PC Survey Tutorial

11 March 2016

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Introduction

Hi! You're about to experience something that is a rarity in today's surveying software world - a program that is easy, fast, powerful and inexpensive. Customers have reported reducing their production time from hours to minutes. In one customer's comparison, his current system took 2-3 hours to produce a finished plat (he said it would have been much longer if he had been using Autocad). On PC Survey, he said he did the same project in 10 minutes. Personally, I think he was exaggerating - but it sure sounds good, doesn't it?

PC Survey is much easier to learn than most other CAD programs because PC Survey is specifically written for the surveyor. There is no need to use another CAD package because a basic CAD system is already included in the package (though if you really want to, you can always create a DXF file of your drawing for import into another program).

A Note on Equipment

This section gives an overview of what equipment and software you will need to successfully use PCS.

Minimum equipment required:

386 computer (486 recommended).
4 MB RAM (8MB recommended)
Hard drive with a minimum of 5 MB free space
VGA monitor and video card. (Super VGA or better recommended)
Mouse or digitizer. (3 button mouse recommended)
Microsoft Windows 95, 98 or NT (We still have a version for 3.1, but it is no longer updated)

Since PCS is a "graphics intensive" or "CAD" application, the faster the computer, the better. Therefore a 486 or Pentium-based computer is your best bet. Also, while Windows will run with 4MB of RAM, it will run faster with 8 or 16MB of RAM. **Some customers have reported problems when using just 4MB.**

PCS uses the middle button of a three button mouse to occupy a point**.** A two-button mouse will work, but will not be as easy to use. Digitizers with 3 buttons or more are also acceptable as long as they provide a Windows driver.

Try to use a video system with at least 800x600 resolution. The higher your resolution, the more data can be placed on the screen at one time. You'll be able to see more of your project (especially while dialog boxes are up) since menus, dialogs and toolbars use up a smaller proportion of the screen as the resolution increases. Modern 14" monitors can usually handle 1024x768 resolution. HOWEVER, using a smaller monitor at high resolutions can result in eye strain. So, if purchasing a new system, get the largest monitor you can afford.

Bottom line - if you're going to spend a LOT of time on your computer, get the best system you can.

We at Soft-Art, Inc. are also expert system consultants. We can advise you on system configuration and purchases. We can also supply equipment at very competitive prices if you are either unable or unwilling to use your local sources. Computer stores often have markups of up to 100% on their equipment. We generally can provide you with information such as the dealer's cost and recommended brands. So, be CAREFUL when purchasing computer equipment. It is very easy to buy something that is overpriced or will cause you support headaches later.

When you install Windows, you must install special drivers in order for your VGA monitor to operate at resolutions higher than the standard VGA resolution of 640x480 (unless you're using an 8514 or XGA configuration). Instructions and software are normally provided with your video card for this purpose.

Recommended: A high-speed modem. Internal modems that operate at 14,400 baud (V.42 bis) and higher are readily available. If you have any questions about a specific project or need software updates, modems can be VERY helpful. With a modem and Internet access, you will be able to exchange mail and files with us.

Plotters/Printers

Since PCS is a Windows application, the best of kind of plotter/printer to own is what is called a ***raster*** printer. Basically this is just about anything EXCEPT pen plotters. If you haven't noticed, pen plotters are going the way of the dinosaur. The problem with pen plotters and Windows is that they are not WYSIWYG (what you see is NOT what you get with a pen plotter) unless one spends a WHOLE lot of extra effort in the program just to handle the pen plotter (which we have done) AND the pen plotter Windows driver (the software that comes with the plotter) is written REALLY well. Additionally, pen plotters are painfully slow.

One of the nice things about Windows is the availability of a myriad of character fonts called TrueType fonts. Unfortunately, TrueType fonts do not work on pen plotters since they are raster fonts.

Therefore, if you are purchasing a new plotter, buy an inkjet, thermal or laser plotter. The HP Designjets, for instance, are good Windows plotters. If you are currently using a pen plotter, don't panic. PCS will still give you quality plots - you just won't have access to niceties such as TrueType fonts.

Before you are able to use PCS with your plotter/printer, the Windows driver for your plotter/printer must be correctly installed. Installation instructions exist in the Microsoft Windows manual and should also be contained with the driver. Printer installation, selection and setup is performed in the ***Printers*** section of the Windows ***Control Panel***. You can quickly verify that your printer/plotter is correctly installed by trying to print a file from the ***Write*** program that is normally found in the ***Accessories*** group.

Technical Support

Technical support for PCS is, unfortunately, FREE. We'd like to keep it that way. Bear in mind that this product is priced quite low relative to most of its competition. Our goal is to provide an inexpensive solution for the surveyor since we know that most surveyors have a difficult enough time trying to make ends meet without having to pay exorbitant amounts of money for overpriced software.

Providing technical support can be very expensive, both in terms of time and money. Resources that are devoted to technical support are not available for improving the product. However, there may be many times that you have a simple task to perform and just don't know where to find the solution in the documentation. Giving us a five minute call may well save you hours of needless searching in the manuals.

Therefore, if you have a problem, give your manuals a quick once-over first. Once you have determined that your problem must be taken to a higher authority, have the following ready:

- The version of PCS you are currently using (found in the ***About*** dialog in the PC Survey Window)
- A description of your equipment (video card and resolution, printer/plotter, etc.)

The technical support phone number is **(385) 312-8567.** We are always open 8am-5pm CST, Monday-Friday, but you can also often reach us at other hours. We understand that surveyors sometimes can only find time to work with their computers only after normal business hours, so don't be afraid to call us in the evening. We request that you don't call on Sundays unless it is a dire emergency.

Some new users have encountered problems understanding the tutorial. If you get stuck while working through the tutorial, use the toll-free line - (800) 652-7279 - to call for assistance.

Since every surveyor seems to find a unique (and often amusing) way to do things, we are interested in any suggestion that you might have for improving the product. (Please ignore any giggles or outright guffaws that you might hear in the background when you call - it's probably just the radio.)

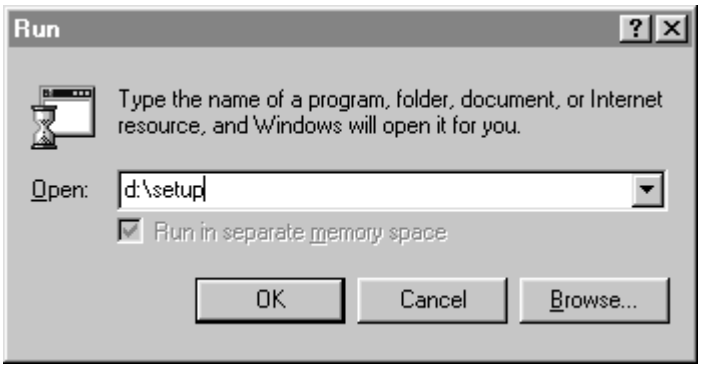
Our address, if you need it is:

Soft-Art, Inc.
2045 W. Shadow Wood Dr.
Lehi, UT, 84043

Installing PCS

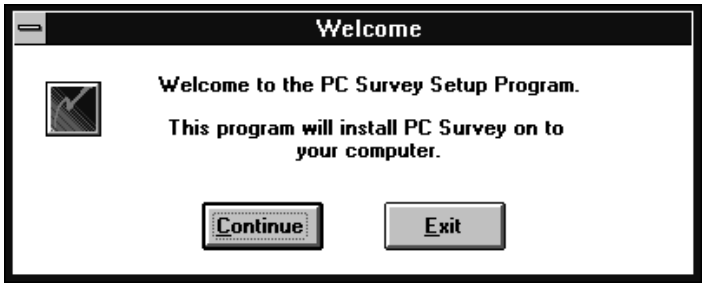
From the CD

1) Place the CD into your CDROM drive.
2) Press the **Start** button on your desktop.
3) Select **Run.**
4) Enter "**d:\setup**" as shown to the right, assuming that your CD drive is D:. If your CD drive is a different drive substitute the appropriate letter (i.e. if the CD drive is E, use "e:\setup").
5) Select ***OK***.



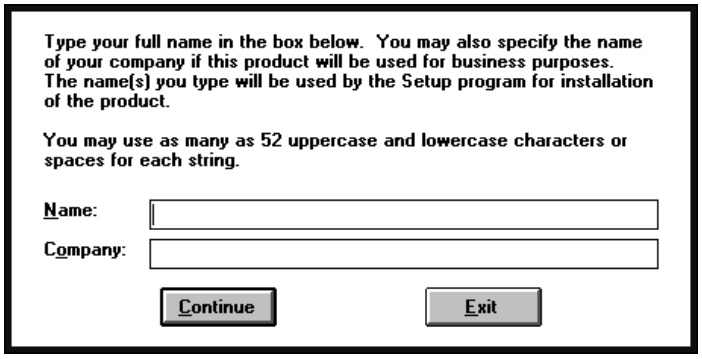
From the Internet

1) Go to PCSurvey.com
2) Go to **Downloads**.
3) Click **Download Now** for the latest version.
4) It will welcome you to the PC Survey Setup Wizard. Click ***Next.***
5) Accept the terms of agreement. Unless you don't agree, click the little circle that marks "I accept." Click **Next.**
6) Enter "**c:\pcs**" or "**c:\Program Files (x86)\pcs**" or wherever else you might deem worthy. Select ***Next*** three times, then ***Install.***



Several dialogs will be presented. The first is the *welcome* screen as shown above.

7) Press the ***Continue*** button in this dialog to move to the next dialog:
8) Fill in your name and company name.

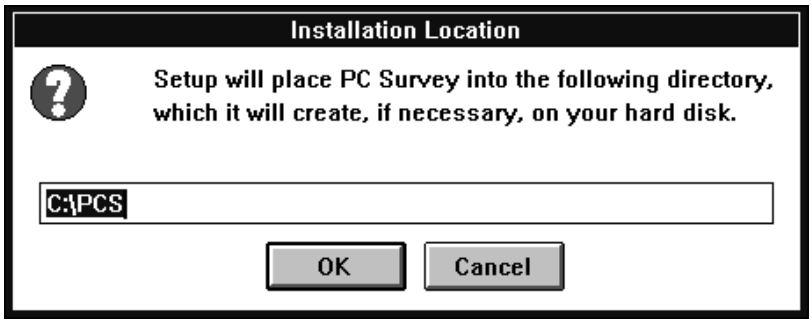


Remember - in Windows, use the ***Tab*** key to move between entry lines or, in Windows-ese, *controls.* Those *buttons* (the Continue and Exit) are also *controls.* Repeatedly pressing the ***Tab*** key will cycle between all the controls in the dialog (normally, but there are exceptions).

9) When you're done filling in this form, press the ***Continue*** button to continue to the next dialog.

Okay, things are starting to get more complicated now - you have some choices to make.

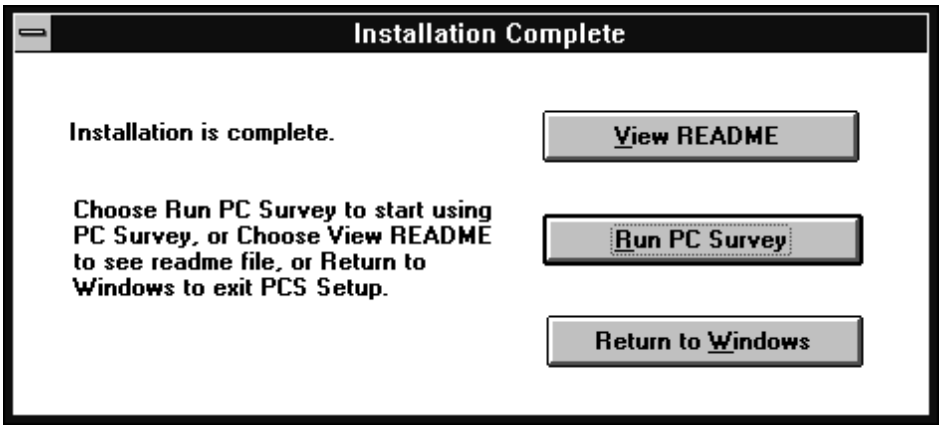
Choosing a different directory



1) If you wish to change the program location, click on the ***Set Location*** button. The following will appear: You can now change the location to wherever you want (assuming that it exists somewhere on your drives).
2) Select ***OK*** and you're back to the *Custom Installation Dialog*. You can save a little space by choosing not to install the ***PC Survey Help*** files. If you don't want on-line help (or just don't have room for it), click on the *checkbox* (the box with the X through it) to the left.
3) When you have finished setting your various options, select ***Install***.

Using the default settings

1) Press ***Install***. The program and all its henchmen will be copied to the location specified at the top (the PCS directory on the C drive).



The setup program will begin copying files to your chosen destination (under ***Install to:***). If you are using the CD, then that is all there is to it.

Congratulations, now you're *really* in trouble. You have to figure out how this software works. Ah, but that's what you're reading this for, right?

If You Haven't Bought the Full Package -

For those of you who haven't purchased the full package, there is a small problem. First, you've ticked us off by not spending as much as you could have. Second, this tutorial travels through DTM and Survey land. If you haven't purchased one or both of these modules, you'll have to take a slight detour once the software is enabled.

Though you can run the DTM and Survey functions before enabling the software with the authorization code, you don't have access to the ***Save***, ***Print*** or ***Export*** functions.

So, if your software is already enabled when working through this tutorial, there is a solution. We have provided some project files that have been created with the Survey and DTM functions. They are found in the PCS\TUTORIAL directory and are as follows:

CONTOUR.PCS is provided for comparison purposes since it can be obtained by working from COGO.PCS to the beginning of the DTM section.

File	Use on page
COGO.PCS	34
CONTOUR.PCS	47
LAYOUT.PCS	49

Authorizing PCS

The program has not yet been *authorized*. As installed, *PC Survey* will not print, save, or export data. In effect, it acts as a demo version when initially installed. This is an attempt to discourage those who feel that there is nothing wrong with using the hard work of others for their own profit (thence the appellation - *software pirate*). However, almost all of the other program functions are available so that you may "play" with the program to see how it works.

Since an authorization code is required to make this program usable for production work, feel free to give copies of the diskettes to your friends along with our phone number. They can call us for a temporary authorization if they wish to play with the program.

To authorize the program, the following steps must be performed:

Pay for whatever portions of the program you wish to use. Currently, you must pay for the COGO/Layout(Drafting) commands. The DTM and Survey commands are optional.

Start PCS by double-clicking on the PCS icon. If PCS is currently running, **close it** and start again. The authorization routines work only when the program is first started.

Select ***Authorize*** from the main window's ***Project*** menu. A dialog box similar to the one shown on the right will appear.

Call the number shown - (800) 652-7279 during business hours if you want a semi-guaranteed live person response. Call during other hours to increase the probability of listening to a boring answering machine recording.

Give the Soft-Art technician the ***Site Code*** shown in YOUR authorization dialog (NOT the one shown to the right - this one only works on computers equipped with Mickey Mouse ears which are only available to the elite corps of PCS software developers).

The Soft-Art technician will give you an *authorization code* which you must enter into the ***Authorization*** box.

Select ***OK*** once the authorization code has been entered. The dialog box will disappear and, if you've sacrificed to the right gods, another dialog will appear announcing that PC Survey "is now authorized" (Select ***OK*** to close the dialog). You can double-check your authorization status by selecting ***Authorize*** again. The same dialog box will reappear but with different information. The ***Site Code*** will be different, but the item that you're interested in is the ***Status***. Instead of *"Not authorized"*, there should be something like *"COGO, DRAFTING, CONTOUR, SURVEY"* (if you have purchased the full package). If you still see the phrase *"Not authorized"*, you, or the technician, have screwed up. Recheck the codes with the technician and try again.

Several files are created in the PCS directory when the program is authorized. Altering the PCS directory location on the hard drive will destroy the authorization. Once you have authorized the program, use the ***Authorization*** function if you need to move the program to either a different computer or a different location on your hard drive.

Windows Concepts

This section will be a basic review of Microsoft Windows terminology, concepts and operating procedures. If you are already familiar with Microsoft Windows, you can probably skip to the next section. Alternatively, you can read your Microsoft Windows manual to obtain a more detailed explanation.

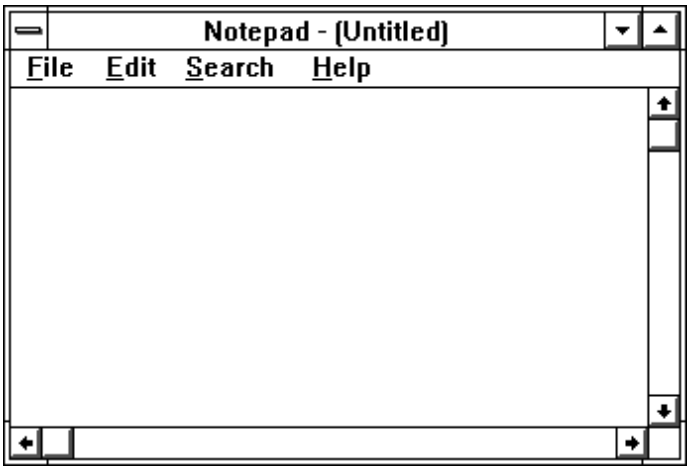
Mouse Terminology

You'll see the following terms used frequently.

Click	To quickly press and release the mouse button. When used by itself, this term applies to the left mouse button. Sometimes, this term will be qualified by the terms *Left-click*, *Right-click* or *Middle-click* to refer specifically to one of the three mouse buttons.
Double-click	To click the mouse button twice in rapid succession.
Drag	To hold down the mouse button while you move the mouse.
Click and drag	To press the mouse button (click) and hold the mouse button down while moving the mouse. This term might be qualified by specifying which button to use, as in *Right-click and drag.*

Windows - Moving, Resizing, Closing

Not all windows have the same elements, but most have certain elements in common, such as title bars and menus. The picture shown below is the window used by the Notepad program that comes with Windows. (Notepad is a primitive text editor).



The ***Control menu*** box is in the upper left corner of each window.

The ***title bar*** displays the name of the document. In this case the bar is where the window title name, "Notepad - (Untitled)" is.

The ***menu bar***, under the title bar, lists the available menus which contain lists of commands.

The window border is the outside edge of the window. When the cursor is on the border, it will look like a pair of opposite facing arrows. The arrows indicate the direction in which you can move the border to change the size of the window. Moving the border is accomplished by clicking with the left button of the mouse, and *holding it down* while dragging the border to its new position. This kind of mouse operation is called a ***click and drag***. The click and drag technique is VERY important to the operation of PCS.

The window corner can be used to shorten or lengthen two sides by again clicking and dragging.

The ***insertion point*** or ***focus*** indicates where you are in a document and is represented by a short, vertical blinking line.

The ***Maximize button*** is in the upper right corner of the window and is represented by a box with an upward pointing arrowhead in it. Clicking on the maximize button will enlarge the window to fill the screen.

When the window is *maximized*, the ***Restore*** button will appear in the upper right instead of the *Maximize* button. Clicking on this button restores the window to its previous size and location. The ***Restore*** button is a box with a double-headed arrow (up *and* down).

The ***Minimize button*** is also in the upper right corner of the window to the left of the maximize button (the downward pointing arrowhead). Clicking on the minimize button will reduce the window to an icon.

The client area is the now empty space inside the frame.

Certain techniques are used to manipulate a window:

* To click on a selected or chosen item or word or place, quickly press and release the mouse button.

* Double clicking means to click the mouse button twice in quick succession.
* To drag, hold down the left mouse button while moving the mouse.
* To point, move the mouse until the mouse pointer on the screen is on the chosen item.
* Selecting is to mark an item with a selection cursor, which can appear as a highlight, a dotted rectangle or both. Selecting alone does not start an action.
* Choosing an item is to initiate an action.
* Zooming is to change the amount of data visible in the window by magnifying or reducing the view.
* To move a window to any location on the desk top, just click on the title bar and drag to the desired location. Release the mouse button. If the action is to be canceled, press <Esc> before the mouse button is released.
* To change the size of a window, select the desired window, point to a border where the pointer will turn into a double headed arrow, and drag the corner or border until the window is the needed size.
* To enlarge an application window, select the desired window and click the Maximize button in the upper right corner of the window.
* To close a window, choose Exit from the File menu, or choose Close from the Control menu, or, as a shortcut, double-click the Control-menu box.

Menus

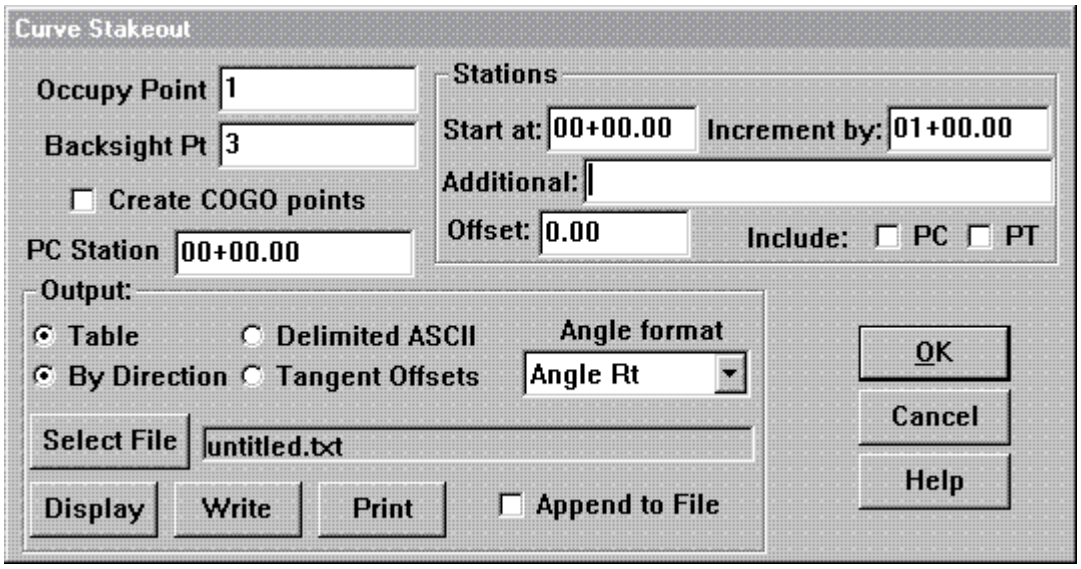
Each application has a list of commands called "Menus" found in the Menu bar at the upper edge of the application window. When a menu is selected, a list of other commands appears in a small box. Choosing a command from there carries out an action.

To select a menu, click on the appropriate menu to open it up. To close the menu, click the menu name or anywhere outside the menu. To remain in the menu bar with the menu closed, press <Esc>.

As mentioned earlier, menus have a list of commands but they also can have a list of characteristics assigned to graphics or text, a list of open windows or files, or the names of cascading menus, which have more commands.

Dialogs

A dialog box requests information about a project or supplies needed information. Most dialogs (dialog boxes) have options that can be selected. Other dialogs have additional information, warnings or messages showing why a requested task cannot be done.



There can be several types of options or *controls* within a dialog box. Some are in the form of buttons, as shown in the above example, such as the ***OK*** button which carries out the command you choose or the ***Cancel*** button which cancels the command you choose or the ***Display*** button which will bring up a list of stake points and the ***Select File*** button. To choose a command button, simply click on it with the mouse. The keyboard can also be used by pressing TAB to move to the button desired and then pressing the SPACE bar. If the button or option has an underlined letter in it, just type that letter while holding down the ALT key.

In the above example you will find some typical controls, most of which are in *edit* or *text boxes*. The terms *edit box* and *text box* can be used interchangeably - they're the same thing. All the white boxes, except the Direction box, require typed in information and are called edit boxes. The edit box titled ***Output*** has two sets of *radio buttons*; only one button of each set can be on at any given time. In this case, ***Table*** was chosen rather than ***Delimited ASCII*** and ***By Direction*** instead of ***Tangent Offsets***. The white box labeled *Direction* and followed by a down arrow button is a *drop-down list*. When the button is pressed, a list of choices will appear. The ***Create COGO points*** box is called a check box because, if you click on it, a check will appear in the little box; if you click on it a second time, the check will disappear.

Focus - this is an important term to understand. When in a dialog, **one** of the controls (buttons, edit box, checkbox, etc.) will be considered to have the *focus*, meaning that any input will be directed at that control. When an edit box has the focus, for instance, there will either be an insertion cursor in the edit box (a vertical bar) or the text in the edit box will be highlighted (in blue on color systems). When buttons and checkboxes have the focus, their text (title or caption - such as ***Create COGO points*** in the above picture) will have a light rectangle around it.

To choose any of these options with the mouse, click on the selected box. Or, with the keyboard, press <TAB> (the **Tab** key on your keyboard - keyboard keys will be designated by **<key>** throughout this manual) to move to the group of options desired, use the arrow keys to select the appropriate button, and then press <ENTER>.

To move a dialog, drag the title bar to the desired location with the mouse, or press Alt-Spacebar to open the Control menu and choose the Move command. Use the arrow keys to move the box to the desired location and press <ENTER>.

To move around inside a dialog, click the desired option or space to which to move or, when not using the mouse, press <TAB> to move forward (from left to right and top to bottom). Press <SHIFT > + <TAB> to move in the opposite direction. Use the arrow keys to move from one option to another within an area.

Fire it up!

OK, we're ready to begin. Sit back and move the mouse cursor over the PCS icon. Double-click it - CAREFULLY! There's a lot of horsepower under the hood of this thing.

