



**By Al Pepling, LS**

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## Prosurv cEZ



**Top** We cross-sectioned the road from the intersection down at the traffic light, up the hill and around the curve.

**Right** A sturdy environmental case helps to avoid down-time due to instrument repair.



**L**earning curve! You hear it all the time. You read it on surveyors' news groups or websites. It is talked about whenever and wherever surveyors meet, be it at the courthouse doing research, the coffee shop, lunch counter or 'annual meetings. From my perspective, it may be the leading hindrance to accepting newer technology and methodology. For some practitioners it may be overshadowed by the subject of cost. It will be hard to use either one of those hindrances to keep from using data collection once you take a look at Prosurv cEZ. Even if you are currently using another data collection package, you may want to take a look at this one.

Prosurv cEZ is written for the Pocket PC platform. It will work with the Pocket PC 2002 and the Pocket PC 2003 operating systems. With the 2003 system you can go wireless with "Bluetooth". The big advantages Pocket PC/WinCE platforms have over the older 48GX hardware types is graphics, data transfer speed, screen real estate, memory and memory options, and processor speed. There are two other advantages for me personally. One is the word processor and the other is the spreadsheet. They give you a more mobile office capability. Combined with a portable keyboard, portable printer and scanner, mobile Internet, and cell phone, you can keep client contact personal and timely. All of the above are keys to giving good service and building a repeat clientele.

What is your definition of a learning curve? Using another data collection software with which I'd had minimal experience, I had started an engineering verification survey of an intersection median island in Monroeville, Pennsylvania at the intersection of Route 22 and McClure Road. Twenty-some shots and an hour later, due to my inexperience and an equipment malfunction, my data collection

was over, and I finished the day with old reliable hand notes. Of course it took an hour or so the next morning to manually enter and check the data into the base mapping. The data served its purpose, though.

In the words one of my favorite commentators, "Now for the *rest* of the story." Let's face it, sometimes when riding the edge of technology, you ride the flat of the blade, sometimes you ride the edge! This time it was the edge. My cables, three of them patched together, hung down to the ground and the iPAQ 3835 sans environmental case was in my hand. Walking around the gun I inadvertently snagged the cable, almost ripping the 3835 out of my hands. I checked my set-up, leveled it up and took backsight again. Kenny was on the narrow median of a four-lane highway in morning commuter traffic taking bottom-of-curb shots. The gun kept "timing-out" on distance. Then it took the shot. Kenny wasn't a happy camper. Same problems with the next two shots and then no communication at all. In the office there was no communication either.

The problem was the thin wafer in the bottom of the 3835 that sits in the cradle and supplies communications and power. It had evidently cracked. The unit worked perfectly after a trip to the manufacturer's repair facility. (Now I understood the comments about the "ruggedness" of the Pocket PCs for data collection.) The problem goes away with the purchase of an environmental case, however. Just like the 48s! The environmental case solved my problems and now I only use one cable. Eventually I will upgrade to a Pocket PC with Bluetooth and be cableless.

