

Carlson Survey 2006

Carlson Software Inc.

User's manual

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Product Overview

1

This chapter describes the product overview, and system requirements for operating Carlson Survey. It also contains instructions for installing and authorizing Carlson Survey, setting up your first project, and a description of non-menu specific commands.

Using the Carlson Survey manual

This manual is designed as a reference guide. It contains a complete description of all commands in the Carlson Survey product. The chapters are organized by program menus and are arranged in the order that the menus appear in Carlson Survey. There is a chapter with tutorials. System variables are located at the end of the manual.

Product Overview

Carlson Survey offers a full suite of commands for downloading, entering, and processing field survey data and for generating final plats and drawings. Carlson Survey can function as a total and complete software solution for the land surveying firm, or as an affordable downloading, calculation, and preparatory solution used in conjunction with the more full-featured Carlson Carlson Survey. Built around the Autodesk 2004 OEM graphics engine, Carlson Survey reads and writes standard AutoCAD drawings and assures familiarity to AutoCAD trained staff.

Data Collection

The power of Carlson Survey begins with data collection. Carlson Survey downloads all major collectors ranging from Geodimeter and TDS to Leica, Nikon, Sokkia, and SMI. The raw data is stored in "RW5" format and can be viewed, edited and processed. The processing, or calculation of coordinates, recognizes "direct and reverse" and other forms of multiple measurement, and processes sets of field measurements. Surveys can be balanced and closed by selective use of angle balance, compass, transit, Crandall, and least squares methods-or simply by direct calculation with no adjustment. Commands exist for finding bad angles and for plotting the traverse and sideshot legs of the survey in distinct colors as a means of searching for "busts" or errors. In addition to downloading of data from electronic data collectors, the program accepts manual entry of field notes directly into a spreadsheet format, permitting review, storage, and editing. Alternatively, field notes can be entered for immediate calculation and screen plotting of points, with the "raw notes" stored simultaneously, permitting re-processing and re-calculation as needed. For data that was not field-surveyed, but was provided in the form of an ASCII or binary point file, Carlson Survey offers the "Import Text/ASCII File" command, unrivalled in its flexibility to read foreign data sources.

Field to Finish

The survey world is recognizing the power of coding field shots with descriptions that lead to automatic layering, linework, and symbol work. Office drafting time can be reduced by 50% or more with intelligent use of descriptions, leading to "field to finish" plotting. For example, breaklines, which act as barriers to triangulation, should be placed on streams, ridges, toe-of-slopes and top-of-banks for more accurate contouring. With the field to finish command, breaklines can be created by field coding, with descriptions such as DL, for creating 3D polyline ditch lines, or TB for creating top-of-bank polylines, etc. and this coordinate data can be simply plotted to the screen as undifferentiated points. However, with the field to finish command, the data can be plotted in one step, creating 3D polyline break lines, building lines, light poles, manholes, edge-of-pavements, that are all distinctly layered and fully annotated. The field to finish command within Carlson Survey is extremely robust, so much so that it can adapt to a coding system made up on-the-fly, or a coding system that has been received from an outsourced survey. Field crew coding and office processing using the field to finish command can save valuable hours of drafting and eliminate misinterpretations, paving the way for quick plat generation or supporting supplemental engineering work.

Deed Work

Carlson Survey allows you to enter old deeds and plot the linework, then add bearing and distance annotation optionally. Distances can be entered in meters and feet, and even in the old measurement forms of chains, poles, links, and varas. Both tangent and non-tangent arcs can be entered. Closures, distances traversed, and areas are automatically reported. Working in reverse, the command Legal Description creates a property description suitable

for deed recording directly from a closed polyline on the screen. If that polyline has point numbers with descriptions at any of the property corners, these descriptions will appear in the deed report, as in "...thence N 45 degrees, 25 minutes, 10 seconds E to a *fence post*...". Deed files can be saved, re-loaded, edited, re-drawn and printed or plotted to the screen in a report form.

Drafting and Design

Carlson Survey offers approximately 150 different symbols and north arrows, broken down by categories (for example, points, trees, map symbols). You can create new categories or supplement or change the available point symbols within any category. The program is designed to receive entire sets of new, customized point symbols in a single command. Attributes of points, such as elevation and point number, can be selectively "frozen," allowing the creation of final plats with symbols and optional descriptions remaining on points, as desired. Linework, typically in the form of polylines, can be drawn by any combination of point number and "snap" selection, to create property lines, street lines, easements and right-of-ways, building lines and borders. In addition to Carlson Survey's standard line types, dozens of special line types are available, including tree lines, fence lines, all manner of utility lines, stone walls, and customizable line types. Design features include automatic street intersections and cul-de-sacs, and automatic lot layout. For lots, you can pick your right-of-way and back property polylines, specify desired acreages and frontage/rear lot parameters, and the lots are automatically calculated and drawn. Hinged Area, Sliding Side Area, and Area Radial from Curve are excellent design tools, with an easy, graphic interface. All design polylines can be converted to point numbers at vertices and radius points for purposes of field stakeout.

Annotation

With a full slate of annotation commands, Carlson Survey is all you need to finalize your boundary surveys and plats. There is a wide range of bearing and distance annotation options, including the Auto-Annotate command, which allows you to annotate an entire selection set of polylines in one step. Station and offset annotating, as for right-of-way lines, is provided. Use commands such as Special Leader, Station Polyline, Draw North Arrow, and Draw Bar Scale to dress up the drawing and give it a hand-drafted look. Commands such as Title Block and Draw Legend, as well as sequential lot numbering and the area labeling commands, help you complete the finished drawing quickly.

Powerful Utilities

Carlson Survey contains many strong utilities, particularly polyline utilities. You can Join Nearest disconnected polylines, turn 2-sided figures into closed, 4-sided figures, offset, trim, and extend 3D polylines, create building "footprints" with left and right entries using Extend by Distance, even reverse polyline directions. There are over 20 significant polyline utilities available, including Reduce Vertices, which weeds out duplicate or unnecessary vertices and cuts down on drawing size. Boundary Polyline is a simplified version of the AutoCAD command Boundary, and its opposite, Shrinkwrap Polyline. Other categories of utilities include point attribute editing, scaling, twisting and re-sizing, text editing, font alteration and re-sizing, and advanced layer manipulation. Raster images such as aerial photos and scanned images can be placed on drawings.

Contouring and Terrain Modeling

There are many higher order features in Carlson Survey. Full contouring is provided, with options for smoothing and labeling contours, highlighting index contours and clipping contours to selected perimeters. Carlson Survey can be used to create both grid files and TIN files (.flt format). Volumes can be computed between grid files, inside any selected polyline perimeter. Profiles can be extracted from contour maps or hand-entered, as generic "point-to-point" profiles or as road profiles with vertical curves. The Design Pad Template command carves in building pads, pits, parking lots, roads, and other 3D features into any existing terrain. Land forms created by contouring and Design Pad Template can be viewed in 3D and rotated in real time, using the 3D Viewer Window command. In addition

to all the commands needed to create final drawings, Carlson Survey also contains commands to perform many engineering tasks typically encountered by survey firms.

Carlson Survey is the ideal stand-alone solution for the survey and drafting organization, but it is also the perfect go-between product for the large civil engineering firm with in-house or outsourced survey operations. It complements Carlson Carlson Survey. Carlson Survey enables Carlson Software to serve the full spectrum of the surveying and civil engineering design world.

System Requirements

Operating System

Windows XP, Windows 2000 Professional, or Windows NT 4.0 with SP 6.0 or later.

NOTES:

- It is recommended that you install and run Carlson Survey on an English version of the operating system.
- Users of Windows NT 4.0 or Windows 2000 Professional must have Administrator permissions to install Carlson Survey. Not assigning these permissions can cause Carlson Survey to perform incorrectly. See Windows Help for information about assigning user permissions.
- Carlson OEM 2004 based products do not support Windows 95, 98 and ME (all editions).

Processor

Intel® Pentium® III, IV or AMD-K6® III PC, 500MHz or higher

RAM

256 MB

Video

VGA display 1024 x 768

Hard disk

500MB free disk space

Pointing device

Mouse

CD-ROM

Any speed (for installation only)

Optional hardware

Printer or plotter

Digitizer

Modem or access to an Internet connection

Open GL-compatible 3D video card

The OpenGL driver that comes with the 3D graphics card must have the following: Full support of OpenGL or later. An OpenGL Installable Client Driver (ICD). The graphics card must have an ICD in its OpenGL driver software. The "miniGL" driver provided with some cards is not sufficient for use with this Autodesk CAD engine.

Web browser

Microsoft Internet Explorer 6.0

Netscape Navigator 4.5 or later

Installing Carlson Survey

If you're installing Carlson Survey on Microsoft® Windows NT® 4.0 or Windows 2000, you must have permission to write to the necessary system registry sections. To do this, make sure that you have administrative permissions on the computer on which you're installing. Before you install Carlson Survey, close all running applications. Make sure you disable any virus-checking software. Please refer to your virus software documentation for instructions.

Note: If you are upgrading from an older version of Carlson Survey, you must uninstall the older version before installing Carlson Survey. This is required for successful software installation and to meet the guidelines of the EULA (End User License Agreement).

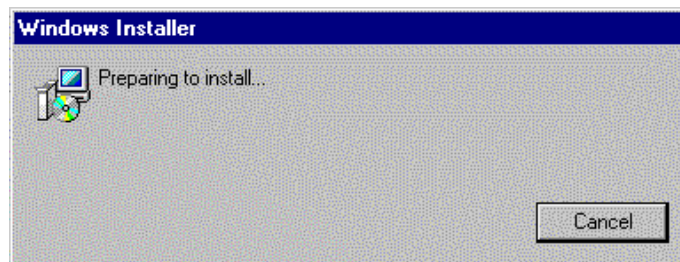
1 Insert the CD into the CD-ROM drive.

If Autorun is enabled, it begins the setup process when you insert the CD.

To stop Autorun from starting the installation process automatically, hold down the SHIFT key when you insert the CD.

To start the installation process without using Autorun, from the Start menu (Windows), choose Run. Enter the CD-ROM drive letter, and setup. For example, enter d:\setup.

2 The Windows Installer dialog box is displayed.

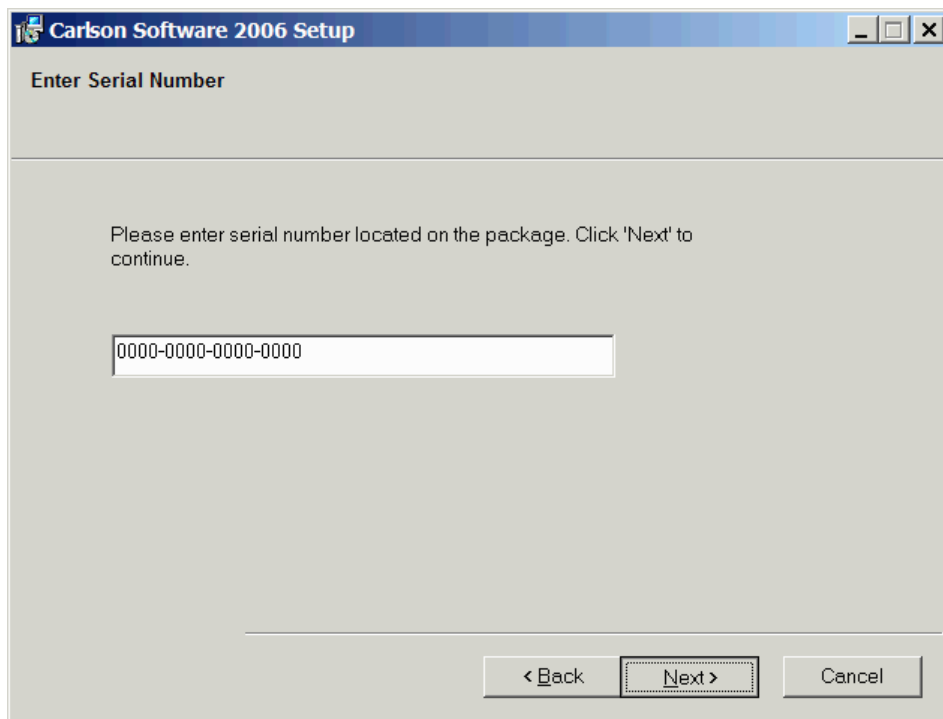


3 After reading the initial Carlson Survey dialog box, press Next. If this is the initial installation, you will see the dialog shown below.



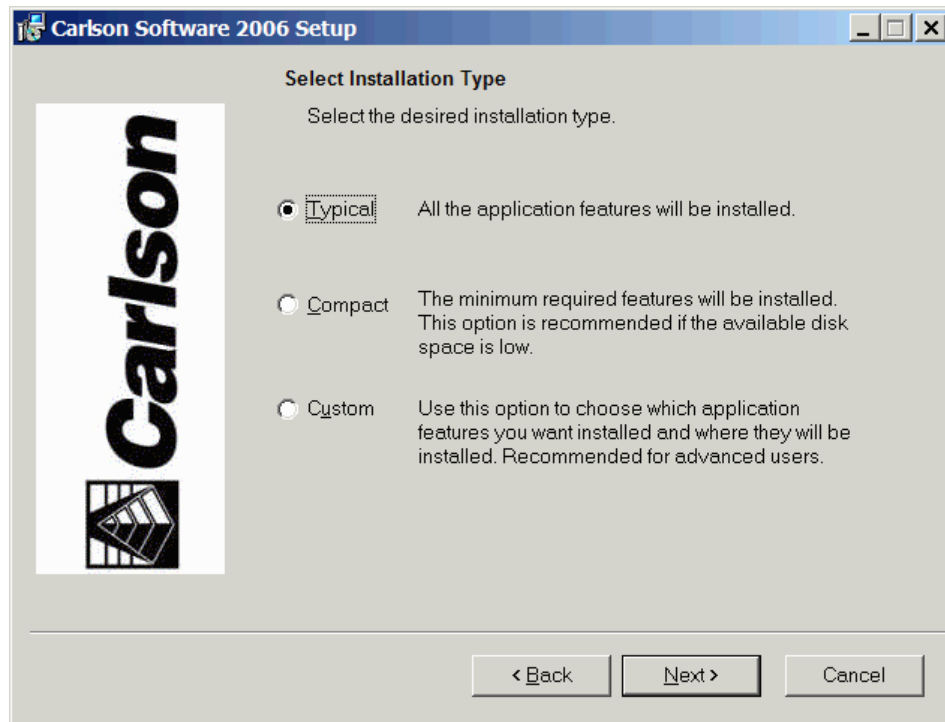
If this version of Carlson Survey has already been installed, you will see a different Add/Remove dialog instead. In this case, it is recommended that you Cancel the current install and go to Windows > Control Panel > Add/Remove Programs and remove Carlson Software 2006. After the old installation is removed, you may start the install process once more to continue.

4 On the Serial Number dialog box, you must enter the serial number provided with your copy of Carlson Survey.



5 On the Select Installation Type dialog box, select the type of installation you want: Typical, Compact, or Custom.

Choose Next.



Typical installs the following features:

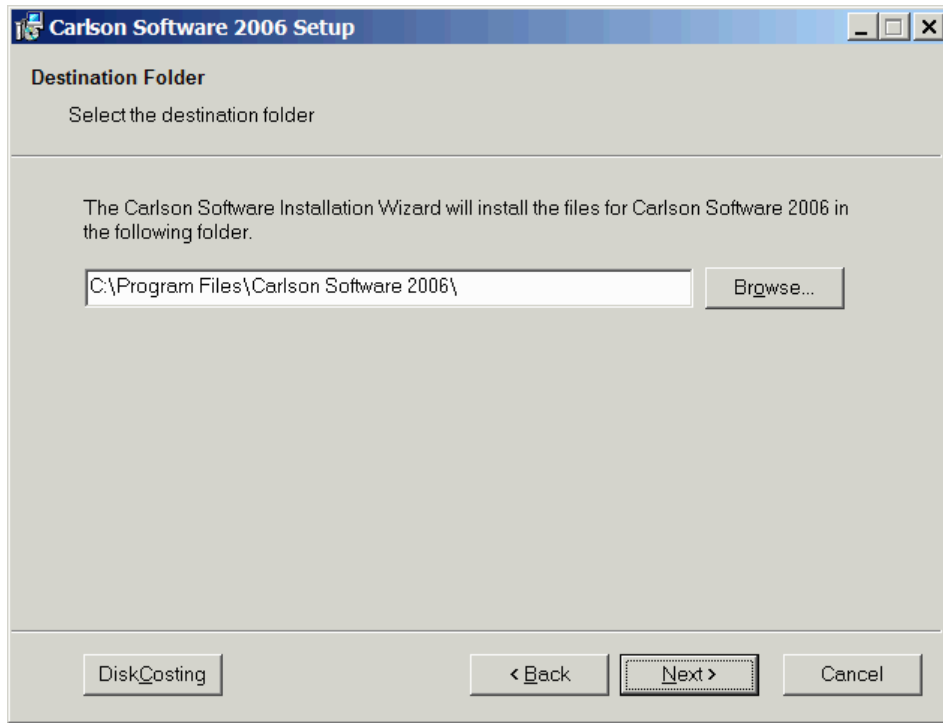
- Program files: Executables, menus, toolbars, Help templates, TrueType® fonts, and additional support files
- Internet tools: Support files
- Fonts: SHX fonts
- Samples: Sample drawings
- Help files: Online documentation

Compact installs only the program files and fonts.

Custom installs only the files you select. By default, the Custom installation option installs all Carlson Survey features. To install only the features you want, choose a feature, and then select one of the following options from the list:

- Will be installed on local hard drive: Installs a feature or component of a feature on your hard drive.
- Entire feature will be installed on local hard drive: Installs a feature and its components on your hard drive.
- Feature will be installed when required only: Installs a feature on demand.
- Entire feature will be unavailable: Makes the feature unavailable.

6 On the Destination Folder dialog box, do one of the following:

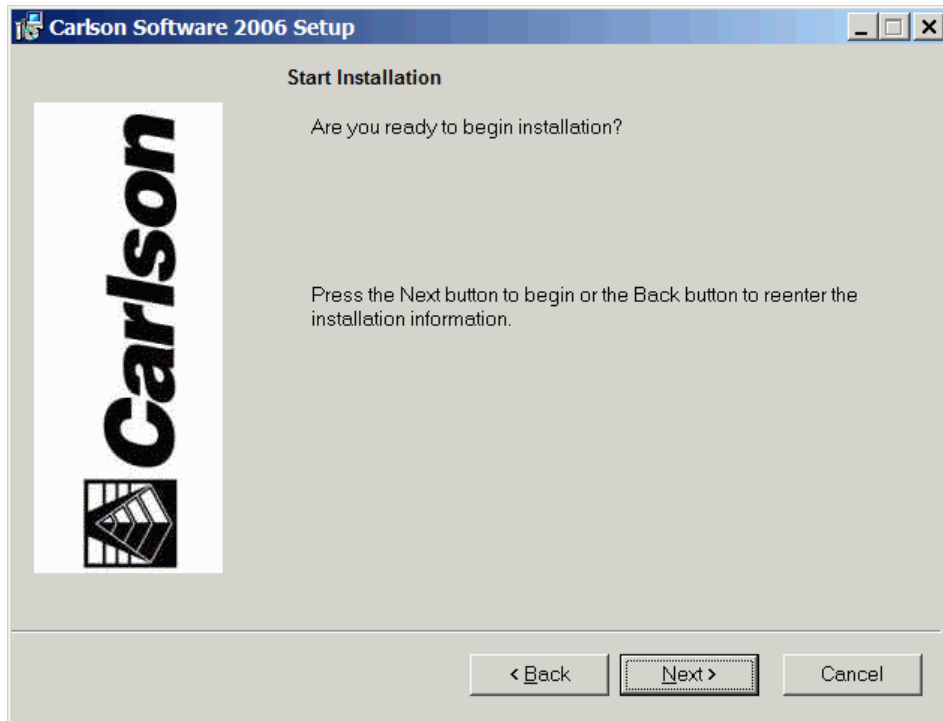


Choose Next to accept the default destination folder/directory.

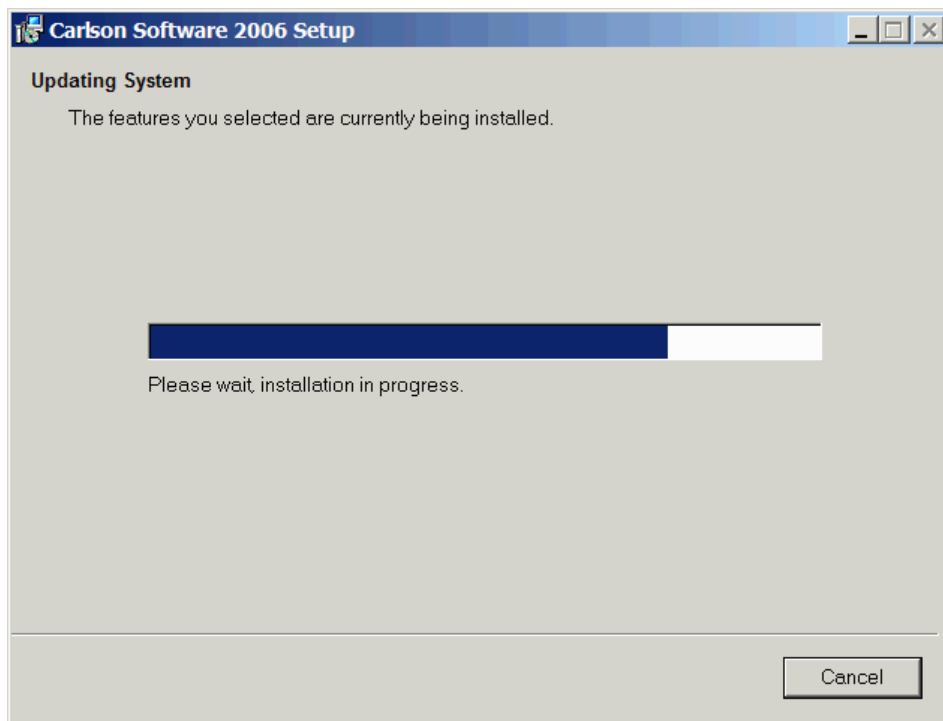
Choose Browse to specify a different drive and folder where you want Carlson Survey to be installed. Choose any directory that is mapped to your computer (including network directories) or enter a new path. Choose OK and then Next.

Setup installs some files required by Carlson Survey in your system folder (for example, c:\Windows\System, or c:\Winnt\System32). This folder may be on a different drive than the folder you specify as the installation folder (for example, d:\Program Files\Carlson Software). You may need up to 60 MB of space in your system folder, depending on the components you select to install. Setup alerts you if there is insufficient free space on the drive that contains your system folder.

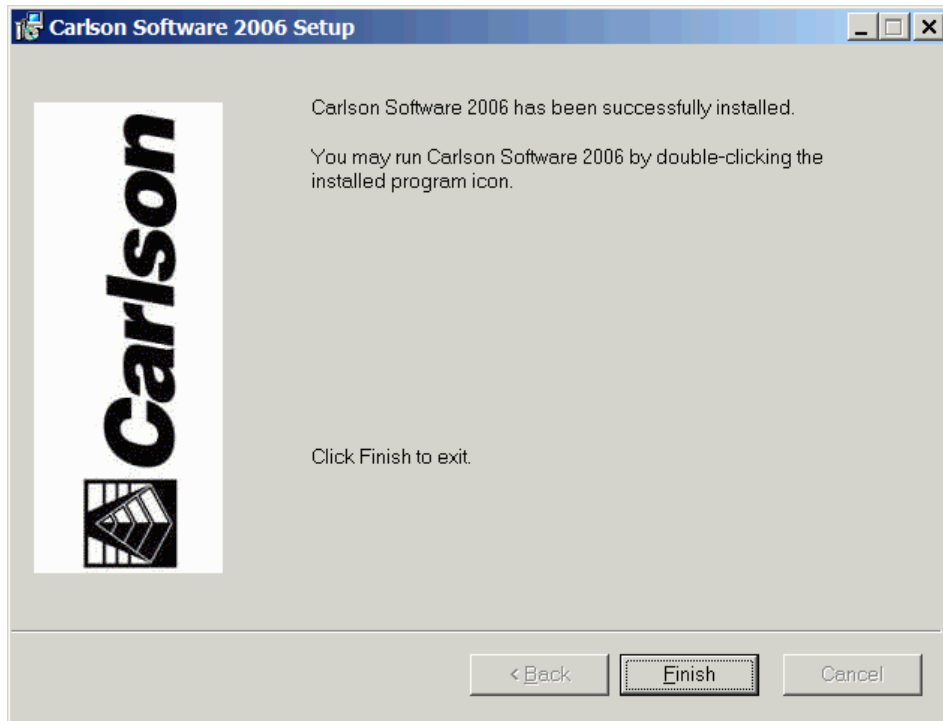
On the Start Installation page, choose Next to start the installation.



The Updating System dialog box is displayed while Carlson Survey is installed.



When the installation is complete, the Setup Complete dialog box is displayed. Choose Finish to exit the installation program.

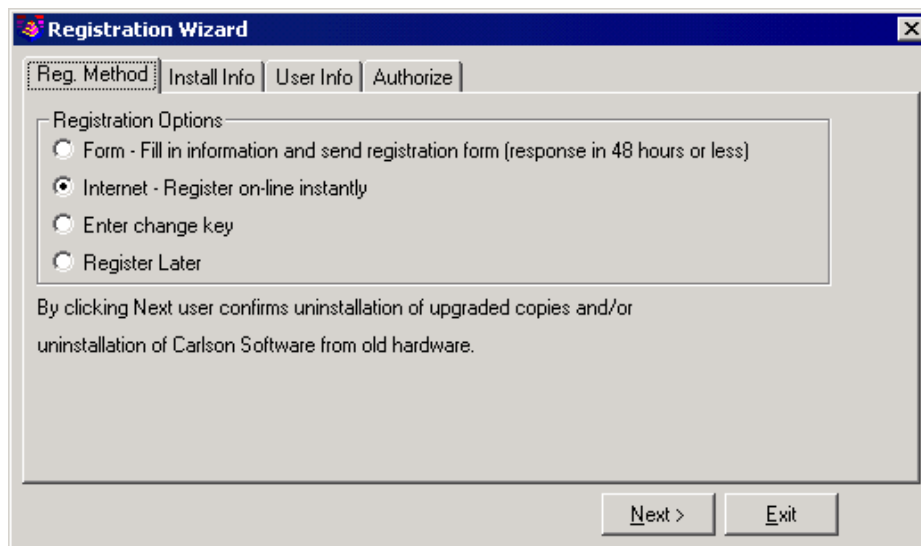


It is strongly recommended that you restart your computer at this point in order for the new configuration settings to take effect.

Congratulations! You have successfully installed Carlson Survey. You are now ready to register your product and start using the program. To register the product, double-click the Carlson Survey icon on your desktop and follow the instructions.

Authorizing Carlson Survey

The first time you start Carlson Survey, the Registration Wizard is displayed.



Carlson Software has installed an automated procedure for registering your software license. Change keys are no longer given over the telephone. Please choose one of the following registration methods.

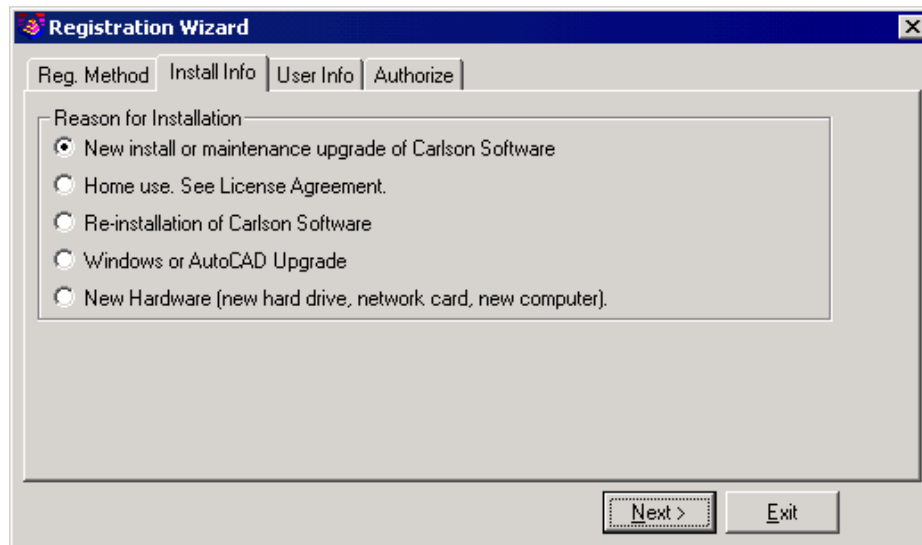
Form: This method allows you to fill out a form that you can print out and fax or mail to Carlson Software for registration.

Internet: If your computer is online, you may register automatically over the Internet. Your information is sent to a Carlson Software server, validated and returned in just a few seconds. If you are using a dial-up connection, please establish this connection before attempting to register.

Enter change key: Choose this method after you have received your change key from Carlson Software (if you previously used the Form method above).

Register Later: Choose this method if you want to register later. You may run Carlson Survey for 30 days before you are required to register.

After you choose the registration method, press Next



Choose the reason for installation. The very first time you install Carlson Survey is the only time you will choose the first reason. All subsequent installations require a choice from the remaining options.

New install or maintenance upgrade of Carlson Software: If you are installing Carlson Survey for the first time, choose this reason.

Home use. See License Agreement: Choose this reason if you are installing on your home computer. See your license agreement for more details!

Re-Installation of Carlson Software: Choose this reason if you are reinstalling on the same computer with no modifications.

Windows or AutoCAD upgrade: Choose this reason if you have reinstalled Carlson Survey after installing a new version of Microsoft Windows.

New Hardware: Choose this reason if you are installing Carlson Survey on a new computer or if your existing computer has had some of its hardware replaced such as the hard disk, network adapter, etc.

After you choose the reason for installation, press Next

The Registration Wizard dialog box has four tabs: Reg. Method, Install Info, User Info, and Authorize. The User Info tab is active, displaying the following fields:

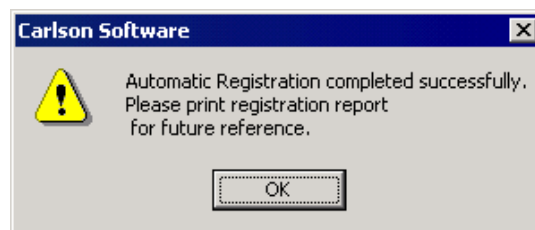
User Name	John Doe
Company	John Doe Surveying
Serial Number	0000-00000-00000-0000
Phone Number	800-555-1212
Fax Number	800-555-1212
E-Mail Address	johndoe@johndoesurveying.org
System Fingerprint	Win: 38697912, Disk: 131137804, MAC: 0:3:47:48:29:38
AutoCAD S/N	000-00000000

Below the fields is a button labeled "Print Fax Sheet". At the bottom right are buttons for "Next >" and "Exit".

Next, enter the required information into the dialog.

If you are using the Form method, press the Print Fax Form button to print out the form. You may fax this form to the number printed on the form or mail it to Carlson Software, 102 W. Second St., Suite 200 Maysville, KY 41056-1003.

If you are using the Internet method, press Next. After a few seconds, your registration will complete. If your registration is successful, you will receive a message such as the one below. If your registration is unsuccessful, please note the reason why and try again. Keep in mind that each serial number may be registered to a single computer only.



If you do not have access to the internet and do not have a printer, you must write down the information from the User Info tab (shown above) and fax it to 606-564-9525 or mail it to Carlson Software, 102 W. Second St., Suite 200 Maysville, KY 41056-1003.

LandXML

What is LandXML?

LandXML, initiated by Autodesk in December 1999, is an industry-driven, open XML data exchange standard that addresses the needs of private and public land development professionals, software/hardware producers, and service vendors. The first draft LandXML schema was derived from the earlier ASCII-based EAS-E (Engineering and Surveying - Exchange) data interchange standard initiative.

LandXML specifies a design data structure that:

- Transfers civil engineering / survey design data between producers and consumers.
- Provide a data format suitable for long-term data archival.

- Provide a standard format for official electronic design submission.

LandXML data may also be used as:

- Source data for quantity take-off, cost estimation.
- Source data for custom calculations and reports.
- Accessible design data from remote/field devices.
- Data extraction and submittal format for GIS databases.
- Engineering design data transport layer for collaborative applications.

In the past year, many software programs adopted native XML support features. Desktop applications such as Microsoft Office, AutoCAD as well as database programs such as Microsoft SQL 2000, IBM DBMS and Oracle support XML data nearly seamless. LandXML provides a specialized XML format for land development professionals that suits their needs and provides data that can be used in new ways with business, technical and database software that supports XML.

For the latest in LandXML developments, visit <http://www.landxml.org/>

Setting up a project in Carlson Survey

Over 200 Carlson Survey settings can be specified in the Configure command on the Settings menu. These values are used to initialize Carlson Survey options when opening a new or existing drawing. Among these settings is the coordinate point number format, object linking options, and settings for the COGO portion of Carlson Survey. The template drawing is the default drawing that opens up each time Carlson Survey is started. To customize the template drawing, run the OPEN command under the File pulldown menu, change the files of type setting to Drawing Template and choose the template drawing, "survey.dwt". Then make your changes and SAVE the drawing as survey.dwt in the Template directory.

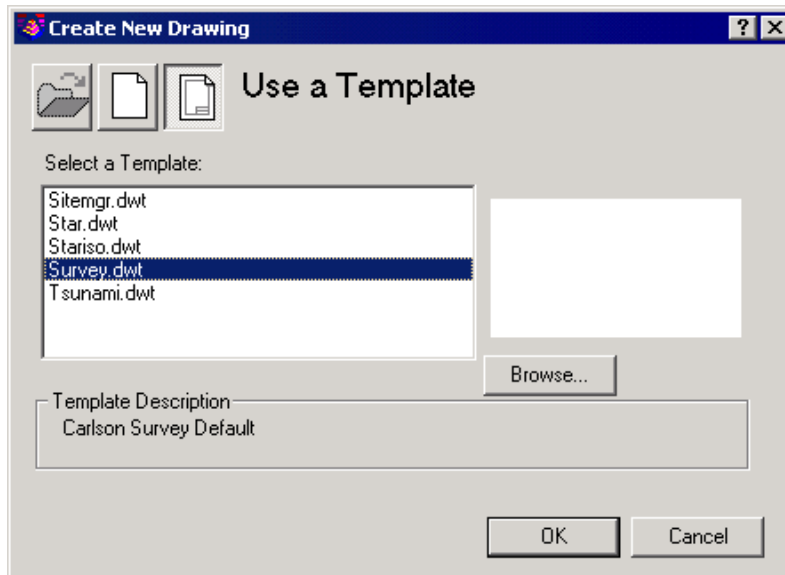
When starting a new drawing, one of the first steps is to run Drawing Setup on the Settings menu. Drawing Setup sets the drawing scale, the units mode as either english or metric, and the text, symbol and linetype size scalers. The initial values for these Drawing Setup variables are set in Configure — General Settings. When a drawing is saved, the Drawing Setup variables are saved with the drawing. Carlson Survey will set the text height according to the drawing scale and text size scaler set in Drawing Setup. For example, if the horizontal scale is set to 50 and the text size scaler is 0.1, Carlson Survey will draw the text with a height of 5 ($50 * 0.1$). Then, when the drawing is plotted at 1"=50', the text will be 0.1 inches.

Every drawing remembers the data files that are being used for the drawing. When the drawing (.DWG) file is saved with the SAVE or SAVEAS command, Carlson Survey writes a settings file that contains all the active data file names. Then, when the drawing is reopened, the data files default to their previous settings. For example, you won't have to choose which coordinate file to use unless you want to change it. The settings file is stored in the same directory as the drawing file and has the same name as the drawing with an .INI extension. For example, a drawing called survey.dwg would have a settings file called survey.ini.

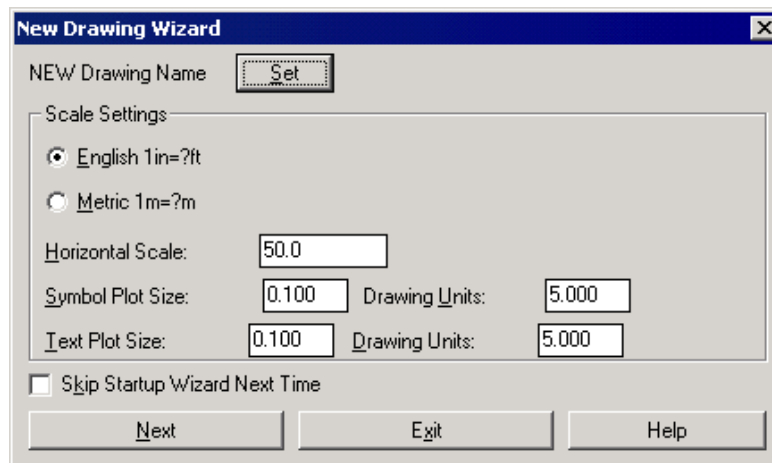
The Drawing Explorer command on the File menu, tracks and stores project files associated with each saved drawing. You may use this command to generate a report of all files used in a particular drawing. The Project Explorer takes this concept one level further and allows you to group drawing files and their associated project files. Reports can also be generated using this tool.

Startup Wizard

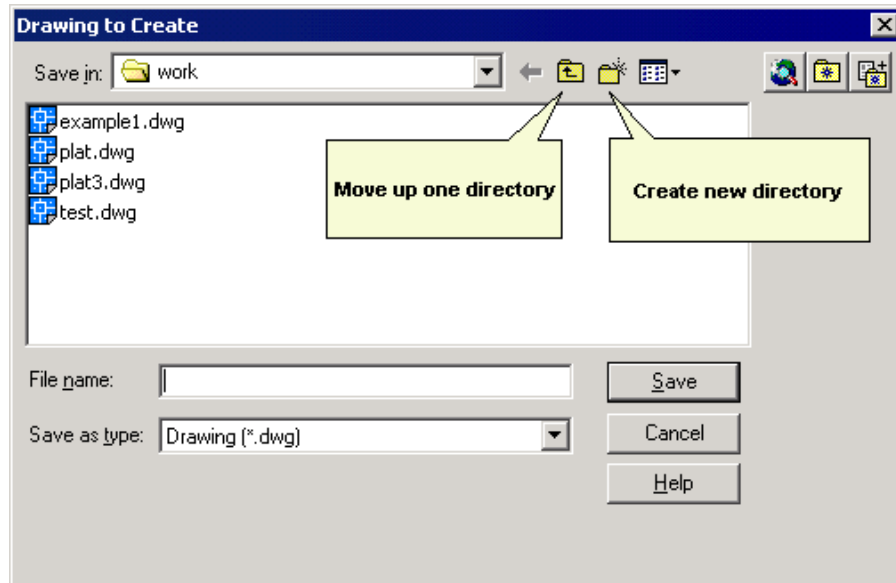
For creating a new drawing in Carlson Survey, the Startup Wizard can guide you through starting and setting up the drawing. This wizard is optional and can be turned on or off in the Configure — General Settings command. You can also exit out of the Startup Wizard at any time.



When the New drawing command is executed, you first get the standard AutoCAD choice of "Start from Scratch", "Use a Template" or "Use a Wizard". Typically, you want to the "Use a Template" option and choose the drawing template (SURVEY.DWT). The drawing template will set of some basic drawing parameters such as default layer names.



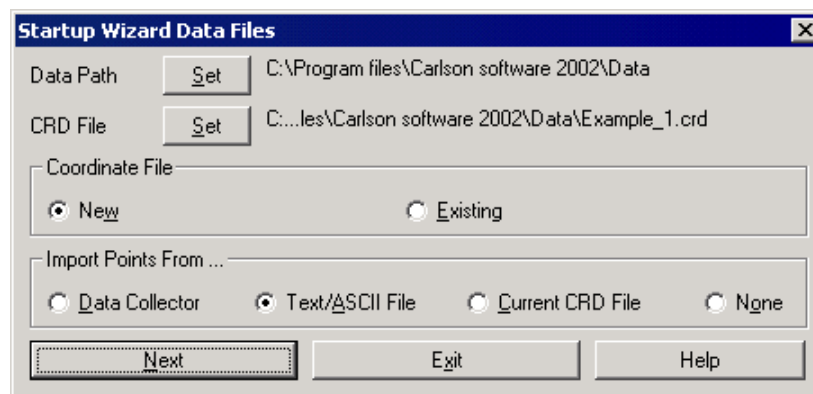
After selecting the AutoCAD new drawing option, the New Drawing Wizard dialog box opens. The Startup Wizard begins with a dialog to set the drawing name and scale. The first step to do is set the drawing (.dwg) name by picking the Set button. This brings up the file selection dialog. Change to the directory/folder ("Save in" field) where you want to store the drawing. You can either select an existing folder or create a new folder. To select an existing folder, pull down the Save in field to select a folder or drive, click the Move Up icon next to the Save in field and/or the pick the folder name from the list. To create a new folder, pick the Create New Folder icon to the right of the Save in field. Then type in the drawing name in the File name field and click the Save button.



After setting the drawing name, you can set the drawing horizontal scale, symbol size, text size and unit mode (English or Metric). Then click the Next button.

The next startup dialog sets the Data Path and CRD File. The Data Path is the folder where Carlson Survey will store the data files such as raw (.RW5) files and profile (.PRO) files. The Set button for the Data Path allows you to select an existing folder or create a new folder. See the Set Data Directory command for more information. The coordinate (.CRD) File is the coordinate file for storing the point data. There is an option to create a new or existing coordinate (.CRD) file. The new option will erase any point data that is found in the specified CRD file. The existing option will retain any point data in the specified coordinate (.CRD) file. If the specified coordinate (.CRD) file does not exist, the wizard will create a new file.

The next wizard step depends on the Import Points option. The Data Collector option will start the data collection routines to download data from a collector. The Text/ASCII option will import point data from a text/ASCII file. See the Data Collection and Import Text/ASCII File commands for more information on running these routines. If the None option is set, then the Startup Wizard is finished.



Once point data has been imported from the data collector or text/ASCII file, the wizard guides you through drawing the points. There are options to run Draw/Locate Points, Field To Finish or None. If None is selected, then the Startup Wizard is finished. Draw/Locate Points will import the points into the drawing using the same symbol and layer for all the points. From the Draw/Locate Points dialog, set the symbol, layer and point attributes to draw (description, elevation) and then pick the Draw All button. The Field To Finish command will import the points into the drawing using different layers and symbols depending on the point descriptions that refer to the code table

defined in Field to Finish. Also Field to Finish can draw linework. See the Draw/Locate Point and Field To Finish commands for more information on running these routines. After drawing the points, the wizard will zoom the display around the points. Then the wizard is finished.

Tutorial Lesson 3 provides additional help on using the Startup Wizard

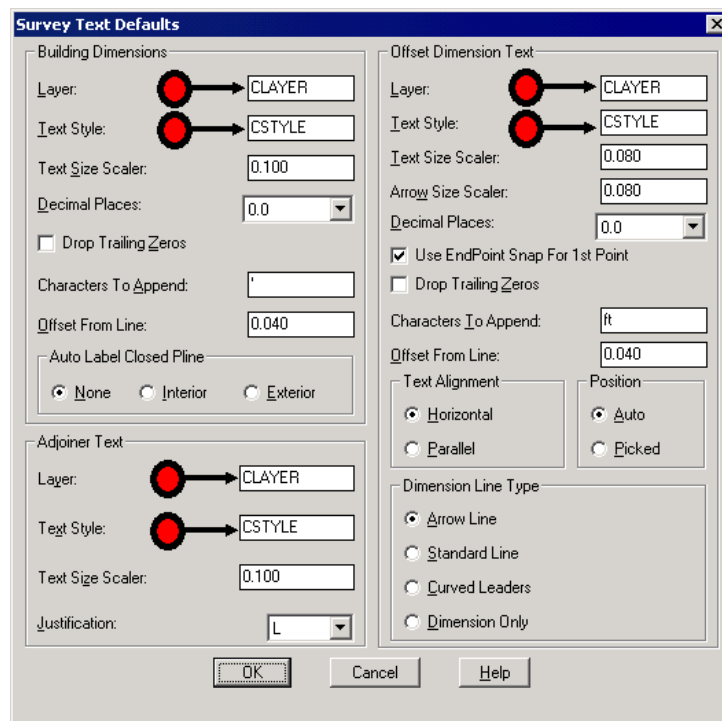
Command Entry

Commands may be issued by selecting an entry from a pulldown menu, clicking a toolbar button, or by typing a command at the command prompt. Pressing Enter at the command prompt repeats that last command. Pulldown menus have a row of header names across the top of the screen. Selecting one of these header names displays the possible commands under that name. The pulldown menus are the primary method for command selection. This manual is organized by the contents of each pulldown menu. Pulldown menus may sometimes be referred to as dropdown menus.