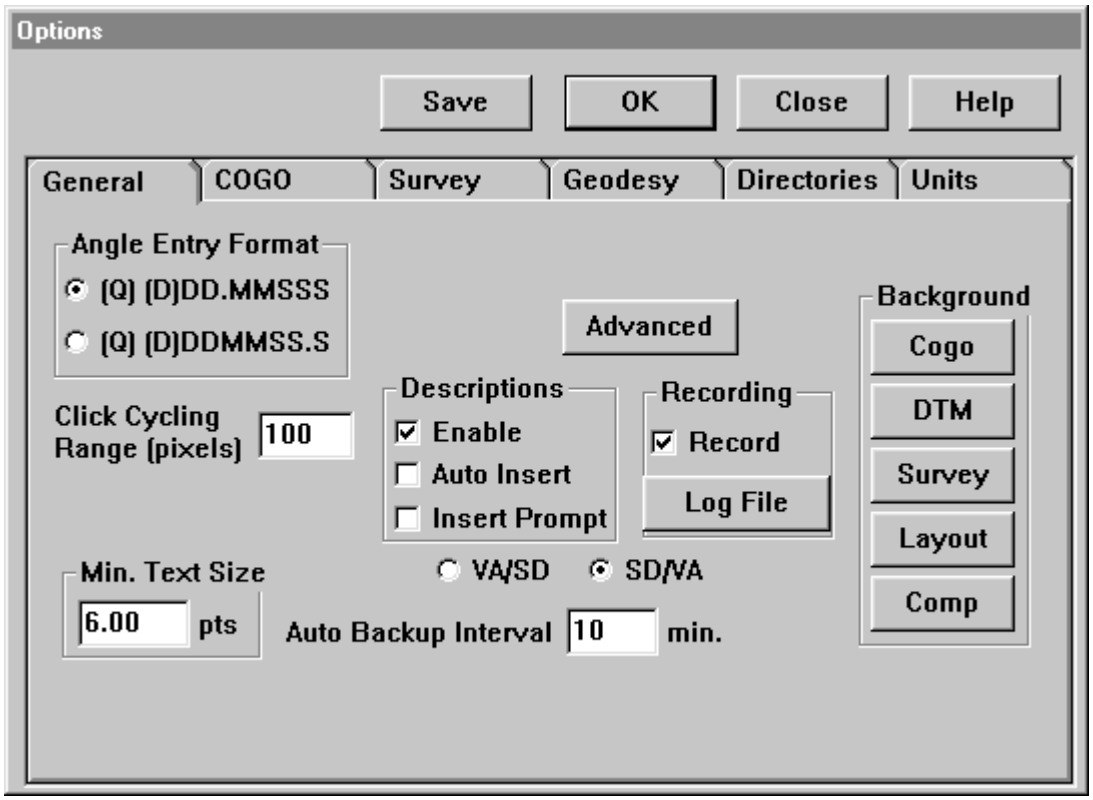
The first thing you'll see is the PCS ***Main Window***. This window is really boring. It has a few menus and a really ugly PC Survey logo in the middle of the screen initially, but is otherwise blank. You'll probably see some text appear in what we call the ***client*** area of the window (all that space underneath the menu), but that's about it. Look at the ***title bar*** - that top line that says "***PC Survey***". When you have a project open, the project name will appear to the right of *"**PC Survey***".

Let's look at the menus:

The first, ***Project,*** is for opening and saving projects, among other things. The second, ***Environment***, contains options that affect most of what happens everywhere else in the program. The ***View*** menu gives you access to various windows of PCS (COGO, Survey, Layout, DTM, Component). You can click on ***Help*** if you want, but that would be rude - I'm telling you what you need to know, so stop looking around for help from someone else. Later on, you can try ***Help*** to access the on-line manual.

Click on ***Environment***. From the ***Environment*** menu that is displayed, select ***Options***.

This dialog allows you to set some global (applies to EVERYTHING) options.

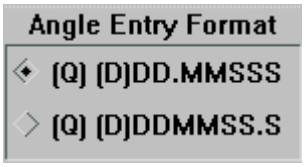


PCS Options Dialog

Angle Input

For instance, in the top left corner is a box labeled ***Angle Entry Format***. There are two basic formats, as shown in the table below. The letters mean the following:

Q - quadrant
D- degrees digit
M - minutes digit
S - seconds digit



Angle Entry Format in Options Dialog

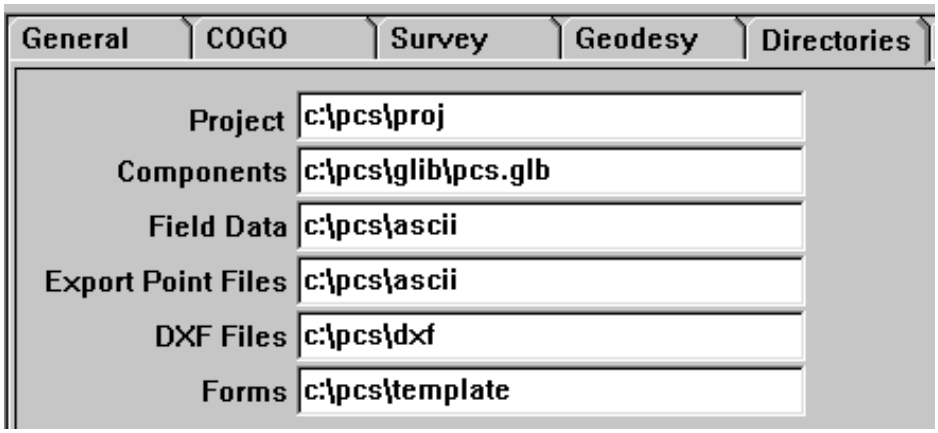
The *quadrant* is an optional field (that is why it is in parentheses) that only applies to the input of bearings. Bearing input in PCS can be done in many ways. Examples for entering the bearing **S58°46'39.2"E** are shown to the right.

This tutorial will assume that the first format (the left column) will be used when entering angles. If your personal preference is to use the second format, you can change it by clicking on the radio button next to that format (as shown on the right). Use the other settings as shown.

Entering **S58°46'39.2"E**	
(Q) (D)DD.MMSSS	**(Q) (D)DDMMSS.S**
2 58.46392 *or* 2.58.46392	2 584639.2 *or* 2.584639.2
58.46392	584639.2
S58.46392E	S584639.2E

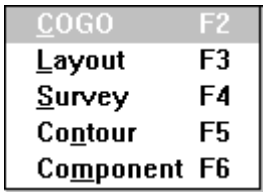
The ***Directories*** settings determine where PCS will initially look when attempting to open project and library files.

1) Select the ***Directories*** tab near the top of the dialog. A dialog similar to the one shown will appear. We want to change the ***Project*** directory setting to the C:\PCS\TUTORIAL directory. If you used the default installation settings, PCS is installed on the C drive in the *root* (top level) directory.
2) Change the path shown in the dialog for the ***Project*** directory to the PCS/TUTORIAL directory.
3) Click ***Save*** to save the settings.
4) Select ***OK*** to close the dialog.



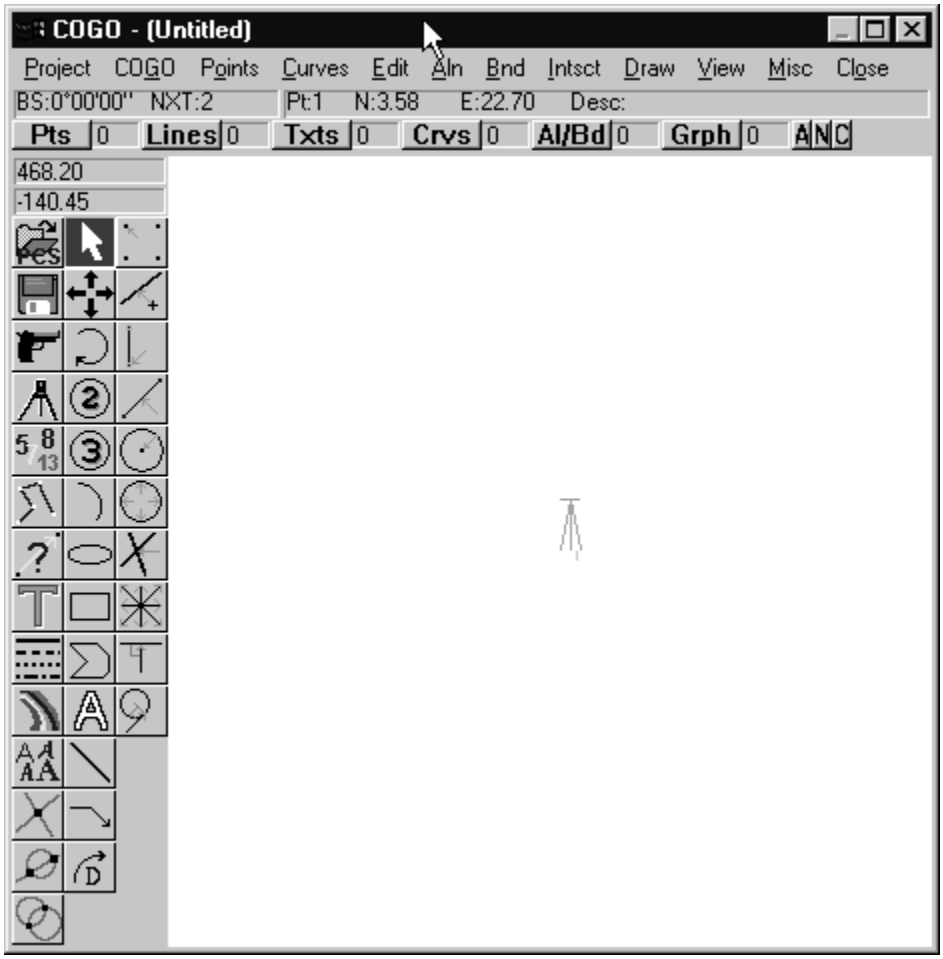
Opening a window

Click on ***View***. You should now see a *submenu*, a vertical menu list. At the top of the list is ***COGO***. This is a list of PCS window names. Clicking on the name of a window in this dialog will bring it to the front so you can see it (sometimes they can be a bit shy). DON'T CLICK ON ANYTHING YET! If you did, you might have ignited the delayed self-destruct! (destructive radius of two disk partitions) Click on the line that says ***COGO*** to bring up the PCS COGO window ***OR*** press the **F2** key on your keyboard. The **F2** key is called an *accelerator* - it is a shortcut keystroke sequence to the ***COGO*** function. Functions that have accelerators will list the accelerator next to the function name in the menus (**F9** is the accelerator for the ***Edit Layers*** function, for example).



View Menu

The COGO Window



Whoa! It's dark in here, isn't it? Except for the Main, Layout and Component windows, PCS windows *default to* (fancy term for *start with*) a black background. This is because we have an arrangement with your local optometrist.

NO! Scratch that. Just a joke. Really. The black background contrasts well with the colors that are used in the program. The Layout window uses a white background as its default because most surveyors like to use black ink on white plotting paper (no imagination, but most customers look askance at fluorescent orange paper).

Let's discuss the parts of the COGO Window. Most of the windows that you will see in PC Survey will be similar to this window so, by getting a feel for the COGO window, you should be able to better understand the terminology in the rest of this manual.

At the top of the screen is the title bar which shows the name of the PCS window (COGO).

Underneath the title bar is the menu bar with the names of the various menus used by PC Survey. Underneath the menu bar is a status bar. This window can be turned on or off - it is on by default. It shows the back sight angle, the number to assign to the next point created and the data for the occupied point which is the number, coordinates, and description.

Underneath the status bar is the ***select status bar***. Underneath the left-side of the select status bar is a display of the North and East coordinates of the mouse. As you move your mouse, the display will be updated. The rest of the row represents selection information for each type of data in the project. The information in this window is more fully explained in the section "Selecting/Unselecting Data" below. The status bar can also be turned on or off.

On the left hand edge of the screen are a series of buttons, called the ***toolbar***, which represent some of the most commonly used functions. From top to bottom, on the left side, are the functions:

Open, Save, Traverse, Occupy/Back Sight, Next Number, Connect Points, Inverse, Text On/Off, Line Style, Color, Font, Bearing/Bearing Intersection, Bearing/Distance Intersection, *and* ***Distance/Distance Intersection.***

The second column of the toolbar contains the drawing functions:

Select, Rotate, 2-point Circle, 3-point Circle, Arc, Ellipse, Box, Polygon/polyline, Text, Line, Straight Dimension, and ***Curved Dimension.***

The third column contains shortcuts to the various snapping modes. They are:

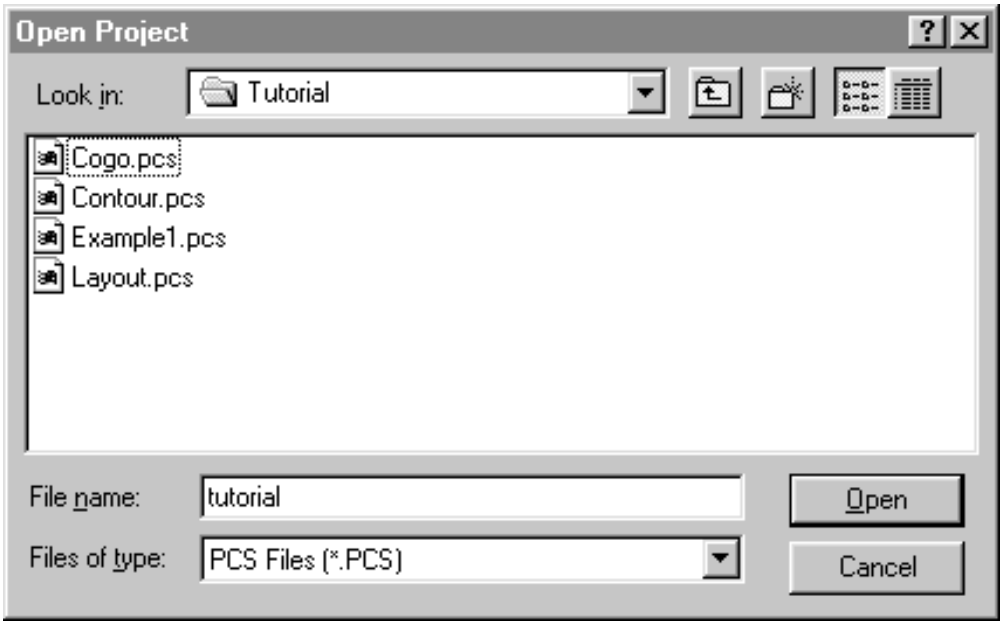
Grid, Nearest, Endpoint, Midpoint, Center, Quadrant, Intersection, Angle, Perpendicular, and ***Tangent.***

More information on each of these functions can be found in the reference section of this manual. The *toolbar*, *status bar*, and *select status bar* can be individually turned on or off through the ***Misc*** menu.

The rest of the screen is the data window. This is where the graphics representing the project are displayed. Let's open an example project file to show you that I'm not lying (at least, not yet). So...

Move the mouse cursor on top of the top left button in the toolbar (the picture of a file folder with PCS underneath it). This is the ***Open*** function that is also accessible from the ***Project*** menu. Notice the bold, italic underlining that was used. When you see this (***Connect Points*** is another example), you know that a menu function is being discussed.

With the mouse cursor over the ***Open*** button, depress the left button. A dialog (a box with various *controls* such as *edit boxes*, *checkboxes*, and *buttons*) wil*l* appear on the screen similar to the one shown, except that the current directory will be ***proj***:



This is your basic Windows file dialog, used for selecting files from the hard drive. To show how this works, we will change to the ***c:\pcs\tutorial*** directory by doing the following:

1) Press the button to the right of the "Look in" list. The button has a picture of a folder with an "up" arrow on it. The list will change and you should now see a directory (folder) labeled ***tutorial***.
2) Move the cursor onto the line labeled ***tutorial*** and double-click with the left mouse button again. This will change the *current* directory (the one displayed in the "Look in" list) to ***tutorial*** and the dialog should appear similar to the one shown above.

In this case we want to open the EXAMPLE1.PCS file that exists in the TUTORIAL directory underneath your PCS directory.

To review this procedure, it goes like this:

to the right of ***Look in:*** is current path (in the picture it is *Tutorial*).

Underneath the current path is a representation of the directory structure for this path. The picture to the left of the texts are supposed to look like a sheet of paper, if the item is a file. If the item is a directory/folder, the picture to theleft will look like a folder. There are no directories underneath (contained in) *tutorial*, so there are no folders displayed in the list.

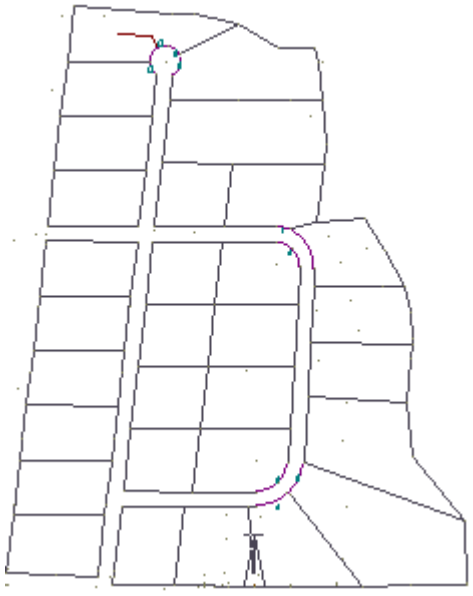
On the bottom is an edit box for entering a file name. Underneath it is a list of the files in the current directory that match the specification in the ***File Name*** box. Notice that the file name defaults to **.pcs* so that the list includes only those files that end with *.pcs*. The "*" (asterisk) in front of the "*.pcs*" is called a *wildcard* and means "any sequence of characters".

Open the EXAMPLE1.PCS job by double-clicking on the *example1.pcs* name in the file list box (right there below *contour.pcs* and above *layout.pcs*. It's **two** below *cogo.pcs* on the far left of the dialog box just above the center. The ***OK*** button is on the opposite side of the box. If you're in Paris walking along the Louvre, you're not even close to where you need to be.)

The ***Open Project*** dialog will automatically close if you double-click on the file name. If you single-click, the name will be placed in the ***File Name*** box. You can then click on the ***OK*** button to complete the operation. There may be a short delay depending on how fast your computer is, but a message that says "Loading, please wait..." should appear. The message will disappear when the project has been loaded. The program will then draw the project in the COGO window.

There are many details that will not be visible until you *zoom in* (get closer). For example, there are many texts along the lines in the drawing that you can't see at this magnification (unless you're using a high-resolution display mode).

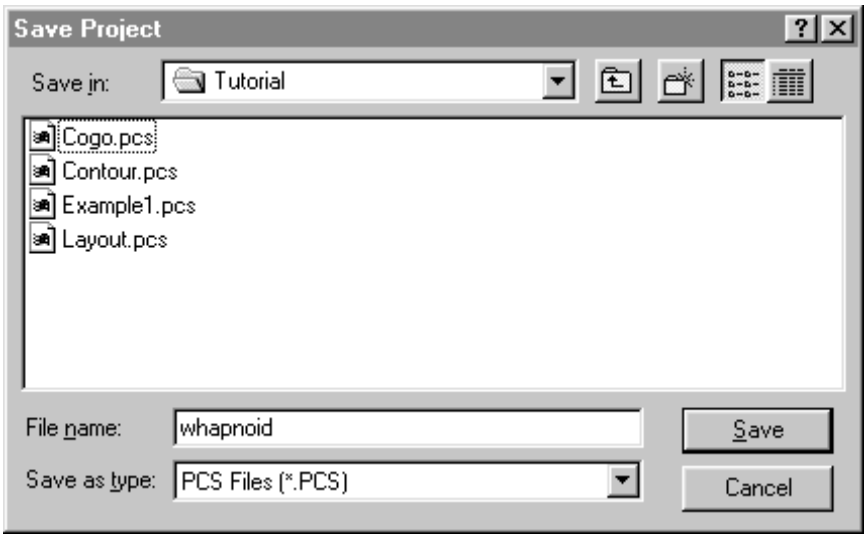
We're going to use this example to demonstrate some of the functions of the program. Before making any changes to this file, we should probably first save it to a different file in order to keep the original intact (just in case you want to go through this portion of the tutorial again).



The Example1 project in COGO

There are two commands for saving a project - ***Save*** and ***Save As***. Both are in the ***Project*** menu. The difference between them is that ***Save*** will overwrite the current project file while ***Save As*** will prompt for a file name to write to. Since we want to create a new project file, the ***Save As*** command is what is needed.

1) Select ***Save As*** from the ***Project*** menu.
2) Enter a file name of your choice (*test*, *pumpkin*, *rumpblat*, anything except one of the names already listed below the ***File Name*** box) in the ***File Name*** box. File names are limited to 8 characters plus a 3 character extension in Windows 3.
3) Select ***OK*** to complete the operation.



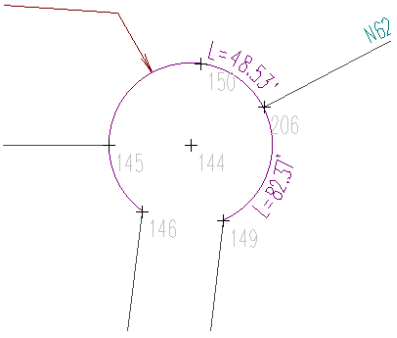
Zooming & Panning

We can now mutilate this project as much as we want. The first things that you'll want to learn are *zooming* and *panning*. *Zooming* is an operation that changes the magnification of the drawing. You *zoom in* to move closer to the drawing - everything becomes bigger. You see more detail but a smaller area is visible. You *zoom out* to see more of the drawing but in less detail. You *pan* to change the area that is visible on the screen without changing the magnification of the drawing.

All of these operations can be performed with the right mouse button. Look at the cul-de-sac near the top of the screen. Let's get closer by *zooming in*. To zoom in, perform the following steps:

1) Move the cursor to the upper left (or lower left) of the area which you want look at…
2) Press the **right** mouse button and hold it down. The cursor will change to a magnifying glass.
3) Keeping the right mouse button depressed, move the cursor to the lower right (or upper right if starting from the lower left) of the area you wish to see. You will see a box outline (the *zoom box*) *rubberbanding* (stretching) from the starting point. Your zoom box should enclose the cul-de-sac.
4) Release the right mouse button. The zoom box will disappear and the screen will redraw to show the area that you have enclosed with the box.

You should now be able to see several details that were not visible previously.



Zooming out is similar to zooming in. Instead of dragging the mouse from the left to the right, however, the mouse is dragged from the right to the left. The new view is calculated by taking the area currently shown on the screen and sizing it to fit inside the zoom box. Therefore, the smaller the box that is dragged the further out that you zoom and vice versa. The center of the zoom box becomes the center of the new screen view.

Panning is also accomplished with the right mouse button. To *pan*,

1) Move the cursor to the point on the screen that you wish to center the display around
2) Double-click with the right mouse button. Remember - this is a *rapid* pressing of the right mouse button twice in a row while holding the mouse still (no position change).

Practice *zooming* and *panning* until you are comfortable with these operations.

Zoom Previous, Full View and *Redraw*

There are three functions that affect the display that are highly useful. They are found in the ***View*** menu.

Zoom Previous will revert the displayed area to whatever it was before the last zoom or pan. It has an *accelerator* - **Ctrl-Shift-F8**. An *accelerator*, if you don't recall, is a keyboard sequence that can be used to access a menu function generally more quickly than selecting the function from the menu. When an accelerator includes more than one key, as in this case, it is executed by pressing **and holding** the buttons down in the order specified. In this case, you would depress and hold the **Ctrl** key followed by depressing and holding the **Shift** key and finally be depressing the **F8** key.

Full View is a quick way to zoom out to the point where the whole drawing is displayed. Its accelerator is **Shift-F8**.

Redraw is used to regenerate the drawing on the screen. This is useful because various functions can partially scramble the screen drawing. The screen drawing may also be incomplete due to interrupted drawing. The ***Redraw*** accelerator is **F8**.

Speaking of interrupted drawing - some computers can be very slow in drawing the screen (386s in particular). Sometimes, you may execute a zoom or pan and not need a complete redraw of the screen.

Screen redraw can usually be stopped by pressing the <Esc> key.

Play with these functions awhile until you are comfortable with them.

Selecting & Unselecting

Now for some other VERY important concepts. Most of the functions in PCS operate on what is called a *select list*. The select list is simply the set of objects (lines, points, arcs, etc.) that are currently *selected*. Selected objects will be displayed with some sort of special highlighting, shading or cross-hatching.

For instance, to change the point symbol of a set of points, you first **select** the points that are to be modified and then execute, in this case, the ***Modify Group*** function from the ***Points*** menu in COGO. We'll get to that one in a bit. First let's discuss how selecting/unselecting is performed.

Selecting is very similar to the *zoom in* operation. Instead of using the right mouse button, however, you use the **left** mouse button. It goes like this:

1) Move the cursor to the upper left (or lower left) of the area which you want to select.
2) Press the **left** mouse button and hold it down
3) Keeping the left mouse button depressed, move the cursor to the lower right (or upper right if starting from the lower left) of the area you wish to select. You will see a box outline (the *select box*) *rubberbanding* (stretching) from the starting point.
4) Release the left mouse button. The select box will disappear and the selected objects will be redrawn with highlighting.

Every object that is enclosed, touched or crossed by the selection box is a candidate for selection. They are candidates because they are selected only if they are *selectable*. Whether an object is selectable depends on two things:

* It must be visible (visible objects might not necessarily be visible on the screen if zoomed out).
* It must be within the selection criterion of the object selection *filters*.

The *selection filters* are controlled through the select status bar - the third line at the top of the screen. We'll talk about them later. Notice for now that, when you select things, the numbers next to the buttons in the select status bar (***Pts, Lines, Crv***, etc.) change to show the number of each type of object currently selected.

Unselecting is the same operation as *selecting* except that, instead of dragging the selection box from the left to right, you drag the box from **right** to **left**.

***Select* by left-clicking and dragging from left to right.**
***Unselect* by left-clicking and dragging from right to left.**

Practice selecting and unselecting with the selection box until (you guessed it) you are comfortable.

Sometimes you may wish to select a single item from a closely drawn group of objects. Dragging a selection box won't allow you to get JUST that one item. In this case, you can use what is called a *point select*. This operation is performed with a single click and release with the left mouse button. The trick is in not moving the mouse while doing this.

When performing a point select, the first left-click will select the nearest selectable object. If this is not the desired object, repeating the left-click without moving the mouse will unselect the first object and find the next nearest object. The next left-click will unselect that object and find the *third* nearest selectable object and so forth. Each successive point select will search outwards for selectable objects until no more can be found within the ***Click Cycling Range*** (specified in the ***Environment*** - ***Options*** dialog). At that point the search begins over again with the nearest selectable object.

Selection Filters

Let's return to the selection filters. As I said, these are accessed through the selection status bar at the top of the screen.

Underneath the left side of the select status bar is a coordinate readout for the current cursor position. The sequence of buttons and numbers are all controls for selectability of COGO objects. The buttons are

Pts	Points
Lines	Lines
Txts	Texts
Crvs	Curves (or arcs)
Al/Bd	Alignments and Boundaries
Grph	Graphics (unconnected lines and curve, polygons, boxes, etc.)
A	All
N	None
C	Clear

The first five buttons will open various dialogs that give detailed control over selectability. The general characteristics are these:

- The numbers to the right of the buttons tell how many of the button objects are selected…
- Left-clicking on the numbers will toggle them between a black and gray color. When the numbers are black, the associated object type can be selected/unselected. When the number is gray, selection operations will not affect the associated object type.
- Left-clicking on the ***A*** button will turn all the numbers black (*All* selectable).
- Left-clicking on the ***N*** button will turn all the numbers gray (*None* selectable).
- Left-clicking on the ***C*** button will unselect everything (all numbers go to **0** and the screen is redrawn).