### Fast-Forward

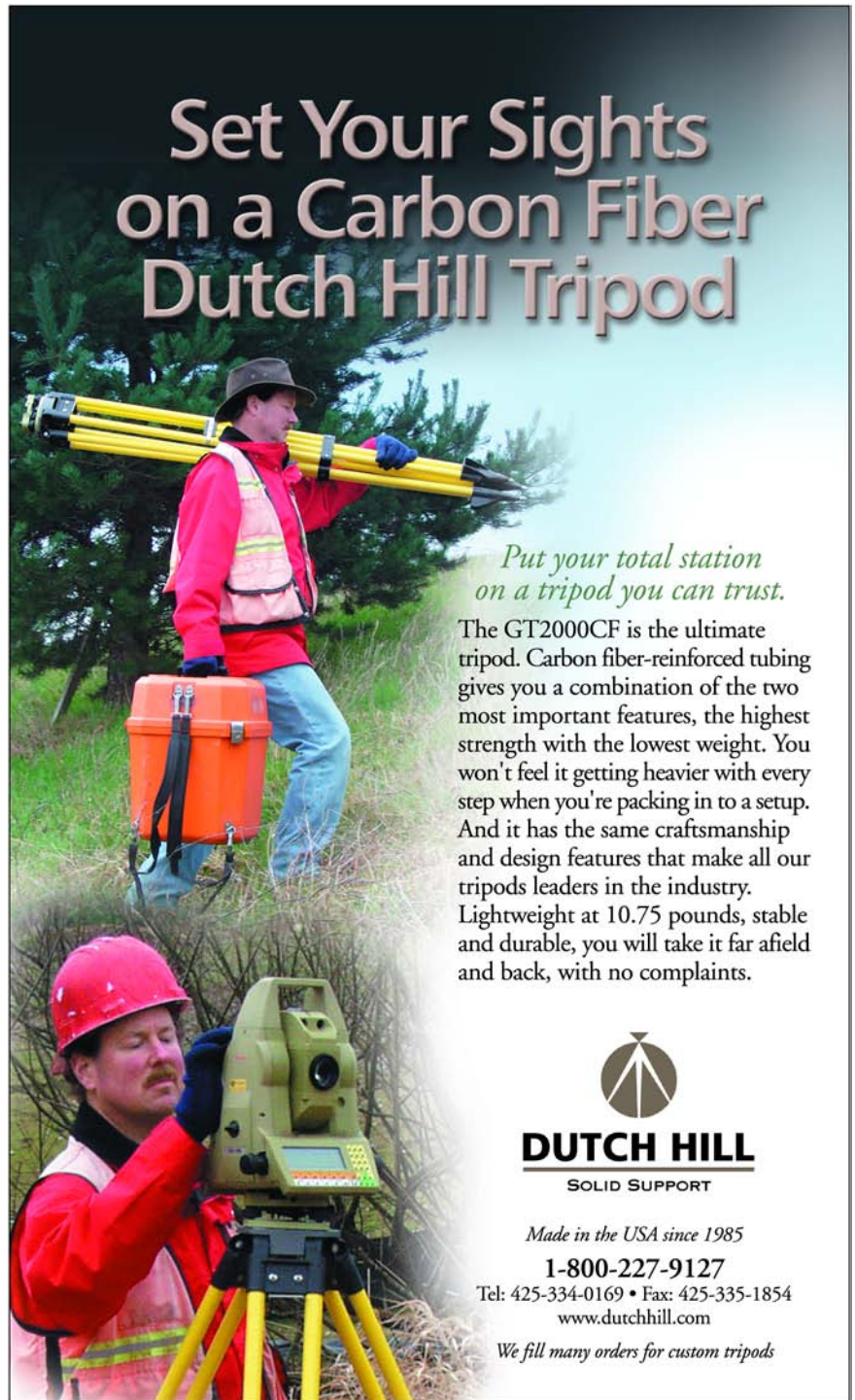
The Prosurv cEZ learning curve is short! Fast-forward a month or so and now the project becomes a full-fledged engineering base mapping and design. Same gun, repaired 3835, environmental case, and this time, Prosurv cEZ data collection software. I perused the manual the evening before I went back to the project site to get a leg up on instrument settings for the data collector.

On site I connected the cable, finished my setup, and cautioned my partner BJ that this was new software, therefore it might take me a little while to get it up and going. I tapped the "jobs" icon, tapped the "new" icon and entered my job name (Figures 1a and 1b). Next I tapped the "data collection" icon, followed by the

"setup" icon (Figures 2 & 3). This, readers, is where the screen real estate comes into play. There is a lot of data displayed and prompt boxes to be filled in. Under the "instrument" you fill in the point number and the instrument height and whether or not you want F1/F2 Tolerance Warnings enabled. Under the "backsight" you can choose a point number or input an azimuth or bearing, input the target height, whether or not you choose to shoot the backsight, and if you are going to do

"Ds & Rs" or F1/F2. To the right of the instrument portion is the choice to shoot or exit the dialog box. This sure beats trying to remember "HIs" and "PHs" when using hand notes. If you choose to shoot the backsight it will display any discrepancy between the points (if you input them), and it will ask if you want to store the point. Being within a hundredth both horizontally and vertically, I accepted the results and continued.