Layer and Style Defaults

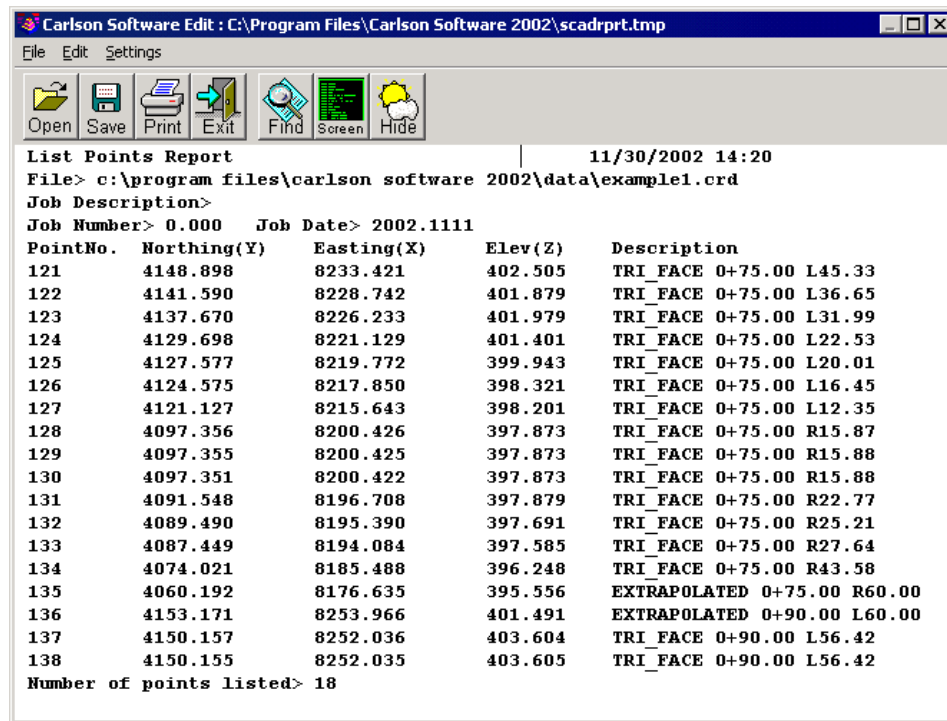
Many Carlson Survey commands have default layers such as AREATXT for area labels and BRGTXt for bearing and distance annotations. These layers can be specified in dialogs for the corresponding commands and several can be set in the Configure command. Sometimes you may want to use the current layer and it can be an extra step to have to open the dialog to set the layer. In this case, instead of using the default layer that set in the dialog, the default layer can be set as "CLAYER" which will use the current layer. For example, if the annotation layer is set to CLAYER then annotation will be drawn in the current layer instead of BRGTXt or whatever the annotation layer used to be.

This same concept applies for text styles. Several commands have specific text styles and if you want to use the current style instead of the command style, use the name "CSTYLE" for the style name.



Standard Report Viewer

Many Carlson Survey routines display output in the Standard Report Viewer as shown below.



The report can be edited directly in the report viewer. Report Viewer commands are described below.

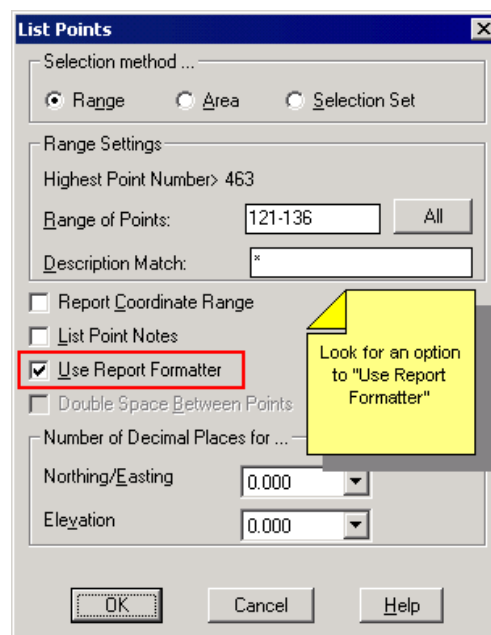
- **Open:** This allows you to open an ASCII file and display the contents in the report viewer.
- **Save:** Save the contents of the report viewer to a text file.
- **SaveAs:** This allows you to save the contents of the report viewer to a file.
- **Append To:** This allows you to append the contents of the report viewer to another file.
- **Print:** Print the contents of the report viewer. This will open the standard windows Print dialog where you can choose the printer and modify any of the printer settings before you actually print.
- **Screen:** Draws the report in the current drawing. The program will prompt you for a starting point, text height, rotation and layer.
- **Undo:** Reverses the effect of your last action. If you mistakenly deleted some text, stop and choose the Undo command to restore it. The key combination Ctrl-Z also performs this action.
- **Select All:** Selects all the text in the report viewer.
- **Cut:** Deletes the selected text and places it on the Windows® clipboard.
- **Copy:** Copies the selected text to the Windows® clipboard.
- **Paste:** Inserts ASCII text from the Windows® Clipboard into the report viewer at the cursor.
- **Search:** Opens the Find Text dialog. Allows you to search for text in the report viewer.
- **Replace:** Opens the Find and Replace Text dialog. Allows you to search for text and replace it.
- **Options:** Opens the Report Viewer Options dialog. In this dialog, you can specify print settings, such as lines per page and margins. You can also specify the font used in the report viewer. This font is used for both the display

and for printing.

- **Hide:** This button allows you to minimize the report viewer window and give focus back to AutoCAD. This allows you to return to working in AutoCAD without closing the report. You can re-activate the report by picking on the minimized report viewer icon.

Report Formatter

A number of Carlson Survey routines use a Report Formatter Tool to allow you to specify how and which results of calculations should be presented in the report. Anytime you see the option "Use Report Formatter", as in the List Points command shown below, you may direct the output to the Report Formatter rather than directly to the Report Viewer. This report routine lets you select a set of data to report and the format of the selected data. The report can be displayed in either the standard viewer described in the previous section, Microsoft® Excel or Microsoft® Access.



The data set in the Report Formatter may be thought of as a spreadsheet, where columns are various fields related to a single item such as point number, elevation, etc. Each new row represents a new item. Descriptions of these field names are displayed in the Available list of the Report Formatter. To include a data field in the report, highlight the field name in the Available list on the left and pick the Add button. This moves the field name to the Used list on the right. The order of items in the right list defines the order in which they will be displayed. In addition the items may be sorted as specified by user in the right column. Items are first sorted by the first column, then items with the same value in first column are sorted as specified for the second column and so on. In the example below, the user has chosen to show Point numbers, northings, eastings, and elevations. The report will be sorted by elevation value from high to low.

Report Formatter Options

Format: LISTPT LISTPT Save Delete Export Import

Available Used Sort

Description		Sort
	Point#	Up
	Northing	No
	Easting	No
	Elev	No

Add > Remove <

Sort Field: ☒ No ☐ Up ☐ Down ☐ Collapse

☒ Columnar format ☐ Use commas in numbers

☒ Auto-width ☐ Fixed width 20 ☐ Ignore repeating fields

☐ Totals Only Total: Grand

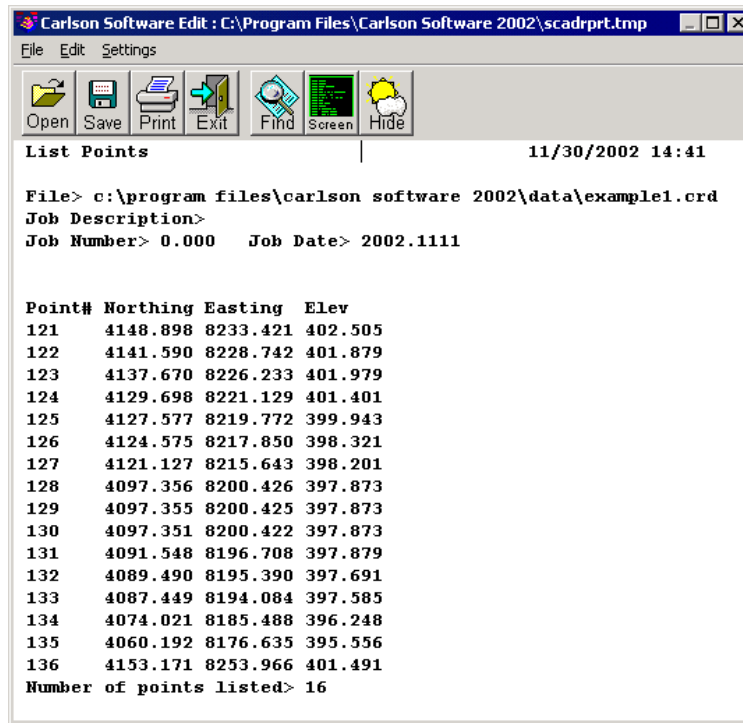
Report MS Excel Import/Export

Display Spread View User Attrib Attrib Options

Exit

These subsequent sortings do not modify sortings of previous columns. If you specify no sorting for some column (even the first one) then no sorting will happen in subsequent columns either. For example you may want to sort production by mining panel name, but not by month.

To generate the report after selecting columns and other preferences, click on Display button. It will bring up a standard built-in viewer with the report. Upon exiting the viewer you come back into the Report Formatter for further data manipulation if needed. The other data output options include saving the specified data into comma-delimited text file and direct export to Microsoft® Excel. Shown below is the List Points report described above.



You may define new columns as equations based on existing columns. Click on the Edit User Attributes button to add a new field name. A list of the existing attributes is available for reference.

User attributes may have one of the several summation options just like program-generated ones (except that for them these options are set by program). The summation level is defined by the "Total" pop-up list in the middle of the dialog. By default only grand total will be displayed at the bottom of the list. By picking the next item in that box, you will get subtotals added each time the value in first column is changed. It makes most sense to use this kind to summation if the corresponding column is sorted. For example is first column is "Area Name" and it is sorted, and "Total" is set to "Grand, Area Name" the report will have a sub-total for each distinct Area Name. This feature makes the Report Formatter a very flexible tool for results exploration, even before or without using a spreadsheet. Various forms of reports may be saved and recalled using controls in the top line of the dialog.

To save a new version of the format, type in a new name (or use default to overwrite old one) and click on the Save button. The next time that you come to the Report Formatter from the same Carlson Survey routine it will recall this last format. To pick another format just pull down on list of formats in the left top corner and pick which format to use. To Delete an unwanted format, pick it from the list first and then click on Delete button.

There are several Microsoft® Excel export options provided. You may specify a spreadsheet file to load before export, as well as a left upper cell to start with and sheet number to use. Totals which are reported when using built-in viewer may be skipped when using Microsoft® Excel export.

Technical Support

Discussion Groups

Carlson Software operates user discussion groups. The NNTP address is news.carlsonsw.com. Visit our website for complete details on how to connect to these discussiongroups.

Electronic Mail

The technical support email address is support@carlsonsw.com.

Internet

The Knowledge base is available at update.carlsonsw.com/kbase.

Program updates and patches are available at update.carlsonsw.com.

Technical support documents are available at www.carlsonsw.com.

Phone or Facsimile

Phone: 606-564-5028

Fax: 606-564-6422

Fax for registrations only: 606-564-9525

Please submit your company name, product version, and serial number with all support inquiries.

Tutorials

2

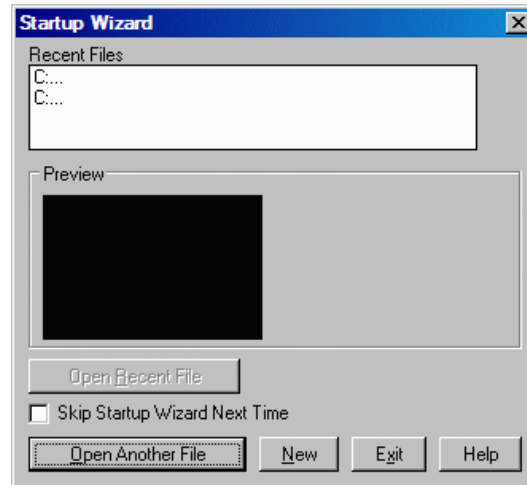
This chapter contains several tutorials designed to assist you in learning Carlson Survey.

Lesson 1: Entering a Deed

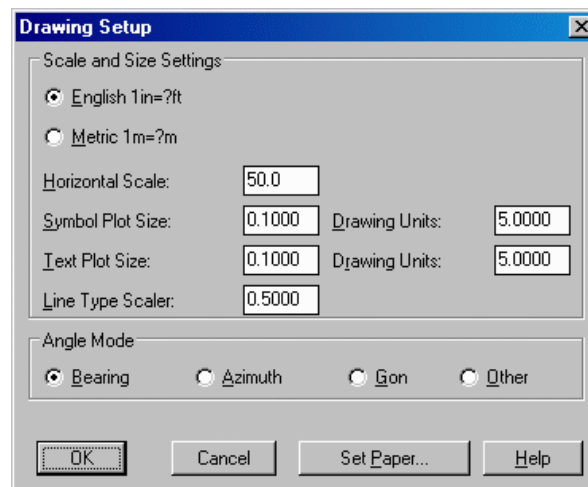
In this short lesson you will create a simple drawing. You will enter a 6-sided deed, add a title block, bar scale, north arrow, title and certification text, and plot the deed area.

Note that the Esc key will cancel most commands, so if you choose the wrong command or enter something incorrectly and want to start over, just press Esc.

1 Click the icon for Carlson Survey. You may be presented with a Startup Wizard dialog box. If so, click Exit.



2 Under the Settings menu, click Drawing Setup. Set the unit setting to English and the Horizontal Scale to 50. Click OK.



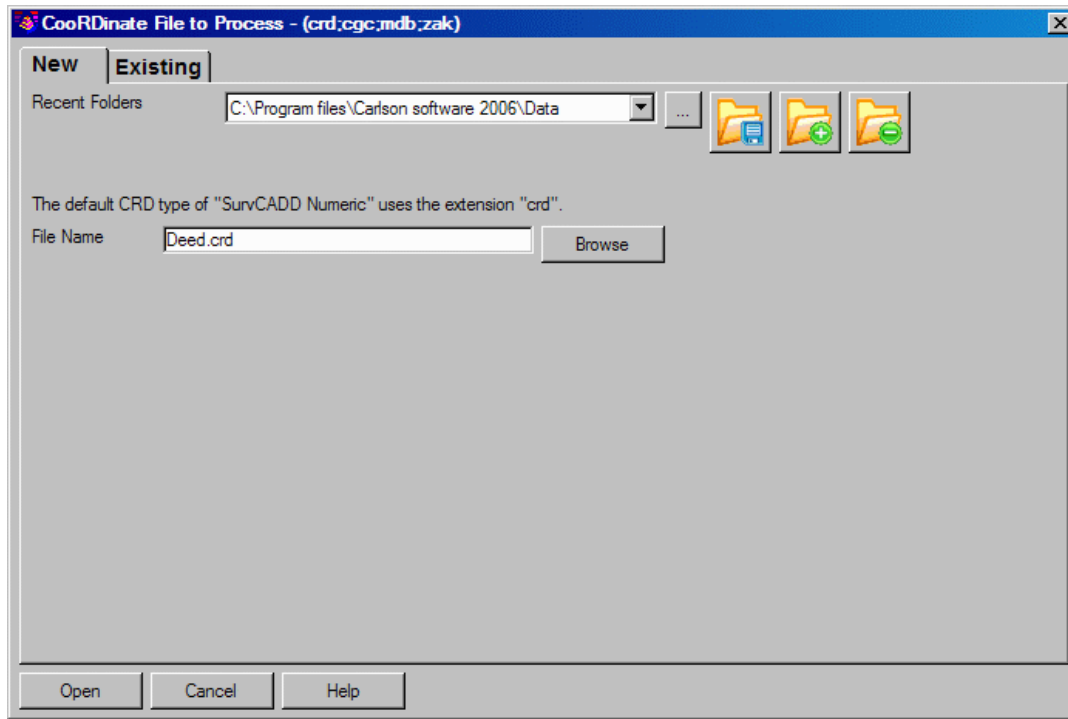
3 Choose Point Defaults from the Points menu, and, in the dialog box, click Elevations off to eliminate the Elevation prompt. Click Descriptions on and also set the point symbol name to symbol 4 (SPT4), which is the round, open circle. Click Automatic Point Numbering on. Click OK.

4 Under the Tools menu, select Enter Deed Description. Use the default settings in the Enter Deed Description dialog box, as shown in this image.

Set the To Table Scaler option to 0.00. This places all of the deed calls in the drawing. The To Table Scaler determines which deed calls appear in the drawing and which deed calls appear in a table. Deed calls less than the To Table Scaler value multiplied by the Drawing Scale will be placed in a table of calls. Set the dialog box options to match those shown above. Click OK.

The command line is the area below the graphics and to the left. When prompted to "Pick point or point number" at the command line, pick a point in the lower left quadrant of your screen to start the deed plotting.

Then, the following dialog box will appear so you can specify where to store the coordinates:



Select New, to the right of File Name, type in Deed. This creates a file called Deed.crd. All Carlson Survey points are stored in files with the "crd" extension, which stands for "coordinates." Pick the Open button.

Then prompting continues on the Command line. If you are prompted for elevation, you failed to turn off the elevation prompt in Point Defaults. Press Esc and return to the Point Defaults command.

When you are prompted for a description, enter "Fence Post".

Respond to the command line prompts exactly as shown here:

Exit/Curve/<Bearing (Qdd.mmss)>: **125.3500**

The quadrant (Q) is 1 for Northeast (2 is Southeast, 3 is Southwest and 4 is Northwest). The bearing is 25 degrees, 35 minutes, and 00 seconds. If all digits for the minutes and seconds are entered as shown above, then the deed call will be fully plotted, including the seconds. If only the degrees and minutes were entered, as in 125.35, then the plot would appear as "N 25° 35' E".

Varas/Poles/Chains/<Distance>: **200.51** Note that you can enter old deeds in the forms of Poles and Links, Chains and Links and even Varas (a unit of measurement formerly used in the southwestern states of the U.S.).

Enter Point Description <Fence Post>: Iron Pin

Undo/Exit/Curve/<Bearing (Qdd.mmss)>: **189.4321**

Varas/Poles/Chains/<Distance>: **225.00**

Enter Point Description <Iron Pin>: **Enter**

Pressing Enter selects the default, which is Iron Pin.

Undo/Exit/Curve/<Bearing (Qdd.mmss)>: **C**

Radius: **75**

Curve direction [Left/<Right>]? Press **Enter** for right

Non-tangent/Reverse-tangent/Bearing/Chord/DeltaAng/Tangent/<Arc Len>: **118.17**

If you don't know the arc length, but you know the tangent, you would choose "T" for tangent.

Enter Point Description <Iron Pin>: **Enter**

Undo/Exit/Curve/<Bearing (Qdd.mmss)>: **200.0000** (due south)

If you were to enter just 2 (no degrees, minutes, or seconds), then the deed call would be plotted "S 000 E".

Varas/Poles/Chains/<Distance>: **178.00**

Enter Point Description <Iron Pin>: **Concrete Monument**

Undo/Exit/Curve/<Bearing (Qdd.mmss)>: **488.2300**

This entry specifies Northwest 88 degrees, 23 minutes.

Varas/Poles/Chains/<Distance>: **300.34**

Enter Point Description <Concrete Monument>: **Fence Post**

Undo/Exit/Curve/<Bearing (Qdd.mmss)>: **454.1109**

Varas/Poles/Chains/<Distance>: **106.93**

Enter Point Description <Fence Post>: Press **Space bar**, then Press **Enter**

Simply pressing Enter uses the default text (Fence Post) again. To avoid drawing the text "Fence Post" twice on the end point, press the space bar, skip a blank character, and press Enter.

You have now completed the 6-sided figure (including one curve).

Undo/Exit/Curve/<Bearing (Qdd.mmss)>: **E**

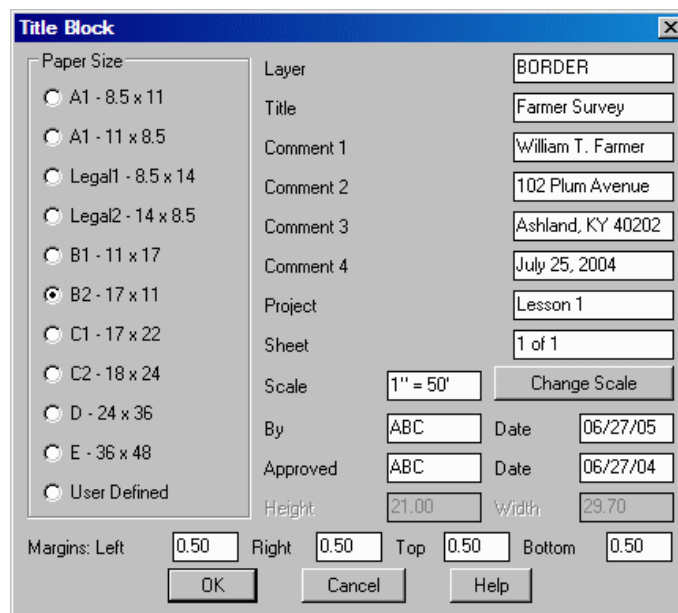
The following results are reported:

```
SQ. FEET: 83921.8  SQ. YARDS: 9324.6  SQ. MILES: 0.0
ACRES: 1.93
Closure error distance> 0.01708540  Error
Bearing> S 52d5'26'' E
Closure Precision > 1 in 66076.89  Total Distance Traversed > 1128.95
```

The resulting deed, has a closure of 1:66077. In the initial prompt "Undo/Exit/Curve...", U for Undo would allow you to reenter the previous deed call.

Use the Extents command on the View menu to see the entire area. Then choose Zoom Out under the View menu, giving you adequate room for the next step.

5 Under the Settings menu, select Title Block. The following dialog should appear allowing you to enter the attributes for the Title Block. Select Paper Size B2 (11 x 17), enter the layer name of BORDER, then choose OK. You will be prompted for the border location, pick a point in the lower left of the survey.

The image shows a software dialog box titled "Title Block". It contains several sections for configuring a title block. On the left, there is a "Paper Size" section with radio buttons for A1 - 8.5 x 11, A1 - 11 x 8.5, Legal1 - 8.5 x 14, Legal2 - 14 x 8.5, B1 - 11 x 17, B2 - 17 x 11 (which is selected), C1 - 17 x 22, C2 - 18 x 24, D - 24 x 36, E - 36 x 48, and User Defined. To the right of this is a "Layer" field set to "BORDER". Below the layer field are four "Comment" fields containing "Farmer Survey", "William T. Farmer", "102 Plum Avenue", and "Ashland, KY 40202". Further down are "Project" (Lesson 1) and "Sheet" (1 of 1) fields. A "Scale" section shows "1" = 50'" and a "Change Scale" button. Below that are "By" and "Approved" fields, both set to "ABC", and "Date" fields set to "06/27/05" and "06/27/04". At the bottom are "Height" (21.00) and "Width" (29.70) fields. A "Margins" section at the very bottom has input boxes for Left (0.50), Right (0.50), Top (0.50), and Bottom (0.50). At the bottom center are "OK", "Cancel", and "Help" buttons.

Enter an option [Align/Fit/Center/Middle/Right/TL/TC/TR/ML/MC/MB/BL/BC/BR]: C for center justified

Specify center point of text: **Pick a point for the centered text**

Choose a point near the top-center of the drawing.

Specify height <4.00>: **10**

Entering 10 make the title text bigger than the default

Specify rotation angle of text <E>: **Press Enter** for the default of East or enter **E** if the default is not E

Text: Farmer Survey

Text: Ashland, KY

Text: **Press Enter**

command line. If you haven't done anything else, such as Zoom or Pan, you can simply press Enter to repeat the last command. If pressing Enter does not repeat the Text command, press Esc to cancel. Enter Dtext at the command prompt and respond to the resulting prompts as shown below.

Pick a point above and to the left of the title block for a certification. You don't have to enter L for left-justification. The Dtext command defaults to left-justification every time.

Height <10.00>: 4

Rotation angle <E>: **Press Enter**

Text: **Surveyor's Certification**

Text: **Press space bar, then Press Enter**

Text: **I do hereby certify that the survey shown hereon**

Text: **is a true and correct representation.....**

Text: **Press space bar, then Press Enter**

Text: _____

Text: **Arnold James, PLS #2534**

Text: **Press Enter Twice** to end

The following is a closeup of the certification that we just entered:

The image shows a closeup of a survey drawing. On the left, there is a point labeled 'Concrete Monument' with a small circle and a crosshair. To the right of this point is a text block for 'Surveyor's Certification'. The text reads: 'Surveyor's Certification', 'I do hereby certify that the survey shown hereon is a true and correct representation.....', and 'Arnold James, PLS #2534'. Below this text is a title block for 'Farmer Survey'. The title block contains a table with the following information:

<i>Farmer Survey</i>		
<i>DRAWN</i> <i>ABC</i>	<i>DATE</i> <i>04/13/05</i>	<i>William T. Farmer</i> <i>102 Plum Avenue</i> <i>Ashland, KY 40202</i>
<i>APPROVED</i> <i>ABC</i>	<i>DATE</i> <i>04/13/05</i>	<i>March 25, 2005</i>
<i>SCALE</i> <i>1" = 50'</i>	<i>SHEET</i> <i>1 of 1</i>	<i>PROJECT NO.</i> <i>Lesson 1</i>

9 Enlarge the two title lines ("Farmer Survey" and "Surveyor's Certification") by a factor of 2.0 using the command Text Enlarge/Reduce on the Edit menu, option Text. When prompted for Scaling Multiplier, enter 2. Select both the Farmer Survey text (at the top of the screen, not in the title block) and the Surveyor's Certification text. When asked again to Select Objects, press Enter.

When you are selecting objects, if you select something you don't want, you can enter "R" at the next Select Objects prompt, and remove items from the selection set. If you want to add objects after you have removed an object, enter "A" at the next Select Objects prompt.

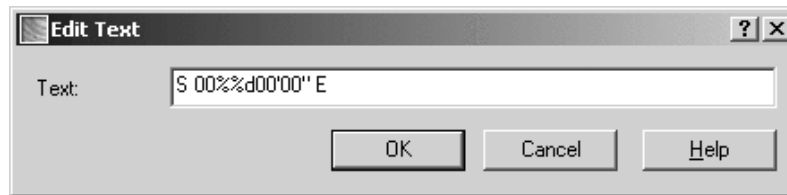
10 Make the enlarged Farmer Survey text at the top of the screen bold by changing its font to the bold font. Select the Text command from the Edit menu, Text, then select the Change Text Font option.

Select Objects: **Pick the Farmer Survey Text at the top of the drawing**

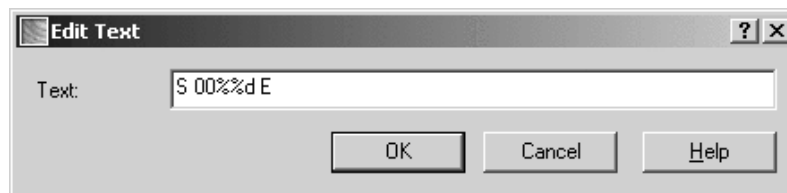
Select Objects: **Press Enter** for no more selections.

Enter new text Style: **Bold**

11 Select the Edit Text command (under the Edit menu, Text option) to change S 00°00'00" E to S 00° E. When you are prompted "Select Text to Edit:" pick the due South bearing text. A dialog box appears as follows:



The degree symbol is represented as %%d. (If you had typed N 15%%d25'35" E in the Dtext command, Carlson Survey would draw that entry as N15°25'35"E.) Click in the text to the immediate right of the quotation mark and press the Backspace key until the text reads as shown here.



Click OK. Press Enter to exit the command.

12 In the enlargement in Step 8 showing the title block and also showing point 5, notice how the linework travels into the circle that represents the point. To clip off the linework at the edge of the corner symbols, use the Trim by point Symbol command on the Points menu. This command requires that all points be in view, so if you cannot see your entire drawing, use the Extents command on the View menu (sometimes referred to as Zoom Extents). Respond to the following prompts:

Select point symbols to trim against. Select objects: **All**

All selects all points, but only linework crossing into corner symbols will be trimmed.

Select objects: **Press Enter**

You can continue to select objects until you press Enter.

The trimming is completed.

13 Prepare for area labeling by selecting the Area Defaults command on the Area menu. The dialog box shown below appears:

The 'Area Defaults' dialog box contains the following settings:

Value	Order#	Prefix	Suffix	Value	Order#	Prefix	Suffix
Perimeter			PERIMET	Lot Description			
Sq. Feet	1		SQ. FT.	Sq. Meters			SQ. MET
Sq. Yards			SQ. YAR	Cuerdas			CUERDA
Sq. Miles			SQ. MILE	Sq. Kilometers			SQ. KM.
Acres	2		ACRES	Hectares			HECTAR

Below the table, the following settings are shown:

- Precision for Square Units Labels: 0.0
- Precision for Other Area Labels: 0.0000
- Precision for Inverse with Area: 0.0000
- Label Area with +/-: ☒ None, ☐ Prefix, ☐ Suffix
- ☐ Use Commas in Labels
- ☐ Label Both Feet & Meters for Inverse with Area
- Layer for area text: AREATXT
- Style for area text: ROMANC
- Area text size scaler: 0.2
- Max gap to join (Area by Lines and Arcs): 0.00010000
- Different Radius Tolerance (Inverse w/ Area): 0.01000000

Buttons: OK, Cancel, Help

Change the Other Area Labels and Inverse with Area decimal precision to four decimal places. Also, make the Area text size scaler 0.2 (doubled from the default of 0.1).

You are going to compute the area by point number, but you could have chosen the Area by Lines & Arcs command. In that command, you would pick the lines and arcs that make up the figure, but since the closure was 0.017 off (the distance from point 7 to point 1), you would exceed the default Max gap tolerance. Unless you changed that tolerance in this dialog box to something larger than 0.017, you would get no result using the Area by Lines & Arcs command. Do not change it for this exercise, because you might forget to change it back. Instead you will compute the area by inversing from 1 through 7 and back to 1. Click OK to exit the dialog box.

14 Select Inverse with Area on the Area menu. Respond to the prompts as shown below:

Station/<Pick Starting point or point number>: **1**

Pick point or point numbers (R-RadiusPt, U-Undo, Enter to end): **2**

Pick point or point numbers (R-RadiusPt, U-Undo, Enter to end): **3**

Pick point or point numbers (R-RadiusPt, U-Undo, Enter to end): **R**

Radius point number or pick point: **CEN** for center "snap"

Now move the cursor, without picking, to the arc and see how the center snap becomes active. When the radius point is found, pick on the arc.

Curve direction [Left/<Right>]? **Press Enter** for the Right option

Pick End of Arc or point number (U-Undo, Enter to end): **4**

Pick point or point numbers (R-RadiusPt, U-Undo, Enter to end): **5**

Pick point or point numbers (R-RadiusPt, U-Undo, Enter to end): **6**

Pick point or point numbers (R-RadiusPt, U-Undo, Enter to end): **7**

Pick point or point numbers (R-RadiusPt, U-Undo, Enter to end): **1**

Pick point or point numbers (R-RadiusPt, U-Undo, Enter to end): **Press Enter** to end

A Standard Report Viewer dialog box showing the complete Inverse with Area report, including these below results, will appear.

SQ. FEET: 83921.8 SQ. YARDS: 9324.6 SQ. MILES: 0.0
ACRES: 1.9266 PERIMETER: 1128.9671

Select Exit at the top of the dialog and respond to the prompts as shown below:

Pick area label centering point: **Pick a point** near the center of the figure, in its interior. The area units you chose in Area Defaults are labeled on the screen.

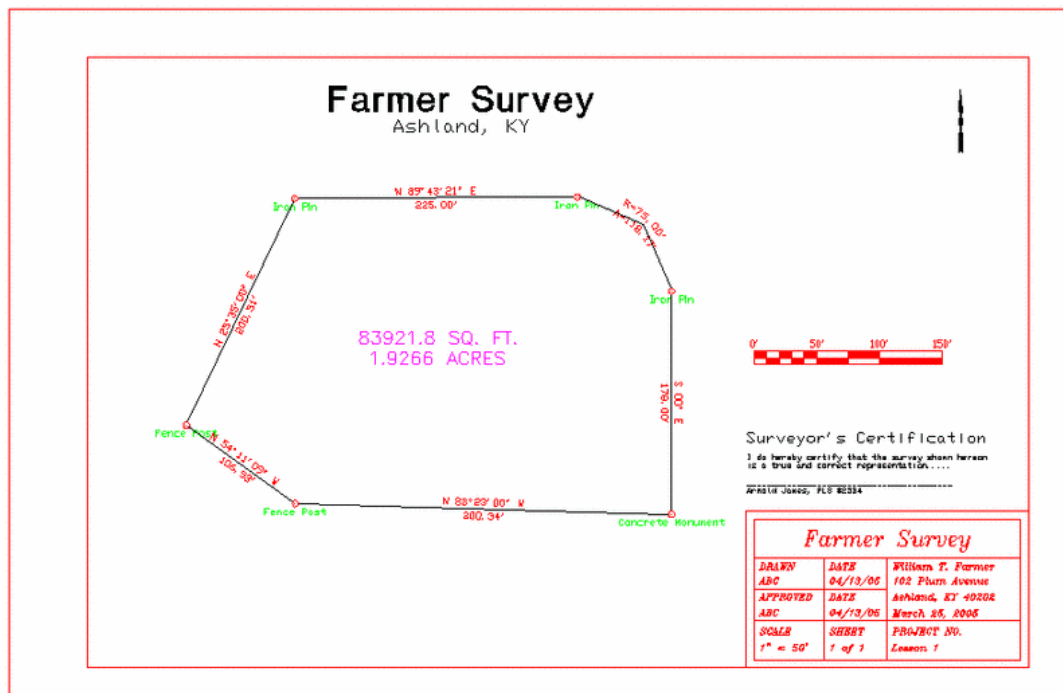
Erase Polyline Yes/No <Yes>: **Y**

This erases a polyline that has been drawn over the original lines and arcs. The Inverse with Area command draws this polyline because often you are solving the area from points and want the new linework drawn.

You snapped to the radius point using the "cen" snap. Additional object snaps appear under Object Snap command on the Settings Menu. Since all plotted points have a node, you could have inversed around this figure by using the "nod" snap for points 1 through 7, and the "cen" snap to capture the radius point. Snaps are typically entered at the keyboard as three characters (for example, "int" for intersect and "end" for endpoint).

15 Freeze the point numbers to finish the drawing by choosing Layer Control on the View menu. In the PNTNO row, click the sun icon to change it to a snowflake icon, which freezes the PNTNO layer. The point numbers remain in the drawing, waiting to be "thawed", but they are not displayed.

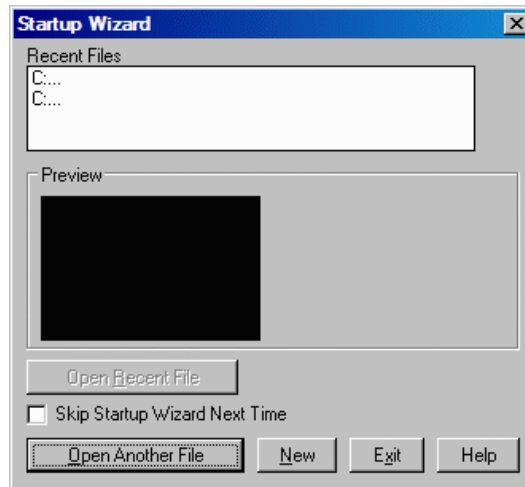
The final drawing is shown here:



Lesson 2: Making a Plat

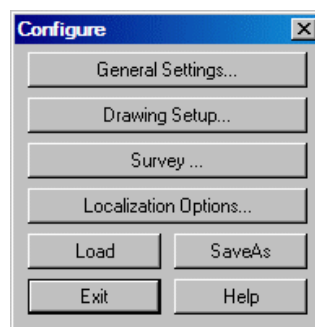
In this lesson you will draw out a plat of a single lot, using Carlson Survey drafting techniques. You will make the plat from an ASCII file of points named Plat.txt.

1 Click the icon for Carlson Survey. You may be presented with a Startup Wizard dialog box as shown below:

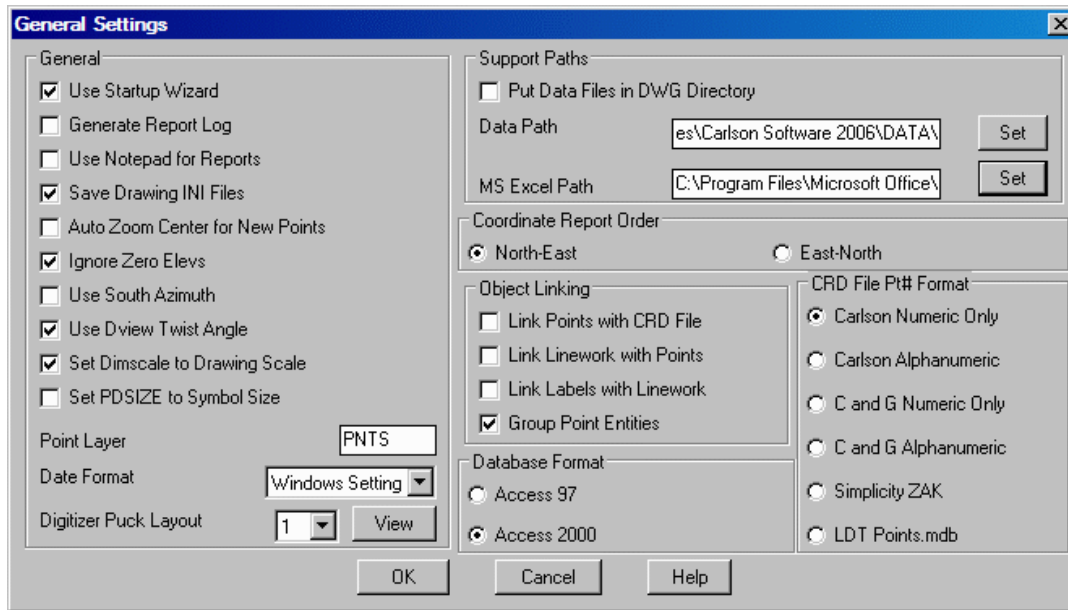


You will use the Wizard in Lesson 3 to quickly perform a series of commands. In this lesson, however, you will enter the commands individually so you can see what each one does. If you see the Startup Wizard dialog box, and you don't want to see it again, as is the case here, click the Skip Startup Wizard Next Time option. Another way to turn off the Wizard is to click it off within the Configure command under the Settings menu.

2 On the Settings menu, click Configure to display the following menu:



Click General Settings to display the dialog box shown here.

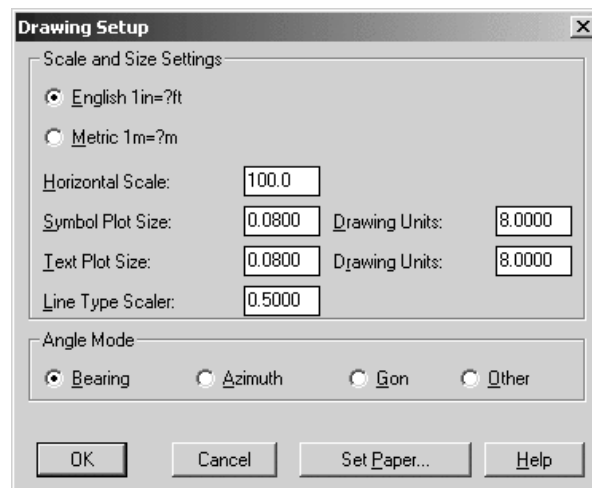


The settings in this dialog box, along with the settings in other configure sub-options, determine default working conditions for Carlson Survey. In this example, set the Data Path, which specifies where data files are stored, to C:\Program Files\Carlson Software 2006\DATA. Turn on Group Point Entities which groups point elevations, numbers, and descriptions (all aspects of the points) into a single entity for moving, erasing, and other commands.

Choose Numeric Only to store points in numeric form. This produces point numbers such as 1, 2, 3, 10, and 11. If you selected Alphanumeric, then you could have point numbers like 1A, 1B, 1C, HUB5, CTRL, SS10, etc. There is a slight speed advantage to working with purely numeric point numbers. The highest numeric point number allowed is 32000. Regardless of format, point numbers are stored in a file that has a .CRD extension. There is no limit to the number of points in an alphanumeric coordinate file.

Click on the Use Startup Wizard option (for Lesson 3). Click OK, which you back to the Configure dialog, then click Exit.

3 Select Drawing Setup from the Settings menu.

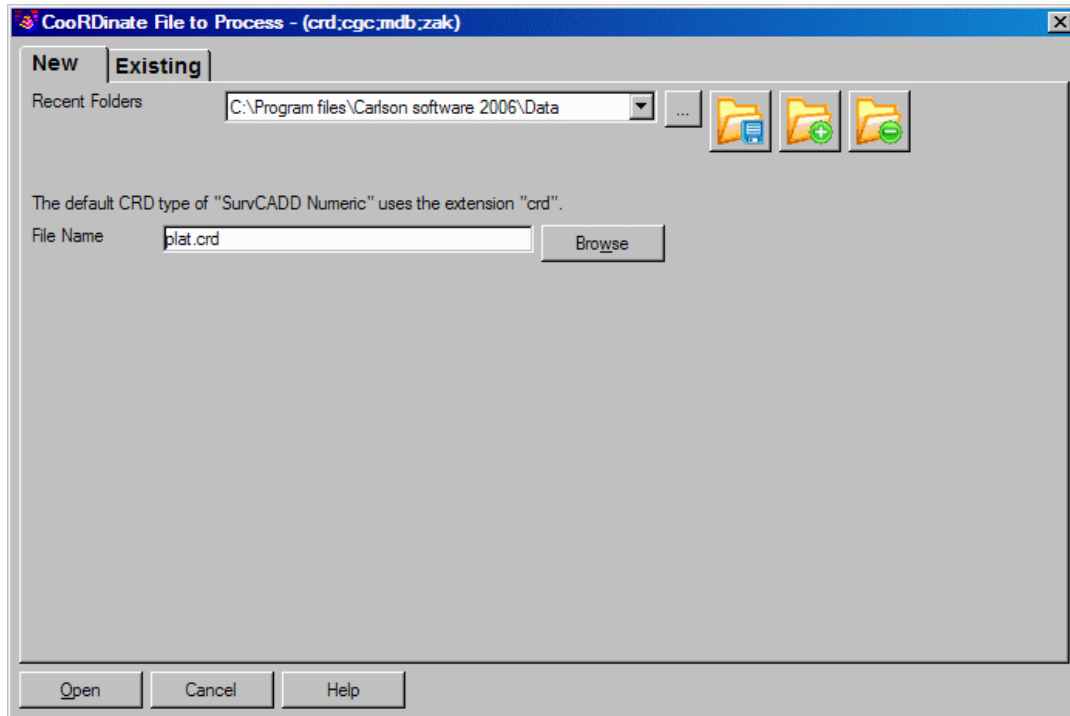


The scale acts as a multiplier on all text annotation. For example, $100 * \text{Text Plot Size (0.08)} = 8$ (text height of 8 units). The Text Plot Size is the effective height, in inches, that the text will appear when plotted at the Horizontal Scale (here 100).

