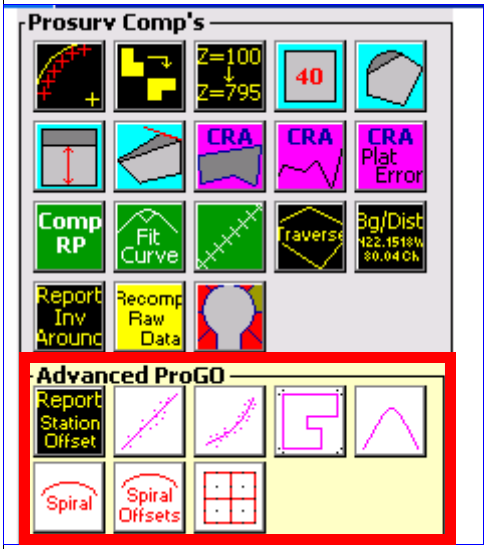
Advanced ProGO

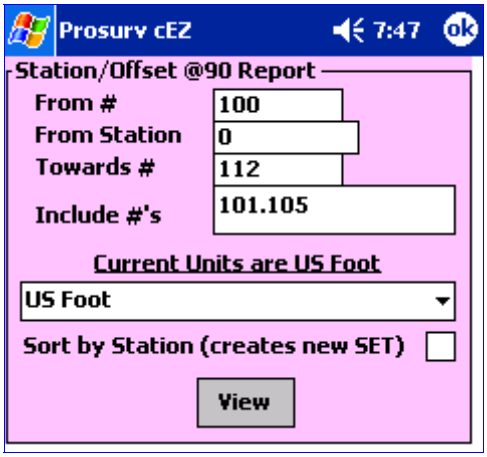


Now, in addition to the extensive computation routines in Prosurv cEZ, the Advanced ProGO routines give you 9 completely new, powerful features.

8 of these Advanced routines are found in the Comp's area. The other Advanced ProGO routine is found in the **Close the Horizon** Traverse routine and allows you to easily perform Celestial Observations, such as Star (Polaris) shots and Sun shots.

The Advanced ProGO routines include:

Station Offset Report



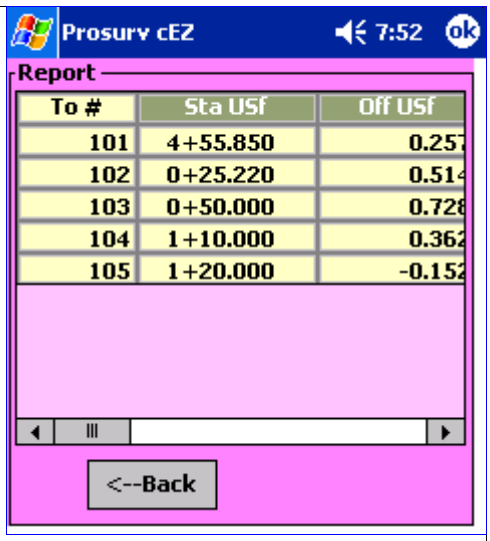
The Station/Offset Report will compute and display the stations and offsets of up to 150 points at a time. Enter a starting point number (From #) and a point that defines the end of the line. You can enter a station that represents the station at the "From" point in order to match a set of plans, for example.

Then, enter a point list of the points whose station and offset you'd like to see. The example above shows that points 101 through 105 will be computed and displayed in the report. You could also enter a pre-defined SET of points, by typing a semi-colon and then the SET #, such as **;5**.

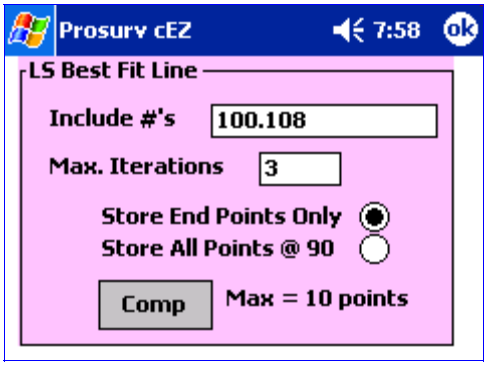
Then, tap the **View** button to see the report. You can scroll across to view the elevations and feature code of each point, and you can scroll down to view more points if needed.

You can also view the report in different units. If you're job is currently defined as Metric, you can view the results in US Foot dimensions. You can even view the results in Chains.

Tap the **Back** button or the **OK** button to return to the previous screen.



LS Best Fit Line



The powerful **Least Squares Best Fit Line** routine uses a Least Squares analysis to determine the best fit line of up to 10 points*.

Prosurv cEZ will automatically store the computed end points of the line. You can select to have Prosurv cEZ store all of the points as they're projected onto the line at 90°.

The default number of Least Square iterations is 3. You can increase the max iterations up to 10. The more iterations, the more precise the results. However, 3 iterations are normally sufficient to generate a confident result. More iterations = more processing time. An example of when more iterations may be required is when the offsets to several points are fairly large.

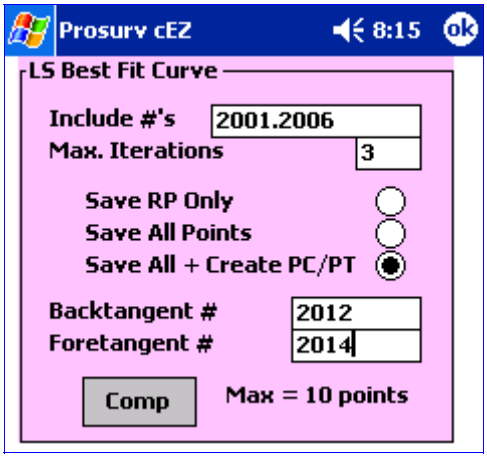
Prosurv cEZ will display the computed Residuals based on the Least Squares computation, as shown below.

To compute the Least Squares Best Fit Line, simply enter a point list, or a pre-defined SET of points (such as **;5**). Then tap the **Comp** button.

*Pocket PC 2003 Versions will be able to compute up to 25 points.

You can scroll left and right to view the Point #, Northing, Easting, and Residuals of each point.

LS Best Fit Curve



The **Least Squares Best Fit Curve** routine will perform a Least Squares Analysis of up to 10* points. Using a LS Best Fit Curve routine is much more precise at determining a radius point that fits curve data, then a simple 3 point radius point computation.

Simply enter a point list, or a pre-defined SET of points such as **;5**, and Prosurv cEZ will perform the LS analysis. There are 3 options available:

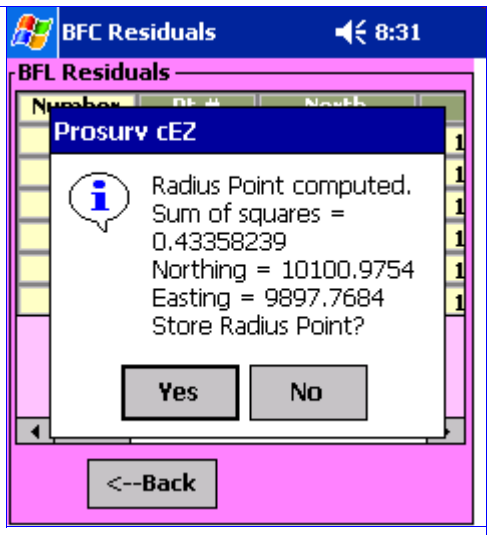
- Save RP Only — This option determines the Best Fit Curve and stores the computed RP automatically
- Save All Points — This option will store the RP, as well as the intersecting point of a line drawn between the RP and each given point projected to the curve
- Save All + Create PC/PT — This option will store the RP, all projected intersecting points, and it will compute the PC and PT of the curve. You are required to enter point numbers that represent points on the projected Tangent lines. These points are used to create the PC and PT at 90° to the RP. **It is important to be sure that the given tangent points will be BEFORE the PC, and AFTER the PT respectively.**

You may change the maximum number of iterations up to 10. More iterations = more processing time.

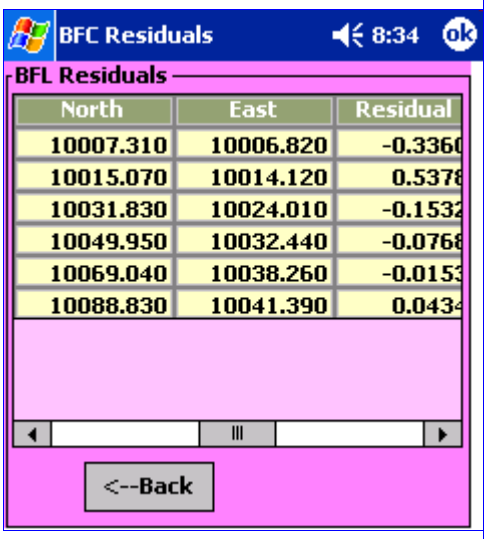
*Pocket PC 2003 Versions will be able to compute up to 25 points.

Prosurv cEZ displays the results of the computations and allows you to select whether to store the computed RP.

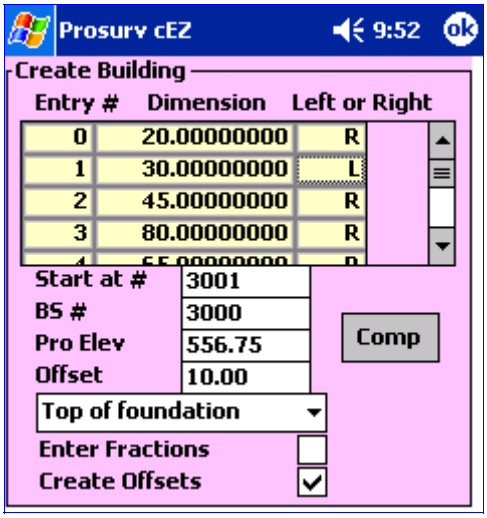
Tap **Yes** to store the Radius Point.



You can then view the North/East and Residuals of each point.

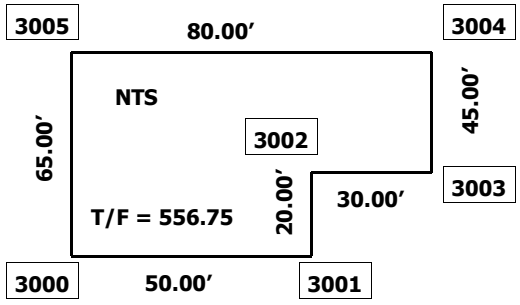


Building Creation



The **Create Building** routine makes computing a foundation easier than ever before. This routine is for computing the points needed to stake out a new building or building foundation.

First, it creates all the points around the building using your entered dimensions, then it automatically creates the 4 building "box corners" and 8 offset points.



To follow along, the starting coordinates are:

- 3000 = 5000N, 5000E
- 3000 to 3001 = N 89° 59′ 00″ E

First, you need to enter two starting points. One will be the "Starting Point" or **Start at #,** the second point is the "Backsight". While these aren't actually a Setup in Data Collection, it helps to think of these points as if standing on the starting point, and backsighting the **Backsight #**.

The dimensions are entered in the spreadsheet by tapping on each row, then entering the dimension. You can enter the dimension in fractions by checking the **Enter Fractions** box.

Then, you "walk" around the building, selecting whether each dimension is "Right" or "Left". In this example, we start at #3001 Backsighting #3000. From there, the 20.00′ dimension is 90° to the right, so you'd select **R** for this dimension. Then you "move up" to that point in your mind, so now, standing on 3002 and Backsighting #3001 means that you'd need to turn 270° to the right, or 90° to the **Left** to get to the next point (3003).

So, basically if you'd have to turn 90° Right, then you'd select **R**. If you needed to turn 90° Left, then you'd select **L.**

You can change each dimension from R to L just by tapping on the cell representing that row and column.