My practice is to always shoot the back-



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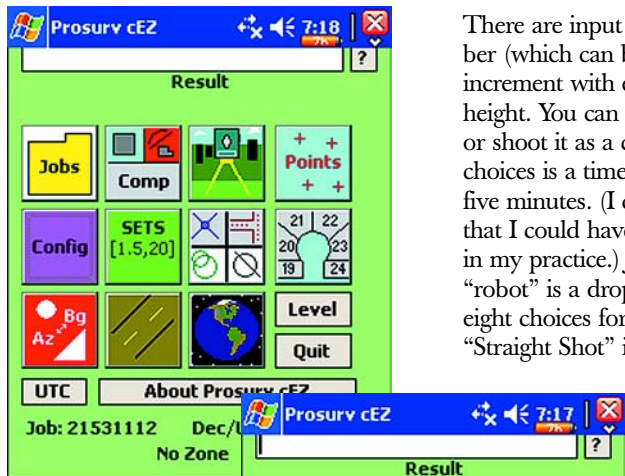
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Figures 1a and 1b show Prosurve cEZ's opening screen and "keyboard".

sight. (One time back in the 80s I skipped that little check, which cost me \$2,500.00 in backhoe time, operator time, and percolation test witness time for

percolation tests done on the wrong lots.) I caught that error that night back in the office with another check of plotting my fieldwork on the drawings for any stakeout that I did. I sure do appreciate this feature in Prosurv cEZ.

The "topo/sideshot" icon was my next pick (Figure 4). The manual states that this is perhaps the one routine that you will be using the most often in Prosurv cEZ. I will attest to that, at least this day.

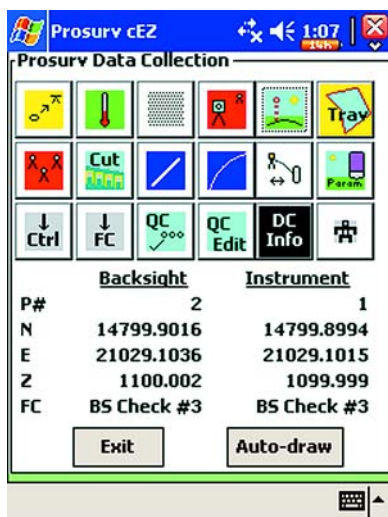


Figure 2 Data collection screen

There are input boxes for the point number (which can be set to automatically increment with each shot) and the target height. You can also choose to use F1/F2 or shoot it as a check shot. Below those choices is a timer that can be set for up to five minutes. (I cannot count the times that I could have used the timer feature in my practice.) Just below the "shoot" "robot" is a drop-down menu that offers eight choices for the "type of shot".

"Straight Shot" is just as it describes, a shot to the prism pole directly over the target. Next choice is a "Separate Angle" which is the manner I used to shoot trees, building corners, etc. You hold the prism pole against the building corner, perpendicular to the sight axis of the gun at the correct prism constant offset to the corner, and tap the "shoot" dialog box. A dialog window pops up giving you a "yes" or "no" choice of when you are ready to take the separate angle

shot. Without changing the zenith angle, you turn to the corner of the building and tap the "yes" dialog box to complete the shot. Utility poles, traffic signs, hydrants, traffic signal poles, etc., are a cinch with this routine.

The third choice is "offset", which upon tapping pops up the "offset shot" dialog box. You enter the offset distance, which gives you four choices: left, right, away, and towards. It also displays a reminder of what the "prompt left" and the "prompt right" mean. When the proper one is selected you tap the "shoot" button.

Fourth is the "angle only" routine. The horizontal and zenith angles are recorded and the software supplies a bogus distance. Bear in mind that the elevation computed is based on the bogus distance, making it bogus as well.

Fifth is the "remote elevation", which is useful for elevations on a building roof, a rock ledge, or perhaps an overhead wire or under clearance of a bridge. Two shots are necessary. The

first one places the rod person under or above the desired point to which an elevation is needed. Then the horizontal angle and distance are recorded and the slope distance is reduced to the horizontal distance. Next you take the second shot to the point where you need the elevation. The zenith angle is recorded and used to compute the elevation of the second point.