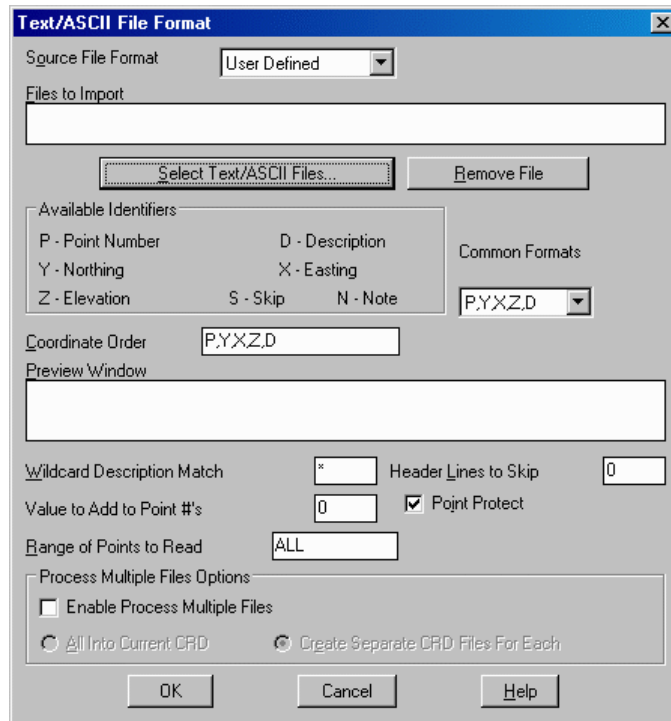
Bearings and Distances, Legends, Title Blocks, and Point Symbols will size up or down on the basis of the Horizontal Scale set within Drawing Setup. Set the Horizontal Scale to 100 and press Enter. Then click OK to exit Drawing Setup.

4 Next, you will import the ASCII file called Plat.txt and store the points in a Coordinate file called Plat.crd. However, since you are in a new drawing, you have not yet set a coordinate file to store the points in. You must have a Carlson Survey coordinate file (.CRD) open and established as the container for your points.

So, under the Points menu, select the command Set CoorRDinate File to display the dialog box shown below. Click New. To the right of File name enter Plat and click Open. You have now created the required .CRD file.

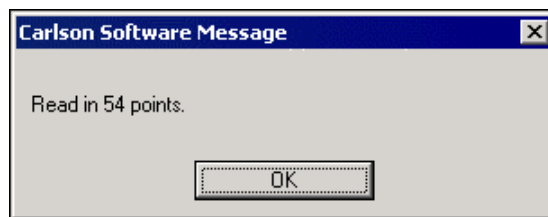


You are now ready to import the points. This time, under the Points menu, select Import Text/ASCII File to display the dialog box shown below.



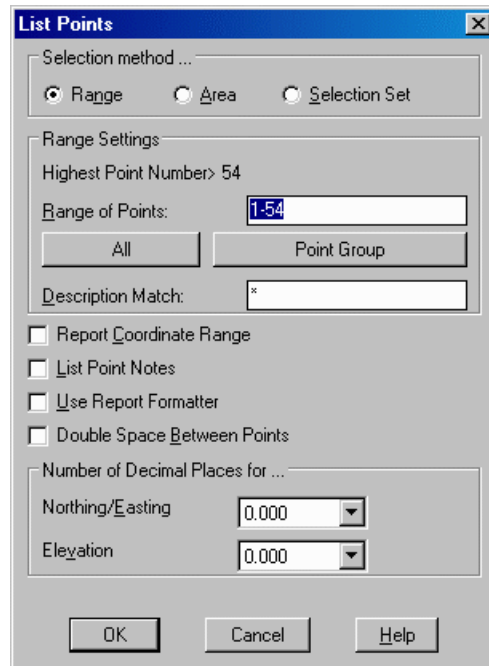
Click the Select Text/ASCII Files button and choose Plat.txt, found in the default data directory (C:\Program Files\Carlson Software 2006\DATA). Plat.txt is an ASCII file containing 54 points in the form of Point Number, Northing, Easting, Elevation, and Description. The format of the points appears in the Preview Window. The format is: Point (P), Northing (Y), Easting (X), Elevation (Z), Description (D), or in short, P,Y,X,Z,D. You must match this format in the Coordinate Order. If you don't see P,Y,X,Z,D in the Coordinate Order box, then select that format from the Common Formats option. Or, you can type the list directly into the Coordinate Order box.

Click Open. The Text/ASCII File Format dialog box appears again. Click OK. Points will be saved and stored in Plat.crd. A confirming dialog appears as follows:



Click OK.

5 Choose the List Points command under the Points menu.



List Points

Selection method ...

☒ Range ☐ Area ☐ Selection Set

Range Settings:

Highest Point Number> 54

Range of Points:

Description Match:

☐ Report Coordinate Range

☐ List Point Notes

☐ Use Report Formatter

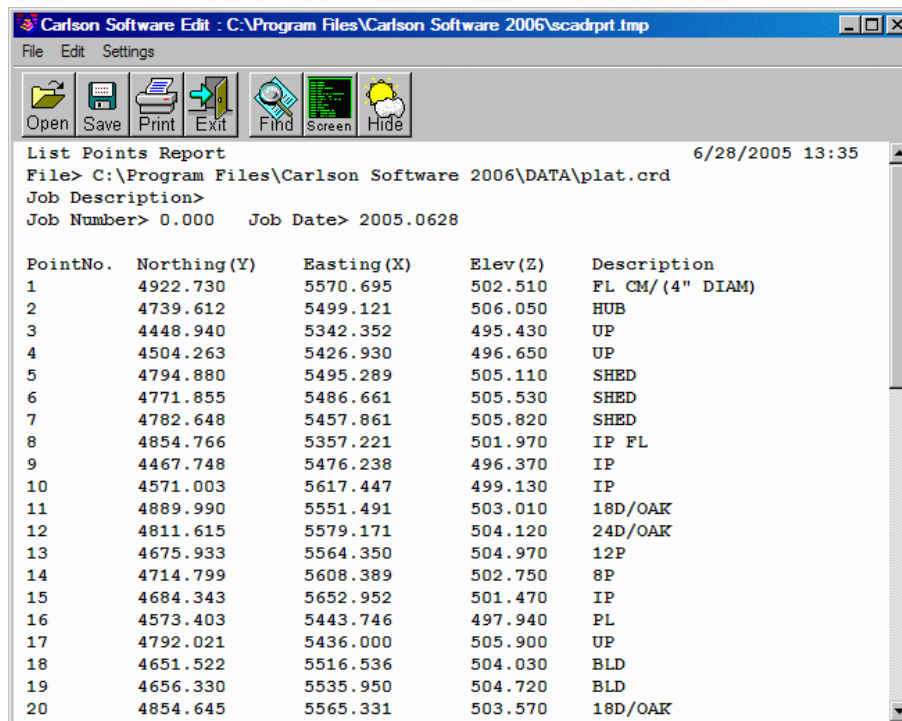
☐ Double Space Between Points

Number of Decimal Places for ...

Northing/Easting

Elevation

The List Points dialog box will typically default to the full range of points, which is 1 through 54 in this exercise. You can control the decimal places for the Northing/Easting and the Elevation of the points in the lower portion of the dialog box. The settings shown result in the report shown below:



Carlson Software Edit : C:\Program Files\Carlson Software 2006\scadpr1.tmp

File Edit Settings

Open Save Print Exit Find Screen Hide

List Points Report 6/28/2005 13:35

File> C:\Program Files\Carlson Software 2006\DATA\plat.crd

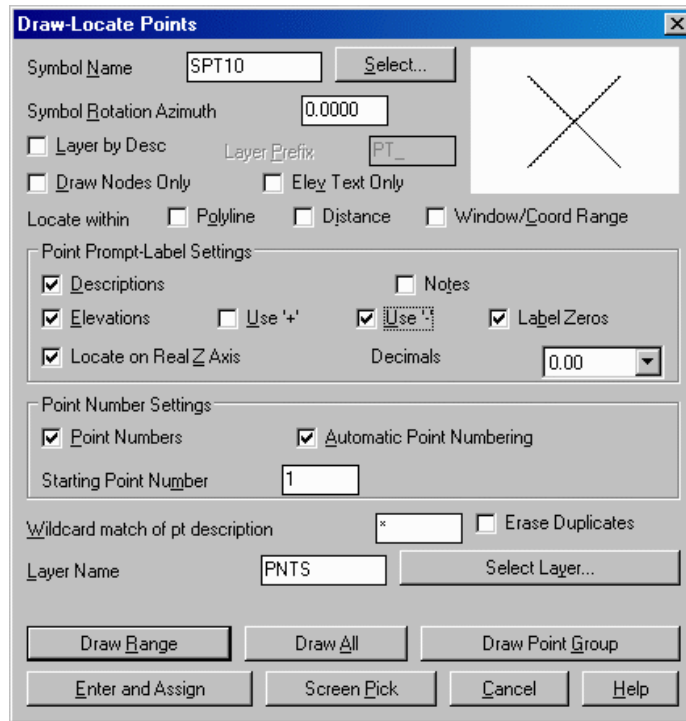
Job Description>

Job Number> 0.000 Job Date> 2005.0628

PointNo.	Northing (Y)	Easting (X)	Elev (Z)	Description
1	4922.730	5570.695	502.510	FL CM/ (4" DIAM)
2	4739.612	5499.121	506.050	HUB
3	4448.940	5342.352	495.430	UP
4	4504.263	5426.930	496.650	UP
5	4794.880	5495.289	505.110	SHED
6	4771.855	5486.661	505.530	SHED
7	4782.648	5457.861	505.820	SHED
8	4854.766	5357.221	501.970	IP FL
9	4467.748	5476.238	496.370	IP
10	4571.003	5617.447	499.130	IP
11	4889.990	5551.491	503.010	18D/OAK
12	4811.615	5579.171	504.120	24D/OAK
13	4675.933	5564.350	504.970	12P
14	4714.799	5608.389	502.750	8P
15	4684.343	5652.952	501.470	IP
16	4573.403	5443.746	497.940	PL
17	4792.021	5436.000	505.900	UP
18	4651.522	5516.536	504.030	BLD
19	4656.330	5535.950	504.720	BLD
20	4854.645	5565.331	503.570	18D/OAK

Exit the report by selecting the Exit icon at the top of the window box, or by clicking the X in the upper right of the window.

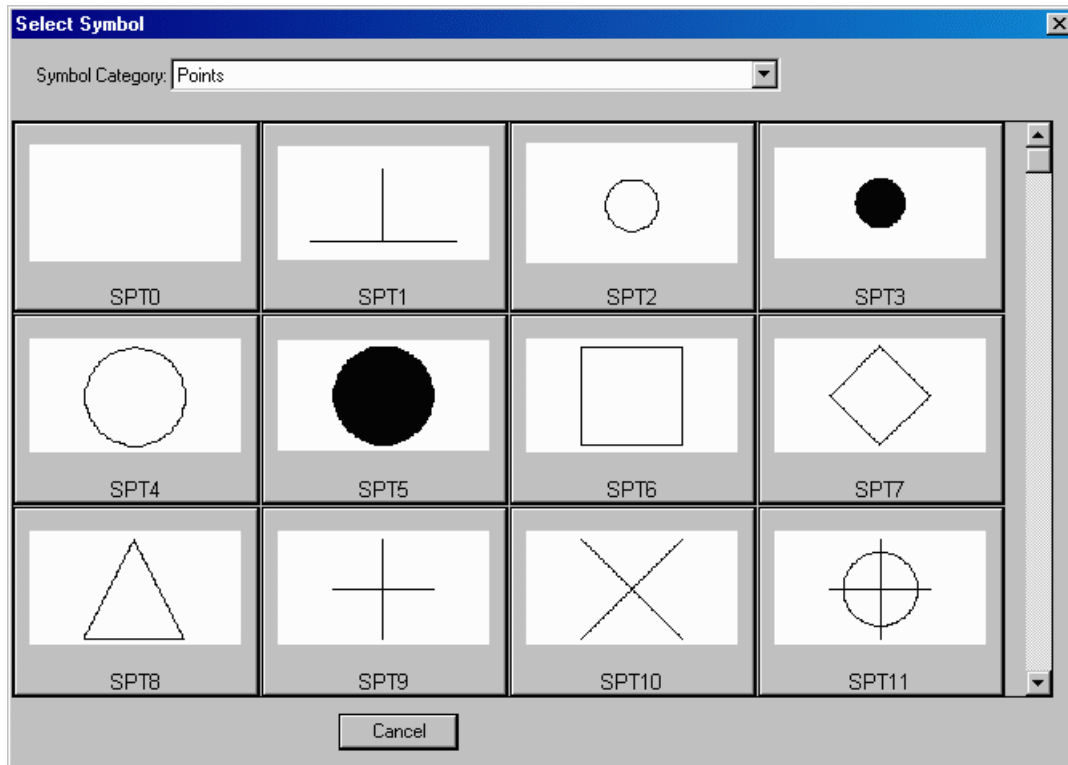
6 Select the Draw-Locate Points command on the Points menu to draw the points on the screen.



In this exercise, the current Symbol Name is SPT10, which stands for Survey Point symbol 10. SPT10 is an X, shown in the symbol display window. You can select a different default symbol using the Point Defaults command on the Points menu.

In this exercise you will change the Symbol Name to null, or symbol 0 (in effect, no symbol). Later you will add official property corner and utility symbols. Although you are working without a default symbol, there will always be a "dot" or a node at the correct insertion point of each point number

Click Select. You will see the following dialog box:



Click the blank SPT0 point symbol option. Note that the scroll bar at the right of this Select Symbol dialog box leads to more pages of symbols.

When you select a symbol, you automatically return to the Draw-Locate Point dialog box. Click Draw All to display the rather busy drawing shown below:



53

47 199.96

48 200.03

HUB EP

53 199.96

MH

25 199.22

16 199.18

PL

4 198.66

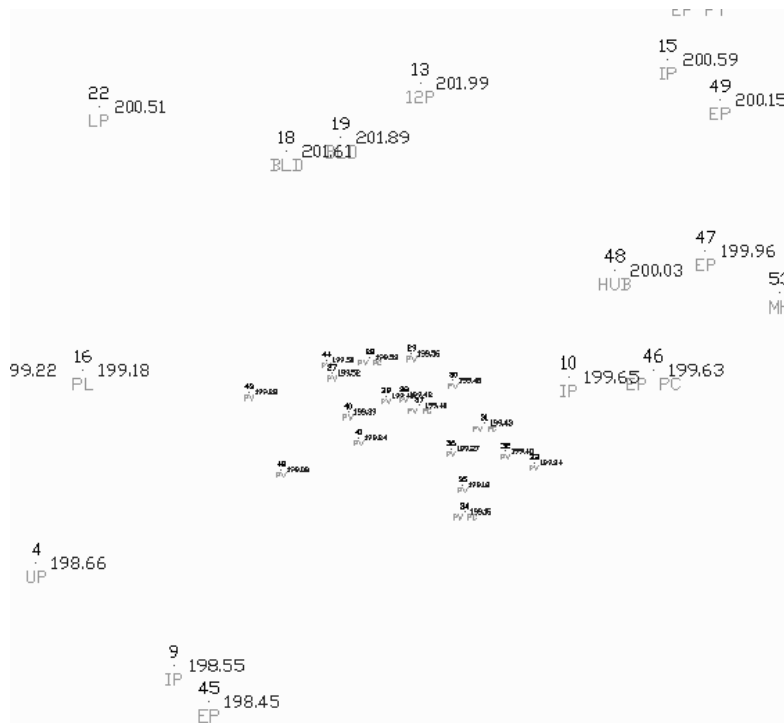
UP

9 198.55

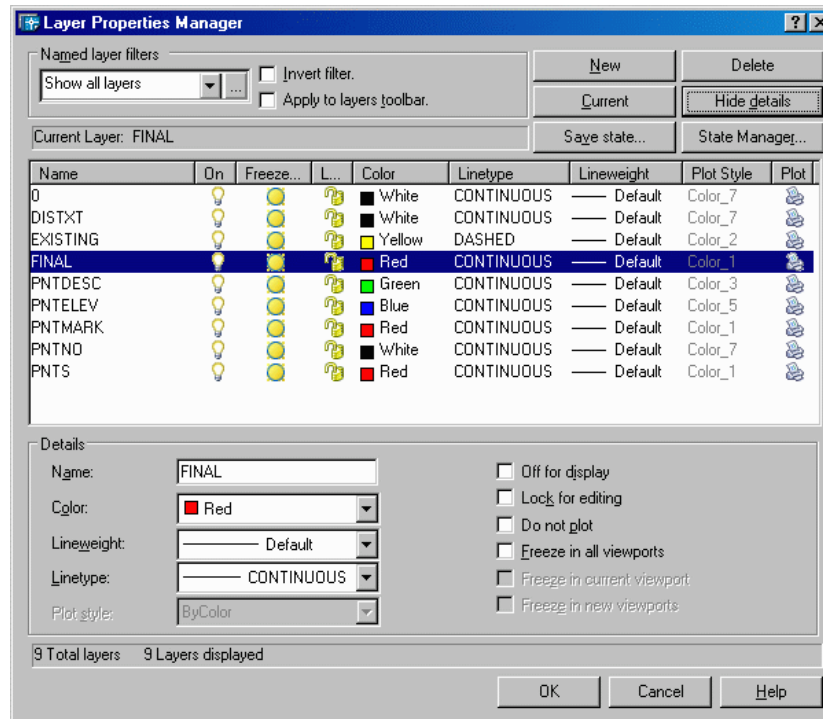
44 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 46

PV PC IP EP

The following shows the scaled points.



8 Next, you will prepare for drawing linework by setting the current layer. You should draft linework and symbol work in designated layers. In this example, you will put linework and symbol work in a layer named Final. (You could put property linework in the Final layer and utility linework in the Utility layer, but for now you will put all linework and symbols in the layer Final.) To pick the current working layer, select the Layer Control command from the View menu.



Click Final. Click Current. Click OK.

9 The 2D Polyline command allows you to enter point numbers to draw a line. First, connect portions of the property line. Select the 2D Polyline command on the Draw menu. Accept the defaults in the Polyline 2D Options dialog box by clicking OK.

[Continue/Extend/Follow/Options/<Pick point or point numbers>]: **1**

[Arc/Direction/Close/Follow/Undo/<Pick point or point numbers>]: **8**

[Arc/Direction/Close/Extend/Follow/Undo/<Pick point or point numbers>]: **Enter**

This creates a polyline. Keep this as a separate polyline, because later you will turn this back lot line into a fence line.

Now, connect some of the other property lines. Repeat the 2D Polyline command. You can press Enter to repeat the command, or you can select it from the Draw menu. To avoid seeing the Polyline 2D Options dialog again, click, or deselect, the Show options on startup radial button at the top left. Now, connect points 8 through 10, and start an arc, by entering as follows:

[Continue/Extend/Follow/Options/<Pick point or point numbers>]: **8-10**

[Arc/Direction/Close/Extend/Follow/Undo/<Pick point or point numbers>]: **A**

This connects points 8 to 9 to 10 and starts an arc at point 10.

[Radius pt/radius Length/Arc length/Chord/Second pt/Undo/<Endpoint or point number>]: **15**

[Arc/Direction/Close/Extend/Follow/Undo/<Pick point or point numbers>]: **1**

[Arc/Direction/Close/Extend/Follow/Undo/<Pick point or point numbers>]: **Press Enter** to end the command

Pick point or point numbers:**8-10**

Undo/+/-/Arc/Close/Length/<Pick point or point numbers>: **A**

This connects points 8 to 9 to 10 and starts an arc at point 10.

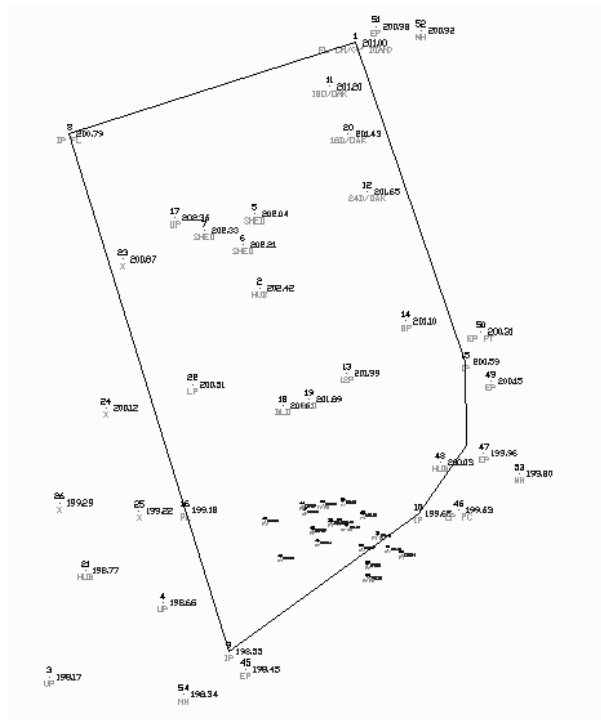
Second point/Radius point/radius Length/<Endpoint or numbers>: **15**

Undo/+/-/Arc/Close/Length/<Pick point or point numbers>: **1**

Undo/+/-/Arc/Close/Length/<Pick point or point numbers>: **Press Enter** to end the command

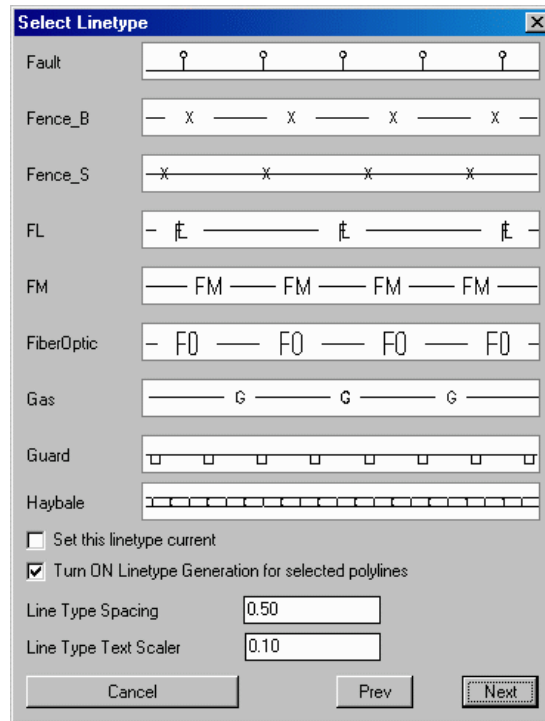
This creates the full lot, with the arc coming off point 10 on a tangent. The line from 15 to 1 is not guaranteed to be tangent to the previous arc.

You should have the following linework at this point:



10 You will now create a fence line on the polyline you drew from points 1 to 8. Go back to Drawing Setup from the Settings menu and set the Horizontal Scale to 50 and press Enter. Click OK to exit Drawing Setup.

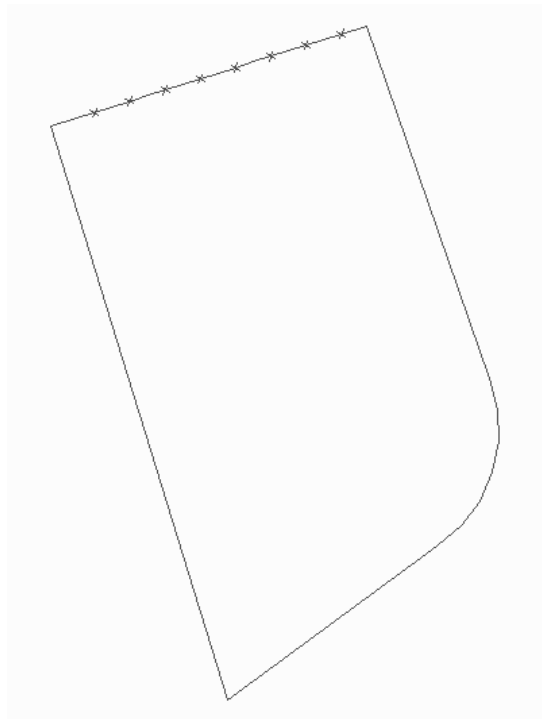
Now, choose the Line Types command on the Annotate menu and select the Change Polyline Linetype command. The Line Types command creates polylines that respond as one entity when selected. When the dialog box appears, click Next twice to display the dialog box shown below.



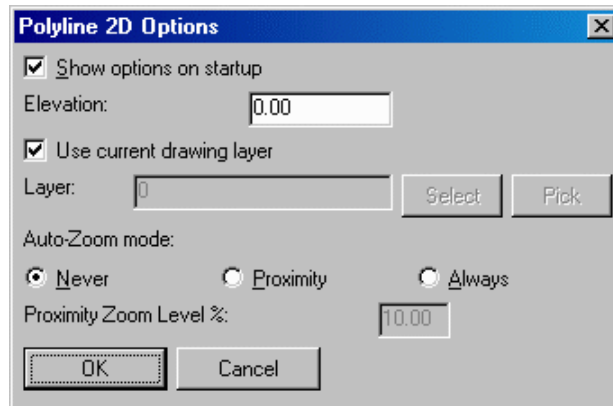
Choose the Fence_S option (the solid fence line).

When prompted to Select Objects, pick the polyline you created from points 1 to 8. Press Enter to end selection. Notice that the Current Line Type Scaler, governing spacing, should be 0.5 (inches) and the Text Plot Size is 0.1. If your settings are different, you may want to Undo (by entering U for undo) the fence line and select the Defaults command on the Annotate menu and set these items to match the example.

On the View menu, select the Isolate Layers command, pick the property line, and press Enter twice. Here is the result:



11 Next, you will connect up the edge of pavement. On the View menu, select the Restore Layers command to restore your points. Then select the 2D Polyline command under the Draw menu. At the command line, type in O for Options. The dialog box, mentioned above, appears as shown below. Make sure that the options selected are the same.



Click OK. Proceed as follows to connect up the edge of pavement:

[Continue/Extend/Follow/Options/<Pick point or point numbers>]: **45-47,49-51**

Press Enter at the next prompt to exit the command and create the road. Note how you can separate range entries using a comma.

12 To smooth the edge of the road, select the Polyline Utilities command on the Edit menu, and select Smooth Polyline.

Enter the looping factor (1-10) <5>: **Press Enter**

Enter the offset cutoff <0.05>: **Press Enter**

Select objects: **pick the edge of road polyline.**

Select objects: **Press Enter**

13 To offset the smoothed edge-of-road polyline by 24 feet to make the opposite edge of the road, Select the Offset command on the Edit menu.

Specify offset distance or [Through] <Through>: **24**

Select object to offset or <exit>: **pick the edge-of-road polyline**

Specify point on side to offset: **pick to the right of the polyline**

Select object to offset or <exit>: **Press Enter** to end the command

Now select the Isolate Layers command from the View menu, pick on any of your linework, and only the entities on the picked layers are displayed.

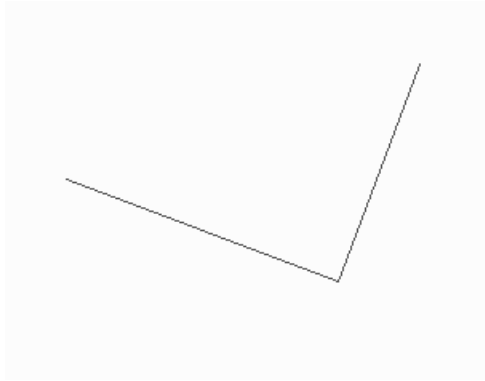
Select the Restore Layers command from the View menu to recover your points. Experiment with the "cadence" of Isolate and Restore Layers. Select Isolate Layers, pick the layers to isolate, then press Enter twice. Then select Restore Layers.

14 Next, you will draw the shed. Select the 2D Polyline command on the Draw menu. To draw a two-sided shed, connect points 5 through 7 as follows:

[Continue/Extend/Follow/Options/<Pick point or point numbers>]: **5-7**

Press Enter to exit at the next prompt.

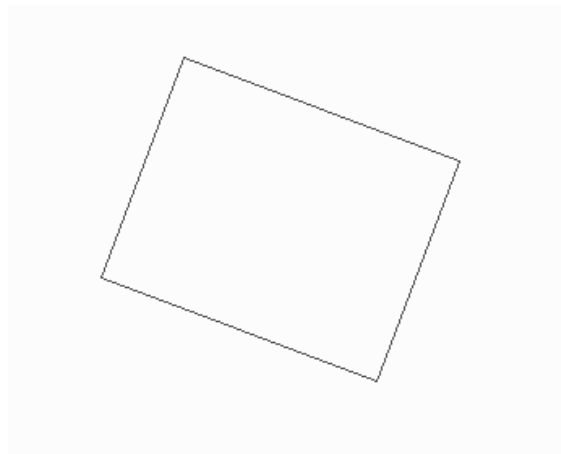
This produces the 2-sided building shown here:



Select the 4 Sided Building command on the Design menu. Turn the 2-sided shed into a 4-sided shed as follows:

Options/<Pick a line or polyline>: **Pick the shed**

Now your 2-sided building looks like this:



15 Focus your attention on the area of tightly spaced points with point numbers ranging from 27 to 44. This is the driveway and paving area. In the case of the driveway, assume that the surveyor who collected the points shot in 3-point arcs. They came up to a PC, shot a point on the arc, and finished up at the PT.

On the View menu, select the Window option, and pick a lower left and upper right point that windows the driveway area. (If you wish to use the View > Previous command to zoom out, then use View > Window to zoom in again.)

Select the 2D Polyline command under the Draw menu, and walk the polyline through the two arcs as follows:

Pick point or point numbers:**27**

Undo/Arc/Length/<Pick point or point numbers>:**28**

Undo/+/-/Arc/Close/Length/<Pick point or point numbers>: **A**

Second point/Radius point/radius Length/<Endpoint or numbers>: **S**

Use S for 3-pt arcs.

Pick Second Point or point number: **29**

Pick End Point or point number: **30**

Undo/+/-/Arc/Close/Length/<Pick point or point numbers>: **31**

Undo/+/-/Arc/Close/Length/<Pick point or point numbers>: **A**

Second point/Radius point/radius Length/<Endpoint or numbers>: **S**

Pick Second Point or point number: **32**

Pick End Point or point number: **33**

Undo/+/-/Arc/Close/Length/<Pick point or point numbers>: **Press Enter**

In the above exercise you started at point 27, went to the PC at point 28 and inserted a 3-point arc through points 29 and 30. You proceeded tangent to point 31, which was another PC, then completed a 3-point arc through points 32 and 33, and ended.

Now, connect up the basketball court area.

Select the Polyline command under Draw, or press Enter to repeat the previous command.

Pick point or point numbers: **27**

Undo/Arc/Length/<Pick point or point numbers>:**44**

Undo/Arc/Length/<Pick point or point numbers>:**43-39** (you can enter "backwards" ranges)

Undo/+/-/Arc/Close/Length/<Pick point or point numbers>: **A**

Second point/Radius point/radius Length/<Endpoint or numbers>: **S**

Pick Second Point or point number: **38**

Pick End Point or point number: **37**

Undo/+/-/Arc/Close/Length/<Pick point or point numbers>: **36**

Undo/+/-/Arc/Close/Length/<Pick point or point numbers>: **A**

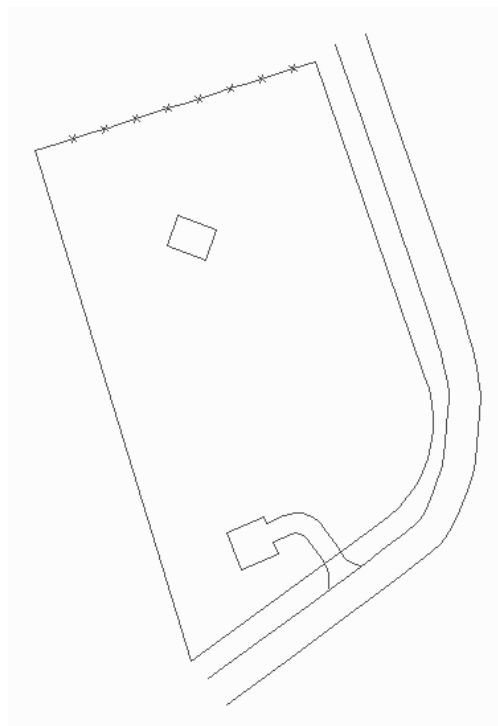
Second point/Radius point/radius Length/<Endpoint or numbers>: **S**

Pick Second Point or point number: **35**

Pick End Point or point number: **34**

Undo/+/-/Arc/Close/Length/<Pick point or point numbers>: **Press Enter**

Shown below is your drawing to this point.



16 Next you will make a building footprint. Points 18 and 19 are two shot corners of a building. Assume that the surveyors taped the main house, going clockwise from point 18, as follows: 10'L, 20'R, 40'L, 20'R, 20'L, 83'L, 60'L, 23'L, 10'R.

You can easily enter these "jogs" in the building using the Extend by Distance command. If you are zoomed in on the driveway, use View > Zoom OUT, then View > Pan to focus on the building north of the driveway. Now use the 2D Polyline command on the Draw menu to draw a line from 18 to 19.

Pick point or point numbers:**18**

Undo/Arc/Length/<Pick point of point numbers>:**19**, then **Press Enter** to end.

Select the By Distance option from the Edit menu > Extend command.

Pick line or pline to extend: **Pick the building line closer to point 18**

This makes the arrow point toward 18 rather than 19. Now you can go clockwise:

Enter or pick distance to Draw:(A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): **L10** (lower case "l" and "r" work also)

Enter or pick distance to Draw:(A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): **R20**

Enter or pick distance to Draw:(A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): **L40**

Enter or pick distance to Draw:(A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): **R20**

Enter or pick distance to Draw:(A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): **L20**

Enter or pick distance to Draw:(A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): **L83**

Enter or pick distance to Draw:(A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): **L60**

Enter or pick distance to Draw:(A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): **L23**

Enter or pick distance to Draw:(A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): **R10**

Enter or pick distance to Draw:(A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): **Press Enter** to end.

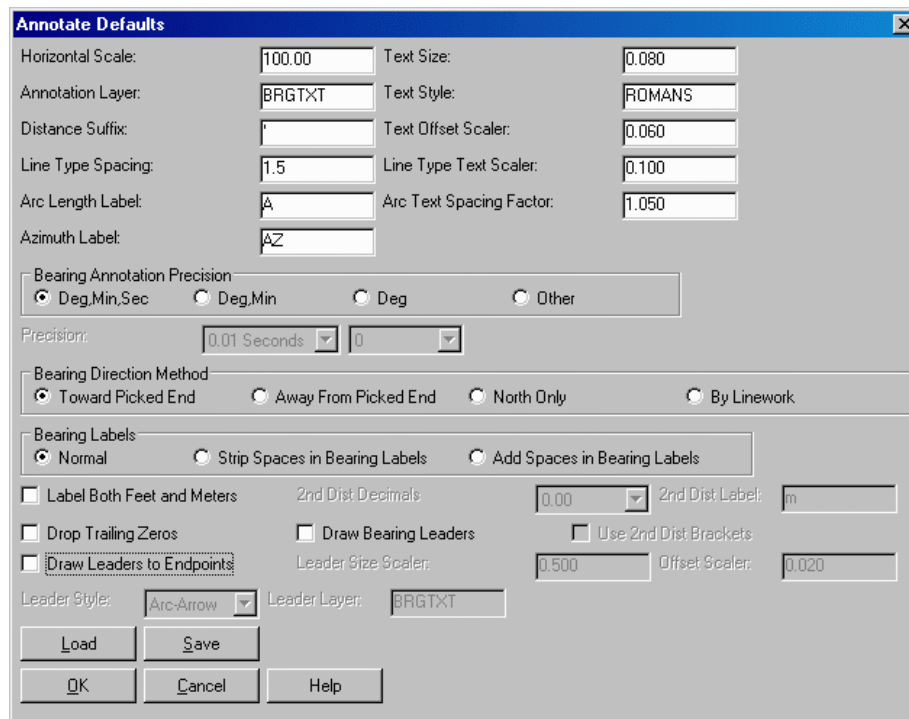
17 Next, you will complete the linework for the sewer line and the electric utility line. Use the View > Extents command so you can see all your points.

The sewer line runs from points 52 to 53 to 54. Select the 2D Polyline command from the Draw menu. To create the sewer line do the following:

[Continue/Extend/Follow/Options/<Pick point or point numbers>]: **52-54**

Press Enter twice to end.

You will next annotate the sewer polyline using the Change Polyline Linetype command, but first you must set the default spacing for the annotation. Select the Annotate Defaults command on the Annotate menu. The following dialog box appears.

The image shows the 'Annotate Defaults' dialog box in AutoCAD. It has a blue title bar with the text 'Annotate Defaults' and a close button. The dialog is organized into several sections. The top section contains input fields for 'Horizontal Scale' (100.00), 'Text Size' (0.080), 'Annotation Layer' (BRGTX), 'Text Style' (ROMANS), 'Distance Suffix' (empty), 'Text Offset Scaler' (0.060), 'Line Type Spacing' (1.5), 'Line Type Text Scaler' (0.100), 'Arc Length Label' (A), 'Arc Text Spacing Factor' (1.050), and 'Azimuth Label' (AZ). Below this is a 'Bearing Annotation Precision' section with radio buttons for 'Deg,Min,Sec' (selected), 'Deg,Min', 'Deg', and 'Other'. There are also dropdowns for 'Precision' (0.01 Seconds) and '0'. The next section is 'Bearing Direction Method' with radio buttons for 'Toward Picked End' (selected), 'Away From Picked End', 'North Only', and 'By Linework'. Below that is 'Bearing Labels' with radio buttons for 'Normal' (selected), 'Strip Spaces in Bearing Labels', and 'Add Spaces in Bearing Labels'. The bottom section contains several checkboxes: 'Label Both Feet and Meters' (unchecked), 'Drop Trailing Zeros' (unchecked), 'Draw Leaders to Endpoints' (checked), '2nd Dist Decimals' (0.00), '2nd Dist Label' (m), 'Draw Bearing Leaders' (unchecked), 'Use 2nd Dist Brackets' (unchecked), 'Leader Size Scaler' (0.500), and 'Offset Scaler' (0.020). There are also dropdowns for 'Leader Style' (Arc-Arrow) and 'Leader Layer' (BRGTX). At the bottom are buttons for 'Load', 'Save', 'OK', 'Cancel', and 'Help'.

Change the Line Type Spacing to 1.5. This will label "S" on the sewer line every 1.5" at the current scale (1"=100').

To annotate the sewer line with an S, select the Line Types command on the Annotate menu, then choose Change Polyline Linetype. Click Next four times and select the Sewer linetype from the list. Then select the sewer polyline that runs next to the road followed by the Enter key. The polyline will be annotated.

Next, create the electric utility line, which runs from point 3 to point 4 to point 17. Select the 2D Polyline command on the Draw menu.

[Continue/Extend/Follow/Options/⟨Pick point or point numbers⟩]:**3**

[Arc/Direction/Close/Follow/Undo/⟨Pick point or point numbers⟩]:**4**

[Arc/Direction/Close/Extend/Follow/Undo/⟨Pick point or point numbers⟩]: **17**

[Arc/Direction/Close/Extend/Follow/Undo/⟨Pick point or point numbers⟩]: **Press Enter** to end

No points were taken beyond point 17 due to obstructions from the various setups in the field. So you must extend the polyline from point 17 to beyond the property. Under the Edit menu, choose Extend, then By Distance. Pick on the electric utility polyline near point 17. Then pick beyond the property. Press Enter to end.

Before you annotate the electric utility line, you must offset it 25' on both sides for a 50' total right-of-way. Select the Offset command under the Edit menu. Enter the offset distance of 25. Pick the electric utility polyline and then pick to one side for the first offset. Repeat for the other side, by first picking the electric utility polyline, then picking the other side for the offset. Press Enter to end.

Now annotate the central electric line with an E by selecting the Line Types command on the Annotate menu, then choose Change Polyline Linetype. Choose the Electric linetype which appears on the second page of linetypes. Select the electric utility polyline to annotate it.

18 Next, make the Property lines bold. Under the Edit menu, select Polyline Utilities, and then select Change Polyline Width.

New Width <0.0>: **1.5**

Select objects: **Pick the property polylines**

Pick once for the fence line portion and once for the remaining property lines.

Select objects: **Press Enter** to end

19 To add color and improve layer management, make a layer for your road and driveway. Select the Layer Control command on the View menu.

Click New in the upper right corner, and enter the name "Road" for the new layer. Choose the color cyan by clicking the color square to the right of the layer name.

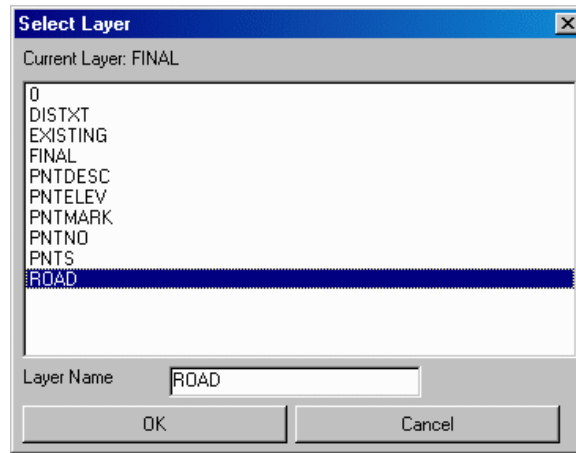
On the View menu, select the Change Layer command.

Select entities to be changed.

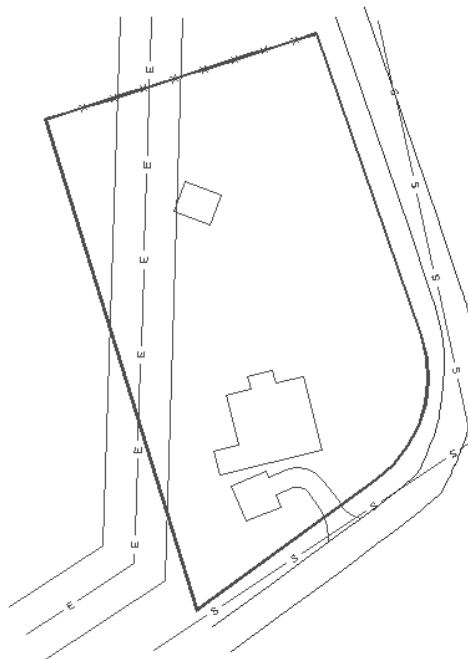
Select objects: **pick all driveway and road entities**

Pick entity with new layer or press Enter to type name: **Press Enter**

This brings up the dialog box shown below. Select Road and click OK.



Your linework is now complete and is shown below:



20 You will add symbols for trees, property corners, manholes, and a light pole.

Start with the trees. Points 11, 12, and 20 are oak trees of different sizes, and point 14 is a pine tree. Use symbol 61 for the deciduous oak trees and symbol 53 for the pine tree. On the Tools menu, select the Insert Symbols command. Use the down arrow key at the right to scroll forward to the tree symbols, which are several pages deep. Choose symbol SPT61. You can also choose Trees under the Symbol category field in the Select Symbol dialog box.

Layer for symbols <PNTS>: **TREES**

This creates a Trees layer if one does not exist.

Symbol Size <8.0>: **18**

A symbol size equal to the diameter of the tree is often effective.

Note: If you were prompted:

Options/Select entities/Pick pt or pt number/<Enter North(y)>:.....then you must enter P to convert to the Pick point or point numbers default condition. Otherwise, you will be expected to enter points by northing and easting.

Options/Select entities/Enter Coords/<Pick point or point numbers>: **11**

Options/Select entities/Enter Coords/<Pick point or point numbers>: **20**

Options/Select entities/Enter Coords/<Pick point or point numbers>: **Press Enter**

Place symbol 61 on the larger point 12 at size 24. Press Enter to repeat the last command or select the Insert Symbols command from the Tools menu. Select symbol 61.