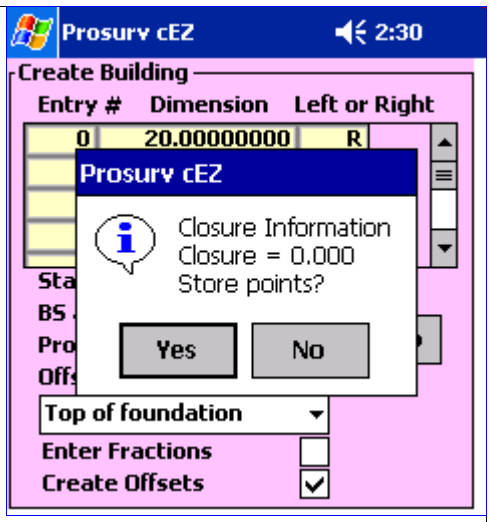
To run this example:

- Enter the 5 remaining dimensions. The first dimension of the building, which is between the **Start** and **BS#** points is not entered, since Prosurv cEZ will simply inverse betweent the two given points.
- Dimension Entry #1 (remember that the entries start with 0), which is the 30′ dimension is the only one in this example that needs to be changed to **Left (L)**.
- Enter the remaining information as shown, and tap the **Comp** button.

The closure information for the building is displayed.

It's important to note here that the final dimension of the building (65.00') is, of course, not actually needed to compute the points, since point #3000 already exists and represents the "starting and ending point" of the building.

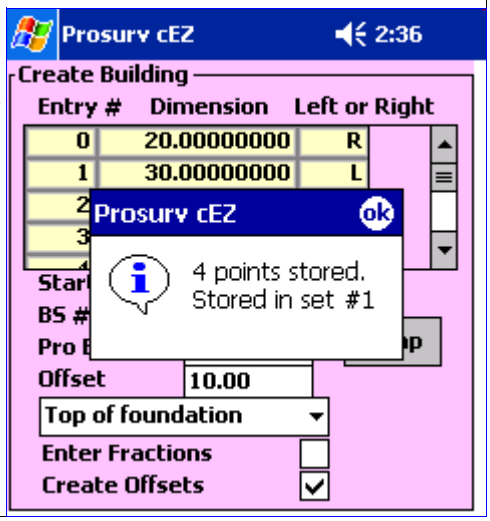
However, you **do** want to enter the final dimension so that the closure is correct.



If the closure is good, tap **Yes**.

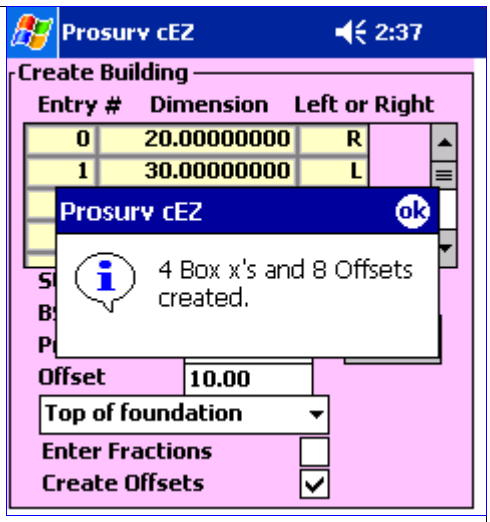
The remaining building points will be created automatically. In fact, the point #'s of the created points, as well as the starting points are AUTOMATICALLY stored in a new SET for you!

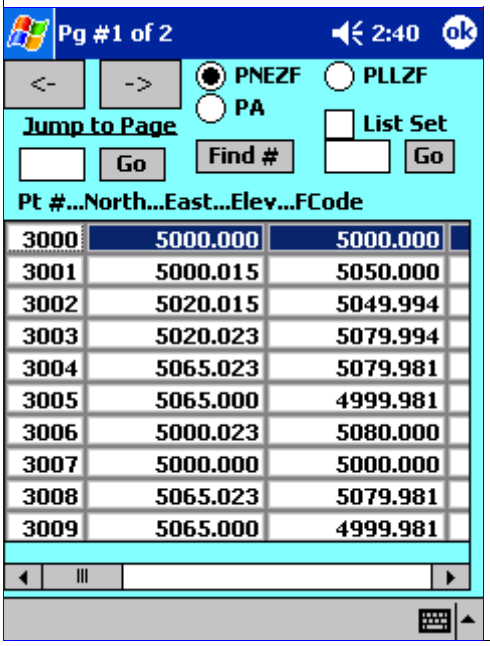
Tap **OK** to continue.



Since the **Create Offsets** box was checked, Prosurv cEZ AUTOMATICALLY created the 4 Building Box Corners and 8 Offsets to those 4 Box Corners.

The Building Box is the outermost "envelope" of the building. That is, the Building Box corners are the result of Intersecting the outermost lines of the Building.



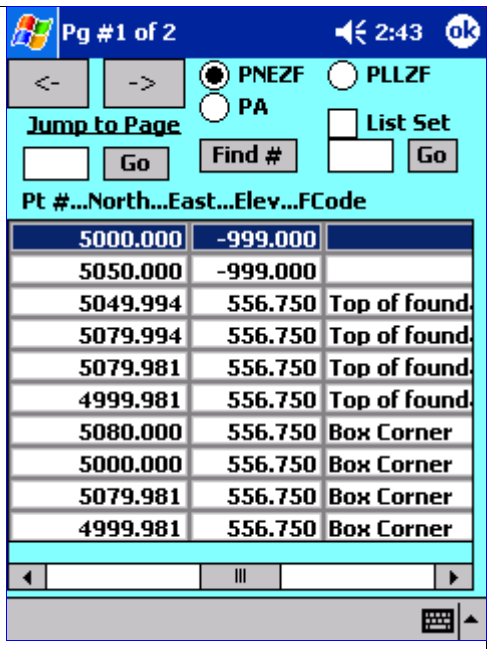


Here we see the coordinates of some of the created points.

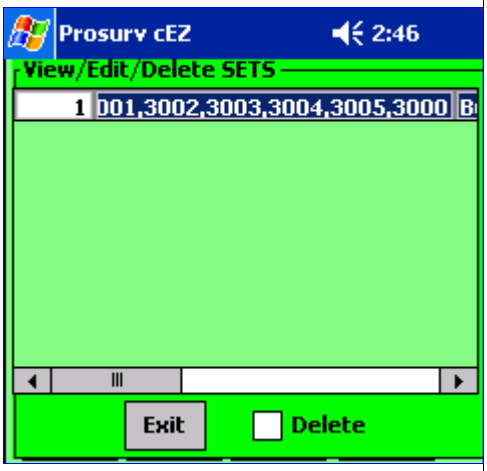
3002 to 3005 are the rest of the foundation corners. 3006 to 3009 are the Building Box corners, and 3010 to 3017 are the 10' offsets.

Scrolling over shows the elevations and descriptions that were automatically stored with each point.

Note that the offsets were also given the T/F elevation, so that all you need to do now is **stake the points!**

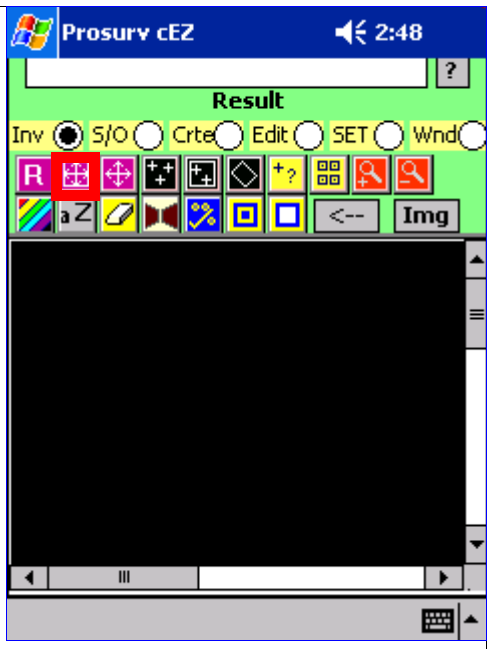


Viewing the SETS shows the contents of SET #1, which contains the computed building corners.

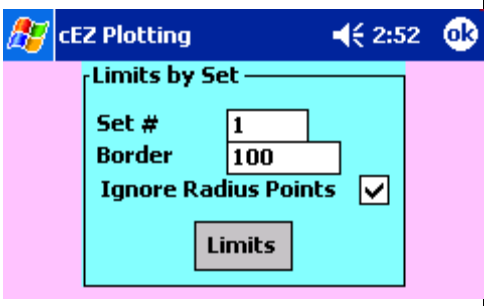


To **Plot** the Building, tap the Plotting button from the Main screen, then:

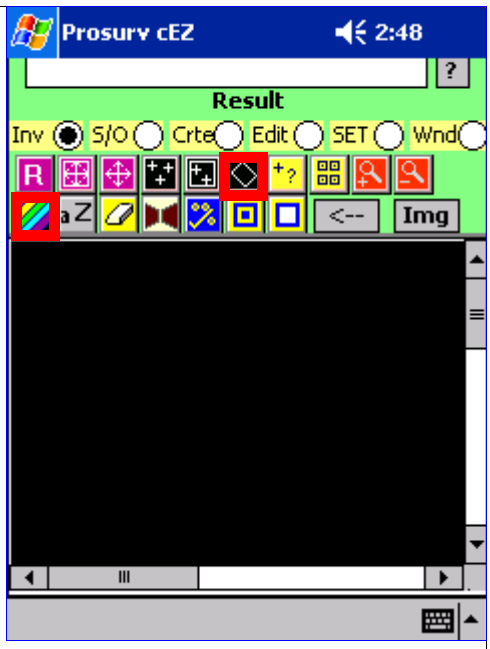
Tap the **Screen Limits by SET** button.



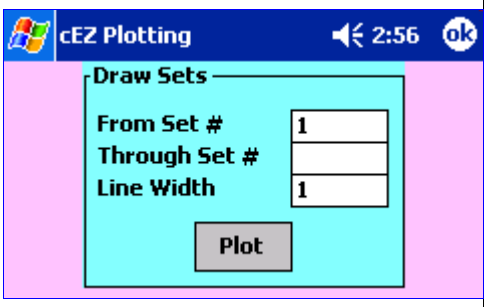
Enter **1** for SET #, since SET #1 represents the building. Then tap **Limits**.



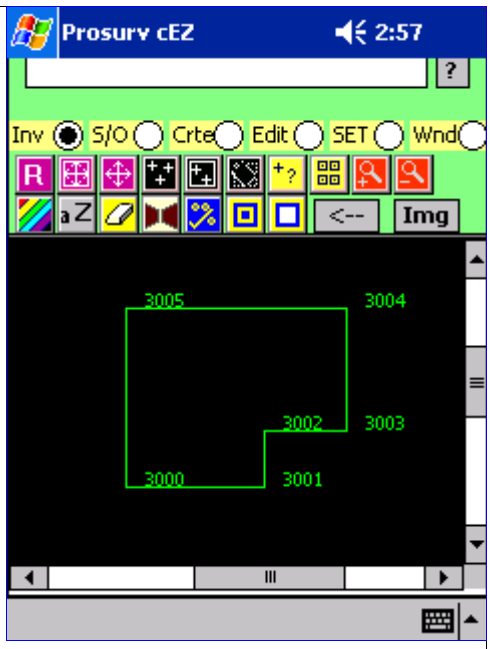
Select a **Color** for the Building, if you'd like, then tap the **Draw SETS** button, as shown to the right.



Enter SET #1 and tap the **Plot** button.

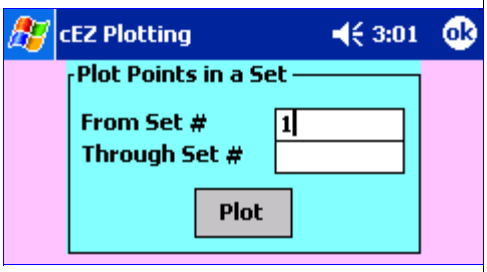


Scroll down and right to view the Building.

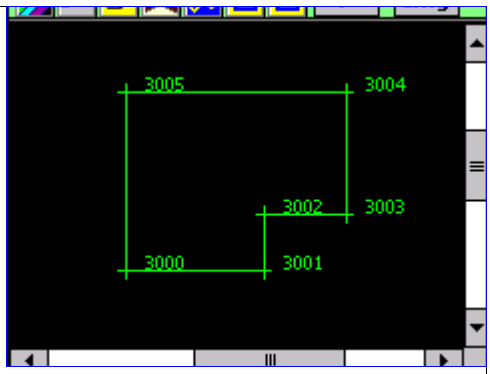


To see the crosshairs for each point, select the **Plot Points in a SET** button.