Sixth is the "fast traverse" routine. Set a point that will not be part of your traverse, rather a point from which to spray topo shots. Use "fast traverse" when you are ready to move to the new point. It will record the shot and then prepare the "setup" screen with your present station as the new backsight station and the "fast traverse" point as the occupied station. Yes, you can use F1/F2 do shoot the new point. You need to enter your new instrument height and change your prism height if necessary and you are good to go!

Seventh is the "copy last shot" routine. Let's say you find an iron pin at the intersection of the edge of a driveway and another at the edge of the street pavement. Basically, this routine allows you to change the point's descriptor without having to shoot it each time. Take the first shot, enter the next descriptor, and tap "copy shot". The original raw data is used with the new descriptor to compute the point.

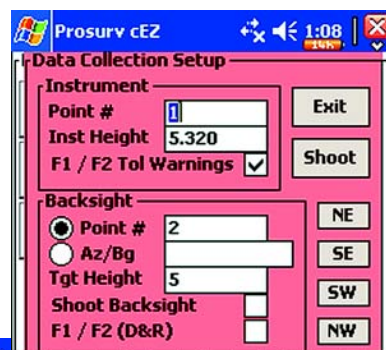


Figure 3 Data collection set-up screen

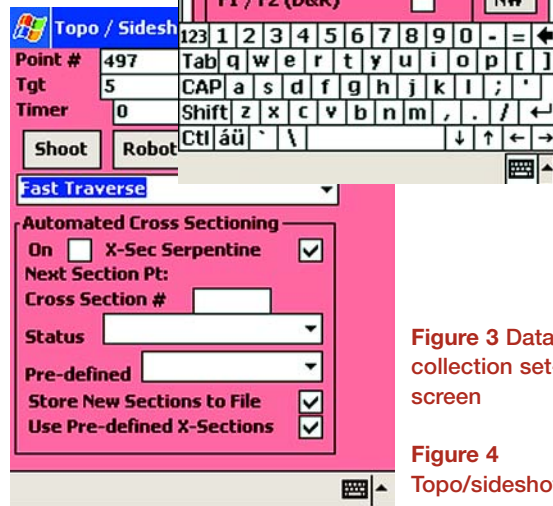


Figure 4 Topo/sideshot screen

Finally there is the “tree shot” routine. It is the same as the “separate angle” shot, except that the distance is the initial piece of data recorded, and the angle is second. This is a very impressive array of offset options for the surveyor to choose from. The best part is that these offsets are just a drop-down menu away.

As shown in the photos on page 76, we had to cross-section the road from the intersection down at the traffic light along the entire frontage of the property with the site construction, which was up the hill and slightly around the curve. We also had some reconnaissance to do for reference monuments on the state highway. We collected approximately 145 shots without a hitch. (With two rods going, the number of shots could have been nearly doubled in the same amount of time, had I been inputting the codes, which could have been entered in the office and called up when in the field.) I made use of the “offset” routines on this job and did backsight checks as the last shot on each set up.

### Back at the office

I set the iPAQ 3835 in the cradle connected to the USB port. Using Prosurv cEZ I exported the points to an ASCII file, then using the Active Sync explorer dragged and dropped the ASCII file, the raw file and the cEZ coordinate file to the proper project file. This took less than a minute. Speed of data transfer is another advantage of this platform. I did all of this without further consulting the manual or Prosurv’s tech support. No training session, either. To put it simply, that was my “learning curve”. Because a fellow surveyor like Dominick Whitham, LS, wrote the package, it is set up to work the way a surveyor works. Dominick is the guy you generally get on the phone, and he does most of the coding. He came up through the ranks and has a lot of field experience to draw from, and this data collection program shows it.

The manual is clearly written and liberally illustrated. Explanations are concise and to the point. Since it is a field data collection package, the manual is formatted to the size of a field book. I printed it out at home in color and then took it to my local copy center to have it trimmed and three-hole punched for a 5 x 7 loose-leaf binder. It is slightly larger than the usual field book, but the pages lay flat for easy studying.