Let's try it out. Click on the ***N*** button to turn off all selections. Click on the **0** to the right of the ***Pts*** button to turn on the selectability of points. Now drag a selection box (remember - left to right) across some portion of the drawing that contains lines and points (arcs, too, if you wish). Notice that only the points select. Select the ***C*** button to remove the selections. It will also turn the selectability of all objects back on again.

Now, play with it for a while on your own until it becomes second nature. When you're done with this exercise, you should feel totally comfortable with moving around in the drawing and selecting/unselecting objects. The Survey, DTM and Layout windows work in a similar way so these are very important concepts to master.

Note:

Another useful way to select/unselect points is to use the command line. The command line is only partially implemented at this time, but two commands that ARE available are **SP** - select point(s) and **UP** (unselect point(s)). To select points 1,2,3 and 5, for instance type ***SP 1-3, 5*** followed by pressing the <ENTER> key. You should be able to see what you are typing appearing in the status bar. This feature only works when you are not in any other function.

Similarly, you can unselect the same points by typing ***UP 1-3,5*** <ENTER>.

Moving, Rotating and Resizing Text

One of PCS's simpler, yet powerful, features is the ability to visually move and rotate texts. With the exception of the default point and curve annotation, all texts can be moved and rotated with the mouse. The procedure is the following:

To move a text:

1) Select it.
2) Place the cursor on the text (anywhere within the rectangular area that includes the text).
3) Depress the left button of the mouse and hold it down while NOT MOVING THE MOUSE. After a short delay, the text will disappear and a rectangular outline box will take its place.
4) With the mouse button still depressed, move the mouse. The outline box will move with the cursor.
5) When the outline box is in the desired location, release the left mouse button. The text will reappear in its new position.

To rotate a text:

1) Perform steps 1 and 5 as above EXCEPT, in step 3, depress and hold the **Ctrl** key on the keyboard before depressing the left mouse button. Hold this key down until the rotation is complete.

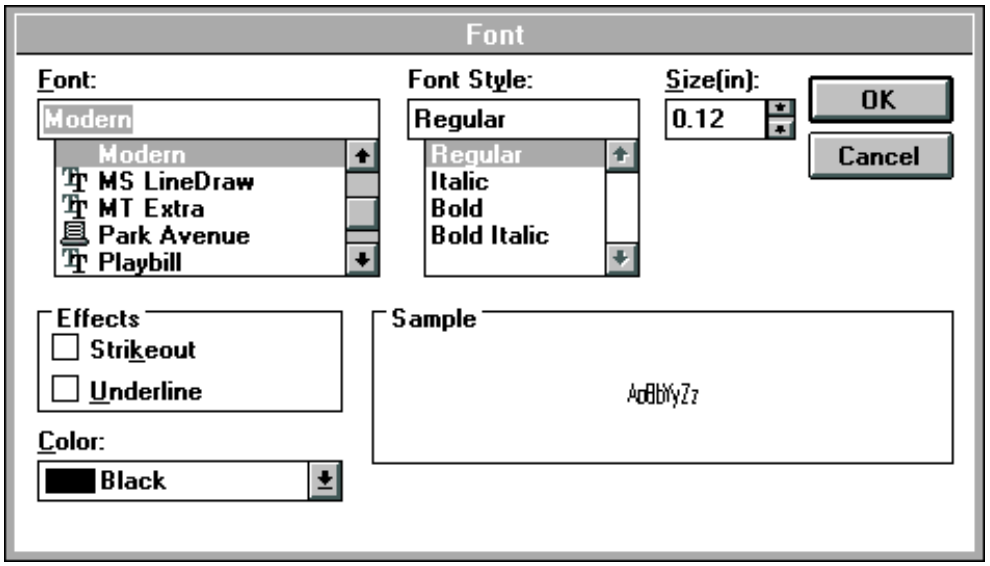
Practice on some of the bearing or distance texts in the example project. Notice that you can't move or rotate the point numbers (though there is an easy way to make this possible) or the curve text.

Changing the size of text is a common operation when modifying a drawing. The move and rotate functions operate on a single text at a time, but changing text size is performed using the ***Set Font*** function which operates on all texts in the selection list. You can therefore select several texts and change their sizes (and font) in a single step.

To change a font:

1) Select one or more of the bearing/distance texts in the example project.
2) Either select the ***Set Font-Other*** function from the ***Edit*** menu or press the ***Set Font*** button in the toolbar. A dialog similar to the one shown below will appear. In this dialog you can alter both the font and size of the text.
3) Change the ***Size*** value to something large - say **0.25** (quarter inch).
4) Select ***OK*** to close the dialog. The screen will redraw and the selected texts should be much larger than they were.

Notes:



- The fonts that are available to you are dependent on the printer that you use. When using a raster-type printer (inkjet, laser, dot matrix, thermal), you can use virtually any font that is installed on the system. When using a pen/pencil plotter, also known as vector plotters, you are limited to vector fonts. There are only three vector fonts that are shipped with Windows - Roman, Modern and Script.

Set Font button

- Precise text alignment can be performed with the ***Text Align*** function or by using the ***Snapping*** functions. Refer to the reference manual for more information.

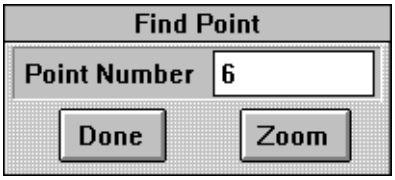
Some COGO Point Functions

In this section we'll play with some of COGO's point functions. You'll be using the zoom/pan and selection functions you have just learned.

Points have several characteristics which can be modified. In addition to their basic data values (number, northing, easting, elevation, and description), points have a symbol, symbol size, layer, color and overlay. Like most PCS objects, points can also be "hidden" or temporarily removed from view. The first functions we'll examine are functions that modify these characteristics.

As a guinea pig, we'll use point 164. To modify this point, it first has to be selected. Though it is possible to select the point without seeing it, we'll practice using the select box technique. To use the select box, we must first be able to see point 164. So where is it?

The Find Point function

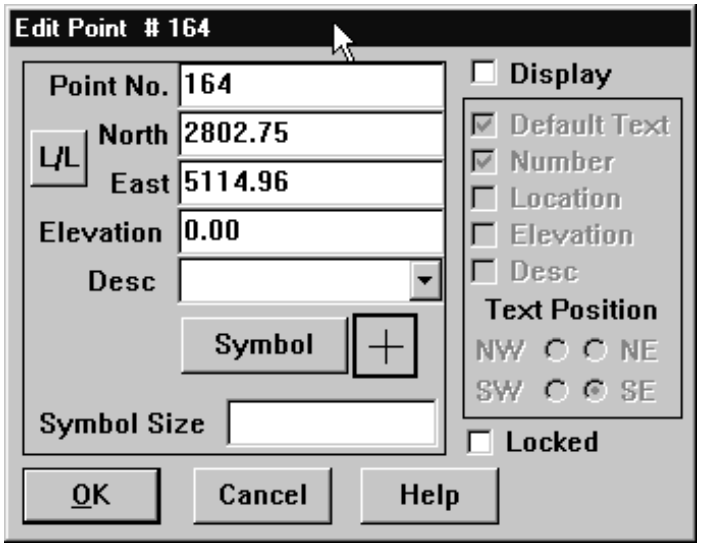


To better demonstrate this function, first use the ***Full View*** function to zoom out to the full extent of the drawing. The fast way is to use the <**Shift**><**F8**> accelerator (remember them?). The slower way is to select ***Full View*** from the ***View*** menu. Pick a method and DO IT!

The ***Find Point*** function will center the screen on a specified point. To use it:

1) Select the ***Find Point*** function from the ***View*** menu. A dialog will appear similar to the one shown.
2) Type **164** into the ***Point Number*** edit box and click on ***Zoom***. The screen will redraw, centered on point 164.
3) If the ***Find Point*** dialog is in the way, move it out of the way by left-clicking on its title (the **Find Point** bar) and dragging it somewhere else.
4) You still may not be able to see where point 164 is, so click on the ***Zoom*** button again. The screen will redraw once more, but this time it will be drawn at twice the previous magnification (it's getting closer...).
5) When you can clearly see the point at the center of the screen, click on the ***Done*** button to close the dialog and put this function out of its misery.

Editing a Point



Now that we have the target in our sights, we need to select it. Do so by using either the selection box or point selection method. I'm counting on you to remember how to do this. Review the previous section on selecting if necessary.

Once the point is selected (there should be a **1** for the ***Pts*** select number and the point should be highlighted):

1) Select the ***Edit Individually*** function from the ***Points*** menu. A dialog box will appear that should look like the one shown on the right.

The dialog shows the point's coordinates, elevation and description. You can use this dialog to alter these values in addition to the point's symbol and annotation.

The annotation parameters and position can be modified through the controls on the right of the dialog. Notice that ***Default Text*** and ***Number*** are currently checked. This means that point is annotated only with its number and that the annotation is in one of the four default quadrant positions.

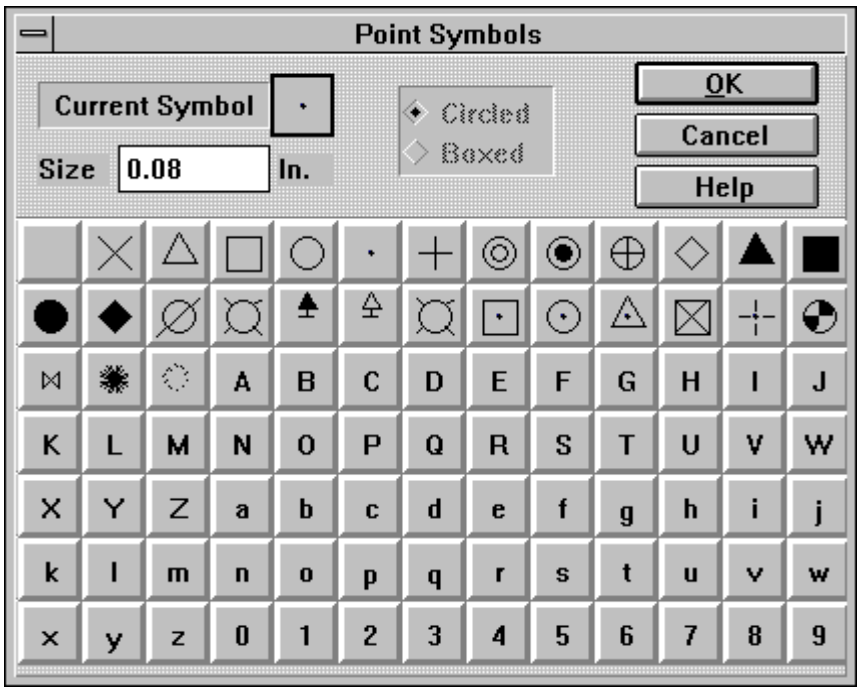
2) Left click on the ***Display*** checkbox to turn on modification of the displayed parameters.
3) Turn off the ***Default Text*** option. This will allow you to move and rotate the point annotation.
4) Type **IPF** into the ***Desc*** edit box and turn on the ***Desc*** option in the ***Display*** section. This will display the text description (now **IPF**) with the point.

Let's change the symbol.

5) Left-click on the ***Symbol*** button. Another dialog, the point symbol dialog, will appear. The first two rows of symbols are standard stuff. The alphabetic characters following the first two rows are for assigning a circled or boxed character symbol to the point.

6) Select the eighth symbol in the top row - (the double circle) and select ***OK*** to close this dialog.

7) Select ***OK*** in the ***Edit Point*** dialog to completely exit the function. Notice the changes that appear on screen.



You should now be able to select the point text (which now includes the description), move and rotate it like the other bearing/distance texts.

By now, you should be getting a "feel" for how the system works.

The Command Line - a method for the keyboard addict.

In many instances, it is much faster and easier to enter commands directly instead of selecting functions from the menus and filling in a dialog. For this reason, a command line has been included with PCS to expedite many of the functions. ***Find Point*** is one of the functions that can be accessed through the command line. To illustrate,

1) Press **<Shift><F8>** to zoom the drawing back out.

2) Type **FP 164 <Enter>**. Notice that, as you type, the keystrokes are echoed (shown) in the status bar in place of the occupied point status. The display will center on point 164 just as if the ***Find Point*** dialog had been used.

3) To zoom in further, type **FP <Enter>** or press **<Spacebar><Enter>.**

4) Repeat the previous step to continue zooming in on point 164.

Notice-

- Pressing <**Spacebar**> recalls the previous command.

The ***Edit Individually*** function also has a command line form. Its command is **PE** (**P**oint **E**dit).
Example: Type **PE 165<Enter>** to see how this command works

Before moving on, select *New* from the *Project* menu to close this project and begin a new one.

The Survey Window

If you have not purchased the Survey module, go to p.34.

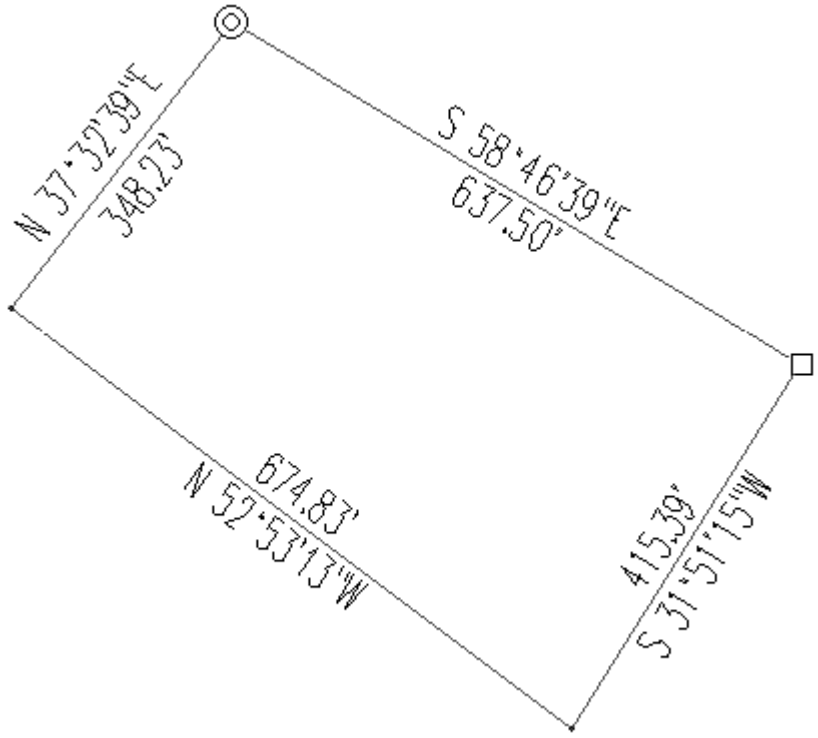
Now that you have seen the COGO window, let's move to the Survey window. Select ***Survey*** from COGO's ***View*** menu **OR** press your <F4> key.

The Survey Window is used for field data entry and adjustment. Data entered in this window is stored with the project so that you have a permanent record for future reference (at least until your 26,000 hour MTBF hard drive eats itself after last night's lightning strike). The Survey Window is also used for mapchecks.

As field data (or measurements, observations, shots - whatever) is entered, a graphics representation is drawn on the screen. A basic measurement consisting of a horizontal angle and distance (plus, maybe, a vertical angle) is represented on the screen as a line drawn from a station ***point*** to a foresight ***point***. ***Points*** are a location represented by some symbol such as a circle, a cross, an X, etc.

An Example Project

It's time to start working an example. The example is a property that is to be subdivided and have boundary markers placed (monuments had been lost or never installed). Therefore, a traverse loop has to be created from the few existing monuments before establishing the property boundaries. Below is a sketch of the property boundaries.



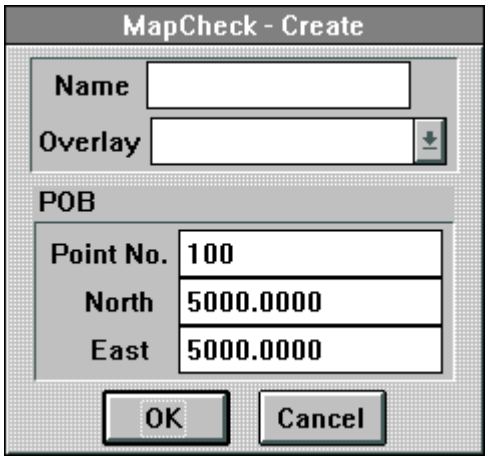
Performing a mapcheck

First, let's do a mapcheck on our data to make sure that it closes properly.

1) From the ***Mapcheck*** menu in the Survey window, select ***Create***. A dialog like the one shown will appear. The ***Name*** field is optional - leave it blank. The ***Overlay*** field is also optional - leave this blank.

2) Change the point number (***Point No.***) in the ***POB*** section (Point of Beginning) to 100. The reason for this is that if the mapcheck data is good, we'll create COGO data from it. We'll want the COGO point numbers for the property corners to possibly be different than the point numbers used for the traverse loop. In this example we'll choose to start the traverse loop at point number 1, so the mapcheck numbers must start somewhere else.

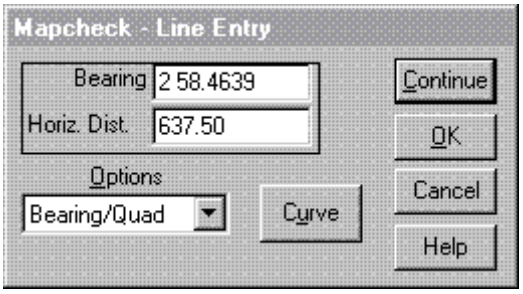
3) The rest of the information, ***North*** and ***East***, can be left as they are. Click on the ***OK*** button to accept this data. An initial point will be created at the location 5000, 5000.



Mapcheck-Create dialog

The next dialog that will appear is the ***Mapcheck - Line Entry*** dialog. Mapcheck line data is input as a horizontal distance and either a bearing or azimuth. The dialog shown is using bearings for input. The input mode can be changed to azimuths by selecting *Azimuth* from the ***Options*** list in the lower left corner of the dialog.

You should now be able to enter the deed data into the mapcheck dialogs. An example of the first entry is shown in the *Mapcheck - Line Entry Dialog* below. (After the bearing data is entered, the field will change to include the N/E, S/W directional characters.)



Mapcheck -Line Entry Dialog

Deed Data	
Distance	*Bearing*
637.50	S 58°46'39" E
415.39	S 31°51'15" W
674.83	N 52°53'13" W
348.23	N 37°32'39" E

4) Enter **2 58.4639** into the ***Bearing*** edit box. Again, the leading **2** is the quadrant and is followed by the bearing angle **58.4639** which stands for 58°46'39". Press your <Enter> or <Tab> key to move to the next field. <Enter> means to press the ***Enter*** key on the keyboard or keypad. We'll abbreviate the command in the following manner from now on:

5) The cursor should now be flashing in the ***Horiz. Dist.*** edit box. Enter **637.50** and press <Enter>. Pressing <Enter> has the same effect as having pressed the ***Continue*** button. A line will appear on the screen and the ***Mapcheck-Line Entry*** dialog will reappear, ready for you to enter the next leg.

6) Continue entering the data for next three legs. After entering the distance for the last leg, instead of pressing the <Enter> key, select ***OK***. This will close the ***Mapcheck-Line Entry*** dialog.

If you enter the last leg and inadvertently press <Enter> or ***Continue*** instead of ***OK***, you will be presented with the ***Mapcheck-Line Entry*** dialog one more time. **This time, select *Cancel* to finish entry of the data.** If you select ***OK*** or ***Continue*** by mistake, another leg will be created. Selecting ***Cancel*** tells the program that you have finished entering data and don't wish to enter the data in the current dialog.

You can correct mistakes by selecting the mapcheck and then using the ***Edit*** command in the ***Mapcheck*** menu (after finally selecting ***Cancel*** in the ***Mapcheck-Line Entry*** dialog) to invoke the mapcheck spreadsheet editor. The editor allows you to modify any of your mapcheck data, including adding and deleting entries. Once all the mapcheck data has been entered, you'll want to generate a report in order to determine whether the deed data closed properly.

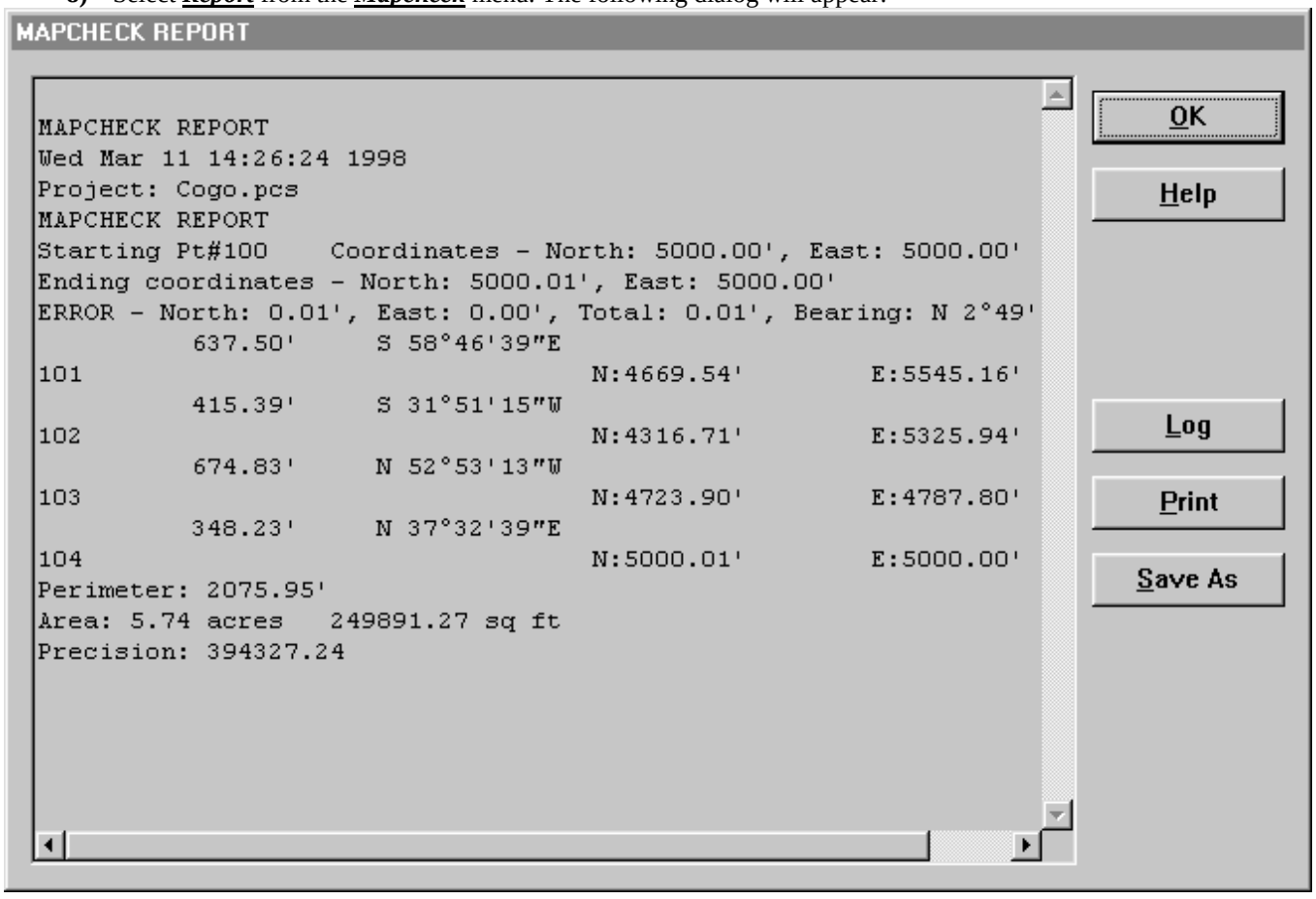
7) Select the mapcheck by doing the following:

To select the mapcheck: click the left button of the mouse and, while holding it down, *drag* the mouse **to the right**. A *selection box* will be drawn on the screen as this is done. The selection box must either enclose or intersect an object in order to select that object. In this case, the selection box needs to only cross any of the legs of the mapcheck in order to select the mapcheck since the mapcheck is comprised of all the mapcheck legs. Release the left button after the selection box has intersected the mapcheck (this is what is called a *click and drag*).

Selecting is a VERY common operation in PCS. Just as objects can be selected by dragging the selection box to the right, objects can also be *unselected* by dragging the selection box to the left. Experiment with selecting and unselecting till you are comfortable it. If this last sentence doesn't sound familiar, then you are among naughty surveyors (ANaSs) who skip the beginning of this tutorial. DON'T do it again. We're watching you (and it's not a pretty sight).

The loop should now be highlighted in bright yellow, with the first half of the first leg highlighted in white (this is done to allow quick recognition of the first leg of a loop). One or more of the shots will also probably be selected - they're highlighted in red and may lie on top of the mapcheck loop's highlighting (so you may see a red leg in the middle of a yellow and white loop - right about now, you should be pining for the days of monochrome monitors). Additionally, in the select status bar, the number ***1*** should appear to the right of the ***Loops*** button, showing that one loop (or mapcheck) has been selected.

8) Select ***Report*** from the ***Mapcheck*** menu. The following dialog will appear:

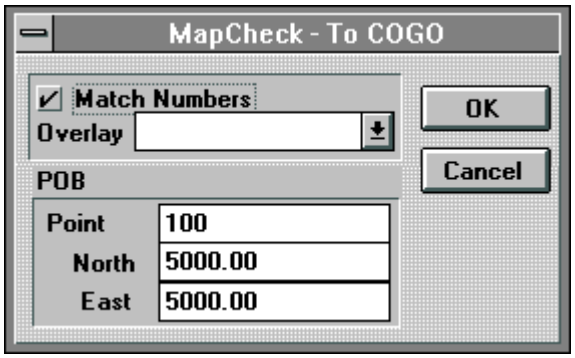


At this point you can print the information by selecting ***Print,*** save the information to a file with the ***Save As*** button, or log the information to the *Main* window by selecting ***Log***: (The *Main* window "hides" beneath any other PCS windows that are open. You may therefore have to move the *Survey* window, or any other PCS windows, to the side in order to see the *Main* window.)