Layer for symbols <TREES>: **Press Enter**

Symbol Size <8.0>:**24**

Options/Select entities/Enter Coords/<Pick point or point numbers>: **12**

Options/Select entities/Enter Coords/<Pick point or point numbers>: **Press Enter**

Place symbol 53 on the larger point 14 at size 8. Press Enter to repeat the last command or select the Insert Symbols command from the Tools menu. Select symbol 53.

Layer for symbols <TREES>: **Press Enter**

Symbol Size <8.0>:**Press Enter**

Options/Select entities/Enter Coords/<Pick point or point numbers>: **14**

Options/Select entities/Enter Coords/<Pick point or point numbers>: **Press Enter**

Place symbol 5 (representing an iron pin) on points 8-10 and point 15. Repeat Insert Symbols. Press Enter to repeat the last command or select the Insert Symbols command from the Tools menu. Select symbol 5 (first page).

Layer for symbols <TREES>: **Final**

Symbol Size <8.0>:**Press Enter**

Options/Select entities/Enter Coords/<Pick point or point numbers>: **8-10,15**

Wildcard match of point description <*>: **Press Enter**

This puts symbols on points 8 through 10 as well as point 15.

Options/Select entities/Enter Coords/<Pick point or point numbers>: **Press Enter**

Place a concrete monument (symbol 13) on point 1.

Press Enter to repeat the last command or select the Insert Symbols command from the Tools menu. Select symbol 13.

Layer for symbols <FINAL>: **Press Enter**

Symbol Size <8.0>:**Press Enter**

Options/Select entities/Enter Coords/<Pick point or point numbers>: **13**

Options/Select entities/Enter Coords/<Pick point or point numbers>: **Press Enter**

Place a manhole (symbol 34) on the vertices (endpoints) of the sewer line, at points 52 through 54. You could use the above method, but you can also use S for Select entities and place the symbol automatically at the vertices of the selected entity.

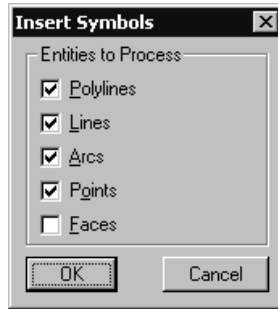
Select the Insert Symbols command from the Tools menu. Select symbol 34.

Layer for symbols <FINAL>: **Press Enter**

Symbol Size <8.0>:**Press Enter**

Options/Select entities/Enter Coords/<Pick point of point numbers>: **S**

The following dialog box appears. Click OK.



Rotation angle <0.0>: **Press Enter**

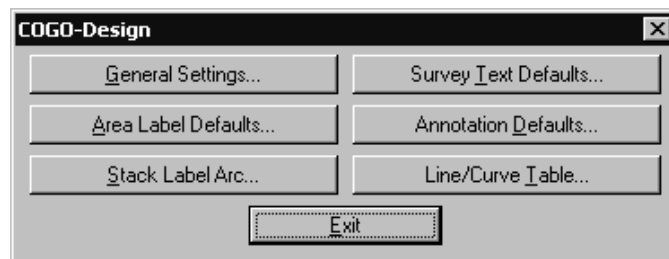
Select arcs, faces, points, text, lines and polylines.

Select objects: **pick the sewer polyline**

The symbols are inserted at the three polyline endpoints.

21 You can reduce clutter by selecting the Freeze Layer command under the View menu, and picking a point number. The points freeze, leaving only linework and symbols. To bring the points back, use the Thaw Layer command under the View menu. The Freeze Layer and Thaw Layer commands go together, just like the Isolate and Restore Layers commands.

22 Next, you will create (in reduced size) your building dimensions. You can set the building dimension text size for the current work session using the Survey Text Defaults option of the Survey Text command on the Annotate menu. However, you can set the text size permanently using the Configure command on the Settings Menu, select the Configure command, then select Survey. The following dialog box appears:



Choose Survey Text Defaults. The following dialog box appears.

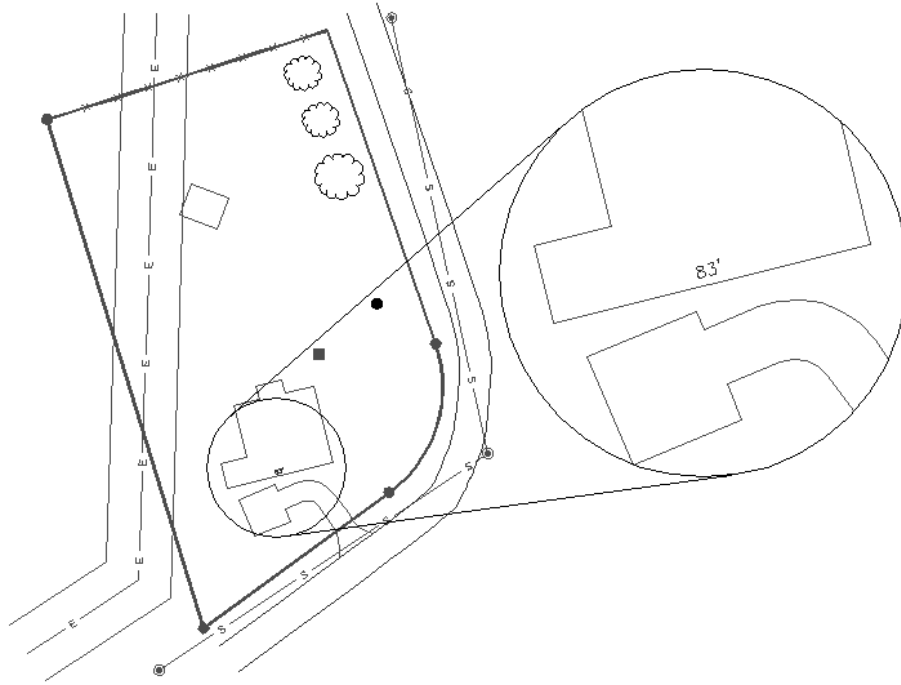
The image shows a 'Survey Text Defaults' dialog box with three main sections: Building Dimensions, Offset Dimension Text, and Adjoiner Text. The Building Dimensions section has fields for Layer (BTXT), Text Style (ROMANS), Text Size Scaler (0.040), Decimal Places (0.0), and a checked 'Drop Trailing Zeros' option. The Offset Dimension Text section has fields for Layer (DTXT), Text Style (ROMAND), Text Size Scaler (0.080), Arrow Size Scaler (0.080), Decimal Places (0.0), and a checked 'Use EndPoint Snap For 1st Point' option. The Adjoiner Text section has fields for Layer (ATXT), Text Style (ROMANS), Text Size Scaler (0.100), and Justification (C). At the bottom are OK, Cancel, and Help buttons.

Section	Field	Value
Building Dimensions	Layer	BTXT
	Text Style	ROMANS
	Text Size Scaler	0.040
	Decimal Places	0.0
	Drop Trailing Zeros	☒
	Label As Feet and Inches	☐
Offset Dimension Text	Layer	DTXT
	Text Style	ROMAND
	Text Size Scaler	0.080
	Arrow Size Scaler	0.080
	Decimal Places	0.0
	Use EndPoint Snap For 1st Point	☒
Adjoiner Text	Layer	ATXT
	Text Style	ROMANS
	Text Size Scaler	0.100
	Justification	C
	Drop Trailing Zeros	☐
	Use EndPoint Snap For 1st Point	☐

The changes you will make are in the upper left section "Building Dimensions." Change the Text Size Scaler to 0.04, change Offset From Line to 0.02, and select Drop Trailing Zeros.

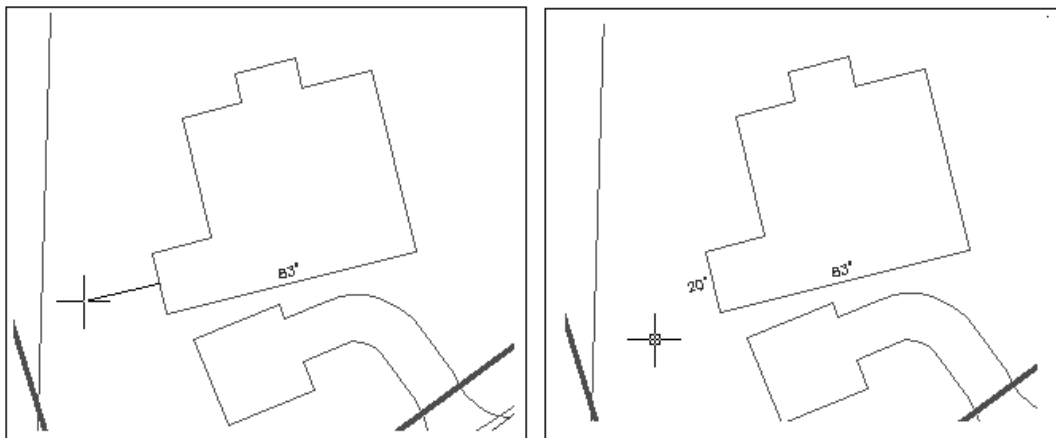
The Drop Trailing Zeros option will label 17.0' as 17'. To save more space, you could blank the Characters to Append box. Enter the name of a new layer for the building text called BTXT so that building dimensions can be frozen to reduce the clutter even more. It is generally a good strategy to use layers for selective freezing and thawing.

Click OK on the above dialog box, then click Exit until you return to the command prompt. On the Annotate menu, choose the Survey Text command, Building Dimensions option. Click on the middle of the bottom segment of the building and drag to the right and slightly above the line. The resulting label is shown below.

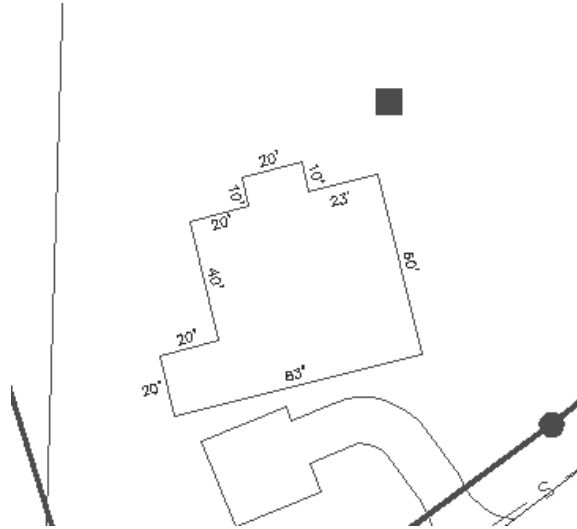


If you had dragged the cursor to the left rather than to the right, with the same near-parallel angle to the line, the 83' would be drawn below the building rather than above.

Another example is shown below. Select Annotate > Survey Text > Building Dimensions and click on the left-most segment of the building, then click roughly perpendicular to the left. This creates a perpendicular, rather than parallel, label as shown below.



Label the building and the shed as shown below. Only two sides of the shed must be labeled. The sides of the shed were not measured in even feet, but the decimal place does not appear in the labels because you selected the Drop Trailing Zeros option when you set your Survey Text Defaults.



If you choose the wrong direction while you are labeling, you can exit the command, or you can erase the incorrect dimension by typing E for erase at the command line, or you can enter U for undo to back out your last work. Once the labels are in place, you can type M for the Move command and move the text to the desired position.

23 Next, you will label the offset dimension from property lines to two building corners, the SE corner as offset from the south property line, and the SW corner as offset from the west property line. Because of the options you set in the Survey Text Defaults dialog box above, Offset Dimensions will be created on layer DTXT, and they will be horizontal, with arrowheads.

On the Annotate menu select Survey Text, Survey Text Defaults. The dialog previously shown will reappear. Change the Text Size and Arrow Size scalars to 0.040.

On the Annotate menu select Survey Text, Offset Dimensions option.

[end on] Pick Bldg/Object Corner: **pick on the SE building corner.=**

[perp] Pick Line To Offset From: **pick on the South property line (before the arc, near the end of the driveway)**

The setback is labeled 43.5 ft. Why "ft" and not "" for distance? If you review the Survey Text Defaults dialog box again, you will see that you set the Characters to Append option to "ft".

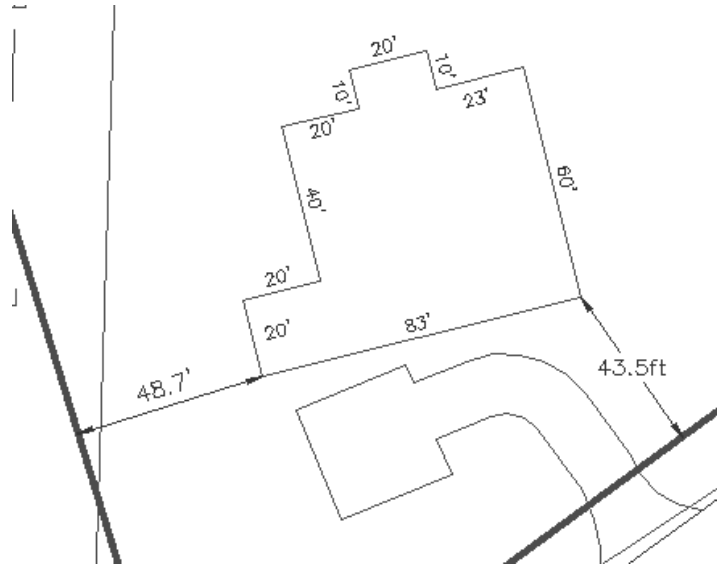
On the Annotate menu, select Survey Text > Survey Text Defaults. Under Offset Dimension Text, change the characters to Append to an apostrophe, " ' ". Also, change the Text Alignment to Parallel instead of Horizontal. Select Annotate > Survey Text > Offset Dimensions.

[end on] Pick Bldg/Object Corner: **pick on the SW building corner**

[perp] Pick Line To Offset From: **pick on the West property line**

Avoid the electric right-of-way line.

Use the Move command to move the 20' text label to the right, so that it is not overwritten by the offset dimension. The result is shown below:



Notice the display, within the above prompts, of the [end on] and [perp] snaps. When Carlson Survey sets a snap for temporary use, it displays the snap within the brackets as shown. A building corner is always an endpoint, so the end snap always applies to the first pick. The offset is the perpendicular distance to the property lines, so the [perp] snap always applies to the second pick. The per, or perpendicular, snap applies to offsets from arcs as well. In the case of arcs, the per snap finds the shortest, radial distance to the arc.

When you enter a snap at the keyboard in response to a "Pick object" request, type only the first 3 letters of the snap, such as "per" or "end". You could use the Offset Dimension command to label the Electric utility right-of-way distance of 50' total, by entering "nea" (for nearest snap) for the first pick, then entering the default "per" snap for the second pick on the other side of the right-of-way.

24 Next, you will add adjoiner ownership text to the property lines. Select the Survey Text Defaults command under the Annotate menu and set the Adjoiner Text option to C for centered, and the Text Size Scaler to 0.6. Then select the Adjoiner Text option on the Annotate Survey Text command.

Pick Line Or Polyline: **pick the west property line**

Pick Starting Point: **pick a centering point west of the property for the adjoiner text**

Text: **Brian W. and Mary T. Jones**

Text: **D.B. 101, P. 37**

Text: **Press Enter**

This produces parallel, center-justified text on the west side of the property. Repeat the command for the north side. Press Enter to repeat the Adjoiner Text command or select it from the menus.

Pick Line Or Polyline: **pick the north property line**

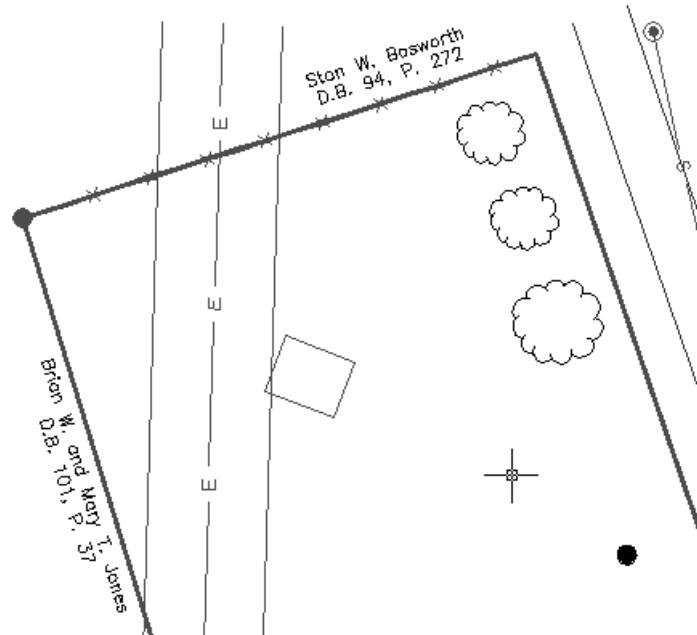
Pick Starting Point: **pick a centering point north of the north property line**

Text: **Stan W. Bosworth**

Text: **D.B. 94, P. 272**

Text: **Press Enter**

The results are shown here:



25 Next, you will add bearing annotation. Select the Annotate menu, choose Angle/Distance, select the BearingDistance_ option to place Bearing and Distance above the line.

Define bearing by, Points/<select line or polyline>: **Pick the northern property line** to the east, or right side. The bearing direction will be labeled towards the picked end, which is northeast.

Define bearing by, Points/<select line or polyline>: **Pick the eastern property line** closest to the southern endpoint of the line.

To label the western property line on the lower (western) side of the line, select the _BearingDistance option of the Angle/Distance command.

Define bearing by, Points/<select line or polyline>: **Pick the western property line** on the northern portion of the line.

To label the southern line segment with a leader, on the Annotate menu, select the Annotate w/Leader command, Brg-Dist w/Leader option.

Define bearing by, Points/<select line or polyline>: **Pick the southern property line** segment on the southwest side.

Pick point to start leader:**pick a point** for the arrowhead

Label Position: **pick a point**

Pick a point off to the right for the left-justified bearing and distance.

Define bearing by, Points/<select line or polyline>: **Press Enter** to end

26 Next, you will want to annotate the arc in the drawing. The label will consist of four entries: arc length, radius, chord bearing, and chord distance.

Select the Annotate Arc command on the Annotate menu and choose the Stack Label Arc option. The Stack Label Arc Settings dialog box appears.

The dialog box is titled "Stack Label Arc". It contains a section for "Label Options" with a table of settings:

	Label	Sequence#
Arc Length:	L=	1
Radius:	R=	2
Delta Angle:	D=	
Chord Angle:	BRG=	3
Chord Length:	C LEN=	4
Tangent:	T=	
Degree of Curve:	Dc=	
External:	E=	

Below the table are three checkboxes:

- ☒ Use Symbol for Delta Angle Label
- ☐ Draw Leader Horizontal Tick
- ☐ Align Text With Chord

There is a section for "Label Chord Angle in" with three radio buttons:

- ☐ Azimuths
- ☒ Bearings
- ☐ Gons

Below that is a section for "Type of Curve" with two radio buttons:

- ☒ Roadway
- ☐ Railroad

At the bottom are three buttons: OK, Cancel, and Help.

Set the sequence column to 1, 2, 3, and 4 as shown.

These changes apply only to this work session. Use the Configure>COGO>Design>Stack Label Arc command to set these options permanently.

When you are done with the dialog box, click OK.

Define arc by, Points/<select arc or polyline>: **pick the arc**

Pick point for labels: **pick a point** to the right to place the label

As the cursor moves, the text "ghosts", allowing you to make the best possible placement decision.

Pick point to start leader at ([Enter] for none): **pick a point** on or near the arc for the arrowhead

Define arc by, Points/<select arc or polyline>: **Press Enter** to end

Sometimes Carlson Survey displays an arc as a series of chords. Type Regen at the command prompt to "regenerate" the arc. Even if an arc shows up on the screen as a group of jagged chords, it will plot as a smooth arc to a printer or plotter.

27 Next, you will label the trees, the shed, and the building using a special leader for a hand-drafted appearance. Under the Annotate menu, select the Special Leader command.

Arrow location: **pick near the southern most corner of the shed**

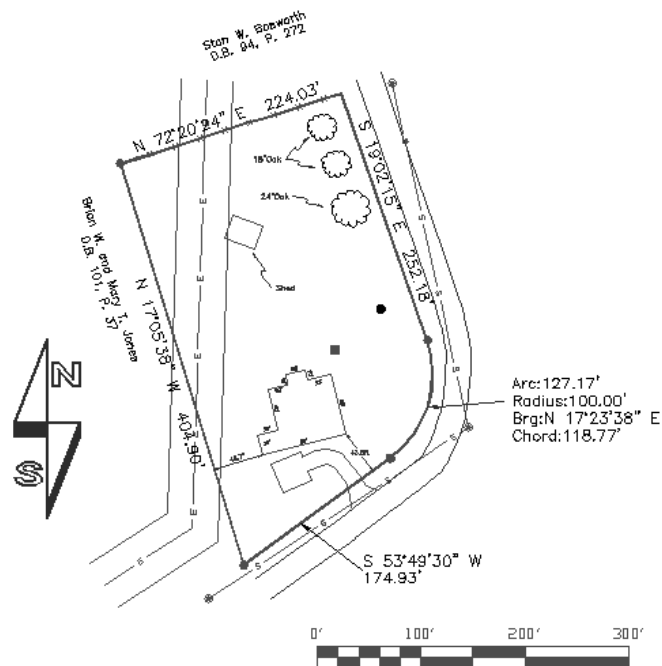
Text location: **pick slightly down and to the right**

Text: **Shed**

Text: **Press Enter** to end

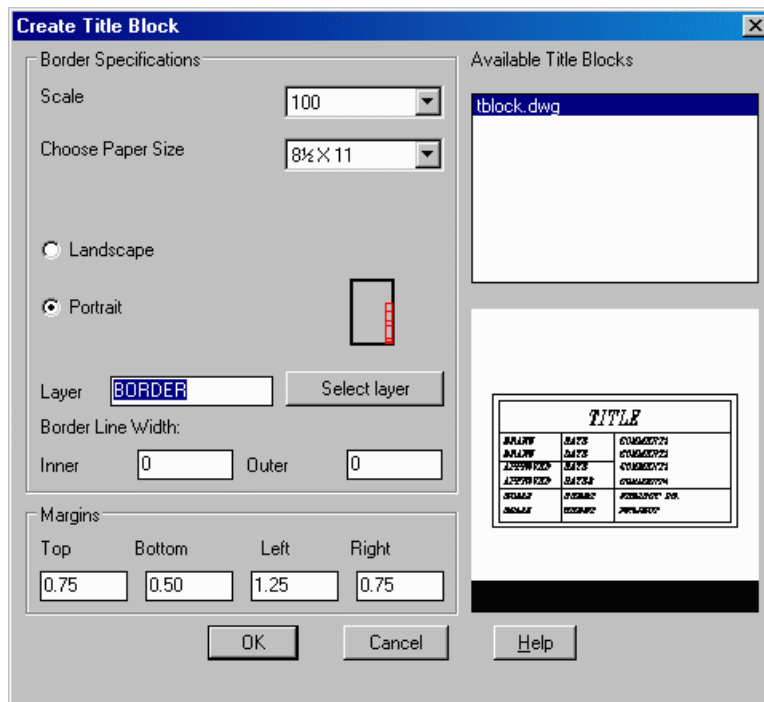
Repeat the process for all the special leader text items shown in the drawing below. In the case of the 18" Oak Trees, create just one leader with text, and on the second oak tree, create only the leader, and press Enter when asked for Text. For best appearance, enter 18"Oak and 24"Oak with no spaces between the characters.

Your drawing should be similar to this one:



28 You can add a North Arrow and Bar Scale by selecting these options under the Annotate menu. When you place the North Arrow, pick an insertion point, then follow the prompting. You place the Bar Scale with a single pick. Both the North Arrow and the Bar Scale can be moved to desired locations with the Move command on the Edit menu.

29 Next, you will insert a title block. Select the Title Block command from the Inq-Set Menu.



Choose paper size A1 (portrait view, 8-1/2 by 11). Click OK.

Enter or Pick lower left corner for border: **Pick a point below and to the left of the survey.** Remember that the title block will be at the bottom so leave extra room at the bottom

The following dialog appears prompting you for the attributes of the title block.

Enter Attributes [?] [X]

Block name: tblock

TITLE Farmer Survey

COMMENT1 William T. Farmer

COMMENT2 102 Plum Avenue

COMMENT3 Ashland, KY 40202

COMMENT4 July 25, 2003

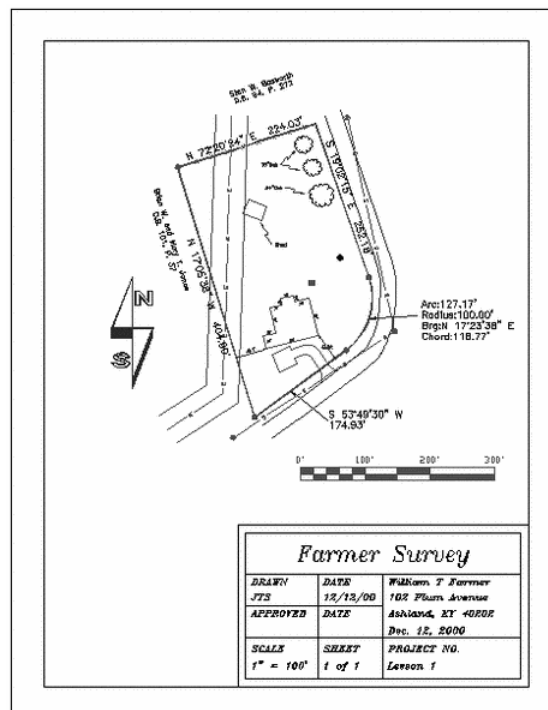
PROJECT NUMBER Lesson 1

DRAWN BY ABC

DRAWN DATE 08/13/03

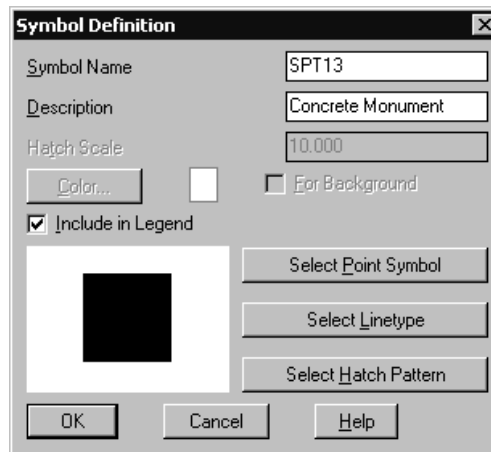
[OK] [Cancel] [Previous] [Next] [Help]

Your drawing should resemble the one shown below.



30 Next, you will add a legend. On the Annotate menu, select the Draw Legend command. Choose New, then Open the default legend name. When the dialog box appears, select Add from Drawing, and then select one of the sewer manholes, one of the iron pins, the concrete monument, one oak tree, and the pine tree. Make one pick for each symbol you want to appear in the legend and then press enter.

If you want to change the order of the items in the list, use the Move Up and Move Down options, after first selecting and highlighting the item to be moved. After the list is ordered correctly, highlight one item on the list and click the Edit button to edit the symbol definition. Below is the symbol definition for SPT13.



Edit each symbol definition individually, typing the following descriptions in the description box:

SPT5 = "Iron Pin"

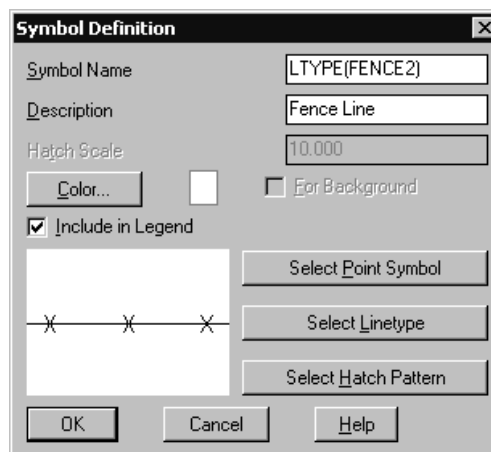
SPT34 = "Manhole"

SPT13 = "Concrete Monument"

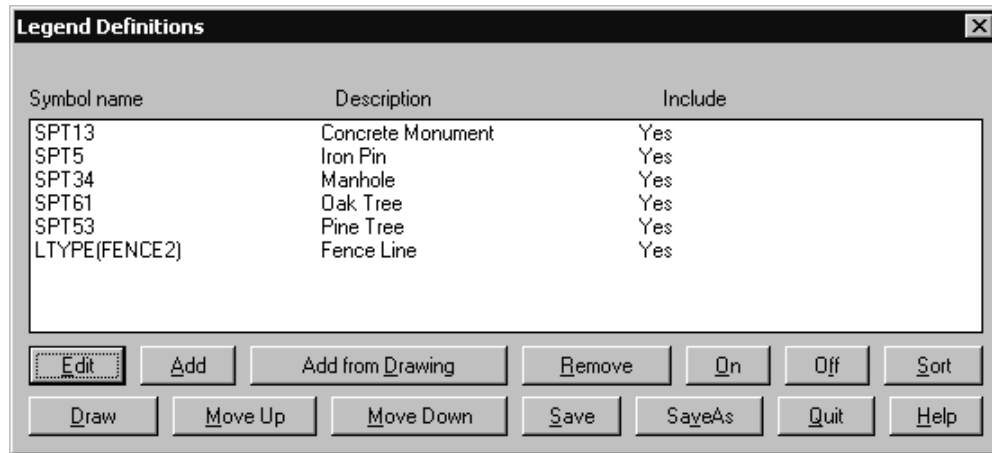
SPT 61 = "Oak Tree"

SPT53 = "Pine Tree"

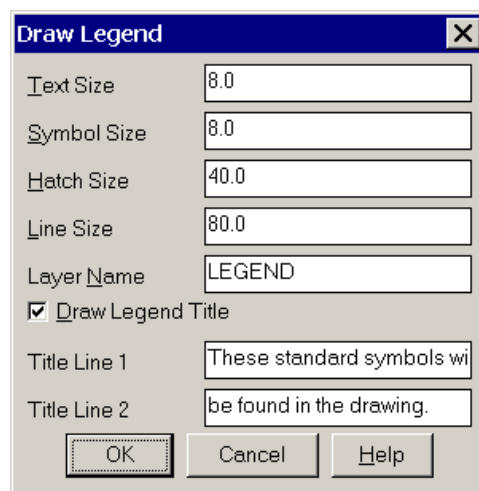
After you have entered the descriptions for the symbols, choose the Add option from the Legend Definitions dialog box, and add the Fence Line type to the list by picking the Select Linetype command, as shown below:



Save the completed legend, which is shown below.

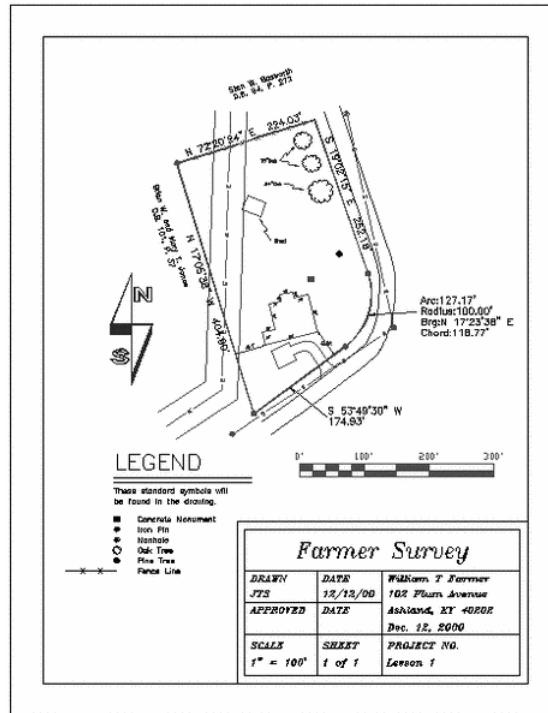


Select the Draw option from the Legend Definitions dialog box. Set the defaults as shown below.



Pick a point for the legend, roughly 5260,4380.

You may need to move the fence line portion of the legend to fit in the tight space. You also may need to move the previously drawn bar scale. Use the Move command. The following shows the drawing to this point:



If you wish to reset the spacing of the sewer and electric utility annotation, use the LTSCALE box in the Drawing Set-up dialog box under the Inq-Set Menu to set it. (The setting is 50, in this example).

31 Next, you will use Dtext to label the road and Mtext to create a certification block.

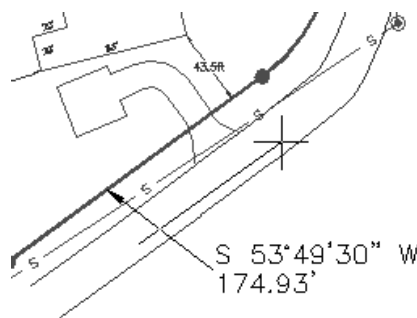
Zoom in on the area shown below. At the command line, type Dtext.

Specify start point of text or [Justify/Style]: **R** (for right-justified)

End Point: **pick a point** as shown below just to the left of the leader annotation

Height <8.00>: **10**

Rotation angle <N 72d20'24" E>: **pick a point** as shown below by the location of the crosshair



Text: **Meadow Lane**

Text: **Press Enter** to end

This right-justifies the label Meadow Lane, ending it before it contacts the leader line.

Now you will enter a certification using Mtext. The Mtext command stretches an entire block of text. Carlson Survey breaks up the lines in the block of text, depending on how you edit and adjust the Mtext window.

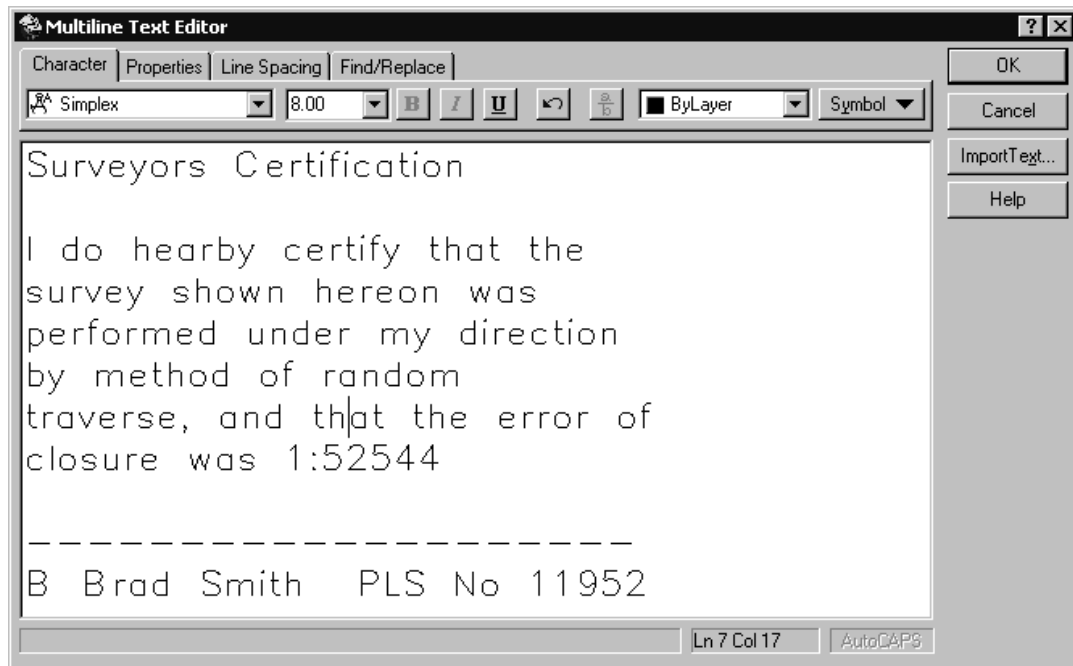
First, use the View> Zoom>Extents command to view the entire drawing. Then, at the command line, type in

Mtext.

Specify first corner: **5660,4980**

Specify opposite corner: **5860,4820**

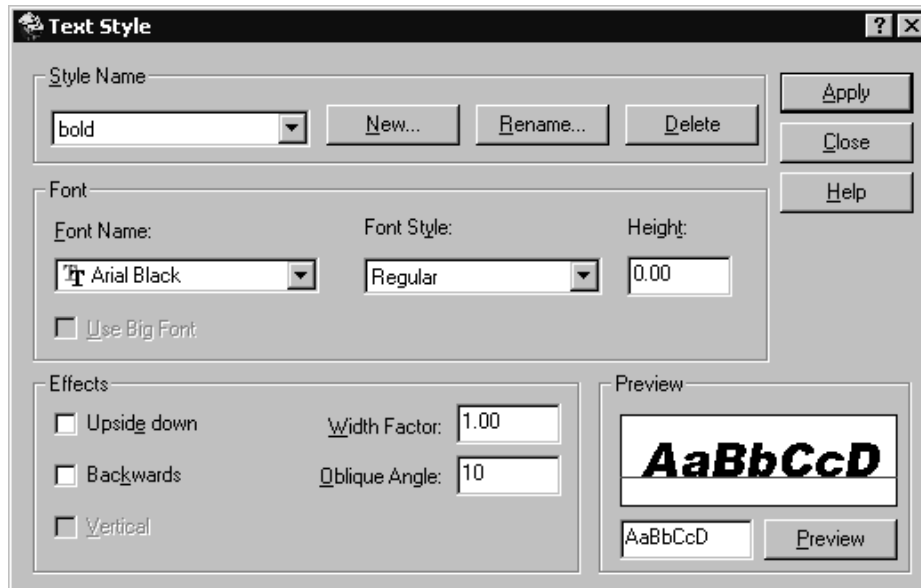
You now see a dialog box that displays all the text heights that you have used in the drawing. Choose the text height of 8. Then type the following into the dialog box:



The command adds carriage returns to the text when it runs out of space in the Mtext window. Click OK at the upper right to place this text into the drawing.

After the Mtext is plotted, you can click on the text to activate the grips. All 4 corners highlight as grips. Pick on a grip, and then you can expand or change the shape of the Mtext rectangle. When you do this, the text adjusts automatically, adding more lines and carriage returns, or condensing many lines into fewer, but longer, lines of text. You can also move the entire text block to a new location.

32 Next, you will define a text style, then add text using that style. On the Draw Menu, under Text, choose select the Set Style option.



Create a Bold Style consisting of the Arial Black font tilted at 10 degree oblique angle, by selecting the settings show above. Then click Apply and Close.

Run the Dtext command by typing Dtext at the command line, and place text at the top of the drawing as follows:

Justify/Style/<Start point>: **pick a point** near the northwest corner of the drawing

Height <10.00>: **20**

Rotation Angle <N 53d46'56" E>: **E** for due East

Text: **William T. Farmer**

Text: **Press Enter** to end

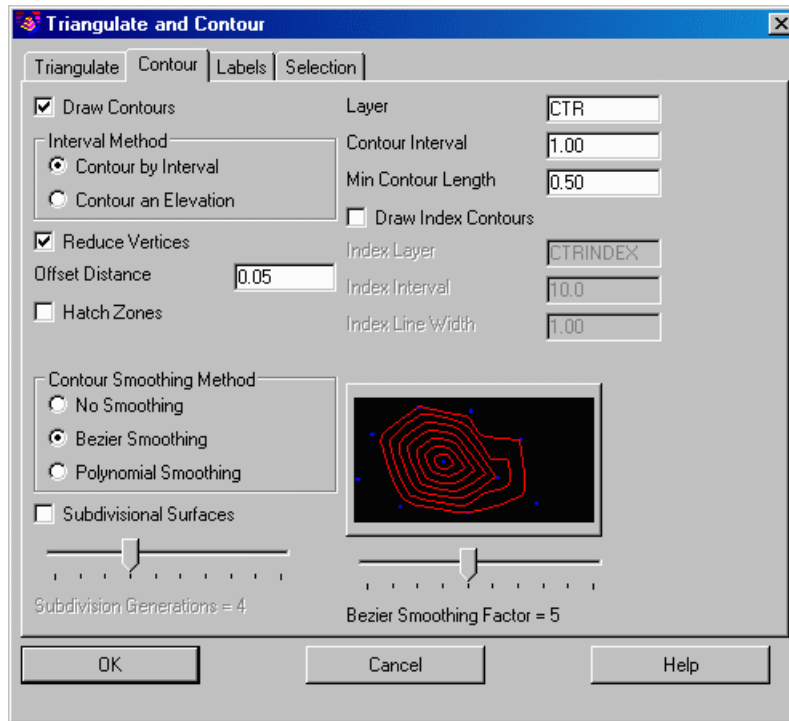
33 Next, you will create an area label for the drawing. Select the Area Defaults command under the Area menu and change the Precision for Other Area Labels to 4 decimal places.

Select the Areas by Lines & Arcs command under the Area menu. When prompted to Select objects, pick the 2 polylines that, taken together, completely enclose the property.

Pick a centering point for the area label under the William T. Farmer title at the top of the drawing.

34 Next, bring the points back and draw a contour map. To draw the points, use the Thaw Layer command under the View menu. If you did not complete this lesson in one sitting, then Carlson Survey won't "remember" what layer to thaw. In that case, select the Layer Control command on the View menu, and thaw the PNTS layer by turning the snowflake to a sun symbol.

Go to the Misc menu and switch to the DTM/Contour menu and Select the Triangulate & Contour command from the Contour menu.



On the Contour Tab, change the contour interval to 1.0. On the Triangulate Tab, click on Use Inclusion/Exclusion Areas.

Press OK and then answer as follows:

Select the Inclusion perimeter polylines or ENTER for none.

Select objects: **Press Enter**

We have no "inclusion" perimeter.

Select the Exclusion perimeter polylines or ENTER for none.

Select objects: **select the building and the shed**

Since the building and shed are closed polygons acting as exclusion perimeters, the contours will not pass through them when they are created.

Select the points and barrier lines to Triangulate: **select a window around the points by picking from the lower left to the upper right**

The contour map is created. Freeze the points again by using View>Freeze Layer and picking one of the points.

35 Next, label the contours. Select the Contour Elevation Label command from the Contour menu. Select OK to accept the default settings in the dialog box shown here:

Contour Label Options

Label Layer: CTEXT

Horizontal Scale: 100.00

Text Size Scaler: 0.08

Decimals: 0

Label Position:
☒ On Contour ☐ Above Contour

☒ Ignore Zero Elevation Polylines

☒ Hide Drawing Under Labels

☒ Break Contours at Label

☐ Draw Broken Segments Layer: CTEXT_BR

☐ Label By Distance Interval: 200.000

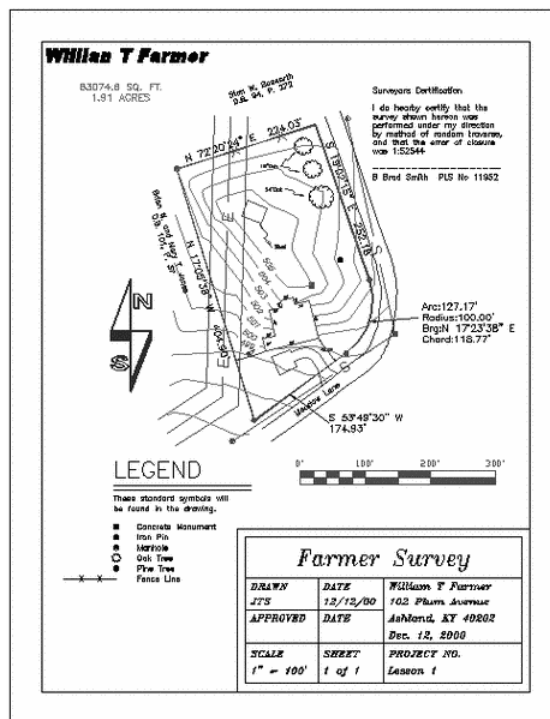
☐ Draw Box Around Text

☒ Align Text With Contour

OK Cancel Help

Now pick two points that cross through one or more contours. The contours are automatically labeled using the slanted Bold style that you set up earlier. You can use the Change Text Font command under the Text command in the Edit menu to change the font to Romans, or to another font.

