

# **CogoCAD 2.5**

## **Reference Guide**

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# Section 1 - Getting Started with CogoCAD

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CogoCAD is a versatile software program designed to be used by Surveyors and GPS/GIS professionals for managing data and generating maps. CogoCAD will work equally well with Total Station survey data, GPS data, GIS data and traditional Traverse data.

Primarily, CogoCAD provides an interface to survey data collectors, Coordinate Geometry (COGO) functions, data adjustment and traverse functions. CogoCAD is compatible with CMT's Surveyor's Assistant, PC-GPS Mapping software and Contour/Volume software. Other data collectors supported include TDS, Lietz/SDR, C&G, Maptech, Pentax SC-5 and others. CogoCAD supports the following input formats along with the standard COGO format (\*.cog): SA3 files (\*.psa), SA 2.2 files (\*.fld), SA 2.0 files (\*.hvd), PC-GPS Feature files (\*.ftr), TDS-500 files (\*.cr5), ASCII files and SDR files.

COGO functions range from simple Translation and Intersection routines to complex Road Design and curve generation. These functions are presented in an easy-to-use Window environment that also includes a comprehensive On-Line Manual and context-sensitive help functions.

## 1.1 Hardware and Software Requirements

To operate CogoCAD you will need the following:

- a) IBM PC or compatible with at least a 486 DX/66 processor
- b) Microsoft Windows 95 or newer
- c) A minimum of 8 Megabytes of RAM

**Please Note:** The minimum requirement for use of CogoCAD is 8MB of RAM. However, with additional RAM you will see an increase in the processing speed, particularly if you have several Jobs open.

- d) Mouse (keyboard functions are available but, as with any Windows application, a mouse is recommended.)
- e) For stakeout, station offset and other printed reports, CogoCAD will call Windows NOTEPAD if the print file is between 32K and 50K. CogoCAD will call WORDPAD if the print file is larger than 50K. Otherwise, the print file will be displayed in the Print Preview dialog box.

## 1.2 Installing CogoCAD on your PC under Windows

To install CogoCAD on your PC, follow these steps:

1. Insert the CD-ROM with CogoCAD software into the CD-ROM drive (this is the D: drive on most PC's).
2. The installation should start automatically. If it does not, choose: Start/Run and type D:\SETUP.EXE (or whatever the drive letter of your CD-ROM drive) then click the OK button.
3. Another dialog box will be displayed. Click on the Continue button and follow the prompts provided by the Setup program. The Setup will automatically install CogoCAD on your hard disk and create a program group and icon in Windows. The default program group is entitled "CogoCAD 2.x". The total amount of disk space occupied by CogoCAD when installed is approximately 8 Megabytes.
4. Reset your PC to insure that CogoCAD has been properly installed.

## 1.3 Starting CogoCAD from Windows

After CogoCAD has been installed, CogoCAD is ready to use. In Windows, locate the program group which contains the CogoCAD icon:



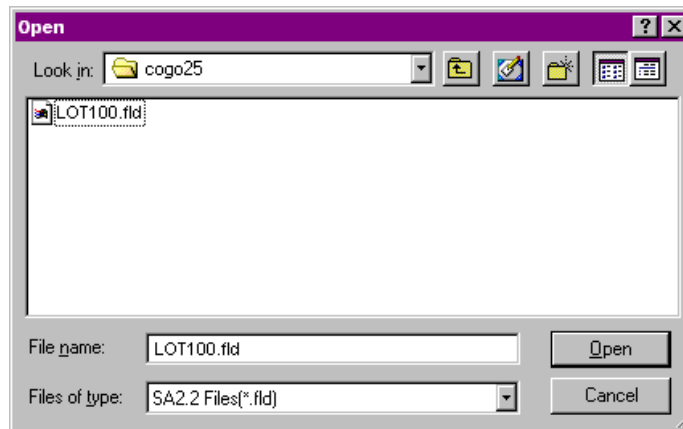
Double click your mouse on the CogoCAD icon. Immediately, CogoCAD will be executed and the CogoCAD introductory screen will be displayed.

## 1.4 Tutorial for CogoCAD

This tutorial is designed to quickly familiarize you with some of the important aspects of the CogoCAD software. The goal is for you to begin using the software as soon as possible. This tutorial highlights the essential functions of opening and viewing/editing your data, but does not cover all the functionality provided by CogoCAD. For additional information, please refer to the other sections of this manual as well as the Online Manual found within CogoCAD.

### 1.4.1 Lesson 1 - Opening a file

Open the tutorial file supplied with CogoCAD. This file is called lot100.fld. This is a sample file that illustrates what data might look like when collected with the Surveyor's Assistant Field software or other Surveying field software. To open the file, select File from the menu options found at the top of the CogoCAD window. Next, choose Open from the File pull-down menu. The following dialog will be displayed:

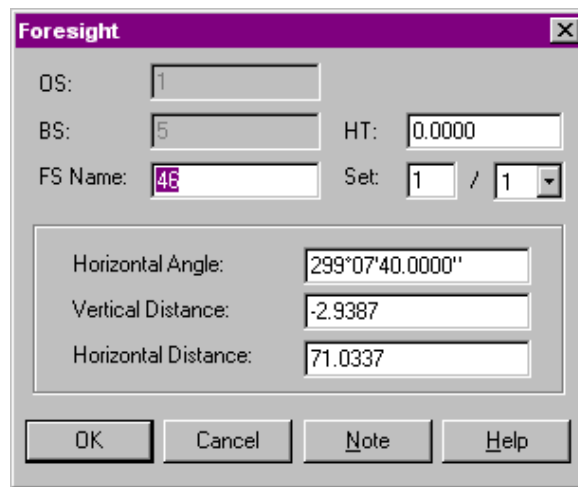


Make sure the File Type is set to be: SA 2.2 Files (\*.fld) files (this is the default setting). If the file type is not set correctly, then click on the pull-down arrow to the right of the "Files of type" box. Choose: SA 2.2 Files (\*.fld) files.

The default folder is the cogo25 folder. This is the folder that contains the lot100.fld file. If another folder is currently selected, click on the pull-down arrow next to the "Look in:" box and choose the cogo25 folder.

In the cogo25 folder, select the file: "lot 100.fld" by clicking on it once and then clicking OK. The file may also be selected by double-clicking on it. The file will be opened in a new CogoCAD window and will look like the following:





This window allows the point name, distance and angle information to be modified. Data set information and target/instrument height can also be edited. Type in any changes and click OK to save your changes.

Entire point records may be added, deleted or edited using the above approach. However, you should use care when editing raw data.

For more information about the Raw Data View, please see section 2.2.3.

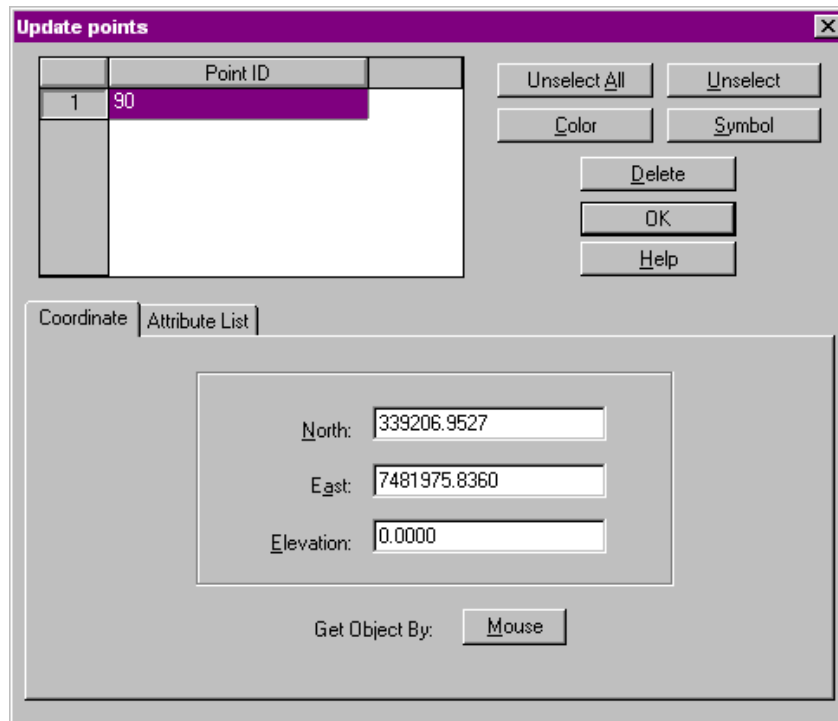
### 1.4.3 Lesson 3 - Adding Points to your Map

There are several ways of adding points or figures to your map. The most common methods include heads-up-digitizing (HUD), COGO functions or importing data. In this lesson, we will focus on digitizing new points into your map.

Choose Map/Add Point by Mouse click. Upon choosing this option, you will be prompted to select the Topic in which the new data will be inserted. The Topic name chosen here corresponds to the Code Name used in the field. For our file, let's choose the topic: 'Edge of Road'. Click on the pull-down arrow to the right of the topic name box to see a listing of available topics. Choose the Edge of Road topic from this list and then click OK. After clicking OK, you will notice that your mouse pointer has turned into a crosshair.

Now you are ready to start digitizing. With the left mouse button, click in the location of the new desired point.

Click three times to add three points in any position you wish. When you are finished, you may use the right mouse button to end the digitizing session. After ending the digitizing session, you can view the coordinates of the points you just created and also assign a value to the attribute "Description". To do so, simply double-click on one of the points. You will see the "Update Points" dialog pop up:



Click on the coordinate tab (shown) to see the coordinates of the point. Click on the Attribute List tab to enter the Value for the Attribute “Description”. After clicking on the Attribute List tab, you will see the list of Attributes and the associated Values. To assign a value, click on the pull-down arrow to the right of the Value box. This will show a listing of available Values. Pick one of these from the list or type in your own value by using the keyboard. For the points we just added, let’s assign these values to be “Edge of Road”. This will help to further identify these points because the Code Description matches the code name (or topic name).

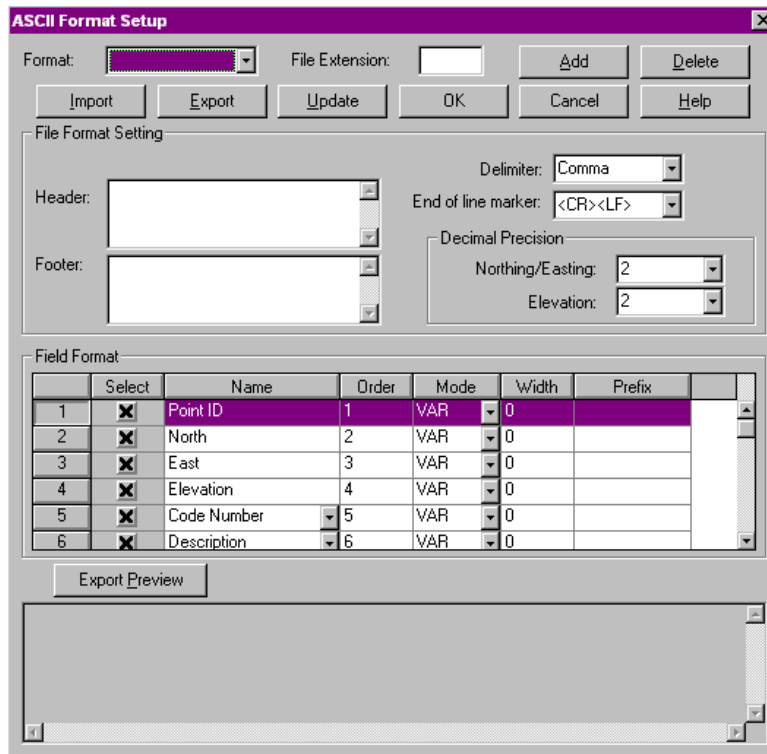
For more information about the update dialog or adding data, please see sections 4.6 and 4.7.

### 1.4.4 Lesson 4 – Importing Coordinates into your Job

The importation of coordinates is one way of building a map. Let’s say you are handed a list of coordinates that need to be entered into a CAD system. Also some new data will need to be added based on these coordinates using coordinate geometry (COGO). The import function can be used to bring the list of coordinates into your CogoCAD job.

**Please note:** ASCII format must match the data to be imported.

Let us assume you have been handed a list of coordinates in a text file. The goal is to bring these coordinates into our existing job: lot100.fld. To bring these coordinates into CogoCAD, you will need to import them using the ASCII Import function. First, we must set up the ASCII Import, so CogoCAD will know what to expect from the imported data. To set up the import, choose Utility from the menu options, and then choose ASCII from the pull-down list. Finally, choose Setup from the different sub-topics listed under the ASCII option. You will see the ASCII setup dialog displayed:



The first step is to define the format and choose a file extension. Since we will be importing point numbers, coordinates, code numbers and descriptions, let's type in the name "PNEZCD" in the format box. We will also need to decide on a file extension. Let's choose "TXT" as the file extension to form a simple \*.txt file when we are done. Type "txt" in the file extension box. Click <OK> when complete.

The "Header" and "Footer" sections are used in case there is an extra line in our text file with header or footer information. We will not have any of these in our file, so we will leave it blank. The delimiter used denotes how the information will be separated in our file. Our coordinates will be separated by commas, so we will leave the delimiter set to "comma". Also, the end of line marker will be left alone to show <CR> and <LF> for carriage return and line feed.

**Please note:** When comma is set to be the delimiter, this means that there is only a comma as the separator. There is no space before or after the comma.

The decimal precision will be used to define how many decimal digits to use when exporting our coordinates for both Northing/Easting and elevation. When importing data, the decimal precision setting has no effect. The imported data will be displayed with the number of decimal digits specified in the Map/Setup screen. (See Section 4.2.)

The Field Format section is used to define the order in which the information is listed in our file. This section is also used to define the order in which we want our information exported. We can also "Turn on" and "turn off" those elements which we do not want to include during import or export.

Our data set will need to follow the format we chose in the ASCII setup. Therefore, we will need to create a text file that looks like the following:

```
new1,339209.4785,7481976.6648,0.00,0,EDGE OF ROAD
new2,339207.4855,7481976.6648,0.00,0,EDGE OF ROAD
new3,339205.6502,7481976.6448,0.00,0,EDGE OF ROAD
```

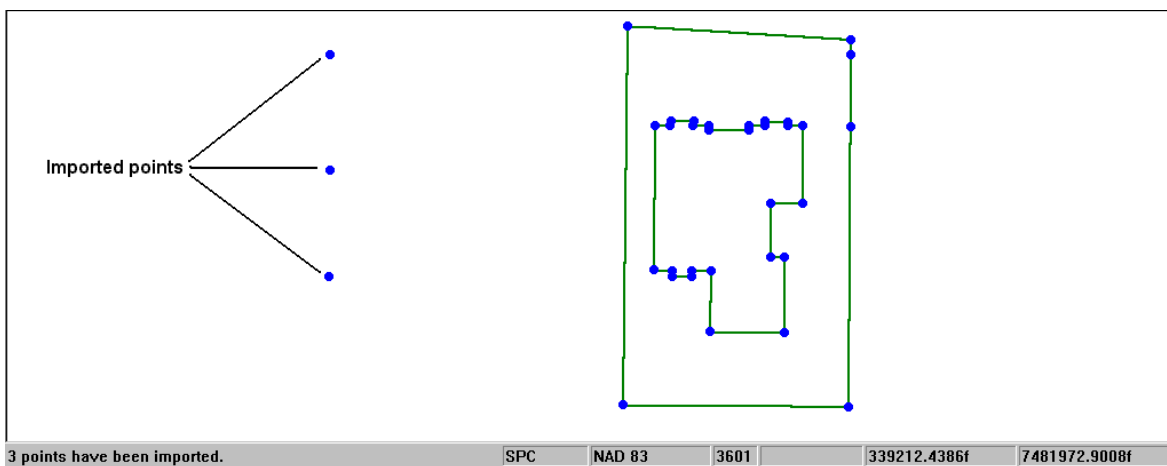
You can create this text file using the Notepad or WordPad (or any other text editing software). Type in the coordinates exactly as you see them above and save the file as "test.txt" in the Cogo25 folder. Remember to add a carriage return at the end of the last line (otherwise that point will not get imported).

**Please note:** Before importing any data into CogoCAD, the Coordinate System, Datum and Units of Measurement must be set to match the data to be imported.

For our data set, we will want to make sure the Coordinate System is set to be: SPC. The Datum should be set to: NAD 83, Oregon, N, Zone 3601 and the units will be: Int'l Feet. We will set the entry measurement to "Grid Distance" and the "Apply Sea Level Correction" option will be checked. For more information about Coordinate Systems and Datums, please refer to the Online Manual.

You are now ready to import the test.txt file into CogoCAD.

Click on the "Import" button from the ASCII setup dialog or choose Utilities from the menu options and then choose ASCII from the pull-down list and choose Import from the sub-options. This will bring up the Open dialog box. The file type will automatically be set to "TXT" based on what we chose earlier for the ASCII setup. Change to the Cogo25 folder and find the file named "test.txt". To import this file, double-click on it or click on it once and choose <OK>. You will get a message from CogoCAD that three points have been imported. Click OK on the message and you will see the three points on your screen:



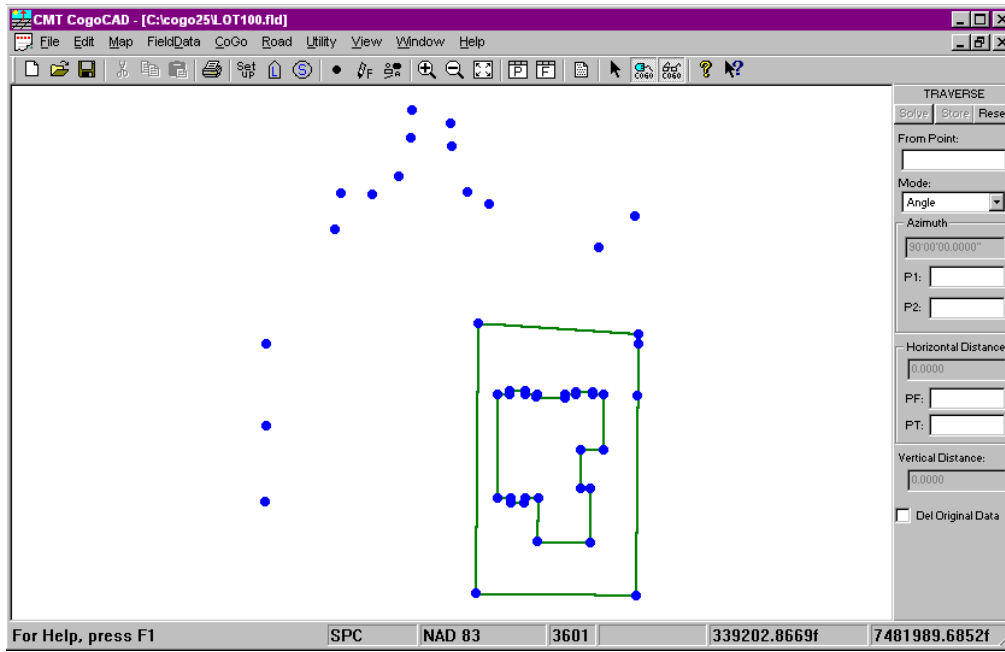
Now that the points have been imported into CogoCAD, they will be treated like any other points. You can double-click on them to bring up the Update Points dialog box where you can update the Point ID or make changes to the Topic name and Values.

### 1.4.5 Lesson 5 – Coordinate Geometry (COGO)

In this lesson, we will learn about one of the many COGO functions offered in CogoCAD. We will be looking specifically at the traverse function in this lesson. The Traverse function is used to add additional points based on an existing point by entering bearing and distance information to the new location and then solving to calculate the coordinates of the new point.

In this lesson, our assignment is to calculate the coordinates of a new point that is 115°32'11.82" azimuth and 10.58 Feet away from the PointID: new3.

To start, let's call up the Cogo/Traverse function. Choose Cogo from the menu options and then choose Traverse from the pull-down list. You will see the Traverse data input dialog box pop up on the side of your CogoCAD screen and will look like the following:



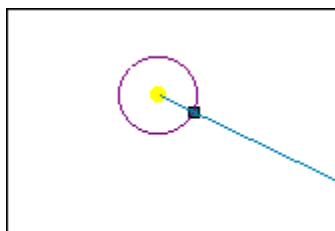
The first step is to click on the point that we want to traverse from. This will be one of the new points that we had imported in Lesson 4. The Point ID is: new3. Upon clicking on this point, you will see the Point ID automatically entered in the field “From Point”. You can also manually type the name of the Point ID into this field.

After selecting the “From Point” you will see the “Azimuth” field become active. For this lesson, the mode will be set to “Angle” to denote that an azimuth will be used for the bearing information in our traverse. A line will be displayed that starts from the beginning point and extends at a default azimuth of 90° from the beginning point. As you move your mouse around the screen, you will see that the azimuth changes according to the position of your cursor. You can click on a location on the map to choose the azimuth or it can be manually typed in using the keyboard. A third option is available for choosing the azimuth that involves calculation of the azimuth angle between two points. This option will not be discussed in this lesson and may be read about in the Cogo section of this manual or in the Online Manual.

We will want to manually type in our desired azimuth. In the “Azimuth” field, use the keyboard to type in the following azimuth: 115°32’11.82”.

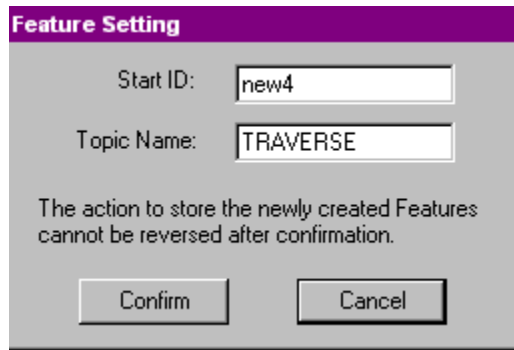
Next, click on the field “Horizontal Distance” to enter the distance away from the starting position. You may use either the mouse or the keyboard to enter this information. For this lesson, we will be use the keyboard. Type in: 10.58.

Now, we are ready to solve the calculation to determine the location of our new point. At the top of the COGO view, click the “Solve” button to see the position of the new point. After pressing the solve button, you should see a small square representing the position of the calculated point:



To accept this solution and store this as a point feature in CogoCAD, click on the “Store” button. The Feature Setting dialog will be displayed to confirm the ID of the new point as well as the Topic Name under which it will be stored:



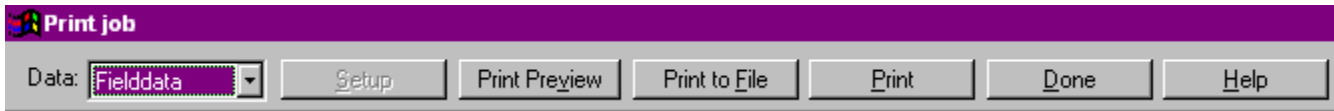


Click on the “Confirm” button to accept these names and to bring up the Update Points dialog where the coordinates may be obtained and Attribute and Value information may be maintained.

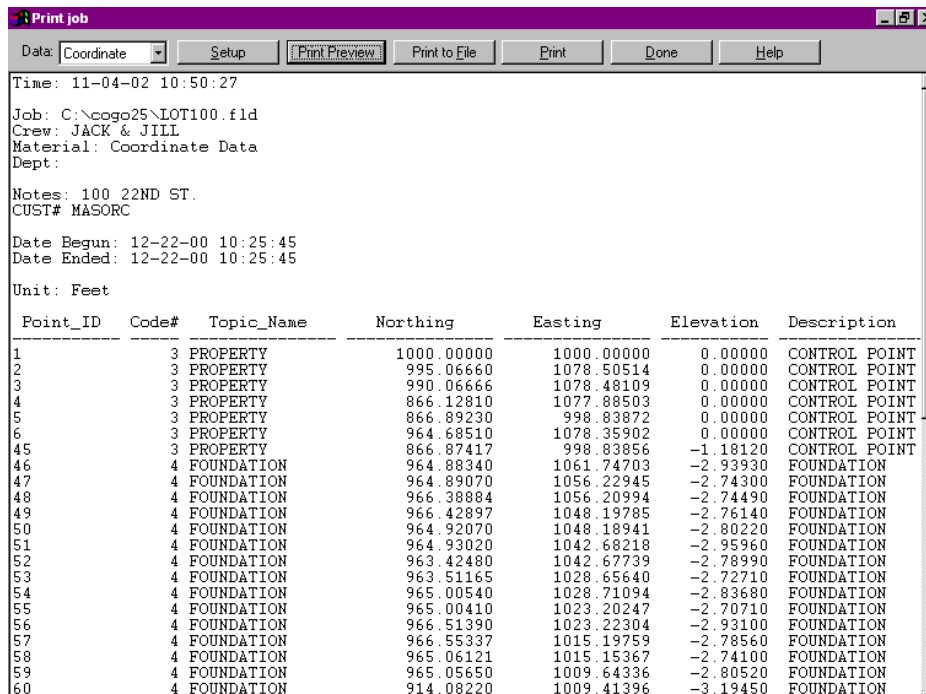
### 1.4.6 Lesson 6 – Viewing and printing coordinates

Once you have obtained all of your coordinates and have them in your map, you can use the Print Job function to view a printout of your data, including: Traverse, FieldData, Stakeout, Coordinate, Figure and Note information. This is a very useful tool for obtaining a paper printout of this type of information. You can also “Print to file” to get a digital copy of the desired Job information. CogoCAD lets you see what you are going to print out before you print it. Just choose the option and then hit the Preview button to see what it will look like.

For our example, let’s say we need the coordinate data for our job. To do so, select File from the menu options and then select Print Job from the pull-down options. The Print Job window will be open and you will have the following selections to choose from at the top of the screen:



For the Data field, click on the pull-down menu and select the “Coordinate” option. Next, click on the Print Preview button to see a preview of the coordinates for our sample job. You will see the coordinates for the job along with some header information that looks like the following:

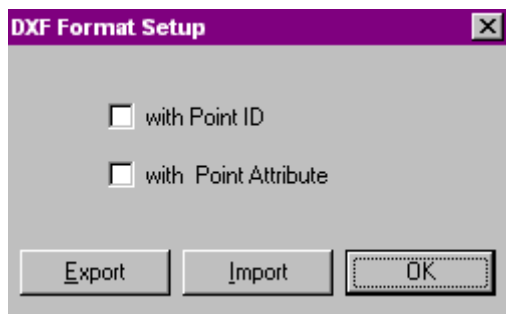


Once you have reviewed the information and are satisfied, you can either choose to print this information out on paper, you can choose to “Print to File” to get a digital copy of the data, or you can simply hit Done to close the window.

### 1.4.7 Lesson 7 – Exporting data to DXF

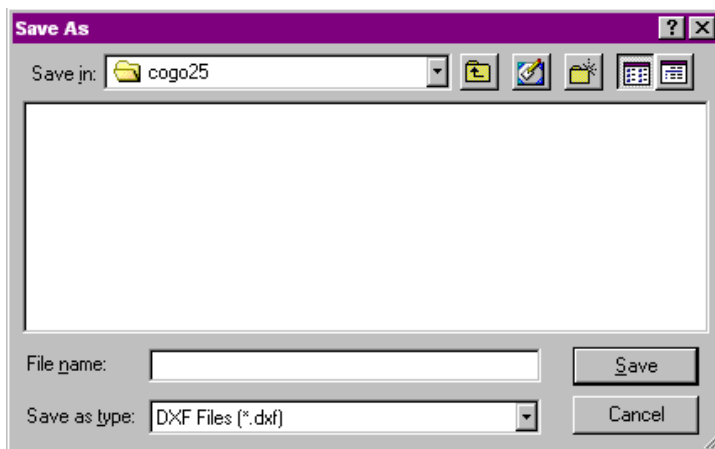
For our final lesson, we will export our data to a CAD system in the form of a DXF file. We have already imported coordinates from ASCII and also created a digital and paper printout of our coordinates. We have created new coordinates using the COGO functions and now we must update our CAD system by exporting to DXF format all of the new information.

To export to DXF, we must first set up the DXF export. Let’s choose Utility from the menu options at the top of the screen and then choose DXF from the pull-down list. Finally, we will choose Setup from the different sub-options listed under DXF. When we choose this option, the following dialog is displayed:



This dialog is used to choose whether or not we want to include the options “with Point ID” and “with Point Attribute” in our export to DXF format. For our example, we want to include both the Point ID and the Point Attribute in the export. Place a check mark in both of the boxes and click OK.

Now, we are ready to export to DXF file. Choose Utility from the menu options at the top of the screen and then choose DXF from the pull-down list. Finally, choose Export from the different sub-options listed under DXF (we could have also chosen the “Export” button in the Setup dialog to access this function). The following dialog is displayed:



To create the DXF file, type in the name of the DXF file in the box called File name. Click on the **Save** button to save this Job in DXF format.

## Section 2 – CogoCAD Fundamentals

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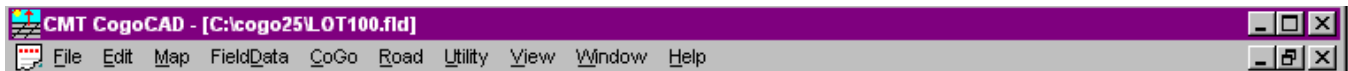
The basic concepts of working with CogoCAD menus and tools are presented in this chapter.

### 2.1 Working with CogoCAD Menus

The main CogoCAD window shows the Main Menu Bar, the Tool Bar and the Status Bar.

#### 2.1.1 Menu Bar

The Menu Bar is located across the top of the main CogoCAD window after a new or existing job has been opened. To see the complete menu bar, choose File/New.



The Menu Bar provides access to all of the active CogoCAD functions. A function can be activated by first clicking with the mouse on the menu option to pull down the function list, and then clicking once on the desired function.

**Please note:** In this manual the convention “Menu option/submenu option” will be used. For example, “File/New” means you should pull down the Menu option “File” and then click on “New”.

#### 2.1.2 Tool Bar

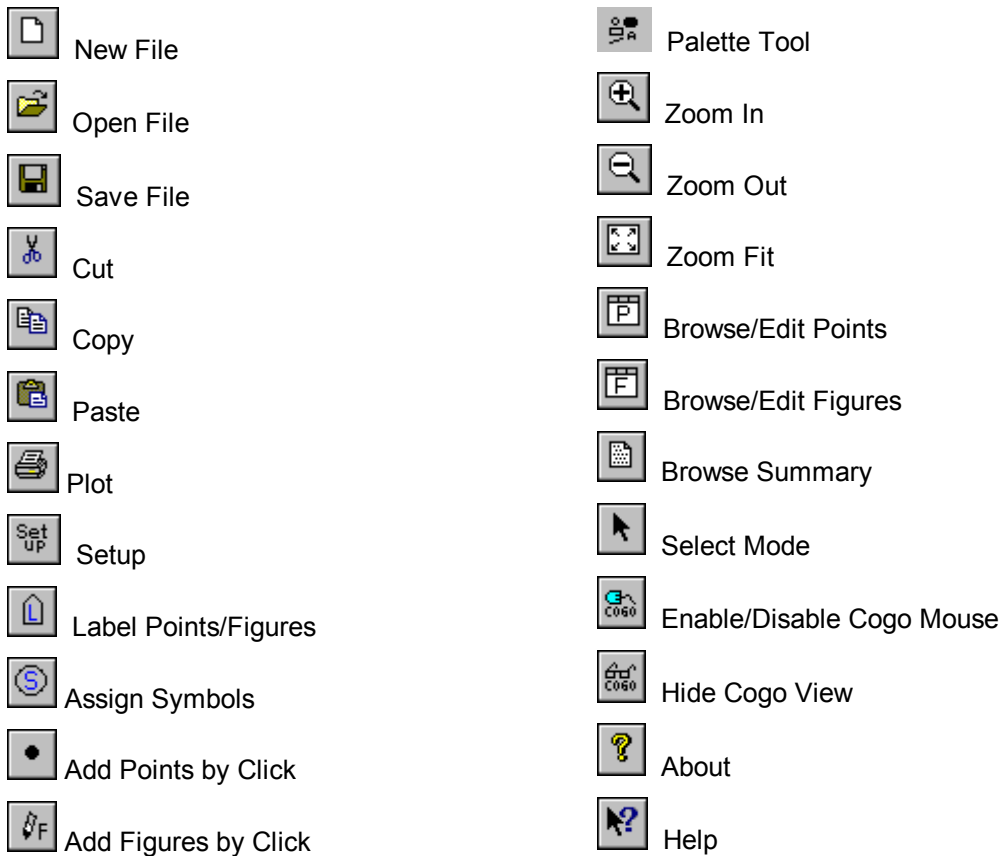
The Tool Bar is located directly below the Menu Bar.



It contains standard Windows button icons for quick access to file management and other often used options. Tool Bar functions can be activated by clicking the mouse once on an active icon. Buttons with inactive functions have icons that appear dull and gray. Simply click on an active button icon to access the associated CogoCAD function.

For example, to create a new file, you would click on the button with the “New File” icon. To open an existing file, you would click on the button with the icon for “Open File”.

A brief description of an icon’s function will be displayed next to the button when the mouse pointer is placed on the associated button. Following is a description of the functions:



### 2.1.3 Status Bar

The Status Bar is located along the bottom of the CogoCAD screen. Messages on the current status of CogoCAD will be displayed in this area. In particular, the progress of opening, saving, importing or exporting files will be represented in the Status bar. In addition, the current coordinate location of the mouse pointer in the Map will be displayed in the Status Bar.



## 2.2 CogoCAD View Modes

Data in your Job can be viewed and managed using several different “view modes”. Each of these modes is represented by a “view mode window” which is displayed along either the bottom or the side of the main survey window. The view modes available are: Survey View, Cogo View, Raw Data View and Traverse View. Traverse View is for working with Quick Traverse jobs only. These views are described below.

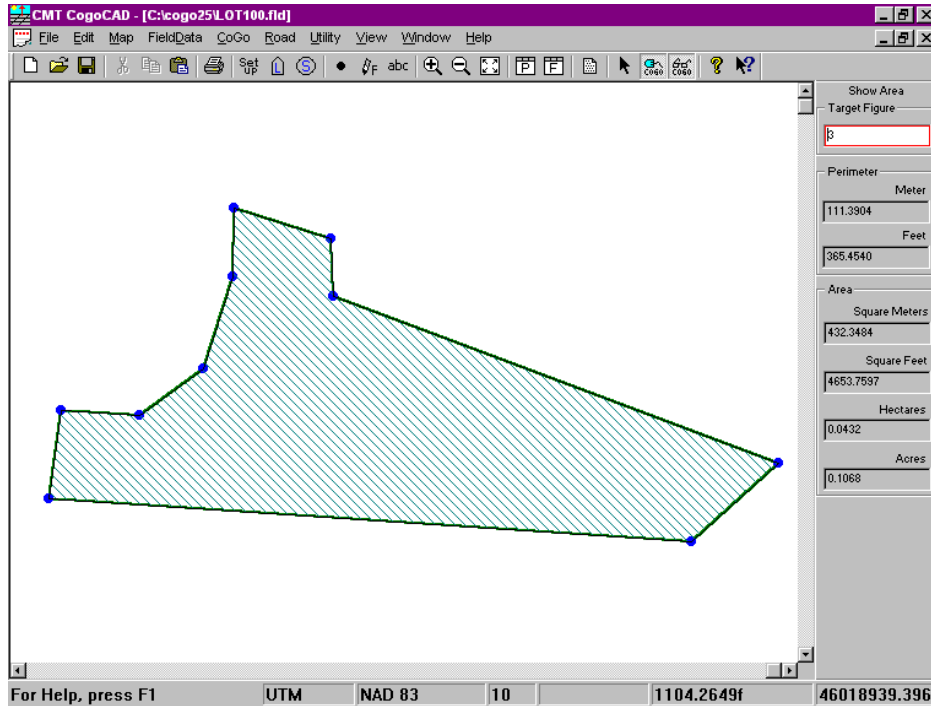
### 2.2.1 Survey View

The Survey View is the main CogoCAD window in which the graphical representation of your data is displayed. This view mode is always displayed.