9) This looks pretty good so click on ***OK***. The next step is to transfer the mapcheck stuff (points, lines and curves) to the COGO window so that it can be used by the COGO functions. To do this,

10) If the mapcheck is not selected, use the procedure above to reselect it.

11) Select ***To COGO*** from the ***Mapcheck*** menu. The dialog shown to the right will be displayed. Leave the settings as they are and select ***OK*** to execute the function. The data will be transferred to COGO.



At this point, we give a copy of the deed data (or do a screen print from the *Survey* window) to the field crew chief, instructing him to find whatever evidence he can and to keep in mind that we want to subdivide this property into three equal lots. He heads out to the property and discovers that there are no monuments to be found for the back two corners of the property. He finds monuments at the front two corners along the road, though. He also discovers that his machete was a good investment because this property resembles the forest primeval. To get close to the approximate corners and subdividing points along the back line of the property, our crew chief wisely chooses several station points with good visibility to the likely property corners.

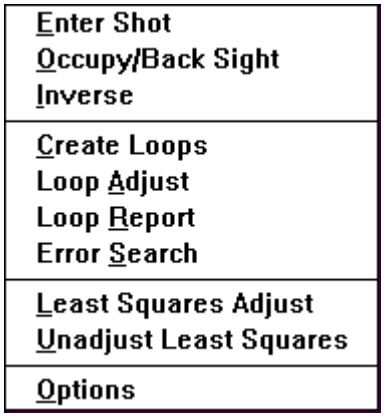
Covered with mosquito bites and rather aromatic from the day's exertions, he hands you his fieldbook, offers some colorful advice on where to put it, and goes home for a well-deserved shower.

Entering Fieldbook Data

Now it's time to enter the field data. You may wish to *Maximize* the Survey window at this time in order to better see what's going to happen. Maximizing a window can be done in Windows 3.1 by left-clicking on the little up arrow in the upper right corner of the window that is to be maximized. If you have Windows 95 or NT, you'll want to left-click on the middle of the three buttons in the upper right. The window will then fill the entire screen and the small up arrow (Windows 3.1) or little page (Windows 95/NT) will be replaced with arrows pointing both up and down (3.1) or a two-sheet button (95/NT). Clicking on these will return the window to its previous size and location.

Following is a copy of the fieldbook data.

Station	BS	FS	Data type	Data		Desc
1 - POB			North, East	5000	5000	SB
1		6	Azimuth	206°12'36		
1	6	2	Angle Rt, Dist	275°02'26" 190°'04'52"	637.50	SB
2	1	3	" "	281°52'01"	326.602	
3	2	4	" "	260°48'30"	214.287	
4	3	5	" "	196°43'32"	172.828	
5	4	6	" "	161°09'42"	217.30	
6	5	7	Angle Rt (closing), Dist" "	264°25'30"	268.00	



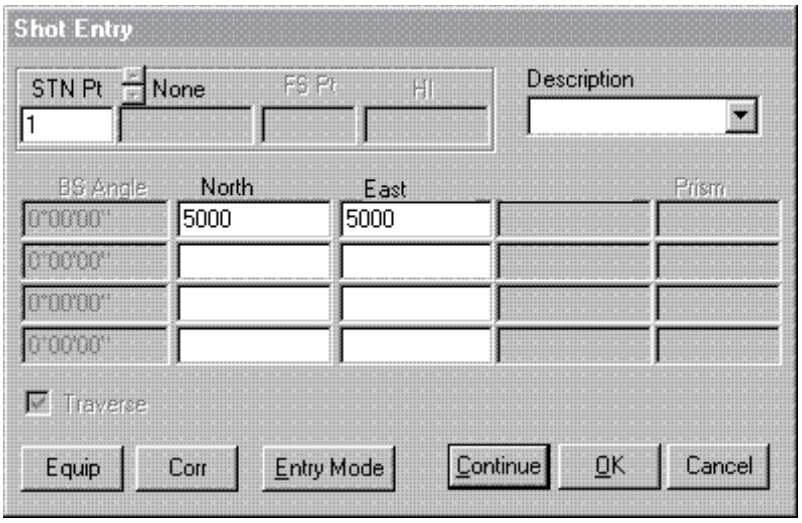
The *FS* column contains the foresight, if any. The first row is an arbitrary initial coordinate location. The second row foresights point 6 from point 1, but has no backsight since it is an absolute angle shot. We use the number 6 because surveyors are naturally clairvoyant and know exactly how many stations they will need during any traverse. This azimuth can be considered a reference angle for the survey. Point 6 will become our initial backsight. Changing this angular value essentially rotates the project.

The remaining shots backsight the station at the previous shot and station at the previous foresight point. For instance, the third row has a station point of 2, a FS of 3 and a backsight of 1. These are all turned angle (*angle right*) shots.

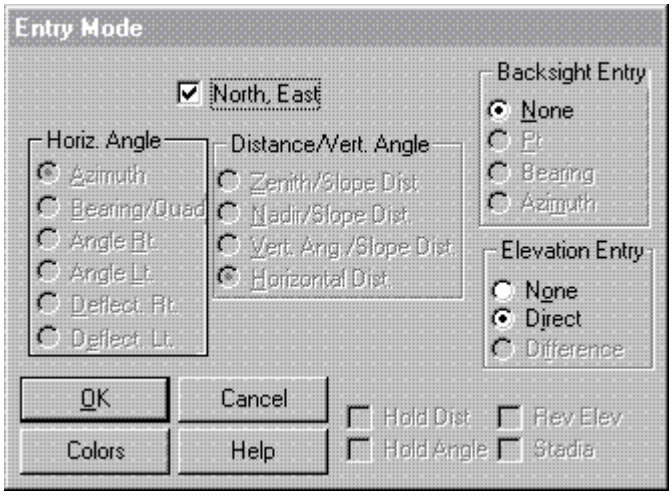
Entering field data in PC Survey can be accomplished using one of three methods. One method is to use the ***Enter Shot*** dialog in the ***Survey*** menu. This dialog is great for the entry of shots that utilize windings (multiple turned angles) as a means of error reduction, but is much slower to use than the command line.

Another method (NOT recommended for entering new shots) is to use the ***Fieldbook Editor*** which is in the ***Edit*** menu of Survey. The fieldbook editor allows the surveyor to view a list of his recorded measurements and optionally edit that list (by inserting, deleting or modifying measurements).

The third, and fastest, method is to use the command line. We'll illustrate both the dialog and command line approaches - you choose which one to use. The dialog entry will be explained first, followed by the command line equivalent.



1) Select ***Enter Shot*** from the ***Survey*** menu (in the Survey window of PC *SURVEY*... isn't this getting a bit redundant?). A dialog similar to the one shown will appear. The first measurement isn't really a measurement at all - it's a starting point. Unless you're working with GPS and state plane grid coordinates, you haven't the foggiest idea of what the coordinates are, so we'll pick a common value of 5000 North and 5000 East. (The units, if you haven't noticed, default to US Feet. You also have the choice of meters and International Feet). Notice that the cursor is flashing in the ***North*** entry box, the program having assumed that you wished to start at point 1. Notice that the ***Elevation*** box is active (i.e. it's not grayed out). This means that the dialog is expecting a value for the elevation. We need to change that.



2) Press the ***Entry Mode*** button. A dialog similar to the one shown on the right will appear. Notice that just about everything is disabled (grayed out). This is because we're in the ***North, East*** entry mode - little else applies. However, you'll notice that two possibilities exist for ***Elevation Entry***.

3) Select ***None*** in the ***Elevation Entry*** section.

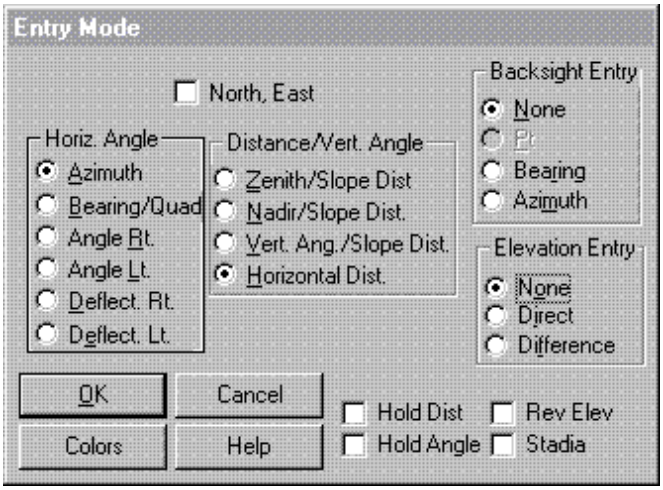
4) Select ***OK*** to close this dialog. This will take us back to the *Shot Entry* dialog.

5) Enter **5000** for the ***North*** value and press <Enter>.

6) Similarly, enter **5000** for the ***East*** value and, again, press <Enter>. At this point, the cursor will be flashing in the ***Description*** box.

7) Press <Enter> one more time OR press the ***Continue*** button - the result is the same. The dialog will disappear briefly and will reappear with empty entry boxes except for the ***STN Pt***, which is now set to **2**. We are now ready to enter the second measurement.

The first measurement establishes the backsight for our first point as well as the angular position of another point in the traverse loop. The REAL orientation is not known yet, so an angular measurement is made to point 6 (the backsight) at an approximate azimuth of 206°12'36". Altering this azimuth later will result in rotating the whole traverse while maintaining angular relationships. Therefore, it is easy to transform the traverse to whatever orientation is desired after all the data is entered. So, we need to enter an azimuth but, if we are using the dialog method, it is expecting a coordinate. One way to change the mode is to use the ***Entry Mode*** button.

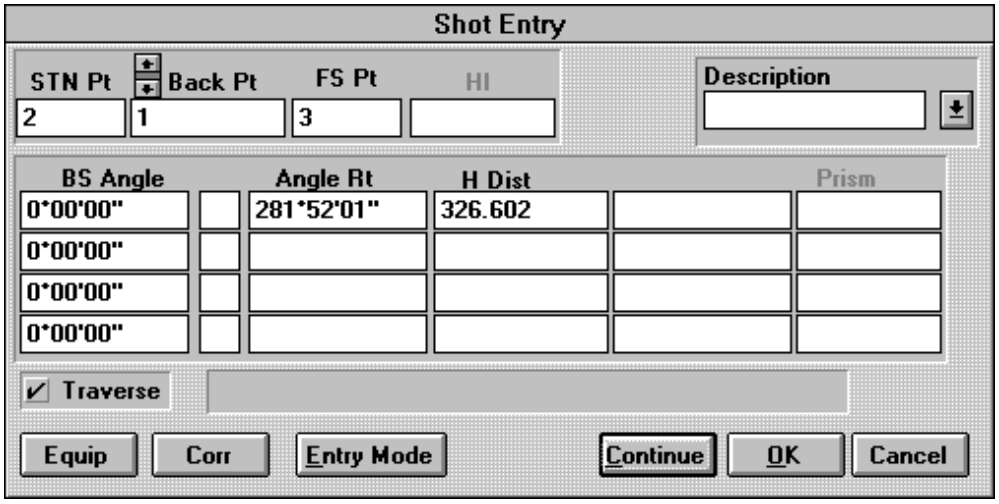


8) Press the ***Entry Mode*** button. This will again bring up the *Entry Mode* dialog box.

9) Click on the ***North, East*** checkbox to so that it is no longer selected. Notice that all the other options now become active.

10) Select a ***Horiz. Angle*** of ***Azimuth*** and a ***Distance/Vert. Angle*** of ***Horizontal Dist.***

11) Select ***OK*** to close this dialog. Notice that the column headers have changed to reflect the new mode.

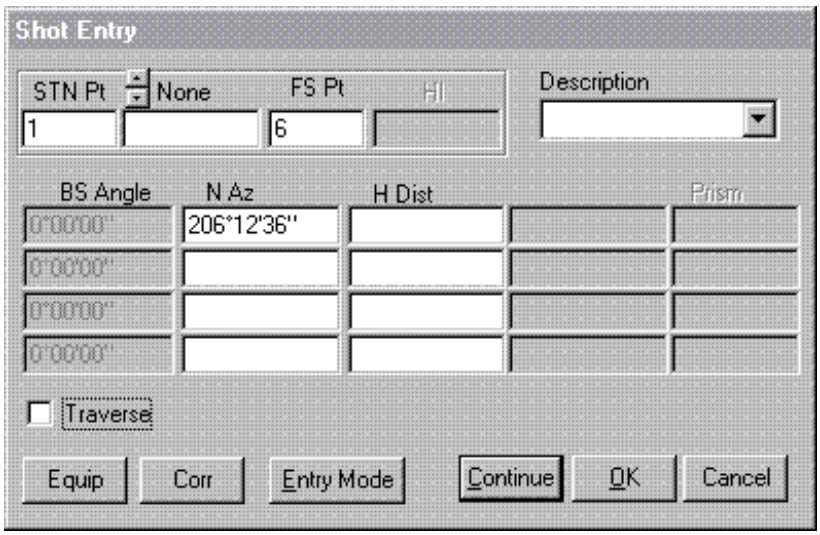


12) Enter **1** for the ***STN Pt.*** and **6** for the ***FS Pt.***

13) Now, enter **206.1236** for the azimuth from station 1 to station 6.

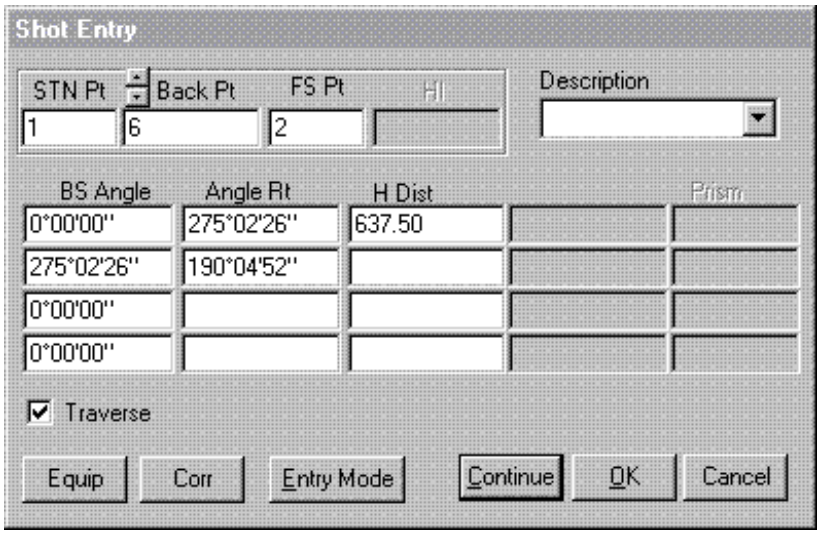
14) Press <Enter>. The dialog should now look something like the one shown. The cursor will be in the ***H. Dist*** box. We're not going to enter anything here this time since only the direction to point 6 is being established at this time.

15) Press ***Continue*** to go to the next measurement (OR, press <Enter> twice). Again, the dialog will disappear briefly and the display will be updated to show the measurement to point 6 as a line from point 1 at the specified azimuth.



The rest of the traverse is entered as angle rights and horizontal distances. In reality, the angle measurements were taken separately (using a plumb bob) from the distance measurements. However, the data can be combined into a single turned angle and distance measurement and entered as such. Windings were used by the surveyor of this project - he doubled his angles. Distances were measured five times, but were done so internally by the total station. The field data is therefore comprised of two turned angles and a single distance value. No problem - in most cases, data can be entered "free form" into PCS. The program generally interprets the data appropriately.

To enter the next measurements, the angle right mode for horizontal angle entry has to be selected. One way to do this is to use the ***Entry Mode*** dialog box again. However, a faster way is to use the command interface for the survey editors. (A listing of the commands that are available can be found in the reference manual.) **This is NOT the same set of commands used by the command line, so don't get them confused!** Let's try one as an example.



16) ***AR*** is the dialog command for angle right. Type ***AR*** into the first edit box (the one under *N Az)* followed by pressing <**ENTER**>. Notice that the column heading changes to *Angle Rt.* instead of *N. Az.*

17) Enter **1** for the ***Stn Pt***, **6** for the ***Back Pt*** and **2** for the ***FS Pt.***

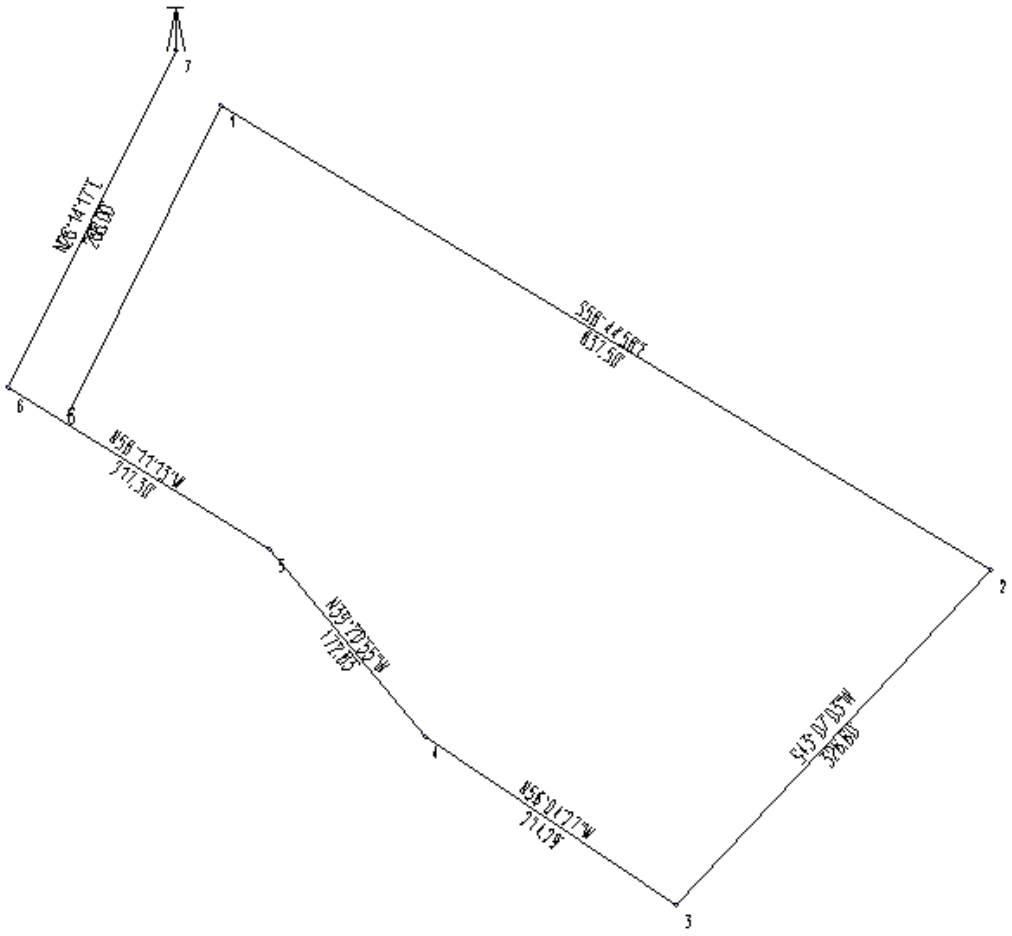
18) Enter the first row's ***Angle Rt*** and ***H.Dist*** data as shown in the dialog box to the right and in the fieldbook data table at the beginning of this section.

19) To quickly enter doubled angles, type ***RA*** (for **R**epeat **A**ngle)in the BS Angle field in the second row and the horizontal angle from the previous winding will be copied into that box.

20) Enter the ***Angle Rt*** for the second row.

21) Select ***Continue*** to finish this measurement.

22) Continue entering the data from the table until it is all done. Remember to select ***OK*** and NOT ***Continue*** on the last entry. If you select ***Continue*** by mistake, you'll be faced with another entry dialog. That's all right - just



select ***Cancel*** to exit data entry. You should end up with something that looks like this (ignoring the mapcheck data):

The Command Line Approach

Using the command line, as mentioned above, is an alternative way to enter data. The advantage of the command line is that it is faster because fewer keystrokes are required to enter the same information. It does not offer as much flexibility as the dialog since it cannot accept windings or repeating angles nor special modes such as ***Hold Angle***, ***Hold Side***, etc.

To begin the command line approach, type **CS 5000 5000 <Enter>** or **CS 5000,5000 <Enter>** from the keyboard. Notice that the numbers (we call them *arguments*) can be separated by either a space or a comma. **CS** is an abbreviation for **C**oordinate **S**tore. We'll abbreviate this command in the following way:

Command: **CS 5000 5000 <Enter>**

If you remember, the second measurement was a distance-less measurement of point 6 from point 1. The command line is not capable of entering distance-less measurements, so refer to steps 8-14 in the previous section to enter this measurement. After the measurement from point 1 to point 6 has been entered, we can use the ***Traverse*** command for the remaining entries.

The command line for the measurement from point 1 to point 2 looks like the following:

Command: **TR 275.0226, 5, 637.50 <Enter>**

Much simpler, huh? The first argument of the command, **275.0226**, is the horizontal angle. The second argument, **5**, controls the interpretation of the horizontal angle value. Quad 0 means that the horizontal angle is an azimuth. Quads 1 through 4 are for bearings, quad 5 is for angle right and quad 6 is for deflection right. If you happen to be entering angle left or deflection left values, just use negative angle values with the appropriate quad number. The distance (horizontal or slope), **637.50**, is entered after the quad.

A restriction exists in that the command line currently has no way of accepting windings. If you need to enter winding data, you will have to use the dialogs. If you are using the command line method for this tutorial, use the first turned angle and ignore the winding.

The command line remembers the last command used so, for the next shots, since you have just used the **TR** command, you will not need to enter it again. **The previous command can be simply recalled by pressing the spacebar or by pressing one of the keys on the number pad**. If you press the number 5 on the number pad, for example, the **TR** command will immediately appear in the status bar followed by the number **5**.-Anyway, the commands are as follows:

TR 281.5201, 326.602 <Enter>
(since you're still doing angle right, you don't need to reenter the **5** quad value)
TR 260.4830, 214.287 <Enter>
TR 196.4332, 172.828 <Enter>
TR 161.0942, 217.30 <Enter>
TR 264.2530, 268.00 <Enter>

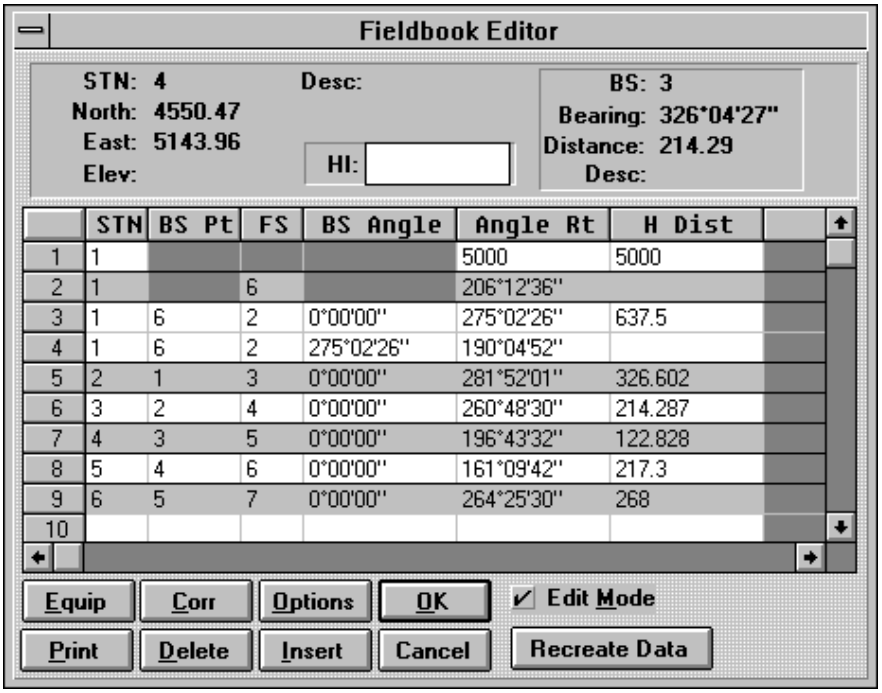
If you are using the number pad, remember to turn the <**Num Lock**> on. Pressing the <**+** > key will enter the commas between the numbers. You can therefore do the entire data entry from the number pad once the command for the first entry has been typed in since pressing any number on the pad will recall the previous command automatically.

Example: **281.5201<+> 326.602 <Enter>**

This is supposed to be a closed traverse - but something is wrong. The distance between points 1 and 7 is too great. Hmm... You recheck your data and find that... I LIED! The distance from station 4 to 5 is NOT 172.828. It's really supposed to be 122.828. Invoking the ***Fieldbook Editor*** at this point is probably a more productive approach than cursing the author of this heinous crime. As mentioned before, the editor can be used for data entry, but it also is what is used to alter data that has already been entered.

Invoke the editor by clicking on ***Fieldbook Editor*** in the ***Edit*** menu of Survey.

The upper portion of the editor contains summary information on the station point, backsight point and instrument height of the current measurement. The spreadsheet section of the dialog is the gridded area. The current measurement is the row that includes the currently highlighted field. As the current row changes, the headings at the top of the columns may change as well to reflect the kind of data that is in each column of the current row. For instance, selecting the first row will result in a ***North*** and ***East*** column heading since this first shot was a coordinate store. Selecting the second row results in columns labeled ***N Az*** and ***H Dist*** since the second shot was an azimuth and horizontal distance shot.



Corrected Fieldbook

Notice that the rows have different shadings. Measurements that comprise the same *shot* have the same shading - the shading helps to quickly see the difference between station setups.

The scroll bars on the right and bottom can be used to move around in the spreadsheet when not all the data is visible. Also notice that when you move the mouse over the edges of the dialog box, the cursor will become the double arrow cursor. This means that this dialog box can be resized to show more or less data at one time.