The Completed Plat is shown here:

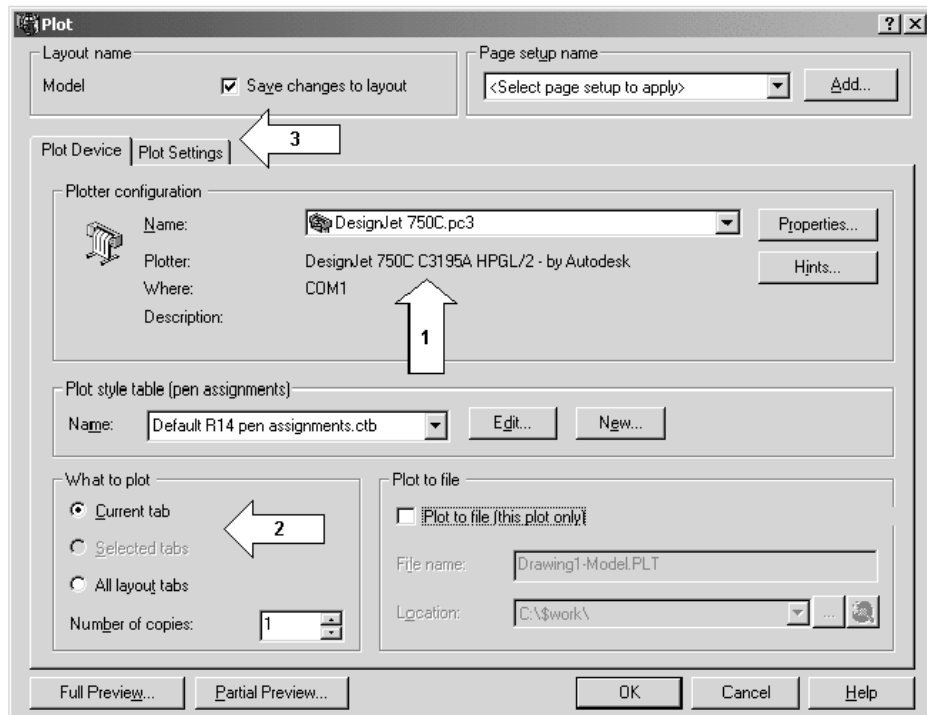


If you have not already saved your drawing, now is a good time to do it. Use the Save command on the File menu.

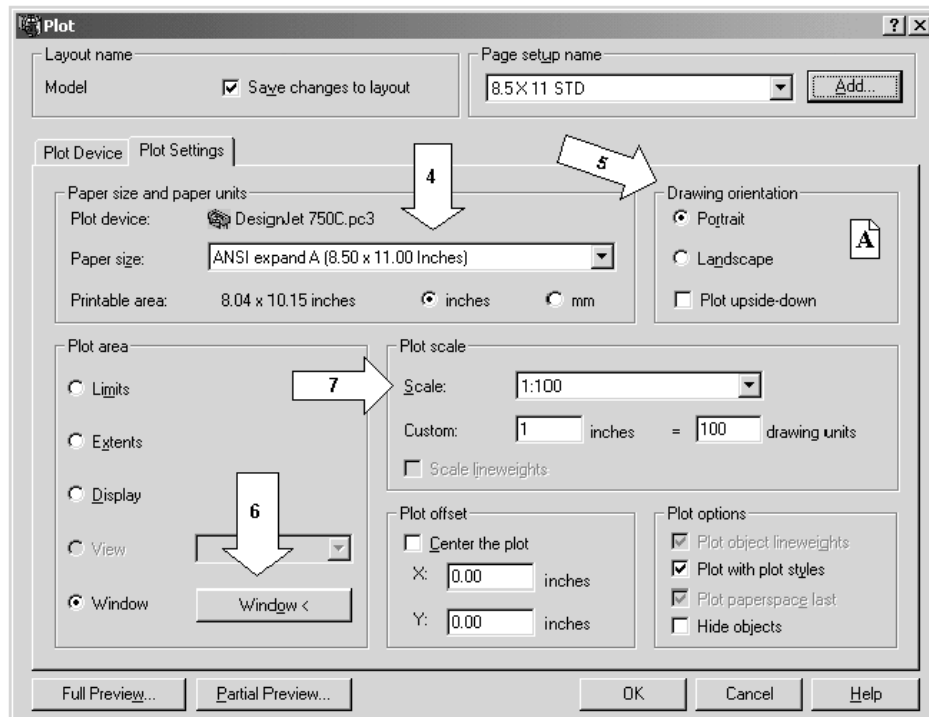
36 Now we are ready to plot the drawing.

Before plotting it's a good idea to do a Zoom Extents, then a Zoom Out (both on the View Menu) before executing the plot command.

To get started, choose Plot from the File menu. There are many variables that can affect how the dialog box will look. Normally it will appear as below:



You should have two tabs on the dialog labeled "Plot Device" and "Plot settings". We will start with "Plot device". The first thing to select is your plotting device (see arrow #1). Here the HP 750C is already selected and that is what we want to use. Next, arrow #2 points to the "What to Plot" section. In this version of AutoCAD, you are either working in the model tab or one of the layout tabs. Our example is drawn in the model tab, so the option labeled "Current Tab" should be selected. If you want more than one copy of your plot, this is where you would change that number. Arrow #3 points to the plot settings tab. Click on here next. Now the dialog should look like this:



Now we are on the "Plot settings" tab. Arrow #4 points to where you can change the paper size and units. Here we chose 8.5 X 11 for our size and inches for our units. The next thing to select is the drawing orientation, arrow #5 shows you where this is. We will choose portrait.

Now looking at arrow #6, we want to choose the window button in order to select the area we want to plot. After you select this button, the dialog will disappear and you can select the upper left and the lower right corners of the drawing border. When you finish, the dialog will reappear.

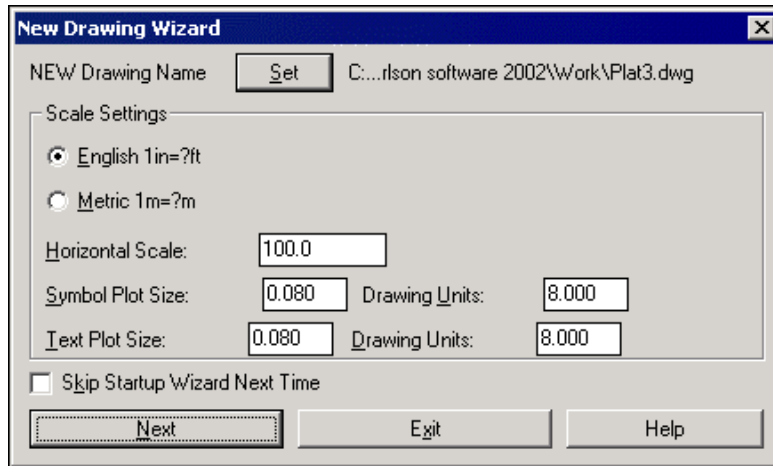
The next thing to do (arrow #7) is choose the correct plotting scale, our drawing is 1"=100' or 1:100. Choose this from the dropdown list. Now we are ready to preview the plot. Press the Full Preview button in the lower left corner of the main dialog. Press ESC to return to the main dialog. One new feature starting in AutoCAD 2000 is the ability to save all the information you have just entered in a "Page Setup". In the upper part of the dialog, check on the box labeled "Save changes to layout", then to the right of that, click the button labeled "Add". A new dialog will appear, at the top of this dialog, enter a name to save your page setup as and click OK. I chose 8.5 X 11 STD. You can see this in the dialog shown above. If your plot preview looked OK, choose OK from the bottom of the dialog and your plot is on its way. The advantage to saving the page setup is that you can open this drawing tomorrow or 3 weeks later and choose 8.5 X 11 STD as your page setup, and then choose OK to plot the drawing exactly like you did today, without having to remember all the settings yourself.

Lesson 3: Field to FinishFaster Survey Work

In this lesson, you will make a plat using field to finish techniques through the Drawing Wizard.

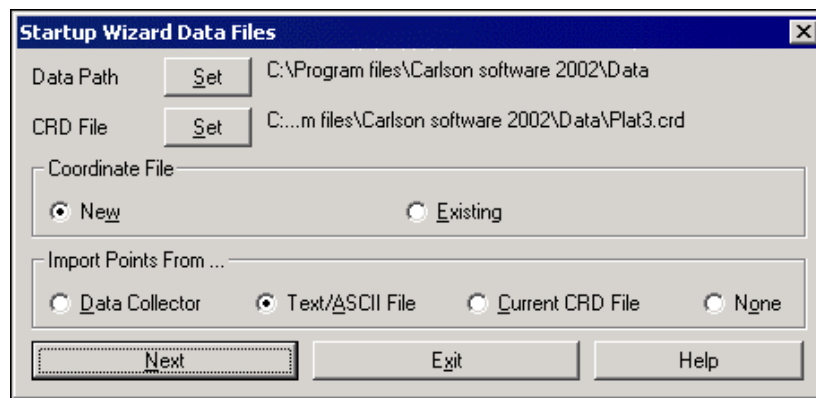
1 Launch Carlson Survey, or, if you are already in the program, select the File menu, and select New to start a new drawing. Save your existing drawing first, if you like. If the Create New Drawing dialog appears, choose the third button on top. This will let you choose a drawing template. Choose "Survey.dwt" from the list of templates. Choose OK.

Next, the first of several Drawing Wizard dialog boxes appears. If the Drawing Wizard does not appear, select the Settings command from the Configure menu. Under General Settings, click Use Drawing Wizard in the upper left of the dialog box. Then repeat step 1 above.



To use the Drawing Wizard, enter a new Drawing Name in the upper portion of the dialog box. Since this is Lesson 3, call the new drawing Plat3.

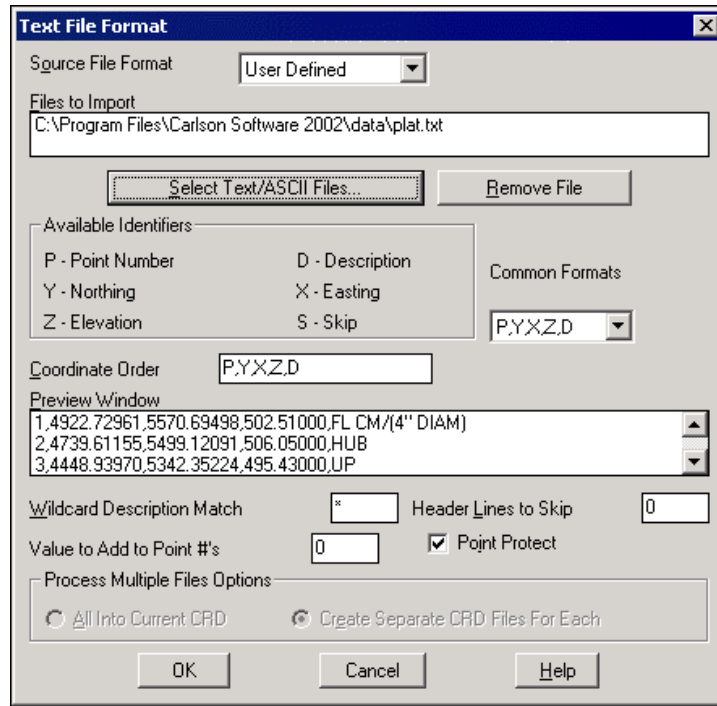
Verify that the other settings match the settings shown, and click Next.



This Drawing Wizard dialog box is used to specify the source of the data. Our source is the same file as in Lesson 2, Plat.txt. This is an ASCII file, so click on the option Import Points From Text/ASCII File.

Set the other options as shown and Click Next.

In the next dialog box, Select Text/ASCII Files. Choose plat.txt from the \Program Files\Carlson Software 2006\Data folder. The format of the points appears in the Preview Window for verification as shown below. Click OK.



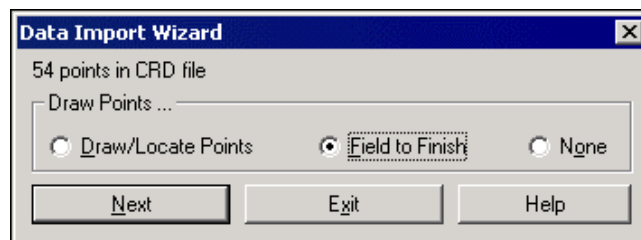
The points are then copied into the file Plat3.crd. If you repeat this exercise, and again use the file name Plat3.crd, you will be asked:

[O]verwrite w/new coordinates, overwrite [A]ll, or use number <55>: **A** (for all)

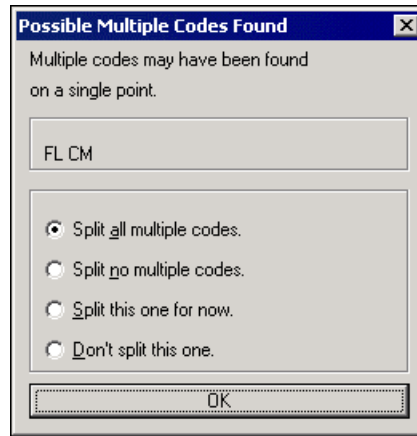
In either case, when you correctly complete the process, the following dialog box appears:



Then another Drawing Wizard dialog box appears:

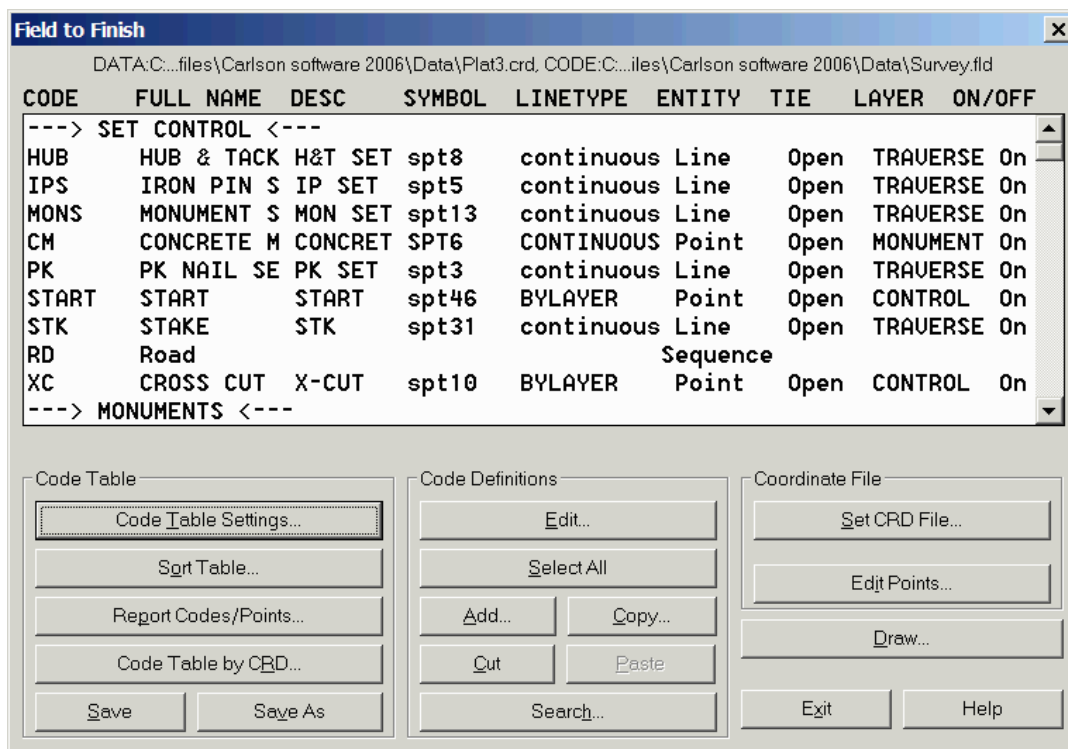


Choose the Field to Finish option and click Next. If you receive a file selection dialog titled Specify Field Code Definition File, choose the file called "survey.fld". The next dialog box warns you that some codes have two descriptions.



The command is asking whether these codes are to be treated as two separate descriptions or as one description that has a space in it. Choose the default (Split all multiple codes), to tell the command that codes with spaces are really two separate descriptions.

The main Field to Finish dialog box appears.



Click the Draw button. This displays a dialog box that allows you to specify the range of points to draw.

Range of Point Numbers to Process

Highest point number: 54

Range of Points: Point Group

Entities to Draw

☒ Points ☒ Lines ☒ Symbols

Point Label Settings

☒ Point Numbers
☒ Descriptions
☐ Point Notes

Elev Label Settings

☒ Elevations
☒ Label Zeros
☐ Use Parentheses
☐ Use '+' ☒ Use ' '

Locate Points on Real Z Axis

☒ On ☐ Off ☐ By Code

Locate Linework on Real Z Axis

☐ On ☐ Off ☒ By Code

PC-PT Curve Type

☒ Bezier ☐ Tangent Arcs

Layer Prefix

☐ Erase Existing Field to Finish Entities ☐ In Range

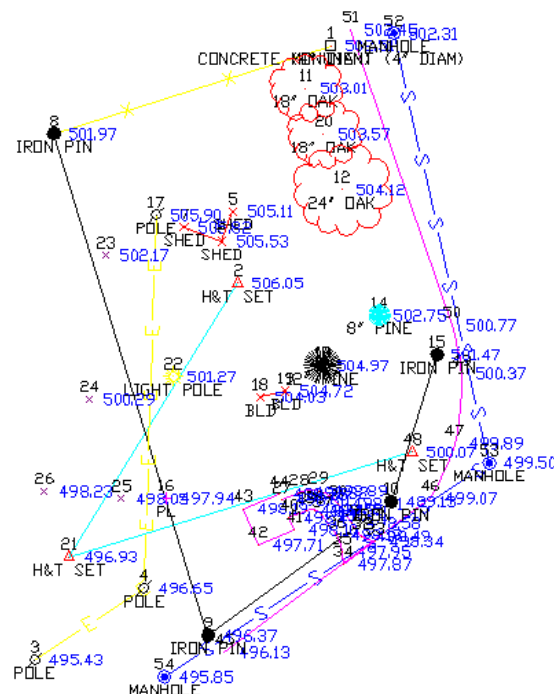
☐ Pause on Undefined Codes

☐ Preview Only ☐ Auto Zoom Extents

OK Cancel Help

You want to draw all points, 1 through 54. Make sure the options are set as shown above, and Click OK.

The Field to Finish now draws the points and linework. Run View->Extents to show the points, as well as the linework and point symbols. Field to Finish saves you many manual steps. Your plat is shown below:



2 To understand how the above drawing was created, select Field to Finish from the Tools menu.

Field to Finish

DATA: C:\Scad2006\Data\Plat3.crd, CODE: C:\Scad2006\Data\Survccadd.fld

CODE	FULL NAME	DESC	SYMBOL	LINETYPE	ENTITY	TIE	LAYER	ON/OFF
I	CURB ISLAN		spt0	BYLAYER	3DPLine	Open	ISLAND	On
MAC	PAVEMENT	MAC	spt0	BYLAYER	Point	Open	PAVEMENT	On
RC	ROAD C/L		spt0	BYLAYER	3DPLine	Open	CLINE	On
SIGN	SIGN	SIGN	spt17	BYLAYER	Point	Open	SIGN	On
SHD	TOP OF CUR	SHD	spt10	BYLAYER	3DPLine	Open	CURB-TOP	On
WLK	SIDEWALK	SW	spt10	BYLAYER	2DPLine	Open	SIDEWALK	On
---> UTILITIES <---								
WG	WG	WG	spt39	CONTINUOUS	Line	Open	UTILITY	On
MH	MANHOLE	MANHOLE	SPT34	sewer	2DPLine	Open	SEWER	On
SMH	SMH	SMH	spt50	CONTINUOUS	Line	Open	SEWER	On
TELBOX	TELBOX	TELE	spt30	CONTINUOUS	Line	Open	UTILITY	On

Code Table

Code Definitions

Coordinate File

Code Table Settings...

Sort Table...

Report Codes/Points...

Code Table by CRD...

Save

Save As

Edit...

Select All

Add...

Copy...

Cut

Paste

Search...

Set CRD File...

Edit Points...

Draw...

Exit

Help

The display window shows point codes, such as IP for iron pin and FL for fence line, that are converted to special symbols and linetypes by Field to Finish. For an example of how the codes are used, look at the sewer line running from point 52 to 53 to 54 (the southernmost point), which is based on a field code of MH. Select MH for Manhole as shown above and click Edit. The following dialog box is displayed.

Edit Field Code Definition

☐ Category ☒ Processing ON ☐ Sequence Companion Codes...

Code: MH Define Code Sequence...

Full Name: MANHOLE Layer: SEWER Set

Description: MANHOLE ☐ Use Raw Description

Dual 3D Polyline Layer: Set Linetype... Set 3D Layer...

Set Symbol... Symbol Pts...

Set Color... ☐ Unit Symbol sewer SPT34

Text Size: 0.080 Symbol Size: 0.100 Line Width: 0.000

Get Template: NONE

Entity Type: ☐ 3D Polyline ☐ 3D and 2D ☒ 2D Polyline ☐ Line ☐ Points Only

Connection Order: ☒ Sequential ☐ Nearest Found

Tie: ☒ Open ☐ Close

Attribute Layout ID: 1 Elev Decimals: 0.00

☐ Hard Breakline ☒ Locate Pts on Real Z ☐ Random Rotate

☐ Smooth Polyline ☐ Distinct Point Layer Set

OK Cancel Help Set Separate Layers...

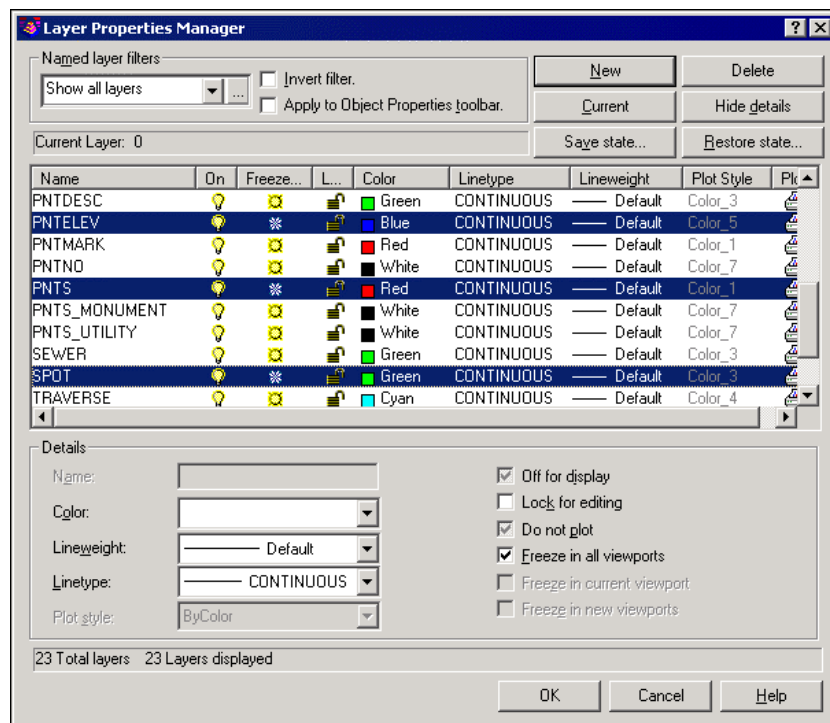
MH has several attributes that are used by the Field to Finish command based on the settings shown above. Field to Finish draws a manhole using the symbol SPT34. It draws a sewer line with the letter S for sewer. It places the

manhole on layer SEWER, and plots a text description of "MANHOLE" underneath the symbol. (Descriptions can be upper or lower case.) When you are done looking at the MH code definition, click OK.

Other codes have fewer attributes. LP is set only to draw a symbol and text (Light Pole), but not to draw linework. FL, for fence line, is set to draw linework but not corner symbols or points descriptions. A code's attributes depend on the entries in Set Linetype, Set Symbol, Description, and Entity Type options.

The "survey.fld" Field to Finish Table is provided with the Carlson Survey software. This table shows one possible system, but with far too many codes for a field crew to remember. You can make your own table by choosing the Select Code Table option from the Field to Finish dialog box, then choose the Select button. Select New from the New or Existing Code Table dialog box to create a new code table (.fld file).

3 Use the Layer ID command to verify the layers of the various plotted entities. Select the Layer ID command under the Inquiry menu. Pick on the Fence Line, the Road, and the Utility line, and notice the different layers (FENCE, EOP, UTILITY). You should study the layers in a drawing before deciding what to freeze and thaw. To reduce clutter on the screen, select the Layer Control command from the View menu.



Freeze the PNTS layer, the SPOT layer, and the PNTELEV layer by turning the sun into a snowflake.

4 Now you will do some drawing cleanup. Note that a single property line is drawn from point 8 to 9 to 10 and to 15. The chord from point 10 to 15 should be an arc. You will erase the segment from 9 to 10 and from 10 to 15, so you can re-draw it, establish the tangent, then draw the arc and finish back at point 1.

To eliminate part of a polyline, select the Edit menu, then select the Polyline Utilities command and click Remove Polyline Segment.

Break polyline at removal or keep continuous [<Break>/Continuous]: **press Enter** for Break

Select polyline segment to remove: Pick the segment from **9 to 10**, then the segment from **10 to 15**, then press Enter to end

To draw the correct polyline, use the 2D Polyline command under the Draw menu. If you prefer to type in the command, enter 2dp, which stands for 2D Polyline

Pick point or point numbers: **9**

Undo/Arc/Length/<Pick point or point numbers>:10

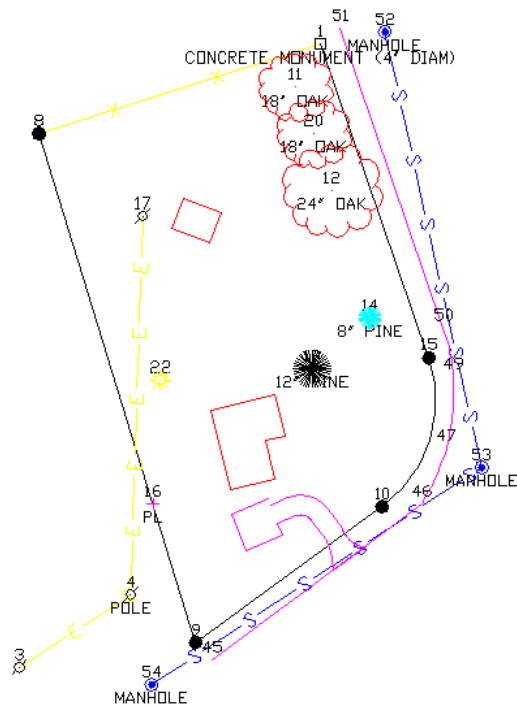
Undo/+/-/Arc/Close/Length/<Pick point or point numbers>: A

Second point/Radius point/radius Length/<Endpoint or numbers>: 15

Undo/+/-/Arc/Close/Length/<Pick point or point numbers>: 1

Undo/+/-/Arc/Close/Length/<Pick point or point numbers>: **press Enter**

Now erase the plotted traverse line that makes a "V" near the left side of the drawing. Then use the 4-Sided Building command you learned in Lesson 2 to create the other 2 sides of the shed located in the upper middle of the screen, near point 17. The end result, to this point, is shown below:



5 Much of the text in the above drawing, such as tree sizes and types, the manhole text, and the light pole text can be used in the final drawing. But some of the text, such as the text plotted for iron pins and poles, can be fully described in the Legend without the redundancy of plotting to the screen. If you use the Erase command to remove the iron pin and pole text, the entire point will be erased because the attributes are grouped with the point. Instead, use the Erase Point Attributes command under the Points menu.

Select Point No., Elev, or Desc to Erase (Enter to End): **Pick the 3 poles and the 4 iron pins**

6 Next, you will use Extend by Distance command to Create a Building. The building will be less complex than the building you created in Lesson 2, but you will learn the "t" and "c" options , in addition to "l" for left and "r" for right. Under Edit, choose the Extend command. Select the By Distance option. Pick the western side of the small line segment west of the 12" pine and north of the driveway. Follow the prompts:

Enter or pick distance to Draw (A,B,C,E,L,M,N,O,P,R,S,T,U,Help): **T50**

"T" or "t" means "total" distance or "to" the distance-so extend "to" 50 feet total.

Enter or pick distance to Draw (A,B,C,E,L,M,N,O,P,R,S,T,U,Help): **L62.5**

Enter or pick distance to Draw (A,B,C,E,L,M,N,O,P,R,S,T,U,Help): **L35**

Enter or pick distance to Draw (A,B,C,E,L,M,N,O,P,R,S,T,U,Help): **L30**

Enter or pick distance to Draw (A,B,C,E,L,M,N,O,P,R,S,T,U,Help): **R15**

Enter or pick distance to Draw (A,B,C,E,L,M,N,O,P,R,S,T,U,Help): **C** (to close)

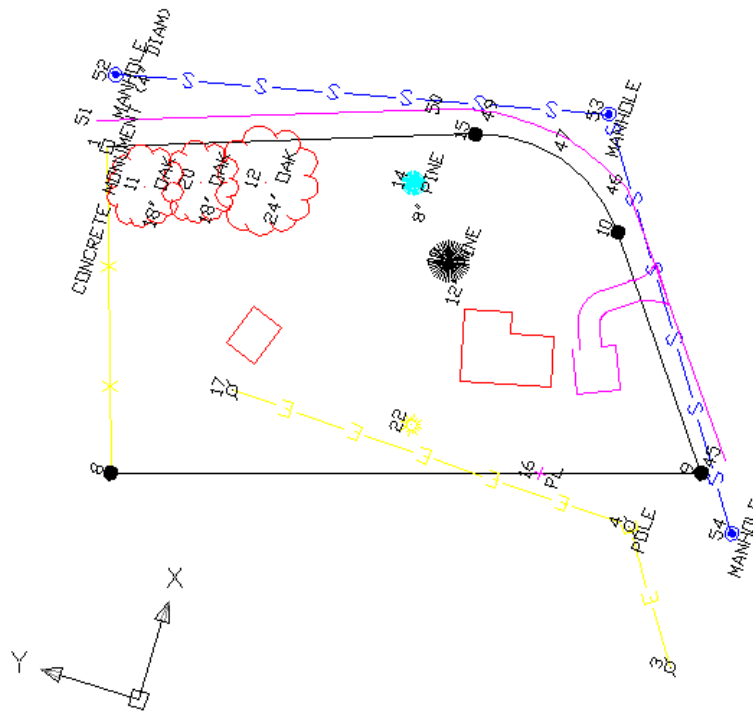
Enter or pick distance to Draw (A,B,C,E,L,M,N,O,P,R,S,T,U,Help): **press Enter**

The Extend by Distance "T" option for total distance solves the dilemma of making a line of unknown length extend to an exact known length.

7 Use the Twist Screen command to position the plat on the sheet. Not every drawing can be plotted "due North." Sometimes North needs to be rotated so that property lines and important features run nearly left-to-right or top-to-bottom on the plotted page, for a better fit. In this drawing, you want the western line from point 8 to point 9 to run left-to-right on a sheet that will be plotted in landscape style (longer left-to-right than top-to-bottom). Select Twist Screen, from the View menu, then select Line.

Pick a line or pline to make horizontal: **Pick the western line** from point 8 to point 9 closer to point 9

Now the drawing appears as shown below:



Notice that the north indicator (referred to as the USCICON), at the lower left, displays the rotation.

8 Now Select Twist Point Attributes, under the Points menu, to twist the point descriptions and point numbers back to a left-to-right rotation.

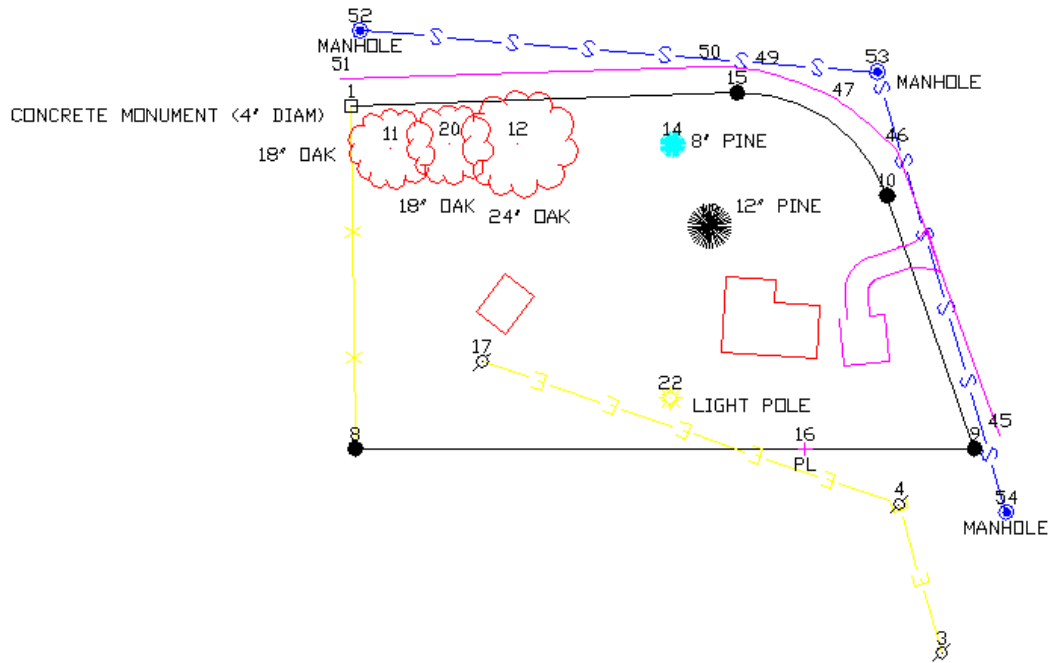
Twist by [<Twist screen>/Azimuth/Entity segment/Follow polyline]? **press Enter** for the default Twist screen method

Select Point Attributes & Symbols to Rotate.

Select objects: **All**

The points then twist back orthogonal to the screen, reading once again left-to-right.

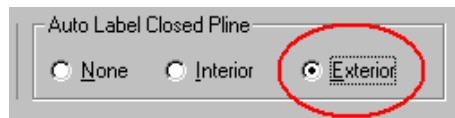
9 The remaining descriptions associated with the points can be used in the final drawing, but they should be moved slightly for a better appearance. For example, the tree descriptions would look better if they weren't inside the tree canopies. Under the Points menu, select Move Point Attributes. The steps of the command are: pick text, pick the new text position, press Enter, press Enter. Then the command repeats. Notice how the text "ghosts" as it moves, which helps you place it in the best position. Try to duplicate this result:



10 Because of the earlier Twist Screen command, the "Es" in the electric utility polyline are upside down. Choose the Text command from the Edit menu and select the from Flip Text option. Select the text to flip.

Select objects: **pick the upside down Es**

11 To label the dimensions of the building and the sheds automatically, you must first activate the Auto Label Closed Polyline Exterior function. To make this a permanent setting, under the Settings menu, select Configure, Survey, Survey Text Defaults, and change the dialog box as shown below:



Click OK. Select Building Dimensions from the Annotate menu, under the Survey Text command. Pick the house and the shed. If the text overwrites the inside corner of the house, use the Move command (under the Edit menu, or type M for Move at the command prompt) and move the 30' dimension beneath the line.

12 To automatically annotate bearings and distance, as well as arcs, select the AutoAnnotate command from the Annotate menu. When the dialog box appears, set Angle to Row 1 and Above and set Distance to Row 1 and Below. Then pick the 3 polylines that fully define the perimeter: the fence line, the polyline containing the arc, and the lower polyline, which is still the western polyline although you have twisted the screen so it runs along the lower portion of the drawing. Use the Move command to move the bearing and distance labels to avoid overwriting other features.

When you move the lower distance label, 404.90' to the left, you want to move perfectly level to the screen, since this was the line you used to Twist the screen, and it runs perfectly left-to-right. To do this, press the function key F8 to activate Ortho. Then pick 404.90' and move it to the left, picking its final position. Repeat this for the S 17°05'38" E bearing. After you move these items, press F8 again to turn off Ortho. Sometimes you will load a drawing from another client or source, and the Ortho setting has been left on. This may initially confuse you during Move commands. Press F8 to deactivate Ortho. Notice that F8 works even with Twist Screen active.

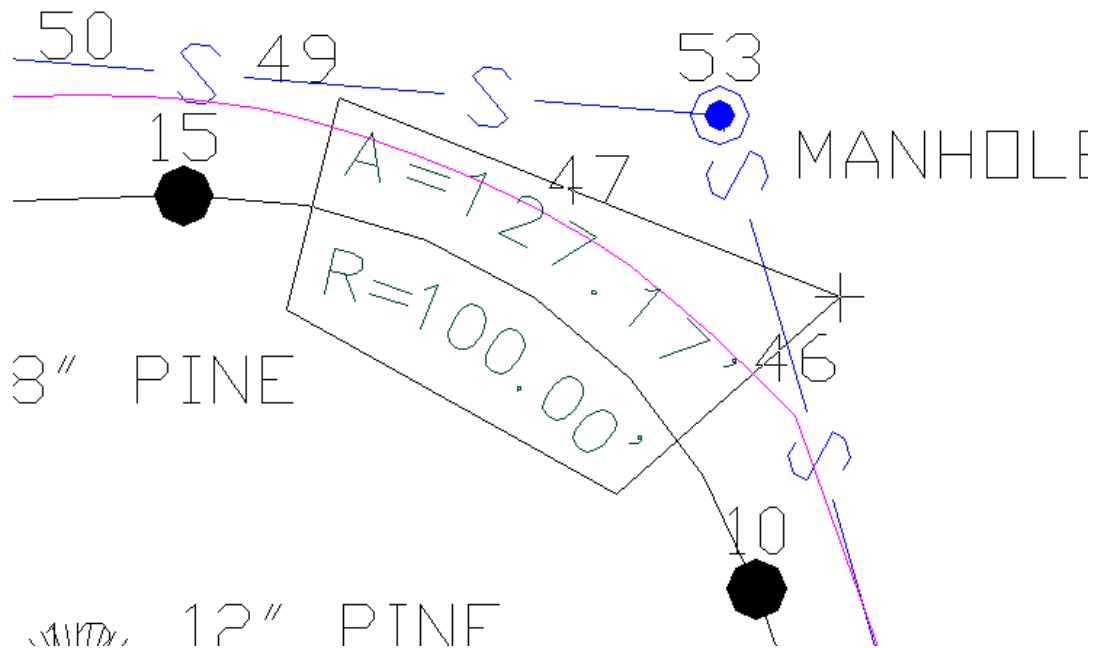
13 Auto Annotate typically centers the arc annotation above and below the arc, which causes the arc data to overwrite the surveyed edge-of-pavement (EOP) polyline. You want to erase both the arc annotations, and use the Label Arc

option of the Annotate Arc command to force both the arc length and radius to be drawn beneath the arc.

At the command line, **enter E** for Erase.

At Select objects: **enter WP**, then pick as shown below:

Press Enter when selection set is complete



There is no close option for window polygon and crossing polygon selections.

Under the Annotate menu, select the Annotate Arc command, then the Label Arc option. Then select the arcs from the screen.

The Label Arc Settings dialog box appears:

Label	Row	Side
Arc Length: L=	1	Inside
Radius: R=	2	Inside
Delta Angle: D=	None	Inside
Chord Angle: BRG=	None	Inside
Chord Length: C LEN=	None	Inside
Tangent: T=	None	Inside
Other Text: Dc=	None	Inside

☐ Flip Text on Arcs that Open to the North

☒ Use Symbol for Delta Angle Label

Label Chord Angles in...

☒ Bearings ☐ Azimuths ☐ Gons

Type of Curve

☒ Road ☐ Rail

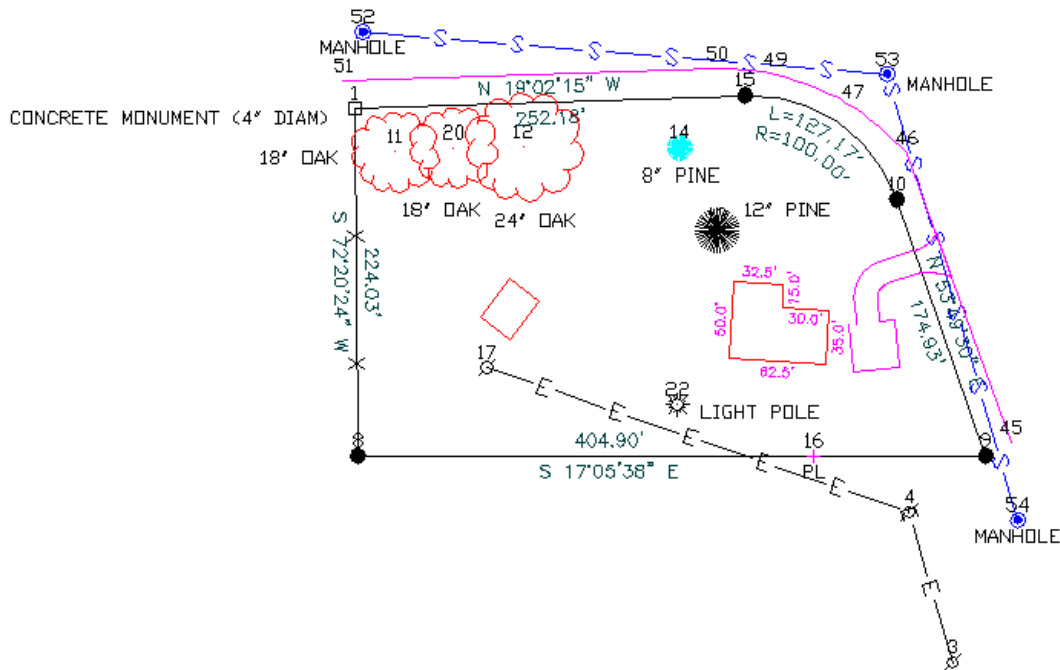
OK Cancel Help

You want to locate the arc text inside the arc, on positions 1 and 2. Position 1 is just under the arc, 2 is under it. To place arc text both above and below the arc, then run the command twice.

Fill out the dialog box as shown above and click OK.

The new arc text will overwrite the 8" Pine, so use the command Move Point Attributes in the Points menu and relocate the 8" Pine.

With the annotations placed in new positions, your drawing should be similar to the one shown below. Move your annotations to match this drawing.



14 To label the area of the lot, first select the Area Defaults command from the Area menu. Set the square units (s.f.) to the nearest whole unit (no decimals) and the other area labels to 2 decimal places. Then click OK to exit the dialog box. Select the Area by Lines & Arcs command from the Area menu and pick the 3 polylines that define the property perimeter. Locate the text to the left of the 12" Pine.

15 Before completing the final formatting of your drawing, you need to do some minor cleanup using procedures you learned in Lesson 2.

You don't want point 16, the PL point, to show in the final drawing. Use the Layer ID command under the Inquiry menu to verify the layer of point 16, which should be MISC. Freeze MISC using the Freeze Layer command on the View menu and pick point 16. Freeze the point numbers using the Layer Control command on the View menu, and freeze the layer PNTNO.

16 To insert an A1, 8-1/2 x 11 title block with the orientation landscape (not portrait), select the Title Block command from the Settings menu. Fill out the dialog box as shown below:

Make any text changes that you like, then click OK. For the insertion point, use 4830,5040 entered at the keyboard (x=4830, y=5040). If you prefer, you can use the Move command and pick the title block and two perimeters and move them. Never move the drawing because you will change coordinates if you do. Move the drawing only if changing the coordinate location does not matter.