Again, enter SET #1 and tap the **Plot** button.



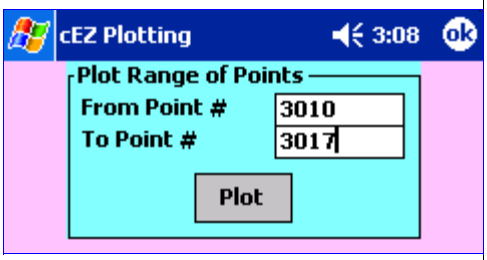
The crosshairs for each point are displayed. The difference between **Plot Points in a SET** and **Draw SETS** is that Draw SETS actually connects the points with lines (and curves), but doesn't show crosshairs.



The Plot Points in a SET routine shows the points with crosshairs but doesn't connect the points with lines.

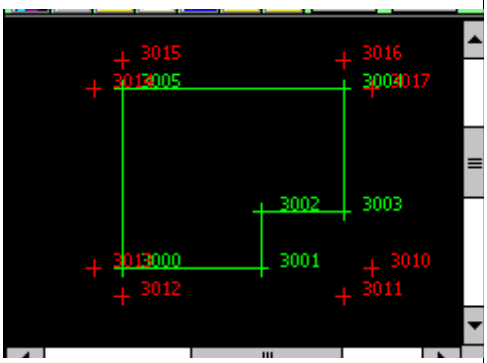
Now, let's plot the 8 offset points. Just tap the **Plot Range of Points** button.

Enter From #3010 To #3017 to represent the 8 offset points.

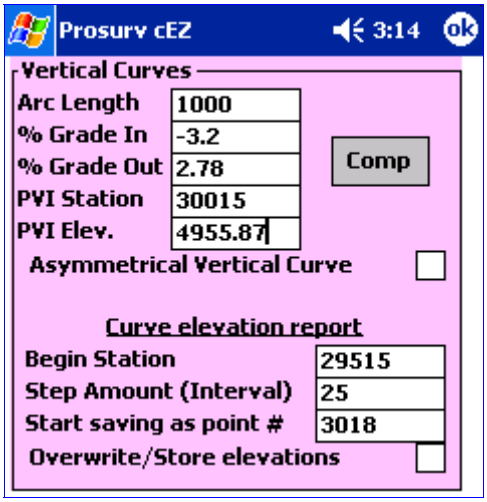


Before plotting the points, I changed the Color from Green to Red.

Remember: When plotting in Prosurv cEZ, changing Colors only affects what you do NEXT. It doesn't change the colors of objects already plotted!



Vertical Curves



Prosurv cEZ's Advanced ProGO also offers a Vertical Curve solution. This solution is separate from the built-in Vertical curve capabilities of cEZ's Baselines. Using Baselines, you can easily enter Vertical curve data, such as PVI Stations and Elevations, and enter Vertical curve data for each PVI.

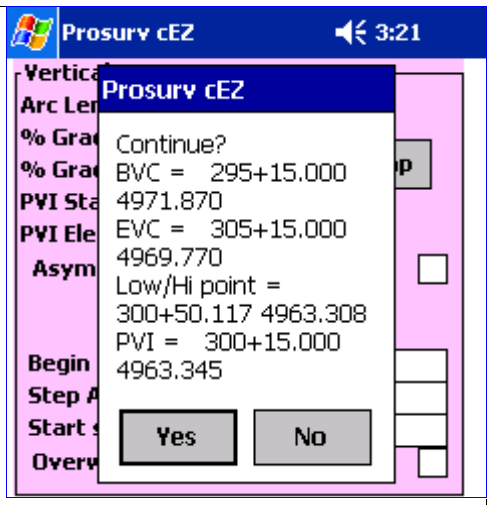
The Advanced ProGO Vertical Curve solution can be used to:

- Compute Vertical Curve data, such as the BVC and EVC
- Compute a Report of Vertical Curve elevations by stationing
- Store the computed elevations as new points
- Overwrite the elevations of an existing range of points with the computed vertical curve elevations

Simply enter your curve data, straight from your plans, and tap the **Comp** button. If your Vertical Curve is Asymmetrical, simply tap the **Asymmetrical Check Box** and enter the **Curve Length In**.

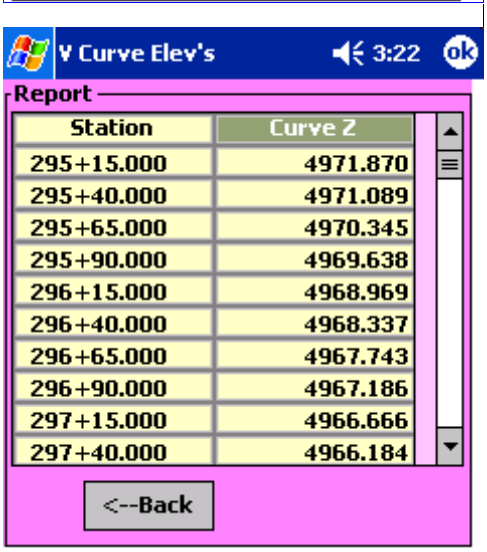
Prosurv cEZ displays the BVC (Begin Vertical Curve), EVC (End Vertical Curve), Low/Hi point, and PVI Curve Elevation information.

Tap **Yes** to continue.



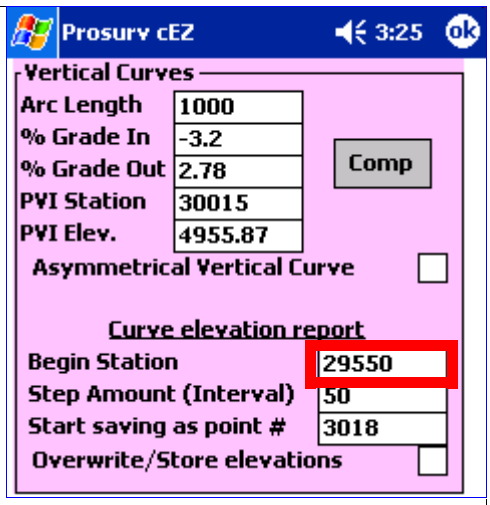
The report is computed and displayed. Note here that these stations may not be the stations needed, since they start at 295+15 and go up every 25'.

To view the stations needed, you can change the **Begin Station** and **Step Amount (Interval)** before computing the report.

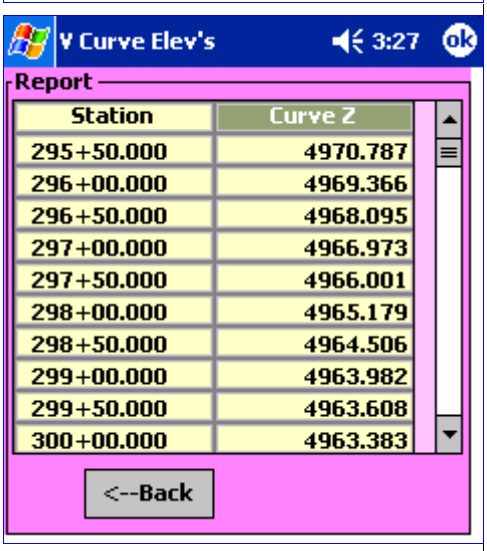


Enter the starting station desired, and change the step amount to the interval you need.

If you'd like to store the elevations as new points, simply check the **Overwrite/Store elevations** box.

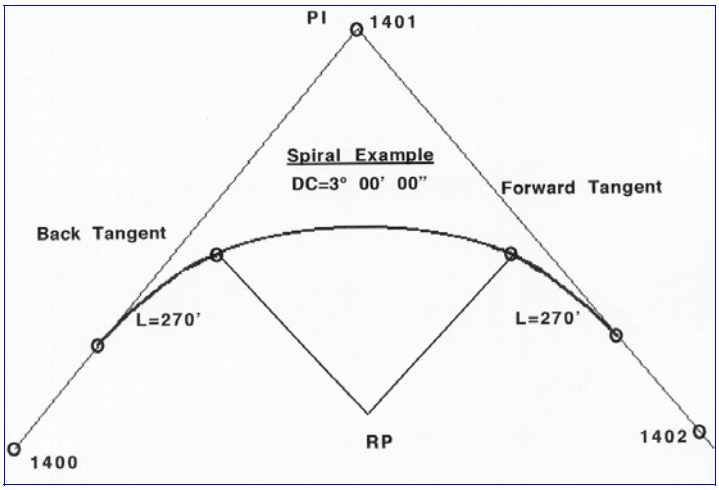


The Stations and Curve Elevations are computed and displayed.



Spirals

Prosurv cEZ's Advanced ProGO offers Spiral Curve geometry solutions. Each Spiral is actually defined as the entire Spiral-Curve-Spiral geometry, where the Length of the Spiral In = Length of the Spiral Out.



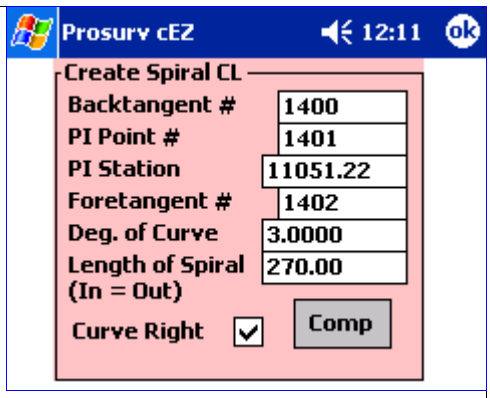
To use spirals in Prosurv cEZ, you first create the CL of the spiral. After creating the spiral, you can use the Spiral Offset routines to:

- Compute points along the CL of the entire geometry (spiral-curve-spiral)
- Compute points offset from the CL of the entire geometry. You can compute many points at once at a given interval, or one point at a time.
- View the Station/Offset of a point as defined by the entire geometry

You can define up to 10 spirals per job, and you can easily select which Spiral CL is currently in use.

Enter the point numbers and Spiral CL Data. Then tap the **Comp** button to compute the CL Geometry.

The Degree of Curve is in D.MMSS format.

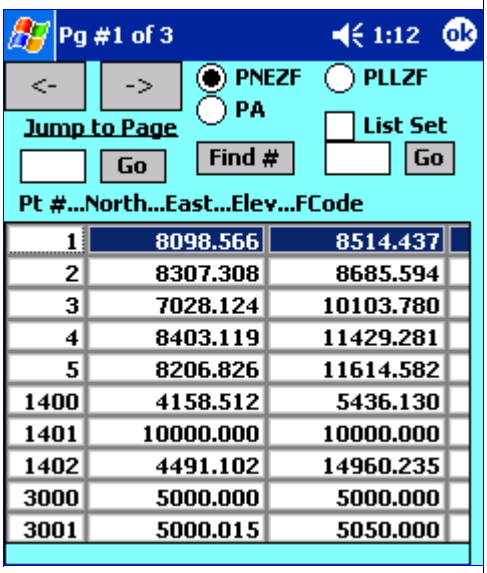


The points used in this example are shown to the right.

Points 1 through 5 are the computed resulting coordinates.

Scrolling to the right will show the descriptors of each point. For 1 through 5 they are:

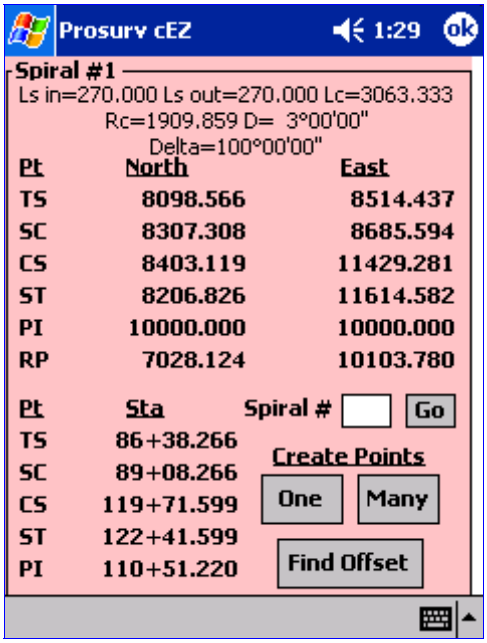
1.Tangent to Spiral
2.Spiral to Curve
3.Radius Point (RP)
4.Curve to Spiral
5.Spiral to Tangent



Important note about Spirals.