### 2.2.2 Cogo View

The Cogo View is displayed along the right side of the main survey window. The Cogo View is used in conjunction with the functions under the Cogo menu. When a Cogo function is selected from the Cogo menu, the Cogo View is automatically displayed. Unique input fields and solutions are provided for each Cogo function.

An example of the Cogo View is illustrated for the Cogo Area calculation. The Survey View for this data is also shown.



The Cogo View can be toggled ON or OFF using the View/Cogo View menu option. The Cogo View icon can also toggle the Cogo View ON and OFF.

### 2.2.3 Raw Data View

The Raw Data View provides a spreadsheet listing of all of the raw data in your Job. This View is displayed along the bottom of the display. The Raw Data View is accessed by choosing Field Data/Raw Data. The Raw Data View will be blank if your Job does not contain raw measurement data (data taken from a Total Station for example). You can edit the data in the Raw Data View or enter Raw Data using the functions available on the side of the Raw Data View. Editing raw data is not encouraged.

	OS	BS/FS	Type	Set	Horizontal	Vertical Dist	Distance	HT	HI	Note	
Edit	4	1	47	SS	1/1	301°28'50.0000"	-2.7430	66.2904	0.0000	0.0000	
Add	5	1	48	SS	1/1	300°22'40.0000"	-2.7449	65.4925	0.0000	0.0000	
Delete	6	1	49	SS	1/1	304°21'30.0000"	-2.7614	58.7371	0.0000	0.0000	
Note	7	1	50	SS	1/1	305°33'10.0000"	-2.8022	59.6052	0.0000	0.0000	
Exit	8	1	51	SS	1/1	308°54'30.0000"	-2.9596	55.2418	0.0000	0.0000	
	9	1	52	SS	1/1	310°05'50.0000"	-2.7899	56.2059	0.0000	0.0000	

For Help, press F1      UTM      NAD 83      10      909.8061f      46018708.1325

- Edit**      Displays the "Foresight" or "Backsight" dialog window for editing of the current data record.
- Add**      Appends a record to the raw data view.
- Delete**      Deletes the selected data record.
- Note**      Adds a note to the selected data record. Note may be applied to the applicable foresight, backsight or station and may not exceed 127 characters in length. Records containing a "note" will show an "X" in the Note column.
- Exit**      Saves changes and exits the Raw Data View.

The Raw Data View can also be toggled ON and OFF using the Field Data/Raw Data menu option.

## 2.2.4 Traverse View

The Traverse View can be toggled OFF when you are performing a “Quick Traverse”. To toggle the Traverse View OFF, choose Map/Traverse View when using a Quick Traverse file. See Section 2.4.3 for information about the File/Quick Traverse function.

## 2.3 Getting Help in CogoCAD

CogoCAD provides Help messages throughout the software. For additional instruction for a given dialog box or menu option, click on the Help menu option, the Help button in the dialog box or the Help icon in the Tool Bar.



Once you click on the Help icon, the Help question mark will be displayed. Simply click the Help question mark on the option, dialog box or area of the window with which you need assistance. A full description of the item will be provided in the Help screen.

### 2.3.1 Help/Index

The Help/Index option provides a complete index of Help Topics. The Search button in the Index dialog box allows you to search for a particular item. A full description of the item will then be provided.

### 2.3.2 Help/Using Help

The Help/Using Help option provides instructions for using the Help utility.

### 2.3.3 Help/Online Manual

The Help/Online Manual option provides a comprehensive Online manual that serves as a complement to this manual and the context-sensitive on-line help function. Some portions of this manual will refer you to the Online Manual for more detailed information.

### 2.3.4 Help/About CogoCAD

The Help/About CogoCAD option provides information on the CogoCAD version and CMT copyright.

## 2.4 The File Menu

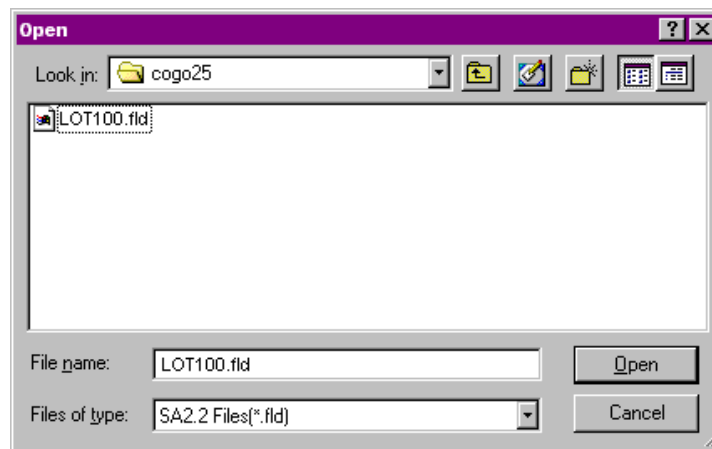
All of the functions available under the File menu option are described in the following sections. Examples are provided where applicable. Within the File menu you can access functions for opening, saving, and plotting files. Many of these options can also be accessed via the Tool Bar icons.

### 2.4.1 File/New

The File/New option is used to open a new File. A blank file called Survey1 will be displayed in the main CogoCAD window. This function can also be accessed by clicking on the “New File” icon in the Tool Bar.

### 2.4.2 File/Open

The File/Open option is used to open an existing File. Once this option has been selected, the File Open dialog box will be displayed as follows:



Select the file to open by either typing in the file name in the File Name box or by double-clicking with the mouse on the appropriate file name listed in the box above.

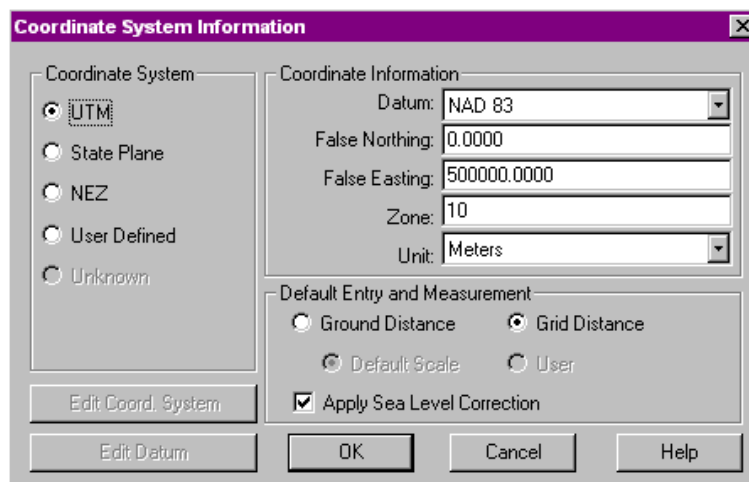
If the file you wish to use is not listed under the current directory, you may want to check other directories on your PC. Click on the pull-down arrow in the “Look in:” box to view a listing of all of the available directories. Next, click on the directory you wish to search.

**Please note:** If you wish to open a file other than an SA2.2 (\*.fld) file, you may change the file type using the arrow to the right of the Files of Type box. The other file options, CogoCAD Files (\*.cog), PC-GPS Files (\*.ftr), SA3 files (\*.psa), SA Files (\*.hvd), TDS Files (\*.rw5) and SDR Files (\*.\*) will be listed.

The File/Open function can also be accessed by clicking on the “Open File” button icon in the Tool Bar.

## Coordinate System

If you have selected a PC-GPS Feature file (\*.ftr) to be opened, the Coordinate System dialog box will be displayed as follows:



The Coordinate System functions are used to verify the coordinate system and datum of the file you are opening.

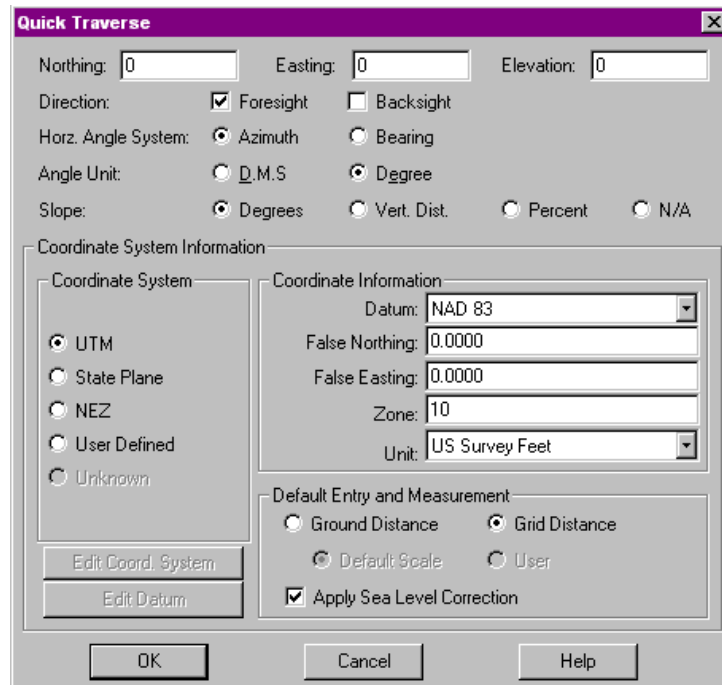
**Please note:** Be sure to select the appropriate Coordinate System, Datum, Zone, etc. for the file you are importing or the data may not be represented correctly.

For more information about Coordinate Systems, please see section 4.1.

### 2.4.3 File/Quick Traverse

Use the File/Quick Traverse function to manually enter data for one or more simple traverses. The Quick Traverse file can only be saved in the .cog format. The data records in Quick Traverse are not related with any survey job file (\*.fld, \*.hvd or \*.cog) that may be open when you started the Quick Traverse job. However, you may copy points from a Quick Traverse file and paste them into a survey job file and vice versa.

When you select File/Quick Traverse, you will be prompted to open a new quick traverse file. Click OK at this prompt to continue. The Quick Traverse dialog box shown below will then be displayed and you will be prompted to open a new quick traverse file. Click OK at this prompt to continue.



Enter the coordinates of the first station in the Northing, Easting and Elevation fields, then specify how your data will be entered using the other fields in this dialog box.

Once you have defined your setup parameters and starting coordinates, click the OK button to display the Traverse View. A new window will be opened and the Traverse Path dialog box will be shown at the bottom of the window:

	Occupy Station	Slope Distance	Slope Angle	Foresight Angle
1	1	0.0000	0.0000	90.0000°

East: 479078.540000    North: 4934458.800000    Elevation: 0.000000    Traversed Dist: 0.000000

For Help, press F1    UTM    NAD 83    10    4934445.4252m    479007.4698m

In the Traverse Path dialog box, you can enter Traverse data, print a text report, plot, adjust and enter Sideshot records. The Point Number of the starting point is automatically entered for you in the Occupy Station field. Enter the Slope Distance, Slope and Foresight Angle from station to station along the Traverse. Use the Append Record icon in the Tool Bar to add a new record. CogoCAD will automatically increment the Point ID field as records are added. The Traverse line will be displayed in the Survey View as stations are added.

**Please note:** To enter Traverse data into a New Job, select File/Quick Traverse.



The icons in the Traverse dialog box Tool Bar allow you to perform several operations. A brief description of each function will be displayed when you place the mouse pointer on the icon. The functions are listed below, from left to right:

- Open**            Edit an existing traverse path, or start a new one. The **Traverse Path** dialog will be displayed.
- Print**            Print a text report of the Traverse Path.
- Plot**             Plot a graph of the Traverse Path.
- Insert**           Insert a Traverse record at the current location.
- Append**          Add a new Traverse record to the end of the Traverse Path.

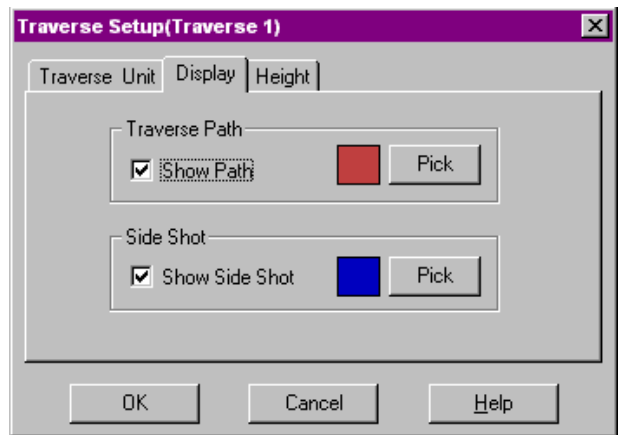
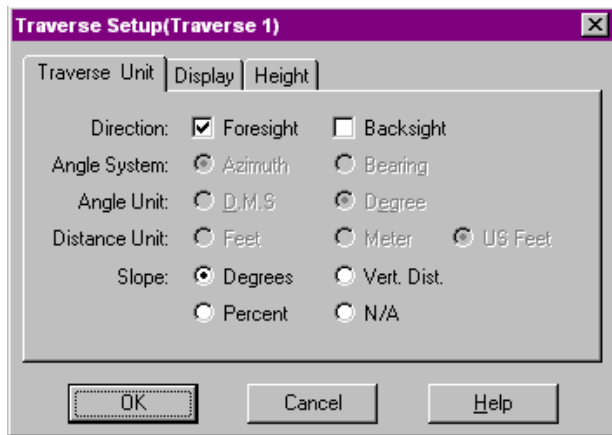
**Please note:**        When you append a new record to the Traverse dialog box, a new Point Feature will be created in your Job, as well as the line segment which is formed between the Occupied Station and the new Point Feature. You may use the Edit/Cut or Edit/Delete commands to remove the Point Feature from your Job. However, you must use the Delete icon in the Traverse dialog box to remove the line segment from your Job.

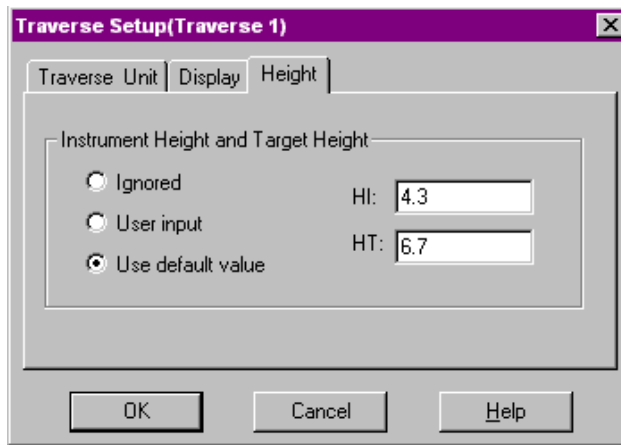
- Delete**           Delete the current Traverse record.
- Clear**            Delete all of the Traverse records.
- Sideshot**        Create Sideshot records from the current Station.
- Setup**            Display the Traverse Setup dialog box (2.4.3.1)
- Adjust**          Adjust a Traverse and balance any measurement errors which have occurred.

You may toggle OFF the Traverse View at the bottom of the screen by choosing Map/Traverse View (see Section 2.2.4).

### 2.4.3.1 Traverse Setup

When you click on the Setup Icon in the Traverse dialog box, the Traverse Setup dialog box will be displayed. The information in the Traverse Setup dialog box will apply only to the Traverse that is active when the icon is clicked.





You can use the Traverse Setup dialog box to establish angle and slope units, to define the display of your Traverse and Sideshot paths and to specify how you would like to enter Instrument and Target Heights. Click OK to save any changes and return to the Traverse dialog box.

Before starting a traverse, be sure to select the proper option for the Direction setting. Select “Foresight” if you plan to enter the horizontal foresight directions as bearings or azimuth angles. In this case, there is no need to enter the backsight angles. Select “Backsight” if you plan to enter the horizontal backsight directions as bearings or azimuth angles. In this case, there is no need to enter the foresight directions. Select both “Foresight” and “Backsight” if you plan to enter the horizontal foresight direction relative to the horizontal backsight direction. In this case, the initial reference backsight direction is due north. (In Section 6.2, you will see how to rotate an entire job by using the Translate/Rotate/Scale function in the COGO menu.) For more information about the specific functions of each page in the Traverse Setup dialog box, click on the “Help” button to access the Online Manual.

### 2.4.3.2 Sideshots

When you click on the Sideshot Icon in the Traverse dialog box, you will be able to enter Sideshot data originating from the current station in the Traverse.

	New	Occupy Station	Slope Distance	Slope Angle	Foresight Angle
1	<input checked="" type="checkbox"/>	1	26.2467	0.0000	90.0000°

East: 1571776.843317    North: 16189136.913000    Elevation: 0.000000    Traversed Dist: 0.000000

**UTM    NAD 83    10    16189157.6950f    1571926.5021f**

The dialog box above is very similar to the Traverse dialog box. You may enter Sideshot data which originates from the current Traverse station and then moves from station to station so as to create a Sideshot Path, or you can enter several Sideshots that originate from the current Traverse station to enter Radial Sideshots.

For example, if you would like to enter two Sideshot records which both originate at Point 14, you would first highlight Point 14 in the Traverse dialog box and then click the Sideshot icon. The Sideshot dialog box would then be displayed, with Point 14 as the Occupy Station. Enter the slope distance, slope angle and direction of the first Sideshot and then click on the New Sideshot icon. A new record will be added to the dialog box. The new record will have a check mark in the new column and the Occupy Station will also be 14. You can now enter the direction, slope and distance data for the second Sideshot.

If you want to enter a Sideshot path, simply press the Append Icon to append a new record. The New column will not be checked, and the Occupy Station field will increment by 1.

### 2.4.3.3 Adjust Traverse

When you click on the Adjust Traverse Icon in the Traverse dialog box, you will be able to apply a compass adjustment to your data (including Sideshot data). This adjustment will work in the same manner as the Adjust function discussed in Section 5.3.

### 2.4.4 File/Close

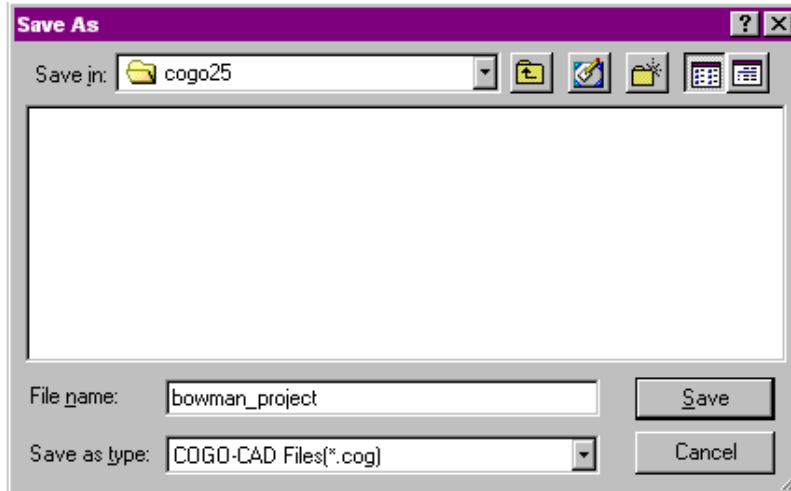
The File/Close menu option is used to close the current survey file.

### 2.4.5 File/Save

The File/Save menu option is used to save an open under the current file name and directory. (The current file name is listed at the top of the main CogoCAD screen.) If the file has not yet been named, the File Save As window will be displayed. The File/Save function can also be accessed via the “Save” icon in the Tool Bar.

### 2.4.6 File/Save As

The File/Save As menu option is used to save the current file under a new file name, in a separate subdirectory and/or as a new file Type. Once this option is selected, the File Save As window will be displayed as follows:

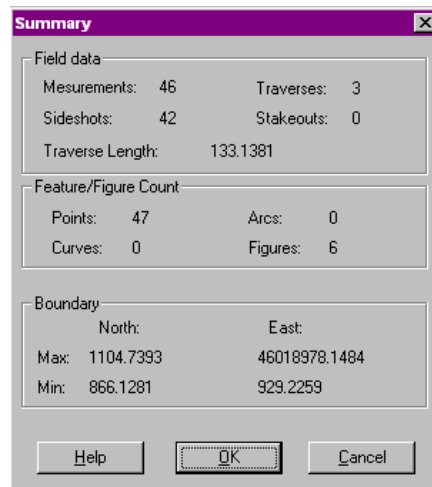


You can type in the new file name in the File Name box and change the selected directory and/or File Type as desired.

**Please note:** You may choose to save your file in one of the SA formats (e.g. \*.psa for SA3, \*.fld for SA2.2, or \*.hvd for SA2) to upload your data to your CMT Field data collection software.

### 2.4.7 File/Summary

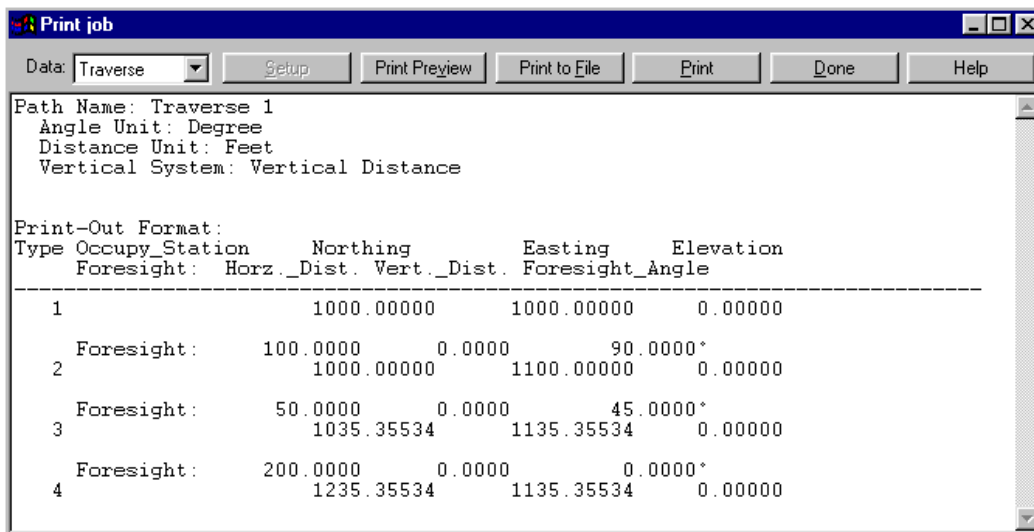
The File/Summary option provides a summary of the current File. When this option is selected, the following Summary dialog box is displayed:



The fields in the Summary dialog box cannot be edited.

## 2.4.8 File/Print Job

The File/Print Job option is used to generate a text report that summarizes all of the Feature and Figure data in the File. The following dialog box is displayed when this printing option is selected. Click on the Print Preview button to see a preview of your data before printing. Please refer to the Online Manual for more information about the different printing options (e.g. Traverse, FieldData, Stakeout, Coordinate, Figure, Note).



## 2.5 Plotting Considerations

This sub-section covers basic plotting considerations. An understanding of the CogoCAD plotting assumptions may save time when you are creating your plot.

### 2.5.1 The Survey View determines what is on your Plot

Your plot is created based on the Features and non-spatial objects that are displayed on the Survey View. All of the objects in the Survey View will be sent together as one “map object” to the Plot Preview window.

**Please note:** Objects that are displayed on the Survey View cannot be individually edited in the Plot Preview window.

Features or objects that are not displayed on the Survey View will not be included in the plot. For example, if you are “zoomed into” a portion of your Map file when you use the **File/Plot Preview** option, only the Features that are visible on the Survey View will be shown in the Plot Preview window.

## 2.5.2 Complete Map Plot and Partial Map Plot

CogoCAD allows you to either plot your complete file or only a portion of the file.

- To plot the **complete Map file**, use the Zoom-Fit function before selecting **File/Plot Preview**.
- To plot **only a particular area of your Map file**, zoom-in to that area of the Survey View prior to using **File/Plot Preview**.
- To **exclude certain Points or Figures from your plot**, toggle OFF the “Visible” option for each Topic (for points) or for each Figure in the Browse/Edit Points or Figures dialog before using **File/Plot Preview**.

## 2.5.3 Symbol Sizes

Point symbols in your plot will be printed to scale. For example, if you have Tree Features in your map that are size 8 and Gate Features that are size 12, these relative sizes will be maintained in the default plot. However, if you wish to set all of your Point symbols to one uniform size, use the Point Size setting in the Plot Setup dialog box to specify a specific symbol size. (Please refer to Section 2.7.3)

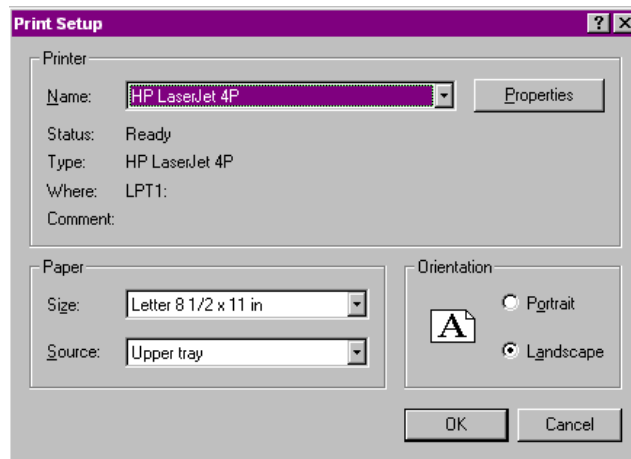
## 2.5.4 Labels in the Survey View

Text Labels that are on the Survey View will be included in your Plot. For proper label sizing in the printed map, the label property “Freeze Text Size in Zoom” needs to be turned OFF.

To turn Freeze Text Size in Zoom for a Text Label OFF, double-click on the label and un-check the Freeze Text Size in Zoom option in the Text Setup dialog box.

## 2.5.5 File/Print/Plot Setup

The File/Print/Plot Setup function displays the standard Windows Print Setup dialog box. This dialog box allows you to specify certain characteristics for your printer. When you select File/Print/Plot Setup, the following Print Setup dialog box is displayed:



## 2.5.6 Coordinate System and Scale Units

The Plot Setup screen allows you to select “paper” units and “real world” units for your plot. Plot scale is stated in terms of paper units to real world units - 1 paper unit = X real-world units. Your paper units may be either inches or centimeters. The real world units may be inches, centimeters, feet, meters, miles, or kilometers.

## 2.5.7 File/Plot

When this manual refers to plotting operations, it is referring to the generation of a graphical representation of the data you have selected to plot. This plot will be sent to your printer, just as in most other Windows applications.

There are two menu options that access the plotting functions:

- The **File/Plot Preview** menu option displays the Plot Preview window for the current map. From the Plot Preview window you can customize plot objects and access the Plot Setup screen. (See Section 2.6)
- The **File/Plot** menu option displays the Plot Setup screen for the current map. After you specify the Plot parameters in the Plot Setup screen, the plot output will immediately be sent to your Printer. **File/Plot** does not provide a preview window.

In most cases, it is recommended that you use the **File/Plot Preview** option to view the plot prior to printing.

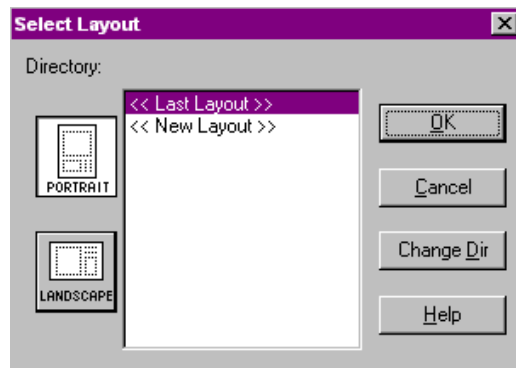
You can plot the current file by clicking on the File/Plot menu option, or on the **Plot Icon**. The Select Layout dialog box will be displayed, as described in Section 2.6.

## 2.6 File/Plot Preview

The **File/Plot Preview** function is used to view your plot prior to printing. Functions in the Plot Preview window allow you to customize your plot. You may change the object placement, text, size and scale. In addition, you might add special shapes and text to create a tailored, professional-looking map.

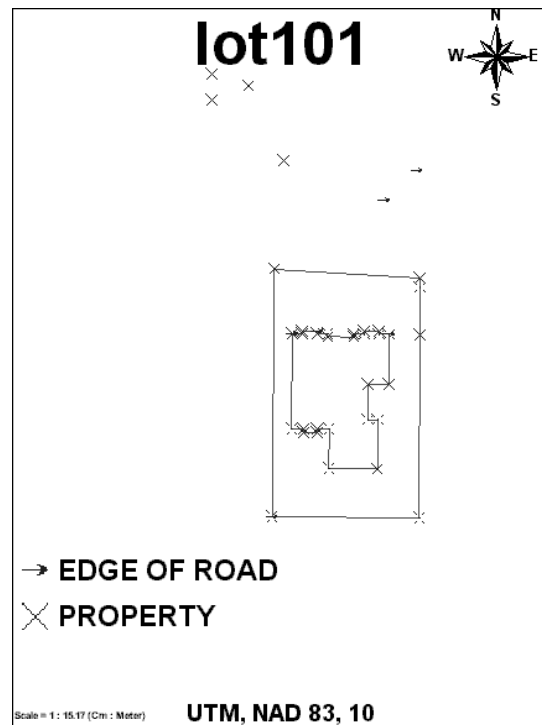
### 2.6.1 Viewing the Default Plot Format

To view the plot of your map, use the **File/Plot Preview** menu option to display the Select Layout dialog box:



From the Select Layout screen, choose either the Portrait or Landscape option by clicking on the associated icon. If you are creating a new Plot Layout, highlight “<<New Layout>>” Layout and then click on the OK button. (Please see section 2.9.2 for information on using specific layout files.)

When you select <<New Layout>> from the Select Layout screen, the default plot Layout will be used. The plot is created using the Map object, header, footer, legend, scale text, plot border and compass rosette (north arrow). Object placement is determined by the orientation – Portrait or Landscape. The example layout below shows the default object placement for portrait orientation.



**Default Plot Layout for Portrait Orientation**

## 2.6.2 Plot Objects and Object Placement

A plot object is an individual object displayed on the Plot Preview screen. Plot objects include the map object, header, footer, legend, compass rosette (north arrow), border, ruler and scale bar.

**Map Object:** Features and non-spatial items displayed on the Survey View when you use the Plot Preview option are collectively referred to as the “map object”. The map object is drawn near the center of the plot page.

**Please note:** Items in the map object cannot be individually edited in the Plot Preview window.

**Header Object:** The Map file name is used as the default header. The Header object is centered at the top of the plot page.

**Legend Object:** The legend lists the Topics in your plot. For landscape orientation, the legend is placed on the right side of the plot page. For portrait orientation, the legend is placed below the map object on the left hand side of the plot.

The default font size for the legend is determined by the number of entries in the Legend.

The text of the legend cannot be edited in the Plot Preview page. In order to modify the legend, you must edit the Topic name in the Survey View (**Map/Browse/Edit Points**).

**Footer Object:** The default footer is the Map Coordinate System, Datum and Zone. The Footer object is centered at the bottom of the plot page.

**Scale Text Object:** The scale of the plot is printed in the lower left-hand corner of the plot page. The number of decimal places shown is determined by the setting in the View/Configure/Map dialog box.

**Compass Rosette Object:** The compass rosette (north arrow) is displayed in the upper-right hand corner of the Plot Preview page.

**Border Object:** A single line border is displayed around the plot.

**Scale Bar Object:** The scale bar is an optional plot object. To display the scale bar on your plot, toggle ON the scale bar in the **Plot Setup/Objects** screen. (Please see Section 2.7.2)

**Ruler Object:** The ruler is an optional plot object. To display the ruler on your plot, toggle ON the scale bar in the **Plot Setup/Objects** screen. (Please see Section 2.7.2)

### Customizing Plot Objects

Plot objects may be moved, re-sized, and modified. For example, you might move the legend, change the header text or decrease your map scale. Options for customizing your plot are discussed in Section 2.7.

### 2.6.3 Default Plot Scale (Units)

The units used for the scale of your map are determined by the Map coordinate system and unit of measure. The chart below shows the defaults for paper : real-world units by coordinate system and unit of measure.

<b>Coordinate System and unit of measure</b>	<b>Paper Units : Real World Units</b>
SPC, UTM, User, or NEZ Coordinates	
Int'l Feet as unit of measure-----	in : int'l feet
Miles as unit of measure-----	in : miles
US Survey Feet as unit of measure-----	in : US survey feet
Meters as unit of measure-----	cm : meters
KM as unit of measure-----	cm : KM
















**The units used for your plot scale may be changed in the Plot Setup screen.**

- Please refer to Section 2.8.4 for information on changing the scale units.

### 2.6.4 Plot Preview Tool Bar

The tool bar in the Plot Preview window provides many functions for viewing and working with your plot. Click on the tool bar icon to activate the associated function. The Zoom-in, Zoom-out, and Tool Palette functions can be toggled OFF by clicking the right mouse button.

A brief summary of each tool bar function is listed below:

- |  |  |
|--|--|
|  <b>Print Out:</b> Send plot to the printer. All pages in the plot will be printed.                     |  <b>Tool Palette:</b> Toggle Palette ON or OFF.   |
|  <b>Printer Setup:</b> Select Printer and Paper size.   |  <b>Zoom-In:</b> Zoom-in to the selected area.  |
|  <b>Save Layout:</b> Save the plot layout with current object placement.                                |  <b>Zoom Out:</b> Zoom out from the current view.   |
|  <b>Plot Setup:</b> Display Plot Setup screen.  |  <b>Zoom Fit:</b> Zoom to fit all of the objects on the page.   |
|  <b>Delete:</b> Delete selected plot object. <u>Note:</u> The map object and ruler can not be deleted.  |  <b>Zoom to Selected Object:</b> Zoom to view the selected plot object.                                 |
|  <b>Zoom to Actual Size:</b> Zoom to Real World scale.  |  <b>Merged Page(s) Mode:</b> Show all plot pages. A blue dashed border will be drawn between the pages. |
|  <b>One Page Mode:</b> Switch page mode to 1 page. The page margins will be shown in blue.              |  <b>Exit the Plot Preview window</b>  |
|  <b>Switch between pages</b> For multiple page plots, use the page arrows to switch between page views. |  |

Row:  Col:  **Move to Selected page.** For multiple page plots, use the



row and column fields to select a specific page for viewing.

## 2.6.5 Printing your Plot from the Plot Preview window

The Plot icon on the tool bar of the Plot Preview window is used to send your plot to the printer. All of the pages of your plot will be printed. The Plot Preview window will remain displayed on your PC screen until you click on the Exit icon.

## 2.7 Customizing your Plot

CogoCAD plotting functions make it easy to create a professional map from your data. The plot format may be completely user-defined. Your plot objects can be moved, re-sized, added or deleted. You can create your own headers and footers. Text labels and drawing shapes can be used to enhance the plot. This section covers the methods for customizing your plot.