The “comps” section of the program will divide up curves, translate and rotate

coordinates, translate elevations, calculate the area of a polygon, calculate the area of a curve segment, calculate predetermined areas, do both closed and connecting traverse compass rule adjustments, distribute a plat error, calculate a three point curve, fit a curve to two tangents, and divide a 2D/3D line.

Another useful data collection section routine is the transfer of an existing bench mark to the gun set-up point.

Temperature, pressure, scale factor, and curvature and refraction can be set in the data collector simply by checking the appropriate box. I appreciate this option since I run my traverses with reciprocal trigonometric observations on each leg to cancel out the need for C & R corrections. Then I check the C & R box for sideshots, even when observing Ds & Rs to boundary markers. Along with other useful explanations, the manual explains the use

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of C & R and cautions against double correction by turning it on in the collector and having it on in the instrument, too.

A provision has been made to collect notes—such as a conversation with a property owner, a particular feature or condition, or whatever you may care to jot down. You can also run a D & R traverse with the “horizon closure” method, not just using the ALTA/ACSM D & R method. I used this method back in my hand note days; when combined with attention to refraction and careful set-ups, it has always impressed me with the consistency of my traverse closures (consistent enough to indicate when my tribrachs needed adjustment). A two- or three-point resection is present, and so is radial stakeout. You can stake to a line or to a curve and also record the position you have staked.

Firms with a lot of sitework or roadwork will quickly come to use the automated cross section routine. This routine will store the codes as the rodman walks the cross section. It can be used in the “learn as you go” mode or from a predefined list. It will then use the code sequence from the first cross section and apply to the next cross section. This routine even allows you to shoot cross sections in the “serpentine” mode.

You can use point descriptors as well as control codes and feature codes. A PC feature code editor is available from the com-

pany website. Control codes are those single codes that your office software uses to automate the office drafting—the “field to finish”, if you will. Feature codes have a similar function and can have up to five attributes per code. Point/Line, line weight and line color information can now be included.

State Plane Coordinates and geographic coordinates are supported. The “set” function is available. This permits you to group certain points into a “set” that you can call up in the collector for plotting or staking. The set could be property corners, utility structures, building corners to be staked, etc. This is a convenient way to give the field crew, say, Lots 3, 4 and 26 for corner and building stake-out, as opposed to the old “point list”.

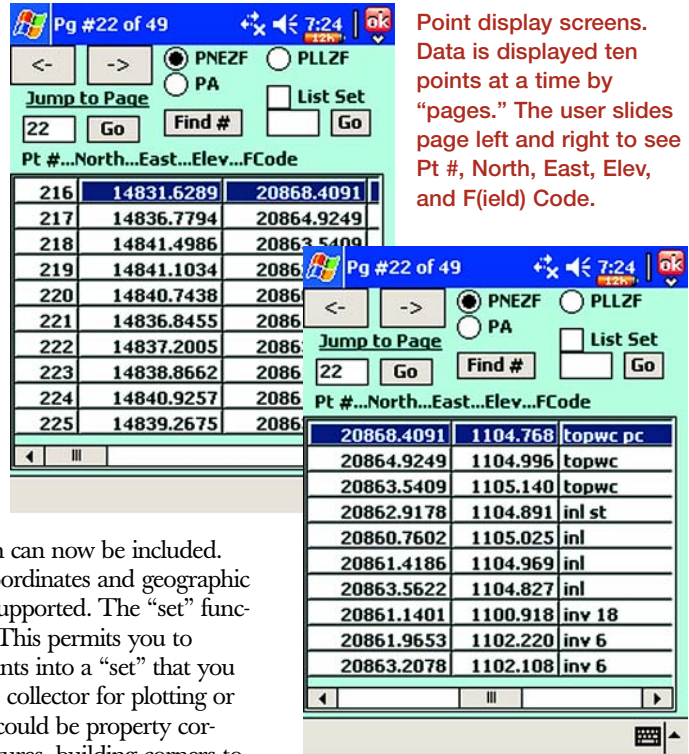
### Multiple Offsets Available

In addition to the usual bearing-bearing, bearing-distance, and distance-distance intersections, Proserv cEZ has a “dual offset” and “known offset”. The dual offset is used by giving the point numbers of each of the two lines and then the offset to each line. Take a building stakeout on a lot for example. After entering the required point and offset data, a point is created at the intersection of the offset lines, say the building corner or the corner of the building envelope. The