Once a spiral curve centerline is computed, the coordinates of the main points on the spiral are stored in the spiral file. *If you end up rotating the spiral's points or changing them in any way, you must re-compute the spiral's points prior to using the spiral for creation of offsets, otherwise you will encounter "errors" in the computed coordinates!*

Spiral Offsets



The **Spiral Offsets** routine lets you create points and find the station / offset of existing points based on the Spiral CL Geometry that you've computed. Prior to using the Spiral Offsets routine, you must have already created a Spiral CL using the Spiral CL routine.

You can store up to 10 spirals per job. To switch to the Spiral CL Geometry you need to use, simply enter the Spiral # and tap the **Go** button.

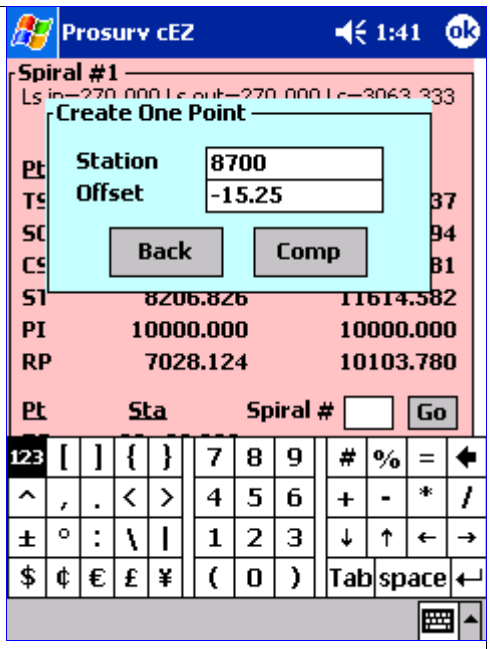
The relevant data of the current spiral geometry is displayed. There are 3 different functions available:

- Create points one at a time, by station and offset
- Create many points at a time, by station, offset, and interval
- Find the Station/Offset of an existing point (Northing/Easting) based on the Spiral Geometry. This routine uses an iterative method to compute the station/offset of the point if the point lines within the Spiral In or Spiral Out.

Tap the **One** button to compute points one at a time. Enter the Station and Offset information, then tap the **Comp** button.

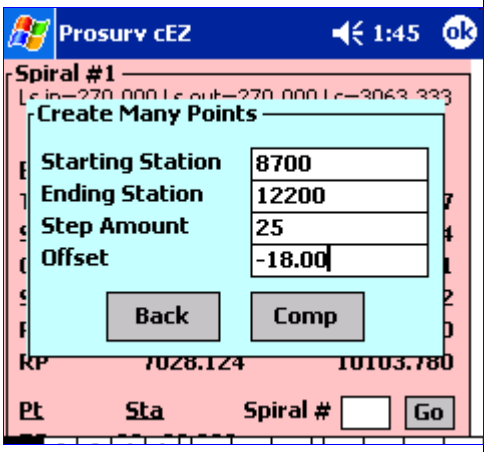
Prosurv cEZ will create the point anywhere within the entire geometry. If the station falls within the Spiral In or the Spiral Out, Prosurv cEZ will compute the point based on the spiral.

If the station lies within the radial curve, Prosurv cEZ computes the point using the Radial Curve, as with any normal curve.



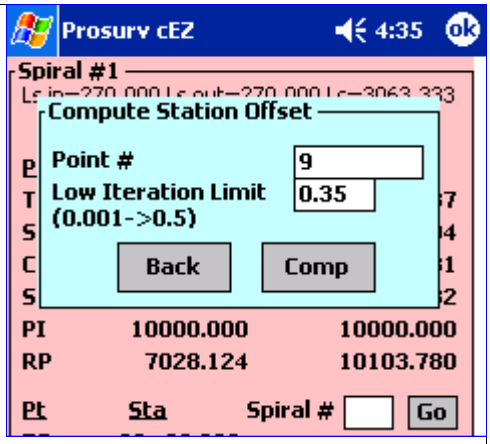
Note that the computed point is stored automatically, using the next Auto Point #.

All points are stored automatically using the next Auto Point #.



Prosurv cEZ's Advanced ProGO can compute the Station and Offset of any given point.

Enter the **Point #** of the point that's needed. You can enter a value representing the **Iteration Limit** of the computations. This value can be used defined (by default) in the ProsurvCE_Defaults.txt file.



In order to find the station/offset, the point must lie somewhere within or offset from the Geometry of the Spiral-Curve-Spiral.

Notes about the computation of the Station/Offset

No precise formula or algorithm exists for finding the station and offset of an x,y coordinate (Easting, Northing) along or offset from a Spiral Curve. In theory, there exists no true offset from a Spiral Curve. However, Prosurv cEZ's advanced Spiral algorithms offer the ability to create points offset from a given Spiral's centerline. The results of these algorithms produce coordinate points offset from the Spiral that are indeed within 0.001 or 0.0001 of spirals computed by well-known CAD applications.

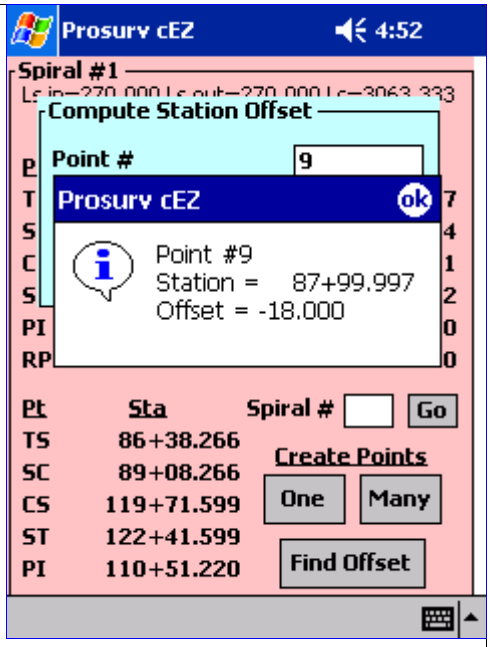
In order to compute a station and offset of a given point, an iterative process must be used. If the point lies within or offset from the radial curve in the geometry, the **exact** answer is computed and displayed using normal curve formulas. However, if the point lies offset from either the Entry or Exit Spiral Curve, the iterative process is used. In theory, Prosurv cEZ steps along the curve, at the interval indicated by the **Low Iteration Limit**. In the example above, Prosurv cEZ will **step along the Spiral every 0.35** and check whether the point is offset from that line (at 90°).

If the point is found to be offset, the Station, and the Offset amount are generated and displayed. Obviously, the lower the limit, the more accurate the results—and the longer it will take to compute those results.

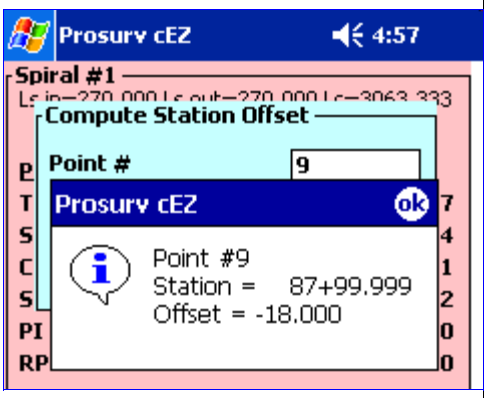
However, it has been found that a value of 0.35 is sufficient to produce accurate station / offset results that are +/- 0.003.

The example shown here shows the station at **87+99.997** and the Offset at –**18.000**.

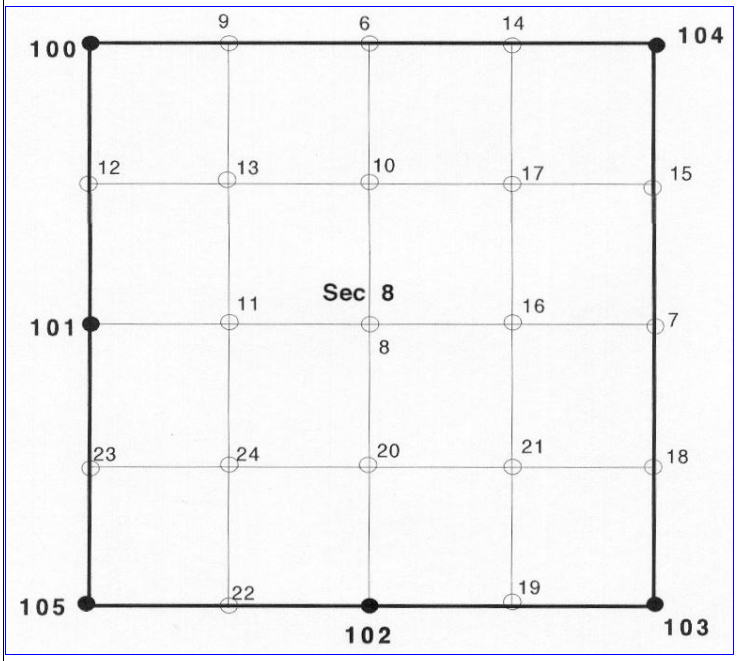
You can see by looking at the Station Information for Spiral #1, that the point lies between the **TS** and the **SC.**



By changing the Low Iteration Limit to 0.30, the results are just slightly more accurate. In fact a lower iteration limit does not necessarily mean a more accurate answer. This is due to the way that Prosurv cEZ uses the value during the iteration process.



Divide Section

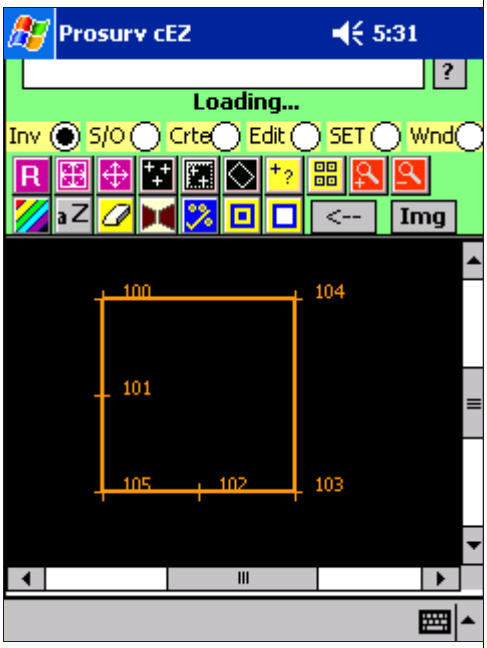


This routine will divide a standard section into aliquot parts. It will automatically break the section down into "40's". You may give Prosurv cEZ up to 8 corners for the section or as little as 4 corners. For proper section breakdown, Prosurv cEZ requires that you have all four corners of the section (either found or computed). Then, Prosurv cEZ would compute the 1/4 corners automatically during it's section breakdown. The window above shows that if you don't have a corner such as the N 1/4 corner, then you should leave the point number as 0. This is how Prosurv cEZ knows that the point doesn't exist.