### 2.7.1 Summary

In some cases, more than one method can be used to “customize” a plot object. The following list summarizes the methods used:

- **Object Placement:**
  - Drag object with mouse in the Plot Preview screen. (Section 2.7.3)
- **Object Font Size:**
  - 1) Stretch object with mouse in the Plot Preview screen. (Section 2.7.3)
  - 2) Double-click on object in the Plot Preview window to go to the Text dialog. (Section 2.7.3)
- **Object Text:**
  - 1) Double-click on object in the Plot Preview window to go to the Text dialog. (Section 2.7.3)
  - 2) For Headers and Footers, you can use Plot Setup screen to enter text. (Section 2.7.2)
- **Map Object Scale**
  - 1) Use Scale options in Plot Setup dialog box to set a specific scale (Section 2.8.5)
  - 2) Stretch map object with mouse in Plot Preview screen. (Section 2.8.6)
- **Point Feature Plot Size**
  - Use Point Size setting in the Plot Setup dialog to set a plot size for all Point Symbols.
- **Deleting Plot Objects:**
  - 1) Select the object from the Plot Preview window and use the Delete icon.
  - 2) Go to Plot Setup screen and toggle OFF unwanted objects.
- **Plot Scale Units:**
  - Use Scale Units settings in Plot Setup dialog box to select paper and real-world units.
- **Plot Margins:**
  - Use Size options in Plot Setup dialog box to change margins. (Section 2.10.2)
- **Printer Selection and Paper Size:**

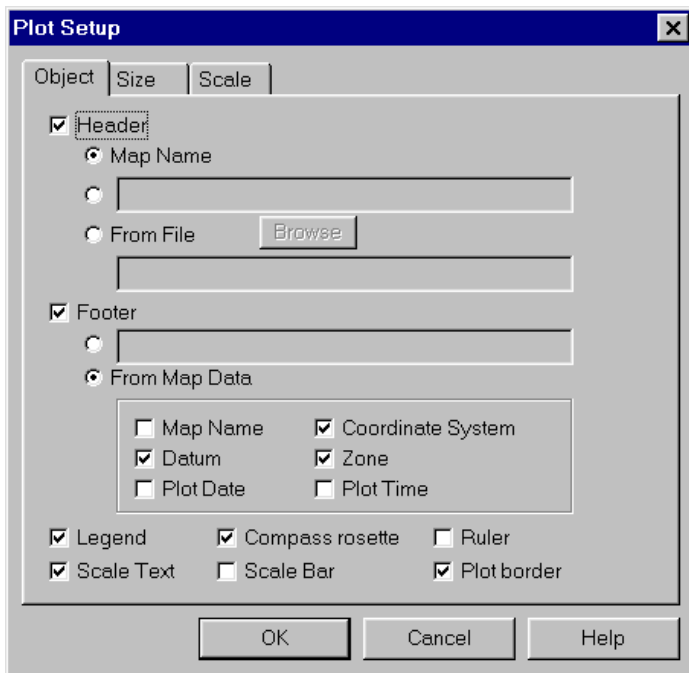
Use Printer Setup icon to display Printer options. (Section 2.10.1)

## 2.7.2 Using Plot Setup to Customize Plot Objects

The display of plot objects can be customized using the options of the **Plot Setup/Objects** screen. The Plot Setup screen can be accessed by clicking on the Plot Setup icon  in the Plot Preview window.

The Plot Setup screen is divided into three pages: Objects, Scale, and Size. The Objects page provides options for customizing the display of plot objects. The Scale page is used to set the map scale and select the scale units. The Size page lists margin and point size options.

The **Objects** page of the **Plot Setup** screen is shown below:



### Default Object Options:

**Header** - Map Name

**Footer** - From Map Data

- Coordinate System
- Datum
- Zone

### **Other Plot Objects**

- Legend
- Scale Text
- Compass rosette
- Plot Border

In this sample screen, each of the default plot objects is selected. Selected objects are marked by either a check mark or selection circle. The mark boxes  are used to toggle ON or OFF the display of the plot objects. The selection circles  are used to choose to a Header or Footer option.

### **Header Options**

There are three options for the plot header. Click on the selection circle that corresponds to the header option you wish to use.

Map Name: (first selection circle)

As the default, your Map file name is used as the header for the Plot. For example, if you are using the example file LOT100.FLD, the header for the Plot would be "LOT100".

Header Name: (second selection circle)

If you wish to enter a header name, click on the second selection circle and then enter a title for the plot in the adjacent entry field. The header may be up to 75 characters in length. (Note: The header entry field has space for up to 26 characters.)

From File: (third selection circle)

If you wish to use a text file for your header, click on the third selection circle and use the Browse button to choose a text file. The text file name will be shown in the corresponding field.

All of the text in the file will be displayed in the space allocated for the header object. You may need to re-size the header object using the mouse in order to display the text in a legible font size. If you are using a file that contains more than one line of text, you may want to change the header alignment and font. For multiple-lines, left-justification and courier font work best.

### Footer Options

There are two options for your Plot footer. Click on the selection circle that corresponds to the footer option you wish to use.

Footer Name: (first selection circle)

If you wish to enter text for your footer, click on the first selection circle and then enter the name in the corresponding entry field.

From Map Data: (second selection circle)

If you wish to use map data for the footer, click on the second selection circle and then mark the data options you wish to use. As the default, the Coordinate System, Datum and Zone are used for the footer.

### Optional Plot Objects

At the bottom of the **Plot Setup/Objects** screen, the optional plot objects are listed. You may toggle ON or toggle OFF any of these options by clicking in the associated mark box. The optional objects include: *Legend*, *Compass rosette*, *Ruler*, *Scale Text*, *Scale Bar* and *Plot Border*.

Optional objects, except the Ruler, may be cleared from the Plot window using the Cut icon.

## 2.7.3 Customizing Plot Objects from the Plot Preview Window

The object placement, object plot size, and text content of plot objects can be easily modified in the Plot Preview window.

### Placement of Objects

To change the placement of an object, first select the object by clicking on the object once.

A “grid box” of black nodes will indicate that the object is selected. Once the object is selected, you can click on the middle of the object, hold down your mouse button and then drag the object to a different location on the page. When you release the mouse button, the object will be displayed in the new location.

### Object Display Size

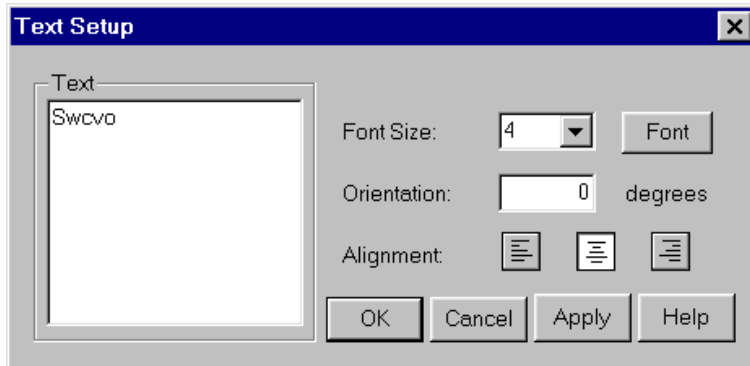
Plot objects may be re-sized using the mouse. To increase or decrease the display size of an object, first select the object by clicking on the object once. A “grid box” of black nodes will indicate that the object is selected. To re-size the object, click on a corner of the grid box, hold the mouse button down and drag the corner of the object in one direction or another:

- Dragging the upper right corner directly to the right or left increases or decreases the width of the object, respectively.
- Dragging the upper right corner up or down increases or decreases the height of the object, respectively.
- Dragging the upper right corner to the upper right or the lower left increases or decreases both the height and the width of the object respectively.

**Please note:** Text labels cannot be re-sized using the mouse if the Freeze Text Size in Zoom option is ON. For information on re-sizing the map object see Section 2.8.5.

## Object Alignment and Orientation

The alignment and orientation of text objects can be changed using the options of the Text Setup dialog box. To access the Text Setup dialog box, double-click on the text object you wish to modify. The following dialog box will be displayed:



**Font Size:** Select a font size from this column.

**Orientation:** Enter a number between 1 and 360 for the orientation.

**Alignment:** Select Left justified, Centered or Right justified.

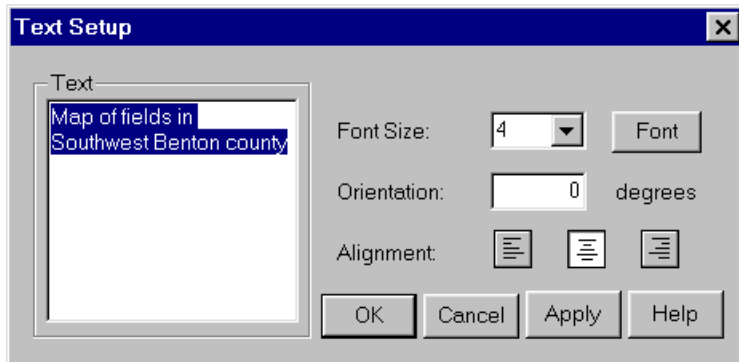
After you have entered an orientation value or an alignment option, click on the OK button to save your changes and return to the Plot Preview screen.

**Please note:** The alignment and orientation of the **Legend** and **Compass Rosette** cannot be changed.

## Object Text

The content of a text object can easily be changed in the Text Setup dialog box. To access the Text Setup dialog box, double-click on the text object you wish to modify.

The Text dialog box will be displayed as shown below.



**Text:** When you double-click on your text object, the text will be highlighted in the Text column.

To change the text, you can either overwrite the existing text or click the mouse cursor on the part of the label you wish to change.

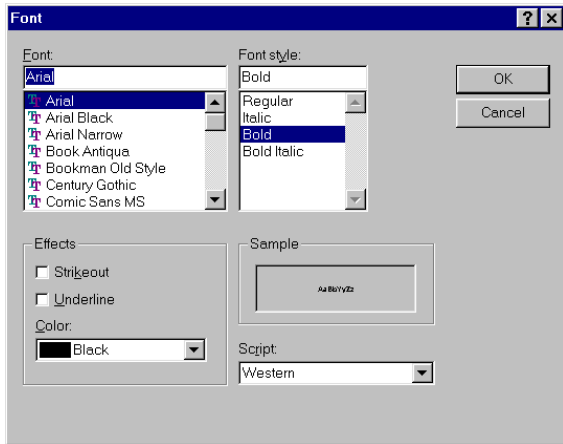
After you enter the new text, click on the OK button to save your changes.

**Please note:** The text content of the **Legend** and the **Compass Rosette** cannot be changed. For headers and footers, you may also use the Plot Setup dialog box to modify the corresponding text.

## Object Font, Color, or Font Size

The font characteristics can be changed using the Font screen. To access the Font screen, first double-click on the object. The Text Setup dialog box will be displayed, as shown on the previous page. Click on the Font button. The Font dialog box will be displayed.

**Please note:** When you double-click on either the Legend or the Compass Rosette, the Font box will be displayed immediately.



**Font:** Select the font type from this column.

**Font Style:** Select the style from this column.

**Color:** Select a display color from this column.

After you have made your selections, click on the OK button in the Font dialog box. The Text Setup box will be displayed again. Click on the OK button in the Text Setup box to return to the Plot Preview window.

**Please note:** The font size of the Legend cannot be selected in the Font dialog box. In order to increase or decrease the font size, you may increase or decrease the size of the object using the mouse.


## Point Symbol Sizing

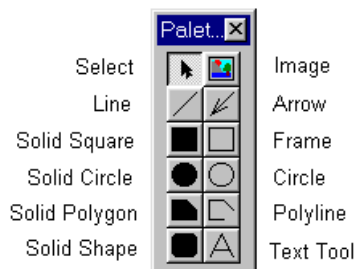
The size of Point Features in the Plot Preview window is initially determined by the size set in the Survey View. To change the size of your Point Features for the plot output, use the Point Size setting in the **Plot Setup/Size** screen.

In the Size page, there are two Point Size options - **Original Size** and **Change Size**.

Select Change Size if you wish to set all of the point symbols in the plot preview to one uniform plot size. Enter the new Point Symbols size in the corresponding field. The Plot size of all Point Symbols will be changed to the value entered. Select Original Size if you wish to use the original symbol display sizes assigned in the Survey View. After you have made a symbol size selection, click on the OK button to save your changes and return to the Plot Preview window. For information about assigning a particular symbol to a group of Point features, see Section 4.8.

## 2.7.4 Adding Drawing Shapes, Text and Logo

Your plot can be enhanced with text, drawing shapes and a logo using the tool palette in the Plot Preview window. When you click on the tool palette icon  in the Plot Preview window, the following tool palette will be displayed:



### Drawing Shapes and Text Labels

Select a tool from the palette by clicking on the associated icon. The mouse cursor will be displayed as a crosshair. Place the mouse cursor on the plot page at the desired location. Click the mouse and hold down the left mouse button while dragging the mouse cursor across the page. When you release the mouse cursor the selected shape will be drawn.

If you are using the text tool, the Text Set Up dialog box will be displayed when you release the mouse cursor. In the Text Set Up dialog, you may enter the text for your label and choose label alignment or orientation.

**Please note:** To choose a font and font style click on the Font button.

## Editing Drawing Shapes

To edit a drawing shape or text label, double-click on the object in the Plot Preview window. The associated shape properties dialog box will be displayed. You may change the style, color or thickness of the drawing shape in the properties box. Click on the OK button to save your changes and return to the Plot Preview window.

### Notes about Drawing Shapes, Text and Image:

- Drawing shapes and text can be moved and re-sized using the mouse.
- Drawing shapes and text are not saved with your layout.
- Drawing shapes and text cannot be placed “under” other plot objects.
- When resizing an “**image**” object, the x/y ratio for the image will remain fixed, preventing unwanted warping of the image.

## 2.8 Plot Scale

The scale of your plotted map can be changed in the Scale page of the Plot Setup dialog box. The scale of the map object can also be modified using the mouse. This sub-section covers plot scale considerations.

### 2.8.1 What is Scale in CogoCAD?

The scale of your map is defined as the number of real world units that are equivalent to 1 paper unit. The scale is stated as 1 paper unit : X real-world units. A scale of 1:5000 means that 1 paper unit equals 5000 units in the real world. The term “paper” means distance measured on your printed plot and the term “real-world” means distance measured on the ground.

In many cases, when referring to scale, the units used for the paper measurement and the units used for the real-world measurement are the same. In this case, units used could either be inches or centimeters.

CogoCAD also provides you the option of different units for Paper and Real World measurements. For example, the paper units might be inches and the real-world units might be feet. Therefore a scale of 1:5000 (in:feet) would mean that 1 inch of paper is equivalent to 5000 feet on the ground. You will notice that in the software and manual, each time the scale is listed, the units (paper:realworld) will also be shown.

#### Larger Scales and Smaller Scales:

When comparing map scales, the terms “larger scale” and “smaller scale” may be used.

Comparatively, larger scale indicates that one paper unit is equivalent to a greater number of real-world units (e.g. 1:5000). On a map of a smaller scale, with the same paper and real-world units, one paper unit would be equivalent to fewer real-world units (e.g. 1:1000).

There is an inverse relationship between scale and map object size. In comparing the same map displayed at different scales, the larger scale map (1:5000 in:in) is smaller on paper than the small scale map (1:1000 in:in).

Therefore, increasing the map scale means making the map object smaller on paper and decreasing the scale means making the map object larger on paper.

## 2.8.2 Understanding Scale in Terms of Paper Space Allocation

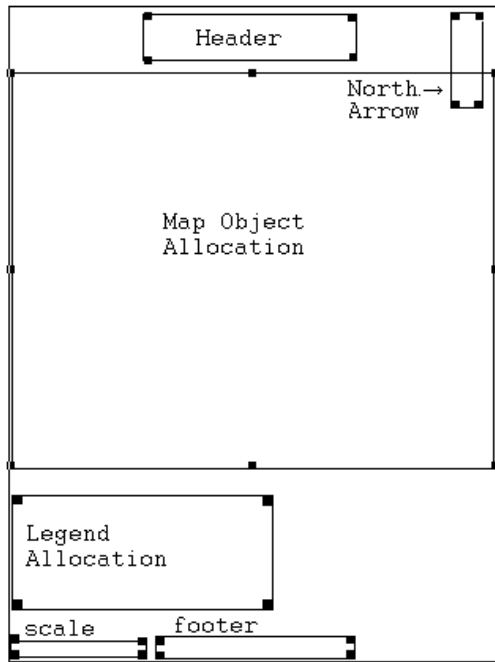
In CogoCAD, the default map scale is determined by the current scale in the Survey View.

### Maximum Paper Space Allocation

The amount of paper allocated to the map object varies according to layout orientation, paper size, and print margins. Examples for standard paper size and margins are shown below.

For a given orientation, paper size, and margin setup, CogoCAD has a maximum paper space allocation. For example, the maximum paper allocation is **10 inches by 7.5 inches** for a portrait orientation on standard letter-size paper with one-quarter inch margins.

### Portrait Layout - Placement and Paper Allocation:



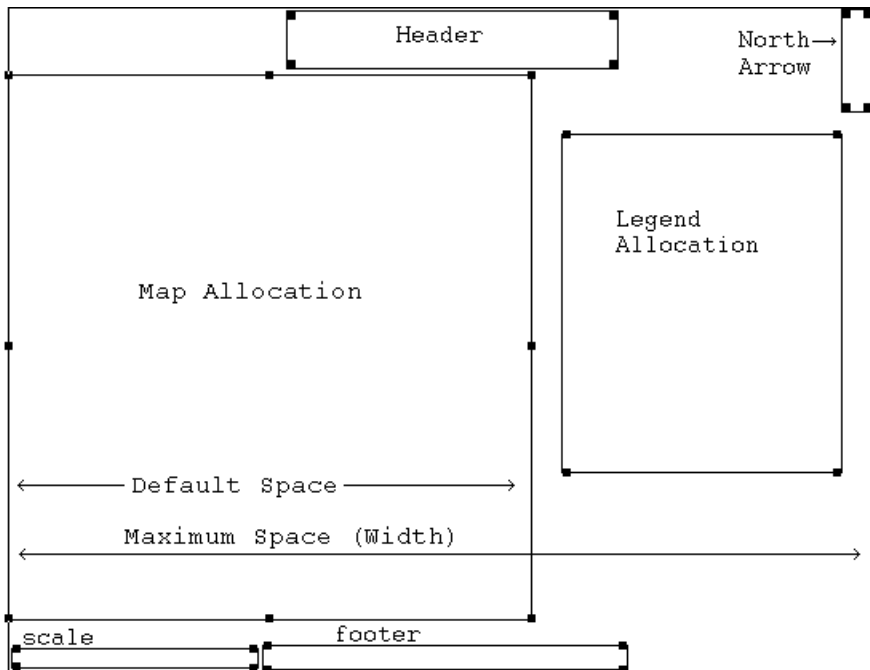
### Portrait Orientation

Standard 8.5 x 11 inch paper  
.25 inch paper margin

### Maximum Paper Space Allocated for Map object

- 10.00 inch height by 7.5 inch width

## Landscape Layout - Placement and Paper allocation:



### Map Object - Landscape Orientation:

Standard 8.5 x 11 inch paper

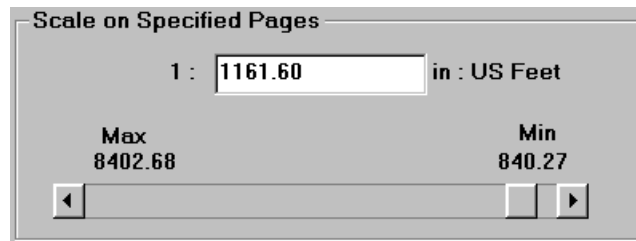
.25 inch paper margin

### Maximum Paper Space for map object

- 7.00 inch height by 10.0 inch width

### Maximum Paper Space and Minimum Map Scale

The maximum paper space allocation defines the minimum scale at which the map can be plotted. For example, the minimum scale may be 1:840 (in:feet). This means that when the map is plotted at a 1:840 scale, the map object is drawn so it completely fills the paper space available on the page. The minimum scale is displayed in the Plot Setup/Scale screen:



The scale of the map can be decreased to the minimum shown on the slide bar.

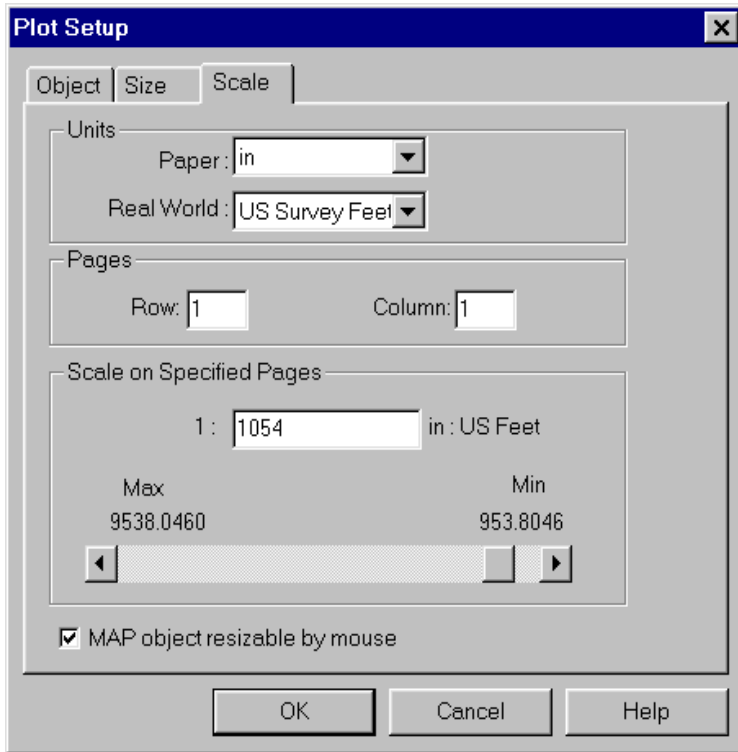
## 2.8.3 Plot Setup/Scale dialog box

The options in the **Plot Setup/Scale** dialog are used to select the **plot units** and **plot scale**. To access the Plot Setup screen from the Plot Preview window, either double-click on the map object or click on the Plot Setup icon:



Once the Plot Setup screen is displayed, click on the **Scale tab**. The following dialog box will be displayed:





### **Plot Setup: Scale options**

**Paper units:** Choose either inches (in) or centimeters (cm)

**Real World:** Choose inches, centimeters, int'l feet, US survey feet, meters, miles or kilometers.

**Pages:** The default number of pages is one - expressed as 1 Row by 1 Column. If you want to use multiple pages, enter the number of pages as Rows by Columns. Row = Vertical Pages; Column = Horizontal Pages.  
Example: 2 Rows x 2 Columns = 4 pages

**Scale:** The current scale is shown in this field. **To change the scale**, enter a value between the maximum and minimum.

**MAP object resizable by mouse:** This option allows you to resize the map using the mouse.

## **2.8.4 Selecting Units: Paper and Real World**

The units used for the default scale of your map are determined by the Map coordinate system and unit of measure. The paper units will always be inches or centimeters. Real world unit options are inches, centimeters, international feet, US survey feet, meters, miles, kilometers.

### **Coordinate System and unit of measure**

SPC, UTM, User, or NEZ Coordinates

Int'l Feet as unit of measure-----

Miles as unit of measure-----

US Survey Feet as unit of measure-----

Meters as unit of measure-----

KM as unit of measure-----

### **Default Paper to Real-World scale**

in : int'l feet

in : miles

in : US survey feet

cm : meters

cm : KM

The paper and real world units can be changed in the **Plot Setup/Scale** screen. To change either the paper units or the real-world units, go to the Scale page of the Plot Setup dialog box. Click on the pull-down arrow next to the respective option. A list of the available units will be displayed. Click on the unit you wish to use. Click on the OK button in the Plot Setup button to save your changes and return to the Plot Preview window.

## **2.8.5 Changing the Map Scale using the Scale option**

The scale of your map can be decreased or increased using the scale option in the Plot Setup dialog box. To increase or decrease your map scale, double-click on the map object to display the **Plot Setup/Scale** screen. Enter the new map scale in the Scale field. Click on the OK button to save your changes and return to the Plot Preview screen. The map object will be re-drawn at the specified scale.

**Please note:** You may use any value between the minimum and maximum scale shown. If you need to plot at a scale larger than the maximum size, you may do so by typing the desired scale into

the Scale box. The maximum scale that is displayed and accessible by the sliding bar is the suggested maximum for your current Map. If you wish to plot at a scale smaller than the minimum scale, you will need to increase the number of pages used for the plot. See Section 2.8.7.

If you enter a scale value which is under the minimum, a message “Scale Out of Range for Number of Pages Selected” will be displayed.

The map scale is inversely related to the relative size of your map object drawing. For example, the scale shown in the Plot Setup dialog box on the previous page is 1:1054. If you *decrease* the scale to 1:1000, then the map object will be *drawn larger* - one paper unit covers fewer real world units. If you *increase* the scale to 1:5000, then the map object will be *drawn smaller* - one paper unit covers more real world units.

## 2.8.6 Changing the Map Scale using the Mouse

The scale of the map object can also be modified using the mouse. As with other plot objects, you may expand or contract the size of the map object by pulling an edge of the map with the mouse in the Plot Preview window.

To increase or decrease size of the map object, first select the map object by clicking on the object once. A “grid box” of black selection nodes will indicate that the object is selected.

- To increase or decrease the width of the map object, click on one of the selection nodes on right edge, hold the mouse button down and drag the mouse cursor right (to increase width) or left (to decrease width). The map object will be redrawn when you release the mouse button.
- To increase or decrease the height of the map object, click on one of the selection nodes on bottom edge, hold the mouse button down and drag the mouse cursor down (to increase height) or up (to decrease height). The map object will be redrawn when you release the mouse button.

**Please note:** If you cannot re-size the map using your mouse, check to make sure that the MAP Object Resizable by Mouse option is toggled ON in the Scale page of the Plot Setup dialog box.

The scale of the map object is dynamically adjusted. If you increase the size of the map object, the scale will decrease. If you decrease the size of the map object, the scale will increase.



## 2.8.7 Multiple Page Plots

If you wish to set your plot to span multiple pages, you may use the Pages option in the **Plot Setup/Scale** screen. From the Plot Preview window, double-click on the map object. The Scale page of the Plot Setup screen will be displayed. In the Pages section, enter the number of rows (vertical pages) and columns (horizontal pages) for the multiple page plot. Click on the OK button to save your changes and return to the Plot Preview window.

### Multiple Page Plot Notes:

- Plot objects can be selected, re-sized and modified using the methods described above.
- Plot objects (header, footer, legend, scale, and compass rosette) are placed in the same relative locations. In merged mode, you can see that the multiple page plot is viewed as “one big page” for object placement.
- Page borders are indicated by blue dashed lines in the Plot Preview window.
- Plot text objects that are placed across page borders may not plot completely. You may want to move header and footer such that the text falls completely within a page.

### **Moving between pages in your Multiple Page plot**

There are two modes to view your plot. - **merge** mode  and **one page** mode . You may toggle between these two modes by clicking on the icons on the tool bar. The default mode is merge mode. In merge mode, all of the pages of your plot will be shown in the Plot Preview window. In one page mode, only one page will be displayed at a time. In one page mode, you can select a specific page by either using the page arrow or the row and column indicators.




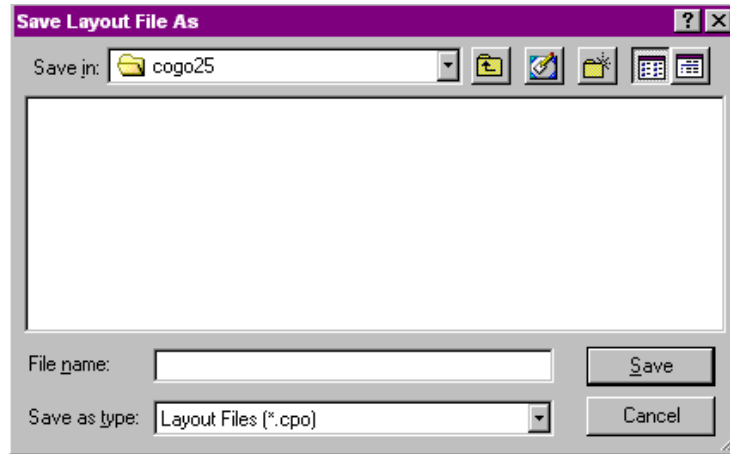
**Page Arrow:** Click on the right or left arrow to move between pages in your plot.

Row: 1 Col: 1

**Row/Column:** Use the pull-down arrow to select either the row or column page.

## 2.9 Saving your Plot Layout

After you have finished customizing your plot, you may want to save the plot layout for future use. The Save Layout icon  on the tool bar of the Plot Preview window is used to save the layout organization of your plot. The Save Layout dialog box will be displayed:



Enter a name for your layout file in the File name field. For easy reference, you may want to use the Map file name as part of the your layout file name. Click on the Save button to save the layout and return to the Plot Preview window.

The file extensions of layout files are \*.CPO for Portrait orientation and \*.CLN for Landscape.

### 2.9.1 What is saved with your Layout

When you create a plot layout, some of the basic layout elements are saved:

- Object placement
- Object size
- Headers and Footers
- Optional Plot Objects: map scale, ruler, border, etc...

When you use the layout file with the same CogoCAD file, these elements will be the same.

**Please note:** Scale is not saved with the plot layout.

### 2.9.2 Using your Layout File

If you have saved a layout file, the file name will be displayed in the Select Layout dialog box when you use either the **File/Plot** or **File/Plot Preview** menu option.

The layout files are listed by layout orientation. If you are using Portrait orientation, all of the \*.CPO files in the current directory will be listed. If you are using Landscape orientation all of the \*.CLN files in the current directory will be listed. Double-click on the name of the layout file you wish to use.


**Please note:** When you select a layout file, the layout will be applied to the current file. For the consistent plot preview results, layout files should only be used with the files they were generated from. If you use a layout file with a different file, the map scale and legend size may be different.

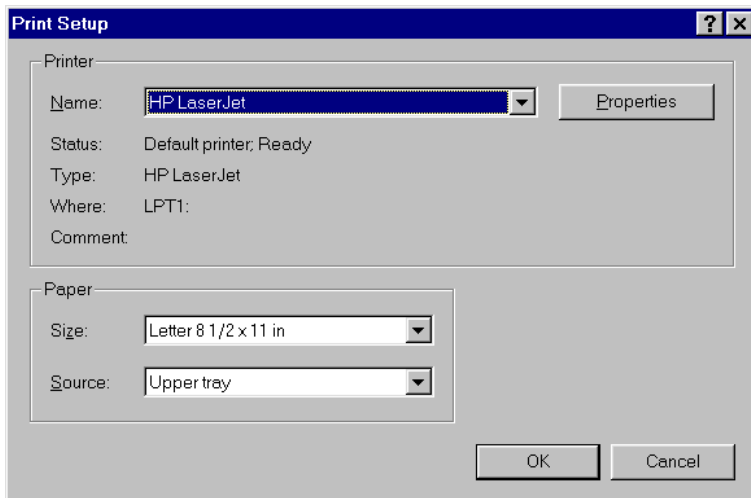
After you have selected a layout file, either the Plot Preview window or the Plot Setup dialog box will be displayed. If you have accessed the Select Layout dialog via the **File/Plot** option, the Plot Setup dialog box for the selected layout will be displayed. If you have accessed the Select Layout dialog via the **File/Plot Preview** option, the Plot Preview window will be displayed.

## 2.10 Plot Output - Sending your Plot to the Printer

Your plot output can be sent to the printer using the **File/Plot** function, the Plot icon or the Print icon from the Plot Preview window. This section covers plot output considerations.

### 2.10.1 Printers and Paper Size

You can plot your map using any printer installed to your Windows system. CogoCAD will use your Windows default printer and paper size. To select another printer or paper size, use either the **File/Print/Plot Setup** menu option or the Printer Setup icon  in the Plot Preview window. The Windows Print Setup dialog box will be displayed:



Select the printer and paper size you wish to use and then click on the OK button.

### How your Printer Type and Paper Size affect your Plot

The plot preview and plot output are affected by your printer selection and paper size.

For example, if you have chosen a color printer, then the Plot Preview window will display all of the plot objects in the selected colors. However, if you have chosen a monochrome printer, the Plot Preview window will not display your plot objects in color.

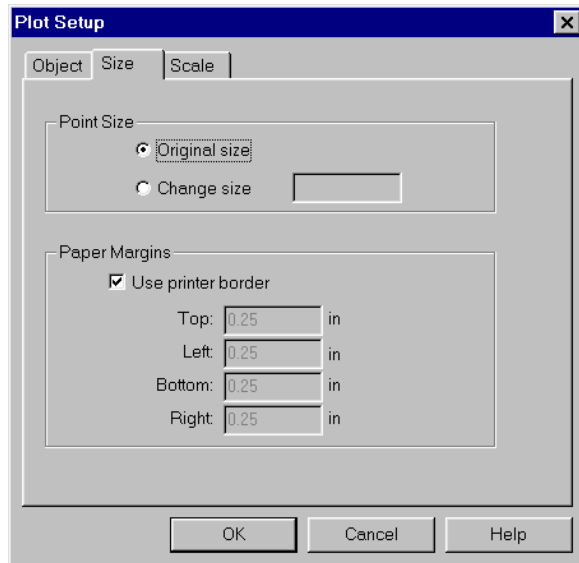
The paper size selection will affect the size and scale of all plot objects. If a given map plots at 1:1150 scale in landscape mode on standard 8.5 x 11 inch paper, the scale may decrease to 1:1000 if it is plotted in landscape mode on legal 8.5 x 14 inch paper.

## Differences between Plot Preview and Plot output

The Plot Preview screen uses your printer selection to determine how the plot objects should be displayed. If there is a difference between the appearance of your plot in the Plot Preview screen and the output from your printer, you should check to make sure that the printer driver you are using matches the printer model.

### 2.10.2 Print Margins

CogoCAD uses the selected printer's margins as the default plot margins. For example, if you were using a HP Laser Jet III printer your printer margin might be .25 inches or .635 centimeters. In this case, the plot margins for left, right, top and bottom would be .25 inches. If you would like to change the plot margins, go to the Plot Setup/Size dialog box. The dialog box will be displayed as shown below:




#### To change the plot margins:

1. Toggle OFF the “Use printer border” option.
2. Enter new margin values in the Top, Left, Bottom or Right fields.
3. Click on the OK button to apply the changes.

**Please note:** The units listed for the margins (in or cm) match the selection under Paper units in the Plot Setup/Scale screen.

### 2.10.3 Plotting from the Plot Preview window

Once you have finalized your plot format in the Plot Preview window, you may use the Plot icon on the tool bar  to send the plot to your printer. After you plot your map, the Plot Preview window will remain your PC screen until you click on the exit button.

### 2.10.4 Plotting your Map using File/Plot Function

When you use the File/Plot function or the Plot icon from the main menu bar, the plot will be sent to your printer when you click on the OK button in the Plot Setup screen. In many plotting situations, you may prefer to preview your plot before sending it to the printer. To preview your plot prior to printing, please use the File/Plot Preview function.

## 2.11 File/Exit

The File/Exit option is used to exit to the CogoCAD program.



## Section 3 - The Edit Menu

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In this Section, each of the editing functions in the Edit menu will be discussed. Editing functions are used with Survey file Features. Figures are edited using the functions under the Map/Browse/Edit Figures menu.

In order to use the editing functions in the Edit menu with Features, data must first be selected. Selection methods are discussed in Section 3.1.

### 3.1 Selecting Data for Edits and other Operations

In order to use editing functions on Features in the Survey File, the Features must first be selected. Provided below are some general guidelines on the requirements for editing:

#### General Guidelines:

- If you wish to perform edits on an individual Feature, that Feature must be selected before the editing function can be used.
- If you wish to perform edits on more than one Feature simultaneously, all of the Features must be selected before the editing function can be used.
- If you wish to edit the coordinates or the color/pattern of a Feature, you may double click on the Feature to select the Feature and access those functions.

