights used for each of the points that followed, until the instrument or rod height was changed (i.e. the next HI/HR entry).

127	HI/HR :	H Inst: 1.59	H Rod: 2.00		
128	Sd Shot:1-77	Ang R: 174°59'48"	Zen: 90°23'42"	S Dst: 25.40	to
129	Sd Shot:1-78	Ang R: 174°04'26"	Zen: 91°00'50"	S Dst: 25.50	to
130	Sd Shot:1-79	Ang R: 172°14'10"	Zen: 91°08'19"	S Dst: 27.02	to
131	Note:	Earsight Target Device Drive			

Figure 17.

- Double Click** anywhere on the row to open a Raw Data input dialog and change to the correct value.

The figure shows two sequential screenshots of a 'Raw Data' dialog box. In the first screenshot, the 'Height of instrument' is 1.593 and the 'Height of rod' is 2.0. In the second screenshot, the 'Height of instrument' remains 1.593, but the 'Height of rod' has been changed to 1.65. Both screenshots include 'Store' and 'Cancel' buttons.

Figure 18.

Click **Store** to make the change.

127	HI/HR :	H Inst: 1.59	H Rod: 1.65
128	Sd Shot:1-77	Ang R: 174°50'48"	Zen: 90°23'42" S Dst: 25.40 to

Figure 19.

- If you need to make a change to the instrument/rod height *within* a sequence of points, highlight the line above the position you want to make the change.

116	Note:	BS Circle Check: angular error...			
116	Sd Shot:1-68	Ang R: 221°02'50"	Zen: 85°56'06"	S Dst: 8.27	to
117	Sd Shot:1-69	Ang R: 212°37'00"	Zen: 84°00'59"	S Dst: 9.86	bf
118	Sd Shot:1-70	Ang R: 191°56'00"	Zen: 88°00'01"	S Dst: 11.44	to
119	Sd Shot:1-71	Ang R: 184°41'03"	Zen: 88°42'39"	S Dst: 14.88	to
120	Sd Shot:1-72	Ang R: 186°30'44"	Zen: 86°03'18"	S Dst: 14.25	bf
121	Sd Shot:1-73	Ang R: 178°57'30"	Zen: 88°27'36"	S Dst: 18.49	to
122	Sd Shot:1-74	Ang R: 178°14'00"	Zen: 90°22'05"	S Dst: 20.18	to

Figure 20. - In this example, we want to make a rod-height change to point 70-76. Line 117 (Point 1-69) is highlighted.

Click **Insert Line(s)** (Select line below which you want to insert) on the **Edit** Menu.

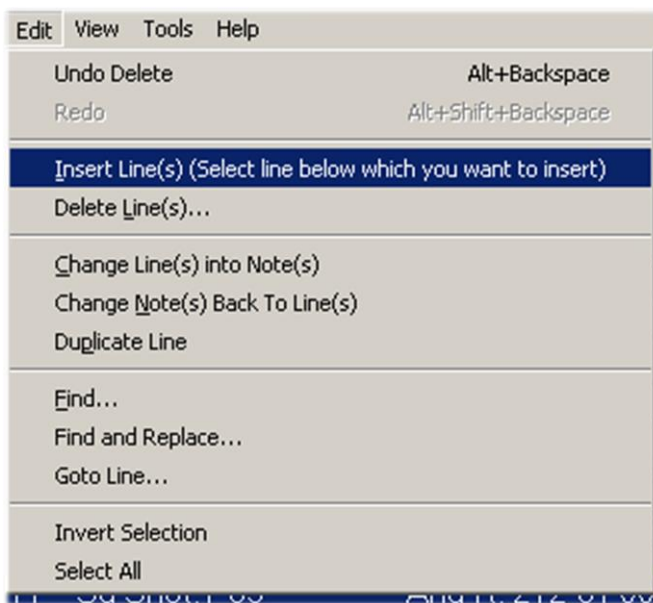


Figure 21.

On the Insert Raw Data window, select the **HiHr Tab** and enter an instrument and rod height (must enter both values). Click **Store**, then close the window (or click cancel).

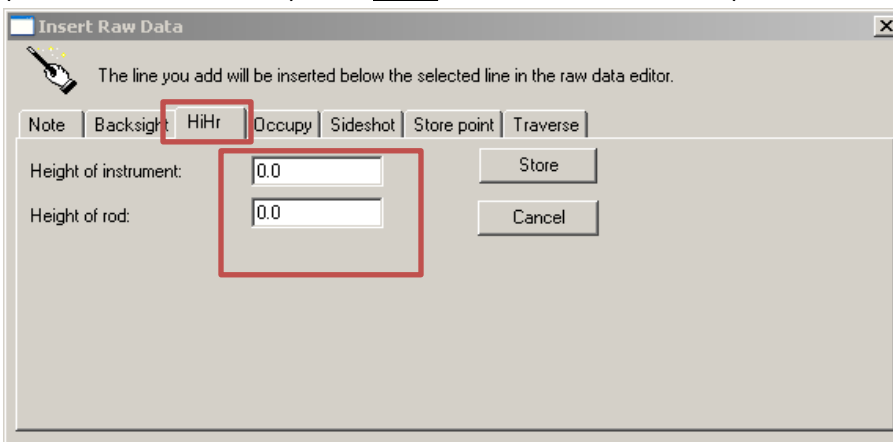


Figure 22.

The line is added to the raw file.