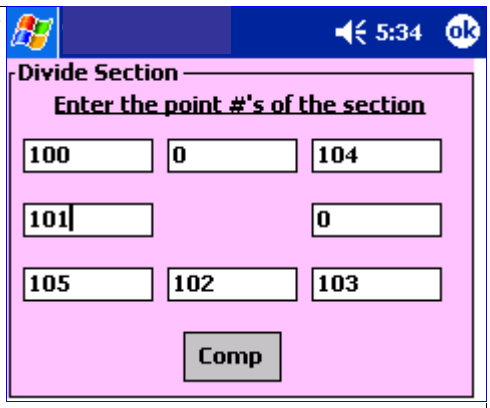
If you do have one or more 1/4 corners, then Prosurv cEZ will of course **hold** the 1/4 corner when computing the centerline of section. Also, Prosurv cEZ will compute the 1/16th corners based on the known quarter cor-

ner as well (on the boundary of the section), treating the 1/4 corner as an angle point. Once Prosurv cEZ computes the unknown 1/4 corners and the center of section, it proceeds by computing the 1/16th corners along the centerlines of the section. Then it uses the 1/16th corners to compute the center of each 1/4 of the section (i.e. #17, the center of the Northeast 1/4 of the section). As the window above shows, simply enter the point numbers that represent the different known corners. Leave unknown corners as 0. Now, just tap the **Compute** button, and Prosurv cEZ does the rest!

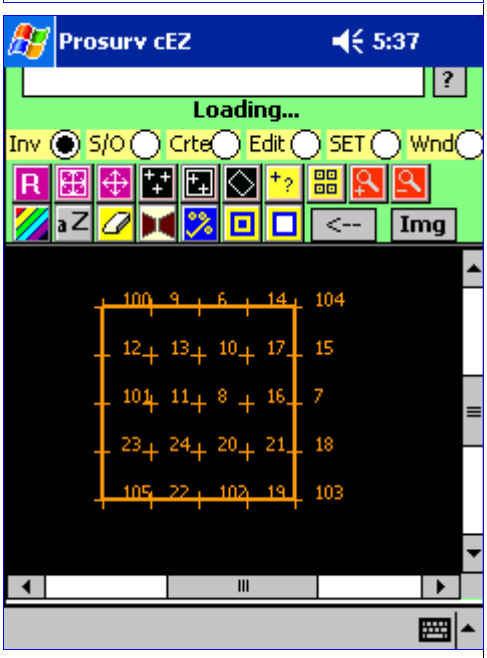
The points were displayed by placing the point #'s 100, 104, 103,102,105,101,100 into a SET (SET #1). Then, the Screen Limits by SET button was tapped, and finally the Draw SETS and Plot Points in a SET routines were used.



Enter the points of the Section just as they appear. Then, tap the **Comp** button.



The above example started with an Auto # of **6**. You can clearly see how Prosurv cEZ goes about creating the corners by following the numbering.



Celestial Observations

The examples used here contain references to the ***Sokkia 2003 Celestial Observation Handbook and Ephemeris*** **© Copyright 2002 by Elgin, Knowles, & Senne, Inc.** This text is an invaluable source of information for surveyors needing to perform Celestial Observations to establish an Azimuth. Prosurv LLC highly recommends reading the entire *Handbook*.

The *Handbook* is an excellent source of information regarding errors, time, accuracies, and a general discussion of all Celestial Observation topics. In addition, the current ephemeris contained in the *Handbook* is required when using the Prosurv cEZ Celestial Observations routines.

Prosurv cEZ uses the **hour angle method** to compute your Azimuth.

Required Information for taking Celestial Observations

The following information is required in order to perform Celestial Observations using Prosurv cEZ:

- **Time** — Required to a high degree of Accuracy. Prosurv cEZ will allow you to hand-enter the exact time of each shot manually, or, Prosurv cEZ can use the built-in clock on the Pocket PC. It is ideal to set the time on your Pocket PC prior to going in the field by any of several modern methods. The clock in your Pocket PC should be sufficiently accurate within several hours of setting the time. Prosurv cEZ will automatically time-stamp your shot(s) on the celestial object. UTC Time is automatically determined based on your Local Time. There is no need to set your local time to UTC (GMT) when setting the time on your Pocket PC.
- **Latitude and Longitude —** These are required to a certain degree of accuracy. A Handheld GPS would provide more than adequate accuracy of Longitude and Latitude for the observation. Also, scaling from a USGS 7.5' Quad Sheet should also provide sufficiently accurate Longitude and Latitude. If you Setup your job so that you're using a State Plane Coordinate Zone, Prosurv cEZ will automatically convert your Occupied point's coordinates (Northing and Easting) to Latitude / Longitude and displays the lat/long in the appropriate text boxes.
- **Observations in Direct and Reverse of the Celestial Object —** The Celestial Observation routines are located in the **Close the Horizon Traverse** routine in Prosurv cEZ. Basically, taking a Celestial Observation is much like shooting in a new traverse point. You simply sight a Backsight Point, and turn to the Foresight, which, in this case, is a Celestial Object such as the Sun

or Polaris. So, it makes perfect sense to include these routines inside Prosurv's Traverse routine.

- **DUT Correction — This correction of time is required when seeking accurate results using a SOLAR Observation.** A definition of the DUT Correction follows: "The time correction to convert UTC to UT1 (DUT = UT1—UTC). This correction is obtained from WWV by counting the number of double ticks occurring within the first 15 seconds of each minute. Each double tick represents a 0.1 second correction. Those occurring within the first 7 seconds are positive, while double ticks beginning with the 9th second are negative. The correction will not exceed plus or minus 0.7 second. DUT, when added algebraically to UTC, will yield UT1 (UT1 = UTC + DUT)."*

Prosurv LLC would like to re-iterate this important information regarding **Solar Observations**, as found in the *Handbook:*

WARNING! Direct viewing of the Sun without a proper filter will cause serious eye damage. Use of a total station without an OBJECTIVE lens filter may damage the EDM components.

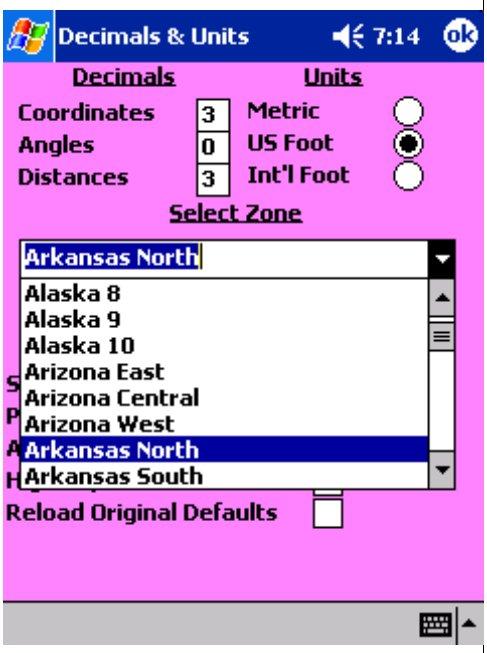
*The *Handbook* Glossary, page 137

Performing a SOLAR Observation

The example used here is taken directly from the *Handbook* pps. 40-43.

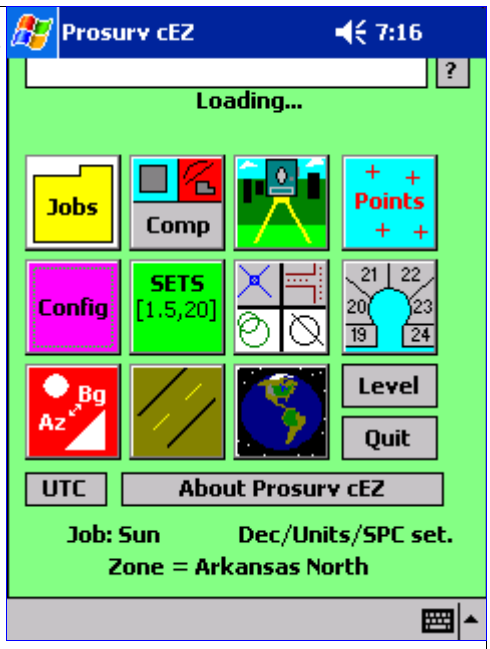
Since the occupied point is known (Latitude/Longitude), we will first enter the Latitude / Longitude as point #1. Also, we will select the **Arkansas North (NAD83) State Plane Coordinate Zone.** Prosurv cEZ will compute the State Plane Coordinates of the point and store the new point. Prosurv cEZ does not store lat/long, rather it computes the Lat/Long as necessary when needed.

Tap the Decimals & Units button to select your zone. Then select Arkansas North. Note here that we're using US Foot units, so when you enter the Lat/Long, the coordinates will be converted from Lat/Long to US Foot SPC's.



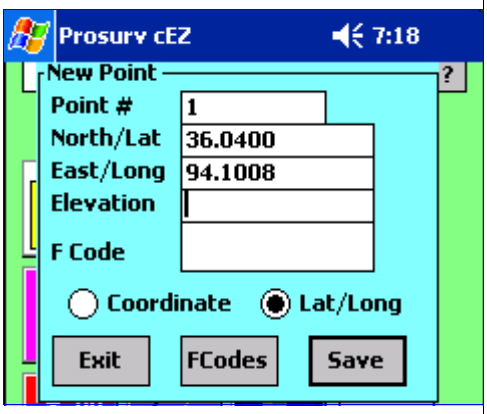
Note the Zone indicated at the bottom of the main screen.

Now, tap the Points button and select **New Point** to enter your Lat/Long for the occupied point.

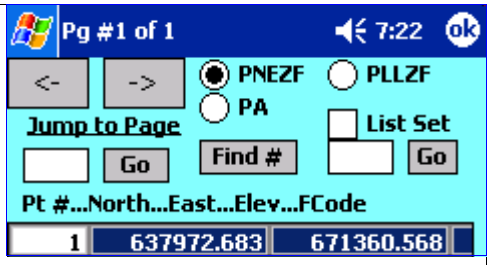


Enter the Lat/Long as D.MMSSssssss and be sure to tap the Lat/Long option.

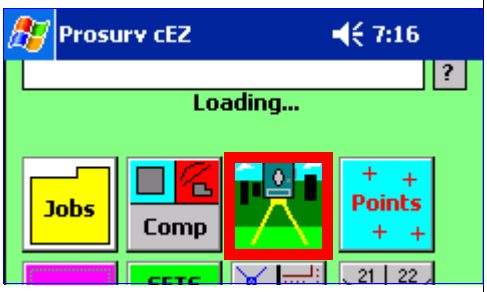
In this example, the Latitude is 36°04'00" and the Longitude is 94° 10'08". Tap **Save**.



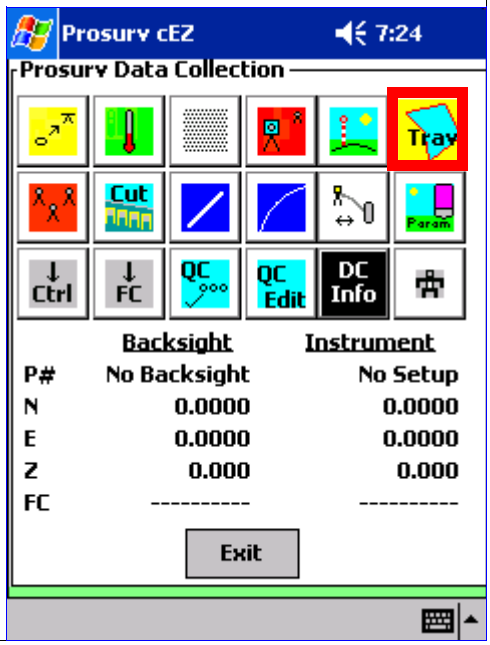
Viewing the Point List displays the North and East coordinates, in US Foot, of the given Lat/ Long.



Now, tap the **DC** button to view the Data Collection routines.

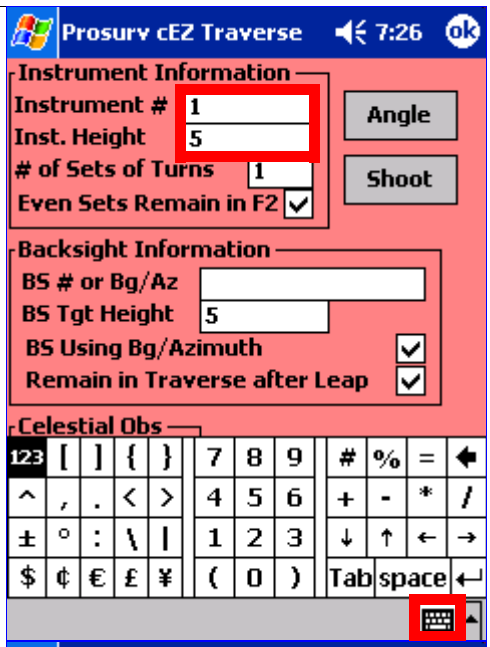


Tap the **Traverse** button to enter the traverse routine.