#### 3.1.1 Selecting Data using the mouse

**Individual** Features can be selected by clicking the mouse once on the Feature, or by drawing a “rubberband” box around the Feature you wish to select. When a Feature is selected, the Feature will be highlighted in yellow. The nodes of the Feature will be displayed in black. You may de-select a Feature by clicking on the background of the Survey View.

**Multiple** Features can also be selected. Select the first Feature by clicking once on the Feature. Select an additional Feature by holding down the SHIFT key and then clicking on the next Feature. Each selected Feature will be displayed in yellow. Multiple Features can also be selected by drawing a “rubberband” box around the Features you wish to select.

**Please note:** Figures can only be selected for edits using the Map/Browse/Edit Figure function.

#### 3.1.2 Selecting Data using Map/Browse/Edit Functions

Features and Figures can also be selected using the Map/Browse/Edit options discussed detail in Section 4.8 and 4.9. Once the Feature or Figure is selected in this manner, the editing functions available in the Map/Browse/Edit dialog box can be used.

### 3.2 Edit/Cut

The Edit/Cut function removes the selected Features from your Job and stores them in the clipboard. Features stored in the clipboard can be recovered using the Edit/Paste function (See Section 3.4). This function can also be accessed using the Tool Bar “Cut” icon.

**Please note:** Current contents of the clipboard will be overwritten by this operation.

### 3.3 Edit/Copy

The Edit/Copy function copies the selected Features and stores them in the clipboard. Features stored in the clipboard can be recalled using the Edit/Paste function (See Section 3.4). This function can also be accessed using the Tool Bar “Copy” icon.

**Please note:** Current contents of the clipboard will be overwritten by this operation.

### 3.4 Edit/Paste

The Edit/Paste function pastes Features which have been copied or cut to clipboard into your file. This function can also be accessed using the Tool Bar “Paste” icon.

### 3.5 Edit/Delete

The Edit/Delete function deletes the selected Features from the file entirely. Features which are deleted will not be copied to the clipboard and therefore can not be recovered using the Edit/Paste function.

**Caution:** Any selected Features which are deleted will be permanently lost. Be careful with this function!

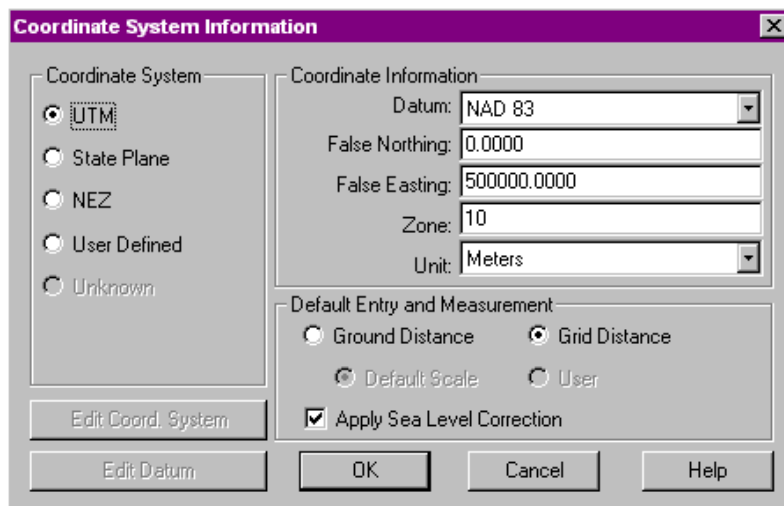


## Section 4 - The Map Menu

The Map Menu provides functions that make it easy for you to design and print out maps. You may generate maps from your field data and optionally incorporate add-on map elements as additional Features or Figures. For example, if your field data consists of three Point Features, you may use the "Map/Add Figure" function to join these three points into a triangle. You may then use the Cogo/Area function discussed in Section 6.6 to find the size of the enclosed area. You may edit the coordinates and attributes of Features and Figures, as well as enhance the map by using symbols and text labels. Each of the Map Menu functions will be discussed below.

### 4.1 Map/Coordinate System

When you import files into CogoCAD, or choose the Map/Coordinate System menu item, the Coordinate System dialog box will be displayed as follows:



The Coordinate System functions are used to verify the coordinate system and datum of the file you are opening, or change the coordinate system and datum of the current file.

The Coordinate System options allow you to select among four different coordinate systems: Universal Transverse Mercator (UTM), State Plane Coordinates (SPC), NEZ and User Defined. There is a fifth option, "Unknown", for opening or importing a file with an unknown coordinate system or datum.

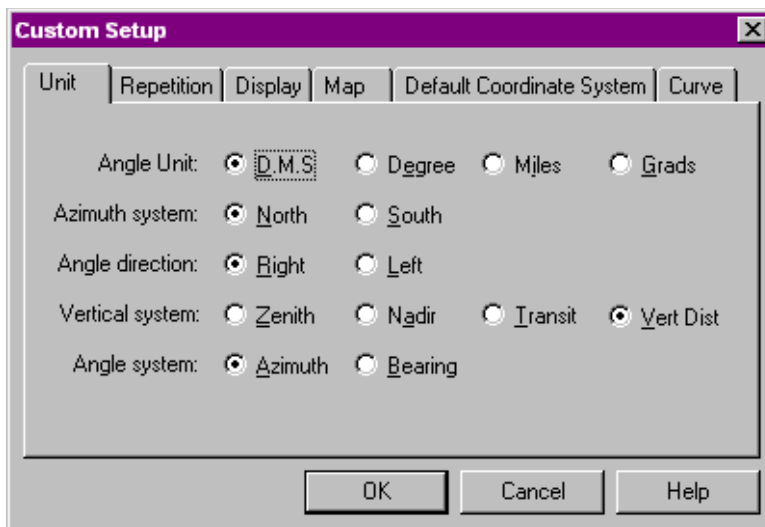
The Coordinate Information section allows you to pick from different pre-defined datums, zones and units of measurement. In general, the default entries for "False Northing", "False Easting" and "Zone" will be correct for the specified coordinate system (and location). You should not change these numbers unless you know what you are doing.

The Default Entry and Measurement section is used to define how distances are calculated and displayed. Distance measurements may either be calculated based on "Grid Distance" or "Ground Distance". For the SPC, UTM and User Defined coordinate systems, the default setting is "Grid Distance".

For more information about Grid and Ground Distance, refer to the Online Manual under the Coordinate System Dialog box page.

### 4.2 Map/Setup

The Map Setup option allows you to customize the global display and default settings for your data. After selecting the Map/Setup option the Custom Setup dialog box is displayed:



### 4.2.1 Unit

The Map/Setup/Unit page is used to define the measurement units and measurement types for Survey angles and distances.

- Angle Unit** Specify the angle units for your survey by choosing either D.M.S. (Degrees, Minutes, Seconds), Degree (Decimal degrees), Miles or Grads. Please note: D.M.S. data entry format: DD-MM-SS.ssss.
- Azimuth System** Specify the azimuth system for your survey by selecting either North or South.
- Angle Direction** Specify the horizontal angle direction for your survey by selecting either Right or Left.
- Vertical System** Specify the vertical system for your survey by selecting Zenith, Nadir, Transit or Vertical Distance.
- Angle System** Specify the angle system for your survey by selecting Azimuth or Bearing.

### 4.2.2 Repetition

The Map/Setup/Repetition option is used to specify the measurement sequence and measurement type for multiple measurement data sets.

- Measurement Sequence** Select the measurement sequence for your survey from BFFB, BFBF or BBFF (where B = Backsight reading and F = Foresight reading) by marking the appropriate selection circle.
- Measurement Type** Select either Single or Average to indicate whether the Foresight distance will be taken from the first foresight shot, or derived from an average of all the foresight shots in the measurement sets. If Single is selected, then a distance measurement is made on the first measurement set only; the other sets just measure angles. If Average is selected, then a distance is recorded with each measurement set.
- Turns** Click on the down arrow to the right of this field for a listing of number of turns. Select the total number of measurement sets to take for the repetition measurement. Each BFFB, BFBF or BBFF measurement sequence involves two turns (sets). Therefore, only an even number of turns is permitted.

### 4.2.3 Display

The Display page is used to toggle on/off and assign colors to your main Traverse, Sideshot, and Stakeout paths. You can also set the Selection Color and Figure line style and color. The display page is accessed when you select Map/Setup/Display or click on the Setup button in the Traverse dialog box.

<b>Selection Color</b>	Click the button to change the color of selected Points and Figures in your survey.
<b>Figure Pattern</b>	Click the Figure Pattern change button to change the line style and color of all figures in your survey.
<b>Traverse Path</b>	Check or uncheck the “Show Path” box to toggle the display of all Traverse Paths in your survey on or off. Click the Change button to change the color of all Traverse Paths.
<b>Side Shot</b>	Check or uncheck the “Show Side Shot” box to toggle the display of all Side Shots in your survey on or off. Click the Change button to change the color of all Side Shots.
<b>Stakeout</b>	Check or uncheck the “Show Stakeout” box to toggle the display of all Stakeouts in your survey on or off. Click the Change button to change the color of the Stakeouts.

#### 4.2.4 Map

The Map page is used to define the zoom factor, number of decimal digits, and Feature/Figure ID type for your Job.

<b>Zoom Factor</b>	The zoom factor reflects the magnitude of the change in scale effected by the zoom-in button. For example, if the zoom-in factor is 2.0, the scale of the Map will be doubled when the zoom-in button is used.
<b>Number of Decimal Digits</b>	The number of decimal digits setting controls how many decimal digits are displayed in the Status Bar, Update Point dialog, Browse Points dialog, Road Property dialog and for all COGO operations.
<b>Feature/Figure ID Type</b>	Select “AlphaNumeric” if you want CogoCAD to create Feature/ Point ID’s that consist of both letters and numbers (e.g. POINT85). Select “Numeric Only” if you want CogoCAD to create Feature/Point ID’s that consist of numbers only (e.g. 85).

#### 4.2.5 Default Coordinate System

This setting defines the default coordinate system to be used when a new Job is created. Click the Change button to bring up the Coordinate System Information dialog, where you can select a different coordinate system.

#### 4.2.6 Curve

The Curve Setup is used to define parameters for the Cogo curve functions.

<b>Translate Curve to Line by Scale</b>	<p>The setting for this option takes effect only if you opt to translate the curves created by the Cogo functions into line figures with new points created at the nodes.</p> <p>The Coarse, Medium, Fine and User selections refer to the number of nodes which will be used to create the Curve Figure. The Coarse setting corresponds to the fewest number of nodes needed to represent the curve, while the Fine setting corresponds to a much larger number of nodes.</p> <p>Example: For a given curve, the Coarse setting may result in 40 nodes in the line and the Fine setting might result in more than 1000 nodes in the line. The User setting allows you to specify the interval between nodes. If your Map distance units are set to feet, an User interval of 1 would be equivalent to 1 node every 1 foot along the line. Please set the desired scale before creating Cogo curves.</p> <p>Please note: the Map distance units may be set using the Unit option under the Map/Coordinate System menu option.</p>
<b>Translate Curves when created by Cogo functions</b>	The curves created by Cogo functions are smooth line figures. If you would like to translate the Cogo curve into a Curve Figure with a point stored at each node, then select <b>Yes</b> for this option. In addition, in the <b>Translate Curve to Line by Scale</b> section, specify how closely the Curve Figure should follow the original curve.

## 4.3 Map/Zoom In

The Map/Zoom In option is used to magnify a particular area of your Job. Once the option is chosen, the mouse pointer will change into magnifying glass. Draw a “rubberband box” around the area you wish to magnify using the mouse. The enclosed area will be magnified to fit the current size of the window. You may magnify an area of the Job further by continuing to click on the left mouse button while magnifying glass icon is displayed. Click on the **right** mouse button to change the magnifying glass icon back to the regular pointer.

This function can also be accessed by clicking on Zoom In icon in the Tool Bar.

## 4.4 Map/Zoom Out

The Map/Zoom Out option is used to decrease the display size of your Job. Each time the Map/Zoom Out option is selected, the display size of your Job will automatically be reduced to one half its current size.

This option can also be accessed using the Zoom Out icon on the Tool Bar.

## 4.5 Map/Zoom Fit

The Map/Zoom Fit option is used to fit your complete Job to the current size of the window. This may either increase or decrease the display size of your data.

This option can also be accessed using the Zoom Fit icon on the Tool Bar.

## 4.6 Map/Add Point

The Map/Add Point option is used to manually add a new point to your Job. There are 2 options under this menu: Add Point/By Mouse Click and Add Point/By Coordinates.

### 4.6.1 Add Point/By Mouse

Click to add a Point Feature, or series of Point Features to your Job. When you select this option, the Topic Name dialog will allow you to create or select the Topic that will contain the added Points. Click on the pull-down arrow to select from a list of existing Topic Names. Available topic names are taken from the active Code List.

**Please note:** The topic name corresponds to the code names used in your Job.

After you select the Topic name, your mouse pointer will change into a crosshair. Move the crosshair to the desired location of the new point and click the left mouse button to add the point. Additional points may be added by repeatedly clicking the left mouse button. Click on the right mouse button when you are finished adding points.

This option can also be accessed using the Add Point icon on the Tool Bar.

### 4.6.2 Add Point/By Coordinate

Select Map/Point/Add Point/By Coordinates to add a Point Feature to your Job by entering coordinates.

When you select this option, the Topic Name dialog will display to allow you to create or select the Topic that will contain the added Points.

After you select the Topic name, the Update points dialog will display to allow you to enter the coordinates of the Point.

Click OK to add the Point.

## 4.7 Map/Add Figure

The Map/Add Figure option is used to create new Figures, view Figure information and edit existing Figures. There are 2 options under the Map/Add Figure menu: Add Figure by Mouse Click, Add Figure by Point List.

### 4.7.1 Add Figure/By Mouse Click

This function allows you to add a new Figure to your Job. A Figure is comprised of individual Points. Points which are part of the Figure are referred to as Components. After selecting Map/Figure/Add Figure/by Mouse Click, the mouse pointer will change to crosshairs. Click the left mouse button on the starting coordinates of the figure, then pull the line (component) to each additional coordinate location and again click the left mouse button. After clicking on the last coordinate location of the new figure, click the **right mouse button** to end the figure.

**Please Note:** You must use existing Points as Components to create the new Figure.

This option can also be accessed using the “Add Figures by Click” icon on the Tool Bar.

### 4.7.2 Add Figure/By Point List

This function allows you to add a new figure to your Job by entering a description of the Figure. The description consists of all Components (Points) that make up the Figure, as well as how each of these Components are connected to each other (Line, Arc, Curve).

When you select Map/Add Figure/By Point List, the Browse Figures dialog will be displayed. Enter a description for the new figure. Click OK. The new figure will be added. Figures are based on existing points in the currently opened map.

#### **Point List Method to Add a Figure:**

When you select Map/Add Figure/By Point List, a figure record is automatically added to the list of existing figures. You may define the new Figure by entering a list of existing point numbers with the proper figure type designation, such as: L:1-5 7 9 6A:10 1. This figure consists of a line joining points 1 2, 3, 4, 5, 7 and 9 in straight line segments and an arc going from point 6 through point 10 to point 1.

#### **Interactive Method to Add a Figure:**

You may use the interactive method to define the components in your figure.

1. The default beginning point number in the Description field is 1. To add point 2 to the figure, click the Type column so the Append button at the bottom of the window is active.
2. Click Append.
3. The Point ID defaults to 1. Change this point number to 2.
4. Or, click the Get Object By Point button to get the point from your map. If you click the Get Object By Browse button, you may select the desired point from the displayed Select Points screen.
5. To add the arc that passes through points 6, 10 and 1, first click the Type column then click Append.
6. Click on the pull-down menu of the newly added point record.
7. Click on Arc.

8. Notice that the Point ID column changes to 3 records filled with the default point number 1. Change these point IDs to 6, 10 and 1.

9. Or, use the Get Object By button to pick the points.

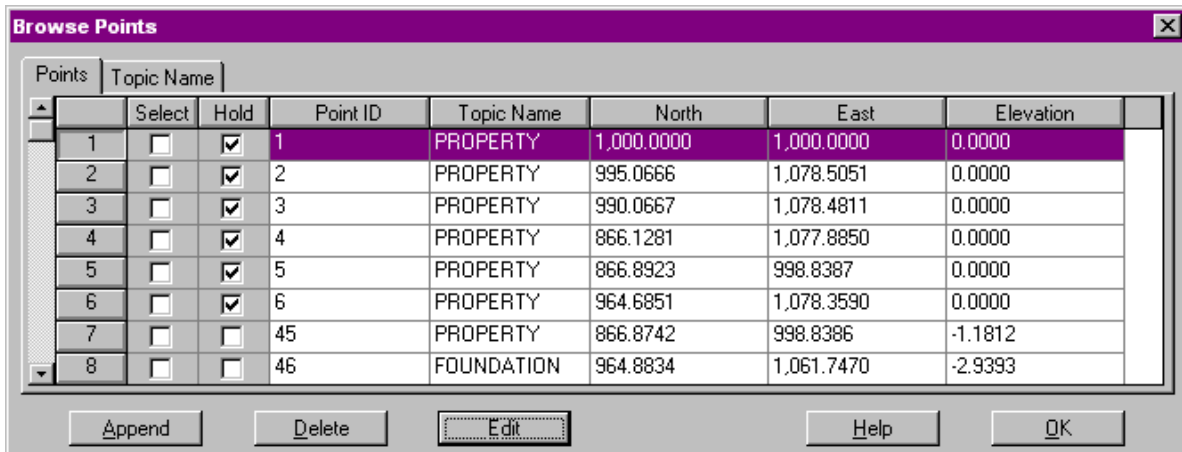
You may add another Figure by clicking the Add button, or simply click OK to exit this screen. The map will show the figure(s) that you have just added.

**Please Note:** You must have Points present in your Job before you can create a new Figure.

## 4.8 Map/Browse/Edit Points

The Map/Browse/Edit Points option displays the coordinates of Points in the Survey file and provides editing functions. When this option is selected, the Browse Points dialog box is displayed. This dialog box has two pages: Point and Topic Name.

**Points page:**



	Select	Hold	Point ID	Topic Name	North	East	Elevation
1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	PROPERTY	1,000.0000	1,000.0000	0.0000
2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2	PROPERTY	995.0666	1,078.5051	0.0000
3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	3	PROPERTY	990.0667	1,078.4811	0.0000
4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	4	PROPERTY	866.1281	1,077.8850	0.0000
5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	5	PROPERTY	866.8923	998.8387	0.0000
6	<input type="checkbox"/>	<input checked="" type="checkbox"/>	6	PROPERTY	964.6851	1,078.3590	0.0000
7	<input type="checkbox"/>	<input type="checkbox"/>	45	PROPERTY	866.8742	998.8386	-1.1812
8	<input type="checkbox"/>	<input type="checkbox"/>	46	FOUNDATION	964.8834	1,061.7470	-2.9393

**Append:** The Append button is used to append points to your Job. The Update Points dialog box is displayed when this option is selected. You can manually input the coordinates for the new Point in the Update Points dialog box.

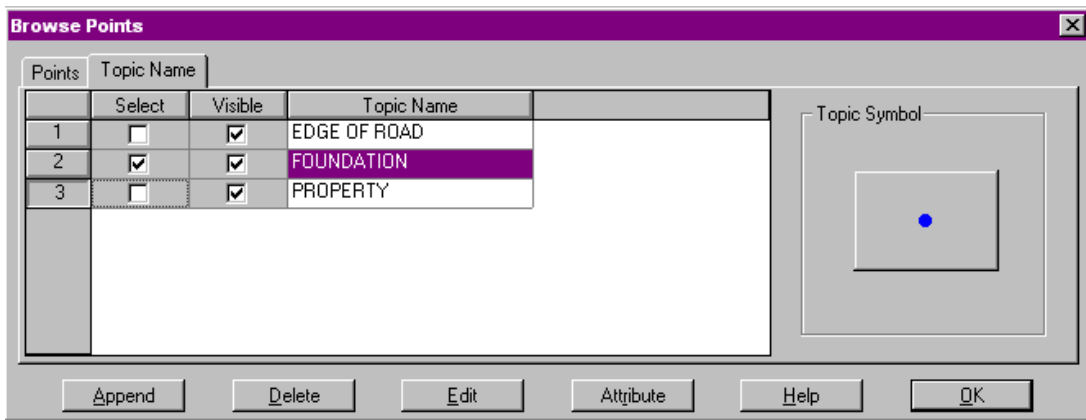
**Delete:** Delete the selected points. You will be prompted to confirm the deletion.

**Edit:** The Edit button is used to edit the selected Points using the functions of the Update Points dialog box. Select a Point (or Points) by marking the Select box for the record. The Update Points dialog box is displayed when this is chosen.

Point information is displayed in this page by individual Points. Points are listed in the order in which they were collected or created. You may select Points in this dialog box, and you may also edit the coordinates of selected Points.

Refer to the Online Manual for more detailed information about each of the columns listed.

**Topic page:**



**Append:** The Append button is used to append new Topics to your Job. All points that have been selected in the Points page of this dialog box will be placed in the new Topic. When you click the Append button, the Topic setup dialog will display to allow you to create the new Topic.

**Delete:** The Delete button is used to delete all Points in the selected Topic. You will be prompted to confirm the deletion.

**Edit:** The Edit button is used to edit Points in the selected Topic using the functions of the Update Points dialog box. Select the Topic by marking the Select box for the Topic name. The Update Points dialog box is displayed when this option is chosen.

**Attribute:** The Attribute button is used to display the Topic Setup dialog. The Topic Setup may be used for Topic management as well as assigning Attributes and Values to the specified Topic.

**Topic Symbol:** Use the Topic Symbol button as a convenient way to quickly manage all of the point symbols for a specific Topic. When you click on this button, the Point Property dialog is displayed allowing you to choose a (or create your own) Point Symbol.

Topic information is displayed in this page by Topic Name. Topics are listed in the order in which they were created. You may select and edit Topics in this dialog box, and you may create new Topics. Available Topic names are taken from the active Code List. When you create new Topics, the first attribute of the Points will be "Description" and is automatically created in the new Topic.

By default, all Points are placed in the default Topic with a blank name.

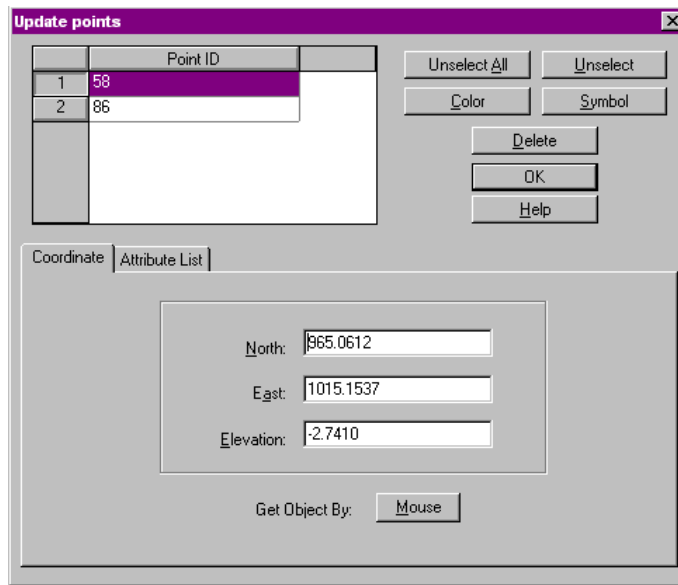
**Please note:** When you delete a Topic, all Points in that Topic are also deleted. You should first create a new Topic for those Points, then delete the old Topic.

**Also note:** Topic names and associated symbology will also be used to generate a "legend" in the Plot Preview screen for printing graphical maps (for Point features only).

Refer to the Online Manual for more detailed information about each of the columns listed.

#### 4.8.1 Update Points Dialog

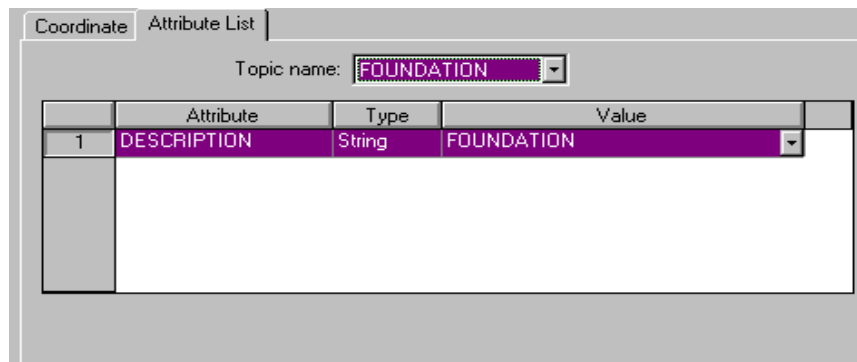
The Update Points dialog box is used to display and edit the coordinates, Attributes, or color/pattern of a Point. The Update Points dialog box is called whenever you double-click on a Point or when you use the Edit button in the Browse/Edit Points dialog box. The Update Points dialog has two pages: the Coordinates Page and the Attributes Page. The Coordinate page of the Update Points dialog box is shown:



To select a Point from this dialog box, click on the Point order number. Refer to the Online Manual for more detailed information about each of the sections shown in the Coordinate screen.

- Unselect All**      The Unselect All button is used to clear all of the Points listed in the Update Points dialog box. This operation does NOT delete any Points from your Map.
- Unselect**        The Unselect button is used to clear the selected Point from the Update Points dialog box. This operation does NOT delete the Point from your Map.
- Color**            Click the Color button to change the Point color. Refer to the Online Manual for more information about the Color Dialog Box.
- Symbol**          Click the Symbol button to change the Point symbol. The Assign Symbols dialog box will be displayed. Refer to the Online Manual for more information about the Assign Symbols Dialog Box.
- Delete**          Click the Delete button to delete the selected Points from your Job. You will be prompted to confirm the delete.
- Get Object by Mouse**      The Get Object by Mouse button is used to change the coordinates of the selected Point. Click the Mouse button and then click any location in the Survey View. The coordinates of the Point will be changed to the coordinates of the clicked location.

Click the Attribute List tab to view information about coordinates:



Refer to the Online Manual for more detailed information about each of the sections shown in the Attribute List screen.



## 4.8.2 Assigning Points to Topics

You can assign groups of Points with common characteristics to Topics. This allows you to work with each group more easily and efficiently. The Topic Name corresponds to the Code Names you entered in the field.

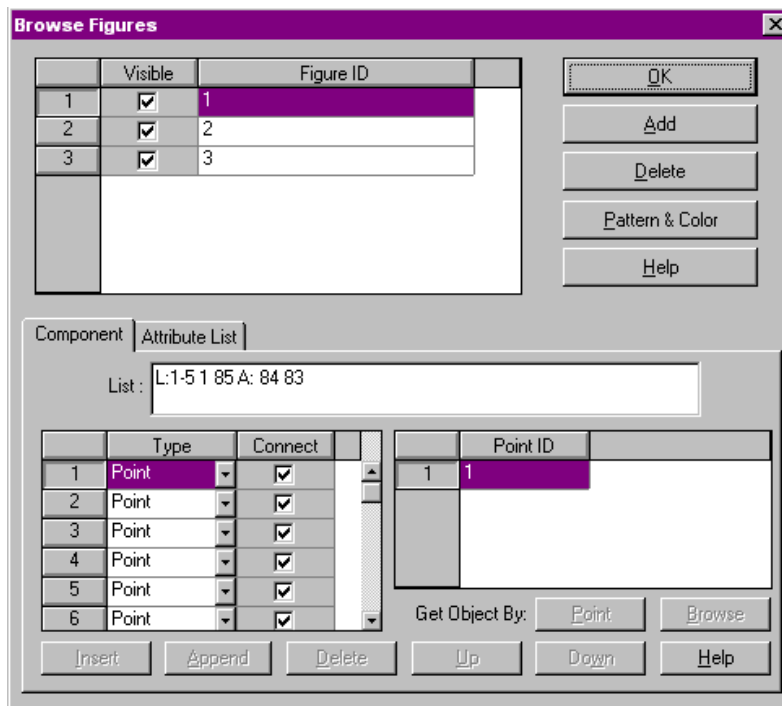
The Topic Name page of the Browse Points dialog gives you access to each Topic (and all the associated Points). From this dialog, you can edit, select and control the display of each Topic. Steps to assign a group of Points to a new Topic:

1. Select (highlight) a group of Points with common characteristics with your mouse.
2. Click the Browse/Edit Points icon or select Map/Point/Browse/Edit Points.
3. Click the Topic Name tab of the Browse Points dialog box
4. Click the Append button to create a new Topic. The Topic Setup dialog box will display.
5. Enter the Topic Name and Attributes for the new Topic.
6. Click the OK button. The new Topic will be created containing all the Points you selected in Step 1.
7. Click on the "Topic Symbol" button to specify the Point Symbol to be used for each Point contained in the newly created Topic (also see Section 4.8).

**Please note:** Topic names and associated symbology will also be used to generate a "legend" in the Plot Preview screen for printing graphical maps (for Point features only).

## 4.9 Map/Browse/Edit Figures

The Map//Browse/Edit Figure option displays the coordinates of Figures in the Survey file and provides editing functions. When this option is selected the following dialog box is displayed:



There are three sections to the Browse Figure dialog box: Figure List, Components, and Attribute List.

## 4.9.1 Figure List

Each of the Figures in the Survey file are listed in this section of the Browse Figures dialog box. The Figures are listed in the order in which they were created or collected. The Figure List section of the Browse Figures dialog box shows the Figure ID number and whether or not the Figure is marked for viewing in the Survey View. For detailed information about the Figure List section, refer to the Online Manual.

- Add** The Browse Figure Add button is used to append a new Figure to the Figure list. By default, the next available integer will be used as the Figure ID. Use the “Get Object by” functions to create the new figure.
- Delete** The Delete button is used to Delete the selected Figure. You will be prompted to confirm the deletion.
- Pattern & Color** When you click on the Pattern & Color button for a Figure, the Shape Properties dialog box will be displayed. The specified pattern and color will be applied to the selected Figure. Refer to the Online Manual for more information about the Shape Properties Dialog Box.

## 4.9.2 Components

Each of the Components (Points) that make up the Figure is listed in this section of the Browse Figures dialog box. The Components section of the Browse Figures dialog box is used to edit existing components by adding, deleting or editing existing Components. For detailed information about the Figure List section, refer to the Online Manual. Click on one of the components listed to access the buttons.

- Insert** The Insert button is used to insert a new Component into the Component list at the position indicated by the mouse cursor. The Get Object By functions are used to select the new Component for the Figure. The new Component will become part of the Figure.
- Append** The Append button is used to append a new Component to the bottom of the Component list. The new Component will become part of the Figure. The Get Object By functions are used to select the new Component for the Figure.
- Delete** The Delete button is used to delete the selected Component from the Component list. The Figure will no longer contain the deleted Component. You will be prompted to confirm the deletion.
- Up** The Up button is used to move the selected Component up one position in the Component list.
- Down** The Down button is used to move the selected Component down one position in the Component list.
- Get Object By** The Get Object By button is used to define a new Component (Point) of a Figure using one of the two options: By Point or By Browse.
- First, select the component (Point) that you wish to edit by clicking on the Select box, or append a new Point Feature. Second, click on the Point ID field of the selected Point. Third, click on the Get Object by button to activate the Get command. You may now select the coordinates of the new Component (Point) as follows:

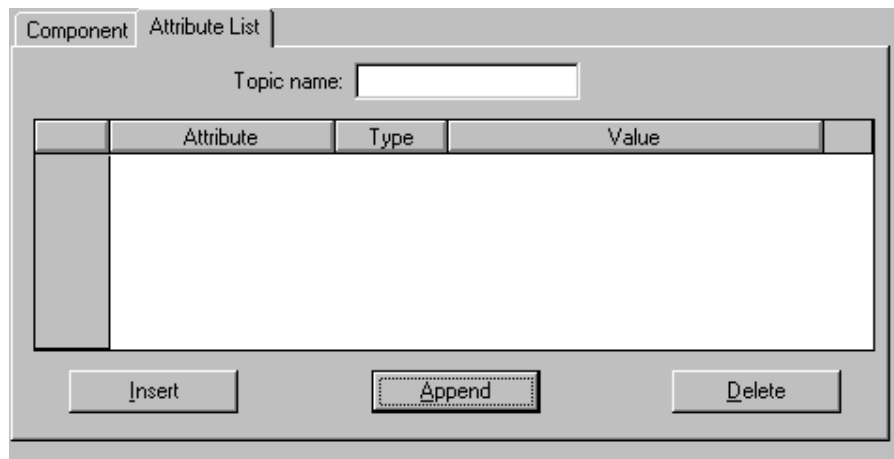
*By Point:* When this option is selected, your mouse pointer will be displayed as a crosshair. Place the crosshair on the desired Point Feature and click the left mouse button. The coordinates of the selected Point Feature will be assigned to the highlighted component.

*By Browse:* When this option is selected, the Select Feature dialog box will be displayed. All of the Point Features in the current Job will be displayed in the dialog box. Highlight the desired Point Feature by clicking on it with the left mouse button, then click **Select**. The coordinates of the selected Point Feature will be assigned to the highlighted component. Refer to the Online Manual for more information about the Select Feature dialog box.

### 4.9.3 Attribute List

In the Attribute Page of the Browse Figure dialog box, the Attributes and Values of the Figure will be listed. In this section, Attributes and Values can be edited, and additional Attributes/Values can be added. You may also specify/edit the Topic Name of the Figure in the Attributes Page.

The Attribute List section of the Browse Figures dialog box is shown:



**Insert** The Insert button is used to insert a new Attribute for the selected Figure into the Attribute list at the current location in the Attribute List. A default Attribute name and type will be entered in the Attribute list at the position indicated by the mouse cursor. The defaults used are: New Attribute and String type. To enter a new Attribute name and Value, place the cursor in the associated field and type in a new name or Value. To select a new Attribute type, use the down arrow key to the right of the field to view the type listing and highlight a new Attribute type.

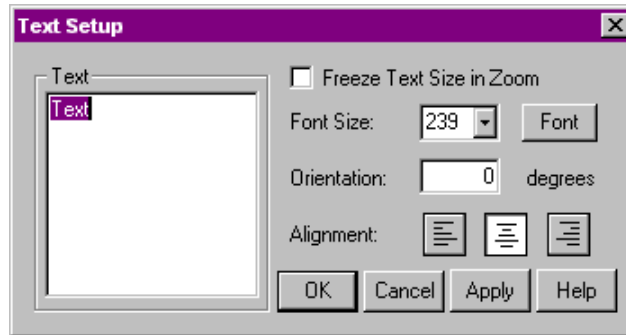
**Append** The Append button is used to append a new Attribute for the selected Figure to the end of the Attribute list. A default Attribute name and type will be entered in the Attribute list at the position indicated by the mouse cursor. The defaults used are: New Attribute and String type. To enter a new Attribute name and Value, place the cursor in the associated field and type in a new name or Value. To select a new Attribute type, use the down arrow key to the right of the field to view the type listing and highlight a new Attribute type.

**Delete** The Delete button is used to delete the highlighted Attribute from the Attribute list. You will be prompted to confirm the deletion.


**Please note:** The Attributes and Values of individual Points can also be edited in the Topic Name section of the Browse Points dialog box (see 4.8 Map/Browse/Edit Points). For detailed information about the Attribute List section, refer to the Online Manual.