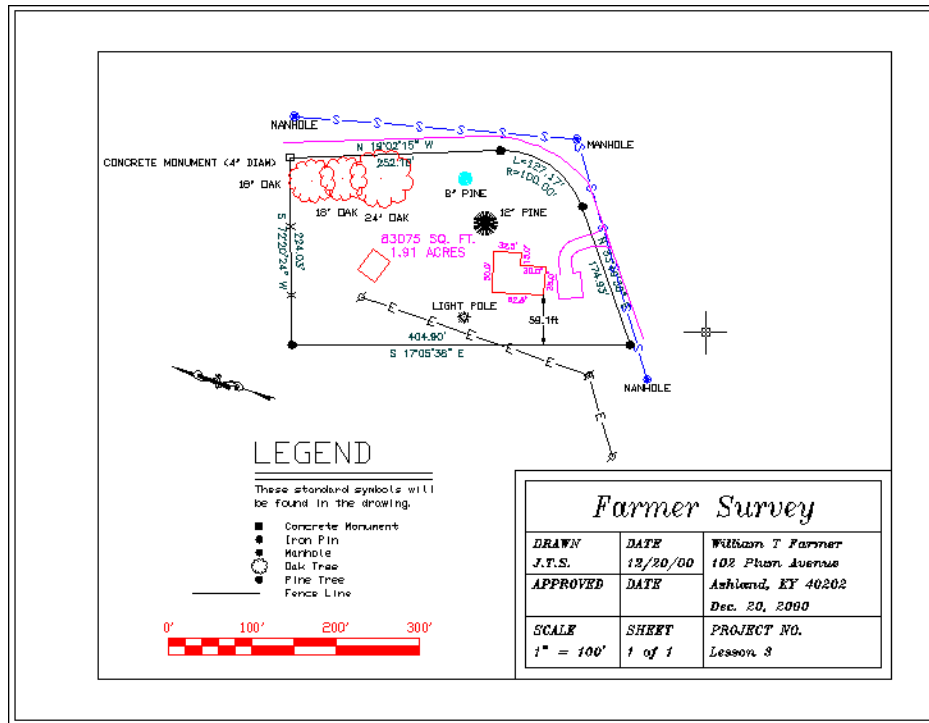
17 Select the Draw Legend command under the Annotate menu, and specify the Plat.lgd file you saved in Lesson 2. Pick a point in the available space to the lower left of the plat. If you did not save a legend in Lesson 2 (or you skipped Lesson 2), follow the steps in that lesson. Use the Scale Point Attributes command under the Points menu and scale up the oak tree symbol in the Legend by a factor of 1.5.

Select the Survey Text command from the Annotate menu, then select, Survey Text Defaults. Change the Offset Dimension Text alignment to Horizontal. (It may have been set to Parallel in Lesson 2.) Select the Offset Dimension command from the Annotate menu and pick the lower right corner of the building, then the lowermost property line (in the current twist screen position). This labels the offset dimension horizontal to the current twist screen.

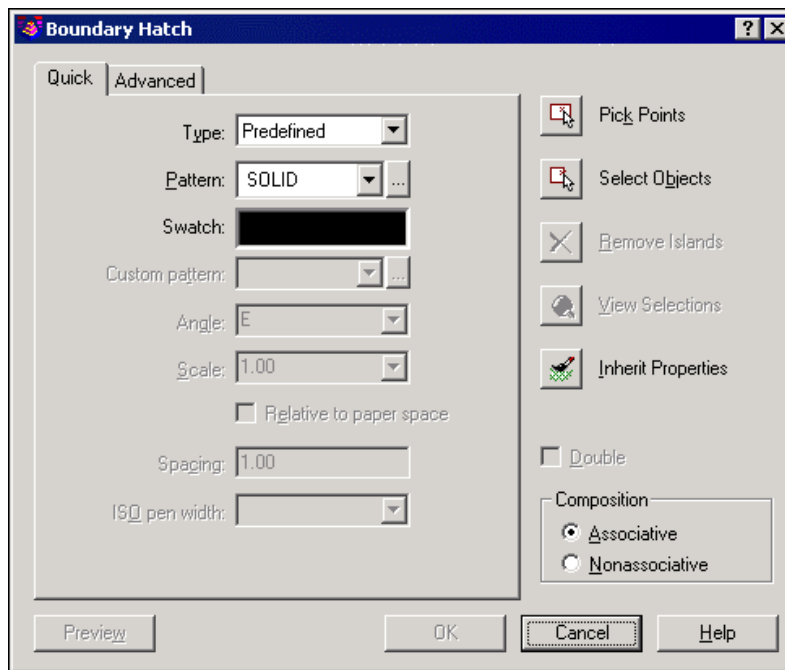
Pick the Draw North Arrow command under the Annotate menu and pick an appropriate location. Note how the arrow draws due north, respecting the twist screen.

Choose the Draw Barscale command under the Annotate menu and pick a location near the lower left portion of the drawing.

Your drawing should now look like this:



18 Select the Hatch command from the Draw menu.



Select the SOLID pattern from the pulldown list, then click Select Objects.

Pick the house and the shed.

19 To offset the EOP Polyline, first try using the Offset command under the Edit menu, and try offsetting the edge-of-pavement polyline that runs roughly parallel to the sewer line. You will see an error message because that object is a 3D Polyline created by the Field to Finish command. To offset a 3D Polyline, you must use a command specifically designed to offset 3D Polyines. Under the Edit menu, select 3D Polyline Utilities, and slide over to Offset 3D

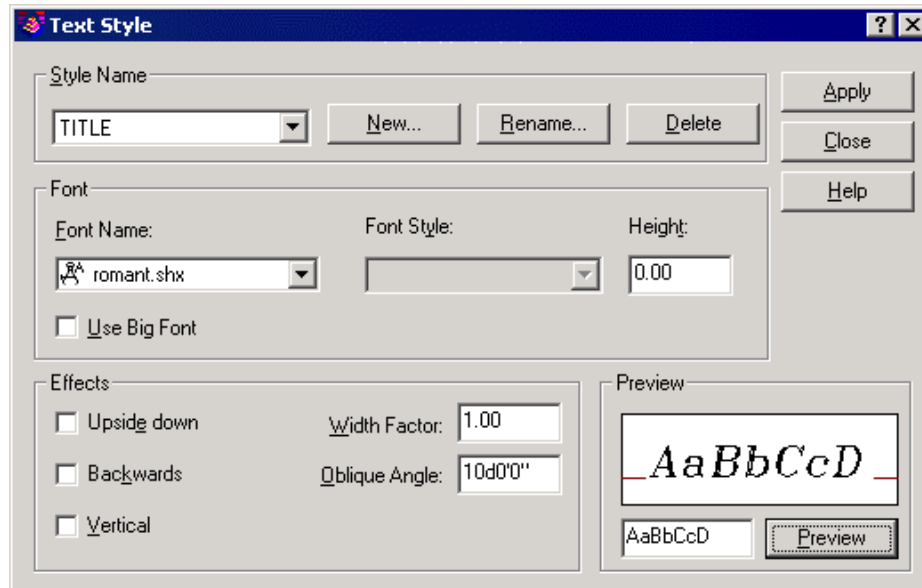
Polyline.

Enter the offset method [<Interval>,Constant,Variable]:**Press Enter** Vertical/<Horizontal offset amount>: **30**
Percent/Ratio/Vertical offset amount <0>: **Press Enter**

Select a polyline to offset (Enter for none): **pick the EOP polyline**

Select side to offset: **pick out and away from parcel**, for the other side of the road

20 Before you add a title to the drawing, create a text style for the title. Choose Text Style in the Settings menu.



Click New and name the style Title. Choose the font named "romant.shx" and then change the oblique angle to 10 degrees as shown.

Click Close.

To create the title, type Dtext at the command line.

Justify/Style/<Start point>: **c**

Center point: **pick a point** near the top right of the screen

Height <8.00>: **20**

Rotation angle <E>: **<Ortho on>**

Text: Farmer Survey

Text: August 15, 2003

Text: press Enter

Select the Text Enlarge/Reduce option of the Text command under the Edit menu. Pick the date you just entered, and scale it by 0.8.

21 Verify your drawing scale using the Drawing Setup command under Settings. Your drawing should have a scale of 100 with a text size of 0.08. To shrink the text size to 0.06, the same size as the building dimensions, label the house "2-Story", "Frame House" (2 lines of labeling), select the Leader with Text command under the Annotate menu.

Arrow location: **pick near the left side of the house**

To point: **pick off to the left**

Text: **2-Story**

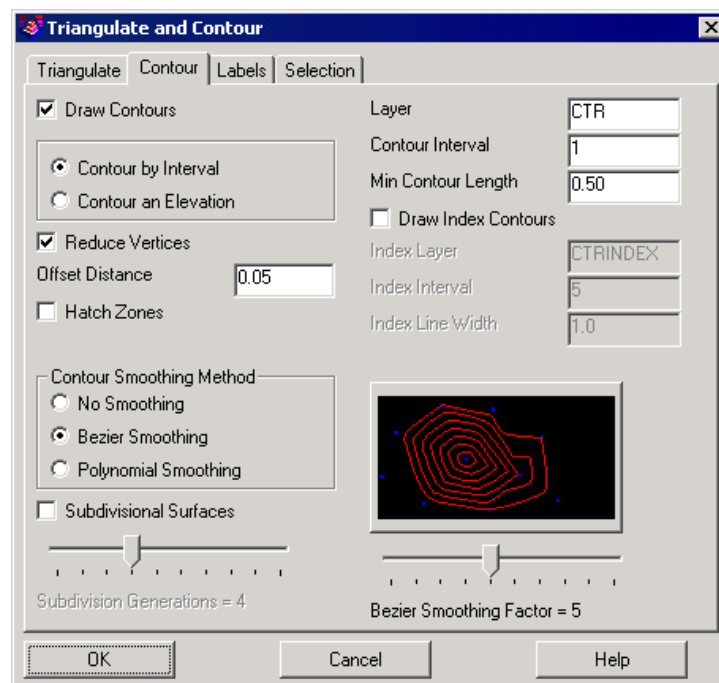
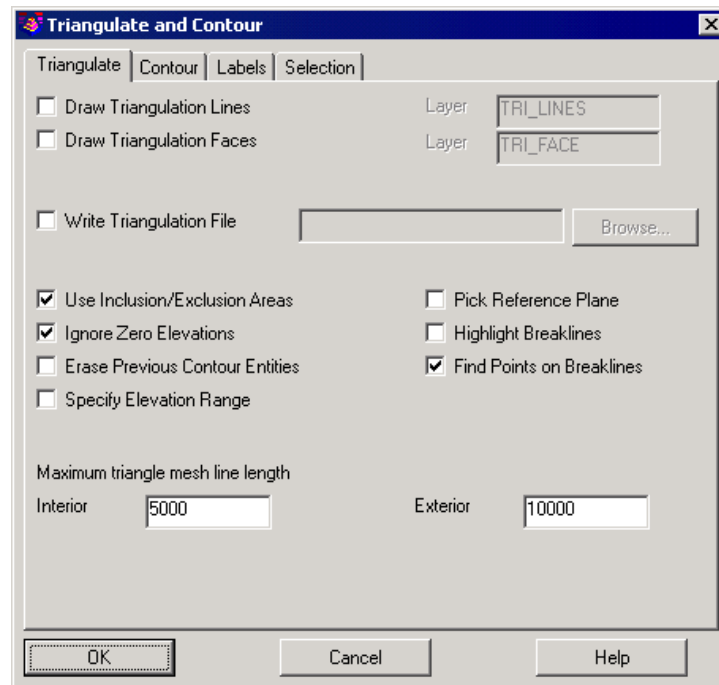
Text: **Farm House**

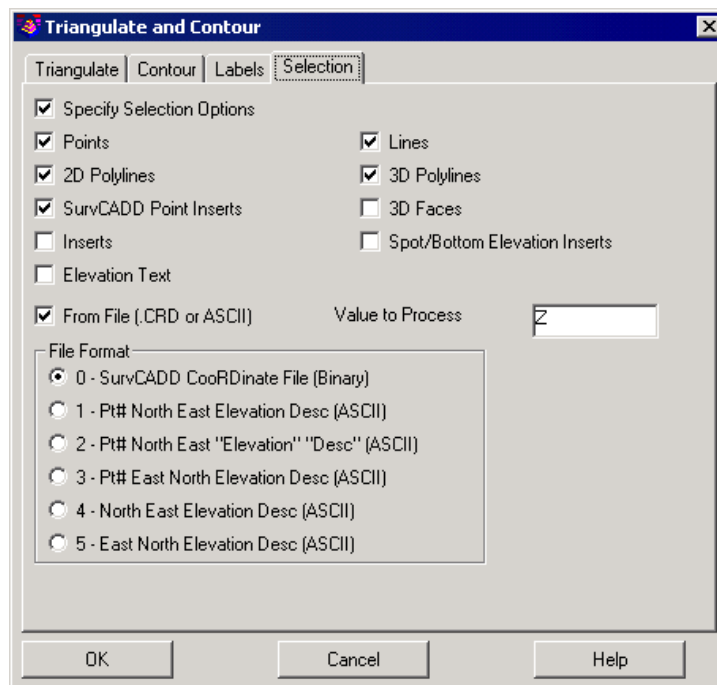
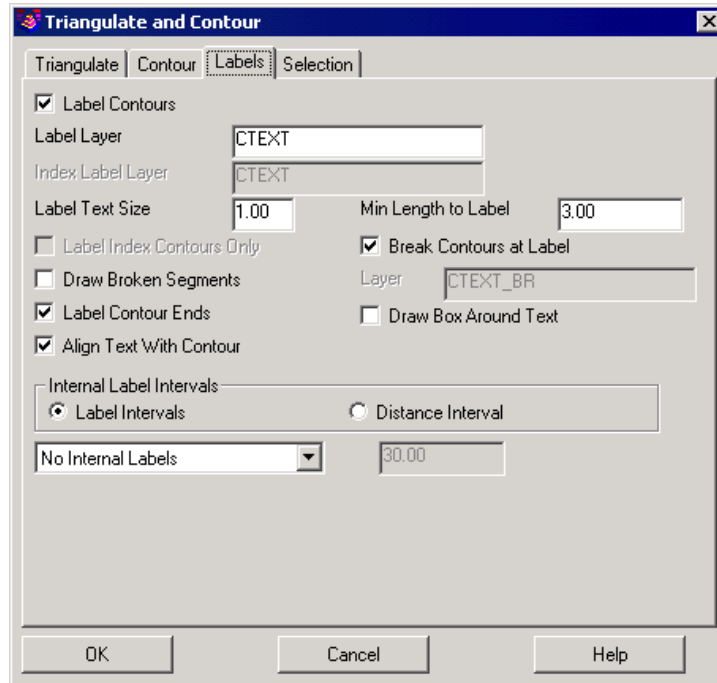
Text: **press Enter**

Pick anywhere on the leader. You see two grip squares (usually yellow), one on the left side and one of the right

side. Pick on the right grip nearest the house. Move your cursor. Note how the arrow moves. Pick again for the new location, and note how the arrowhead is properly oriented.

22 Select the Triangulate & Contour command from the Surface menu. Fill out the dialog as shown in the next 4 illustrations.





Then click OK.

Select the Inclusion perimeter polylines or ENTER for none.

Select objects: **press Enter**

Select the Exclusion perimeter polylines or ENTER for none.

Select objects: **Pick the house and the shed.** Since these objects have now been filled, the selection may be a little more tricky. We could (actually should) have placed the solids on their own layer and froze the layer before beginning the contour command. But we can use the fact that Carlson Survey is filtering the objects to get around the problem. When prompted to select the objects, issue the C (for crossing) option, then pick a box that crosses the edge of the filled polylines. Carlson Survey will accept the polyline but reject the fill.

Select the points and barrier lines to Triangulate. Select a right-to-left window of the property. A right-to-left selection behaves as a crossing, which means that any object that is touched by the window or included inside the window is selected. (A left-to-right selection is a window selection, which means that only objects that are fully enclosed by the window are selected.)

Select objects: **Window**

Other corner: **pick a point**

125 found

Select objects: **press Enter** to end

Pick the coordinate file that contains the points and click Open.

Reading points ... 200

Range of Point Numbers to use [/Group]: **press Enter**

Wildcard match of point description<*>: **press Enter**

Pick the lower left elevation "502" contour near the end. The grips are displayed. The first grip is used for stretching.

**** STRETCH ****

<Stretch to point>/Base point/Copy/Undo/eXit: **press Enter**

Clicking the right button on your mouse is the equivalent to pressing enter.

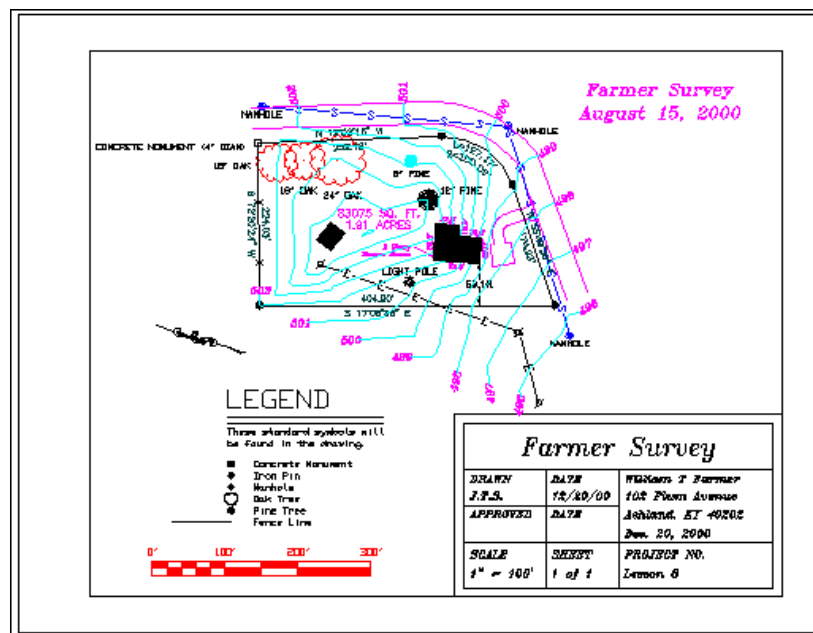
**** MOVE ****

<Move to point>/Base point/Copy/Undo/eXit: **press Enter**

```
** ROTATE **
```

<Rotation angle>/Base point/Copy/Undo/Reference/eXit: **Move your cursor** to the desired rotation, which is roughly left to right, and **pick a point**

Here is the final drawing:

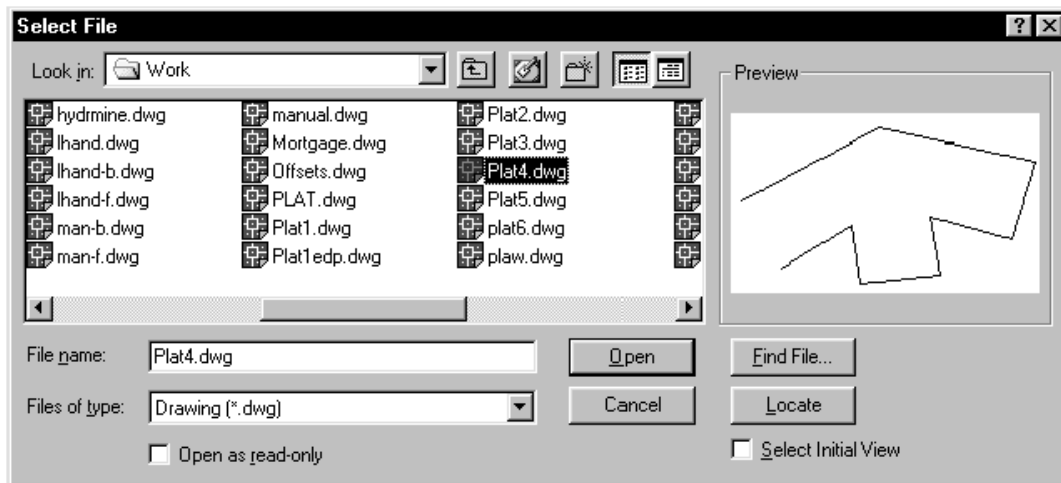


Lesson 4: Intersections and Subdivisions

1 Click the icon for Carlson Survey and start-up from Windows.

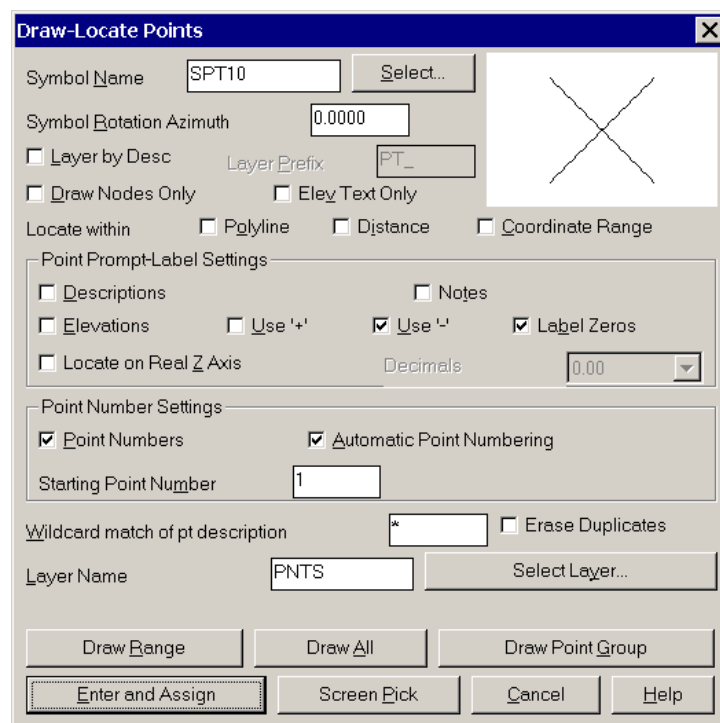
2 Once in Carlson Survey, click Open under the File pulldown menu. Look for the file Plat4.dwg and click on it. When it lights up blue, as shown below, it will appear in the Preview Window at right. It should look like the

open-sided property shown here. Plat4.dwg is found within the Work directory of Carlson Survey. You search for the file as you typically would in Windows, clicking the yellow up-one-level button to go to the parent directory of the current directory, or by clicking the adjacent down arrow to find the desired path in the full tree of directory locations.



Now click Open to select the file Plat4.dwg.

3 Enter & Assign a Starting point for the Street Centerline. Select Draw/Locate Point under the Points pull down and obtain the dialog shown below:



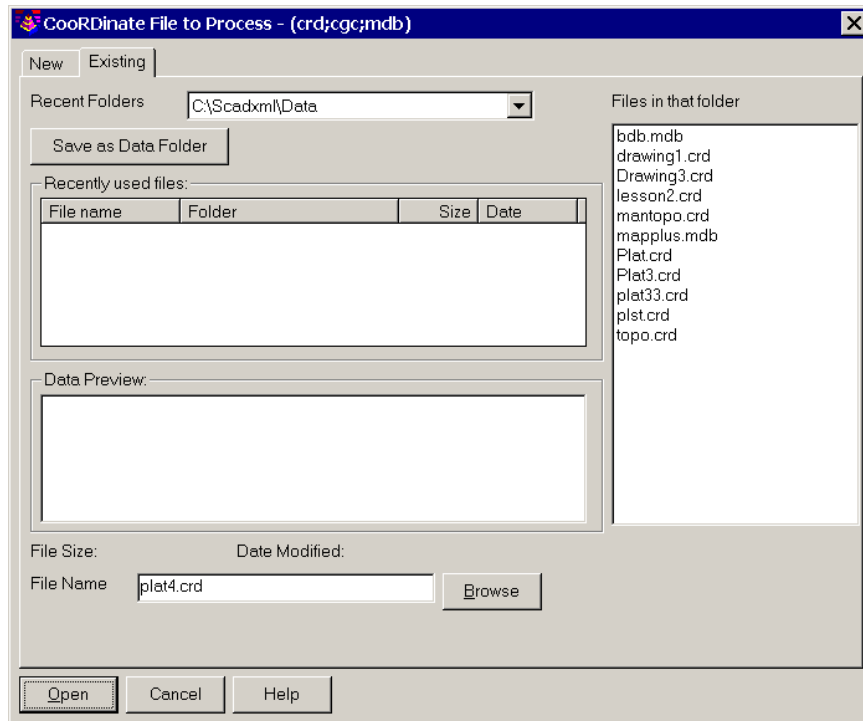
Click off the prompting and labeling for Descriptions, Elevations and Locate on Real Z Axis (make them blank as shown). Up top, change the symbol to SPT10 by picking Select (at the very top of the dialog) and choosing symbol 10 from the dialog of symbol choices (not shown here). Also verify that Automatic Point Numbering is clicked on, that the Starting Point Number is 1, that the layer is PNTS. Match these entries (which are mostly the default conditions) and click Enter & Assign at the lower left.

Prompting will appear at the bottom of the screen. We will enter the starting point as follows:

Enter North(y): **4809.17**

Enter East (x): **4391.28**

The program will recognize that you've not yet started a coordinate file, and will prompt:



Click New and enter the File Name as **Plat4** (which should be the default). If you enter Plat4, you do not need to enter the extension .crd. The program will add extensions automatically. Then you will be prompted again:

Enter North(y): **Enter** (for no more points we're done)

4 Traverse from PI to PI (to the two endpoints of our centerline). Select Traverse under the COGO pulldown menu, or alternately just enter T at the command line. (T is a hot key. Other hot keys are I for Inverse and SS for Sideshot).

Traverse, Line OFF, RAW FILE OFF

Exit/Options/Arc/Line/SideShot/Inverse/Angle-Bearing Code <7>: **1**

Enter Bearing Angle (dd.mmss) <90.0000>: **58.1848**

Number inverse/<Distance>: **736.73**

(5018.19 5196.15 0.0)

Exit/Options/Arc/Line/SideShot/Inverse/Angle-Bearing Code <1>: **E** (to exit)

You could keep on traversing, but we stop here to review. You have created point 2, traversing NE from point 1. To review, code 1 is for NE, 2 for SE, 3 for SW, 4 for NW, 5 for Azimuth, 6 for Angle Left, 7 for Angle Right, 8 for Deflection Left and 9 for Deflection Right. This is the standard way that traverses and sideshots are entered in Carlson Survey with a code entry (followed by Enter), then the angle or bearing entry (followed by Enter). Lesson 1, the Deed Description exercise, presented another method, where the angle and bearing are together in the form of 158.1848. That is a rare form, designed to save keystrokes, and used primarily only in Enter Deed Description. Now you've been exposed to both!

5 Line On/Off. Click Line On/Off under the COGO pulldown menu to turn on simultaneous linework with traversing. This command toggles on and off each time you click it, with the On status indicated by a checkmark. Now repeat the Traverse command (try T for Traverse this time, entered at the command line).

Traverse, Line ON, RAW FILE OFF

Exit/Options/Arc/Line/SideShot/Inverse/Angle-Bearing Code <1>: 2

Enter Bearing Angle (dd.mmss) <58.1848>: **75.0627**

Number inverse/<Distance>: **553.69**

(5553.28 5053.85 0.0)

Exit/Options/Arc/Line/SideShot/Inverse/Angle-Bearing Code <2>: **E** (to exit)

6 Draw a Polyline from Point 1 to Point 2, and connect the segments with Join Nearest. We could have turned linework with traverse on before we got started, but now we will do it after-the-fact. So choose 2D Polyline under Draw (some users like to simply type in 2DP at the command line that starts the Polyline command also).

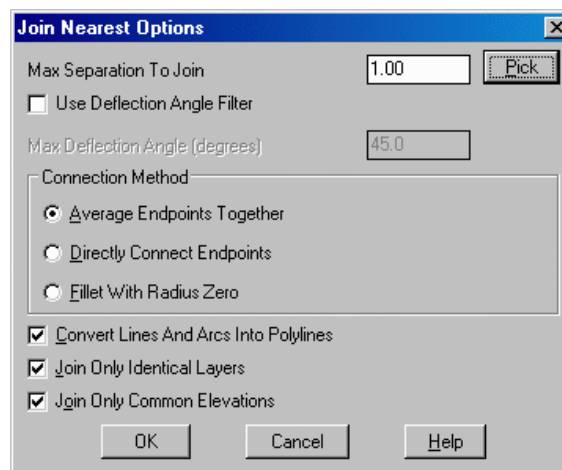
Polyline 2D Options dialog You can turn off this dialog with the Show options on startup toggle. Click OK.

Pick point or point numbers: **1**

Undo/Arc/Length/<Pick point or point numbers>: **2**

Undo/+/-/Arc/Close/Length/<Pick point or point numbers>: **Enter** (to end)

Now we have two line objects. The first, from point 2 to point 3 is a pure Line. The second, from point 1 to point 2, is a true Polyline (even though its only one segment long). It is officially a LWPOLYLINE, a lightweight polyline. This can be verified by picking it within the List command under Inquiry. Polylines are linked combinations of one or more line segments that behave as one unit. We encourage use of polylines versus lines, because they offset as a unit, will take on a thickness or width, are easier to select, and have superior editing capabilities. To join the polyline and line objects into a single polyline, choose the very useful command Join Nearest, found under Edit.



Just click OK (the defaults are good). Now pick the polyline from 1 to 2 and the line from 2 to 3, then hit Enter for no more.

Now just grip on the new polyline, by picking it with the cursor. See how the whole thing highlights? That is proof that it is joined up as a polyline.

7 Draw a Curve with a 500' Radius. Under Draw, Pick Curves and slide over to 2 Tangents, Radius.

Radius of Arc <0.00>: **500**

[nea] Pick Point on 1st Tangent Line: **Pick on the 1st polyline** segment closer to point 2

[nea] Pick Point on 2nd Tangent Line: **Pick on the 2nd polyline** segment close to point 2

The arc draws in, and the centerline remains a polyline, now with 3 segments.

8 I for Inverse. Entering I for Inverse, at the command line, is a handy way to get on a point to begin another traverse. Practice inversing. Enter I. Inverse from point 1, then to point 2, then to point 3 then back to 1. But you can also inverse (go to) a snapped position on a line or polyline, such as the midpoint of an arc. Let's do that, because we

want to traverse south from the midpoint of the arc. Enter I, for Inverse.

Command: **I**

Calculate Bearing & Distance from starting point?

Traverse/SideShot/Options/Arc/Pick point or point number: **MID** (for midpoint snap) of **Select the Arc**

Traverse/SideShot/Options/Arc/Pick point or point number: **T** (for traverse)

Traverse, Line ON, RAW FILE OFF

Exit/Options/Arc/Line/SideShot/Inverse/Angle-Bearing Code <2>: **press Enter**

Enter Bearing Angle (dd.mmss) <75.0627>: **10.11**

Points/<Distance>: **400**

Exit/Options/Arc/Line/SideShot/Inverse/Angle-Bearing Code <2>: **E** (to exit traverse)

Notice that you can transition from inverse, to traverse, to sideshot, etc. with these COGO options. We were in inverse, but we did T for traverse, and could have done I for inverse to return to inverse. This cuts down on keystrokes and adds to the sense of fluidity of the software.

9 Turn a Line into a Polyline. The command Offsets & Intersections requires pure polylines, not lines to execute. So since we had Line On with the last traverse, we have created a line. To use this in street design, we need to convert it into a polyline. Select Entities to Polylines from the Polyline Utilities command under the Edit pulldown menu.

Select lines, arcs, circles, 3DFaces, ellipses, splines, multilines, regions and solids to convert.

Select objects: **pick the line**

Converting ...

Convert 1 entities to polylines.

10 Offsets & Intersections. Under the Design pulldown menu, select Offsets & Intersections.

Select all PRIMARY road polylines.

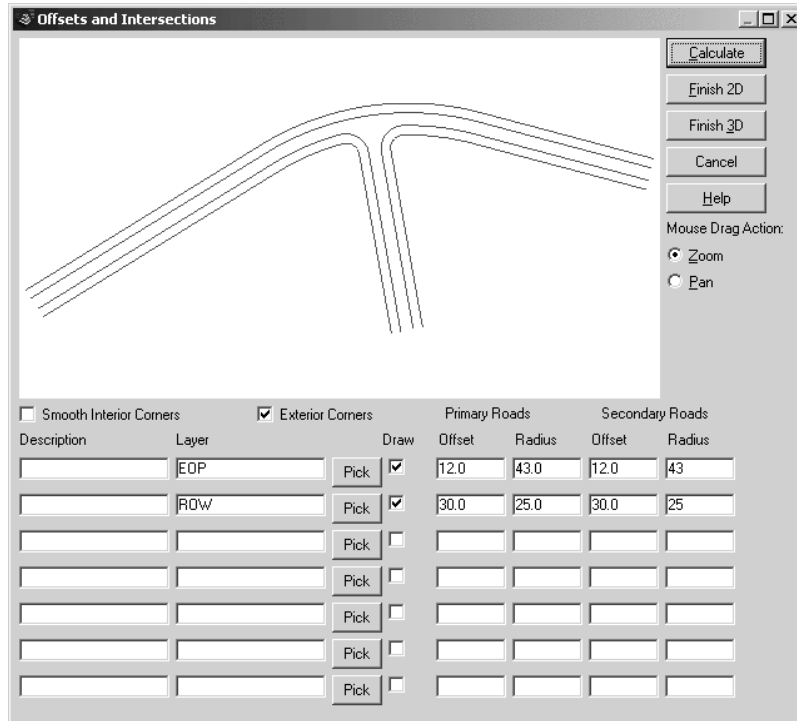
Select objects: **Enter** (we will consider both these subdivision streets secondary)

Select all SECONDARY road polylines.

Select objects: **Pick the main centerline**

Select objects: **Pick the side road**

Select objects: **Enter** (for no more)



The street intersections are presented in a dynamic dialog as shown above. Try experimenting with different radii under the Secondary Roads column, then clicking Calculate. The streets will re-draw in the upper graphical area. But after experimenting, change the 4 values under Secondary Roads to those shown (ignore Primary Roads those don't apply here) and click Calculate. Then click Finish 2D. Note the drawn-out street intersection.

Now select Layer ID under the Inquiry pulldown. Pick on the outside polyline (it is layer ROW). Pick on the next polyline in from the outside (it is layer EOP). For example, if you had clicked off EOP under the Draw column in the above dialog, the edge-of-pavement polyline would not have drawn.

11 Standard Cul-de-Sac. Under Design, select Cul-de-Sacs. You may want to zoom into the area of the bottom center, near point 4. When finished with the procedure below, zoom back out.

Prompting:

Select all offset polylines to end with cul-de-sac.

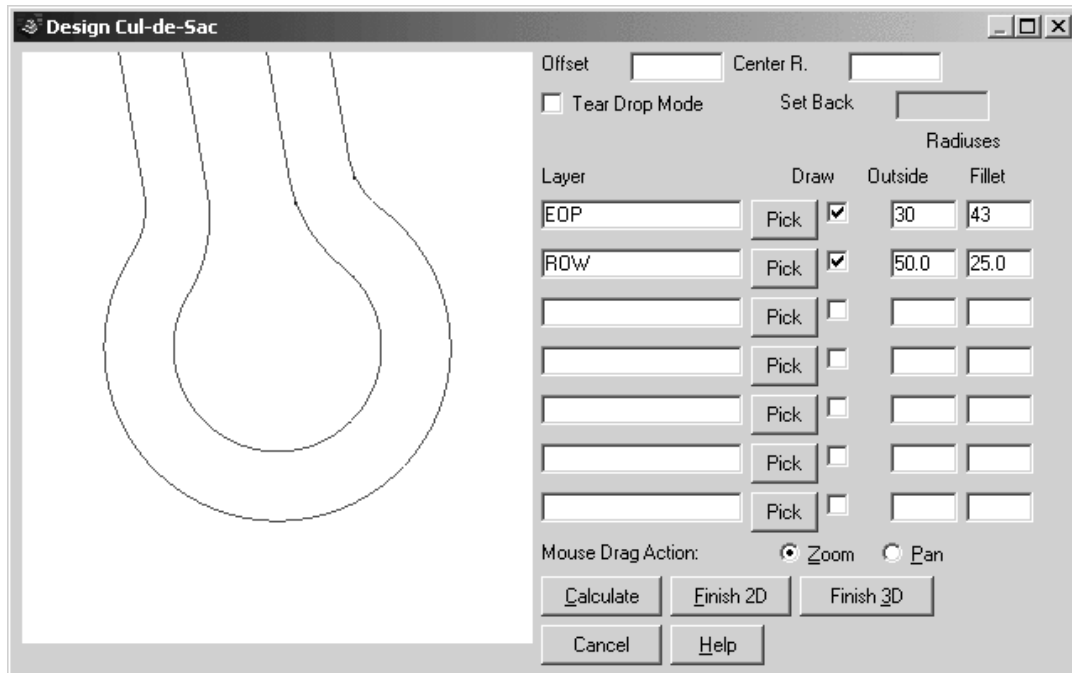
Select objects: Do a **crossing selection** (pick from right to left) across the lower side road, passing across and selecting all 5 polylines (ROW-L, EOP-L, CL, EOP-R, ROW-R)

Select objects: **press Enter** (for no more)

Pick cul-de-sac center projection onto centerline: **END** (type end for endpoint snap)

Pick near the endpoint of the centerline of the lower side road (near point 4). However make sure the pick is on the centerline polyline or the routine will say the centerline not found.

This brings up the following dialog:



Again, you can change the Fillet Radius and the Outside Radius on the EOP or ROW, hit Calculate, and check out its effect. (Don't make the Outside radii too small or it will fail calculate there is no workable solution). Set values as shown above. Then click on Finish 2D.

12 Teardrop Cul-de-Sac. Now select the Cul-de-Sacs routine again. Prompting:

Select all offset polylines to end with cul-de-sac.

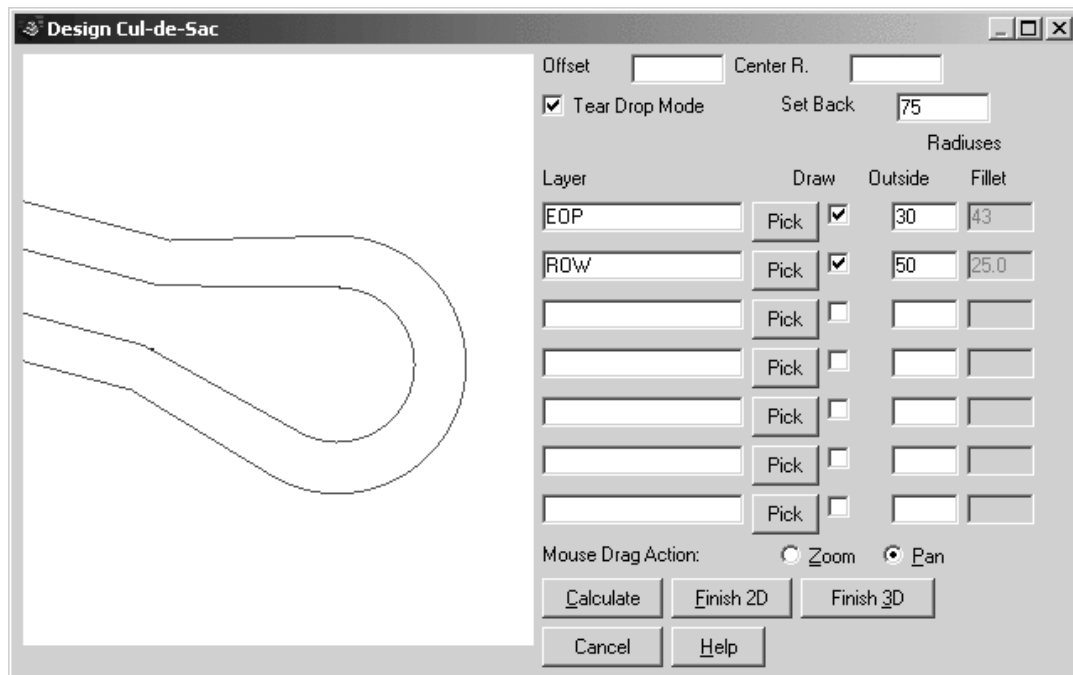
Select objects: Do a **crossing selection** (pick from right to left) across the right main road, passing across and selecting all 5 polylines (ROW-L, EOP-L, CL, EOP-R, ROW-R)

Select objects: **Enter** (for no more)

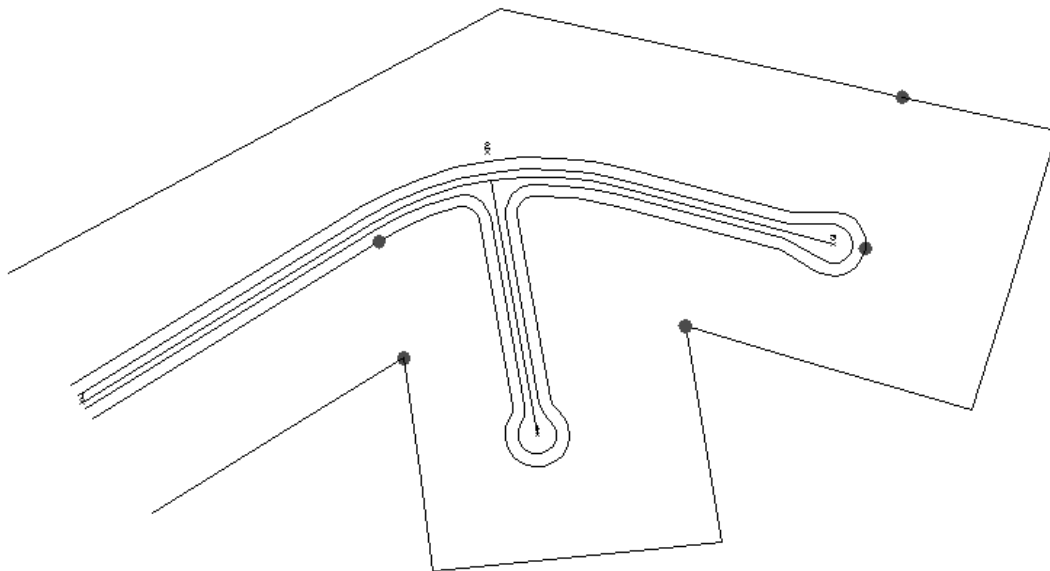
Pick cul-de-sac center projection onto centerline: **End** (type end for endpoint snap)

of **Pick the endpoint of the centerline** of the lower side road (near point 3)

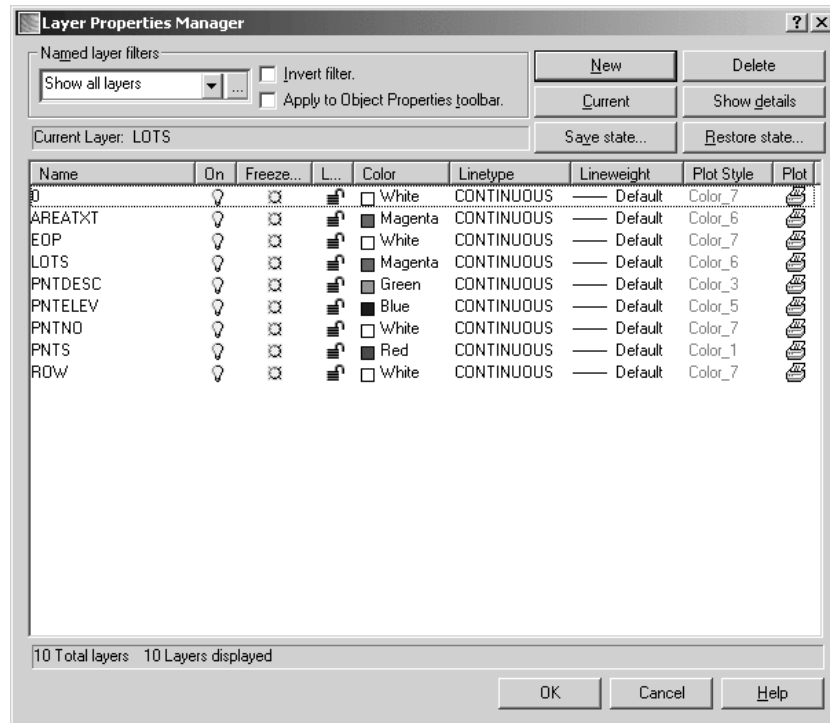
For a teardrop cul-de-sac, fill out the dialog as follows, then click on Calculate and Finish 2D:



Teardrop cul-de-sacs allow moving vans and other large vehicles more turning room, and have been popular in the Cincinnati area, for instance. Our drawing now appears as shown below (with the exception of the filled reference dots):



13 First let's make a layer called Lots, using Layer Control found under View. It's a good idea to create a layer and set it current before beginning the design process. Select Layer Control and obtain the following dialog:



Click on New. When Layer1 highlights (as shown at lower left), type over it with LOTS, then click under the C (color) column and change the color to Magenta. Then click the Current button up top to make this layer current. Then click OK to exit the dialog.