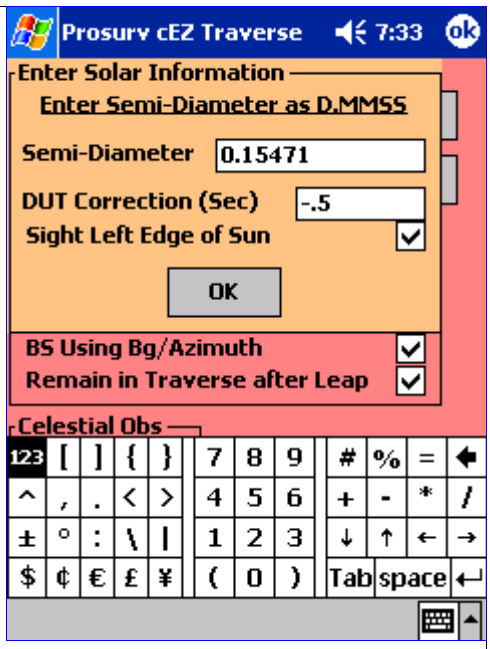
Enter your Instrument point #, in this case 1, and an instrument height (can be any value).

Then, tap the Keypad button to make the Keypad go away. This will allow you to see the **Celestial Observations** box.



Tap the **Solar** button to enter your Celestial Observation data.

Important: If you need to change your data, tap the Off button, then re-tap the Solar (or Polaris) button.



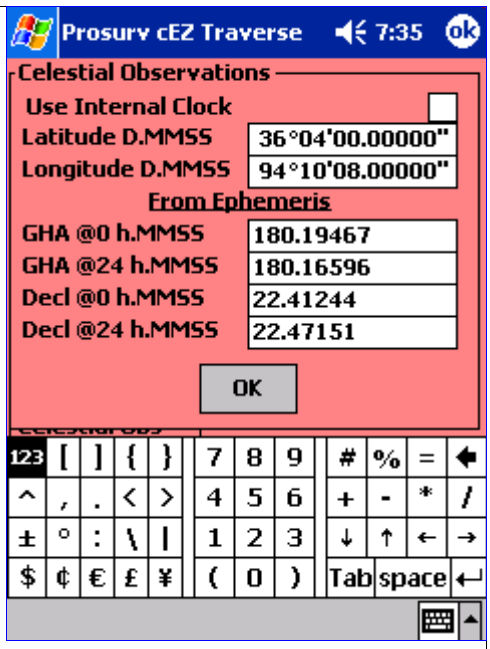
As given in the *Handbook* example:

- **Semi-diameter = 0°15'47.1"**
- **DUT Correction = -0.5"**
- **Latitude = 36°04'00.00000"N***
- **Longitude = 94°10'08.00000"W***
- **GHA @ 0h = 180°19'46.7"**
- **GHA @ 24h = 180°16'59.6"**
- **Decl @ 0h = 22°41'24.4"**
- **Decl @ 24h = 22°47'15.1"**

*Entered automatically by Prosurv cEZ based on your SPC's for point #1. Notice that a degree/minute/second format is displayed. Prosurv cEZ can accept angles in **D.MMSSssss or °/'/"** format.

In this example, we'll be hand-entering the time of each shot, so the **"Use Internal Clock"** selection is not checked.

Tap **OK** to go back to the main traverse screen.



How the routine works

The Prosurv cEZ Close the Horizon Traverse routine shoots your points using the following method:

1. Shoot your Backsight, Face 1 (Direct). A Backsight distance measurement is not required. Simply tap the **Angle** button to shoot your backsight without a measurement. Or, tap the **Shoot** button to take a distance-measurement type shot on your Backsight. Prosurv cEZ will automatically set zero on your backsight if connected to certain instruments.
2. Turn to the Celestial object needed in Face 1 (Direct). The **Shoot** button will be **disabled** and you'll only be able to measure in **Angle** only mode. If using the Internal Clock, the Time is stamped automatically into the routine. If not using the Internal Clock, you'll be asked to enter the Time of the observation.
3. Flop the Instrument and shoot the Celestial object in Face 2 (Reverse). Again the time is stamped automatically, or, you will be asked to enter the Time of the observation.
4. While still in Face 2 (Reverse), re-sight your Backsight (Angle only or Shoot).

This constitutes one Set of angles. You can pre-select to turn up to 8

complete Close the Horizon sets. When finished, you'll be asked to confirm the average sets of angles etc. **It is important to note here, that due to the movement of the celestial body, your Direct and Reverse angles of your set(s) will, obviously, be quite different. Normally, when using the Close the Horizon routine for traversing, you would expect "good" closure of your angles. Therefore, keep in mind that the angles turned will not match, and that the "closure" of the angles may appear to be largely incorrect.**

From the *Handbook*, the following data were observed:

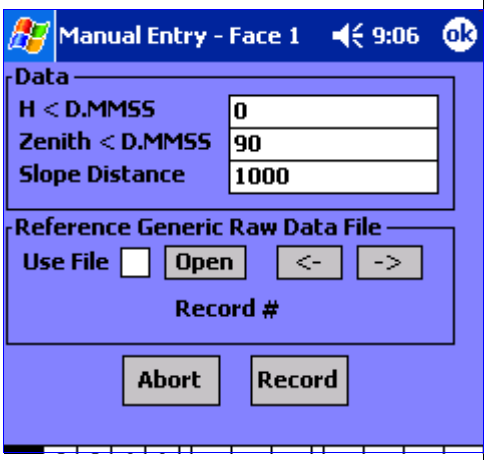
- UTC Time (Stopwatch = 0): 13h 34m 02.0s*

Object	Angle	Stopwatch Time	UTC Time
Backsight Direct	0°00'00"	0:00:00	13:34:02.0
Sun Direct	351°24'54"	0:12:15.6	13:46:17.6
Sun Reverse	171°51'39"	0:15:42.0	13:49:44.0
Backsight Reverse	180°00'05"		

Note: Prosurv cEZ has been set to shoot in Manual mode, for this example.

Tap the **Shoot** button to take the first shot on the Backsight. The data is entered here in Manual mode.

Tap **Record** to store the data and proceed to the next shot.

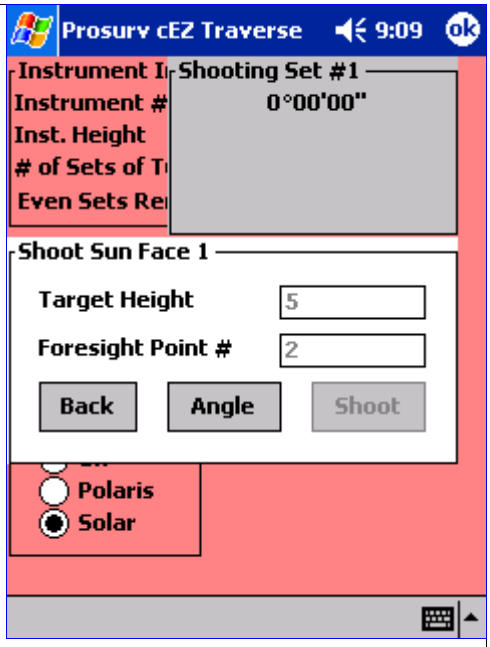


*Note: The UTC time is entered because Prosurv cEZ will compensate for the UT1 time automatically, based on your DUT entry.

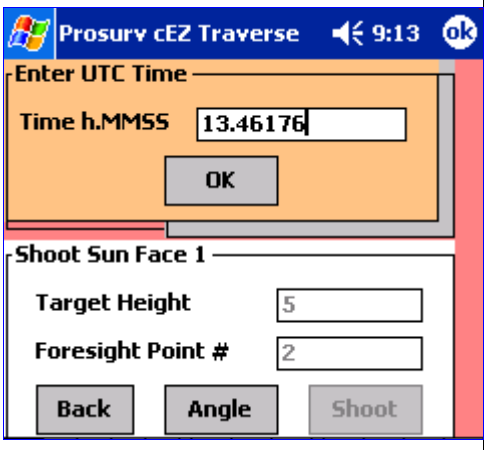
You're now ready to shoot the Sun in Face 1. Note that the **Shoot** button is disabled, since you'll only be measuring an angle to the Sun.

Tap the **Angle** button when ready to shoot the Sun. Note the Foresight point # will be 2, since this is the next Auto #.

When you tap the **Angle** button, you'll be asked to enter the time of the observation (since the **Use Internal Clock** is NOT checked).

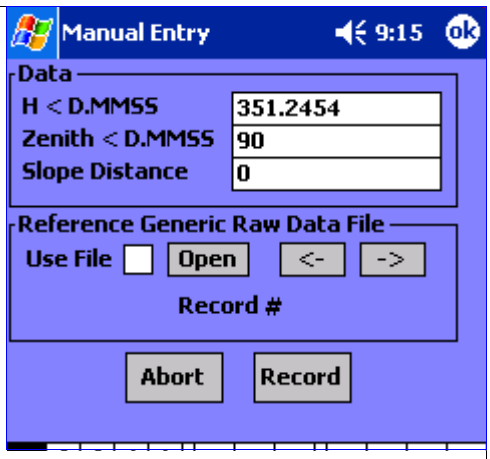


Enter the Time of the observation in h.MMSS format. Then tap **OK**.

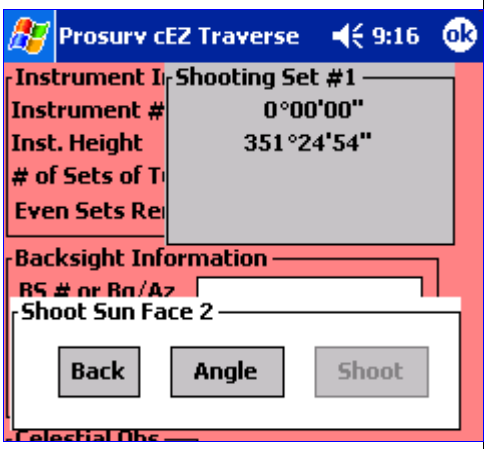


Now enter the observed Face 1 Angle to the Sun.

Tap the **Record** button.

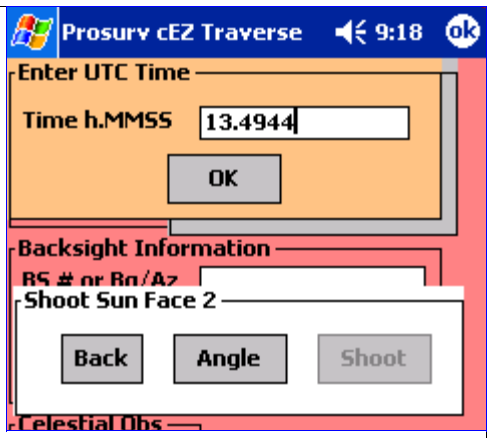


Flop the gun (turn to Face 2) and tap the **Angle** button when the left edge of the Sun is once again sighted.

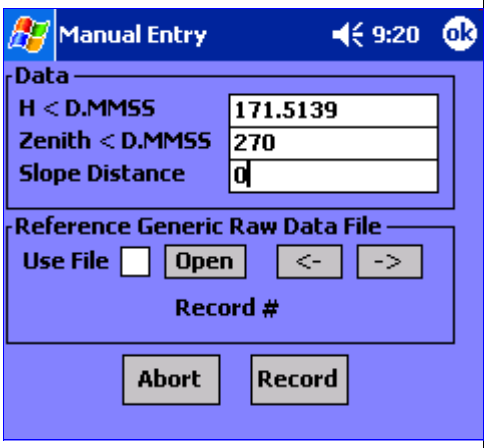


Enter the Observation Time for the Face 2 sighting of the Sun.