## 4.10 Adding Text and Shapes











Use Map/Add Text to place text in your Map. This function is very useful for creating labels, writing notes, etc. When you select Map/Add Text, your mouse pointer will change into a crosshair. Position the crosshair at the location you would like to place the text and then click and drag the mouse to form a rubberband box. The Text Setup dialog box will then be displayed:



This function can also be accessed by clicking on the Add Text icon in the Tool Bar. For more information about the Text Setup dialog box, refer to the Online Manual.

For CogoCAD 2.5, use the Drawing Tool Palette icon found on the Tool Bar for adding text . The Tool Palette provides access to a number of drawing tools for shapes and labels. The functions of the Tool Palette are shown below.

### Tool Palette Functions

rectangle frame			solid square
circle frame			solid circle
polyline			solid polygon
text tool			solid shape
line with arrow			line

## 4.11 Map/Traverse View

Within Quick Traverse, when you create a new Traverse record or select an existing Traverse Path to edit, the Traverse View will be displayed on the bottom of the screen:

	Occupy Station	Slope Distance	Slope Angle	Foresight Angle
1	1	0.0000	0.0000	90.0000°

East: 0.000000      North: 0.000000      Elevation: 0.0000

The initial azimuth reference is NORTH.

Press TAB to go to the next data entry field. After entering data for a record, press the ENTER key at the Foresight Angle field to create the traverse point and add a new traverse record.

CogoCAD does not register a point as an occupied station until the traverse record from that point has been completed and the cursor has advanced to the next record.

For a closed-loop traverse, the first occupied station and the first backsight point must be control points. For an end-ties traverse, the first and last points must be control points. To check the point status, click on the Map menu, select Browse/Edit and click on Points. You can change the point status by using the check box in the Hold column.

Points with a HOLD status will not be adjusted. After an adjustment, all points are marked as HOLD points.

As you enter traverse records, the coordinate location of the current station will be displayed in the bottom of the Traverse View.

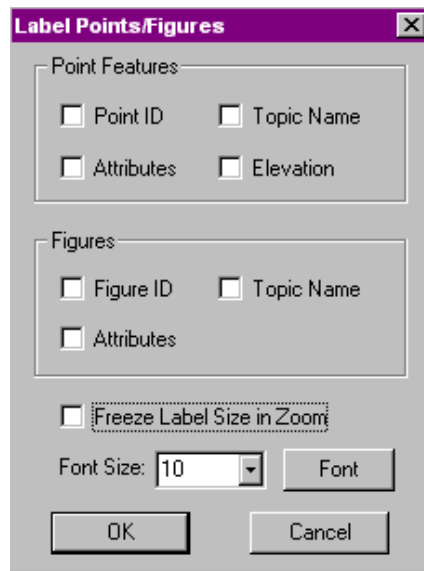
To remove a leg of the traverse from the displayed map, you must delete its corresponding traverse record.

**Please Note:** Some COGO functions may be partially blocked by the Traverse View. To see the COGO View in full, click Map/Traverse View to hide the Traverse View.

Refer to the Online Manual for detailed information about the Traverse View.

## 4.12 Map/Label

The Map/Labels function is used to label Points and Figures in your Job based on user preferences. When you select Map/Labels, the following dialog box will be displayed:



Points can be labeled by: Point ID, Topic Name, Attributes and/or Elevation. Mark one or more of these options to automatically label all Points in your job. If you mark multiple options, each label will be displayed on its own line.

Figures may be labeled by Figure ID, Topic Name and/or Attributes. Mark one or more of these options to automatically label all Figures in your job. If you mark multiple options, each label will be displayed on its own line.

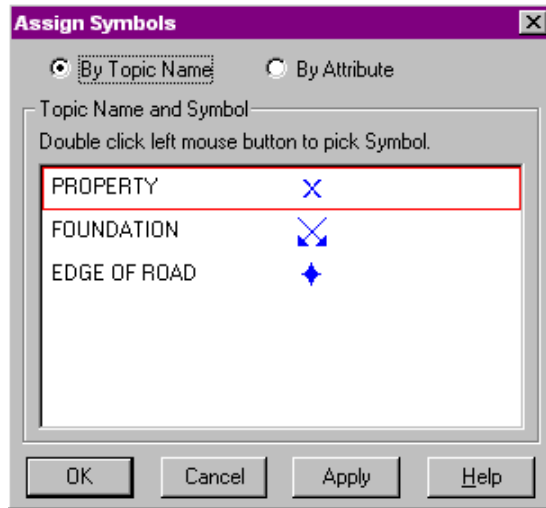
**Please note:** If you mark the Attributes option, the Attribute List dialog will display to let you choose which attributes to include for each topic. For more information about the Attribute List dialog, please refer to the Online Manual.

For more information about Font Labels, please refer to the Online Manual.

- Please Note:** If you make changes to Points/Figures, you must select Map/Labels again for these changes to be reflected in the Labels.
- Also Note:** To select a different Attribute to use, uncheck the Attribute box then re-check it. You can then select a different Attribute.

### 4.13 Map/Assign Symbols

The Map/Assign Symbols function allows you to assign map symbols to Points with common characteristics. When you select Map/Assign Symbols, the following dialog box is displayed:



Symbols may either be assigned by Topic Name or by Attribute. Double-click on a symbol to display the Symbols dialog box. You may then select from the libraries of available symbols or create new symbols. Click the Apply button to apply the current symbol without closing the dialog box. This allows you to assign several different symbols in one session.

**By Topic Name:** The by Topic Name option is used to assign the selected symbol to all Points with the same Topic name.

**By Attribute:** The by Attribute option is used to assign the selected symbol based upon Values for a particular Attribute. Each Point in your Job which meets the Attribute and Value criteria will be assigned the selected symbol.

Steps to assign a symbol by Attribute:

1. Select an Attribute name by pulling down the selection arrow to the right of the first field.
2. Select an operator (e.g. >, <, =, etc.) in the second field in the same manner.
3. Select a value in the third field in the same manner.
4. Click on the OK button.

### 4.14 Map/Refresh

The Map/Refresh option is used to re-draw the map.

## Section 5 - The FieldData Menu

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In this Section, each of the functions under the FieldData menu will be discussed.

### 5.1 FieldData/Job Information

The FieldData/Job Information option is used to define crew and Job Information. When this option is selected, the following dialog box is displayed:

The dialog box titled "Job Information" contains the following fields and values:

- Job Name: C:\cogo25\LOT100.fid
- Date Begin: 02-18-03 19:05:56
- Date End: 02-18-03 19:05:56
- Coordinate name: LOT100.JOB
- Job Crew: JACK & JILL
- Job Dept: (empty)
- Job Desc: 100 22ND ST.  
CUST# MASORC

Buttons at the bottom: OK, Cancel, Help.

The Job Information dialog box is used to establish some "header" information for your Job. You can use your mouse to select a field, or use the TAB key to move from field to field. You can enter up to 62 characters into the Coordinate Name field, 30 characters each into the Job Crew and Job Dept. fields, and up to 125 characters into the Job Desc field. The Job Name may not be edited. You may use the File/Save As function to save your Job under a different name.

### 5.2. FieldData/Raw Data

The FieldData/Raw Data option is used to display the Raw Data sheet along the bottom of the display. The default is for the Raw Data view to be OFF. When the Raw Data View is ON, there will be a selection mark displayed to the left of the Raw Data label in the FieldData menu. To toggle the Raw Data View, pull down the FieldData menu and click on the Raw Data label.

An example of the Raw Data View is shown below. Please refer to the online manual for more details.

Edit		OS	BS/FS	Type	Set	Horizontal	Vertical Dist	Distance	HT	HI	Note
	3	1	46	SS	1/1	299.1278*	-0.8959	21.6513	0.0000	0.0000	<input type="checkbox"/>
Add	4	1	47	SS	1/1	301.4806*	-0.8361	20.2053	0.0000	0.0000	<input type="checkbox"/>
Delete	5	1	48	SS	1/1	300.3778*	-0.8366	19.9621	0.0000	0.0000	<input type="checkbox"/>
	6	1	49	SS	1/1	304.3583*	-0.8417	17.9031	0.0000	0.0000	<input type="checkbox"/>
Note	7	1	50	SS	1/1	305.5528*	-0.8541	18.1677	0.0000	0.0000	<input type="checkbox"/>
Exit	8	1	51	SS	1/1	308.9083*	-0.9021	16.8377	0.0000	0.0000	<input type="checkbox"/>

For Help, press F1      UTM      WGS 84      31      329.4966m      360.3003m

**Edit:** Allows you to edit the current record.

**Add:** Adds a new record in Raw Data View.

**Delete:** Deletes the current record from Raw Data View.

**Note:** Allows you to view and create new notes about the current record.

**Exit:** Exits the Raw Data View and returns to the main CogoCAD window.

## 5.3 FieldData/Adjustment

The FieldData/Adjustment option is used to adjust a traverse and balance any measurement errors, which have occurred. There are two options in the Adjust Traverse dialog box: Setup and Raw Closure.

### Summary of Steps to Adjust a Traverse:

1. Select FieldData/Adjustment.
2. Specify the beginning and ending traverse points. For a closed-loop traverse, the first and last points are the same. For an end-ties traverse, the last point must be a control point.
3. Select adjustment options, then press RAWCLOSURE to see the raw closure data.
4. If it looks good, then press ADJUST to adjust the coordinates.

A closed-loop or end-ties traverse needs to meet certain requirements on how the ending measurements are taken in order to be successfully adjusted. These requirements must be taken into consideration when you are collecting data with the Surveyor's Assistant program in the field.

Please keep the following things in mind:

- Last OS of closed loop traverse with internal BS must be the same as the internal BS.
- Last OS of closed loop traverse with external BS must be the same as the first OS point.
- End-ties traverse must have last OS at a control point.
- Last FS of closed loop traverse with internal BS must be the same as the first OS point.
- Last FS of closed loop traverse with external BS must be the same as the first BS.
- End-ties traverse must end with FS to an azimuth mark.

### 5.3.1 Adjustment Setup

The FieldData/Adjust/Setup option is used to define traverse type and adjustment methods.

When this menu option is selected the following dialog box is displayed:

The screenshot shows the 'ADJUST RAW DATA' dialog box. At the top, there are two dropdown menus for 'Start Point' and 'End Point', both set to '1'. Below these are two tabs: 'Setup' (active) and 'Raw Closure'. The 'Setup' tab contains several sections: 'Traverse Type' with radio buttons for 'Open Traverse', 'Closed Loop' (selected), and 'End Ties'; 'Adjust Method' with radio buttons for 'Compass' (selected), 'Transit', and 'Least Square'; 'Angle Adjust' and 'Elevation Adjust' each with 'Yes' and 'No' radio buttons, both 'No' buttons are selected. At the bottom, there are input fields for 'Tolerance Distance' (32.8084) and 'Tolerance Angle' (10.0000°), and three buttons: 'Adjust', 'Exit', and 'Help'.

**Traverse Type:** Specify the traverse type by choosing selecting Open Traverse, Closed Loop, or End Ties. CogoCAD will automatically select the Traverse Type for you based on your data.



**Adjust Method:** Specify the adjustment method choosing Compass, Transit, or Least Square.

**Angle Adjust:** Specify whether the angles should be adjusted by choosing either Yes or No.

**Elevation Adjust:** Specify whether elevations should be adjusted by choosing either Yes or No.

**Tolerance:** Specify a tolerance for the Distances and a tolerance for the Angles. CogoCAD will confirm if you wish to proceed with the Adjustment if your data is outside the specified tolerance.

After you have selected the adjustment options, click on the RAW CLOSURE tab to view the raw closure data. If the raw closure looks good, click on the ADJUST button to adjust the coordinates.

When you save the job, the adjustment setup and the adjusted coordinates will be saved. The raw data is not affected.

### 5.3.2 Adjust/Raw Closure

The FieldData/Adjust/Raw Closure option displays the results of the raw closure test made using the input in the Setup dialog box. These fields cannot be modified. When this option is selected, the following dialog box is displayed:

Closing Points			
	Northing:	Easting:	Elevation:
Start Point:	-0.0000	100.0000	0.0000
End Point:	226.3803	427.6457	0.0000
Actual Point:	226.3803	527.6457	0.0000

### 5.3.3 Adjust Button

If the raw closure information is satisfactory, click the **Adjust** button to adjust the traverse and sideshots.

For more information about the error summary information, refer to the Online Manual.



## Section 6 - The COGO Menu

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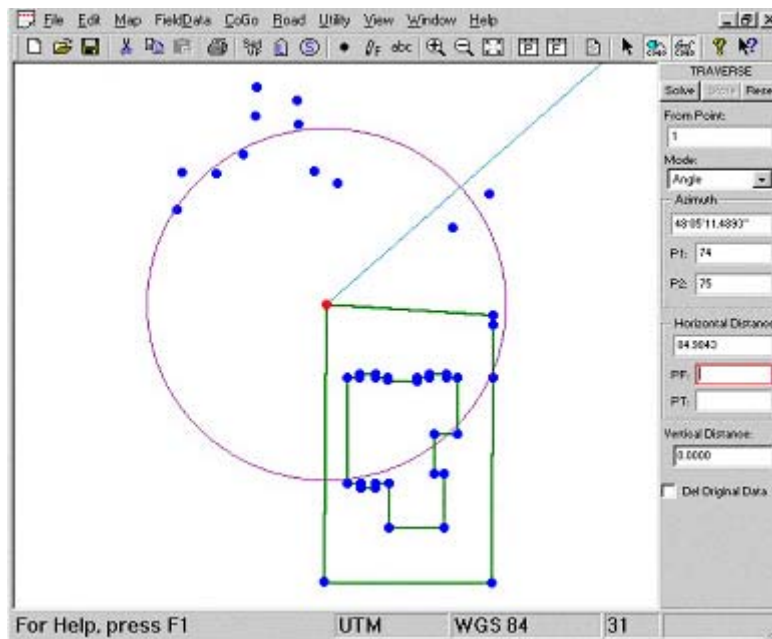
The coordinate geometry (COGO) operations let you define new points by various mathematical techniques. You are probably familiar with most of these functions. Therefore, only a few examples will be covered in this manual. For additional information regarding specific COGO functions please refer to the On-Line manual, accessible through the Help menu. The available COGO functions are described briefly below:

<b>Traverse</b>	Traverse by direction and distance, or by Scale factor.	<b>Inverse</b>	Determine direction and distance between Points.
<b>Scale</b>	Scale Features or Figures to a fixed Point.	<b>2 Point Resection</b>	Use angle and distance data to two known Points to get coordinates of a new Point.
<b>Rotate</b>	Rotate Features or Figures around a fixed Point.	<b>3 Point Resection</b>	Use angle data to 3 known Points to get coordinates of a new Point.
<b>Translate</b>	Move Features, Figures or your entire Job.	<b>Horizontal Curve</b>	Define and place a Horizontal Curve.
<b>Corner Angle</b>	Find the corner angle defined by 3 Points.	<b>3 Point Curve</b>	Define a Horizontal Curve using 3 known Points.
<b>Multiple Points</b>	Define new Points along a line at even intervals.	<b>Curve bet. Tangents</b>	Determine the Curve between two Tangent lines.
<b>Area</b>	Calculate the area of a Figure or Feature.	<b>Curve by Radius</b>	Define a curve by using a known point as the PI.
<b>Direction Cut</b>	Determine the cut Points for a specific area by direction.	<b>Vertical Curve</b>	Define and place a Vertical Curve.
<b>Hinge Cut</b>	Determine the cut Point for a specific area by a hinge Point.	<b>Spiral Curve</b>	Define and place a Spiral Curve.
<b>Station Offset</b>	Create Stakeout Points from your Figures and Features.	<b>Bench mark</b>	Determine the elevation of a Point by measuring to a known Point.
<b>Intersection</b>	Distance, direction and Line intersections.	<b>Earth Work</b>	Compute the volume of a simple shape

For most COGO functions, you may use your mouse to select Features or Figures, and in some cases to specify distance and direction information. You may turn this mouse function ON and OFF using the Cogo Mouse icon in the Tool Bar. The default is for this function to be ON.

### 6.1 COGO/Traverse

This function is used to create a new point by a traverse method. When you select Cogo/Traverse, the following CogoCAD window will be displayed:



**From Point:** Enter the Point Number of the From Point by clicking on it once, or by typing in the Point Number.

**Mode:** Select a Traverse Mode: Angle, Horizontal Angle or Scale Factor.

#### For Angle Mode

1. Enter the Azimuth or Bearing using one of the following methods:
  - Moving your mouse around the From Point
  - Typing the angle with your keyboard
  - Choosing two points (P1 and P2) to define the angle
2. Enter the Horizontal distance from the known point using one of the following methods:
  - Moving your mouse around the From Point
  - Typing the distance with your keyboard
  - Choosing two points (PF and PT) to define the distance. The distance between the PF (From Point) and the PT (To Point) will be applied to the Original From Point for the Traverse.
3. Enter the Vertical distance. A positive number reflects a higher elevation than the known point; a negative number reflects a lower elevation.
4. Click on the Solve button to determine the new point.
5. Click on the Store button to store the solution.

**Please note:** Place a check mark in the box: “Del Original Data” only if you wish to delete the original data point from which the Traverse was taken.

#### For Horizontal Angle Mode

1. Enter the Horizontal distance from the known point using one of the following methods:
  - Moving your mouse around the From Point
  - Typing the distance with your keyboard
  - Choosing two points (PF and PT) to define the distance

2. Enter the Vertical distance. A positive number reflects a higher elevation than the known point, a negative number reflects a lower elevation.
3. Enter the Point Number of the traverse Back Point, another known point, by clicking on it once, or by typing in the Point Number.
4. Enter the horizontal angle at which you wish to move from the line formed by the From Point to the Back Point.
5. Click on the Solve button to determine the new point.
6. Click on the Store button to store the solution.

**For Scale Factor**

1. Enter the Point Number of the To Point which, with the From Point, will form a line. The new point will be placed along this line.
2. Enter a scale factor using the following rules: A scale factor of .5 will place the new point halfway between the From and To points, a scale factor of 1 will place the new point on the To Point, and a scale factor of 2 will place the new point such that the To Point is halfway between the From Point and the new point.
3. If you are working in 3 dimensions, click on the box for Scale with Elev.
4. Click on the Solve button to determine the new point.
5. Click on the Store button to store the solution.

**Please note:** There is a Quick Traverse option under the file menu.

## 6.2 Translate/Rotate/Scale

The Cogo Translate/Rotate/Scale function allows you to perform 3 functions:

**Translate:** The translation operation takes a set of points and moves them a fixed distance in the x, y, and z directions. The distance moved may be specified with relative or absolute quantities.

**Rotate:** The rotation operation turns a Figure or Point around a pivot point. The amount of turn can be specified as an absolute or relative quantity.

**Scale:** In the scale operation, the distance of a Figure or Point to a fixed point is rescaled.

You can use the combined Translate/Rotate/Scale function to transform your job from one coordinate system to another if you know:

- The displacement of the origin of one system with respect to the other
- The orientation of one system with respect to the other and
- The length conversion scale factor.

When you select Cogo/Translate/Rotate/Scale, the following COGO View will be displayed:



### Steps to use the Translate/Rotate/Scale function:

**Target Shapes:** Click the Points or Figures you wish to select. As you click each Point or Figure, its ID will be displayed in the Target Shapes box. You can also click the Add button to select all Points/Figures that are highlighted in the Survey View.

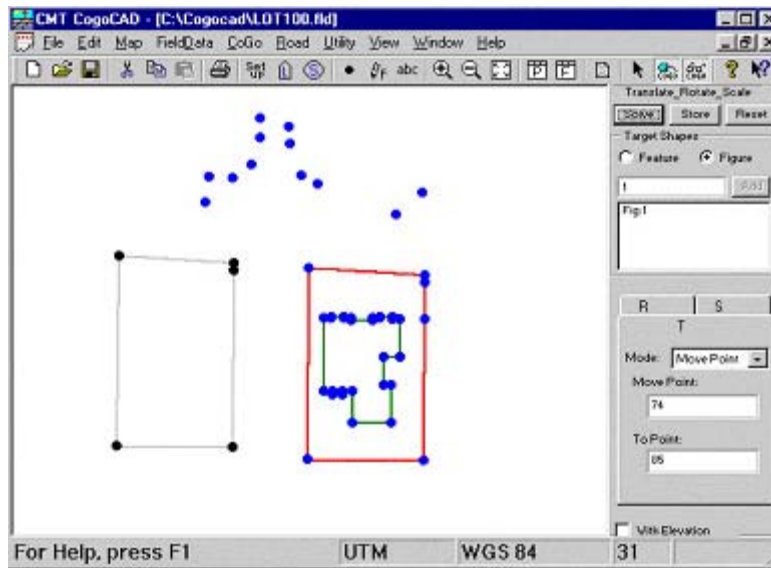
To add a group of points or figures to the Target Shapes list, first click on the Target Shapes field to highlight it. Click the Select Mode (arrow) icon. Use the mouse to drag a rubberband box around the items of interest. Click the Add button. All the highlighted points and figures will be added to the target list.

### T/R/S:

- Click on the T tab to use the Translate function.
- Click on the R tab to use the Rotate function.
- Click on the S tab to use the Scale function.

## 6.2.1 Translate

The translation operation takes a set of points and moves them a fixed distance in the x, y, and z directions. The distance moved may be specified with relative or absolute quantities. When you click the Translate tab, the following COGO View will be displayed.



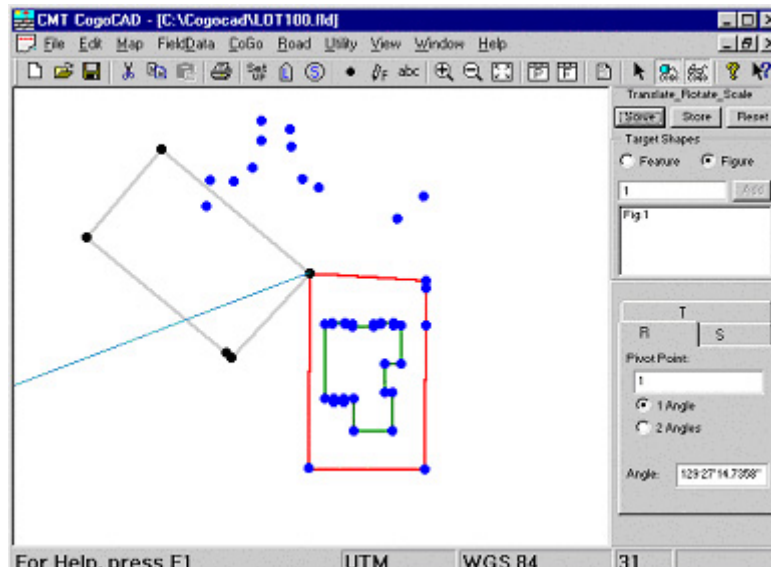
Some useful applications for the Translate function:

- You can easily relocate your job with an assumed origin of 1000,1000,0 to the actual location.
- You can easily change the elevation of all the points in your job.
- You can replicate a figure. Do not mark the "Delete original data" option so that the original figure stays intact when the translated figure is stored.

Please refer to this section in the CogoCAD online manual for an example on how to use this function.

## 6.2.2 Rotate

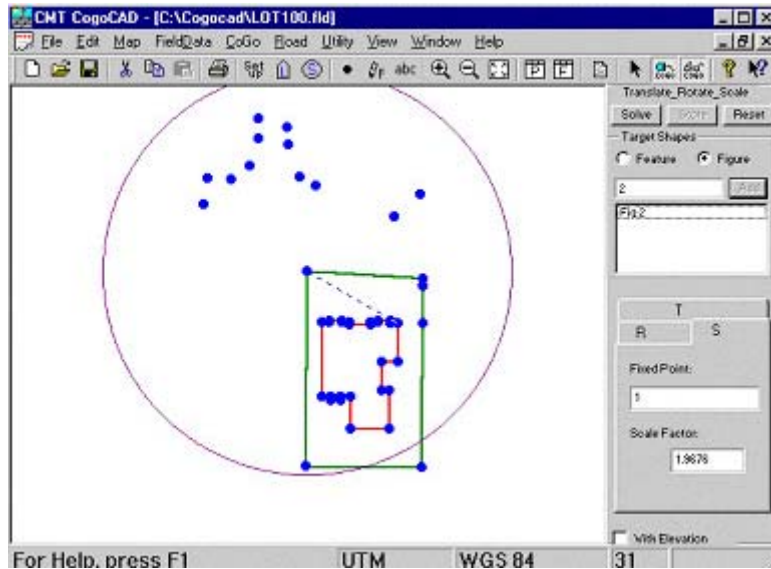
The rotation operation turns a Figure or Point around a pivot point. The amount of turn can be specified as an absolute or relative quantity. When you click the Rotate tab, the following COGO View will be displayed:



Please refer to this section in the CogoCAD online manual for an example on how to use this function.

## 6.2.3 Scale

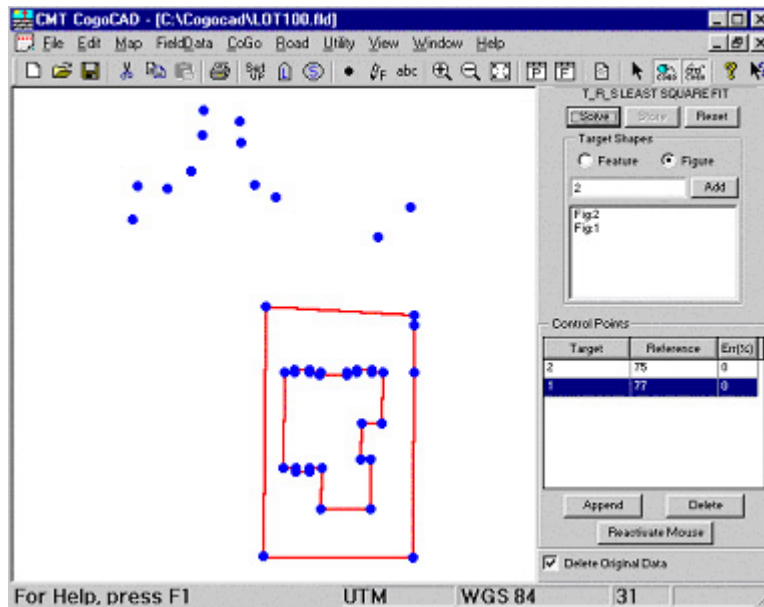
In scaling, the distance of a Figure or Point to a fixed point is rescaled. When you click the Scale tab, the following COGO View will be displayed.



Please refer to this section in the CogoCAD online manual for an example on how to use this function.

### 6.3 T/R/S Least Square Fit

The TRS-LS Fit function is useful when you need to adjust the job with respect to known bench marks, or when you need to combine the data points from 2 jobs that have been collected in two different coordinate systems. When you click Cogo/T/R/S/ Least Square Fit, the following COGO View is displayed:



#### Steps to use the T/R/S Least Square Fit function:

**TARGET SHAPES:** Click the Points or Figures you wish to select. As you click each Point or Figure, its ID will be displayed in the Target Shapes box. You can also click the Add button to select all Points/Figures that are highlighted in the Survey View.

To add a group of points or figures to the Target Shapes list, click on the Target Shapes field to highlight it. Click the Select Mode (arrow) icon and then use the mouse to drag a rubber-band box around the items of interest. Click the Add button. All the highlighted points and figures will be added to the target list.



**CONTROL POINTS:** Enter each Control Point pair using the following steps:

- A. Click in the Target field
- B. Select the Target Control Point by left-clicking over the Point or typing the Point ID in the Target field
- C. Click in the Reference field to the right of the Target field
- D. Select the Reference Control Point by right-click over the Point or typing the Point ID in the Reference field

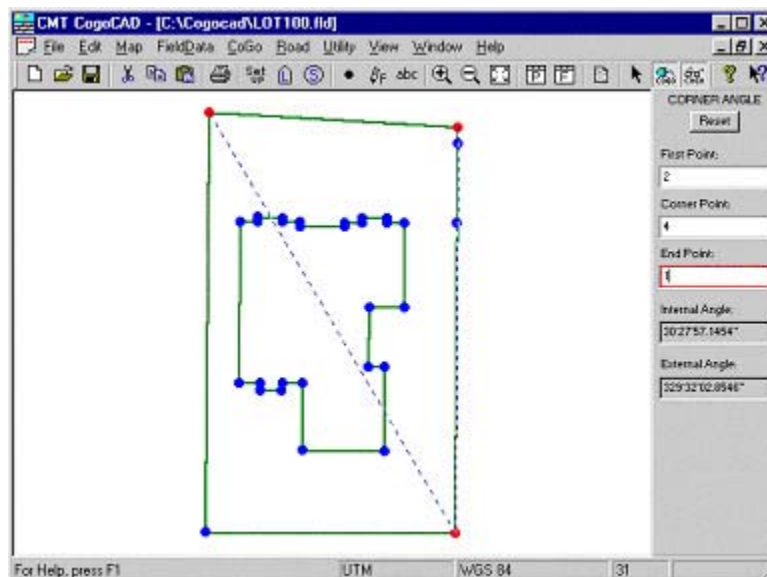
Any error will be reported in the Err(%) field

- Click SOLVE to adjust the Target Features (Automatic Translate/Rotate/Scale).
- Click STORE to save the adjusted coordinates of the Target Features.

Please refer to this section in the CogoCAD online manual for an example on how to use this function.

## 6.4 Corner Angle

Use this function to calculate the angle between two points using a third point as your corner/hinge point. When you select COGO/Corner Angle, the following COGO View will be displayed:



**First Point:** Enter the Point Number of a point on the first leg of the angle to be computed by clicking once on the point, or by typing in the Point Number.

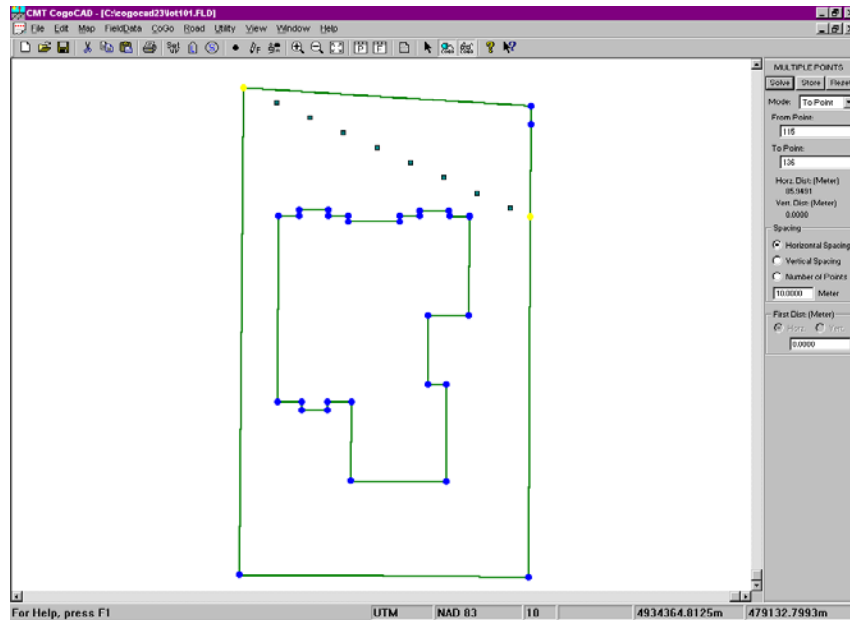
**Corner Point:** Enter the point number of the corner/hinge point by clicking once on the point, or by typing in the Point Number.

**End Point:** Enter the point number of a point on the second leg of the angle to be computed by clicking once on the point, or by typing in the Point Number.

CogoCAD will automatically compute the internal and external corner angle for you.

## 6.5 Multiple Points

The Cogo/Multiple Points function is used to generate a series of Points along a line formed by two existing Points. You may specify the desired number of points or the desired spacing interval between the new points. CogoCAD will calculate the positions for you based on the most recent entry of the specifications. When you select Cogo/Multiple Points, the following COGO View is displayed.



**From Point:** Enter the Point Number which will define the starting Point of the line along which the new points will be generated by clicking once on the point, or by typing in the Point Number.

Select the Mode you wish to use: **To Point** or **Angle**.

### For To Point mode:

1. To Point: Enter the Point Number which will define the ending Point of the line along which the new points will be generated by clicking once on the point, or by typing in the Point Number.
2. Enter the number of new Points that you would like to create along the line defined by the From and To Points. CogoCAD will then calculate the interval between the new Points. Alternatively, you may enter the Horizontal or Vertical spacing between the new Points and CogoCAD will determine the number of new Points for you.
3. Enter the distance along the line, from the From Point, that you would like to place the first new Point, if different than the Horizontal spacing.
4. Click the Solve button to calculate the new points.
5. Click the Store button to store the new points.

### For Angle mode:

1. Enter the Azimuth or Bearing using one of the following methods:
  - Moving your mouse around the From Point.
  - Typing the angle with your keyboard.
  - Choosing two points (P1 and P2) to define the angle.
2. Interval: Enter the distance interval between the new points.
3. Offset: Enter the distance offset for the new points (positive value for right offset, negative value for left offset).
4. # of Points: Enter the number of new points to be created.

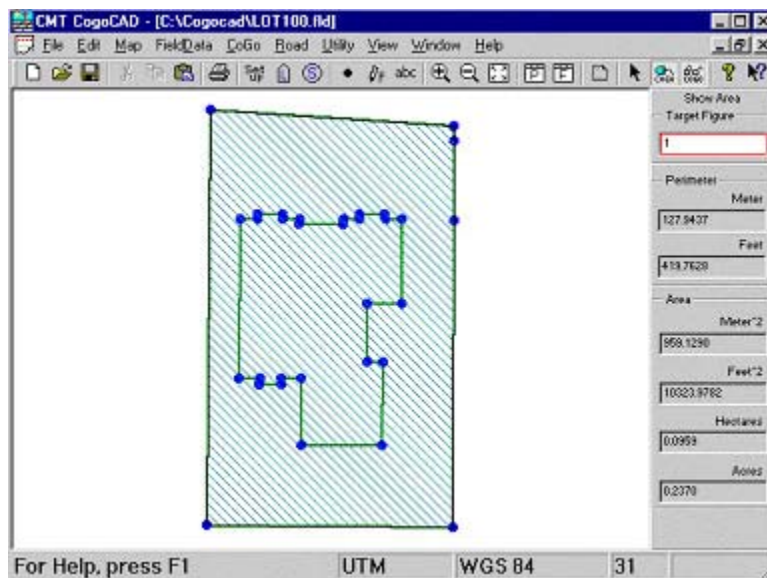
5. First Dist.: Enter the distance from the From Point to the first new point (zero means the first new point is the same as the From Point).
6. Click the Solve button to calculate the new points.
7. Click the Store button to store the new points.

## 6.6 Area

The Area functions can be used to show the area of a region, as well as compute coordinates that enclose a region with a specified area. The options available for Area operations are Area, Direction Cut and Hinge Cut.