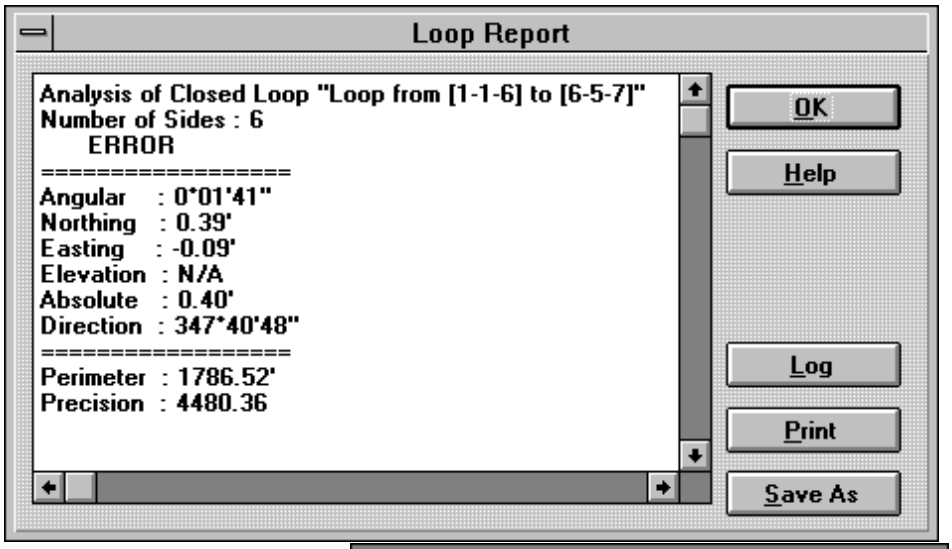
Look at row #7, the ninth entry. Double-click on the ***H Dist*** column of 172.828 and change it to 122.828. Click on ***OK*** and the display will be updated. Notice that the traverse now looks closed. There is a small error, of course, that you can see by zooming in closely.

Adjusting the Traverse Loop

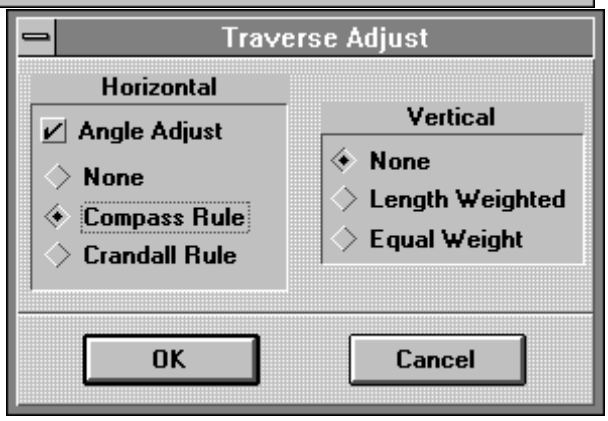
When a traverse is created that appears closed to the program, a *closed loop* is automatically created. Closed loops can be adjusted by various methods, but for this example we will use angle balancing and compass rule adjustment.

To adjust the traverse, it must first be selected. Many of the functions in PCS require that something be selected before any action can be taken. The loop adjustment function is one of these - it acts on any *selected* loops. Select the loop by dragging a selection box across it with the left mouse button - just as you did when selecting the mapcheck. The loop should now be highlighted in bright yellow except for its first leg, which is highlighted in white. Additionally, in the select status bar, the number *1* should appear to the right of the ***Loops*** button to show that one loop has been selected.

Select ***Loop Report*** from the ***Survey*** menu. The following dialog will appear, displaying an analysis of the loop. Notice that there is a closure error.

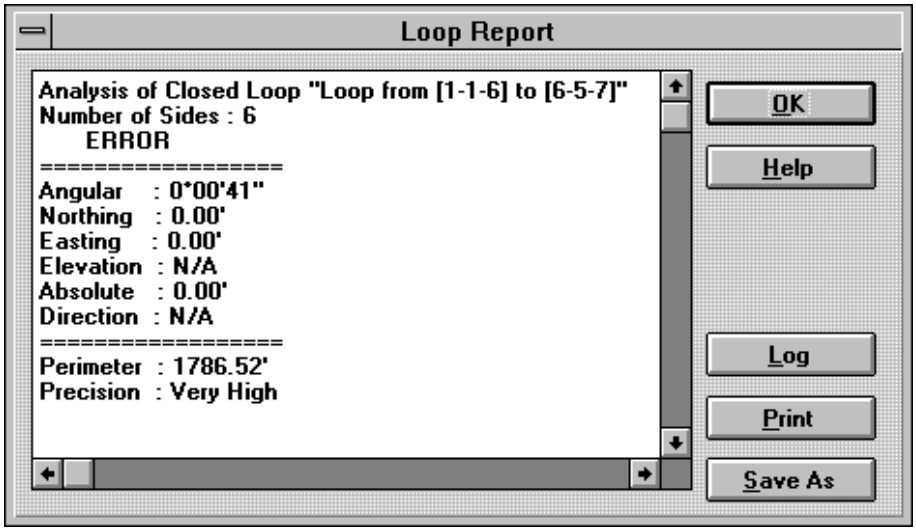


Once the loop is selected, it can be adjusted. Select ***Loop Adjust*** from the ***Survey*** menu. A dialog box like the one below will be displayed:



Change the settings to match the picture by selecting ***Compass Rule*** and ***Angle Adjust.*** Select ***OK***. The loop will be adjusted and another report dialog will appear displaying a summary of the adjustments that were performed. Select ***OK*** to close this dialog.

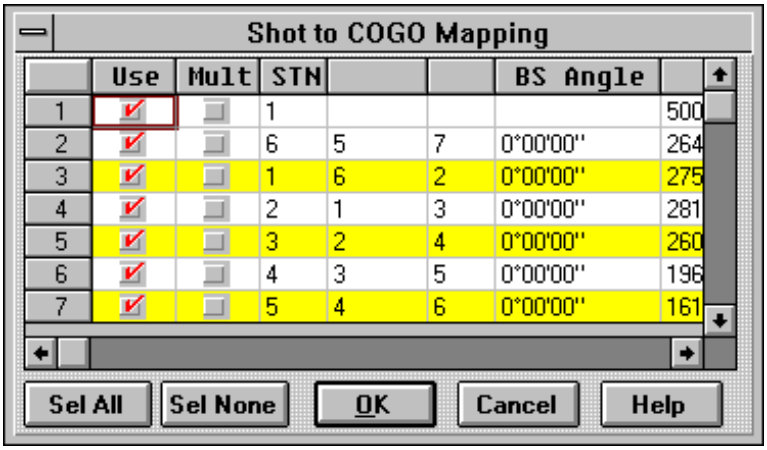
Verify the adjustment by clicking on ***Loop Report*** in the ***Survey*** menu. The ***Loop Report*** dialog will appear again, displaying the analysis of the loop.



Generating COGO points

Once the traverse loop has been entered and adjusted, you'll want to send the point data over to COGO to allow performing a stakeout of the property corners from the traverse station points.

Select ***Generate COGO points*** from the ***Edit*** menu of *Survey*.



You should see a dialog box similar to the one shown. It will list all points and the shots that create them. It behaves similarly to the ***Fieldbook Editor***. As the current row changes, the headings at the top of the columns may change as well to reflect the kind of data that is in the each column of the current row. The checkboxes in the first two columns are the only fields which can be edited. The other fields are provided for reference only.

Notice that the shots that created points 1 and 7 are listed next to each other with the same color. Any points which are 'really' close together will be listed together to show that they can optionally be averaged together to become the same COGO point. Also, in Survey (but not in COGO), it is possible to have two different points with the same point number, such as with multiply determined sideshots. These points will also be grouped together in this dialog to show that they can also become the same COGO point.

After we adjusted our loop, points 1 and 7 (represented in rows 1 and 2 in the above picture) have the same location.

2) We don't want to transfer both points, we can click in the ***Use*** checkbox for row 2 to get rid of the check. Now point 7 will not be transferred to COGO. Anything which has no check in the ***Use*** column will not transfer to COGO.

If we had left the check, they would have become two different points in COGO.

To change the width of any column, move the mouse to the line in the header row which separates that column from the next column. The cursor should change to a ‖ with arrows on each side. Click and drag the mouse until the column is the size you want. You can change the size of the entire dialog by moving the cursor onto the edges or corners, clicking the left mouse and dragging the edge of the dialog.

To create one COGO point that is an average of both points, click in the ***Mult*** column for both rows. This checkbox is used to show that a COGO point will be created by averaging multiple survey points.

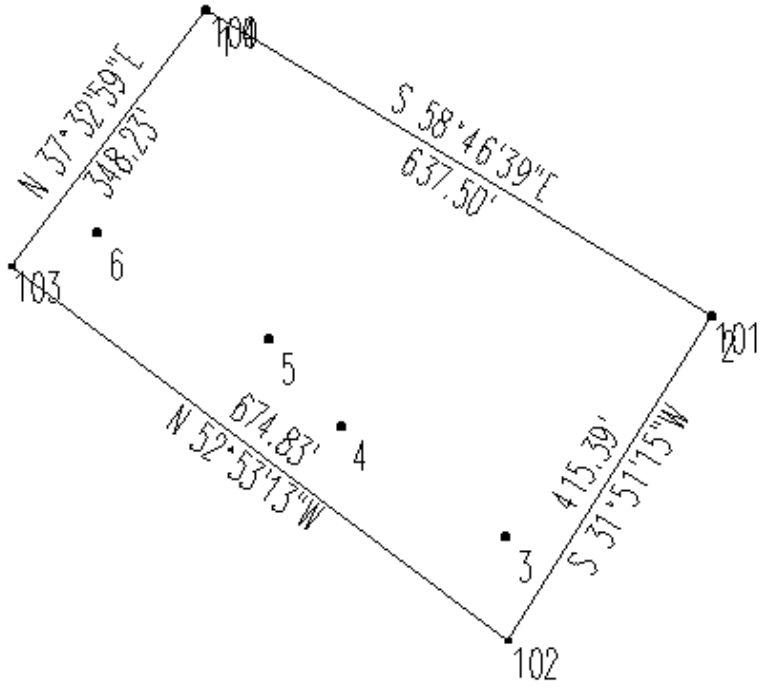
In summary, if ***Use*** is not checked, the point will not transfer to COGO. If ***Use*** is checked and ***Multiple*** is not, the Survey point will be directly transferred to COGO. If both ***Use*** and ***Multiple*** are checked, the position will be averaged in with any other points grouped with this point which are also checked in both columns.

So, for example, if you had four shots to point #22 and three were checked in the ***Use*** column and two of those three were also marked in the ***Multiple*** column, these two shots would be averaged to create one COGO point, the shot marked ***Use*** but not ***Multiple*** would create another COGO point (with a different COGO point number), and the final shot would essentially be ignored. When you click ***OK***, the traverse loop points will be transferred to the *COGO* window.

GO to COGO

If you have not purchased the Survey module, open COGO.PCS (in the PCS\TUTORIAL directory) to work through this section.

If you haven't already done so, open the *COGO* window again by pressing **F2** or by selecting ***COGO*** from the ***View*** menu in either the *Main* or *Survey* window. Select ***Full View*** from the ***View*** menu in *COGO*. You should see something like the following:



Saving the Project

At this point, you will want to save your information so that it won't be lost. Selecting ***Save*** in the ***Project*** menu saves the current project with the current project name. However, since this project has not yet been named, a dialog box will appear in which you can type the name of the project. Type **EXAMPLE** for the project name and then click **OK**. Notice that the title bar now shows the name of the project as *example.pcs*. Now, if you select **Save** again, the project will be saved as *example.pcs* and no dialog box will be displayed.

If the project has a name and you want to change the name, select ***Save As*** from the ***Project*** menu. If, for example, you wanted to change the name to Xanadu, type *Xanadu* in the ***File Name*** box and then press <ENTER> or click on the ***OK*** button. The current project would now be XANADU.PCS. Notice that upper and lower case letters can be used interchangeably. File names are *case-insensitive*; DOS (and therefore Windows) doesn't care.

If you have an unnamed project, ***Save*** and ***Save As*** have the same effect.

Selection Status

Let's review the select status bar. As you select/unselect objects, watch the select status bar (remember - the 2nd bar underneath the COGO menu). If, by chance, you have inadvertently turned the select status bar off (i.e. you can't see it!), it can be turned on again by selecting it in the ***Misc*** menu. The numbers that are next to the data type buttons (Point, Line, Curve, etc.) should change to reflect how many of each type of object is selected. This facility is provided to allow you to quickly see if anything is selected and, if so, how many and what type of objects are selected.

The words *object* and *data type* have been used. *Data types* in the COGO window include *Points, Lines, Curves, Texts,* and *Alignments/Boundaries.* In the Survey window, the data types are *Shots, Texts* and *Loops*. Each window has its own set of data types that are determined by the function that the window performs. An *object* is a single item of some data type such as a point or a text.

As mentioned before, many of the functions in PCS act only upon what is currently selected. Controlling what is selectable is therefore important. There are several facilities in place to help you select only what you want to work with.

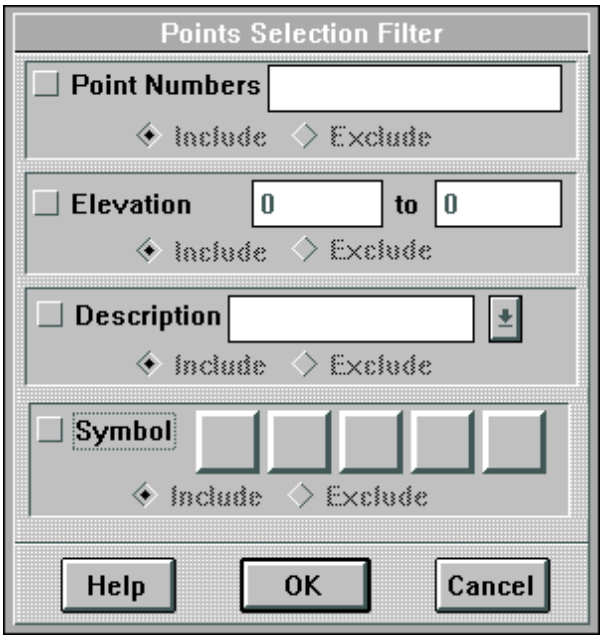
Clicking on the numbers in the select status bar will toggle (alternate) them between black and gray. When a number is grayed, the data type associated with that number is ***disabled***; it cannot be selected. For that matter, it can't be unselected either, except through the *Clear Select* function (patience - I'll explain that in a bit).

There are three buttons labeled **A, N,** and **C** on the right side of the select status bar. These letters stand for *ALL, NONE* and *CLEAR* respectively. Clicking on the **A** button will enable ALL selections (only does something when a data type has been disabled). Clicking on **N** will DISABLE ALL selections - all the selection numbers will turn gray. The **C** button CLEARS all selections. Anything that has been selected becomes unselected, even if its data type has been disabled (as mentioned above).

Additionally, you can control (or 'filter') which data items of that type can be selected or unselected. If you click on the ***Points*** button, a dialog box will appear in which you can set a range of point numbers to include or exclude when selecting or unselecting points. You can also filter your selections by ***Description*** and/or ***Elevation***. Click on ***Cancel*** to close the filter.

Suppose you want to only include points which have a description which starts with the letter A. This can be done by using *regular expressions*. For more information, see the section in the Reference Manual on *Regular Expressions*.

For this example, let's turn the point selection status on (black) and all of the others off (gray). To do this quickly, click on the **N** button on the right of the select status bar. All the select numbers will turn gray. Now click on the number next to the *Points* button. The number will turn black to indicate the selecting of points is enabled. Now draw the box from ***left*** to ***right*** over the drawing, just like you did before. This time, only the points will be selected, even if the box included other things like lines or texts.

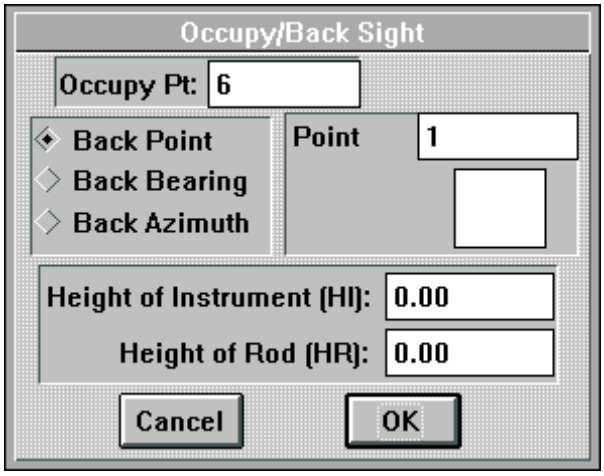


Points Filter Dialog

Occupying a Point

Various functions use the ***occupy point***. The current *occupy point* parameters are displayed in the right side of the status bar, so it is easy to *look* at any point by simply occupying that point and looking at the status bar information.

You can occupy any point in the file by moving the mouse near the point and holding down the right mouse button and then clicking the left button or, if you have a three button mouse, by clicking the middle mouse button.



Another way to set the Occupy Point is to select ***Occupy/Back Sight*** from the ***Cogo*** menu or click on the ***Occupy*** button in the *Tools* window. Either of these options will bring up a dialog box (similar to the one shown). While the dialog box is up, you can either type the point number in the box or move the mouse near the point in the data window and click the left button. If you click the mouse a second time, it will replace the previous value with the next closest point. When you have the point you want, select the ***OK*** button or press <**ENTER**>. If you change your mind and do not want to change the occupy point, click on the ***Cancel*** button or type **<ESC>**.

The command line approach is:

Command: **OC** *Pnt* **<Enter>**

where *Pnt* is the number of the point you wish to occupy.

Deleting Items

The data is a bit cluttered. We really don't need point 101 since it is the same as point 2 or points 100 and 104 since they are the same as point 1. Let's clean things up a bit by deleting these points. Deleting, like just about everything else, uses the select list.

We need to select the points that we want to delete but we need to be careful not to select anything else. A quick way to select individual items is to do a left-click and release (NO DRAG!) in the vicinity of the desired object. This will select the nearest item. Performing another left-click and release will unselect the first item and select the nearest item - and so on and so forth.

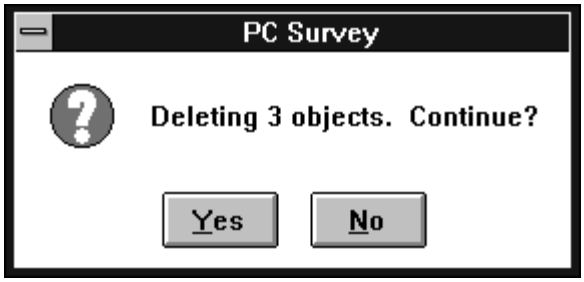
For this example, though, we're going to use a more elaborate approach to give you an idea of the control that can be exerted in selecting objects.

* • Click on the ***C*** button in the select status bar to make sure that nothing is selected.
* • Click on the ***N*** button to turn off the selectability of all data types.
* • Click on the number next to the ***Pts*** button to enable selecting points.

Now points are the only data type that can be selected.

In addition, let's click on the ***Pts*** button to set up the point filter. Click on the ***Point Numbers*** checkbox so that point number filtering is enabled. Make sure that ***Include*** for point numbers is selected and then type *100-110* in the ***Point Number*** edit box. This will only allow selecting points with numbers from 100 to 110. Click on the ***OK*** button.

We will still need to be careful not to select points 102 and 103. Draw a selection box around point 100 and 104 then draw another selection box around point 101. The selection status bar should show 3 points selected. Now, go to the ***Edit*** menu and select ***Delete Objects***. A dialog box will pop up showing the number of items selected and asking if you want to continue. The program, concerned for your welfare, just wants to make sure that you do not delete anything by accident. Of course, there is always the ***Undo*** function. So you can be brave and click ***Yes***. Now don't panic when you see that some lines and texts were also deleted. When you delete a point, any lines or curves that were connected to it will be deleted. When a line is deleted, any text on the line like the bearing and distance text will also be deleted.



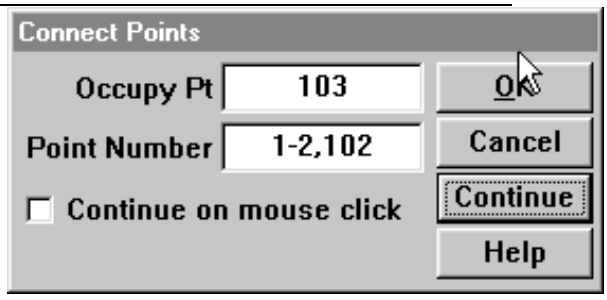
Open the ***Pts*** filter again and turn off the ***Point Numbers*** filtering before continuing.

As I said, this is a much more involved procedure than we needed, but you should now have a better appreciation for the control that is available if needed.

Connect Points

Connect Points button

Now we will want to create the boundary of the lot using points 1, 2, 102, and 103. To do this, select ***Connect Points*** from the ***Cogo*** menu or click on the ***Connect Points*** button (shown above). Since we still have the line from 102 to 103, we will just traverse from 103 to 1 to 2 to 102. So set the ***Occupy Pt*** which is the starting point for the traverse to *103*. We could just type one point number at a time in the ***Point Number*** box clicking ***Continue*** each time but we can also enter the whole series of points at once as *1-2, 102*. This means use every point from 1 to 2 and then use 102. If we click ***OK***, the points will be connected in order and we now have our boundary.

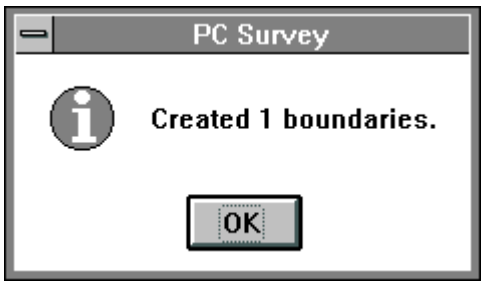


The command for ***Connect Points*** is: **PT** *Pnt List.* The first point in *Pnt List* corresponds to the ***Occupy Pt*** in the dialog. Therefore, to perform this same function, we can type:

Command: **PT 103, 1-2, 102<Enter>** or
PT 103,1,2,102<Enter>

Creating a Boundary

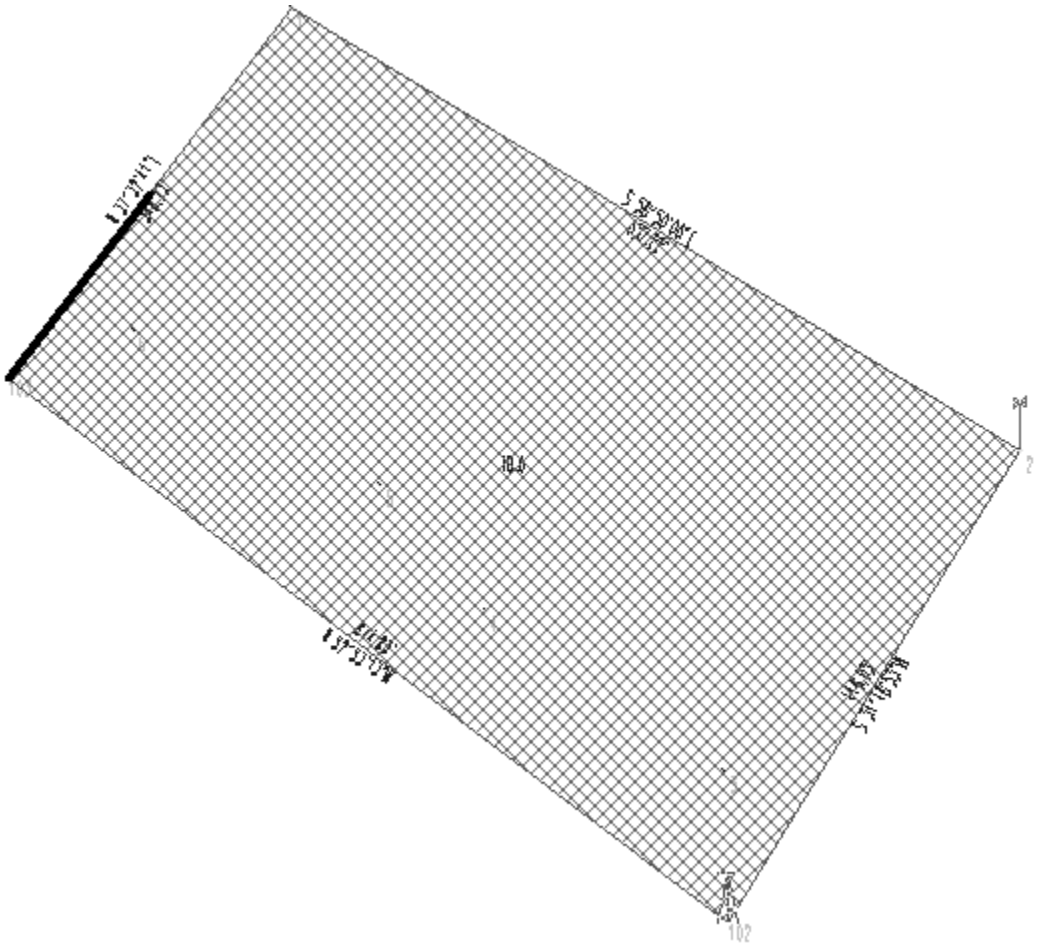
In PC Survey, a series of connected lines and curves is called a *boundary* or *alignment*. ***Boundaries*** start and end at about the same point. Boundaries have a name, an area and perimeter. They are easily annotated with any combination of these values (name, area, perimeter), so they are very useful for representing property lots. ***Alignments*** don't start and end at about the same location - they can be used for road centerlines. Alignments and boundaries can be automatically created during traversing but this option is off by default. Functions that use alignments and boundaries include ***Predetermined Area***, ***Offset***, and ***Bnd/Aln-Annotation***. To create a boundary from existing bounding lines and/or curves, the lines and/or curves that bound the area which is to be enclosed by the boundary must first be selected. We want to create a boundary of the lines bounding the property so that the ***Predetermined Area*** functions can be used to subdivide the lot.



Example of Create Boundary Message

Making sure lines are selectable, select the four bounding lines of the property that we just created. The four lines should now be highlighted in bright red (assuming you haven't changed the color definitions).