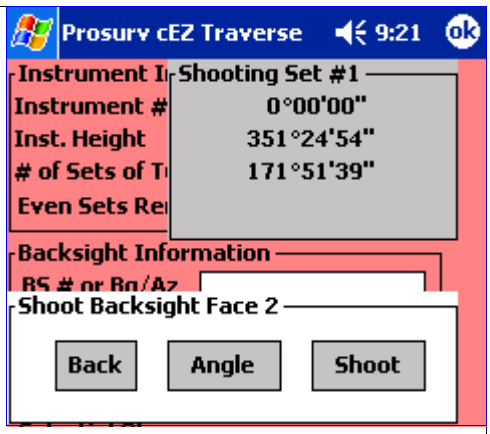
Tap **OK**.



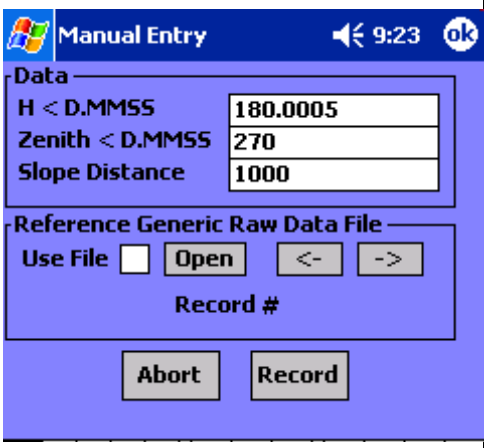
Enter the observed data. Note the 270° Zenith entry for Face 2.



Tap the **Shoot** button to close out this set by shooting your Backsight in Face 2.



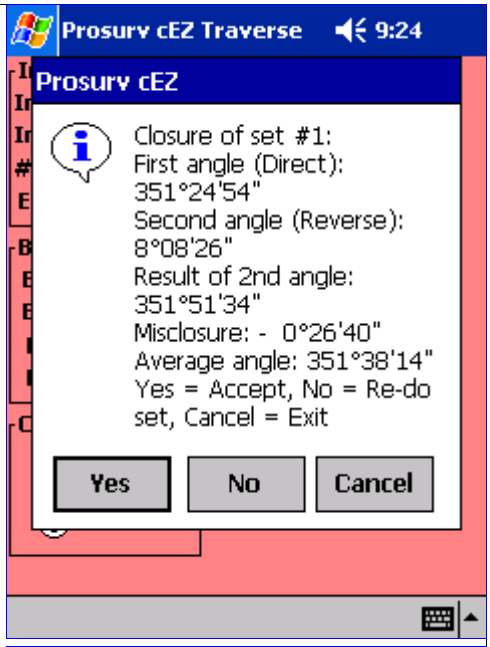
Enter the final data for your Backsight, Face 2. Note the 270° Zenith angle and the 1000' slope distance to the backsight.



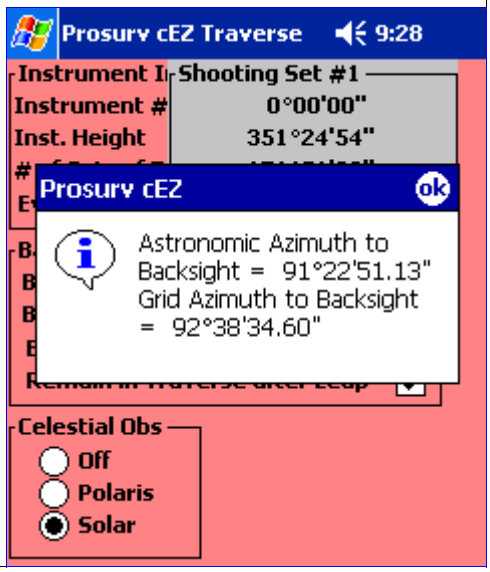
Prosurv cEZ computes the Closure for set #1, just as it does when traversing using this routine.

Note the large Misclosure, which is expected due to the apparent movement of the sun across the sky.

Tap **Yes** to continue.

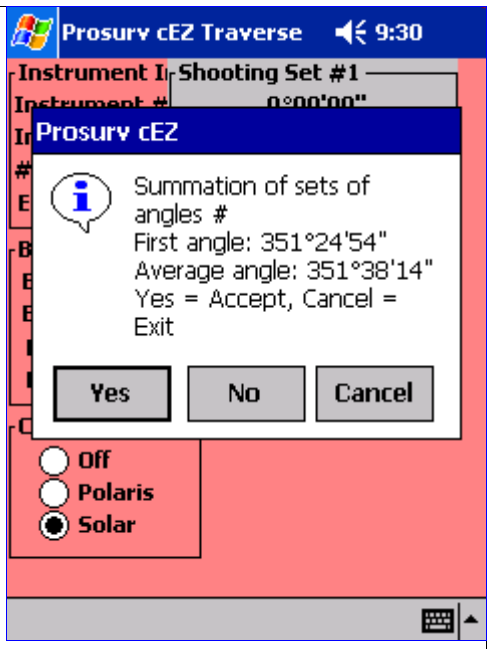


The computed Astronomic Azimuth **to your Backsight** is displayed. And, since you're currently using a State Plane Coordinate Zone, the **Grid Azimuth to your Backsight is also displayed.**



The summation of the sets of angles is displayed, although because we're shooting the sun, you can ignore these angles.

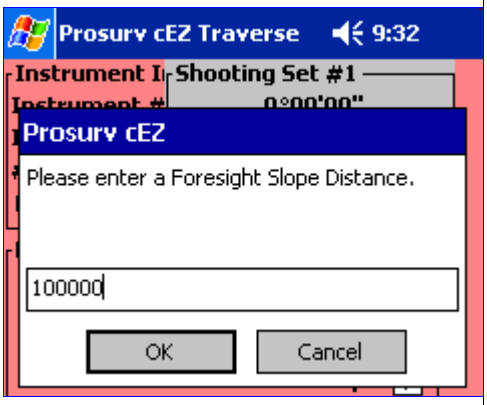
Tap **Yes** to continue.



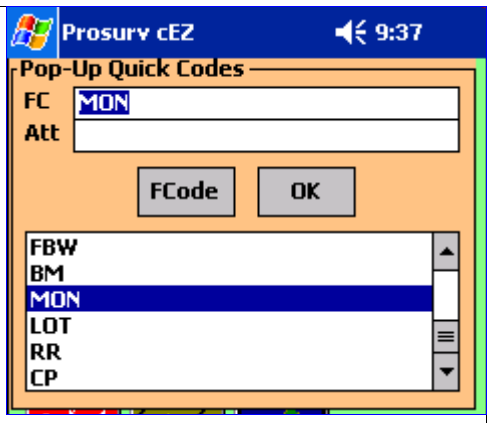
Because we were measuring in Manual mode, and we entered 0 for the slope distances, Prosurv cEZ asks that we enter a distance to the Foresight, in order to compute a coordinate to the point.

Naturally, this will be a "bogus" point, where only the angle to the point from this occupation is correct.

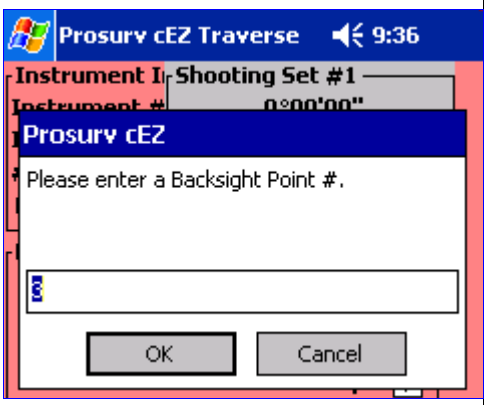
Tap **OK** to continue.



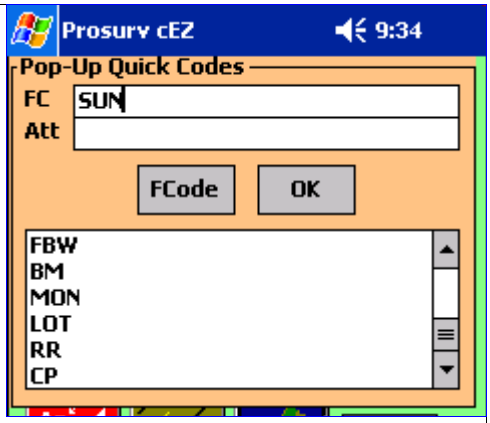
Enter a Feature Code for the **Backsight** and tap **OK**.



Prosurv cEZ now asks for a Backsight Point #. The next Auto # is used by default.



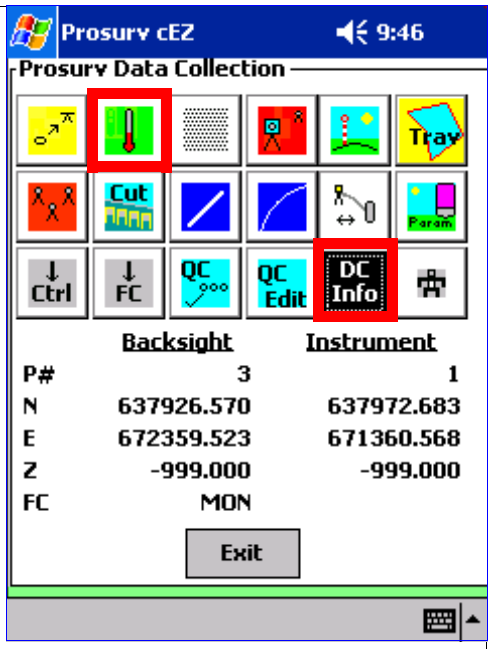
Enter a Feature Code for the **Foresight**.



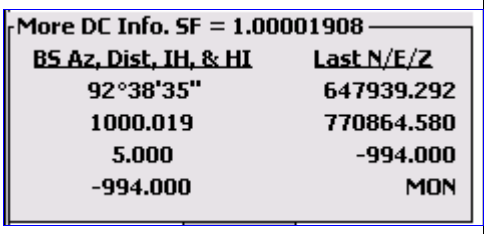
Finally, tap **No** so that Prosurv cEZ will store the Setup automatically.

Storing the Setup means that you can now perform Topo, or continue Traversing using the computed Backsight Azimuth.

Prosurv cEZ now displays the Setup information. Note the automatically computed Backsight



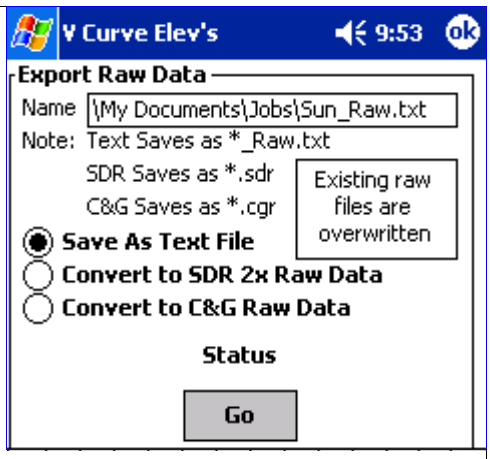
Tap the **DC Info** button to view extended information for the Setup.



Since we're using a SPC Zone, Prosurv cEZ automatically computes the Combined Scale Factor (CSF) for the Occupied point. The CSF is the result of the horizontal scale factor multiplied by the sea level scale factor. For this reason, the elevation of the occupied point, if using SPC's, should be correct. You can re-set the CSF to 1.0 in the Temperature and Pressure settings.

If you'd like to see a complete summary of the Celestial Observation data, simply go to **Jobs—>Export Raw** and export the Raw Data as a Text file. The example data is shown below:

Tap **Go** to save the raw data as a text file.