### 6.6.1 Show Area

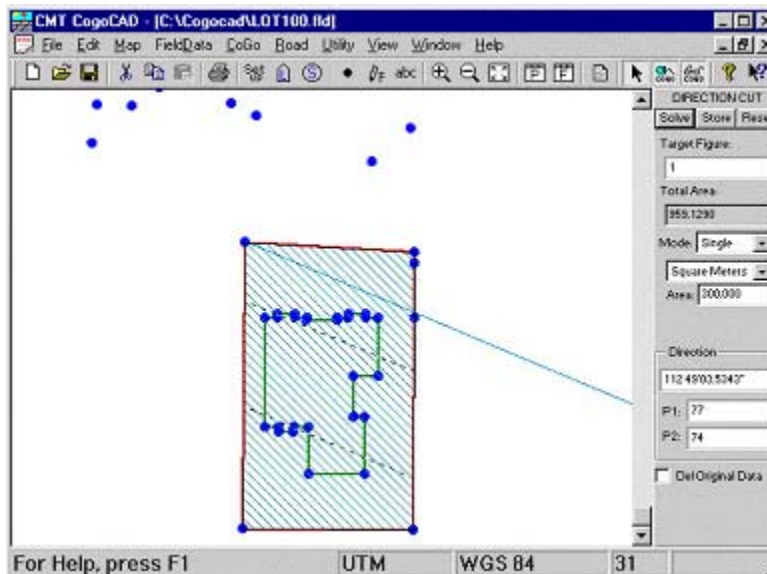
This function takes a Figure and computes the area for the enclosed region in that Figure. When you select COGO/AREA, the following COGO View is displayed:



**Figure/Feature:** Select the Target Figure with your mouse or enter the Figure ID with your keyboard. CogoCAD will automatically compute the area and display it for you in Sq. Feet, Sq. Meters, Hectares and Acres.

### 6.6.2 Direction-Cut Area

Direction-cut calculates the location of two new points on a Figure that define a line delimiting a region of a specified size using a specified direction as a reference. When you select COGO/DIRECTION CUT, the following COGO View will be displayed:



**TARGET FIGURE:** Enter the ID of the Figure you will be working with by clicking once on the Figure, or by typing in the ID. The Total Area of the selected Figure will be displayed.

**MODE:** Select Single to calculate points for a single cut. Select Multiple to calculate points for multiple cuts.

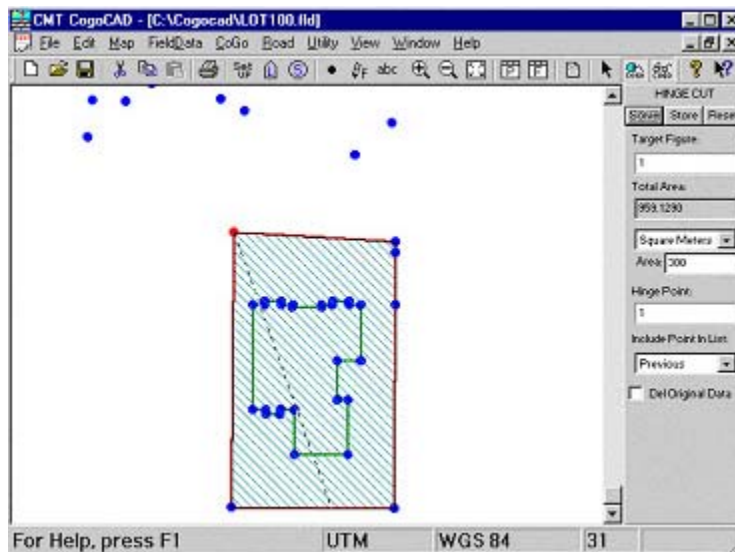
**AREA:** Enter the area that you would like to determine within the Figure. Choose from Sq. Feet, Sq. Meters, Hectares and Acres.

**DIRECTION:** Enter the direction using one of the following methods:

- Moving your mouse around the From Point
- Typing the angle with your keyboard
- Choosing two points (P1 and P2) to define the angle
- Click the Solve button to determine the solution. There will be two solutions.
- Click the Store button to store the solution points.

### 6.6.3 Hinge-Cut Area

Hinge-cut Area calculates the location of a new point that delimits a region of a specific size when a line is drawn from a fixed point (the hinge point) to the new point. When you select COGO/HINGE CUT AREA, the following COGO View will be displayed:



**TARGET FIGURE:** Enter the ID of the Figure you will be working with by clicking once on the Figure, or by typing in the ID. The Total Area of the selected Figure will be displayed.

**AREA:** Enter the area that you would like to determine within the Figure. Choose from Sq. Feet, Sq. Meters, Hectares and Acres.

**HINGE POINT:** Enter the Point Number of the hinge point by clicking once on the Point, or by typing in the Point Number. This point will be the origin of the line that encloses the specified area.

**INCLUDE POINT IN LIST:** Select Previous or Next. Selecting Previous will include the node previous to the Hinge Point within the enclosed area. Selecting Next will include the node after the Hinge Point within the enclosed area.

Click the Solve button to determine the second point which forms the line enclosing the specified area.

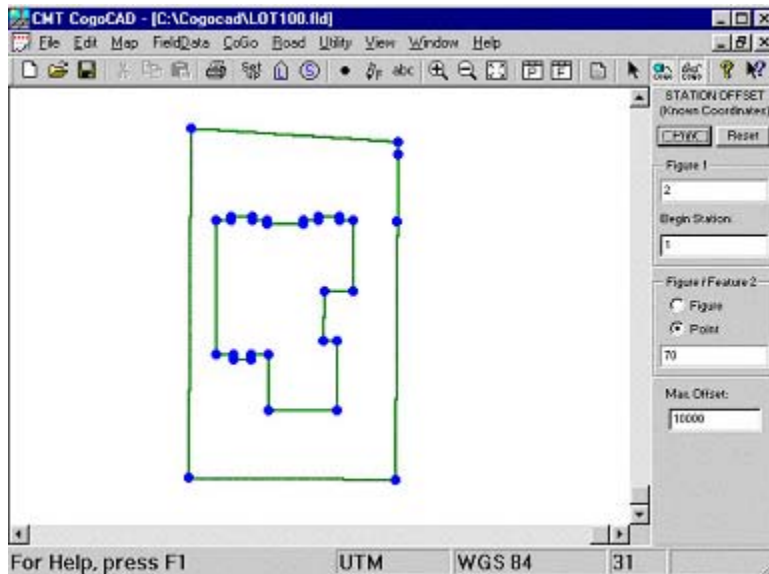
Click the Store button to store the solution point.

## 6.7 Station Offsets

Given a set of points which defines a centerline either by a defined figure or by a Point, you can define the coordinate values of new points with a defined offset from the centerline. You may perform station offsets by selecting Station Offset from the COGO Menu. There are four options from which to select: Known Station and Offset, Known Coordinates, Known Offset and Known Measurement.

### 6.7.1 Known Station and Offset

This routine enables you to calculate the coordinates of a new point by specifying a known station on a Figure and then applying an offset to that station. When you select COGO\STATION OFFSET/KNOWN STATION and OFFSET, the following COGO View is displayed:



**TARGET FIGURE:** Enter the ID of the Figure you will be working with by clicking once on the Figure, or by typing in the ID.

**BEGIN STATION:** Enter the station value of the first point of the Figure specified above. This may be an arbitrary number assigned to the first point. Subsequent stations are automatically set up at intervals of one unit of distance measure, such as 1 foot or 1 meter. Their station values are assigned accordingly.

**STATION:** Enter the station value of the point of interest in the Figure specified above.

**OFFSET:** Enter the offset of the new point from the Figure. That is, how far from the Figure will the new point be.

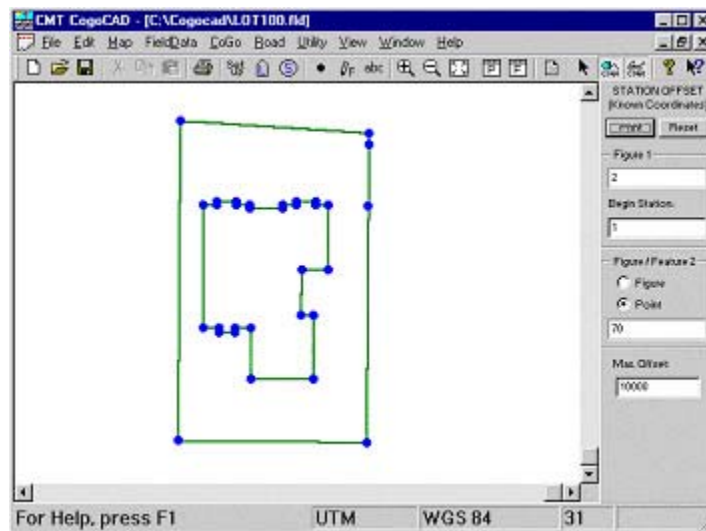
**DIRECTION:** Enter the direction, left or right, of the offset w.r.t. the direction of increasing station numbers.

Click the Solve button to determine the new Point.

Click the Store button to store the new Point.

## 6.7.2 Known Coordinates

This routine determines from the known coordinates of an offset point its station value and offset value. When you select COGO/STATION OFFSET/KNOWN COORDINATES, the following COGO View is displayed:



**FIGURE 1:** Enter the ID of the Figure you will be working with by clicking once on the Figure, or by typing in the ID.

**BEGIN STATION:** Enter the station value of the first point of the Figure specified above. This may be an arbitrary number assigned to the first point. Subsequent stations are automatically set up at intervals of one unit of distance measure, such as 1 foot or 1 meter. Their station values are assigned accordingly.

**FIGURE / FEATURE 2:** Enter the ID of the second Figure or Point feature with which you will be working. This will be the Point feature or Figure for which you will be determining the offset value.

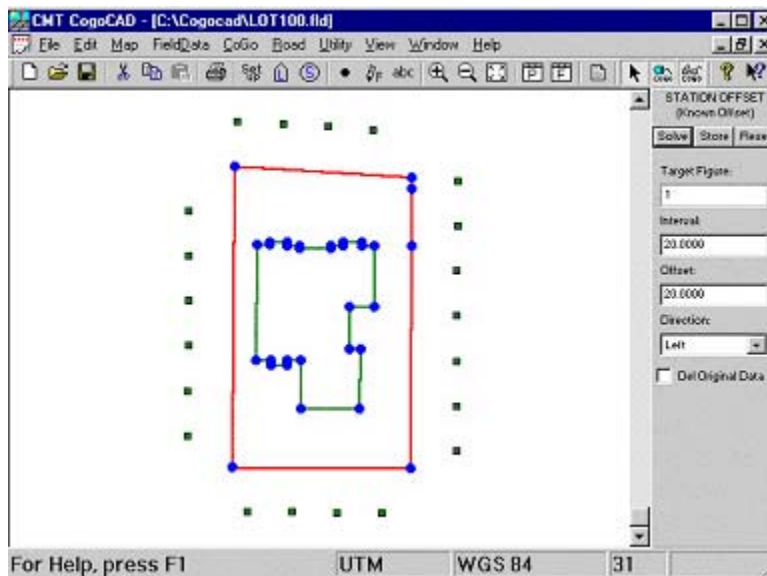
**MAX OFFSET:** Enter the maximum allowable offset. This value may limit the possible solutions, as it cannot be exceeded.

Click the **Print** button to display a text report. Click on the Print button on this display to print a text report of the offset data. A sample printout is shown below:

STATION AND OFFSET OF POINT TO FIGURE			
POINT	STATION	OFFSET	ELEVATION
70	12.5684	-28.5563	-2.7110
70	88.1238	-40.9931	-2.7110
70	179.1629	-45.4572	-2.7110
70	215.7581	18.9530	-2.7110
70	234.8013	0.0000	-2.7110

### 6.7.3 Known Offset

The Known Offset function is used to create new Points which are offset from an existing Figure. When you select COGO/STATION OFFSET/KNOWN OFFSET, the following COGO View will be displayed:



**TARGET FIGURE:** Enter the ID of the Figure you will be working with by clicking once on the Figure, or by typing in the ID.

**INTERVAL:** Enter the interval at which you would like to place the offset points.

**OFFSET:** Enter the distance at which you would like to offset the new points from the Figure or Feature.

**DIRECTION:** Enter the direction of the offset: Right, Left, Center, or R+L+C (all three). The direction of the offset is defined w.r.t. the direction of increasing station numbers.

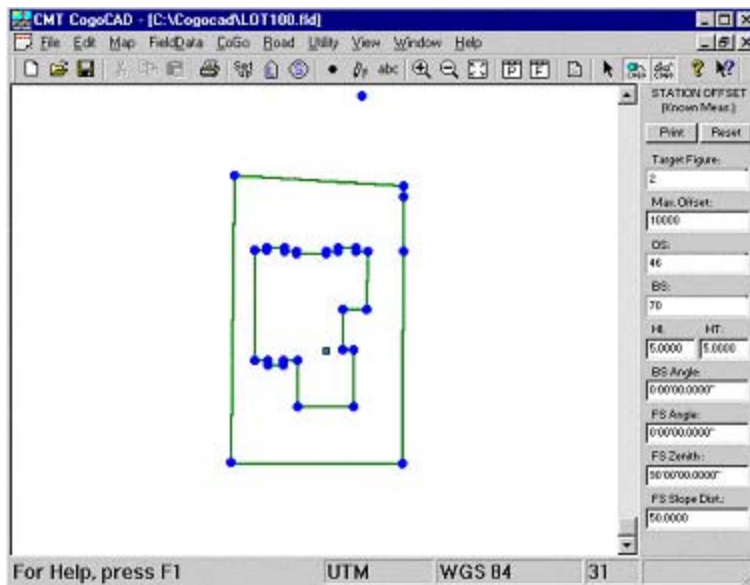
Click the Solve button to determine the locations of the offset points.

Click the Store button to store the new points.



## 6.7.4 Known Measurements

The Known Measurement function uses known measurement information to determine Station and Offset information from the selected Figure. When you select COGO/STATION OFFSET/KNOWN MEASUREMENT, the following COGO View will be displayed:



**TARGET FIGURE:** Enter the ID of the Figure you will be working with by clicking once on the Figure, or by typing in the ID.

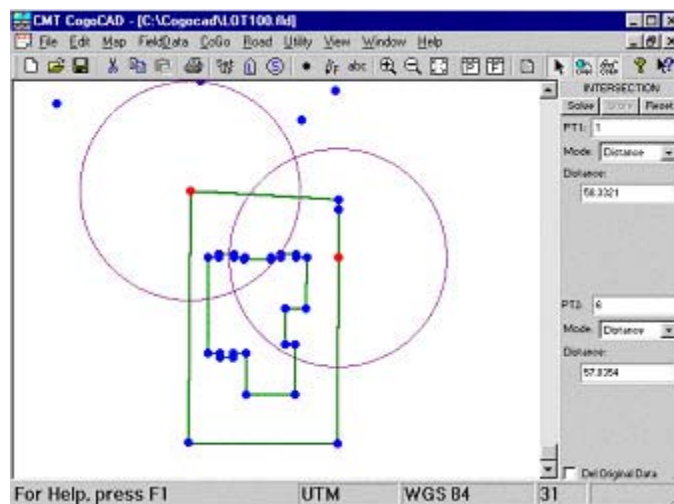
**MAX. OFFSET:** Enter the maximum allowable offset. This value may limit the possible solutions, as it cannot be exceeded.

**OS, BS:** Enter the OS Point and BS Point that you are using to take your measurements.

**HI, HT, etc:** Enter the measurement data.

## 6.8 Intersection

COGO Intersection takes two points and a direction (and optional offset) or distance from each to calculate the point of intersection. When you select COGO/INTERSECTION, the following COGO View will be displayed:





**PT1:** Enter the Point Number of the first known point by clicking once on the Point, or by typing in the Point Number.

**MODE:** Specify the Mode of Intersection for the first known point: Distance or Angle.

Input the Distance, Bearing or Azimuth (and optional offset).

**PT2:** Enter the Point Number of the second known point by clicking once on the Point, or by typing in the Point Number.

**MODE:** Specify the Mode of Intersection for the second known point: Distance or Angle. Note that the Mode can be different for each known Point.

Input the Distance, Bearing or Azimuth (and optional offset).

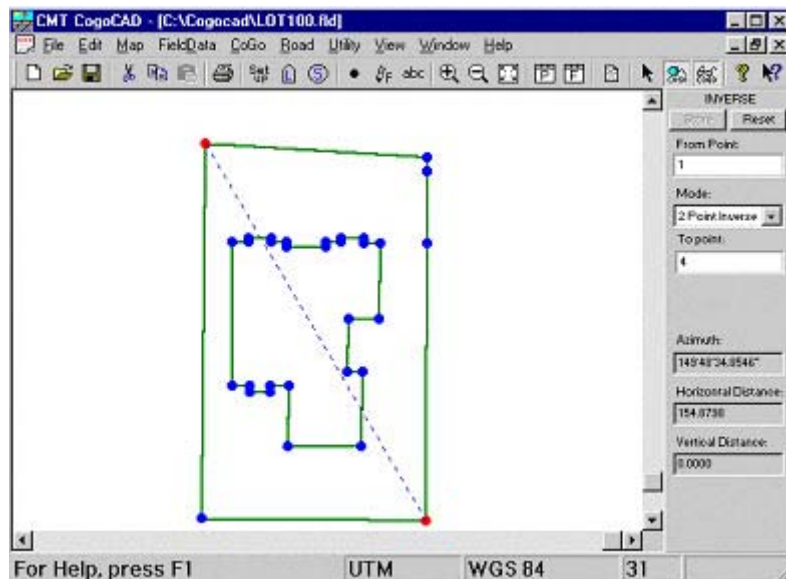
Click on the Solve button to calculate the intersection Point(s). Some intersections may have two solutions.

Click on the Store button to store the solution Point(s).

## 6.9 Inverse

Use COGO Inverse to show the direction and distance between two points or to define the perpendicular displacement from a point to a line. No points are created in the process.

When you select COGO/INVERSE, the following COGO View will be displayed:



**FROM POINT:** Enter the Point Number of the From Point by clicking once on the Point, or by typing in the Point Number.

**MODE:** Select the Mode: 2 Point Inverse or Inverse to Line.

**TO POINT:**

- **For 2 Point Inverse**, enter the Point Number of the To Point by clicking once on the Point, or by typing in the Point Number. CogoCAD will automatically compute the Angle (Bearing or Azimuth), Horizontal Distance and Vertical distance between the two points.
- **For Inverse to Line**, enter the Point Number of two points that define the line by clicking once on each Point, or by typing in the Point Number of each. CogoCAD will automatically compute the Angle (Bearing or Azimuth), Horizontal Distance and Vertical distance between the From Point and the new point.

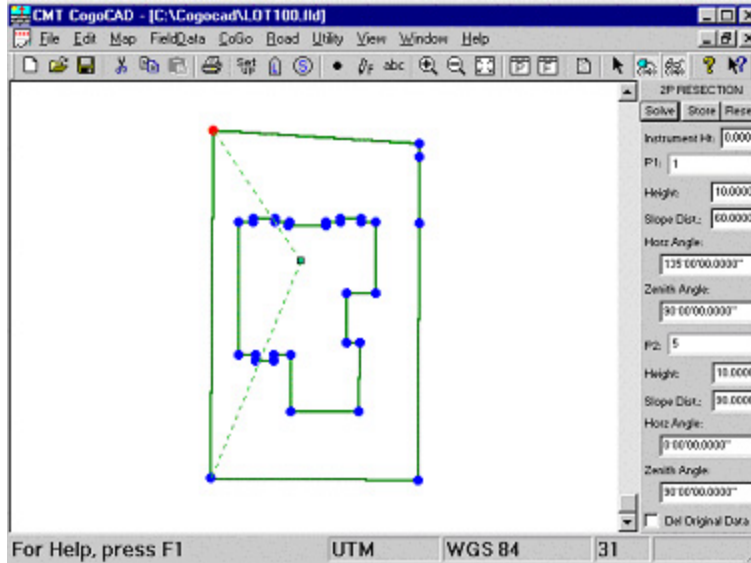
**Please note:** For Inverse to Line, click on the Store button to store the solution point.

## 6.10 Resection

Two types of resection may be performed: 2-Point resection (requiring a pair of angle and distance measurements) and 3-Point angle resection (requiring three angle measurements). In each of these cases, the point of interest is an unknown position, and then distance and angle measurements or three angle measurements are made to known points to determine the position of the point of interest. In the case of 2-point resection, the elevation of the unknown point is also determined. Also, the precision of the solution is shown to permit you to verify the accuracy of the measurements.

### 6.10.1 2-Point Resection

2-Point resection is used to determine your position when angle and distance measurements can be made to two points with known coordinates. When you select COGO/2 POINT RESECTION, the following COGO View will be displayed:



Steps to use the Two Point Resection function:

1. **INSTRUMENT HT:** Enter the Instrument Height.
2. **P1:** Enter the Point Number of the first known point by clicking on the point once or by typing in the Point Number.
3. **HEIGHT:** Enter the Height of Target for the first point.
4. **SLOPE DIST.:** Enter the Slope Distance to the first point.
5. **HORZ ANGLE:** Enter the Horizontal Angle to the first point.
6. **ZENITH ANGLE:** Enter the Zenith Angle to the first point.
7. **P2:** Enter the Point Number of the second known point by clicking on the point once or by typing in the Point Number.
8. **HEIGHT:** Enter the Height of Target for the second point.
9. **SLOPE DIST.:** Enter the Slope Distance to the second point.
10. **HORZ ANGLE:** Enter the Horizontal Angle to the second point.

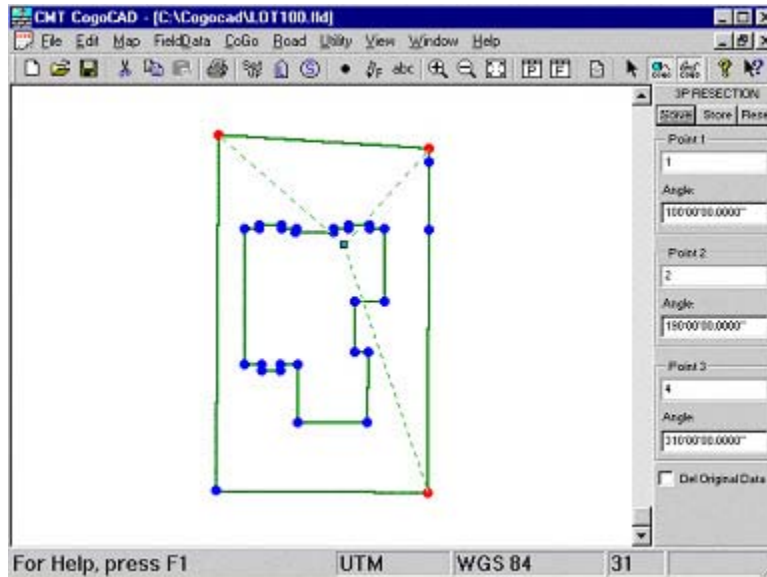
11. **ZENITH ANGLE:** Enter the Zenith Angle to the second point.

Click on the SOLVE button to determine the solution. If an exact solution is not available, a precision indicator will be displayed, with higher numbers representing higher precision. If no solution is available, you will be prompted.

Click on the STORE button to store the solution point.

### 6.10.2 3-Point Angle Resection

3-Point Angle resection allows you to determine a location by sighting three known points and measuring the angle from each of them. When you select COGO/3 POINT RESECTION, the following COGO View will be displayed:



Steps to use the Three Point Resection function:

1. **POINT 1:** Enter the Point Number of the first known point by clicking once on the point, or by typing in the Point Number.
2. **ANGLE:** Enter the Horizontal Angle to the first known point.
3. **POINT 2:** Enter the Point Number of the second known point by clicking once on the point, or by typing in the Point Number.
4. **ANGLE:** Enter the Horizontal Angle to the second known point.
5. **POINT 3:** Enter the Point Number of the third known point by clicking once on the point, or by typing in the Point Number.
6. **ANGLE:** Enter the Horizontal Angle to the third known point.

Click on the SOLVE button to determine the solution. If an exact solution is not available, a precision indicator will be displayed, with higher numbers representing higher precision. If no solution is available, you will be prompted.

Click on the STORE button to store the solution point.

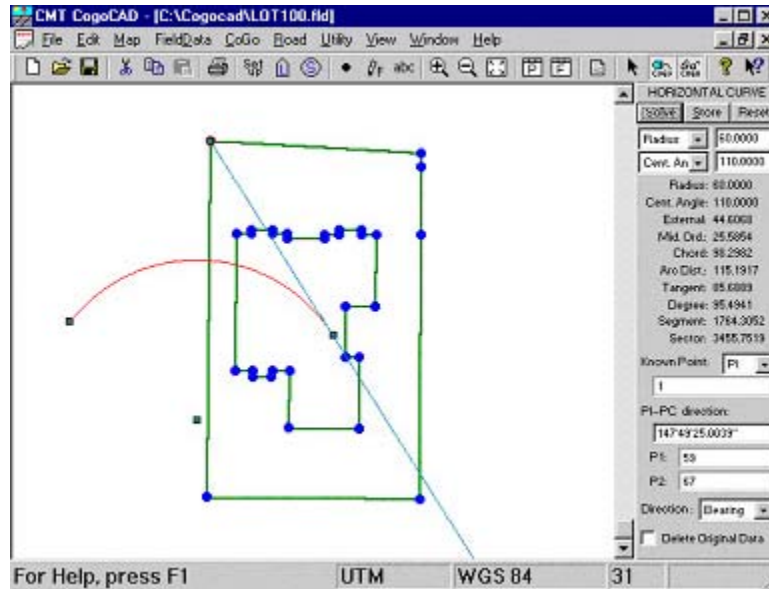
**Please Note:** This method does not solve for the elevation of the unknown location.

## 6.11 Curves

CogoCAD supports three fundamental types of curves. The curve solutions supported are Horizontal Curves, Vertical Curves and Spiral Curves.

### 6.11.1 Horizontal Curves

The Horizontal Curves operation permits you to create horizontal curves from some known data. When you select COGO/HORIZONTAL CURVE, the following COGO View is displayed:



For a horizontal curve, the following terms are used to specify the reference and solution points: PI, PC, PT, and RP.

The PI is the point of intersection; this is the point where the curve tangents intersect. The PC is the point of curvature, or where the curve begins. The PT is the point of tangency, or where the curve ends. The RP is the radius point, i.e. the center of curvature of the curve described.

There are eight different components that may be used to define a curve. These components are defined below:

**RADIUS:** The distance from the radius point (RP) to PC or PT

**CENTRAL ANGLE:** The angle between the lines PC-RP and RP-PT

**EXTERNAL:** The distance from PI to where the line RP-PI intersects the arc PC-PT

**MIDDLE ORDINATE:** The distance from where the line RP-PI intersects the line PC-PT to where the line RP-PI intersects the arc PC-PT

**CHORD:** The straight-line distance from PC to PT

**ARC:** The arc distance from PC to PT

**TANGENT:** The distance from PC to PI (or from PI to PT)

**DEGREE:** The angle subtended at RP by a 100-ft long arc on the arc PC-PT

Steps to use the Horizontal Curve function:

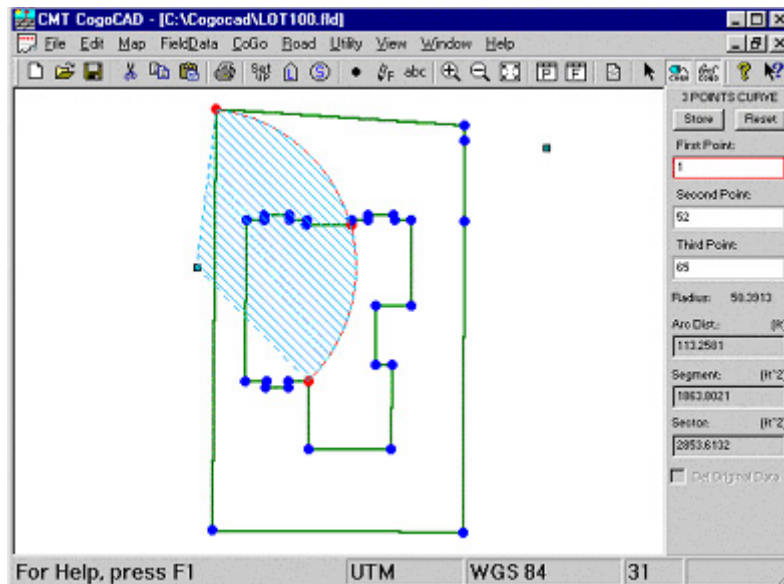
1. **RADIUS, CENT. ANGLE:** You can define a horizontal curve by providing any two pieces of data about the curve. As a default, CogoCAD asks you for the Radius and Central Angle. All of the other curve information can be determined from the two entered pieces of information.
2. **KNOWN POINT:** Enter the Point Number of a known point which will be used to tie the curve to your Job. Enter the PI, PC, PT or RP.
3. **PI—PC DIRECTION:** Enter the azimuth or bearing from the PI to the PC.

Click the Solve button to display the solution. Curve sector area and segment area (shaded area) are also displayed.

Click the Store button to store the three new points that define the curve.

### 6.11.1.1 Three Point Curve

This function allows you to define a curve by specifying three points through which the curve will pass. When you select COGO/3 POINT CURVE, the following COGO View will be displayed:



**FIRST POINT, SECOND POINT, THIRD POINT:** Enter the Point Numbers of three points through which the curve will pass by clicking once on each point, or by typing in the Point Numbers.

Click the **Solve** button to generate the curve.

CogoCAD will calculate the curve segment area as defined by the Chord formed by the Point Features which begin and end the curve.

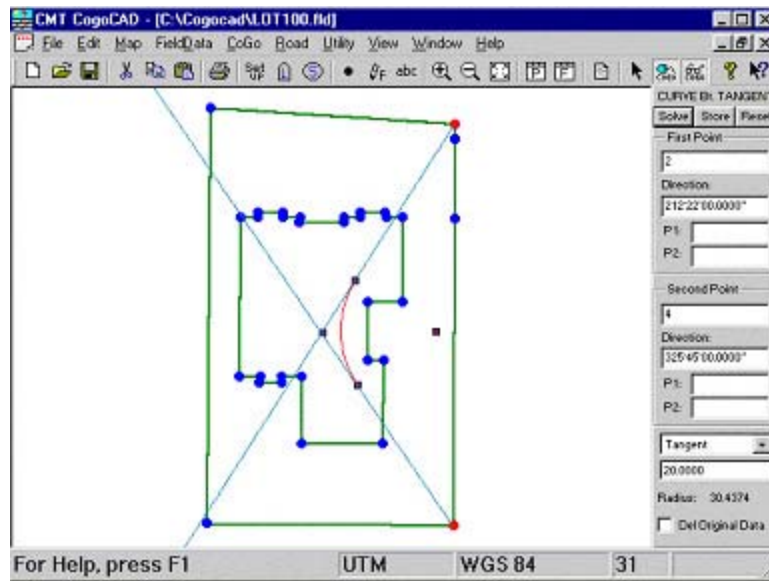
CogoCAD will calculate the curve sector area and segment area (shaded area).

Click the **Store** button to store the PI and RP.

### 6.11.1.2 Curve Between Tangents

This function allows you to define two lines, each passing through a known point and having a known angle, and calculate a horizontal curve tangent to the two lines. The curve is defined by a tangent, a radius or a known point through which the curve being calculated should pass.

When you select COGO/CURVE BETWEEN TANGENTS, the following COGO View is displayed.



**FIRST POINT:** Enter the Point Number of a Point Feature through which the first tangent line passes by clicking once on the point, or by typing in the Point Number.

**SECOND POINT:** Enter the Point Number of a Point Feature through which the second tangent line passes by clicking once on the point, or by typing in the Point Number.

**DIRECTION:** Enter the direction using one of the following methods:

- Moving your mouse around the From Point
- Typing the angle with your keyboard
- Choosing two points (P1 and P2) to define the angle

**TANGENT, RADIUS, or POINT ON ARC:** If you select Tangent as the third input, enter the distance from PC to PI or that from PI to PT. If the point of tangency is unknown, you can enter the RADIUS or POINT ON ARC instead. RADIUS is the radius of the circular arc. For POINT ON ARC, specify the point number of a known point through which the circular arc should pass.

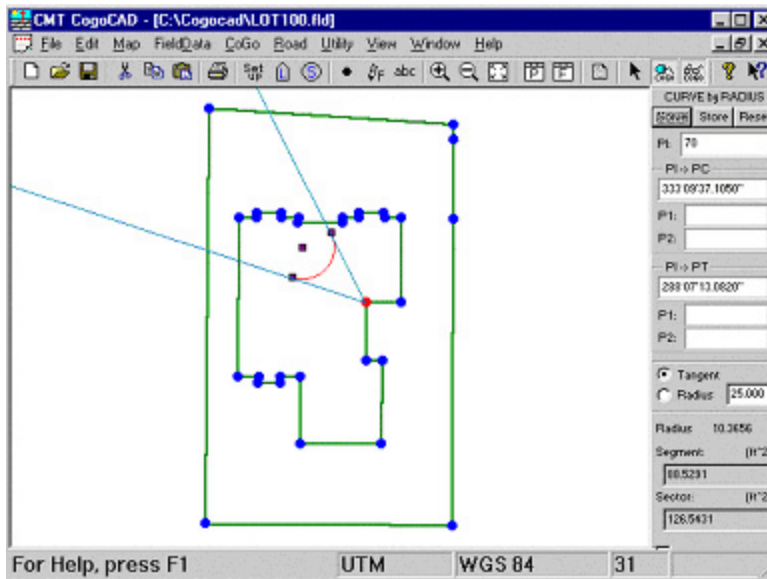
Click on the **SOLVE** button to determine the solution points. There are four solution points (PC, PI, PT or RP) created by the Curve between Tangents solution.

Click on the **STORE** button to store the solution points.

### 6.11.1.3 Curve by Radius

This function allows you to define a curve by using a known point as the PI. You then supply the azimuth or bearing to the PC and PT, and the radius or the tangent of the curve. CogoCAD will then solve for the curve.

When you select COGO/CURVE by RADIUS, the following COGO View will be displayed:



**PI:** Enter the Point Number of a point which will be the PI of the curve by clicking once on the point, or by typing in the Point Number.

**PI->PC:** Enter the direction from the PI to PC using one of the following methods:

- Moving your mouse around the From Point
- Typing the angle with your keyboard
- Choosing two points (P1 and P2) to define the angle

**PI->PT:** Enter the direction from the PI to PT using one of the following methods:

- Moving your mouse around the From Point
- Typing the angle with your keyboard
- Choosing two points (P1 and P2) to define the angle

**TANGENT or RADIUS:** Enter the Tangent or Radius of the new curve.

Click the Solve button to determine the solution points.

CogoCAD will calculate the segment area (as defined by the Chord formed by the PC and PT, the black line in the window above).

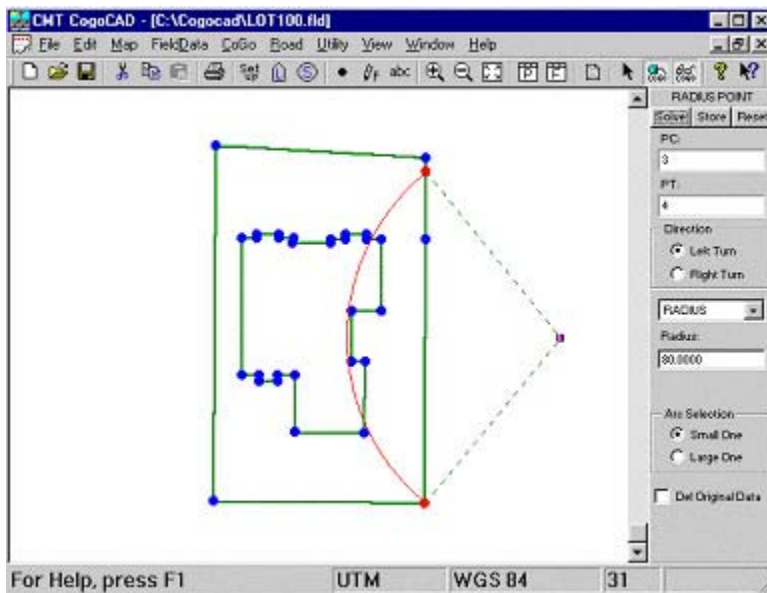
CogoCAD will calculate and display the sector area and segment area.