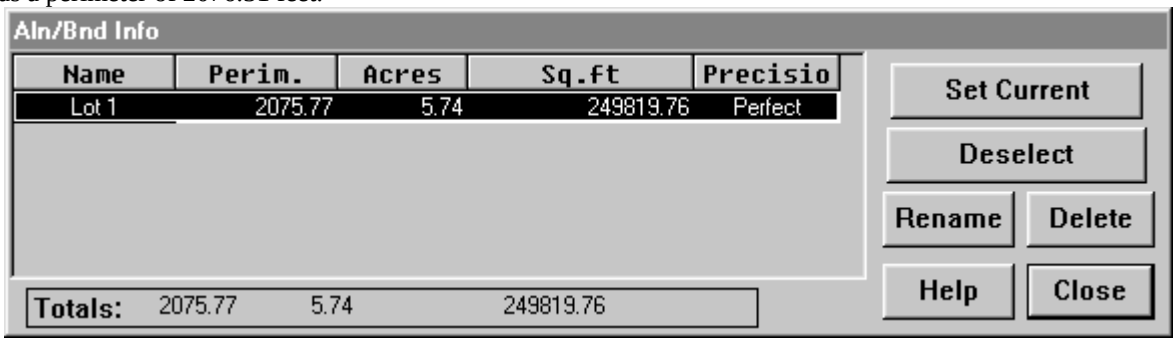
Now, to create a boundary of these lines, select ***Create*** from the ***Bnd*** menu. PC Survey will display a message showing that one boundary was created. It will also automatically select the boundary. This is convenient for us since, to look at the area and perimeter information, the boundary needs to be selected. If you want to select an alignment or boundary, the selection box only needs to intersect one of the lines/curves in the alignment/boundary. When a boundary is selected, it is hilighted by being filled with cross-hatched lines. When an alignment is selected, it is highlighted with a heavy yellow line. In both cases, the first half of the first line in the alignment/boundary is hilighted in white.



Example of Boundary highlighting

Computing Area

At this point, the number of selected alignments/boundaries should be 1. Select ***Info*** from the ***Bnd*** menu. This will bring up a dialog box which will list all selected alignments/boundaries (we only have one in this case) with their associated perimeter and area (in both acres and square feet). The totals will be displayed in the bottom of the box. Since we have not named this boundary yet, the program gave it a name of *Lot 1* and we can see that the lot encloses 5.74 acres and has a perimeter of 2076.31 feet.



Alignment/Boundary Info Dialog

If we want to name this boundary "Lot A", click on the ***Rename*** button which will bring up a dialog box. Type in *Lot A* followed by pressing <**ENTER**> or clicking on the ***OK*** button. After this dialog box disappears, notice that the name of the boundary as listed in the ***Info*** box is now *Lot A*. When you are tired of this dialog box, click ***Close*** to move on.

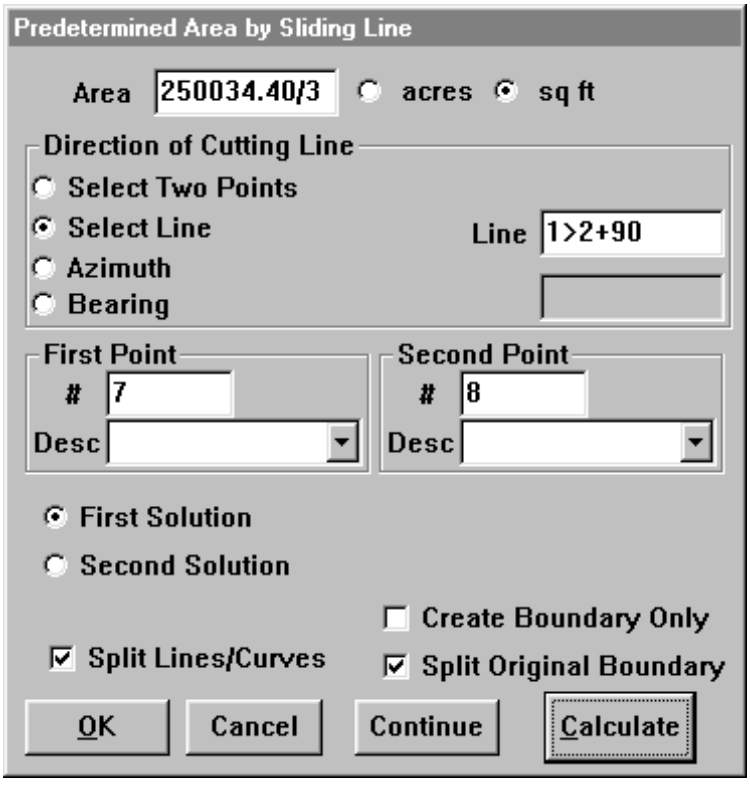
Subdividing the Lot - Predetermined Area

We're now ready to subdivide the property by dividing it into three equally sized lots with division lines that are perpendicular to the frontage line. There are two predetermined area functions. One uses the sliding line method (***By sliding line***) and the other is a hinged method (***By pivot line***). The sliding line method is applicable to this problem.

1) With the boundary selected, select ***Predetermined Area - By sliding line*** from the ***Bnd*** menu. A dialog box similar to the one shown will appear.

This is going to be a two-step process. We will first cut off a parcel that is one-third of the total size. Then we will split the remaining two-thirds in half. We could continue the process, by splitting the half in half again, but that could be fattening since that would get us Half & Half.

The ***Area*** shown in the dialog is the current area of the property. The value of *5.74* is the acreage of the area to 2 decimal places of precision. This is not a lot of precision, so click on the ***Sq. Feet*** radio button to change the value to square feet (250034.40). Since there are many more significant digits in this value, when we divide by 3, the internal result will be more accurate. Since we want to divide the lot into three sections, append */3* to the end of the area value so the ***Area*** now reads *250034.40/3*.



Predetermined Area by Sliding Line dialog

2) For ***Direction of Cutting Line***, click on ***Select Line*** which shows that we will be defining the direction of the cutting line by using a line that already exists.

3) Now, in the view window, click near the line which runs from 1 to 2. (If the dialog box is in the way, click and drag on the caption of the dialog and move it until it is out of the way.) Notice that the ***Line*** edit box says **1>2** or **2>1** depending on which end of the line the mouse is nearer when you click. This is shorthand for the angle from 1 to 2 (or 2 to 1). But the line is supposed to be perpendicular to the line from 1 to 2. No sweat.

4) Just add '+90' to the ***Line*** edit box so that it now reads **1>2+90** (or **2>1+90**). Translation: Take the angle from 1 to 2 (or 2 to 1) and add 90 degrees. If you are curious what the actual angle is, type a '='. It will show that the angle is **S31°09'54"W**.

5) Press the ***Calculate*** button. Two white lines should appear on the screen within the boundary. These two lines represent the two possible solutions. Notice that near the bottom of the dialog box there is a ***First Solution*** and ***Second Solution*** radio button. Click with the left mouse button near each of the solution lines (the white lines) on the screen while watching the ***First Solution*** and ***Second Solution*** radio buttons. Each white line represents one of the solutions calculated from either end of the boundary. Clicking near a solution line selects the corresponding solution radio button.

6) When ***OK*** or ***Continue*** is selected, the selected solution line will be added, along with the two points at either end. Since the lots will be equal size, either solution can be selected for this example. For the purpose of this tutorial, select the right solution by clicking near the rightmost line.

If ***Split Lines*** is checked, the lines which are intersected by the solution line will be split into two smaller segments at the point of intersection. If ***Create Boundary Only*** is selected, a boundary will automatically be created that encloses the area you are cutting off, but the original boundary (with the full acreage will remain). If ***Split Original Boundary*** is selected, the cut-off boundary will be created AND the original boundary will be reduced by the area of the cut-off.

7) This is the easier way to do this, so check the boxes for ***Split Lines*** and ***Split Original Boundary***.

8) Select ***Continue***.

At this point there should be two boundaries. One will bound the first 1/3 parcel and the other will bound the remaining area. The remaining area is automatically selected. To create the next parcel, we will not have to go through all the steps we did in creating the first parcel.

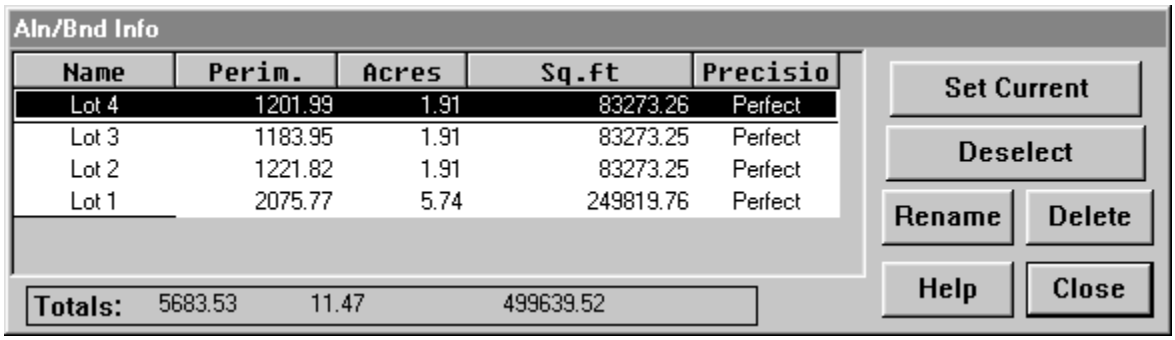
The dialog should still be displaying square feet. This is a characteristic of the PCS program - many of the dialogs "remember" their previous settings. The dialog will also display the previous cutting angle, which we will use again.

9) Select ***Calculate***. This time, the two solutions will almost on top of each other. Due to internal round-off in the calculation, the two solutions may not be *exactly* the same, but they'll be close.

10) We don't really care which one we use, so simply select ***OK*** to create the remaining two boundaries and close the dialog.

11) Now, select all of the boundaries that have been created (there should be three of them).

12) Select ***Info*** from the ***Bnd*** menu - you should get a dialog similar to the following:



13) The parcels are indeed each one-third of the total. ***Close*** the dialog. If you haven't done so lately, select ***Save*** from the ***Project*** menu to save your work to this point.

Staking the corners

Once the points have been generated for the corners of the lots, it is possible to stake out the points at the site. Stakeouts of points are performed on a set of selected points along with a specified station and backsight point. Several stakeouts will be necessary in this example because several different station locations will be used. One function that can be used when only doing a point or two at a time is the ***Inverse*** function. When performing stakeouts on large sets of points or, when a formal printout or downloadable data file is desired, the ***Stake Tools*** functions (curve and point) are preferable. Let's examine ***Inverse***.

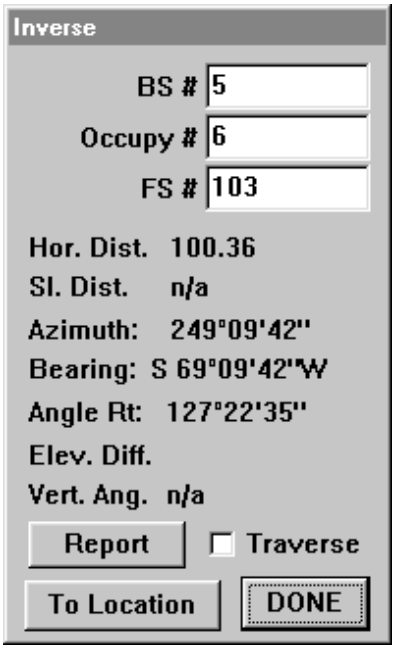
Inversing by Point Number

Inverse is used to inverse between two points. Inversing means to compute the direction and distance between two points or between a point and a location (the location being specified as a northing and an easting value). It is selected either from the ***COGO*** menu or from the ***Inverse*** button in the *Tools* window.

Inverse does not affect the occupied point.

In the EXAMPLE project, to find the bearing from point 6 to point 103 and the distance between those points, select ***Inverse*** from the ***COGO*** menu or click on the ***Inverse*** button in the *Tools* window. The ***BS Point #*** will default to the current backsight point, if there is a current backsight point. The ***From Point #*** will default to the current occupy point. Since we are already in the ***To Point #*** box, we will set it to 103 by either typing *103* or clicking with the left button near point #103. Next, type a <SHIFT - TAB> (backtab) to get to the ***From Point #*** field and either type *6* or click with the left button near point #6. Finally, set the ***BS Point #*** by entering *5* in the ***BS Point #*** box or selecting point 5 from the screen when the cursor is in the ***BS Point #*** box. Type a <TAB> and the data in the dialog box will be updated to show the distance as well as the angle as an azimuth, bearing and angle right. The angle right and distance values can be used as stakeout data. You can write this data down or click on the ***Report*** button to add it to the current report and optionally print the data or save it to a disk file or the log file. The default log file is *log.txt*.

The stakeout data is for field use. This is just one example of how to generate stakeout data. You can try this technique with some of the other corner points if you wish by merely changing the point data. If you are satisfied with your newly acquired expertise, select ***DONE*** to close the dialog.



Inverse Example

Summary

Upon reaching this point, you have a project stored on your computer called EXAMPLE.

Now, take a break before you satisfy that urge to drop-kick the computer into the next timezone. There is no need to save the project since nothing was changed since it was last saved. Don't delete the *example.pcs* file - you're not done with it yet.

More COGO

As described earlier, the customer has a development plan for the piece of property you have stored as the project file named *example.pcs*. The first step in that plan involved subdividing the property into three lots. With the three lots divided, we'll now have to find something to do to exercise some of the other functions in the program. Okay, let's say the owner has decided to build a strategic missile silo. The silo entrance will have a covered entrance that houses a vehicle elevator so that he can store his Abrams M1 main battle tank and '71 Volkswagon SuperBeetle 300' underground.

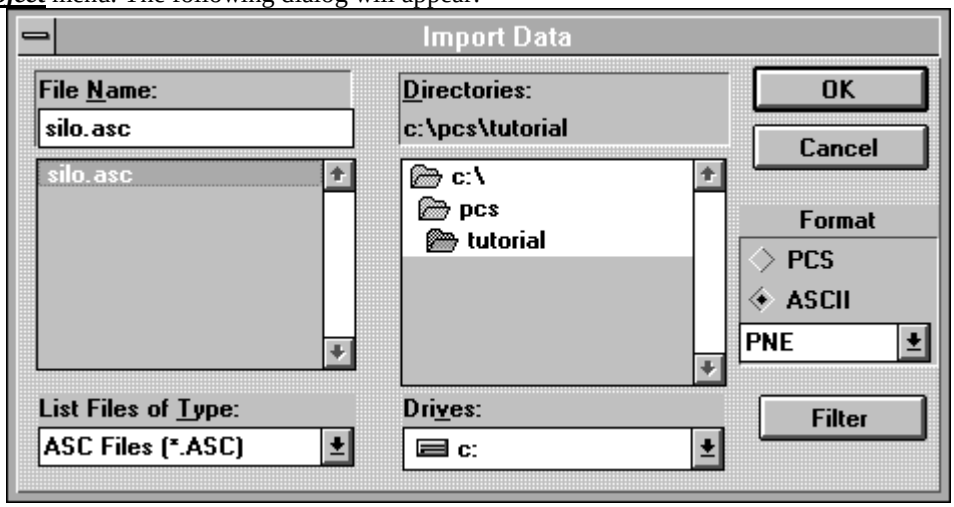
Being an intelligent person, the owner recognizes that it is only a matter of time before one of the Russian wheat farmers would try to hook one of those ICBMs left lying around to his plow. Of course, farmer Boris could easily screw up the launch programming and the owner intends to reply in kind if such an event throws a MIRVed warhead in HIS direction.

Given this common scenario, we need to place a silo entrance and steel-reinforced driveway from the entrance to the street (those M1s are HEAVY). We'll worry about the silo blast doors and early warning radar placement later (if Boris doesn't send a present our way first).

The silo architect visits the property to pick out a good location for the entrance. He stakes out the corners of the proposed building and your crew chief takes a few shots to locate the building on the plat. However, this time he decides to use his trusty GollyWhomper 2000 data collector (the .44 Magnum model) to reduce the data down to a set of coordinates. He does this, of course, because he knows that we needed an example of how to import points from an ASCII file.

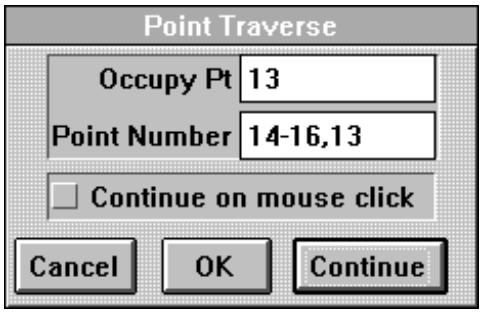
Importing an ASCII point file

This point file is called SILO.ASC and is found in your TUTORIAL directory. To import this data, select ***Import Points*** from the ***Project*** menu. The following dialog will appear:



Well - something LIKE this dialog will appear. After you select the SILO.ASC file it will look more like the above. Notice the ***Format*** section on the right. This is where you specify what kind of file it is that you are trying to import. In this case we are importing an ***ASCII*** file that has the ***PNE*** format (Point number, Northing and Easting). The ***Filter*** button is used for restricting what points are to be imported from the specified file. In our case, we want 'em all, so there is no need to fool with the ***Filter*** settings. This dialog is a derivative of the standard Windows file dialog. If you are totally lost as to how to use this kind of dialog to locate a file, review your Windows documentation to get a basic understanding of how Windows works.

Once the SILO.ASC is selected and the ***Format*** settings are correct, select ***OK*** to import the points. You should see five additional points (points 13-17). Four represent the four corners of the silo entrance (points 13 - 16). Point 17 marks the PI of the driveway curve.



One of the first things we can do is draw the outline of the silo entrance. This is a "connect the dots" operation and that should immediately bring to mind the ***Connect Points*** function. Select ***Connect Points*** from the ***COGO*** menu or click on the ***PTRA*** button in the toolbar. We'll start at point 13 and traverse to 14, 15, 16 and back to 13. There is a quick way to do this. Make your dialog look like the one shown on the right.

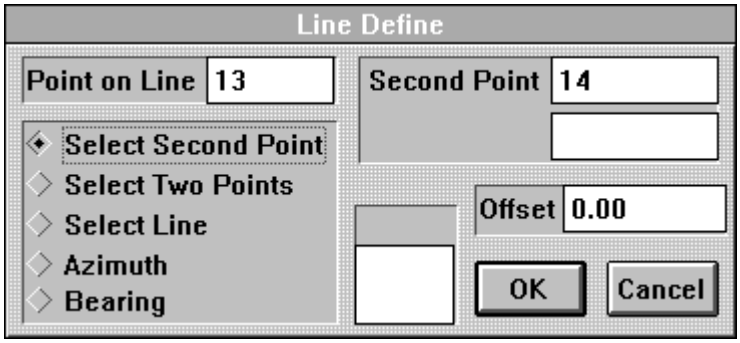
Notice the entry for ***Point Number***. This line says that, starting at point 13, traverse to 14, then to 15, then to 16 and, finally, back to 13. If we had wanted to traverse to points 1, 3, 5, 6, 7 in that order, we would have entered the line **1,3,5-7** instead.

Click ***OK***. You should see a box drawn neatly around the four corner points. Unfortunately, you also may see a garbled mess of distance text created. We could have avoided this by turning off automatic distance text creation in the ***Options*** dialog under the ***Edit*** menu, but it is just as easy to delete them after they have been created. To delete them, select the four texts, check the status bar to make sure that ONLY four texts are selected (a 4 next to *Texts* and 0 next to everything else), and hit the **<*Del*>** key on your keyboard (make sure NumLock is off if you use the keypad). The four texts should miraculously disappear. If your screen looks a bit garbled, select ***Redraw*** from the ***View*** menu or press ***F8***.

Point in Direction

Now it's time to begin work on the driveway. We want the center of the driveway to contact the center of building, so let's set a point at the center of the north side of the building. We'll use the ***Point In Direction*** function that is found in the ***Points*** menu to accomplish this task. First, inverse between the two north corners of the building with the ***Inverse*** function. You'll find that the distance between the corners is 40 ft. We therefore want to set a point 20 ft from either corner on the north edge of the building.

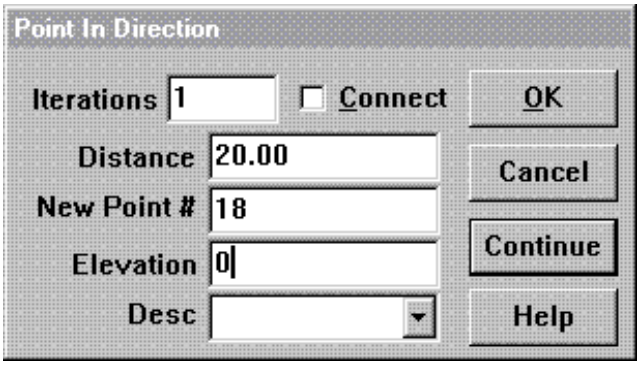
Select ***Point In Direction*** from the ***Points*** menu or from the toolbar. You'll be greeted with the ***Line Define*** dialog. Click near point 13 to select it as the ***Point on Line***. Select ***Select Second Point*** if it is not already selected. With the cursor in the ***Second Point*** edit box, click near point 14 or type **14** in.



Click on ***OK***. A magenta line will be drawn from point 13 through 14 and to the edge of the window. This shows the direction to travel to create the new point(s). Also, another dialog will appear as shown. Set the ***Distance*** to 20, the ***New Point #*** to **18** and select ***OK.*** Point 18 will be created on the midpoint of the north edge of the building outline.

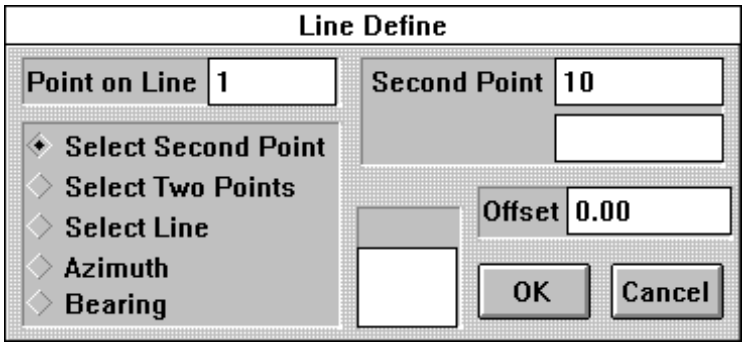
One more point is needed - the intersection of the centerline with the property edge on the northeast side. We want the centerline to be perpendicular to the property boundary.

> ***Note:*** As an alternative, there is a faster way to do this task by eliminating the use of the ***Inverse*** function and using a *distance formula* instead. We could have entered the formula **13:14/2** into the ***Distance*** box of the ***Point in Direction*** dialog (instead of **20**). This formula says to take the distance between points **13** and **14** (the **13:14** part) and divide that by **2** (the **/2** part).

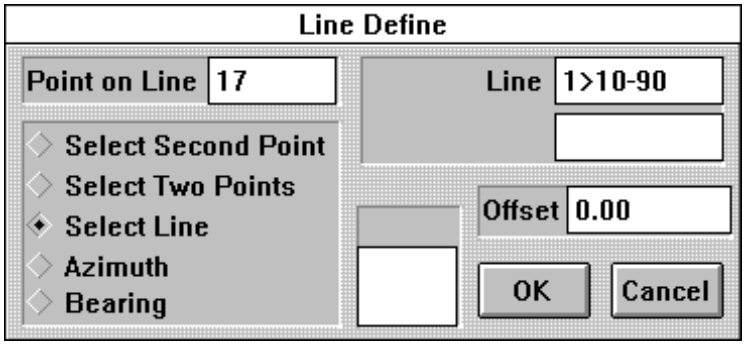


Bearing-Bearing Intersection

To get this point, use the ***Bearing-Bearing*** intersection routine in the ***Intsct*** menu. This routine essentially finds the intersection of two lines and therefore uses the ***Line Define*** dialog box twice. After selecting this function, fill in the first ***Line Define*** dialog to look like the one on the right.

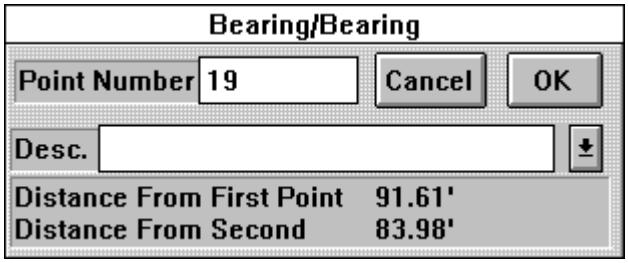


In this dialog, we are defining our first line to pass through point 17 with a direction that is perpendicular to the property line. This dialog behaves very much like the one we used in ***Predetermined Area***. With ***Select Line*** selected, we can click near the line that we will use for a reference which in this case is the line from 1 to 10 so the dialog box will show '1>10'. But, since we want the line to be perpendicular to this line, we will subtract 90. If you are curious what the azimuth would be, type a '=' and you should see 31°09'54". You can leave it showing the actual azimuth or you can type '=' again to show the formula. Click ***OK***. A magenta line will be drawn on the screen to represent the line you just defined. It should pass through point 17 and be perpendicular to the northeast edge.



The second ***Line Define*** dialog will appear. We want to define the second line to be colinear (on top of) the northeast property line. This can be done in a number of ways. In the method shown, we define a line that passes through one of the corners (point 1) and also passes through point 10 using ***Select Second Point***. Alternatively, you could select ***Select Line*** instead of ***Select Second Point*** and selected the northeast property line with the mouse. Or you could select ***Select Two Points*** and selected 1 and 10 to define the line Once you have the dialog box filled in, click ***OK***. A second line will be drawn on top of the northeast property line. The intersection of the two lines will be where the new point will be located.

The third and final dialog for this function will appear which is used for actually creating the point at the intersection. You can change the point number and description that will be assigned to the intersection point by filling in the appropriate edit boxes. Notice that the distances from points 1 and 17 to the intersection point are also shown for additional information. Select ***OK*** to create point 19.

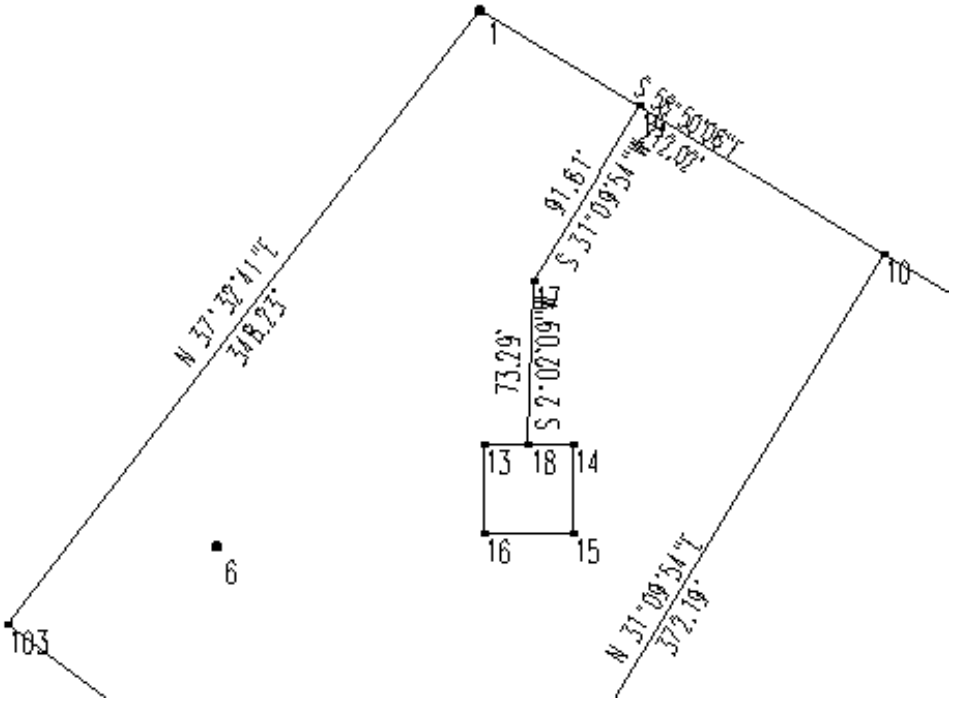


The command line syntax for ***Bearing-Bearing*** intersection is: **BB** *Pnt, Angle, Pnt, Angle.* To use the command line, you would then type in

Command: **BB 1, 1>10, 17, 1>10-90<Enter>**

Notice that you CAN use formulas in the command line.