“known offset” comes in handy here in some Pennsylvania towns, where some control marks were set on offset lines. You can set on a known block corner and then backsight a known offset control mark. The actual other end of the block corner will be calculated and can then be staked out.

Many other routines are also included, some that are briefly mentioned below. Proserv cEZ includes screen plotting of

Point display screens. Data is displayed ten points at a time by “pages.” The user slides page left and right to see Pt #, North, East, Elev, and F(ield) Code.



points, line and curves. Individual points, a range of points, or “sets” can be plotted. I often use the conversion routines included. Especially useful are the triangle solver, decimal foot-to-foot and inches, area and units, and the curve solver when verifying plans. The SPC to Lat & Long and Sea level and Scale factor are also available.

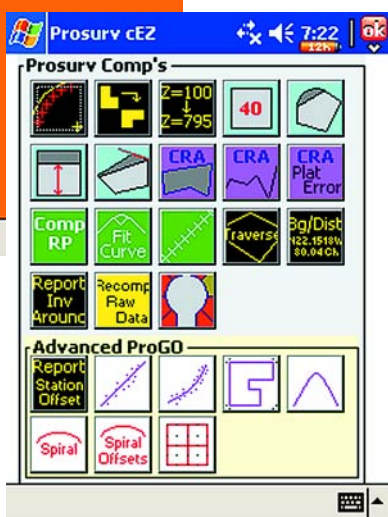
A command line set of functions and baseline functions are included, too (Figure 5). The baseline routines are what you use to create horizontal and vertical control for roads. According to the manual, they are the most powerful routine in Proserv cEZ. You can create centerline curves, tangents, compound curves and reverse curves. Similarly, vertical baseline geometry can be created from PVI to PVI using station and elevation including vertical curves. An entire baseline can be offset at any interval, and grades are computed for your selected station interval. Individual station coordinates and station coordinates and elevations can be calculated. Reports can be generated. You can compute PCs, PTs and intersecting angle points at a given offset automatically.

For a nominal cost you can purchase digital leveling routines. An “Auto-Draw” feature, which gives you feature code-based linework in real time can be added, too. Advanced ProGO is another add-on. GPS capability and wireless Bluetooth capability for cable-free com-



Figure 5 Baseline functions

Figure 6 Advanced ProGO



munication with your total station is available for additional cost.

Advanced ProGO, in my opinion, has “must have” routines (Figure 6). Leading my list are the least square best-fit line and curve routines. Next on my list is the building stake-out routine that automatically generates the offset stake locations. Two are created on the four corners of the overall building rectangle. Spiral curve centerline geometry is next, followed by the spiral offset computations and find offset routine. Star and sun shot observations are included. My guess is that Public Land System surveyors would probably put the “Divide a ‘standard’ section into its aliquot parts” at the head of their lists. I haven’t had much time to use the Advanced ProGO, but I’m looking forward to doing so!

Overall, there is lots of data collection capability included in this software for a very attractive price. Visit the Prosurv website at [www.prosurv.com](http://www.prosurv.com) and check it out for yourself. You will be hard pressed to find a comparable value! I like to think of it as having “menu-driven software, without being driven by menus”!

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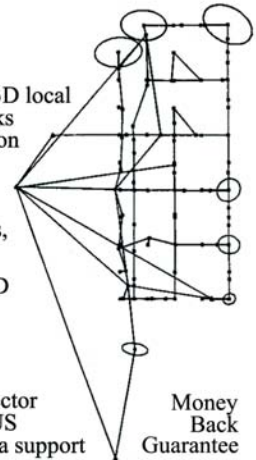
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