Click the Store button to store the solution points.

#### 6.11.1.4 Radius Point

The Radius Point operation allows you to calculate the location of the Radius Point of a Horizontal curve by inputting the PC, PT and the Radius, Central Angle, or the Tangent of the curve. When you select COGO\Radius Point, the following COGO View is displayed:





**PC, PT:** Enter the Point Numbers of the PC and PT by clicking once on each Point, or by typing in the point numbers.

**DIRECTION:** Specify if the curve will be a right or left curve.

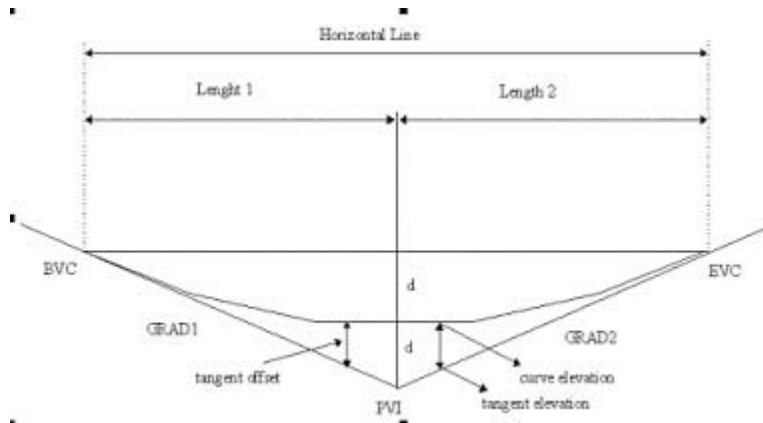
**RADIUS, CENTRAL ANGLE, or TANGENT:** Enter the radius of the curve, the central angle of the curve, or the tangent of the curve.

Click the **Solve** button to plot the curve and the Radius Point.

Click the **Store** button to store the Radius Point.

### 6.11.2 Vertical Curves

The vertical curve operation allows you to create either a symmetric or non-symmetric vertical curve, including the high or low point of the curve and where the curve stops. The following diagram will help you understand the layout and reference points for vertical curves.



**BVC:** Beginning of vertical curve.

**PVI:** Point of vertical intersection (where the BVC and EVC intersect).

**EVC:** End of vertical curve.

**GRAD1:** Percent gradient of the tangent line from BVC to PVI.

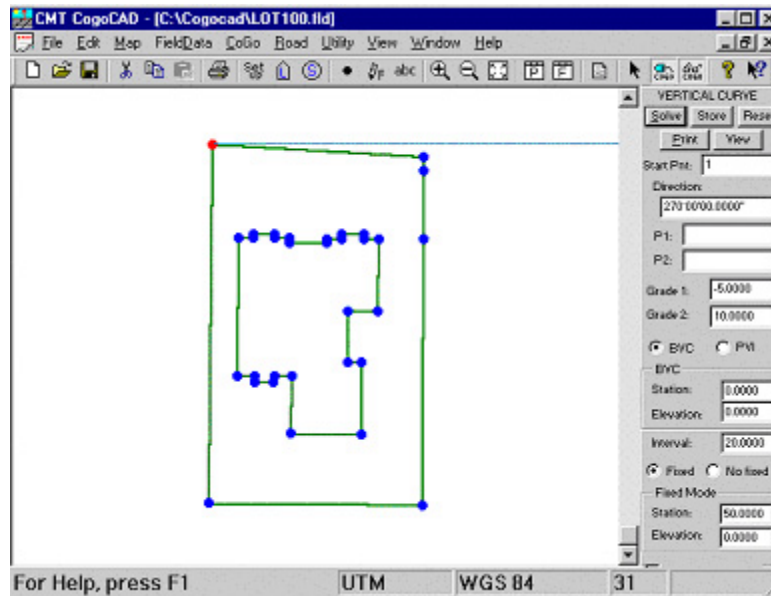
**GRAD2:** Percent gradient of the tangent line from PVI to EVC.



**LENGTH 1:** Horizontal distance from the BVC point to the PVI point.

**LENGTH 2:** Horizontal distance from the EVC point to the PVI point.

When you select COGO/ VERTICAL CURVE, the following COGO View will be displayed:



**START PNT:** Enter the Point Number of the starting point by clicking on the point, or by typing in the point number.

**DIRECTION:** Enter the direction using one of the following methods:

- Moving your mouse around the From Point
- Typing the angle with your keyboard
- Choosing two points (P1 and P2) to define the angle

**GRADE 1:** Enter the percent gradient of the tangent line from BVC (Beginning of Vertical Curve) to the PVI (Point of Vertical Intersection). For example, if you have a 5.12% gradient, enter 5.12, omitting the percentage sign. Enter a negative value for a downward slope.

**GRADE 2:** Enter the percent gradient of the tangent line from PVI to EVC (End of Vertical Curve). Enter a negative value for a downward slope.

**BVC or PVI:** Enter the station value and elevation of PVI along the horizontal line. For BVC Station, enter the station value and elevation of BVC.

**INTERVAL:** Enter the interval along the horizontal line at which to determine points on the vertical curve.

**FIXED / NO FIXED PT:** Select Fixed if you want the curve to pass through a known point, otherwise select No Fixed Pt.

**FOR NO FIXED PT MODE:**

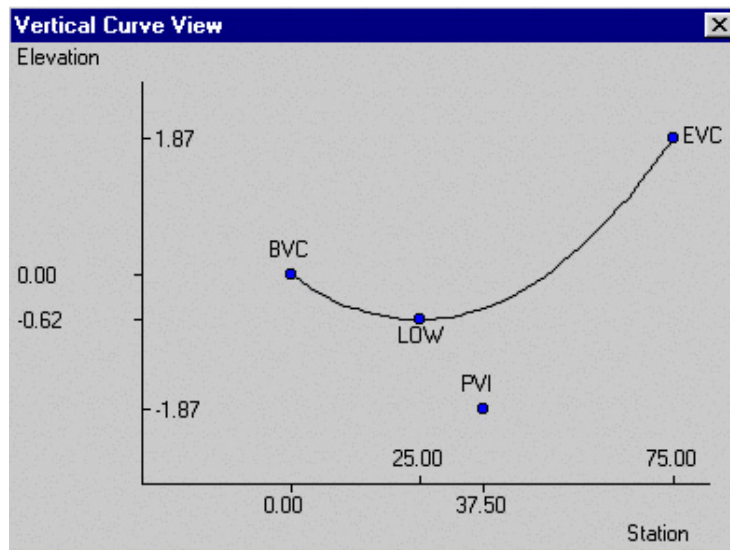
- **1ST LENGTH:** Enter the horizontal distance from BVC to PVI.
- **2ND LENGTH:** Enter the horizontal distance from PVI to EVC.

**FOR FIXED MODE:**

- **STATION:** Enter the station value of some point on the vertical curve.
- **ELEVATION:** Enter the elevation value of the same point on the vertical curve.

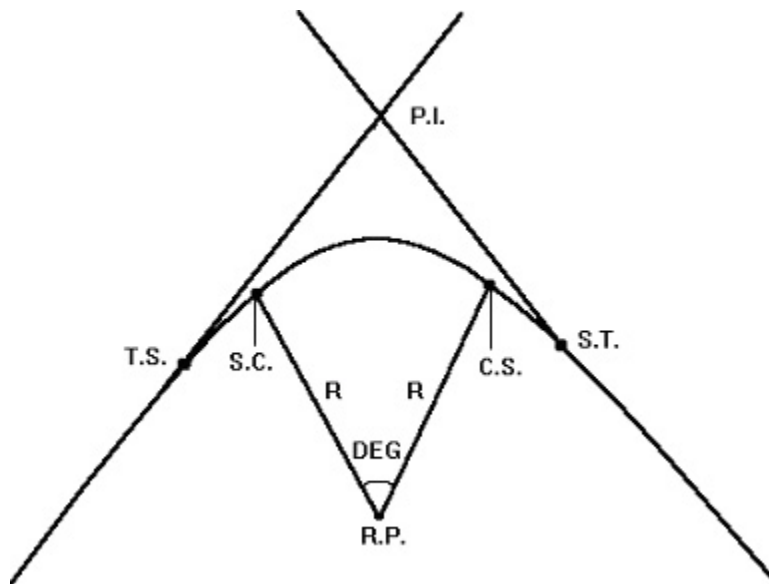
Click the **SOLVE** button to calculate the EVC station value and elevation and the High or Low point station value and elevation.

Click the **VIEW** button to see a graphical representation of the solution. A sample graph is displayed:



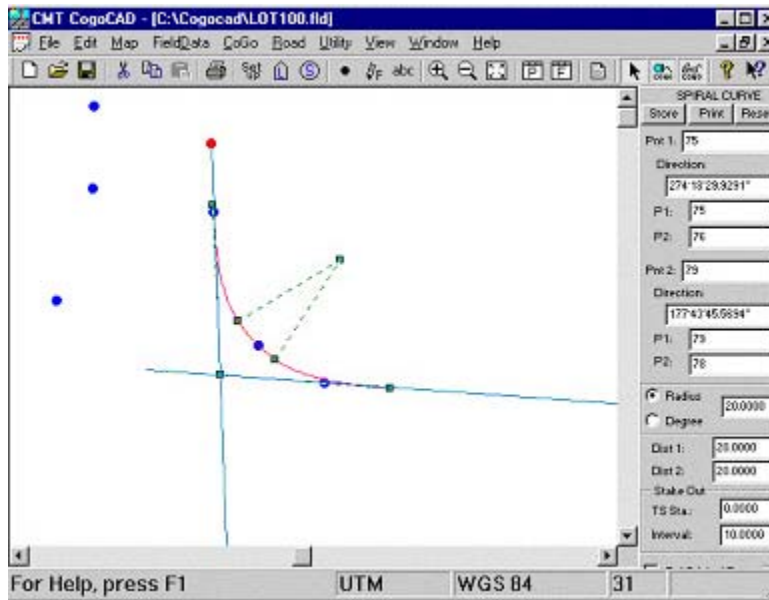
### 6.11.3 Spiral Curves

The spiral curves option allows you to design a spiral curve in the horizontal plane. The following diagram defines the notation used in the spiral curve function:



- PI:** Point of intersection
- RP:** Radius point for the circular curve portion
- TS:** Tangent to Spiral interface point
- SC:** Spiral to Circular Curve interface point
- CS:** Circular to Spiral interface point
- ST:** Spiral to Tangent interface point
- R:** Radius of the circular curve portion
- DEG:** Angle subtended by the circular curve portion, in degrees

When you select COGO/SPIRAL CURVE, the following COGO View will be displayed:



**PNT 1:** Enter the Point Number of any point on the first tangent line clicking on the Point, or by typing in the Point Number.

**DIRECTION:** Enter the direction using one of the following methods:

- Moving your mouse around the From Point
- Typing the angle with your keyboard
- Choosing two points (P1 and P2) to define the angle

**PNT 2:** Enter the Point Number of any point on the second tangent line clicking on the Point, or by typing in the Point Number.

**DIRECTION:** Enter the direction using one of the following methods:

- Moving your mouse around the From Point
- Typing the angle with your keyboard
- Choosing two points (P1 and P2) to define the angle

**RADIUS OR DEGREE:** Enter the Radius of the spiral curve, or the degrees of the internal angle of the spiral curve.

**DIST 1:** Enter the distance from the TS point (Tangent to Spiral) to the SC point (Spiral to Circular).

**DIST 2:** Enter the distance from the CS point (Circular to Spiral) to the ST point (Spiral to Tangent).

**TS STA.:** Enter the station value of the TS point.

**INTERVAL:** Enter the interval between the stakeout station locations.

Click the **STORE** button to store the new points which define the spiral curve.

Click the **PRINT** button to view and print the spiral curve solution.

## 6.12 Earth Work

The Cogo/EarthWork function will compute the volume of a simple shape for you. This method applies to the following shapes:

- 1) A shape formed by joining a number of vertical sections parallel to one another, facing the north direction.
- 2) A shape formed by using an arc to join two sections that are at an angle with each other.

3) A shape consisting of borrow pits at given base elevations

For more complex shapes, please use the **Utilities/Contour** function (see Section 8.6).

### 6.12.1 Volume Based on Cross-sections

Section volume computations may be performed on two or more **vertical cross sections that are parallel to the east-west direction**. The vertical cross sections are placed at specified stations along a straight line in the **north-south direction**. Use this method to compute the volume of a pile of earth if you can approximate its shape with a train of sections with varying cross section areas.

Keep in mind that for a vertical cross-section, you will only be able to see its top edge in the Survey View.

If the sections in your job are not parallel in the east-west direction, you may use Cogo Translate/Rotate/Scale (see Section 6.2) to rotate the group of points for volume calculations.

First, use **Cogo/EarthWork/Section** to define the cross-sections for volume computation.

Type	Section#	Sta/Elev	Area	Figure
X	1	0.0000	10000.0000	Sections1

Section#:

Type:  C/F Type:

Mode:

Figure ID:

Station:

Area:

Click on **Append** to add a section record.

Specify that this section is a **Xsection** (vertical cross-section).

The vertical cross section may be defined by specifying a pre-defined Area Feature or by manually entering an area value (**Direct**).

Click the **Select Feature** button if you wish to use the mouse to select an area feature from the map.

In the **C/F** field, specify if the volume is of "cut" or "fill" type.

Following is a summary of the status fields:

**Type:** "X" refers to a cross section.

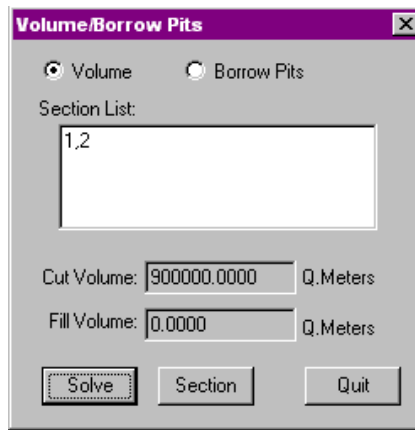
**Section#:** The section number for this record.

**Sta/Elev:** The cross section's station value.

**Area:** The area for the cross-section record.

**Figure/Feature:** ID of the Feature or Figure. A Feature consists of a series of nodes. A Figure is a shape formed by joining existing Point Features.

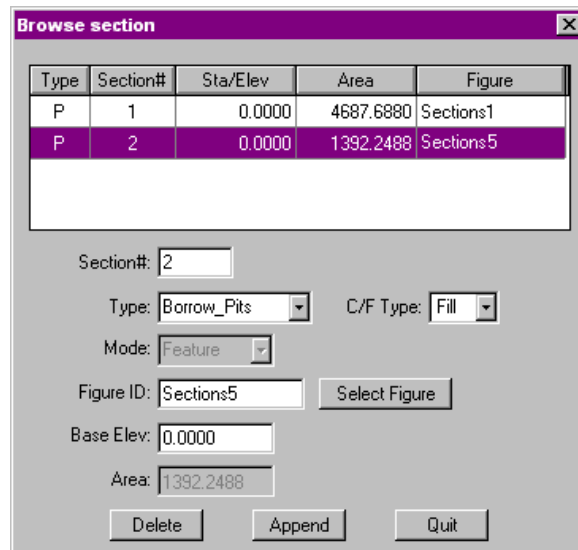
Suppose you have defined 2 sections using the above procedure. When you select **Cogo/EarthWork/Volume**, you will be able to enter "1,2" into the Section List of the Volume/Borrow Pits screen and see the computed volume:



### 6.12.2 Volume of Borrow Pits

Use this method when you can approximate the volume by representing it as a number of straight-sided pits or mounds. Borrow-pit volume calculations are performed on horizontal borrow-pit sections with specified base elevations.

First, use **Cogo/EarthWork/Section** to define the borrow pit sections.



Click on **Append** to add a section record.

Specify that this section is a **Borrow Pit**.

The borrow pit must be defined by specifying a pre-defined feature or figure.

Click the **Select Feature** button if you wish to use the mouse to select an area feature from the map.

The **C/F** field specifies the cut or fill type of the defined borrow pit section. The borrow pit section is of "cut" type if it is above the base elevation. The borrow pit section is of "fill" type if it is below the base elevation.

In the **Base Elev (MSL)** field, enter the **mean-sea-level value** of the borrow pit's base elevation. The **MSL** (mean-sea-level) elevation of the borrow pit area and the **MSL** base elevation are used in the volume computation.

Following is a summary of the status fields:

- Type:** "P" refers to a borrow pit.
- Section#:** The section number for this record.
- Sta/Elev:** The MSL base elevation of the borrow pit.

**Area:** The area for the borrow pit record.

**Figure/Feature:** ID of the Feature or Figure. A Feature consists of a series of nodes. A Figure is a shape formed by joining existing Point Features.

After you have defined the borrow pits, select **Cogo/EarthWork/Volume** to display the Volume/Borrow Pits screen. Click on the **Borrow Pits** option.

Enter the cross section numbers separated by commas, such as "1,2,3". The computed volume will be displayed.

### 6.12.3 Curvature Volume

The Cogo/Earth Work/Curvature function is used in conjunction with the vertical cross sections only. This function will calculate the volume of a curved shape with the two end cross-sections joined by a circular curve.

The screenshot shows a dialog box titled "Curvature Volume". It contains the following fields and buttons:

- XSection 1: 1 [Pick]
- XSection 2: 2 [Pick]
- Eccentricity 1: 0.0000 Meter
- Eccentricity 2: 0.0000 Meter
- Radius: 30.0000 Meter
- Curve Angle: 050°00'00.000
- Volume: 65087.6880 Q.Meters
- [OK]

**Xsection 1:** Section number of the first cross-section.

**Xsection 2:** Section number of the second cross-section.

**Eccentricity1:** Distance between the centroid of the first cross section and its centerline.

**Eccentricity2:** Distance between the centroid of the second cross section and its centerline.

**Radius:** Radius of the circular curve connecting the centers of the two cross-sections.

**Curve Angle:** The angle subtended by the curve from the first to the second cross-section.

**VOLUME:** The computed volume is displayed in this field.

## Section 7 - The Road Menu

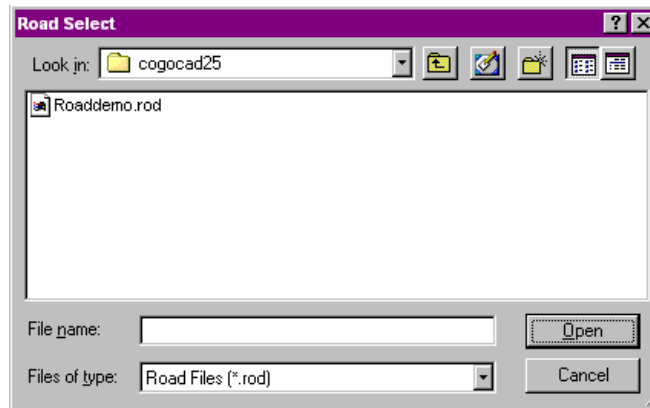
---

The Road menu provides several options for defining and staking out a Road. This information can then be added to your jobs, or downloaded to your hand-held computer for field stakeout.

When you select Road from the Main Toolbar, the following options are provided: **New/Open**, **Property**, **Layout** and **Save**.

### 7.1 Creating or Selecting a Road File

The **Road/New/Open** option allows you to create a new Road file, or select an existing one. When you select Road/New/Open, the following dialog box is displayed:



If you wish to use an existing road file simply double-click on the file or select the file and click the Open button to activate it.

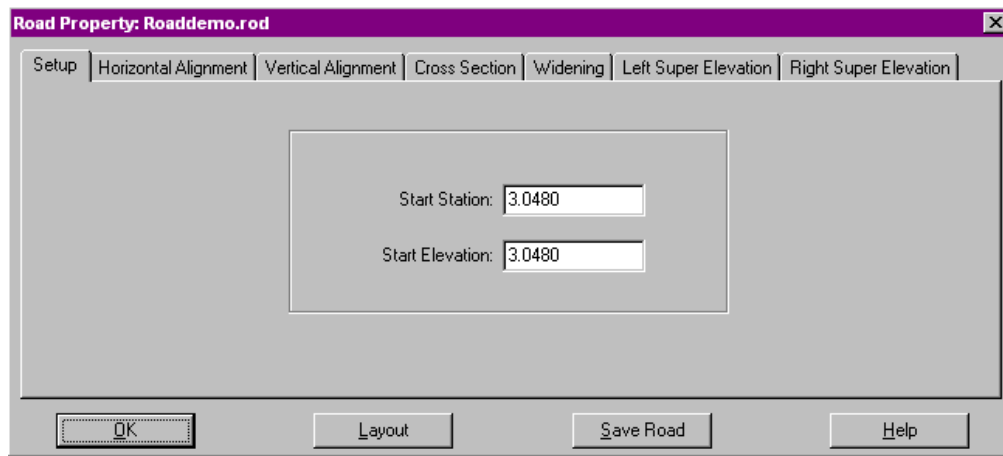
#### **To create a new road file:**

1. Select the **New/Open** option under the Road Menu.
2. Enter a new name in the File Name field.
3. Click the **Open** button to create the road. Once a Road has been created or selected, the **Road Property** dialog box will be displayed.
4. Use the **Road Property** dialog to specify the properties of the road, such as horizontal alignment, vertical alignment, etc. You can define new left and right templates or use existing templates to specify the cross-section for the road.

Use the Road Layout dialog box to place the road onto the map at the specified location.

### 7.2 Road Properties

After you have created or selected a Road file, you will want to assign properties to the Road. When you select **Road/Property**, the Road Property dialog box will be displayed:



The Road Property dialog box contains several pages for entering Road property information. These pages are described in the following sections.

### 7.2.1 Road Setup

The Setup page of the Road Property allows you to designate a starting station and starting elevation for your Road. All of the Road Property information that you supply will begin at this station number and elevation.

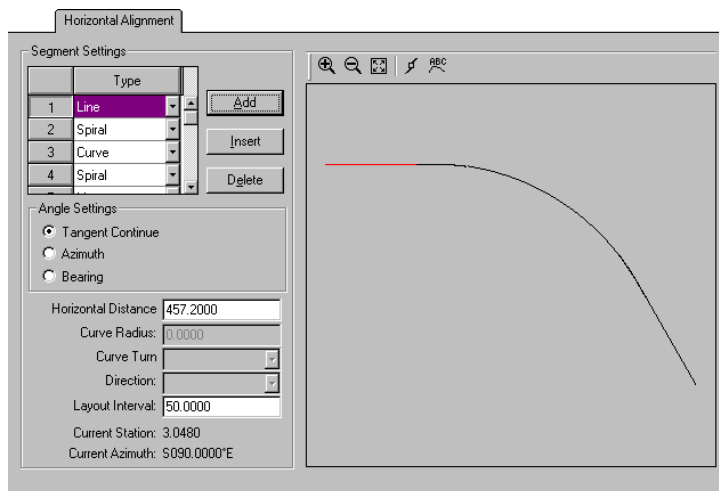
- OK:** Save the current settings of the active road file and returns to the Survey View.
- Layout:** Display the layout dialog box. This function will allow you to place your road in the current job file.
- Save Road:** Save the settings for the current road file to a new filename.

### 7.2.2 Horizontal Alignment

Horizontal Alignment is used to describe how the Road is laid out in the horizontal plane.

You will use the Horizontal Alignment page to define each change in direction for your Road, and also to define how far your Road will travel in the specified direction.

When you select the Horizontal alignment option in the Road Property dialog box, the following page is displayed:



**Add:** Appends a new segment record to this page.

**Insert:** Inserts a new segment record above the current record.

**Delete:** Deletes the segment current record from the page or dialog box.

**Type:** Select the segment type from Line, Curve or Spiral. For line types, only horizontal distance and layout interval may be entered to define the line. Curves allow entry for all fields except direction. Spirals must use all fields to define the spiral.



**Horizontal Distance**

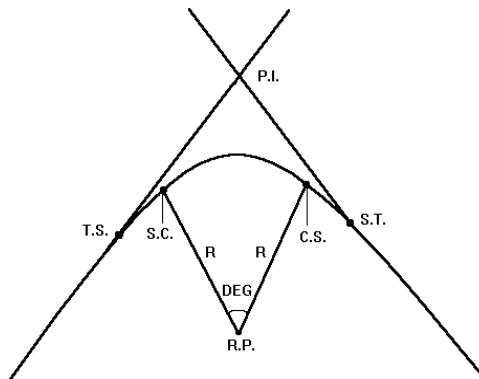
**/Spiral Length**

**/Curve Length:** Enter the length of the current segment. The current segment is highlighted in red in the graphical display window.

**Curve Radius:** Enter the radius of the curve or spiral.

**Curve/Spiral Turn:** Enter the direction of turn for the curve or spiral.

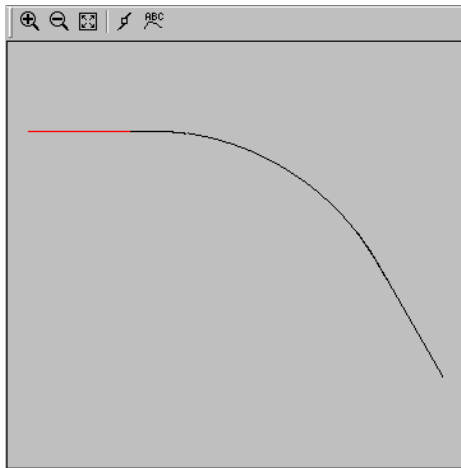
**Direction (Spirals only):** Specify the direction of the spiral from CS → ST or from ST → CS. See diagram below for more information about the different components of a spiral curve.








- PI:** Point of intersection
- RP:** Radius point
- TS:** "Tangent to spiral curve" intersection point
- SC:** "Spiral to circular curve" intersection point
- CS:** "Circular to spiral curve" intersection point
- ST:** "Spiral curve to tangent" intersection point
- R:** Radius of the circular curve
- DEG:** Angle subtended by the circular portion of the spiral curve, in degrees
- DELTA:** Supplement of the angle between the incoming and outgoing tangents (equal to the central angle subtended by the entire spiral curve)
- Layout Interval:** Specify the interval between the stakeout station locations.
- Current Station:** The Current Station field displays the station number where the current segment of the road alignment will begin.
- Current Azimuth:** The Current Azimuth field displays the azimuth at the point where the current segment begins.

You may use as many records as necessary to define the Horizontal Alignment of the Road.

The Horizontal Alignment dialog also provides a graphical display of the Horizontal Alignment of your Road, based on the data entered.

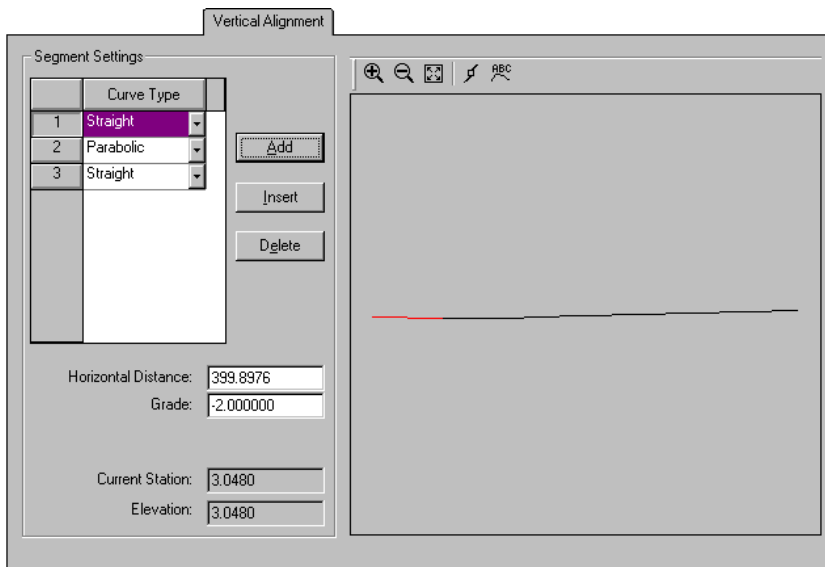


-  : Zooms in on the plot
-  : Zooms out on the plot
-  : Scales the plot to fit inside the window
-  : Shows the location of the segments along the Road.
-  : Labels each segment of the road with the record number.

### 7.2.3 Vertical Alignment

The Vertical Alignment is used to describe how the elevation of the Road changes, through the use of straight grade or parabolic vertical curves. You will define where changes in grade occur, and how long the grade is maintained.

When you select the Vertical alignment option in the Road Property dialog box, the following page is displayed:



**Add:** Appends a new segment record to this page.

**Insert:** Inserts a new segment record above the current record.

**Delete:** Deletes the current segment record from the page or dialog box.

- Curve Type:** Select from Straight or Parabolic to define the current segment type. The current segment is highlighted in red in the graphical display window.
- Horizontal Distance:** Enter the Horizontal Length of the Grade or Parabolic Curve.
- Grade:** Enter the grade of the segment in percent slope. For Parabolic segments a beginning and ending grade will need to be entered.
- Current Station:** The Current Station field displays the station number where the current segment of the road alignment will begin.
- Elevation:** The Elevation field displays the elevation at the start of the current grade or vertical curve.

You may use as many records as necessary to define the Vertical Alignment of the Road.

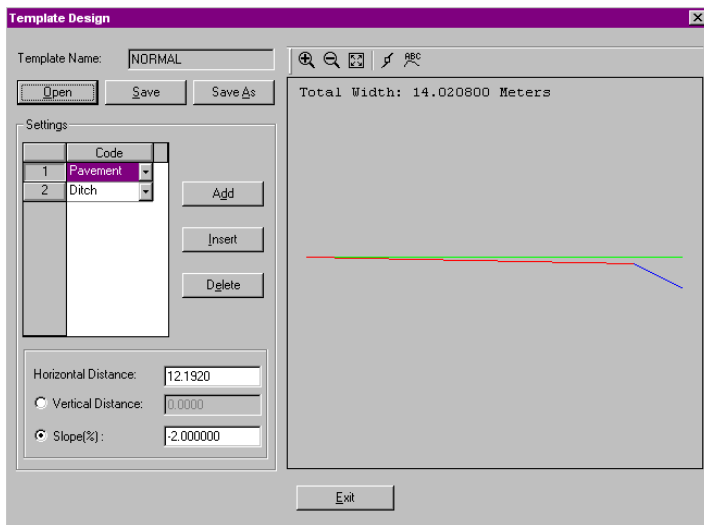
## 7.2.4 Cross Section

Once you have defined your Vertical and Horizontal Alignments, you are ready to create a Cross Section of your Road. You will need to assign the Templates to be used for specific station ranges of your Road. When you first enter the Cross Section option from the Road Property dialog, you will want to click on the **Template Design** button to define cross section templates. The creation of templates increases productivity in Road Design by reducing the number of repetitive steps to define your cross section.

A Template is used to describe a cross-section of a specified segment of the Road, given that the centerline of the Road has been established using the Horizontal and Vertical Alignments described above. Each Template describes segments of the Road that extend perpendicular to the centerline of the Road.

The Templates describe the Road width, curbing, sidewalks, ditches, etc., as well as the grading of the Road from the centerline out. Each Template describes one side of the Road between two specified stations.

When you click on the **Template Design** button from the **Road Cross Section** dialog, the following page will be displayed:



**Open:** Opens a template.

**Save:** Saves the current template under the current template name.

**Save As:** Saves the current template under a different name.

**Add:** Appends a new code record to the current template.

**Insert:** Inserts a new code record above the current record.

**Delete:** Deletes the current code record from the page or dialog box.

**Template Name:** Display the name of the Template currently being used.

**Open:** Open an existing Template to view or modify.

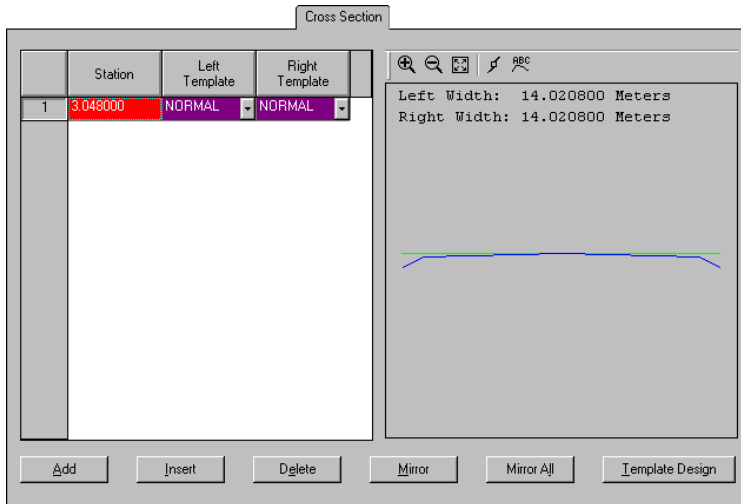
**Code:** This field is for a descriptive code of the Template segment. CMT-SURVEY provides some default codes (Pavement, Curb, Sidewalk, Ditch), or you may type in your own.

**Horizontal Distance:** Enter the Horizontal distance of the segment. The first segment in the Template starts at the centerline of the Road. Subsequent segments start at the end of the previous segment.

**Vertical Distance:** Enter the Vertical Distance of the segment. A positive value indicates a gradient above the centerline. Conversely, a negative value will indicate a downward gradient. As an alternative, you can enter the Slope as a percentage.

You may add as many segments (code records) as necessary to define the Template of the Road.

After definition of the templates, you are ready to design your Road Cross Section. Click on the **EXIT** button at the bottom of the page to exit and return to the Cross Section dialog. The following page will be displayed:



**Add:** Appends a new record to this page.

**Insert:** Inserts a new record above the current record.

**Delete:** Deletes the current record from the page or dialog box.

**Mirror:** Assigns the specified template to the blank template field in the same record.

**Mirror All:** Assigns the specified template to the blank template field for every cross section record.

**Template Design:** displays the select dialog box, which allows you to select a template from all existing templates.

**Station:** Enter the Station number where the specified Template will be applied to the Road.

**Left Template:** Specify which Template will be applied to the left side of the Road at the specified Station number.

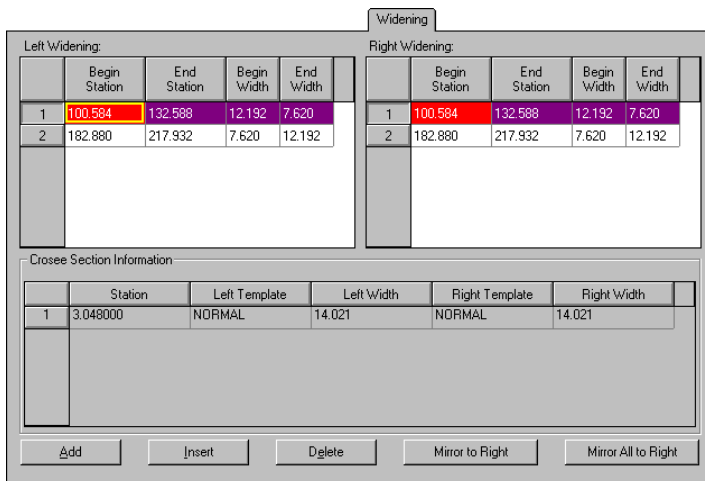
**Right Template:** Specify which Template will be applied to the right side of the Road at the specified Station number.