Next we will use Break at Selected Point. The Lot Layout routine under Design works nicely with reasonable polylines that run roughly parallel. Our goal is to make 1-acre lots. Lots of zigs, zags and jogs in the polylines cause the perpendicular offset logic to fail to find a solution (lots will radiate perpendicular from the front polyline in Lot Layout). Not only should the front and back lines run opposite each other, but they should end at some point before the calculation runs into difficulty with impossible math

The outer R-O-W polyline currently runs left-to-right, goes around both cul-de-sacs and returns right-to-left in one, connected polyline. We need to break it near where the filled dot is pointing. It should be easy to layout lots along the upper portion of the subdivision, as long as we stop or break the R-O-W polyline before it turns and runs back through the lower, more complex frontage and back property portions.

Under Edit, select Break, and slide over to At Selected Point. It prompts:

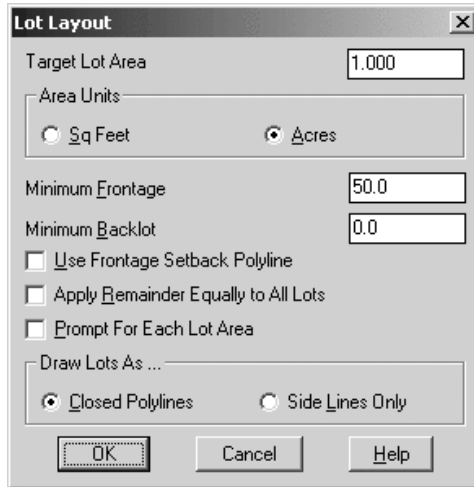
Select object: **Pick near the filled dot** on the outer boundary polyline in the upper right. (see graphic above)

Repeat the command for the ROW polyline.

Select object: **Pick near the filled dot** on the far right end of the Teardrop cul-de-sac R-O-W polyline.

To prove you have broken the polylines in two, click on the R-O-W polyline on the south side (only the south portion should highlight), then click on the north R-O-W polyline (which we will use as our frontage polyline in the command Lot Layout). Then press the ESC key twice, which gets rid of the grips, as does zooming or panning.

14 Select Lot Layout under Design. A dialog appears:



Fill out as shown. In particular, click off Apply Remainder Equally to All Lots (if it is on) so that we force 1.000 acres lots and don't just get equal lots of some size such as 1.0017 (because the remainder lot that wouldn't fit was added onto all lots).

Making Closed Polylines means that our side lines will be doubled up each lot sharing a side line. Click OK. You get prompted:

Select front polyline: **Pick north R-O-W**

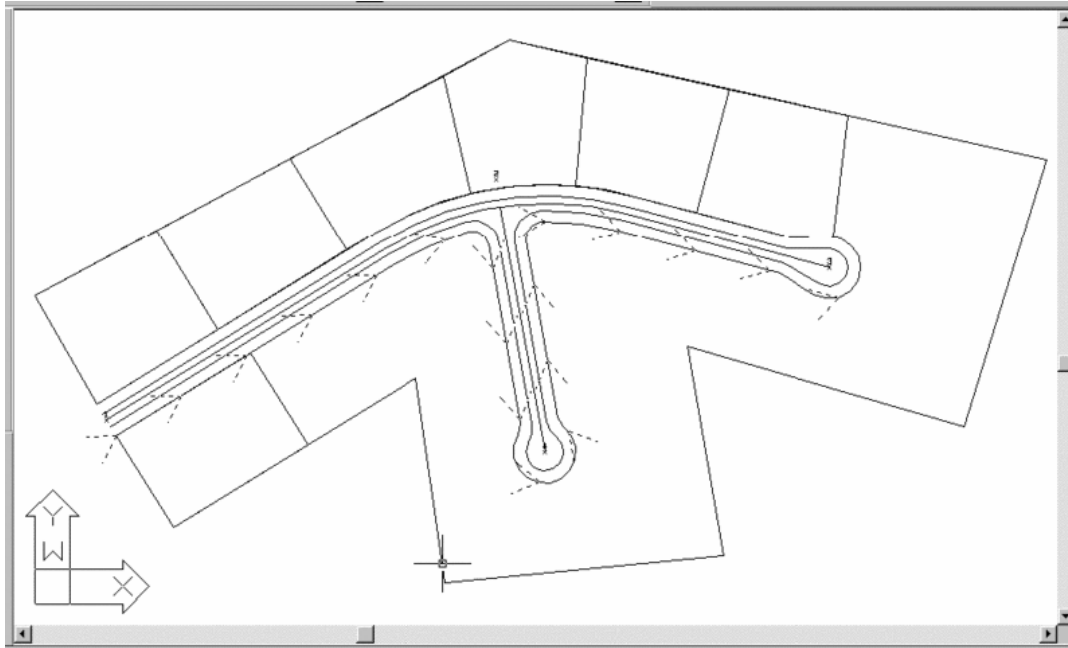
Select back polyline: **Pick northernmost polyline** the back property line.

The 1.00 acres lots are laid out as far as is possible. You may get a small lot at the end of the row, which you would erase.

15 Applications of Reverse Polyline. We can get one more lots from Lot Layout, by doing the lower R-O-W at the left side of the drawing, and picking the southern back polyline. Let's try. Select Lot Layout under Design. Use same dialog entries. Select the front polyline as the southern edge of the road R-O-W, near the left side of the drawing. Select the back polyline as the southern property line. Oops! Nothing drew. It was unable to calculate. It turns out that the direction of the polyline is important. The southern R-O-W polyline starts way off to the right, so the program wasn't even considering where we were looking! We need to reverse the direction of the southern R-O-W polyline so it starts on the left side. Select Reverse Polyline found under the Edit pulldown, sliding over from Polyline Utilities. It prompts:

Select Polyline to Reverse: **Pick the southern R-O-W polyline.**

The polyline now reverses direction, goes left-to-right, and shows phantom direction lines (which are automatically removed when the command ends). Now repeat the Lot Layout command as outlined in the beginning of Step 15, and we get one new lot out of the exercise, as shown below. If you get a second wedge shaped lot, erase it.



16 Break at Intersection. The lower back property line is still continuous. We can work with it in small pieces rather than as one big polyline. Say we want to break it as the inside corner identified by the arrow above. To do this, select Edit pulldown, Break, sliding over to At Intersection. Prompting:

Select Line, Arc, or Polyline to Break: **Pick the south property line**

[app on] Pick Intersection to break at: **Move the cursor to the intersection point indicated above, look for the INT snap to appear as you approach the exact corner (which is an intersect), then click there.**

17 Draw a Polyline from the corner indicated by the filled dot to the beginning of the R-O-W arc, also indicated by a filled dot in the previous graphic. Select 2D Polyline under Draw.

Pick point or point numbers: **End** (type in end for the endpoint snap)

of **..Pick the inner back property corner**

Undo/Arc/Length/<Pick point or point numbers>: **End** (type in end for the endpoint snap)

of **..Pick the beginning of the Arc** (it will show endpt when you get close to the true start of arc)

Undo/+/-/Arc/Close/Length/<Pick point or point numbers>: **Enter** (to end)

18 Area by Interior Point. We have just created a new lot, but the lot is not defined by one, single, closed polyline. If we want to verify its area, however, we can still use the command Area by Interior Point. Select Area by Interior Point under Area.

Pick point inside area perimeter: **Pick inside our new lot**

SQ. FEET: 40997.2 SQ. YARDS: 4555.2 SQ. MILES: 0.0

ACRES: 0.9412 PERIMETER: 830.5026

Pick area label centering point: Press **Enter** here to avoid labeling.

The lot is less than 1 acres. We will set as a goal to extend its lower boundary to the right to obtain 1 acre. That is the command Hinged Area. But Hinged Area works best if we have a nice, closed polyline for the new lot. We can get one using the command Boundary Polyline.

19 Boundary Polyline. Choose Boundary Polyline from the Draw menu.

Then pick all the polylines that surround our new lot. After you hit Enter to Select objects, press Enter for the default snap and for current layer. Then pick inside the lot. This creates a new closed polyline, in the current, Lots

layer (magenta).

Select polylines:

Select objects: **pick the surrounding lot polylines**

Enter snap tolerance <0.0001>: **press Enter**

Enter layer name for polylines <CLAYER>: **press Enter**

Pick an internal point: **pick inside lot**

Pick an internal point (U-Undo,Enter to end): **press Enter**

20 Select Hinged Area under the Area pulldown.

Define area by points or closed polyline [Points/<Linework>]? **Enter** (for linework)

Select polyline segment to adjust: **Pick on the right-side line**

Select hinge point[endp]: **Pick on the upper right hinge point** (see arrow)

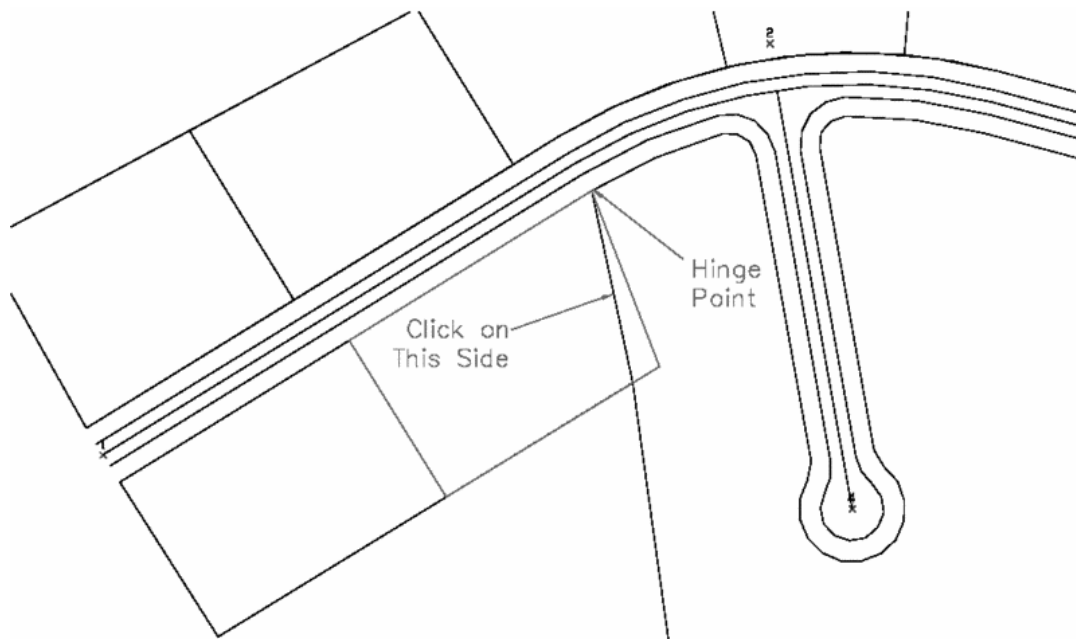
Keep existing polyline [Yes/<No>]? **N**

Area: 40997.20 S.F, 0.9412 Acres

Acres/Enter target area (s.f.): **A** (for acres)

Enter target area (acres): **1.0**

The new lot draws, as shown below:



21 Next use the Erase command to remove the segment that is pointed to above with the text Click on This Side.

22 Make 2 More Lots with Polyline command. Choose Draw->2D Polyline.

[Continue/Extend/Follow/Options/<Pick point or point numbers>]: **END** (type in the endpoint snap) of **Pick the endpoint** (which is the lower right corner of the new lot).

[Arc/Direction/Close/Follow/Undo/<Pick point or point numbers>]: **PER** (type in the perpendicular snap) to **Pick on the R-O-W polyline to the right.**

[Arc/Direction/Close/Follow/Undo/<Pick point or point numbers>]: **Enter** (to end)

Now for the second lot. Referring to the drawing below, repeat the PL command, and answer as follows:

[Continue/Extend/Follow/Options/<Pick point or point numbers>]: **NEA** (enter the nearest snap)

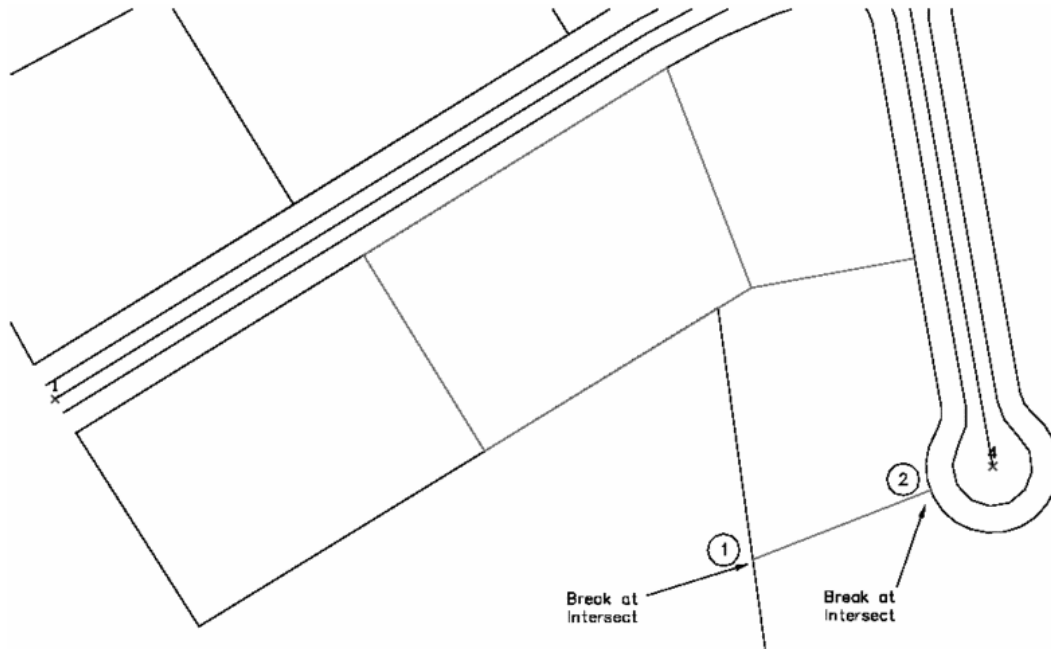
of **Pick on the property line anywhere near the circled point 1** (no need to be exact)

[Arc/Direction/Close/Follow/Undo/<Pick point or point numbers>]: **PER** (type in the perpendicular snap, which when intersecting arcs means radial to the arc)

to **Pick on the R-O-W polyline near circled point 2.**

[Arc/Direction/Close/Follow/Undo/<Pick point or point numbers>]: **ENTER** (to end)

The drawing appears below:

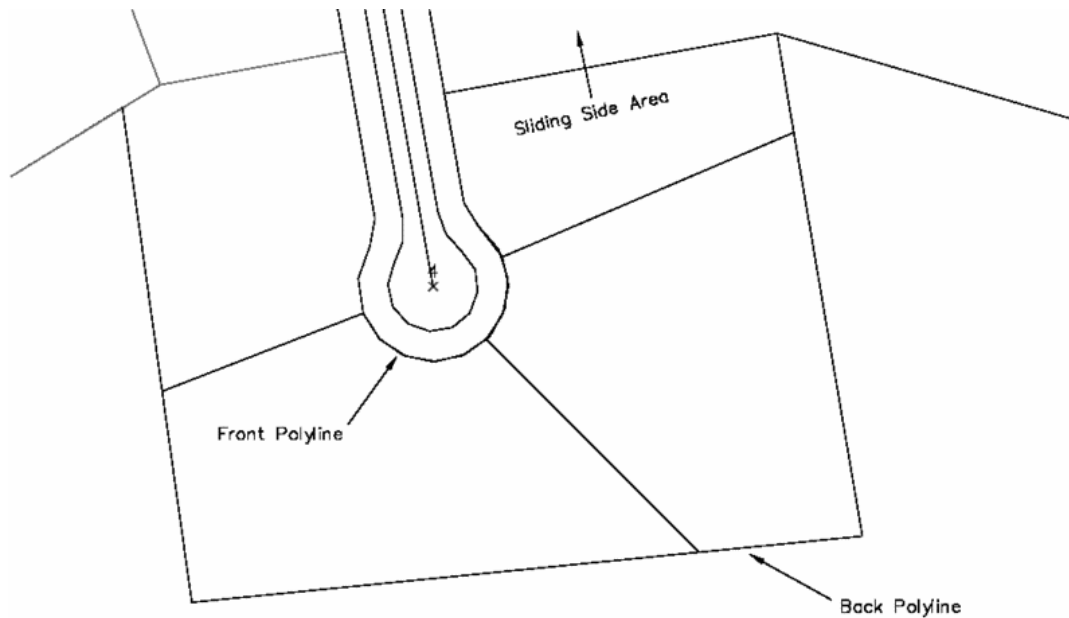


23 Issue the Break at Intersect command and break the back property polyline and the cul-de-sac R-O-W polyline at the intersections with are newly drawn polyline from step 22. Repeat this command and break the back property polyline at the filled dot to the right of the "Sliding Side Area" label below.

24 Repeat Lot Layout with the same entries as before. The front and back polylines to select are shown below, along with the results. This gives us 2 more usable lots.

Next use the Polyline command to generate a segment (above the "Sliding Side Area" label below) that runs from the ENDpoint of the corner to a point PERpendicular to the R-O-W line. Then use Boundary Polyline command in the Draw menu to create a closed boundary inside it.

Erasing the original segment you placed is a little tricky since the newly formed polyline is on top. When two pieces of geometry lie on top of each other Carlson Survey will take the one created last. Issue the Erase command, then hold down the control key while picking the segment above the "Sliding Side Area" label. When the single segment highlights, press enter to erase it, leaving the boundary polyline.



25 Sliding Side Area. Because we have a small closed polyline, we can investigate another area command, the Sliding Side Area. As shown in the graphic above, we want to slide the north side of the last, smaller lot parallel to its current bearing such that the lot will contain 1.00 acres. Select Sliding Side Area under the Area pulldown.

Define area by points or closed polyline [Points/<Linework>]? **ENTER**

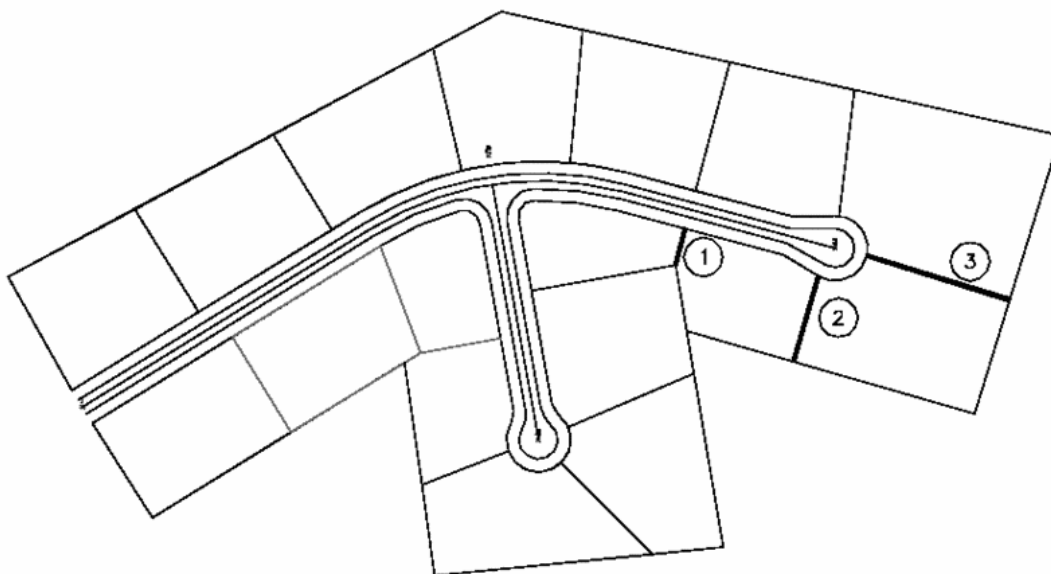
Select polyline segment to adjust: **Pick the north side of the lot** above (shown here containing the words Sliding Side Area)

Keep existing polyline [Yes/<No>]? **ENTER**

Area: 20375.30 S.F, 0.4678 Acres

Acres/Enter target area (s.f.): **A** (a for acres)

Enter target area (acres): **1.0**

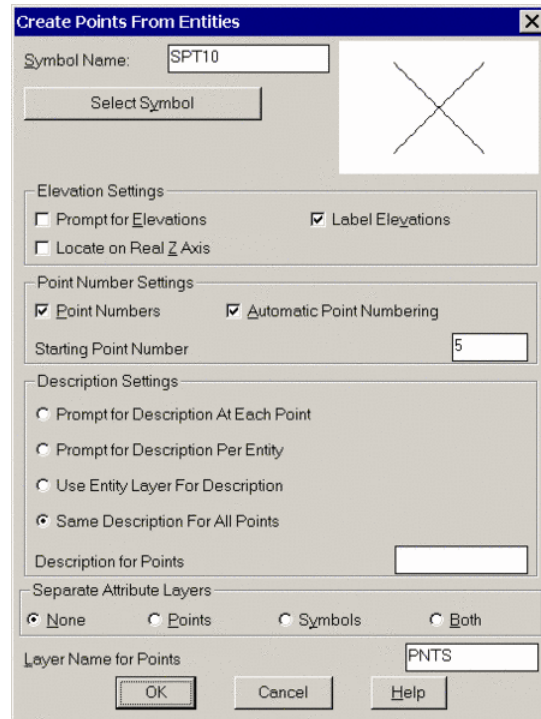


26 Complete the remaining Lots. Using the PL for Polyline command, use endpoint snaps and perpendicular snaps

(end and per) to draw the final 3 polylines, shown below marked 1, 2 and 3 for reference.

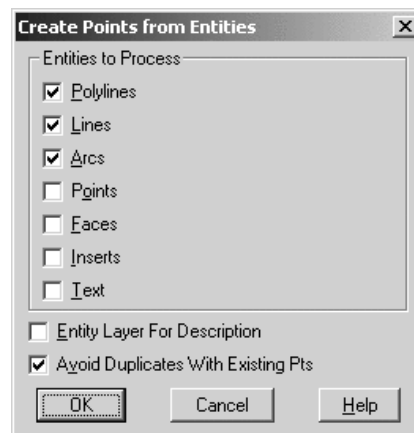
It may not be the most aesthetic subdivision, but we applied a lot of tools making it. But we're not done. There's some real automation ahead.

27 Create Points from Entities. We've designed a subdivision, in effect, without point numbers. First, we need to make point numbers in order to stakeout the subdivision. To do this, Select Create Points from Entities, under COGO. The following dialog appears:



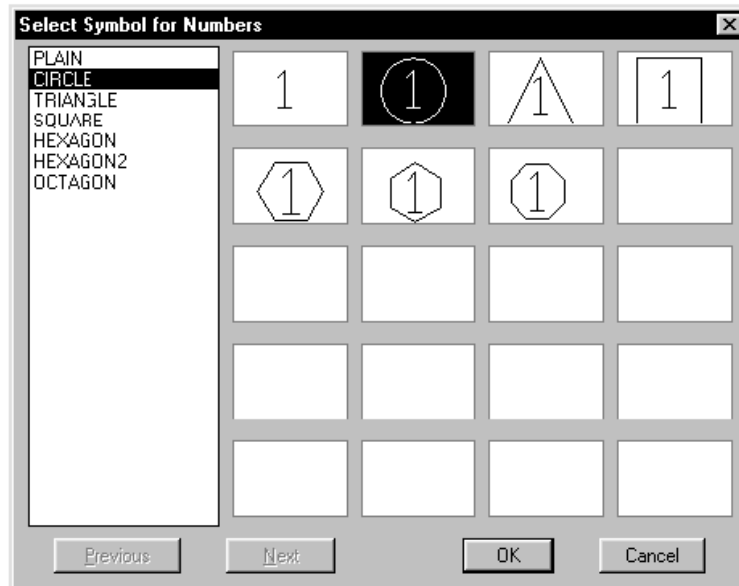
Set the starting point number to 5, verify the dialog as shown, and press Enter.

A second dialog, covering what entities to capture, appears next. Stick with the default settings and click OK.

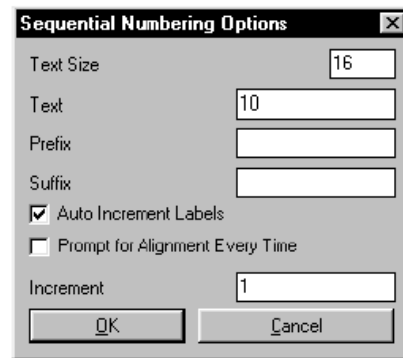


When it asks, Select objects, type in All. Press Enter for no more selections. All the point numbers for stakeout are created.

28 Number the lots, clockwise from the upper left, using the command Sequential Numbers. Under Draw, select Sequential Numbers. This dialog appears:



Choose the circled text and click OK.



Set the text size (height) to **16** and the starting text value to **10**, as shown. Then click **OK**.

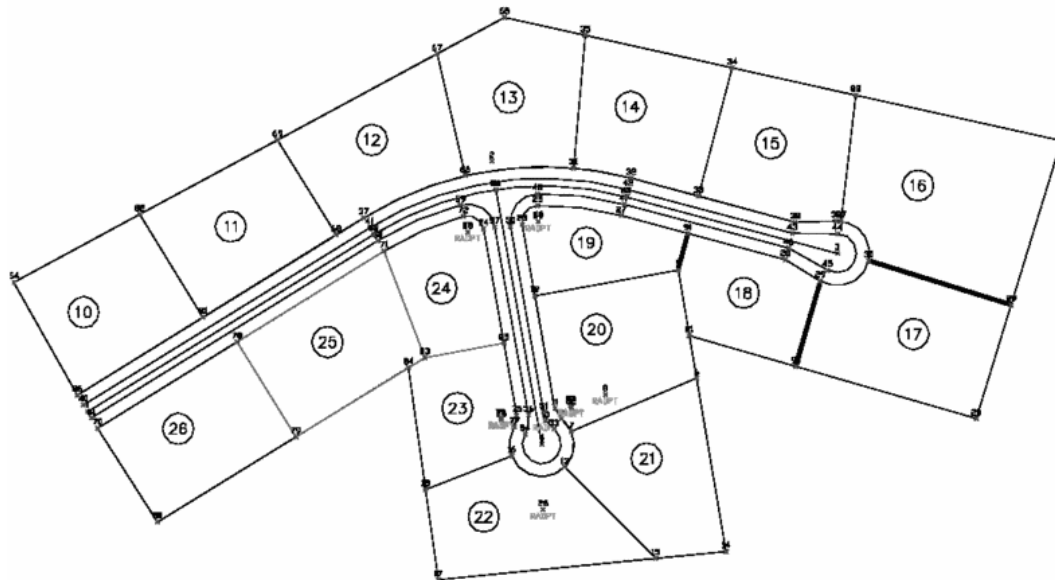
Pick point at beginning of label: **Pick near the center of the first upper left lot.**

Pick point for label alignment: Press **F8** for <Ortho on> **Pick to the right.**

Now pick near the center of all of the lots, going clockwise.

When done and back to the command line, press **F8 again** to set Ortho off.

The resulting drawing, with point numbers, is shown below:



29 Lot File by Interior Text. Official lot files can be created whenever a lot number or name exists within a lot as the sole text (other text may be present but could be frozen). So we will play it safe and first freeze the point number layer. Before we do, take note of the point number assigned to the NW corner of Lot 10. In our case, it is point 64 (it may be different in your case, depending on how you selected the objects in the command Convert Entities to Points).

Under View, select Freeze Layer and pick on one of the point numbers. Now select Lot File by Interior Text, under the Design->Create Lots pulldown.

Starting point number <96>: **Enter**

Block Name <1>: **Enter**

Select lot lines, polylines and text.

Select objects: **Pick the lots and the lot numbers.**

The Lot Files will be created. Before we look at the Lot Files, let's finish up and do Area Annotation on the upper lots, by the command Area by Interior Point.

Note: If we had not made points at all lot corners, using Convert Entities to Points, the Lot File by Interior Text would make point numbers. This is the reason for the prompt: Starting point number. If points are found, no new ones are created. Lot files must have points at all the corners.

30 Area by Interior Point. Select Area Defaults in the Area menu and cancel the square feet plot, leaving only the area plot to 3 decimal places. Set as shown below:

Value	Order#	Prefix	Suffix	Value	Order#	Prefix	Suffix
Perimeter			PERIMET	Lot Description			
Sq. Feet			SQ. FT.	Sq. Meters			SQ. MET
Sq. Yards			SQ. YAR	Cuerdas			CUERDA
Sq. Miles			SQ. MILE	Sq. Kilometers			SQ. KM.
Acres	1		ACRES	Hectares			HECTAR

Precision for Square Units Labels: 0.0

Precision for Other Area Labels: 0.000

Precision for Inverse with Area: 0.00

Label Area with +/-: ☒ None ☐ Prefix ☐ Suffix

☐ Use Commas in Labels ☐ Label Both Feet & Meters for Inverse with Area

Layer for area text: AREATXT

Style for area text: ROMANC

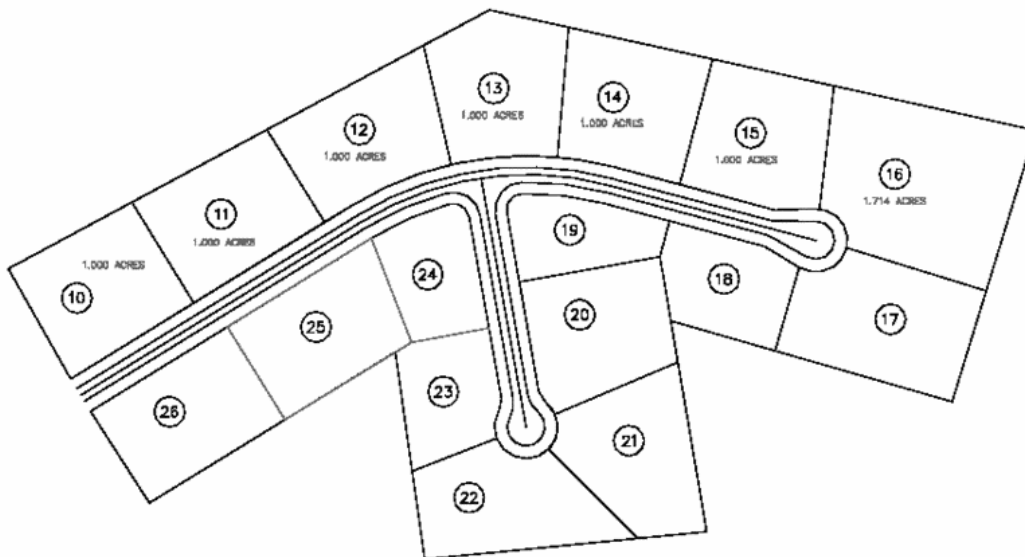
Area text size scaler: 0.100

Mag gap to join (Area by Lines and Arcs): 0.00010000

Different Radius Tolerance (Inverse w/ Area): 0.01000000

OK Cancel Help

Now choose Area by Interior Point, under the Area pulldown menu, and pick inside Lots 10 through 16, as shown below:



31 Select Lot File Report, under Design, and the following dialog appears:

Lot File Report

Lot File: c:\scad2006\DATA\plat4.lot

Lot name	Block	Type	Group lot/block
10	1	LOT	
11	1	LOT	
12	1	LOT	
13	1	LOT	
14	1	LOT	
15	1	LOT	
16	1	LOT	
17	1	LOT	
18	1	LOT	

☐ Report Areas Only ☐ Add Page Break Between Lots
☒ Report Stations ☐ Report Elevations ☐ Report Point Descriptions
☐ Use Report Formatter Unequal Radius Tolerance: 0.001000

Report Closure By:
☒ Start/End Coordinates ☐ Angle/Distance Precision

Coordinate/Distance Precision: 0.000 Angle Precision: 0

Pick on Lot 10 and click Report. This will lead to the lot report for Lot 10, including the point numbers, shown next:

Lot Report 06/04/2002 16:49

CRD File> c:\work\plat4.crd

LOT 10 OF BLOCK 1

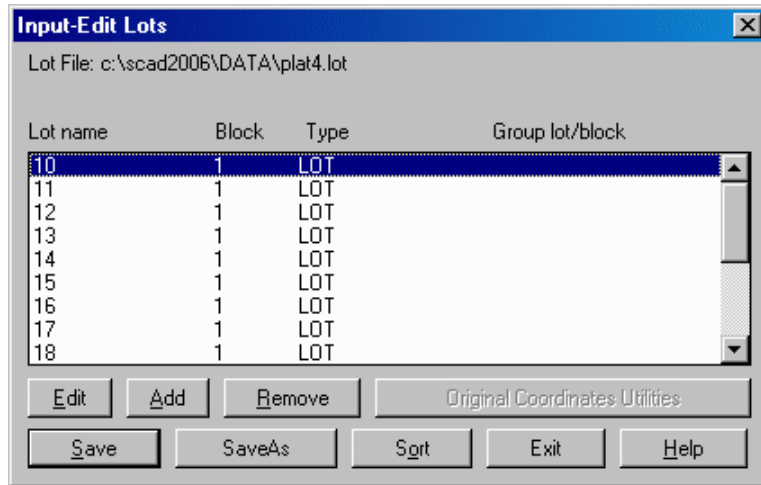
PNT#	BEARING	DISTANCE	NORTHING	EASTING	STATION
81			4955.061	4570.508	0.000
	S 58°18'48" W	229.144			
83			4834.698	4375.522	229.144
	N 29°20'38" W	200.158			
84			5009.174	4277.434	429.302
	N 61°42'33" E	221.351			
82			5114.083	4472.345	650.653
	S 31°41'12" E	186.879			
81			4955.061	4570.508	837.533

Closure Error Distance> 0.00000
 Total Distance> 837.533
 LOT AREA: 43560.0 SQ FT OR 1.000 ACRES

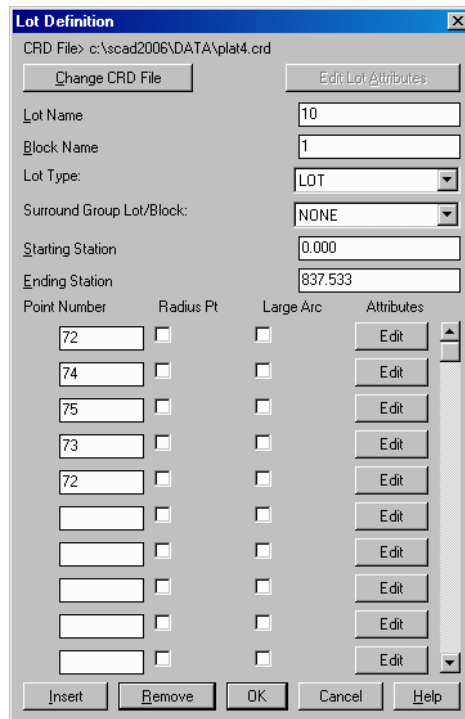
 BLOCK 1 TOTAL AREA: 43560.0 SQ FT OR 1.000 ACRES

This dialog is typical report viewer. You can click on 1 or more lines, highlight them and hit the delete key on the keyboard, and these lines will delete. You can edit lines directly in the dialog. You can save the report to disk with the Save icon shown above. To exit, click the Exit icon.

32 Input Edit Lot File can be used to describe a lot by different point numbers or to assign a lot to a different block. Click Input-Edit Lot File under the Design pulldown menu. Pick a lot to edit from the dialog shown below (e.g. Lot 10).



Then click the Edit button and you get this dialog:



This is shown for reference purposes.

33 Re-Drawing Lots after Editing Points. Let's assume you actually changed the point numbers that define Lot 10. That would cause the lot to draw differently. Also, you could simply alter the coordinate values of a point in the current lot file. That would also cause the lot to draw differently. Let's take the latter approach. Remember point 64? It is the NW corner of lot 10 (in our case yours may be different as stated above). So select Edit Points under the Points pulldown menu. Scroll down to point 64 (or whatever point is your NW corner of Lot 10).

Coordinate Data Sheet					
File Edit Search					
	Point#	Northing	Easting	Elevation	Description
79	79	5108.6459263	4819.3122485	0.0000000	
80	80	5229.1806743	4686.1854010	0.0000000	
81	81	4955.0614019	4570.5082237	0.0000000	
82	82	5114.0833600	4472.3453752	0.0000000	
83	83	4834.6980011	4375.5217907	0.0000000	
84	84	5050	4277.4341895	0.0000000	
85	85	5297.9123898	5582.3326016	0.0000000	
86	86	5340.2951672	5390.6502085	0.0000000	
87	87	5390.6344278	5162.9834409	0.0000000	
88	88	5362.1380224	4933.2076959	0.0000000	
89	89	4819.3812004	4384.9767163	0.0000000	
90	90	5093.3291257	4828.7671741	0.0000000	
91	91	5152.4530222	5229.2945017	0.0000000	
92	92	5084.7411846	5483.9084181	0.0000000	
93	93	5083.8664385	5553.6811550	0.0000000	
94	94	5027.6471580	5538.7302409	0.0000000	
95	95	5061.5473511	5477.7402671	0.0000000	
96	96	5129.2591887	5223.1263507	0.0000000	
97	97	5145.5682847	5088.7096082	0.0000000	

Point 84 Notes					
1					
2					
3					
4					
5					
6					

Click on the Northing and edit it to 5050. This is for illustration purposes. In reality, you might be fine-tuning your subdivision design points. As long as the same points define the lots, you are, in effect, making a ready-made new drawing. Now select at the top of the dialog File, then Save and Exit.

34 Draw Lot File. Before we draw the lot file, save your drawing by selecting Save under the File pulldown menu. Then choose New, exit the Startup Wizard (if it appears), and go straight to Draw Lots from File, under the Design pulldown menu. Then in the dialog below, choose all lots by clicking Select All.

Select Lots

Lot File: C:\work\PLAT4.lot

Lot name	Block name
18	1
17	1
16	1
15	1
14	1
13	1
12	1
11	1
10	1

☒ Draw Lot Polyline

Polyline Layer:

LOTS

☒ Label Lines & Arcs
☒ Label Areas

Select All

Clear All

OK

Cancel

Help

This leads to the Auto-Annotate Dialog, shown here. Stick with the defaults. Click OK.

The Auto-Annotate dialog box, Arcs tab, is shown. It contains the following settings:

- Angle: 1, Side: Above, Order: First
- Distance: 1, Side: Below, Order: First
- Orientation: Parallel
- Position Types: Above/Below
- Angle Format: ☒ Bearings, ☐ Azimuths, ☐ Gons
- ☐ Always Use Line Tables
- To Line Table Scaler: 0.00
- Starting Table Number: 1
- Preview area showing 'Angle' and 'Distance' labels.
- ☐ Apply Label Settings By Layer, ☐ Avoid Label Overlap
- Buttons: General Settings, Layer Settings, Overlap Settings, Reset To Defaults, OK, Cancel, Help, Load, Save.

Next comes the Area Defaults dialog, just as shown in Step 30. Fill out exactly as shown in Step 30.

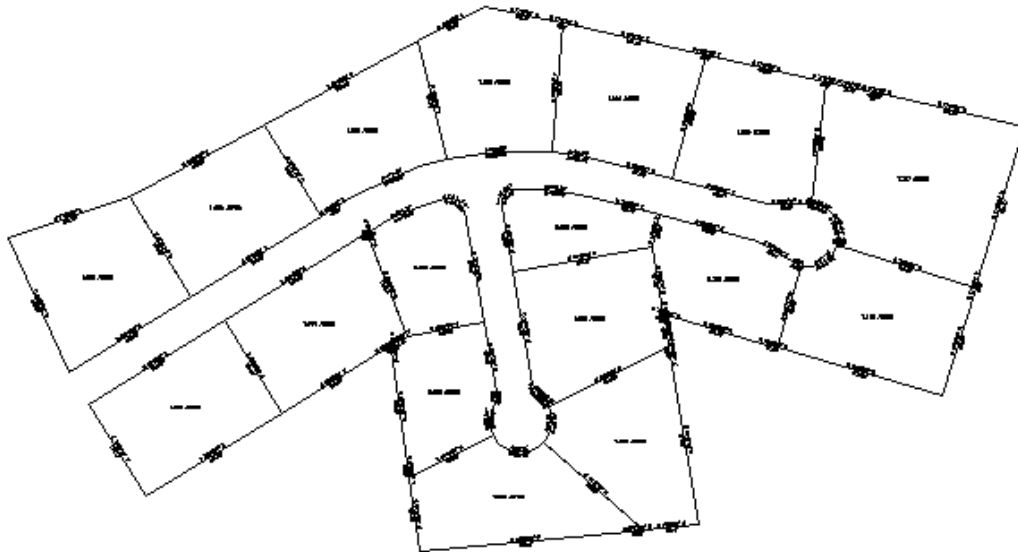
The Area Defaults dialog box is shown. It contains the following settings:

Value	Order#	Prefix	Suffix	Value	Order#	Prefix	Suffix
Perimeter	1		PERIMET	Lot Description	1		
Sq. Feet	1		SQ. FT.	Sq. Meters	1		SQ. METE
Sq. Yards	1		SQ. YARD	Cuerdas	1		CUERDAS
Sq. Miles	1		SQ. MILES	Sq. Kilometers	1		SQ. KM.
Acres	1		ACRES	Hectares	1		HECTARE

Below the table, the following settings are shown:

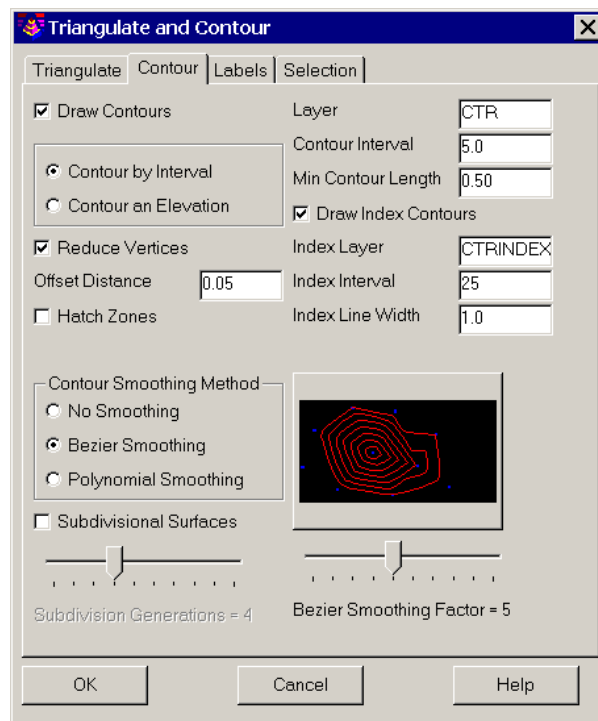
- Precision for Square Units Labels: 0.0
- Precision for Other Area Labels: 0.00
- Label Area with +/-: ☒ None, ☐ Prefix, ☐ Suffix
- ☐ Use Commas in Labels
- Layer for area text: AREATXT
- Style for area text: ROMANC
- Area text size scaler: 0.100
- Buttons: OK, Cancel, Help.

This leads to the plot shown below, created entirely from stored Lot Files, and showing our revision of Lot 10.