KI: ,Point#1,North=637972.682660127,East=671360.567600039,Elev=-999,FC/Att=/*/
NO: ,Begin Traverse:
NO: ,# of sets (entered) = 1
NO: ,IH (entered) = 5
NO: ,BS Tgt (entered) = 5
NO: ,Instrument # (entered) = 1
NO: ,Grid scale factor = 0.99997130
NO: ,Sea level scale factor = 1.00004779
NO: ,Combined scale factor = 1.00001908
NO: ,Begin Celestial Observations (Sun)
NO: ,Latitude = 36°04'00.00000"
NO: ,Longitude = 94°10'08.00000"
NO: ,GHA 0hr = 180°19'46.70000"
NO: ,GHA 24hr = 180°16'59.60000"
NO: ,Decl 0hr = 22°41'24.40000"
NO: ,Decl 24hr = 22°47'15.10000"
NO: ,Time Stamp = 12/26/03 9:05:07 PM
NO: ,Time entered manually
NO: ,Semi-Diameter of Sun 0°15'47.10000"
NO: ,DUT time correction = -0.5 seconds
NO: ,Sighting Left edge of Sun
NO: ,Traverse, 0°00'00", 90°00'00",1000.000,5.000
NO: ,UTC Time (Manual Entry) = 13°46'18"
NO: ,Traverse, 351°24'54", 90°00'00",0.000,0.000
NO: ,Angle above was to Sun Face 1
NO: ,UTC Time (Manual Entry) = 13°49'44"
NO: ,Traverse, 171°51'39",270°00'00",0.000,0.000

```
NO: ,Angle above was to Sun Face 2
NO: ,Traverse, 180°00'05",270°00'00",1000.000,5.000
NO: ,Closure (seconds) on traverse set #1 = -  0°26'40"
NO: ,Foresight Sun
NO: , 91°22'51.13"
NO: , 91°22'51.13"
NO: ,Traverse set #1 Adjusted Horizontal < 351°38'14"
NO: ,Summation of sets of angles:
NO: ,First angle: 351°38'14"
NO: ,Average angle: 351°38'14"
NS: Gun;,1,N=637972.683,E=671360.568,L=-999.000,BS;3,BS_Az= 92°
38'35",BS_Dist=1000.019,HI=-994.000
NO: ,Horizontal distances multiplied by a scale factor of 1.000
NO: ,12/26/03 9:41:01 PM
SH: ,0,HA:  0°00'00",VA: 90°00'00",SD:1000.000,Tgt:5.000,BS check
SH: ,2,HA:351°38'14",VA: 90°00'00",SD:100000.000,MON
```

Celestial Observations—Shooting Polaris Example

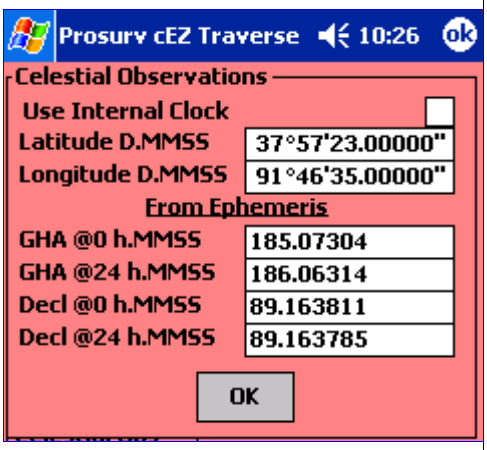
Most of the data entry for this example is similar to the entry methods used in the **Sun** example. For this reason, only certain screen shots will be shown for the Polaris example. Please see the Sun example for a detailed explanation on using the Celestial Observation routines.

Information for this example is taken from the *Handbook*, pps. 63-65.

- **Latitude = 37°57'23"N**
- **Longitude = 91°46'35"W**
- **Missouri Central SPC Zone**

The Lat/Long are entered as point #1, with Lat/Long selected. The SPC Zone Missouri Central was selected from the drop down list.

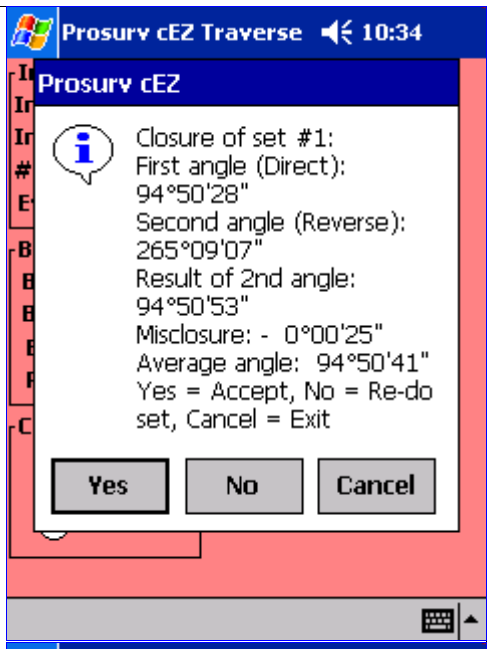
Next, Prosurv Data Collection is activated, and the Traverse button is selected. Enter the Instrument point #, (1), and the instrument height. Tap the **Polaris** button to enter the data as shown.



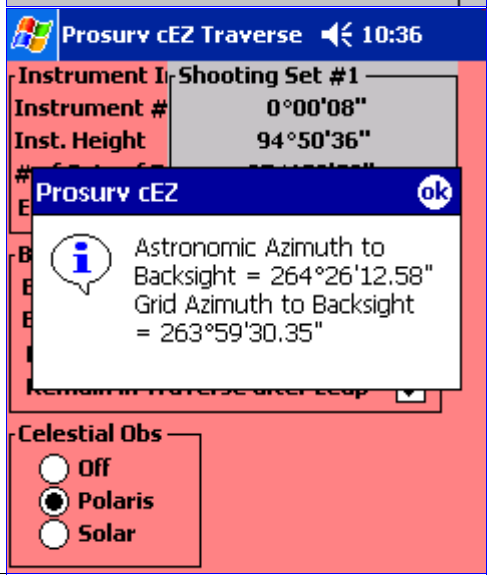
Object	Angle	UTC Time
Backsight Direct	0°00'08"	
Polaris Direct	94°50'36"	2:16:21.5
Polaris Reverse	274°50'56"	2:19:36.1
Backsight Re-verse	180°00'03"	

Using the information shown above, the data is entered manually into Prosurv cEZ. If you're connected to an instrument, the angular data is automatically recorded from the instrument, just like when shooting a point in Topo mode.

The results of using the data are shown to the right.

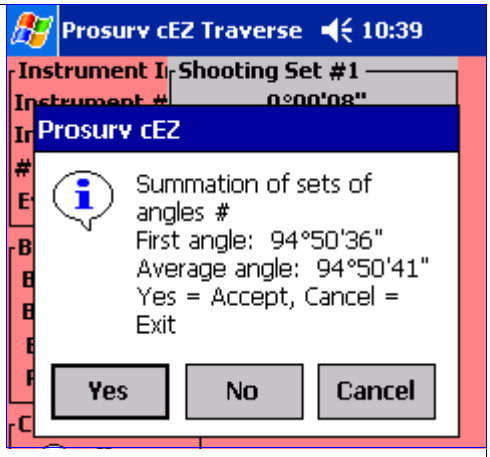


Prosurv cEZ computes the Astronomic Azimuth to the Backsight. Since we have selected to work in a State Plane Coordinate Zone, Prosurv cEZ also computes the Grid Azimuth to the Backsight.



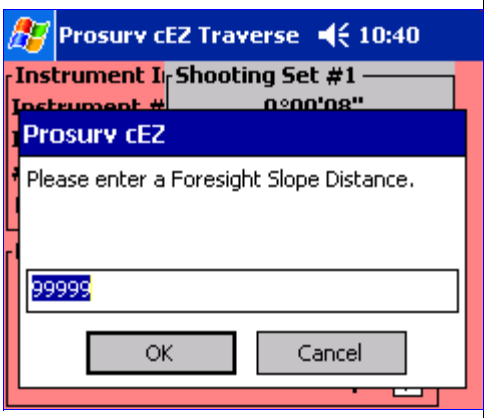
Prosurv cEZ computes the summation of the sets of angles, however, when using Celestial Observations, this screen can be ignored.

Tap **Yes** to continue.

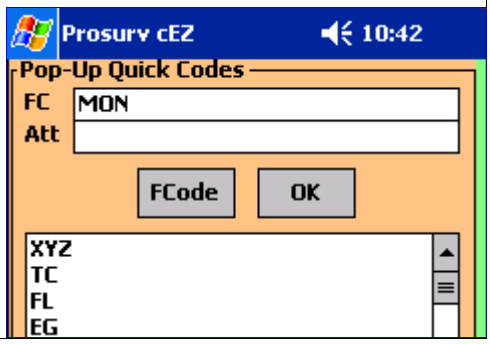


Since Manual entry was used (and zero was entered for the foresight distances), a bogus foresight distance is required.

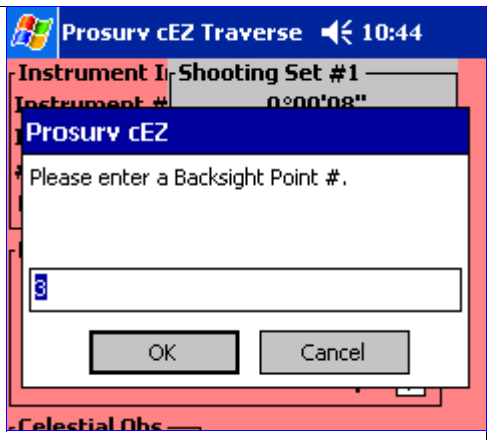
Tap **OK** to continue.



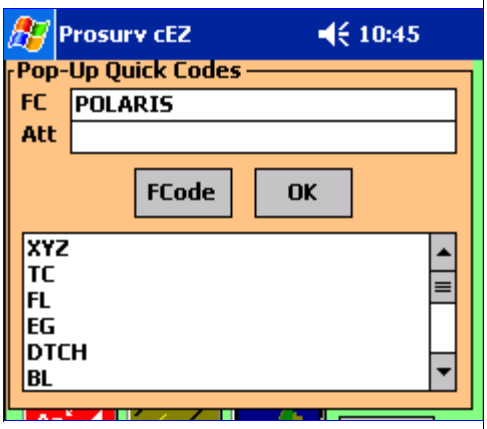
Select a Feature Code for the **Backsight.**



Enter a **Backsight** Point #. Since the Foresight is #2 (Auto #), the next available auto # is displayed.

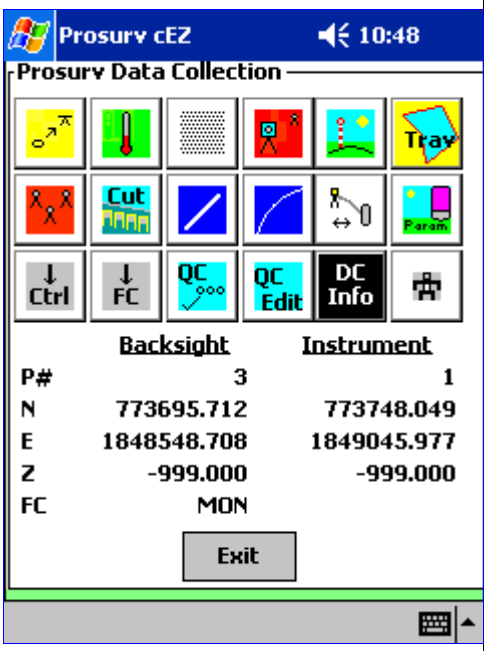


Enter a Feature Code for the **Foresight**.

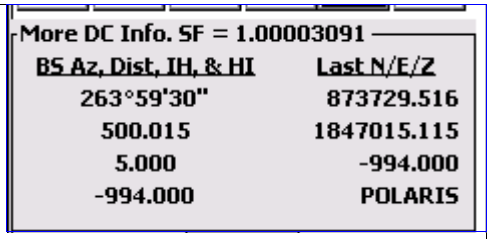


Tap **No** so that the new Setup is stored (you're obviously not leapfrogging and occupying Polaris!)

The Setup is automatically computed and stored. You're now ready to Topo or begin traversing.



The **DC Info** button shows the Azimuth to your Backsight and other data.



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You can export the raw data as a text file to view the entire observation. Just go to **Jobs—>Export Raw Data** and save the raw data as a text file.

For answers to questions about Prosurv cEZ's Advanced ProGO functions, please e-mail techsupport@prosurv.com, or call toll-free **1-888-647-9500**.

Thank you for using Prosurv cEZ and the Advanced ProGO functions! HAPPY SURVEYING!