No	Notes	BS	Circle check: angular error...			
116	Sd Shot:1-68		Ang R: 221°02'50"	Zen: 85°56'06"	S Dst: 8.27	to
117	Sd Shot:1-69		Ang R: 212°37'00"	Zen: 84°00'59"	S Dst: 9.86	bf
118	HI/HR :		H Inst: 1.59	H Rod: 1.65		
118	Sd Shot:1-70		Ang R: 191°56'00"	Zen: 88°00'01"	S Dst: 11.44	to
119	Sd Shot:1-71		Ang R: 184°41'03"	Zen: 88°42'39"	S Dst: 14.88	to
120	Sd Shot:1-72		Ang R: 186°30'44"	Zen: 86°03'18"	S Dst: 14.25	bf
121	Sd Shot:1-73		Ang R: 178°57'30"	Zen: 88°27'36"	S Dst: 18.49	to
122	Sd Shot:1-74		Ang R: 178°14'20"	Zen: 90°33'05"	S Dst: 20.16	to

Figure 23.

- When you have completed the changes to the raw file, you need to regenerate the coordinates (.job file). Select **Generate Coordinates from Raw Data** in the **Tools Menu**.



Figure 24.

- Set **Change elevations only** to **Checked** and **Change Descriptions** to **Unchecked**.

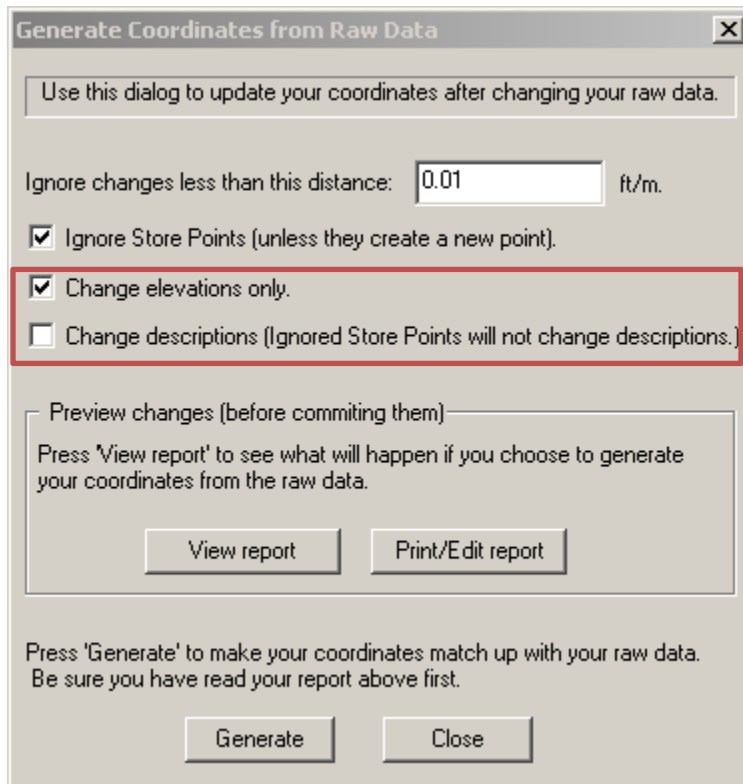


Figure 25.

10. Click **View Report** to verify your changes. Then click **OK** to close the Report viewer.

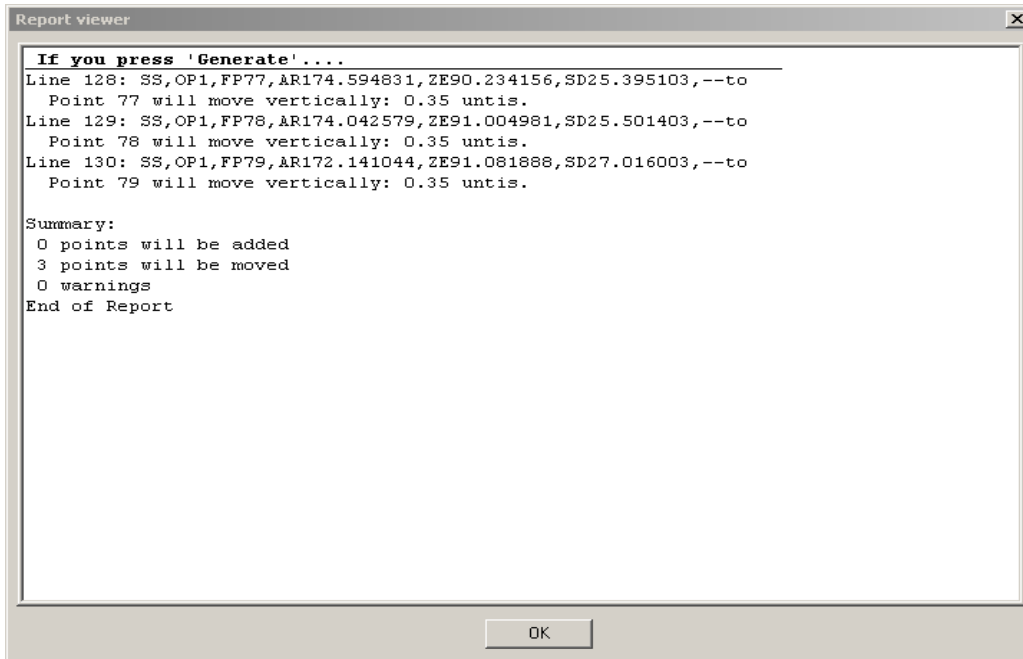


Figure 26.

11. If you are satisfied with the changes, click **Generate** to make the changes to the .job file.