You may use as many records as necessary to define the Cross Section of the road. Use the Add, Insert and Delete buttons to create and remove records. Click on a pull down button to view a list of the available Templates from which you can make a selection. Click the **Mirror** button to apply the same Template to both sides of the Road for the current segment, or click the **Mirror All** button to apply the same Template to both sides of the Road over the entire course of the Road.

## 7.2.5 Widening

Widening is used to temporarily modify the width of the inner-most segment of your cross-section. You can also do this with a new Template, but the Widening function provides for a smooth transition and requires less work. You can define separate Widening for the left and right side of your Road.

When you select the Widening option from the Road Property dialog box, the following page is displayed:



**Add:** Appends a new record to this page.

**Insert:** Inserts a new record above the current record.

**Delete:** Deletes the current record from the page or dialog box.

**Mirror to Right:** Copies the current record in the left super elevation or widening page, to the right super elevation or widening page, or vice versa.

**Mirror All to Right:** Assigns the specified template to the blank template field for every cross section record.

**Begin Station:** Enter the station where the Widening will begin to be applied. You can see the station number in the Horizontal Alignment page.

**End Station:** Enter the station where the Widening will be completed.

**Begin Width:** Enter the width of the innermost segment of the Template at the Begin Station.

**End Width:** Enter the width of the innermost segment of the Template at the End Station.

You may use as many records as necessary to define the Widening of the Road. Click the **Mirror to Right** button to apply the current width to the right side of the Road as well. Click the **Mirror All** button to apply all of the widths to the right side of the Road as well.

**Please note:** You must create a second Widening record which returns the Template to its original width, or the changes created by the Widening will carry through until a new Template is assigned to the Road.

## 7.2.6 Super Elevations

Super Elevations are used to temporarily change the grading of the center segment of the cross-section. Super Elevations are typically used to create banking in your Roads as they enter and leave curves. You will apply different Super Elevations to the left and right sides of the Road, so there are two pages available.

When you select the Left Super Elevation or Right Super Elevation option from the Road Property dialog box, the following page will be displayed:

	Begin Station	End Station	Begin Slope	End Slope	Parabolic Begin Length	Parabolic End Length
1	460.248	710.184	-2.000	6.000	0.000	0.000
2	1609.344	1859.280	6.000	-2.000	0.000	0.000

Left Super Elevation

	Station	Left Template	Elevation
1	3.048000	NORMAL	-1.158

Cross Section Information

**Add:** Appends a new record to this page.

**Insert:** Inserts a new record above the current record.

**Delete:** Deletes the current record from the page or dialog box.

**Mirror to Right:** Copies the current record in the left super elevation or widening page, to the right super elevation or widening page, or vice versa.

**Mirror All to Right:** Assigns the specified template to the blank template field for every cross section record.

**Begin Station:** Enter the station where the Super Elevation begins.

**End Station:** Enter the station where the Super Elevation ends.

**Begin Slope:** Enter the slope, in percent, at the beginning station.

**End Slope:** Enter the slope, in percent, at the ending station.

**Parabolic Begin Length:** If you will use parabolic transitions, enter the length of the parabola that smoothes the transition from the Begin Slope to the End Slope.

**Parabolic End Length:** If you will use parabolic transitions, enter the length of the parabola that smoothes the transition from the End Slope to the Begin Slope.

You may use as many records as necessary to define the Super Elevation of the road. Use the Add, Insert and Delete buttons to create and remove records. Click the **Mirror to Right** button to apply the current super elevation segment to the right side of the Road as well. Click the **Mirror All** button to apply all of the super elevation segments to the right side of the Road as well.

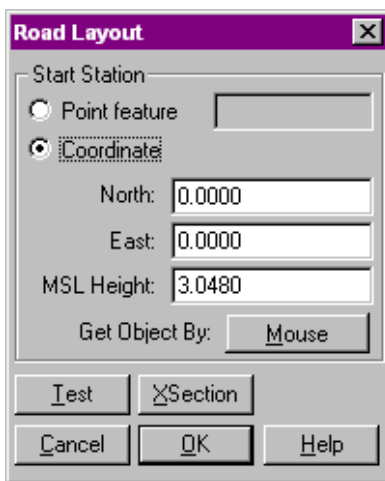
**Please note:** If you are not using a parabolic transition, you must create a second Super Elevation record to bring your grading back to that of the original Template.

The functions of the Layout and Save Road buttons are detailed in Section 7.3 and 7.4.

## 7.3 Road/Layout

The Road Layout dialog box is used to assign the current Road file to a specific location in your current Map. After specifying the location for the road, click the **Test** button to see how the road looks on your map. Click OK only if the road is exactly where you want it to be. When you click OK, the road and all the stakeout points will be added to your map.

When you select the Road/Layout menu option, or click the Layout button from the Road Property dialog box, the following Road Layout dialog box is displayed:



**Mouse:** Click on a coordinate location in the current job which will serve as the starting point for the centerline of your road.

**Test:** Lets you see how the road will be placed in the current job.

**XSection:** Displays the XSection dialog box. In this dialog box, you will see a profile of your road as you move from station to station.

**Cancel:** Cancels the Layout function and returns to the Survey View or the Road Property dialog box.

**OK:** Click the OK button only after you have used the “Test” Button to check the layout and determined that it is satisfactory.

Define the placement of the start of the Road centerline within your Job by Point Feature or by Coordinate.

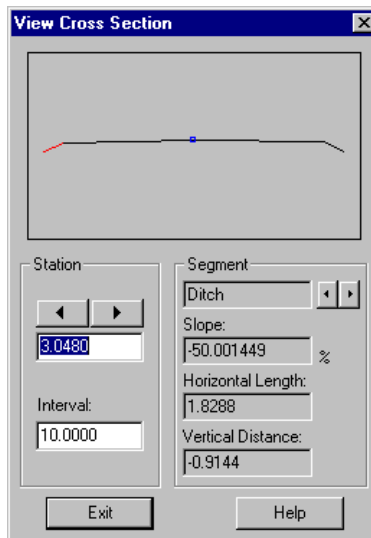
**Point Feature:** If you select the Point Feature method, enter the Point Number of the Point Feature in this field.

**North, East, MSL Height:** If you select the Coordinate method, enter the starting coordinates in the appropriate fields.

**Layout Interval:** Enter the interval at which you would like to determine coordinates along the Road for the purpose of creating a Line Feature of each Road segment, and for staking out the Road.

Click on the **Test** button to place the Road in your Job. If the position of the Road is correct, click the OK button.

Click on the **XSection** button to see a graph of the cross section of the Road.



**Interval:** Specify the interval at which you would like to move along the Road as you view it in the View XSection dialog box.

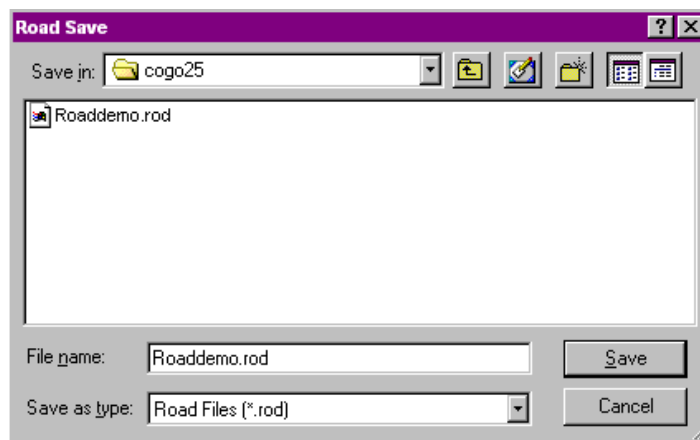
**Station:** This field displays the station number of the station that is currently being displayed.

**Segment:** Use the fields in this box to select a specific segment of the Road (highlighted in RED in the display) and the Horizontal Length, Slope and Vertical Distance for that segment will be displayed.

For example, click the right arrow until the center left segment is highlighted. The horizontal length, slope and vertical distance of the segment will be displayed.

## 7.4 Road/Save

The Road/Save menu option is used to save the configuration of the active Road file. When you select Road/Save, or click on the Save Road button in the Road Property dialog box, the Save Road dialog box below is displayed:



The Road Save dialog box operates like a standard Windows Save As dialog box. Enter the name of the Road to be saved and click the OK button to save it. If the Road already exists, you will be asked if you would like to overwrite the existing Road file.





## Section 8 - The Utility Menu

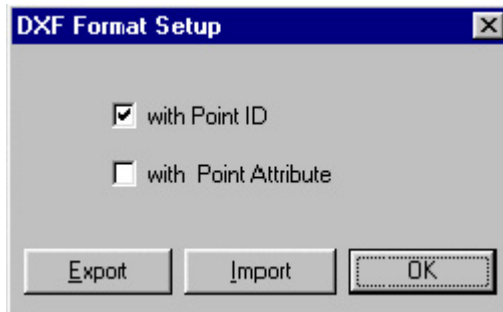
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### 8.1. DXF Export

The Utility/DXF function allows you to import DXF files into your survey and export your survey data to DXF format. There are three options within the DXF function: Setup, Import and Export.

#### 8.1.1 DXF Setup

The Utilities/DXF Setup option is used to define options for Points exported in .DXF file format



Select with **Point ID** to include Point IDs of Points in the .DXF file.

Select with Point Attribute to include the attributes of Points in the .DXF file.

You can select one, both, or none of these export options.

**Please note:** Any text you add to the map by using Map/Add Text will not be exported to a DXF file.

#### 8.1.2 DXF Import

The Utilities/DXF Import option is used to import DXF file data into your Survey file. When you select the Utility/DXF Import option, an Open dialog box (see below) will be displayed showing the available DXF files in the current directory.

Select the DXF file you wish to import by either typing in the file name in the File Name box or by double-clicking with the mouse on the appropriate file name listed in the file name column.

If the file you wish to import is not listed under the current directory, you may want to check other directories on your PC. Click on the root directory icon in the Directories column to view a listing of all of the available directories. Next, click on the associated icon of the directory you wish to search. All of the .DXF files in the selected directory will be listed in the File name column.

#### 8.1.3 DXF Export

The Utilities/DXF Export option is used to export data from your Survey file into a DXF file format. The DXF file format is widely accepted by many GIS and CAD software packages. The compatibility of the DXF format with any specific software package may vary. The CogoCAD DXF output is designed to be compatible with AutoCAD release version 12.

To export data in the DXF format, open the Survey file you wish to export and then select Utilities/DXF Export. The output file will have the same name as your job but with a .DXF extension.

Elevation values are exported to the DXF format. In order to use the elevation values, you must import the .DXF as a block into AutoCAD. Then explode the block to see the elevation values.

Any text you added to the map by using Map/Add Text will not be exported to the DXF file.

**Please Note:** You can confirm or modify the DXF Export options by selecting Utility/DXF Setup (see 8.1.1).

## 8.2 ASCII Format

The Utility/ASCII function allows you to import ASCII data into your survey and export your survey data to a user-defined ASCII format. There are three options within the ASCII function: Setup, Import and Export.

### 8.2.1. ASCII Setup

The Utility/ASCII Setup option is used to define various ASCII formats for your field data.

When you select Utility/ASCII Setup, the ASCII Format Setup dialog box is displayed. This dialog box allows you to customize the format of field data to be imported and/or exported to/from CogoCAD.

This allows your ASCII format to be very flexible in order to work with other software packages.

	Select	Name	Order	Mode	Width	Prefix
1	<input checked="" type="checkbox"/>	Point ID	1	VAR	0	
2	<input checked="" type="checkbox"/>	North	2	VAR	0	
3	<input checked="" type="checkbox"/>	East	3	VAR	0	
4	<input checked="" type="checkbox"/>	Elevation	4	VAR	0	
5	<input checked="" type="checkbox"/>	Topic Name	5	VAR	0	
6	<input checked="" type="checkbox"/>	Attribute	6	VAR	0	

Export Preview

```
Welcome to my document!  
1,1000,0000,1000,0000,0,00,,DESCRIPTION,I,P,NWPX  
2,995,0666,1078,5051,0,00,,DESCRIPTION,Property,X,NEX  
3,990,0667,1078,4811,0,00,,DESCRIPTION,I,P,5S,<PX  
4,866,1281,1077,8850,0,00,,DESCRIPTION,I,P,SEPX
```

**Add:** Creates a new ASCII format.

**Delete:** Deletes the current ASCII format.

**Import:** Imports an ASCII file in to your job.

**Export:** Exports your job to an ASCII file. Save as dialog box will be displayed.

**Update:** Updates the ASCII format setup with the parameters you entered

**Export Preview:** Allows you to see preview of how the data will be exported to the current ASCII format

#### To define a new ASCII format:

1. Click the Add button
2. Enter the Format Name
3. Define the format parameters (Header, Footer, Delimiter, etc.)
4. Click OK. If you click Cancel here, your newly defined ASCII format will not be saved.

#### Options for ASCII export and import:

1. The ASCII setup function provides pull-down lists to let you change the "Topic Name and Attribute" to "Code Number and Description". When you do so, the available output fields are:

- **North**
- **East**
- **Elevation**
- **Code Name**
- **Description**

This is consistent with the Surveyor's Assistant PLAIN data output format.

2. The number of fields per record in the ASCII file to be imported must match your ASCII setup. Otherwise, you will get unexpected results in the imported job. For example, if each record of the ASCII data import file contains Northing, Easting, Elevation, and Description, then you should leave the Code Name (or Topic) field unchecked for import.

Similarly, check only those fields for which you want data in the exported ASCII file.

3. An easy way to create or modify an ASCII file for importing into CogoCAD is to place the data in a Microsoft Excel worksheet. To modify an existing ASCII file, first open it in Excel by specifying the appropriate delimiter (usually a comma). Add or remove columns as needed. Then save the file as a \*.csv (comma separated values) file. The \*.csv file can be directly imported into CogoCAD.

**Please note:** You may define many different ASCII formats, each with its own format name. Use the pull-down list in the Format: field to select a previously defined ASCII format.

## 8.2.2 ASCII Import

The Utility/ASCII Import function allows you to import existing ASCII field data into your Job.

An Open dialog box will be displayed to allow you to select the file you wish to import.

**Please note:** Be sure to define the format of the ASCII file you wish to import by clicking Utility/ASCII/Setup. Once the format has been defined, you can select it by clicking in the List files of type: field in the Open dialog box.

**SA Users Note:** This function DOES NOT support direct ASCII import from SA2 in the PLAIN format. You should transfer any SA job to CogoCAD using the Utility/File Transfer function.

## 8.2.3 ASCII Export

The Utility/ASCII Export function allows you to export field data in your Job to an ASCII file.

A Save As dialog box will be displayed to allow you to export the file.

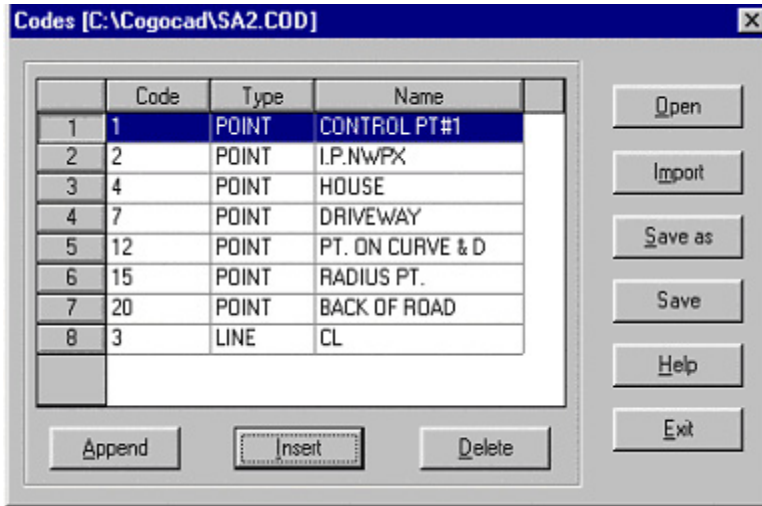
**Please note:** Be sure to define the format of the ASCII file you wish to export by clicking Utility/ASCII/Setup. Once the format has been defined, you can select it by clicking in the Save files of type: field in the Save As dialog box.

**SA Users note:** This function DOES NOT support direct ASCII export to SA2 in the PLAIN format. You should transfer the CogoCAD job to any SA using the Utility/File Transfer function.

### 8.3. Code Lists

The Utility/Code Lists function allows you to define codes to be used with Surveyor's Assistant.

When you select Utility/Code Lists, the following Codes dialog box is displayed:



**Open:** Opens an existing code list.

**Import:** Imports codes from an existing code list.

**Save as:** saves the current code list with a different name

**Save:** Saves the current code list.

**Append:** Adds a new code to the end of the list.

**Insert:** Inserts a new code.

**Delete:** Deletes the selected code.

By assigning codes to commonly collected features, you can improve the efficiency of your data collection and organization. When you import your Jobs from Surveyor's Assistant, each Point will retain its assigned code in the Description attribute. The specific code will be used in the Topic name in addition to the Description. This function is beneficial because it eliminates the need to type in a description for every point collected.

You may save a **code list** under any name; however, please be aware of the following:

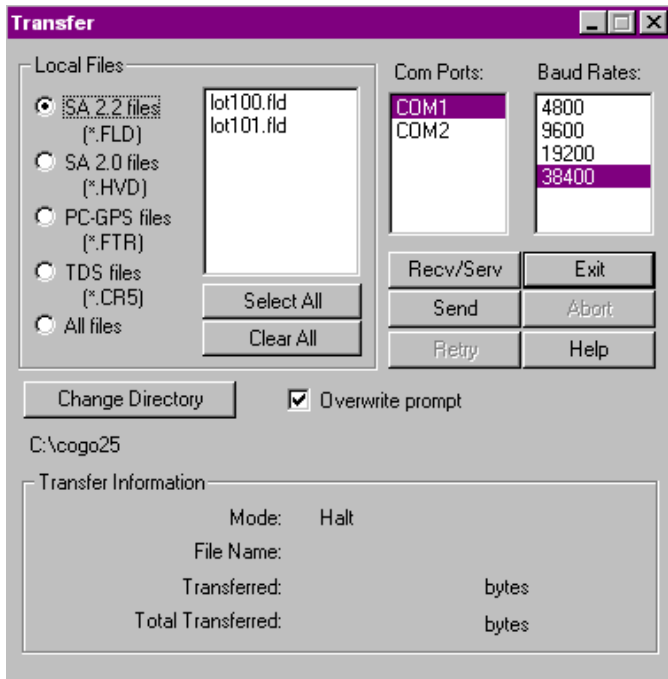
- SA 2.2 and CogoCAD \*.FLD jobs can only recognize the code file name SA2.COD.
- SA 1, SA 2.0x and CogoCAD \*.HVD jobs can only recognize the code file name SA.COD.
- When you save any job, CogoCAD will automatically save the code list with the appropriate name for the type of job file saved.
- SA.COD and SA2.COD are global to all jobs. Take care when overwriting an existing .COD file.
- SA3 does not utilize the Code List feature.

**Please note:** Whenever you add a new topic to the current job, the topic name will be added as a code name in the currently active Code List.

### 8.4 File Transfer

The Utility/File Transfer function allows you to transfer files to/from your hand-held data collector.

To transfer files, first connect your transfer cable from COM1: on your CMT data collector to an open COM Port on your PC (usually COM1). Then, select Utility/File Transfer. The following dialog box will be displayed:



**Receive/Serv:** Initiates the transfer from your data collector to your PC.

**Send:** Initiates the transfer from your PC to your Data collector.

**Select all:** Highlights all the listed files.

**Clear all:** Deselects all the listed files

**Change directory:** Changes the directory in which CogoCAD will search for files. The current directory is displayed below the button.

You must select the proper settings on both your PC (COM Port and Baud Rate) and CMT data collector (File Type and Baud Rate) in order to achieve a successful file transfer.

To **receive** files from your CMT data collector:

1. In the Com Ports: box, select the PC communications port that is connected to your data collector.
2. In the Baud Rates: box, select 19200.
3. (Optional) Click the **Change Directory** button to select a different directory to receive the file(s). The directory that will receive the files is displayed to the right of this button.
4. (Optional) Check the Overwrite prompt box if you want to be notified when a file you are trying to receive already exists in the current directory on your PC.
5. Click the **Recv/Serv** button to initiate the transfer.

To **send** files to your CMT data collector:

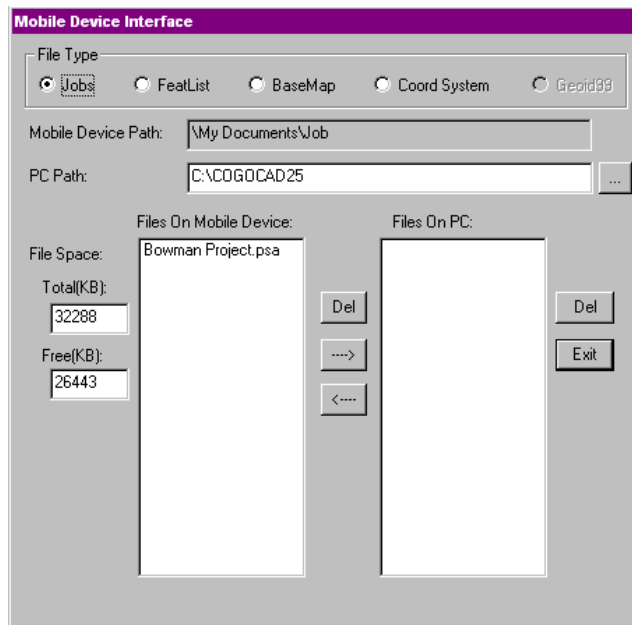
1. In the Com Ports: box, select the communications port that is connected to your data collector.
2. In the Baud Rates: box, select 19200.
3. (Optional) Click the **Change Directory** button to select a different directory to receive the file(s). The directory that will receive the files is displayed to the right of this button.
4. In the Local Files box, select the type of file you want to send.
5. Highlight all the files you want to transfer in the dialog box listing.
6. Click the **Send** button. (To send files to the **SA2.05**, click the **Receive/Serv** button.) The progress of the file transfer will be reported in the Transfer Information section.

When file transfer is complete, click the **Exit** button.

## 8.5 Utility/Mobile Device Interface

This function provides an interface between the Surveyor's Assistant 3 (SA3) Windows CE program and CogoCAD.

To view the data files stored in your mobile device or to transfer various types of files, select Utilities/ Mobile Device Interface in CogoCAD to display the following dialog:



Specify the appropriate folders on the PC. The path on the Mobile Device is automatically selected for you.

Select the appropriate file type, highlight one or more files, then click on → or ← to transfer the files in the corresponding direction.

A separate utility called **SAView** is used for installing the SA3 program onto the mobile device unit. The SAVIEW software can also be used to transfer files to and from your PC and your mobile device.

Follow these steps to install SA3 on your mobile device:

1. Establish connection between your PC and the mobile device.
2. Select the appropriate SA3 Platform (such as Toughbook 01 or iPAQ).
3. Click on the **Install SA3** button.

An example of the SAVIEW installation button is shown:



## 8.6 Utility/Contour

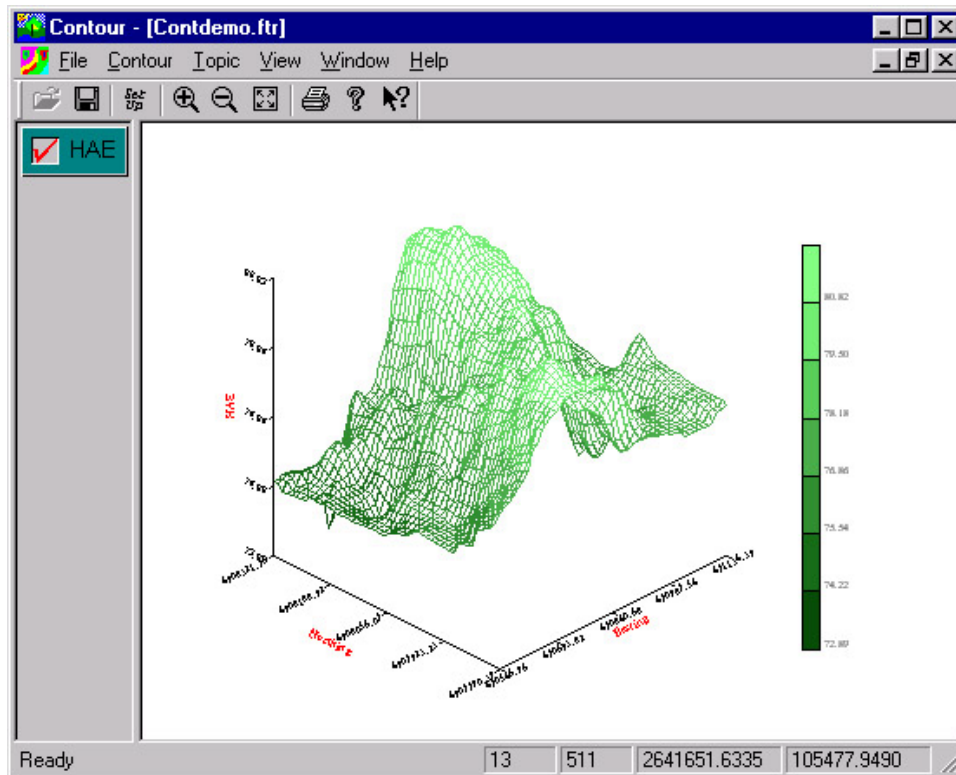
The **Utilities/Contour** is used to create a 2-Dimensional Contour Plane or a 3-Dimensional Grid Surface (relief map) from an XYZ data file. The XYZ data may consist of coordinate points in the following file formats:

1) GPS Feature files (\*.FTR), 2) ASCII files (\*.CSV or \*.DAT), 3) or Excel spreadsheets (\*.XLS) with X and Y representing the geographic location of each point in the horizontal plane and Z representing the altitude of the point. The XYZ data may also be a collection of data points that express the relationship among three different variables. For example, divide your state map into 10 equal sections horizontally; then divide it into 10 equal sections vertically. Each rectangle can be represented by a pair of XY coordinate values. Now, count the number of people who live within each rectangular region and assign the population figures to the Z variable. Just as a relief map of a Feature file lets you readily see the differences in altitude at various locations, so a Grid Surface map of the above example will give you a good idea of the distribution of population in your state at a glance.

A fundamental concept in presenting data in the 2-D Contour Plane or 3-D Grid Surface format is that the resulting map is an approximation of the original data. The construction of the 2-D Contour Plane and 3-D Grid

Surface is based on regularly spaced X and Y values which form a grid. On the other hand, your data points may or may not have regularly spaced X and Y values. Even if your data points correspond to a regular array of X and Y values, the grid used to represent the data points may be finer (to effect a smoother appearance) or coarser (to save computer memory space).

An example of a 3-D Grid Surface is shown:



Therefore, an essential step in the contouring process is to compute from the given data points the Z value at each grid node (intersection of an X grid line and a Y grid line). Depending on the gridding method and the grid size used, the resulting Z values could be a crude, fair or excellent approximation to the original data.

When you open a file in CONTOUR, CONTOUR generates from the original data points a set of transformed data points based on a default grid density. Once the mathematical formulas have been applied and the transformation has taken place, CONTOUR can produce a variety of 2-Dimensional Contour Plane and 3-Dimensional Grid Surface displays and perform volume calculations. You may save the transformed data as a PC-GPS Job file (\*.ftr) or a bitmap file (\*.bmp). Alternatively, you may export the data as an ASCII file (\*.dat or \*.csv) or an Excel spreadsheet (\*.xls).

For more information on Contour please see the Online Manual for the Contour program.





## Section 9 - The View and Windows Menus

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In this Section, each of the functions under the View menu and the Windows menu will be discussed.

**Please note:** For the View menu options presented, ON means the tool or View is displayed and OFF means that the tool or View is not displayed. When a tool or View is ON, a check mark will be visible to the left of the specific option under the View menu.

### 9.1 View/Toolbar

The View/Toolbar option is used to toggle the display of the Toolbar ON and OFF. When the Toolbar is ON, there will be a selection mark displayed to the left of the Toolbar label in the View menu. The default is for the Toolbar to be ON. To toggle the Toolbar ON or OFF, pull down the View menu and click on the Toolbar label.

### 9.2 View/Status Bar

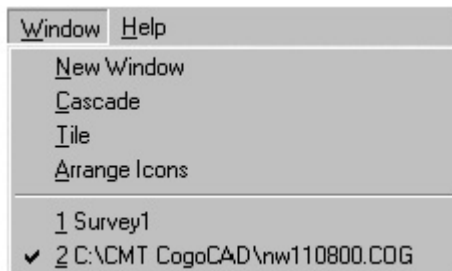
The View/Status bar option is used to toggle the display of the Status Bar ON and OFF. When the Status Bar is ON, there will be a selection mark displayed to the left of the Status bar label in the View menu. The default is for the Status Bar to be ON. To toggle the Status Bar, pull down the View menu and click on the Status bar label.

### 9.3 View/Cogo View

The Cogo View provides input and solution fields for each of the Cogo menu functions. The default is for the Cogo View to be OFF. However, whenever one of the Cogo functions is used, the Cogo View will automatically be displayed. The functions of the Cogo View are described with each of Cogo options in Section Six. You can turn the Cogo View off by clicking on the Cogo View icon or the Cogo View option in the View menu.

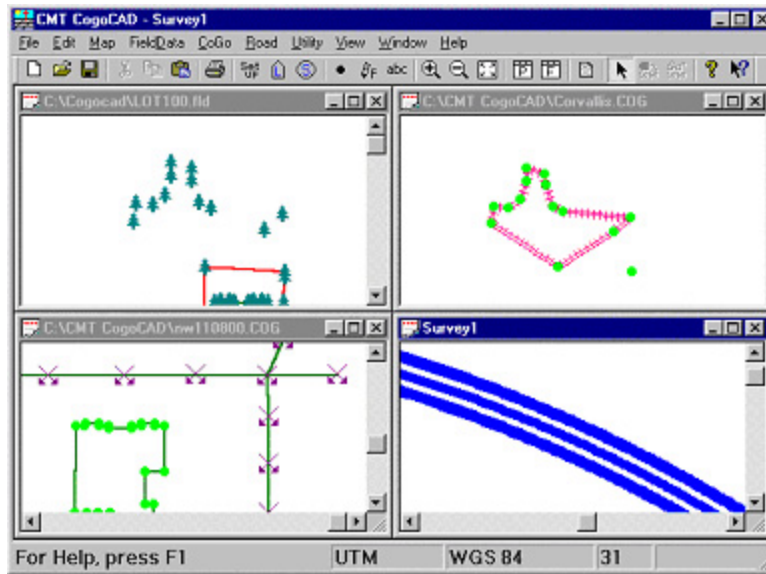
### 9.4 Windows

The Windows menu options are common to many Windows applications. These options provide useful options for displaying open files.



#### 9.4.1 Windows/Tile Horizontal

The Windows/Tile option is used to display all of the open files in a tile arrangement.

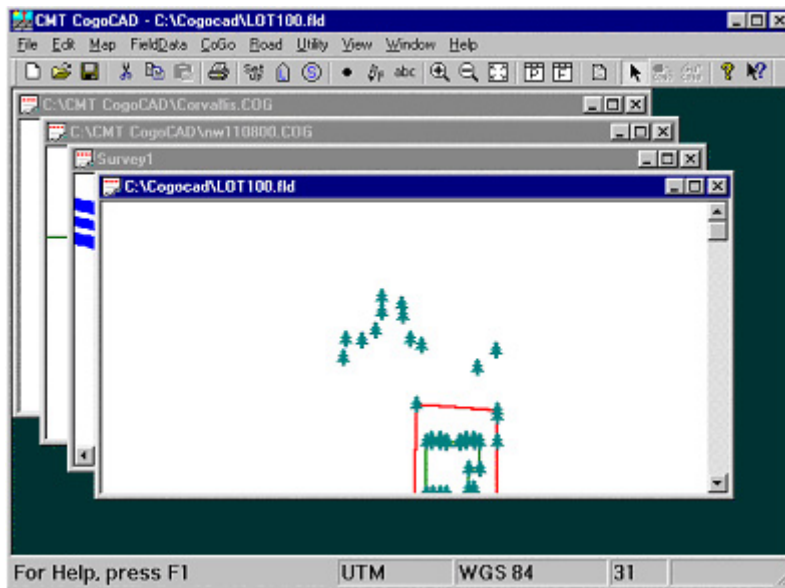


### 9.4.2 Windows/Arrange Icons

The Windows/Arrange Icons option is used to arrange the CogoCAD icons at the bottom of the window.

### 9.4.3 Windows/Cascade

The Window/Cascade option is used to cascade all of the open files.



# Appendix A

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## CogoCAD End User License Agreement

This is a legal agreement between you, the End User, and Corvallis Microtechnology, Inc. ("Company"). By opening the sealed package containing CogoCAD 2.5 and installing it on your PC, you are agreeing to be bound by the terms of this agreement.

1. The CogoCAD 2.5 software contains intellectual property, i.e., software programs, that are licensed for the end user customer's use ("End User"). The licensed software programs are protected by United States copyright laws and international treaty provisions.
2. A sale of the CogoCAD 2.5 software is not a sale of the intellectual property that it contains. The End User is granted the right to use such intellectual property, but not its ownership.
3. The End User shall not copy, disassemble or reverse-compile the software programs.
4. The software programs are provided to the end user "as is" without warranty of any kind, either express or implied, including, but not limited to, warranties of merchantability and fitness for a particular purpose. The End User shall bear the entire risk of the quality and performance of the software programs.
5. The company and the company's suppliers shall not be held to any liability for any damages suffered or incurred by the End User (including, but not limited to, general, special, consequential or incidental damages including damages for loss of business profits, business interruption, loss of business information and the like), arising from or in connection with the delivery, use or performance of the software programs. Information in the CogoCAD 2.5 User's manual is subject to change without notice and does not represent a commitment on the part of Corvallis Microtechnology, Inc.

This Agreement is governed by the laws of the State of Oregon.

If you have any questions concerning this Agreement, please write to: Customer Service, Corvallis Microtechnology, Inc., 413 SW Jefferson Avenue, Corvallis, Oregon 97333, U.S.A.

## Liability Statement

CMT makes no expressed or implied warranty with regard to the CogoCAD 2.5 software or the merchantability or the fitness of the software for any particular purpose. The software is made available solely on an 'as is' basis and the entire risk as to its quality and performance is with the user. Should the CogoCAD 2.5 software prove defective, the user shall bear the entire cost of all necessary correction and all incidental or consequential damages in connection with or arising out of the furnishing or use or performance of the CogoCAD 2.5 software. If the material portion of CogoCAD 2.5, i.e. the CD-ROM containing CogoCAD 2.5, proves to be defective, the only remedy is the replacement of the material portion by CMT.

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## Appendix B

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### Technical Support

CMT provides technical support through a variety of sources. For fast, efficient service, we suggest that you utilize CMT's CogoCAD Club found on the CMT website under Software Discussion Groups.

Questions not answered on the CogoCAD Club may be submitted to CMT's technical support staff at the following address:

**[support@cmtinc.com](mailto:support@cmtinc.com)**

In addition to support questions, you can also obtain software updates on our anonymous ftp site at the following address:

**[www.cmtinc.com](http://www.cmtinc.com)**

You can also get product information and view common questions and answers on our website at:

**[www.cmtinc.com](http://www.cmtinc.com)**

Customers without Internet access may send messages to CMT by fax at (541) 752-4117.

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