Now, you'll want to draw the centerline of the driveway by using ***Connect Points*** to draw a line from point 18 to 17 and from point 17 to 19. Remember that ***Point Traverse*** is found in the ***COGO*** menu. Since you've used this function before, I'm going to leave out the details of this step - you're on your own. When done you should have a drawing that looks something like the following:

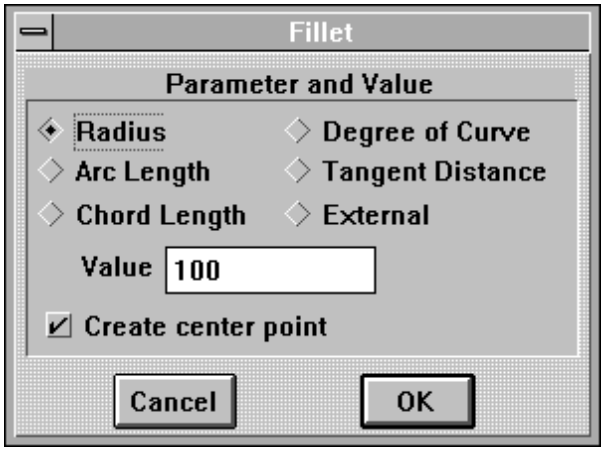


Notice that the line to the silo entrance is not quite perpendicular to the entrance. If you wish, you could adjust this by doing another ***Bearing-Bearing*** intersection to move the PI, point 17, a bit more southwest. However, there is an ulterior motive to this, so leave it as it is.

There is one more step that needs to be taken to finish our centerline - a curved bend needs to be inserted.

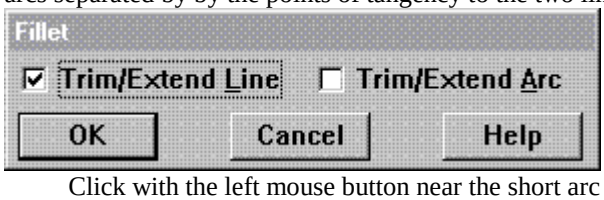
Curve Creation - Fillets

Select the two lines comprising the driveway by clicking and dragging a select box across them. Make sure that no other lines are selected by verifying that the number **2** is in the select status box next to the ***Lines*** button. Select ***Fillet*** from the ***Curve*** menu. This function can generate a tangent arc between either two lines, two arcs, or a line and an arc. A dialog similar to the one shown to the right will appear



Select ***Radius*** from the list of possible parameters and set its value to **100**. Select the ***Create center point*** option so that the radius point will be created at the same time the curve is generated. Click on ***OK***.

A dialog will appear similar to the one shown below. At the same time, several arcs and a circle will appear on the screen, representing the various possible solutions. The circle is actually comprised of two arcs separated by by the points of tangency to the two lines.



Click with the left mouse button near the short arc that represents our desired fillet. The arc will highlight in a different color.

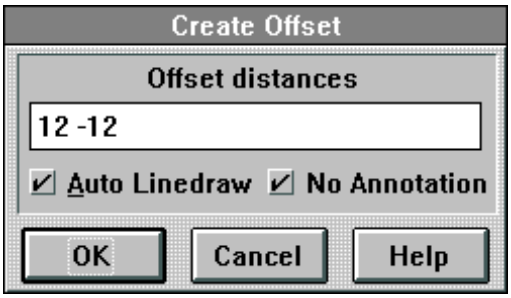
Check the ***Trim/Extend Line*** option in the dialog as shown.

Select ***OK*** to generate the fillet. The two lines will be shortened, the curve inserted and a radius point, PC and PT point will be created in one step.

The Offset Function

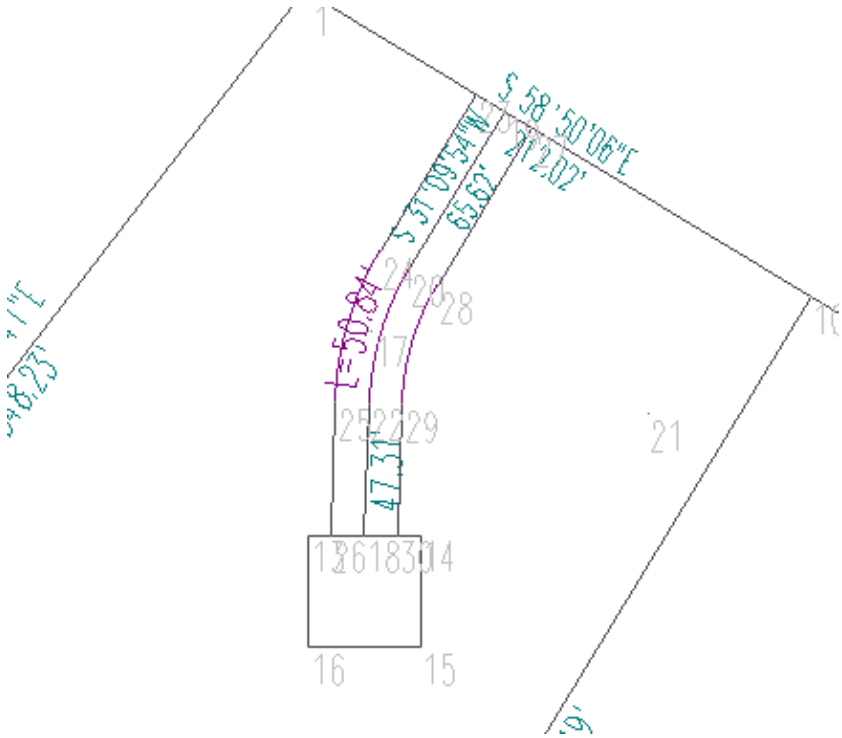
With the curve in place, the centerline of the driveway is complete. Now we need to add the edges. This is a two-step process. We want to use the ***Offset*** function which can operate on individual lines and curves or alignments/boundaries. If we used it for the lines and curve without creating a alignment/boundary, it would create extra points. It will be a little cleaner in this case to create the offset off of an alignment/boundary so we must first make an alignment that defines the driveway centerline. An alignment is a sequence of lines and curves that do not close (i.e. form a loop).

To define the alignment, select the two lines and the curve that comprise the centerline. Now, select ***Create*** from the ***Aln*** menu. A message will appear, notifying you that one alignment has been created. Click ***OK*** in the message box to clear the message. The driveway centerline should now be highlighted in a bright yellow to indicate that it represents an alignment. Additionally, you should see the number **1** next to the ***Al/Bd*** button in the select status bar to indicate that 1 alignment/boundary is currently selected.



1) Select ***Offset*** from the ***Aln*** menu. This function will create points at an specified distance from a curve, line, alignment or boundary. The created points will lie on imaginary lines that are perpendicular to the path of the alignment and passing through any points on the alignment. In this case, we want to create an offset on both sides of the alignment with ***Offset distances*** of 12 and -12 for 12 feet to the right and 12 feet to the left, respectively (to give a total driveway width of 24 ft. Remember - BIG tank).
2) Enter **12<SPACE>-12**. Any number of offset distances can be entered, separated by spaces. The ***No Annotation*** option should already be checked, turning off automatic annotation for the lines and curves that are to about to be created.
3) Enable the ***Auto Linedraw*** feature to connect the newly created points with lines or curves as appropriate, so make your dialog look like the one shown.
4) Select ***OK***.

You should now see a driveway complete with centerline and edges on your screen. You should now have a drawing of the driveway area that looks something like the following:

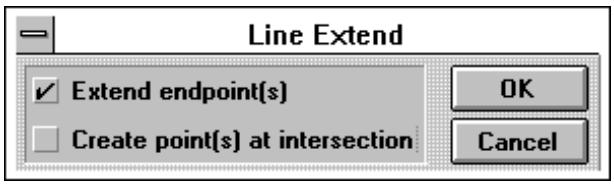


If you zoom in close to the building, you'll notice that the driveway edges don't connect cleanly with the building outline. The right side overlaps slightly while the left side is a little short. This was done deliberately so that we can make use of:

Line Extend

The ***Line Extend*** function operates on selected lines (no big surprise, here). All selected lines are extended (or shortened) to contact a chosen line or curve. If a point is chosen as the object to extend to, the selected lines are extended or shortened until their endpoints lie on a line perpendicular to the endpoint's line and passing through the chosen point. The chosen point then becomes a perpendicular offset to the endpoint of each selected line.

1) With all selections cleared, select the two driveway edges (created in the previous step) next to the silo entrance.
2) Select ***Line Extend*** from the ***Edit*** menu. The hilighting for the two lines will be removed. A dialog similar to this one will appear:
3) While this dialog is up, select the north side of the silo (using a select box) which is the line we want to extend the other points to.



Extend endpoint(s) means to change the lines by extending the appropriate endpoint to sit on the selected line. ***Create point(s) at intersection*** means to leave the current line the same but create a new point and a new line from the current endpoint to the new point. If neither are selected, a new line will be created from the current endpoint to the spot on the line where the new point would go.

4) In this case, check ***Extend endpoints(s)*** since we want to actually alter the lines rather than add a new line to extend the old one.
5) Click ***OK*** and the points should now be sitting at the intersection of the edges of the driveway and the north side of the silo.

Text

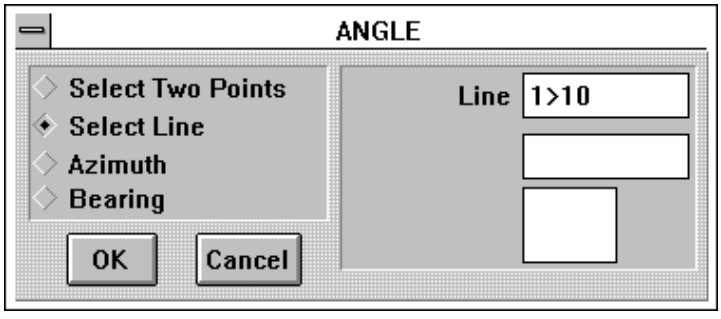
Let's label the road that passes in front of the lot as Birkdale Rd. To do this, we will enter text mode by either selecting ***Text*** from the ***Draw*** menu or clicking on the button with the ***A***. The cursor will change to an I-beam to remind you that we are in text mode. Now, move the cursor to where you want the text to be and click with the left button. A horizontal bar will appear to show the text insertion point. Now type *Birkdale Rd*. After this has been done, you have several options.

* • To add a second line of text, press the <Enter> key to move the insertion point beneath the B.
* • To add another text, move the cursor and click somewhere else and then start typing in the text.
* • To leave text mode, hit the <Esc> key or click again on the A button. The cursor will return to normal.

This is all the text that we want to create for now, so hit the <Esc> key or click on the A button.

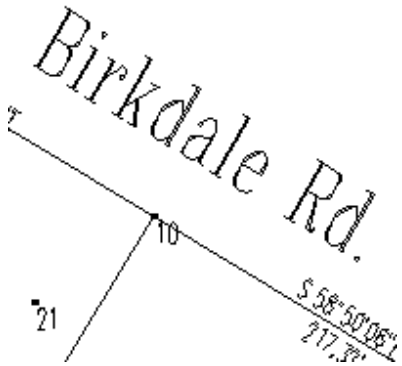
The text was placed horizontal to the screen but of course it would look a lot better if it ran parallel to the frontage line. No problem. Just place the cursor over the text and, holding down the Shift key, click with the right button. (First make sure that texts are selectable. The text itself doesn't have to be selected but texts must be selectable. This makes it easier to select the data type that you want since some data types make it difficult to select others.) A popup menu will appear.

Select ***Align***. Boy, this dialog looks a lot like the ***Line Define*** dialog. It works just the same. Click on ***Select Line*** and then click on the frontage line. The edit box should show a '1>10'. Click ***OK***. The text now heads in the same direction as the line.



It would look a lot better if the text were larger so select the text and then select ***Set Font-Other*** from the ***Edit*** menu. Let's make the ***Size*** 0.5" tall and set the ***Font*** to *Roman*. This is one of the strengths of Windows. Any font you have installed in your Windows can be used by **PC Survey**. However, if you are using a vector draw device (such as a plotter), when you actually plot the drawing, all fonts will be mapped to the vector fonts. If, on the other hand, you are using a raster device such as a laser printer or an inkjet, you can use any font you wish. If you haven't yet done so, close this dialog by clicking ***OK***. Now Birkdale Rd is much larger and a little fancier.

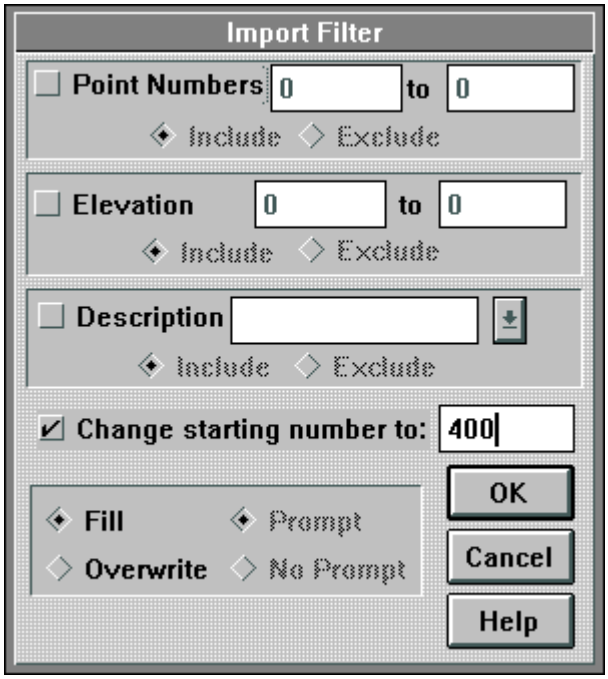
That's enough COGO for now. *And now for something entirely different*.



Introduction to Contouring

If you have not purchased the DTM module, skip to p.49.

PCS has a separate window devoted to the DTM functions, including contouring, profiles, earthwork and cross-sections. Before invoking the DTM window, however, we need to have some points with elevations to contour with. Fortunately, there is a ASCII point file supplied with your software for just this purpose. We're going to make use of the ***Import Points*** function to bring the contour points into the *Example* project. We'll then go to the DTM window and generate a contour map.



1) Select ***Import Points*** from the ***Project*** menu in the *COGO* window.
2) Set the ***Format*** option to ***ASCII*** and then click on the down arrow and select ***PNEZ*** (for Point no., Northing, Easting, Z or Elevation) from the list of default formats.
3) Find a file called ***cntpts.asc*** in the ***tutorial*** folder underneath the ***pcs*** folder.
4) Let's use the Import ***Filter*** option this time. Click on ***Filter***. The dialog box similar to the one on the right will appear. The Import Filter allows you to restrict which of the import file points are imported and determines any point number remapping that might occur. In this case, the ***cntpts.asc*** points have point numbers less than 100. Whimsically, we're going to move them up to start at point number 400. That way it will be easier to quickly see whether a point is a contour point or something else.
5) Enable the ***Change starting number to*** checkbox and set the number to 400 as shown.
6) Select ***OK.***
7) You should now be back at the ***Import Data*** dialog. With the ***cntpts.asc*** file selected, click on ***OK***. Your project should immediately develop a bad case of chicken pox with points appearing all over two of the lots.
8) Now that we have some points with elevations on them, we're ready to go to the *DTM Window*. Select **DTM** from the **View** menu (or press the F5 key) to change from the *COGO Window* to the *DTM Window*.

The DTM Window

The *DTM Window* looks like other PCS windows except that now the status bar has selection buttons and numbers for four types of data. They are:

Points - DTM points or points with elevations.

Clines - Contour lines or contours

Texts - Primarily the contour elevation labels.

Segs - Triangulation network (TIN) segments. These are the various line segments that comprise the TIN.

In addition to the standard Northing-Easting display on the left of the select status bar, there is now a Z or Elevation display. Initially, "**N/A**" will be shown in this box (Not Available). Once the contours have been generated, however, clicking with the middle button anywhere in the contoured area will result in the interpolated elevation at the cursor location being displayed in this third readout.

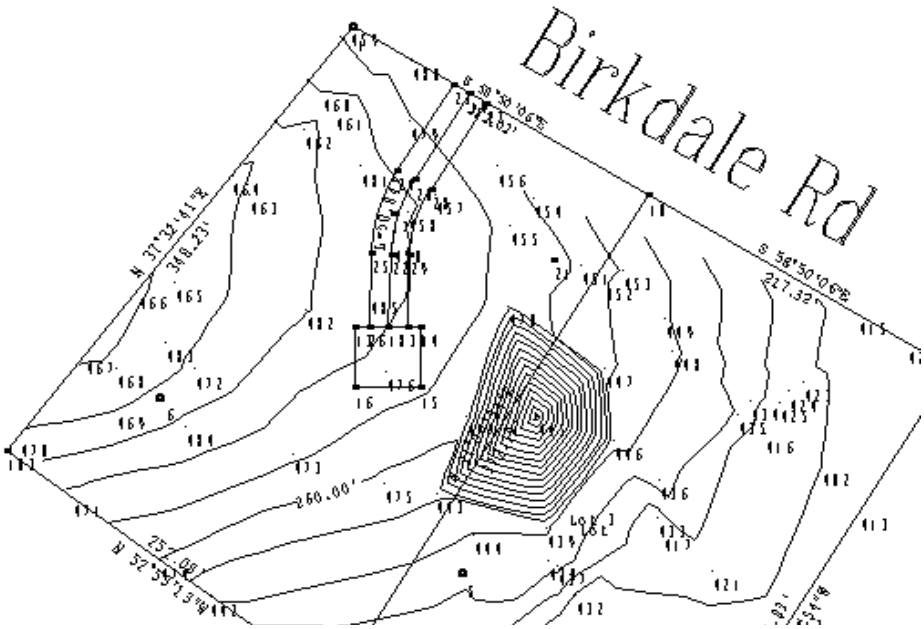
Inserting the contour points into the TIN

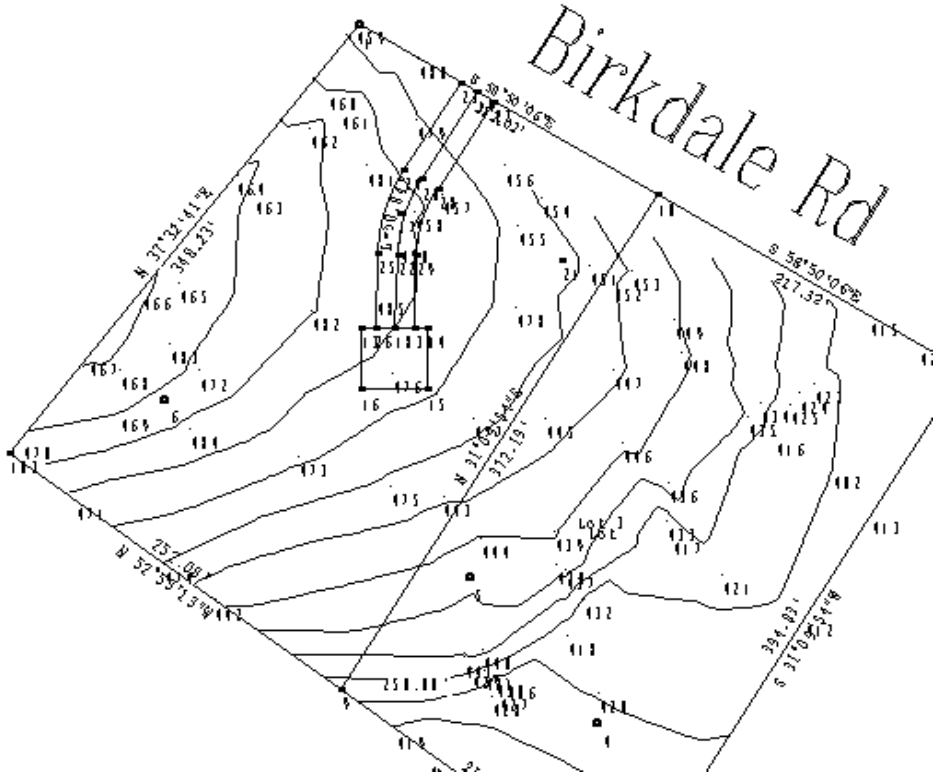
TIN means "Triangulated Irregular Network". The TIN lies at the heart of almost all contour programs. It is a mesh of triangles whose vertices are the contour points.

The first step, therefore, is to identify which points are to be used to generate the TIN. To insert the points into the TIN, they have to first be selected (so what's new?). So…

1) Select all the points by dragging a selection box across the whole project.

2) Select ***Insert Points*** from the ***TIN*** menu. A dialog box will appear, allowing you to select the TIN to use for these points.
3) Enter a name for your TIN (how about "S1"?). After closing that dialog, those points which have an elevation will be inserted into the TIN and will become unhilighted. We can now generate the TIN.
4) Select ***Triangulate*** from the ***TIN*** menu. A dialog will appear on the screen to notify you of the progress. The first message that you will see is ***Adding New Points***. Then, the message ***Optimizing*** will appear. Finally the TIN will appear on the screen and the dialog will go away.
5) Now, to generate the contours, select ***Generate*** from the ***Contours*** menu. After a little bit of thinking, the contours are there, looking something like this picture (without triangulation).
6) But, wait a minute, what is that hill doing around point #445? You don't remember there being a hill! It was just a gently sloping piece of land.
7) Open the COGO window (F2).
8) Select point #445.
9) Select ***Edit Individually*** from the ***Points*** menu. The dialog box shows us that the ***Elevation*** is 288.81. You pull out your field notes and find that the elevation for point #145 (remember, we changed the point number) is 258.81 (the 5 in your fieldbook does look a lot like an 8).
10) With the ***Edit Point*** dialog box still up, change the ***Elevation*** from 288.81 to 258.81 and click ***OK***.
11) To change the contours to reflect the new value, just go back to the *DTM* window and select ***Generate*** from the ***Contours*** menu again. The new contours should look something like the picture shown.

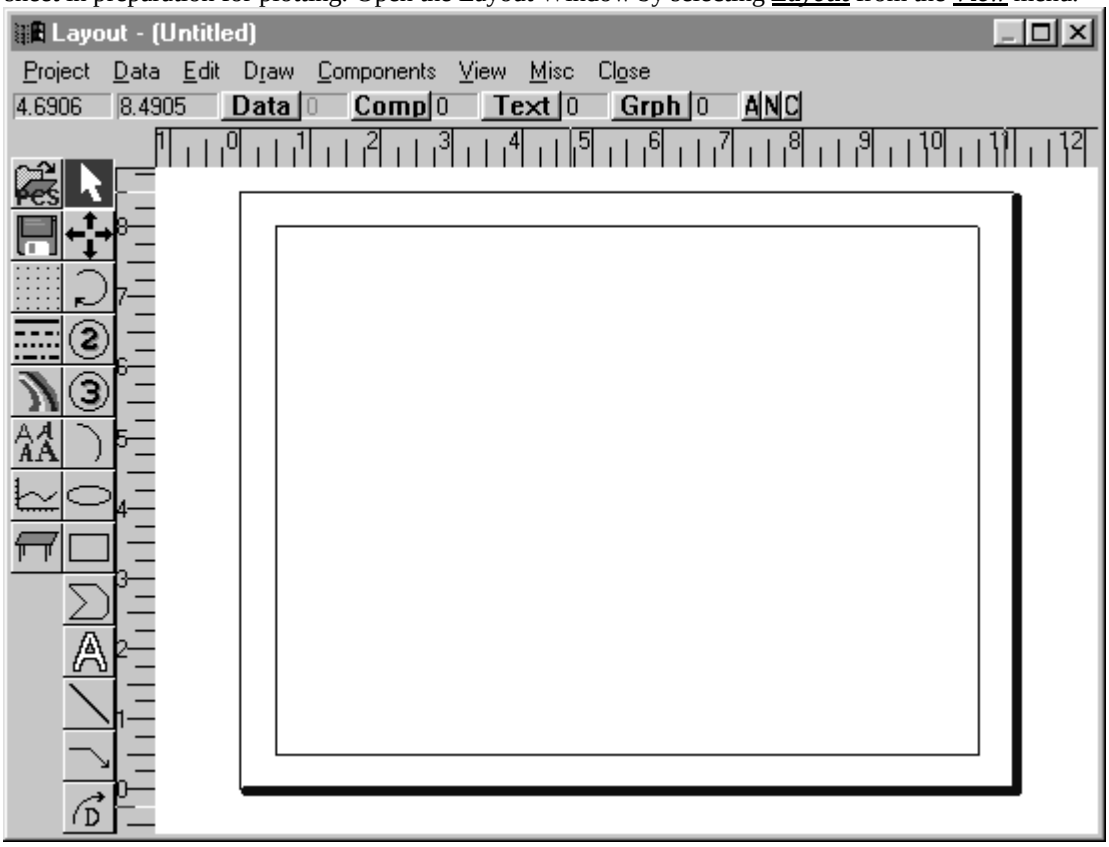




The Layout Window

If you have not purchased the DTM module, open LAYOUT.PCS in the PCS\TUTORIAL directory to continue the tutorial from this point.

It's time to make use of another tool of PCS - the ***Layout Window***. The Layout Window is used for arranging your data on a sheet in preparation for plotting. Open the Layout Window by selecting ***Layout*** from the ***View*** menu.



The appearance of this window is similar to the other windows of PCS. There is a select status bar beneath the window's menu and a toolbar on the left side. The left column toolbar functions are: ***Open, Save, Grid/Snapping, Line Style, Color, Font, Profile*** and ***Table.*** The right column toolbar functions, from top to bottom, are: ***Selection Cursor, 2 point circle, 3 point circle, Arc, Ellipse, Rectangle, Polygon/Polyline, Text, Line, Rotate, Dimension-Bent,*** and ***Dimension - Curved.*** There is a also an ***X-Y readout*** in the select status bar on the left side that displays page coordinates as the cursor is moved.

There is a picture of a sheet of paper in the center of the paper. The box that is drawn inside the sheet is offset from the edges of the sheet by the margin values set in the ***Project | Page Layout*** settings. This interior box is for reference purposes only and, like the sheet outline, is not printed. The sheet is initially set to the size and orientation used by the ***default printer***. The default printer is set in the ***Printers*** section of the Windows ***Control Panel***.

This window also includes *rulers* on the top and left sides that aid in understanding the physical dimensions of the drawing.

There are four different basic data types in *Layout* that are referenced by the select status buttons.

Data - Data refers to what you see in the COGO/DTM windows. You can place the entire project (Full View), just what you see at whatever zoom you're currently using in the COGO window (Screen View), or use one of the View Areas. (View Areas haven't been explained yet - see the reference manual for more information).

Components - Examples of components are title blocks, certifications, north arrows and scales. Components can be placed in libraries for future use. A sample library named PCS.GLB is included with your software.

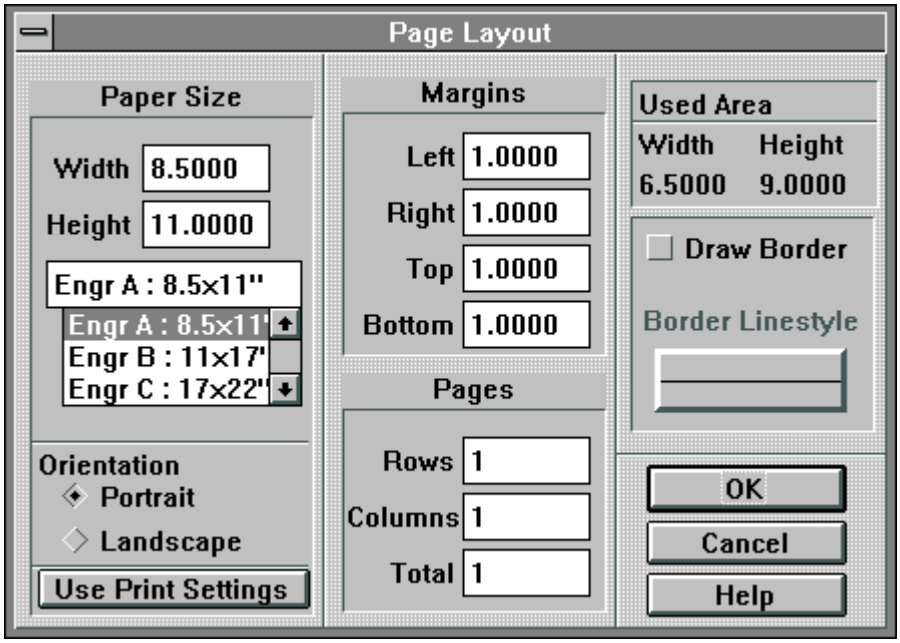
Texts - Text is… text.

Graphics - Examples of graphics are circles, lines, arcs, etc. These are primitive drawing objects. *Components* are comprised of a collection of graphics.

Setting the sheet size

As mentioned, the sheet size that is initially displayed is set to your ***default printer*** sheet values.

1) Select ***Page Layout*** from the ***Project*** menu. This dialog allows you to change the sheet size, margins and sheet orientation. It also allows you to specify that you are creating more than one page, either for multiple views or for one view that spans multiple pages. It also allows creating an automatic border at the margins and specifying a specific line type for the border.



Page Layout Dialog

2) Select ***Arch D*** for the ***Paper Size***. Select ***Landscape*** for the ***Orientation.***
3) Select ***OK*** to close the dialog. If these settings are different from what you originally had, the paper outline in the Layout Window will change to reflect the new settings.

Placing the data on the sheet

Next, you'll want to place your COGO drawing on the sheet. The COGO data doesn't look "finished" yet, but it doesn't matter. After you place the COGO drawing in Layout, any changes you make in COGO will be reflected in Layout.

1) Select ***Place Full View*** from the ***Data*** menu. The cursor will change to an X-ed out box with a small set of crosshairs in the upper left. The crosshairs represent the upper left corner of the COGO view data.
2) Move the cursor so that the crosshairs are somewhere in the upper left area of the sheet. Click with the left button. The COGO data will appear on the sheet.

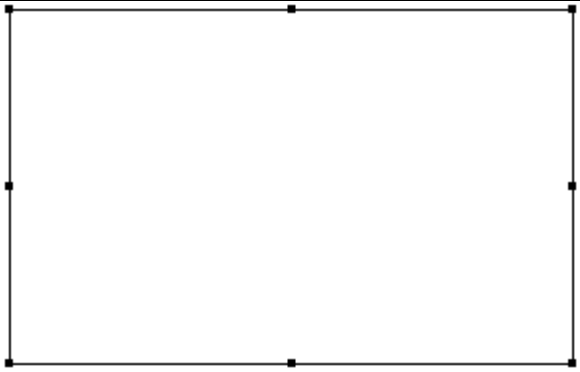
You probably aren't going to be satisfied with where the data has been placed. No problem - you can move and rotate the data to any position and orientation you desire. It's initial orientation is the same as that of COGO. To move or rotate the data, it must first be selected. However, there is a small problem - the data is not selectable yet. If you look at the select status bar, you'll notice that the ***Data*** number has been grayed (not selectable) while all the other data types are black (selectable). This is the default in Layout. The reason for this is that it is too easy to inadvertently select and move the data view while operating on other items when *Data* defaults to selectable.

Moving objects in Layout

1) Left-click on the *Data* number to toggle it to black.
2) Select the data view by either single-clicking inside it or dragging a selection box across it with the left button.

Once selected, an outline box will be drawn around the data view. The box has ***nibs*** on it - little boxes on the corners and on centers of each of the lines. You can click and drag the nibs to change the size of the outline box. The only purpose in doing so is if you wish to *clip* the drawing. *Clipping* means to cut off a portion. If the outline box is shrunk so that only a portion of the drawing is shown, only that portion will print.

We're not interested in clipping the drawing right now. We want to move it so that it has a good position on the sheet. To move the drawing,



A box with nibs

3) Left-click inside the outline box. **Keep the button depressed and don't move the mouse until the data disappears and all that is left is the outline box.**
4) Keep the mouse button depressed and drag the outline box to whatever position suits you.

*This **move technique** - click, hold and drag - is used for moving anything inside the Layout Window. If your mouse is the type that rolls around (as opposed to a stationary or trackball mouse), you must be careful not to move the mouse during the slight delay between the initial click and the point where "move mode" has been entered. If the mouse moves too much too soon, the program will think that you are trying to select something instead of move something.*

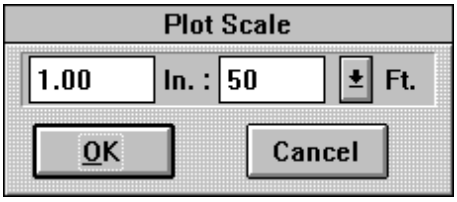
5) Finally, return the data view to its original unselectable state by clicking on the ***C*** button in the select status bar (far right side). This will also clear all selections (just like in COGO).

Add a border

Now that the data is on the sheet, let's dress up the sheet a little bit. The first thing that we can do is add a border.

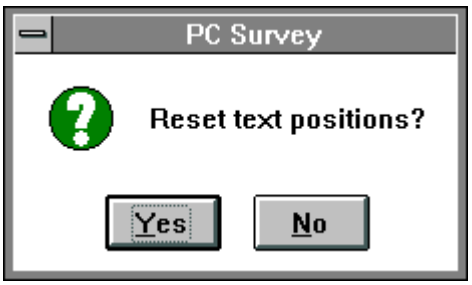
1) Select the ***Page Layout*** command again in the Layout ***Project*** menu.
2) Check ***Draw Border***.
3) Think it should be thicker? Click on the button below ***Border Linestyle***. Several line styles are displayed. Select the solid line style and enter **0.10** in the ***Line Width*** box to provide a 1/10 inch thick border.
4) Select ***OK*** to return to the ***Page Layout*** dialog box and then select the ***OK*** button to leave the ***Page Layout*** dialog. You now have a border.

Changing the scale



Sometimes it is necessary to alter the scale of the drawing to get a better fit on the page. This can be done from either the COGO or Layout windows. In COGO, the scale is set in the ***Options*** dialog. In Layout, to change the scale, you must first select the view that is to be affected.

1) Select the view again (remember to enable selection by toggling the ***Data*** number).
2) Select ***Set Scale*** from the ***Data*** menu. Reduce/increase the scale value to increase/reduce the drawing size.
3) Selecting ***OK*** will result in two messages. The first will ask if the COGO scale should be updated - select ***Yes***.
4) The second will ask if you want to reset the text positions - select ***Yes*** again.



When the scale is altered, the text size remains the same. Text will therefore tend to be placed incorrectly after scale changes. The program will therefore automatically reposition the text at the new scale when you answer ***Yes*** to the second question.

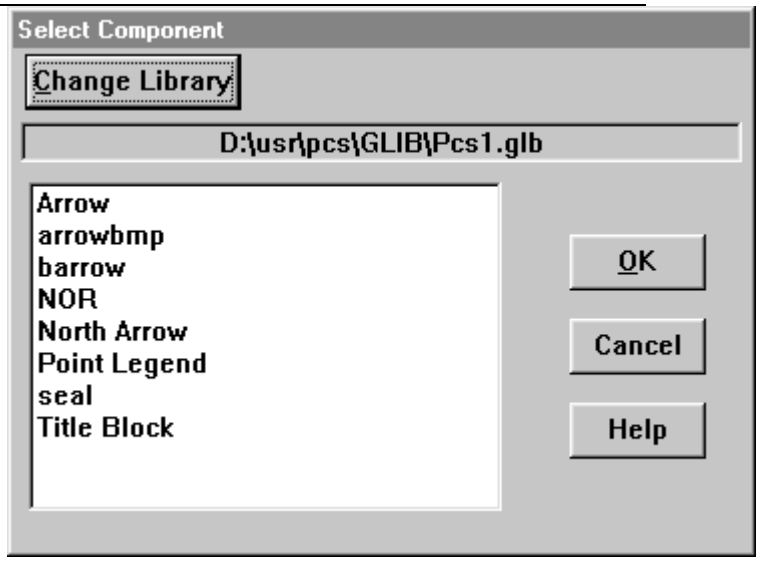
Adding a North Arrow

North Arrows are special objects in PCS. Any *component* can be a North Arrow which means that the surveyor can define the North Arrow to be anything he can draw.

Components are a user-definable collection of graphics such as title blocks and certifications, and are stored in component libraries. Creation of components will be discussed in a later section.

To place a North Arrow, one (and only one) data view must be selected. When a component is placed as a North Arrow, it is attached to the selected view so that if the view is rotated, the North Arrow is also rotated to maintain its alignment with the view.

There is a component in the example library provided with your program that can be used as a North Arrow.

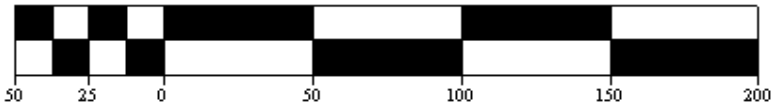


Place North Arrow dialog

1) Select the view once more. Remember to enable *Data* selection in the *select status bar* first (the number to the right of *Data* should be black, not gray).
2) Select ***Place North Arrow*** from the ***Data*** menu. A dialog similar to the one shown on the right will appear.
3) Select the component *Arrow* from the list.
4) Select ***OK***. An outline box will appear on the screen. The outline will move with the mouse.
5) Move it until it is about where you would like the North Arrow to be placed.
6) Left click to place the North Arrow. Like other Layout objects, you can move the North Arrow after it is placed.

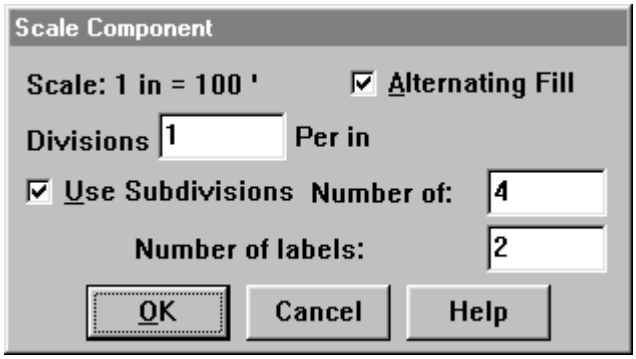
Creating a Scale Component

Another special object in Layout is the Scale Component. The Scale Component, like the North Arrow, is attached to a single selected data view. If the data view's scale is altered, its Scale Component (if it has one) is updated to reflect the change.



Example of a Scale Component

1) Select ***Create Scale Component*** from the ***Data*** menu. The current scale is shown at the top left.
2) Select ***Alternating Fill*** to generate a cross-patch type design. Leave the ***Divisions*** at 1/in.
3) Select ***Use Subdivisions*** and set the ***Number of*** to **4** and the ***Number of labels*** to **2**.
4) Select ***OK***. The cursor will change to a small picture of a scale.
5) Move the cursor to where you would like to the place the upper left corner of the scale and left-click.
6) A Scale Component will be created at that location. Once it is created you can select it and then either move (click, hold and drag) or stretch it (by dragging the nibs) to its final position and shape.



Create Scale Component dialog

The font used to draw the text can be changed with the ***Set Font*** - ***Other*** command in the ***Edit*** menu. Just select the Scale Component first. The dialog box is the same as the one we used when we set the font for the road name in Survey.

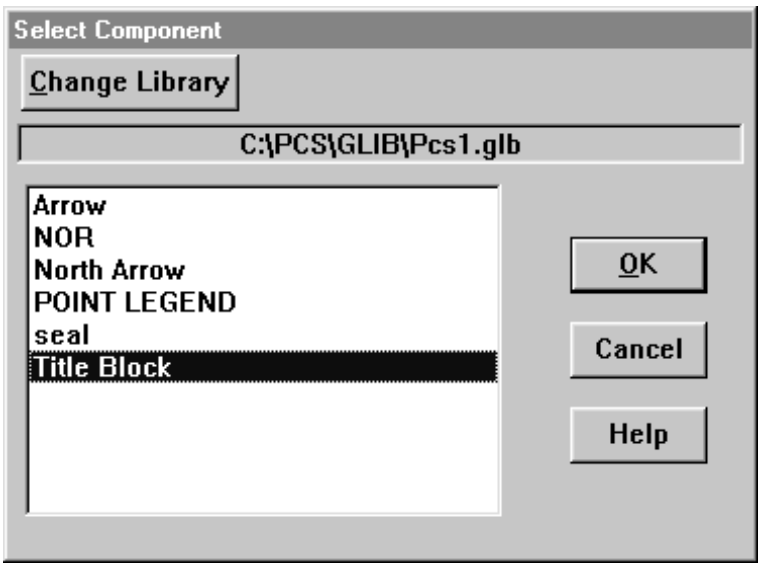
Creating a Component

You'll probably want to create your own title blocks and other components and store them in a library. To demonstrate how this is done, we'll take a sample title block and modify it. We'll use several of the component functions in the process so that you'll have a better understanding of how components can be quickly created, modified and used.

Get the Title Block

To get a component from a library,

1) Select ***Get*** from the ***Components*** menu. The default library should be C**:\pcs\pcs1.glb** if you installed **PC Survey** to the default directory in the installation program.



(If not, click on the ***Change Library*** button. The dialog that will appear is similar to the dialog used for selecting projects. Set the directory to where **PC Survey** was installed and set the ***Filename*** to **pcs1.glb**. Select ***OK*** to finish.)

You should see a list of components, one of which should be **Title Block**.

2) Select **Title Block** from the list.
3) Select ***OK***. You will now get a pink box that will move as you move the mouse. The box represents the outline of the component to be placed.
4) Move the pink box until it is in the lower right corner of the page and left-click. You should now see a title block.

Smash the Title Block

Zoom in on the title block. Notice that it is a title block used by a surveyor in Georgia. For your purposes, you will need to at least change the name and location (you may want to change more than that). To do this, we will first need to break the component down into its constituent parts, a process called "smashing". To do this,

1) Select the title block.
2) Select ***Smash Component*** from the ***Components*** menu by selecting ***Component*** from the ***View*** drop down menu, and then going to layout under the ***View*** drop down menu there, and selecting ***Smash***.

If you now click inside the title block, it will select one of the pieces of the title block rather than the whole thing. The various pieces of the title block can now be modified.

Alter the Text

1) First, change the name of the surveyor. To edit text, we will need to go into a text mode similar to the one we used in COGO. There are two ways to edit text. In this case, do the following,
2) Select the **A** button in the toolbar and notice that the cursor changes to an I-beam again.
3) Move the cursor so that it right after **Doe** and in front of the ',.
4) Left-click. A bar will be placed to show the current text insertion point.
5) Press the Backspace key until the name has been erased
6) Type in your name.
7) When you are done, press the <Esc> button or select the **Arrow** button (top button in the toolbar). This will exit text mode.

Next we will need to change the name of the city and state.

8) Clear all selections by clicking on the **C** button in the select status bar.
9) Select the city text (which also selects the address).
10) Select ***Edit Text*** from the ***Edit*** menu. This time it will pop up a dialog box showing the text. This box works like other edit boxes.
11) Delete any text you want to get rid of and add any new text.
12) Select ***OK*** when you are done.

Using these methods, change the text to be anything that you want.

Creating a new component

Once a desired component has been drawn, the component can be created in the following manner:

1) Draw a selection box around all of the pieces that need to be in the title block. Make sure that everything is selected that you want in the title block and nothing is selected that will not be a part of it.
2) Select ***Create*** from the ***Components*** menu.
3) Provide a name for the component (**Title**, for example)**.**
4) Select ***OK***.

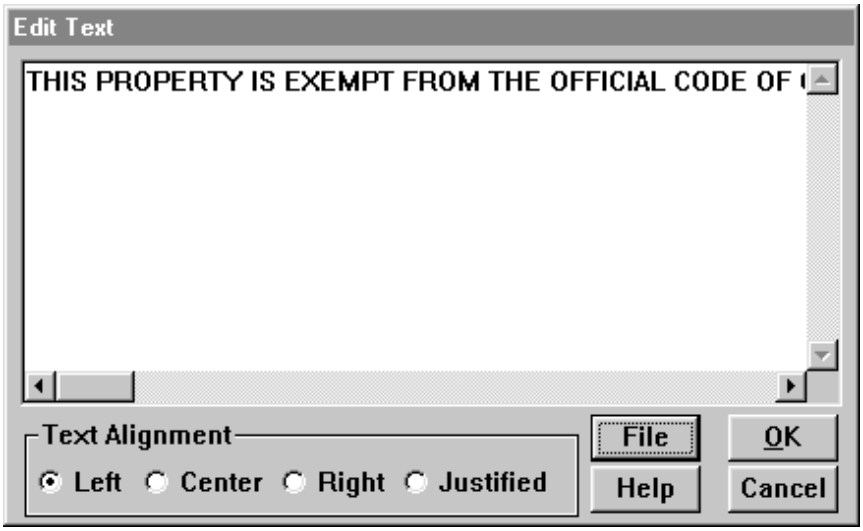
At this point, the component exists in the project. But it has not yet been put into a library where it can recalled for later use. The program will now ask if you would like to place your component in a library with the dialog shown to the right.

5) Select yes. You will now be prompted for the library in which to put the new component. The default library will be displayed (C:\PCS\GLIB\PCS1.GLB). You can change this if you want with the ***Change Library*** button, but let's leave it as it is.
6) Select ***OK***. The new component will now be inserted in the library.

Add a Certification

Next, let's add a certification to this plat and use the text already stored in a file on the computer.

1) Select ***Block Text*** in the ***Draw*** menu.
2) Press the ***File*** button. Make sure that the directory is **c:\pcs** or wherever the job was put. There should be a file named exempt.txt.
3) Select **exempt.txt** from the list and then click on ***OK***. When we get back to the ***Edit Text*** dialog box, the text from the file is now in the edit box as shown in the picture to the right.
4) Select ***OK***. The dialog will close and there will be a box cursor on the screen.



5) Put the cursor at the upper left of where you would like to place the text and left-click. The text will appear within a bounding box that can be stretched and moved when the text is selected.

Adding graphic primitives

The certification would look a lot better with a box around it.

1) Select the box icon from the tool buttons or select ***Box*** from the ***Draw*** menu. The cursor will change to a cross-hairs cursor to remind you that you are in a drawing mode.

2) Move the cursor to one of the corners for the new box.
3) Click the left button and move the mouse to the opposite corner. A pink box will show where the box is being placed.
4) Left-click one more time - the pink box will become black to show the box that was created. The cursor is still a cross-hairs to show that you can now create another box if you want to.

Selection Cursor

Click on the ***Selection Cursor*** in the toolbar to return to editing/selection mode! You can also press the <***Esc***> key.

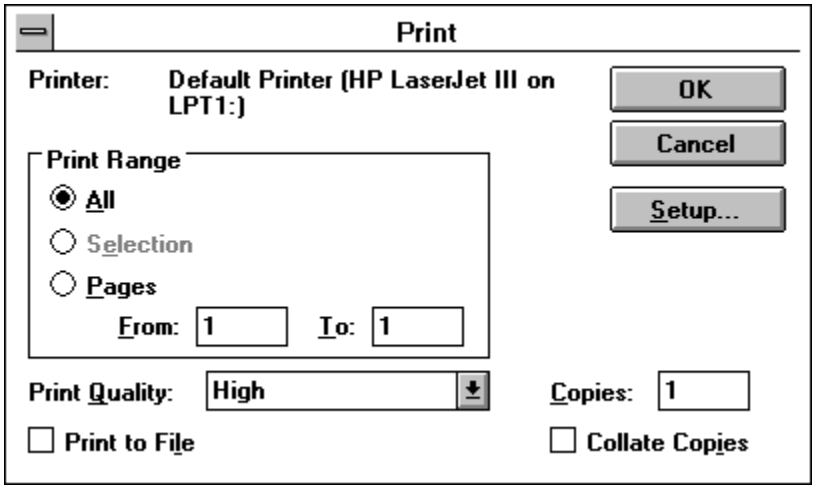
If you want to change the line type, select the box (left-click on it or left-click and drag across it). Select ***Line Style*** from the ***Edit*** menu. Pick a linetype from the types displayed and select ***OK***.

Perhaps you don't like its placement? Use the *move technique* to change its placement.

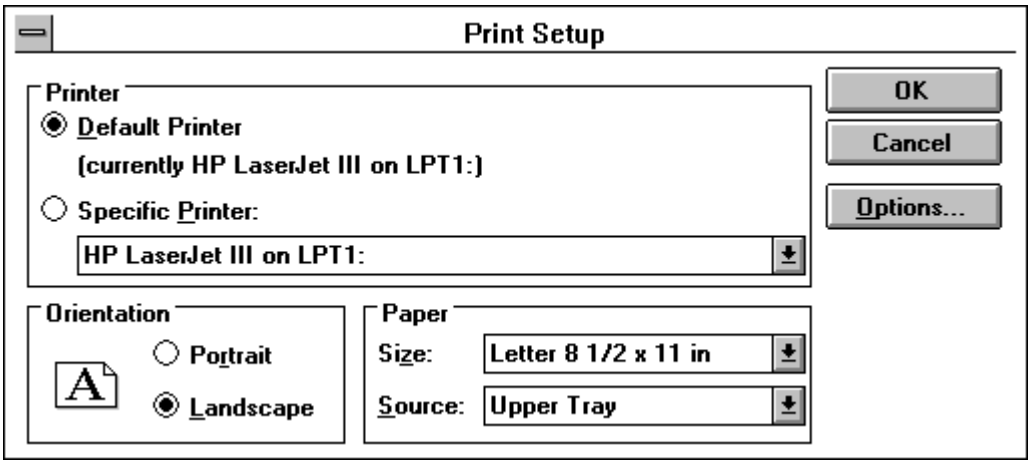
Make it smaller? Make it larger? Select the box. Notice the nibs that appear at the corners and centers of the lines. When the cursor is on top of one of the nibs, it will turn into a crosshairs cursor. Click and drag one of the nibs to alter the box's size.

Let's print it out

Time to print out what we have created. If you still only have a demo version, you will need to get an official version before you can print. If you have an official version, select ***Print*** from the ***Project*** menu.



The most important thing here is to make sure that the printer is correct. If the printer listed at the top of this dialog box is not the one that you want to use, click on the ***Setup*** button. This will bring up a dialog similar to the following:



Click on ***Specific Printer*** to select a printer other than the default. Then click on the down arrow button to show all currently installed printers. If the printer you need is in this list, click on the printer and then click ***OK***. If the printer you need is not in this list, it will need to be installed. Consult the Windows reference manuals for information on installing printer drivers. If you do not have the printer driver that you need, you will need to contact the printer company to find out if they have a Windows' driver and get a copy of it if they do.

When you have your printer set up, click ***OK*** in the ***Print*** dialog and the job will be printed out, assuming of course that the printer is turned on and is ready to print. Wow. You have just completed your first project with **PC Survey**. You can go back to COGO and alter the arrangement of text at any time - the Layout sheet will be updated automatically. You might want to try turning off the points (done quickly through the ***Visibility*** command in the COGO ***View*** menu) rearranging or deleting the texts to improve the appearance of your plot. You can also play with the linetypes (make sure targeted lines are selected first) and point symbols (***Edit Individually*** or ***Modify Group*** in the ***Points*** menu of COGO). Experiment. Consult the reference manual for more information or call technical support for suggestions or help.

Epilogue

This tutorial has hopefully successfully introduced you to the basic elements of PC Survey. You should now have a pretty good feel for how the system works. The next step is to read through the reference manual for more ideas on what can be done. There are many functions that we have not discussed (Leader Lines, Tables, Auto Draw, User-defined linestyles, etc.) in this tutorial, but they are thoroughly documented in the reference manual. We hope that this program will enhance your productivity by reducing the amount of time necessary to generate your drawings and maintain your project data.