Lesson 5: Contour, Break Lines, Stockpiles

- 1 Click the icon for Carlson Survey or start-up Carlson Survey from Windows.
- 2 Once in Carlson Survey, click Open under the File pulldown menu. Look for the file Mantopo.dwg in Carlson Survey's Work folder and click on it.
- 3 Select Triangulate & Contour at the top of the Surface pulldown menu. Let's target contours at a 1-unit interval, and contour the area of points. You will see this dialog:



Make all settings as shown (typically, these settings are the default). The only likely change is the Contour Interval

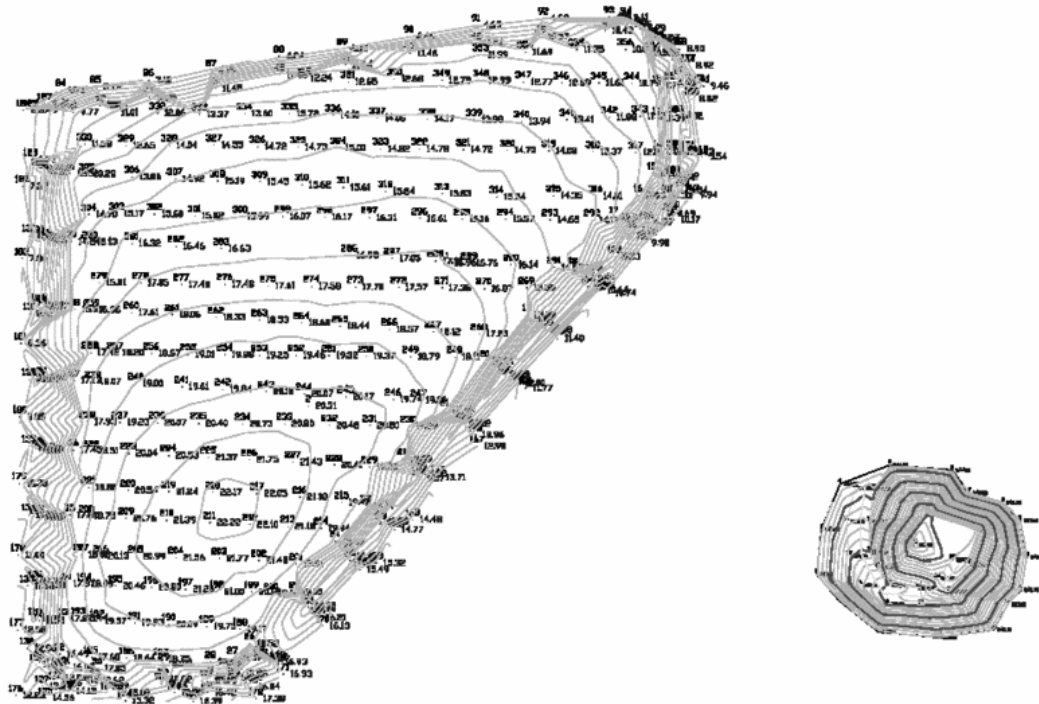
(middle right), which we will set to 1. Click OK.

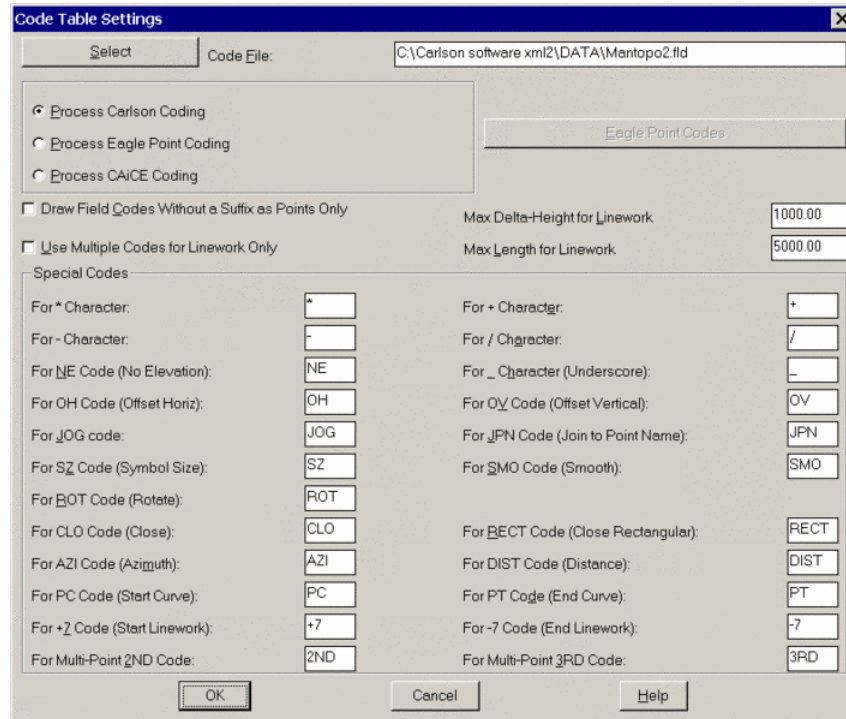
Select the points and breaklines lines to Triangulate.

Select objects: Do a bottom right to upper left crossing selection by picking just to the left of the small, stockpile contour map, near the bottom of the screen, and then picking the upper left of the screen (capturing all points).

Select objects: **Enter** (for no more)

Contours are drawn, but notice the unacceptable wavy look around the perimeter an area which is meant to be a ditch.

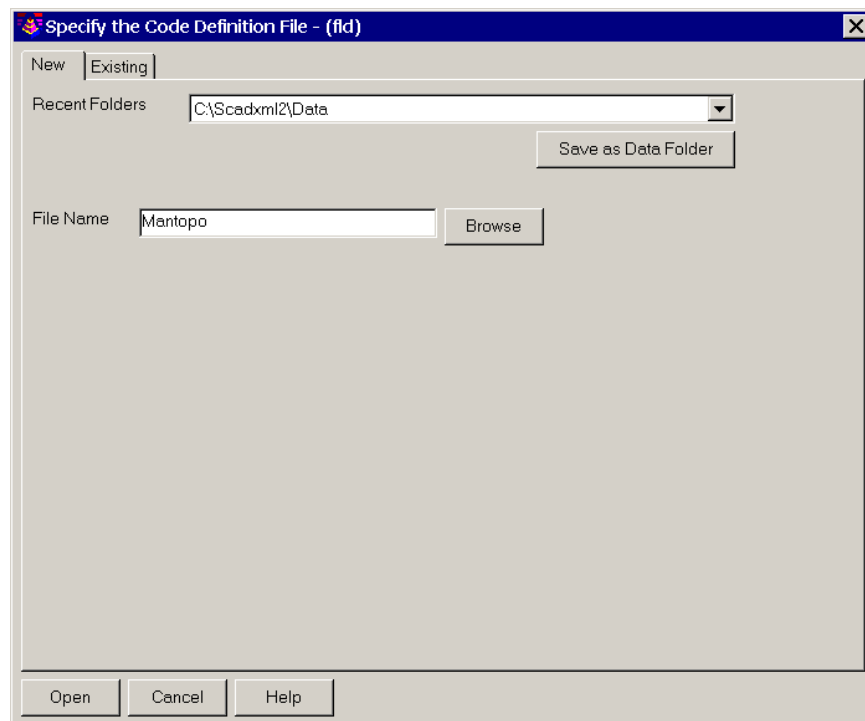




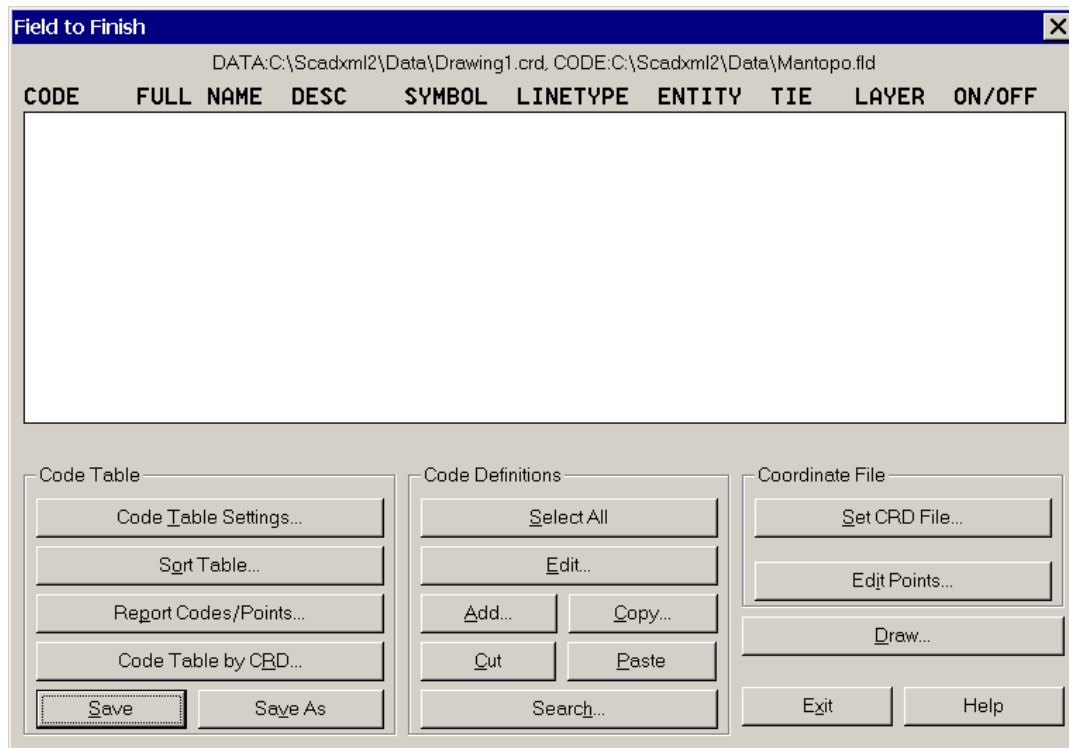
We want to make a new code table, because the coordinate file for the field survey includes special coding (17 and 18) for ditch lines and top of banks.

You can react to whatever a field crew uses, by making a new field-to-finish table that can load up the codes right from whatever descriptions were used in the field.

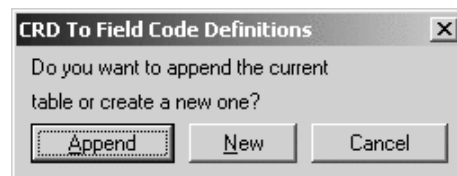
To do this, click Select in the upper left, then choose New (for new file) and you might name it Mantopo, as shown below:



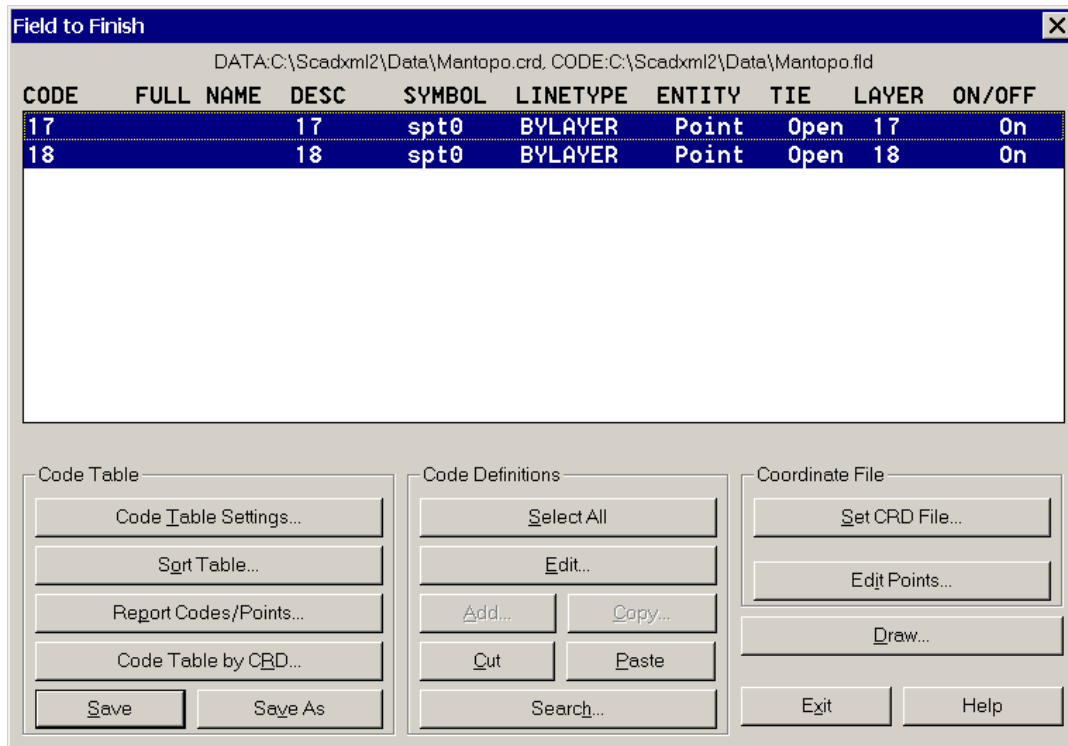
Click Open, then OK at the previous dialog, and you will return to the main Field to Finish table, completely empty, as shown below:



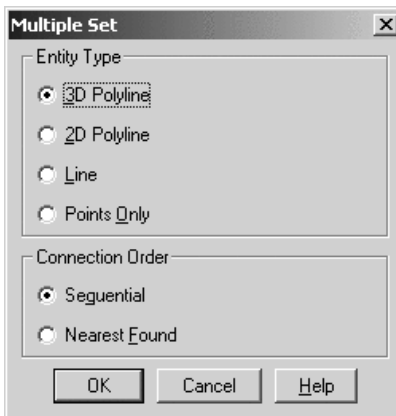
Now, jumpstart the table by choosing the button, Code Table by CRD (located in the lower left of the dialog). Choose Append.



In this Lesson, we only care about code 17 and 18, so highlight all the others (by holding the CTRL key down and picking them), then choose Cut.



Now highlight both 17 and 18, and pick the middle Edit button and then the Entity button. We will turn them both into 3D polylines (which will act as break lines or barrier lines for contouring).



The last steps are to Save the Field-to-Finish (fld) file Mantopo by clicking the Save button. Then click Draw (lower right) to draw the 3D polylines. You will see the following dialog which allows you to control the details of what to draw. Make sure lines is the only entity to be drawn, not points or symbols, and then choose OK.

Range of Point Numbers to Process

Highest point number: 356

Range of Points: Point Group

Entities to Draw

☐ Points ☒ Lines ☐ Symbols

Point Label Settings

☒ Point Numbers

☐ Descriptions

☐ Point Notes

Elev Label Settings

☒ Elevations

☒ Label Zeros

☐ Use Parentheses

☐ Use '+' ☒ Use 'J'

Locate Points on Real Z Axis

☒ On ☐ Off ☐ By Code

Locate Linework on Real Z Axis

☐ On ☐ Off ☒ By Code

PC-PT Curve Type

☒ Bezier ☐ Tangent Arcs

Layer Prefix

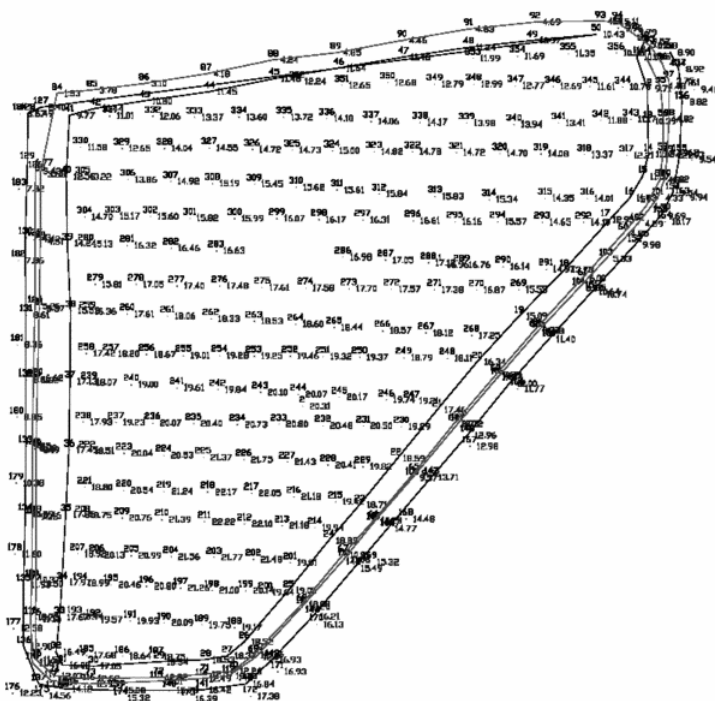
☐ Erase Existing Field to Finish Entities

☐ Pause on Undefined Codes

☐ Preview Only ☐ Auto Zoom Extents

OK Cancel Help

The following drawing is obtained. All the ditch lines and top of bank lines, because they were coded 17 and 18, are drawn in one quick procedure.



5 Because the field crew did not use start and stop logic (e.g. appending 7 or some agreed upon code to a description could end a polyline and start another), some polylines connect that should not. In particular, the line pointed to near the NW corner is clearly crossing the ditch line. It must be removed. Choose the Edit pulldown, then Polyline Utilities, then Remove Polyline Segment.

Break polyline at removal or keep continuous [<Break>/Continuous]? **Enter**

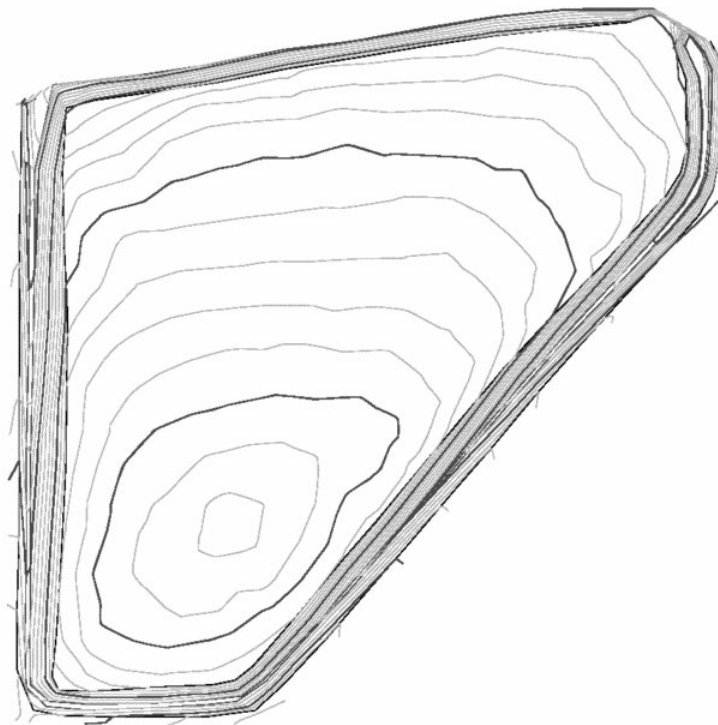
Select polyline segment to remove: **Select the polyline segment** to the right of point 127. You will recognize this as a long segment running from point 127 to point 50.

Select polyline segment to remove: **Enter** (for no more)

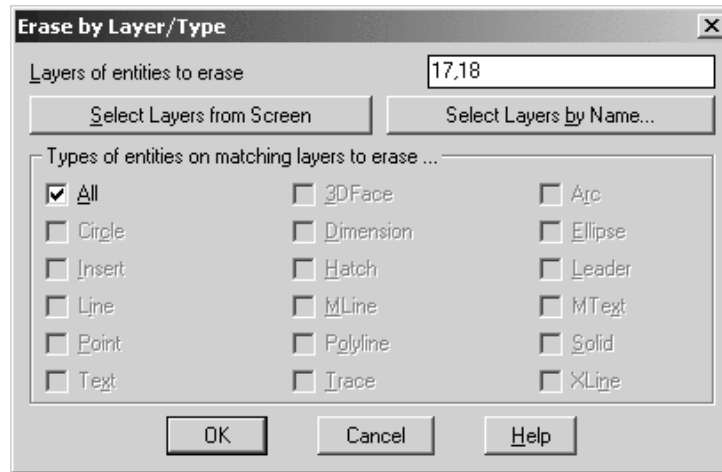
6 Select Triangulate & Contour, under Surface, and set the standard contour interval to 1 (as before), but specify Draw Index Contours. Set the index interval to 5. Then do a right-to-left crossing selection as before (avoiding the stockpile at the lower right).

Now we get excellent contours, with a sharply defined ditch. Under View, do Freeze Layer and pick on a point. The points will freeze.

Here is the improved drawing, helped out by 3D polylines, which, if selected, act as break lines, which were produced by Field-to-Finish.



7 Erase By Layer. Let's say that now you don't want the break lines on there. You don't want to even freeze them, you want to fully delete them. There is a command for that under Edit called Erase By Layer..., go to it. This dialog appears.



If you know the layer names, you can just type them in. If you know where they are but not their names, then click on Select layers from Screen. If you'd recognize the layer name if you saw it in a list, click Select Layers by Name.

8 Explode. Inserted Drawings need to be exploded. Do a View pulldown, option Window and window in on the stockpile at the lower right of the drawing. If you type E to Erase and try to erase any aspect of the stockpile, the whole stockpile will erase-all features. That is because the Stockpile was another drawing inserted into this drawing. Sometimes other drawings that are inserted are referred to as Blocks. In any case, this stockpile block or inserted drawing needs to be exploded. Explode just breaks it up into its unit objects which then start to behave normally. Select Standard Explode under Edit. Then pick the stockpile. It is now a set of normal objects.

It's also worth noting the while the block has been exploded, it still exists in the drawing as a block definition. That means now that's it's exploded it's taking up twice the amount of storage space in the drawing. As such you should purge the drawing of the unused block, or turn on the explode toggle when inserting one drawing into another. As a basic rule, if it's a symbol don't turn on the explode toggle, if it's a complete dialog turn it on.

9 Change Elevations. Let's assume our stockpile drawing is too high and should be lowered in elevations by 540 units. To best see the effect of this command, bring back the points by selecting Thaw Layer under View. Now select the Edit pulldown, then Change, then Elevations.

[A]bsolute or [D]ifferential Change <Absolute>: **D**

Positive number increases, negative number decreases elevation.

Scale/Elevation difference <0.00>: **-540**

Ignore zero elevations [<Yes>/No]? **Enter**

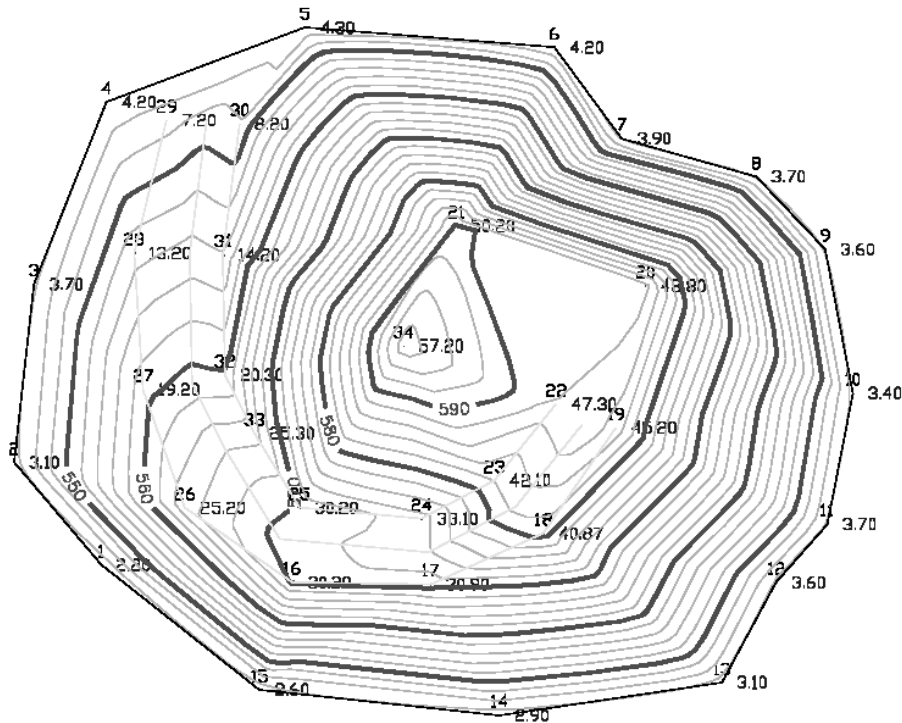
Change Layer for changed entities [Yes/<No>]: **press Enter**

Select Entities for Elevation Change.

Select objects: **Do a lower right pick to upper left pick (automatic crossing) selection.**

Select objects: **Enter** (for no more)

Notice in the drawing below how everything has change elevation, including the points, but with the exception of the contour text.



Do the command List Elevation under the Contour pulldown, pick on an index contour, and notice how the elevation has indeed changed. Repeat step 7 and delete the layer Ctext, so as to remove the 5 index contour elevations, which are no longer accurate.

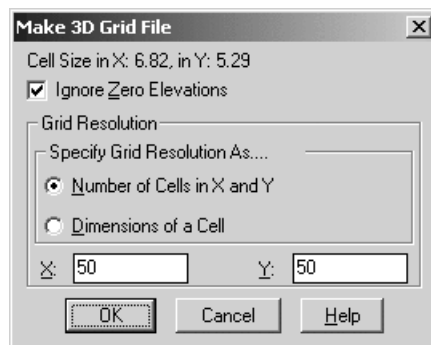
10 Volumes by Layer. One of the signature commands of Carlson Survey, Volumes by Layer will produce accurate volumes without making any files. The only prerequisite is that the existing and final surfaces exist on the drawing in separate, distinct layers. It is also very important to have a drawn inclusion perimeter to pick and define where the volumes are being calculated. In our example, the original ground will be the 3D polyline connecting points 1 through 15, and everything else above will be the final ground (including the 3D perimeter itself).

Select Volumes by Layers under the Surface pulldown menu.

Pick Lower Left limit of surface area: Pick below and to the left of the stockpile, but as close as possible to the stockpile without clipping it in the window. You want to totally include it, but with little wasted margin.

Pick Upper Right limit of surface area: Pick above and to the right of the stockpile.

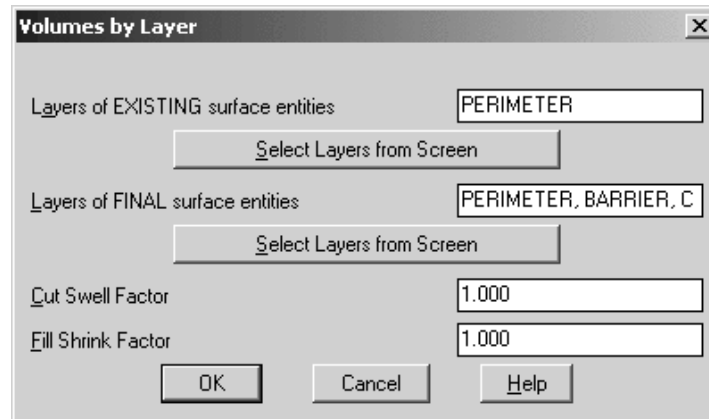
A dialog appears:



We will stick with the defaults, as shown. Notice that we are using 50 grid cells within our window, and since our window was not a perfect square, the cell sizes are not whole numbers (In this example it is 6.82 x 5.29, you my

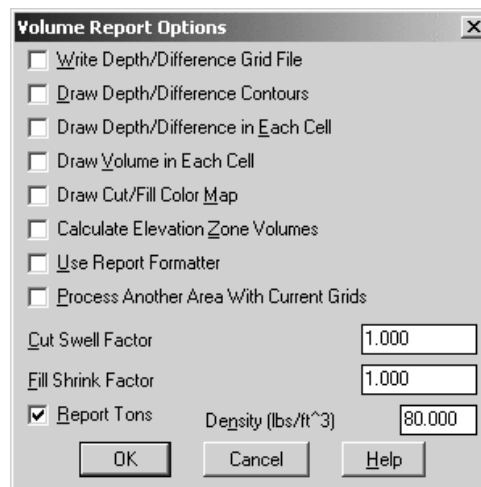
have slightly different sizes). Seeing this, if we wanted 5 x 5 cell size, we could click the Dimensions of a Cell option and set the size to 5 x 5. Hundreds or thousands of cells in both directions will increase calculation time. You can experiment with more cells, or if you prefer, smaller cells (which makes more cells), and see when you get diminishing returns in terms of accuracy changes. After a while, tighter, smaller cell sizes don't add any value to the precision of the calculation. Click Ok.

Then pick the layers that define the existing ground (Perimeter) and the layers that define the final ground (Perimeter, Barrier, Ctr, Ctrindex).



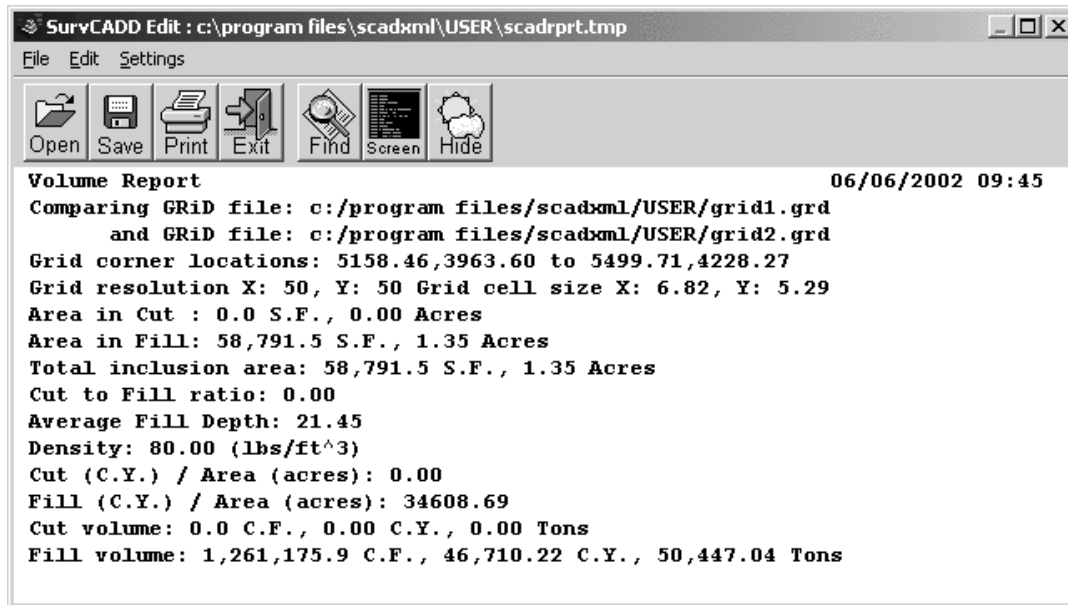
Then click OK. Notice how the Perimeter layer is common to both. If you want to be a master of volumes, remember this as a mantra: The perimeter should be a 3D polyline in a distinct layer, common to both surfaces. A stockpile is just a special case in that sometimes the 3D perimeter is all you know about the base surface.

When asked to Select objects, do a right-to-left (crossing) selection of the entire stockpile area. Lastly, you will be asked for the inclusion perimeter (pick the white/black perimeter polyline) and the exclusion perimeter (none). This leads to a flexible reporting and output dialog:



Elevation Zone Volumes, for example, would produce volumes in any desired increment from the base of the stockpile going up. If the stockpile consists of coal (80 lbs/c.f.), then Report Tons can be clicked on and a Density value entered.

Click OK and the basic report is produced, as seen below. We didn't include the points in the final layer. Since there is a high point, for example, the top of the stockpile, the points would lift the volumes up slightly, to around 46,700 c.y.



Click the Exit icon to return to the command prompt and you are finished.

AutoCAD Overview

3

This chapter explains the essentials of using AutoCAD including command entry, selection sets and layers. Since Carlson Survey is built on the AutoCAD OEM engine, it is helpful to know the AutoCAD basics. Several of the Carlson Survey commands are native AutoCAD commands and many others have an AutoCAD style user-interface.

Issuing Commands

Virtually all commands in Carlson Survey have three or more ways they can be initiated. The two most common are the menu and the toolbar, but the command line can many times be a very easy method of working through commands. Using the menu and toolbar should be second nature to Windows users, so this section will mainly focus on the command line usage in Carlson Survey.

Command Line Prompt-Command:

Carlson Survey has a command line prompt where commands are "issued" and the status of a command is reported. When you select a command from the menu or toolbar, that command name is sent to the command line and is executed. Before most commands can begin, all other commands must be terminated. The exceptions are referred to as transparent commands. The easiest way to see if no commands are running is to look at the command line. If it displays Command: no commands are currently in progress.

Enter

When you are required to press the Enter key in Carlson Survey, you can use the Enter key on the keyboard or you can press the spacebar or click the right mouse button.

Pressing the Enter key will perform different operations depending on your location within Carlson Survey. If you are in the process of running a command, the Enter key will end the command (if there are no available options) or it will select one of the options available (see below). If you are at the command line Command: prompt, pressing the Enter key will repeat the last command.

Right Mouse Button

As mentioned above, the right mouse button can be used as enter. However, you can set the right mouse button to perform different functions. The control for the Right Mouse Button behavior is in the Mouse Click Settings command. When you click the right mouse button, you will get a drop down list of the options and can select the desired one. Move the cursor the desired option and click on it with the left mouse button.

Getting Out of a Command-Esc

For commands that provide no options, the Enter key (or spacebar or right mouse button) will end the command you are using. Also, when a command is issued in Carlson Survey, this action will also automatically end the previous command. However, there are exceptions to these two rules.

To avoid any problems with using the above methods to end a command, you can press the Escape (**Esc**) key. For example, if the command line displays something other than Command: or if a command you want to run does not start because you are using another command, you will want to end the command and return to the command prompt. Using the Escape (Esc) key will accomplish this every time.

Note: Some commands have several optional levels which will require the escape key to be pressed more than once.

If you accidentally select a location on the screen and start a selection window, the command prompt will prompt for another corner. Either select another point on the screen to finish the selection (not advised) or press the **Esc** key to return to the Command: prompt.

Commands Option

When any command is issued, the command line acts as a status bar that will show the available options and "ask" for input from you.

When there are options for the command you are currently running, these options will be shown on the command line with capital letters in the option name. To use one of the options, type the capital letter(s) at the prompt. For example, if you issue the Zoom command, the command prompt will show All/Center/Dynamic/Extents/...<Realtime>: To select the Dynamic option, type **D** at the command line, then press the Enter key. If you do not input an option and just hit enter, you will be selecting the option that appears in the <> brackets. For the example shown, that is the Realtime Zoom option.

Transparent Commands

Several commands in Carlson Survey can be run transparently. This means that they can be performed while another command is running. For example, if you are in a command and are trying to select something in the drawing but it is too small to see, you can use the zoom command transparently. Zoom to the area where the object is, then select the object without ending the initial command. The most commonly used commands are the View commands of Zoom and Pan, and the Properties commands including the Layer dialog box.

To issue a transparent command, type an ' (apostrophe) before the command name. For example, 'Z would be transparent zoom. Note that many commands will automatically be assumed to be transparent if they are issued from the toolbar while another command is running.

When you are in a command that is running transparently, this will be indicated with a >> at the far left of the command line preceding any options or other text. When a transparent command is complete, you will return to the command you were previously running. If you are in a transparent command and want to end the command to get back to the command prompt, you will need to press the **Esc** key twice.

Note: If you select a View command while running another command, the other command will not end. You will be running the View command transparently. This is one of the exceptions to the rules for ending a command. If you do not want to run the View command transparently, you need to complete the other command or end it by pressing the **Esc** key.

General Commands

Enter

When you are required to press the Enter key in Carlson Survey, you can use the Enter key, the spacebar on the keyboard or click on the right mouse button.

Repeating Commands

When you press the Enter key at the command line Command: prompt, you will repeat the last command.

Cancel

The Escape key (**ESC**)key can be used to cancel any command. Some commands may require pressing the Escape key more than once.

Command Options

The command line changes as a command is running. When there are options available for the command you are running, they will display at the command line. To select one of the options, type the capital letter(s) in the name of the option and press the Enter key.

Selection of Items

Most commands in Carlson Survey require the selection of objects. When you need to select objects, the command line will prompt **Select objects:.** When you are at this prompt, your next step will be to create a selection set. While creating the selection set, the prompt **Select Objects:** repeats and you can continue to select objects until you press the Enter key, at which time the command you are using will continue and use the objects selected. If you are selecting object for an Eagle Point Software command, the objects selected will be then used for that command.

Selection Sets

There are several ways to create a selection set from the **Select objects:** prompt. With all selection methods, the number of objects selected will be displayed in the command line along with any objects that were duplicated. Following are the most commonly used methods for creating a selection set:

Single

A single selection is made when you move the object selection target to an object on the screen and click on it. The selected object will highlight and the select objects prompt will return. The cursor changes to a small square when the command line displays **Select objects:.**

Window

A Window will select all objects completely inside of the rectangle drawn. Create a window by selecting a point on the view screen and then moving the cursor right. The window will display as a solid rectangle. You can also create a window by typing **W** at the select object prompt. In this case you can move the cursor to the left to create the window.

Crossing

A crossing will select all objects within the rectangle as well as those touched by the rectangle. If you select a point on the view screen and move the cursor to the left, you are creating a crossing. The crossing will display as a dashed rectangle. You can force a crossing by typing **C** at the select objects prompt, allowing you to move the cursor to the right and create the crossing.

Previous

After you select several objects, they will be temporarily stored as a selection set. Should you want to re-use the same objects that were selected by the last command, you can type **P** at the **Select objects:** prompt.

Remove

If you select incorrect objects, you can type **R** to remove objects from the selection set. When you are in Remove mode, the prompt will be **Remove objects:.** Click on the objects that you do not want to include in your selection. To return to select or add mode, type **A** at the command line.

Grips

Objects may also be selected before issuing the command and receiving the **Select objects:** prompt. This selection will turn on Carlson Survey "grips." Grips appear as small blue squares in the drawing. All objects with grips will be used when a command is issued. Grips are turned on similar to selecting objects as described in the previous section, but with the command line at the **Command:** prompt, not the **Select Objects:** prompt. You can select single objects

by clicking on an object with the standard cursor or you can select multiple objects by clicking in the view where there are no objects, then creating the window (right) or crossing (left). To remove grips, press the **Esc** key twice.

Using Grips

Grips can also be used to edit or change the location of objects in the drawing. Move your cursor to a grip and click. You should notice the cursor "snap" to the grip. The grip will turn from blue to red. The object grip is now attached to the cursor so you can move the object to the desired location and release it by clicking again.

Properties and Layers

Properties define how an object in Carlson Survey is stored. One of the most common properties is the Layer. Layers can be turned off or frozen so the objects on that layer are hidden from the view of the drawing. Layers that are turned off can still be selected while frozen layers are essentially removed from the working set of the drawing. After layers are turned off or on, a redraw (which is done automatically) will update the view. A redraw of a file is a rather quick process. After a frozen layer is thawed, a regeneration may be required to update the view. Regenerations on large files may take a considerable amount of time depending on your hardware.

Layer Dialog Box

The Layer dialog box provides control of the drawing layers. You can turn layers on, off, freeze or thaw them, change the layer color and linetype, set the current layer, add new layers, delete layers, etc. To perform any of these functions, click on the **Layers** button .

In the Layer dialog box, you can highlight several individual layers to perform actions on at once by holding down the Control key and clicking on the desired layers. You can also highlight a continuous range of layers by highlighting one layer, holding down the Shift key, and clicking on another layer. All layers between the two will be selected. To select all of the layers, hold down the CTRL key and press A on the keyboard.

Layer Drop List

To turn layers on/off or freeze/thaw, you can also use the drop list on the toolbars. When you click on the symbols in the list, the layer's status will be changed appropriately.

Setting Current Layer

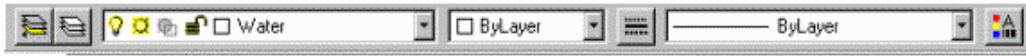
The current layer will be the one shown in the Layer drop list box. You can change the current layer by selecting the desired current layer from the drop list. You can also use the Set Current Layer button and select an object on the layer. The layer the object is on will become the current layer. Finally, you can highlight a layer in the Layer dialog box and click on the **Current** button to make the highlighted layer current.

You cannot freeze the current layer, but you can turn that layer off (not recommended).

Changing Properties

To change the properties of an object in the drawing, use the Properties button on the toolbar or the Change command from the command line. This command will allow you to change the layer an object is on, the color or linetype of the object. The color and linetype can be set to bylayer or to a specific setting. Bylayer means that when the property for a layer is changed, so does the property for the object. For example, the specific setting of an object may be the color blue. No matter what color you set for the layer the object is on, that object will be blue.

Properties Toolbar



If this toolbar (or any toolbar) is not displayed, you can open it using the Toolbars dialog box. Type **toolbars** at the command line.

Layer

The Layer dialog box is used to modify layers properties (color or linetype) or status (on/off, freeze/thaw).

Key-in: **LA** or **ddlmodes**

Toolbar: 

Current Layer

The Current Layer is the layer that you are on and will be working with. The Current Layer is the one shown in the Layer drop list. For example, in the above toolbar illustration, the Current Layer is **Water**.

Toolbar: 

Change

The Change command allows you to modify the properties of an object, such as layer and color.

Key-in: **CH**

Toolbar: 

File Commands

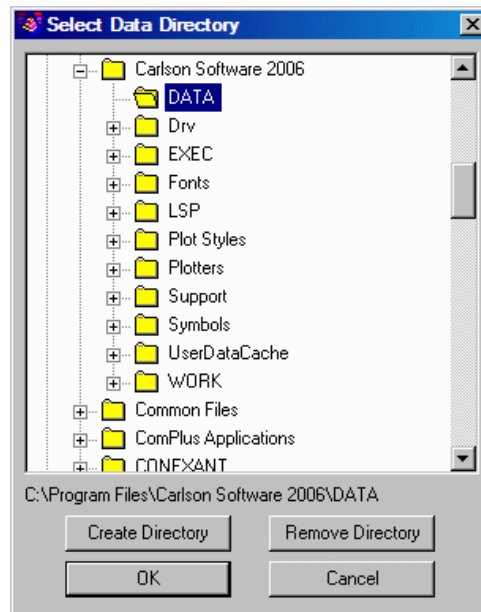
4

This chapter provides information on using the commands from the File menu to organize, save, and plot your drawings.

Set Data Directory

Function

This command sets the data directory to use as the default directory for creating Carlson Survey data files such as coordinate (.CRD) and profile (.PRO) files. The routine shows the tree structure of existing directories available on your computer. The display is set to the current data directory. To set the data directory, highlight the directory name and then click OK. To create a new data directory, first highlight the parent directory to create the new one inside, and then pick the Create Directory button. The program will then prompt you for the new directory name. The Remove Directory button allows you to delete directories that have no files inside.



OK: To set the data directory, highlight the directory name and click OK.

Create Directory: For creating a new data directory.

Remove Directory: For deleting empty directories.

Pulldown Menu Location: File > Project

Keyboard Command: SETTMPDIR

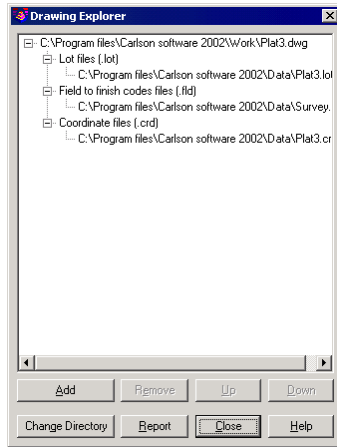
Prerequisite: None

Drawing Explorer

Function

The Drawing Explorer command presents a list of all data files associated with a drawing. Data files, such as a coordinate (.CRD) file, are listed in the order that they were created to help you manage drawing-related data.

The "knowledge" of these files is contained in the .INI file that shares the drawing name (for example, Estates.dwg and Estates.ini). If a drawing was not created in Carlson Survey, or does not have a companion .INI file, then Drawing Explorer will display "No Files." If Configure, General Settings, Save Drawing INI Files is off, then Drawing Explorer will display "No Files." Drawing Explorer will also not list any data files when a drawing name starts with the seven letters "Drawing." A deleted or missing file will appear in Drawing Explorer with a special red "no entry" symbol.



In the Drawing Explorer dialog box, you can modify the data file list.

Add: This option allows you to add a file to the list

Remove: This option allows you to remove a file from the list.

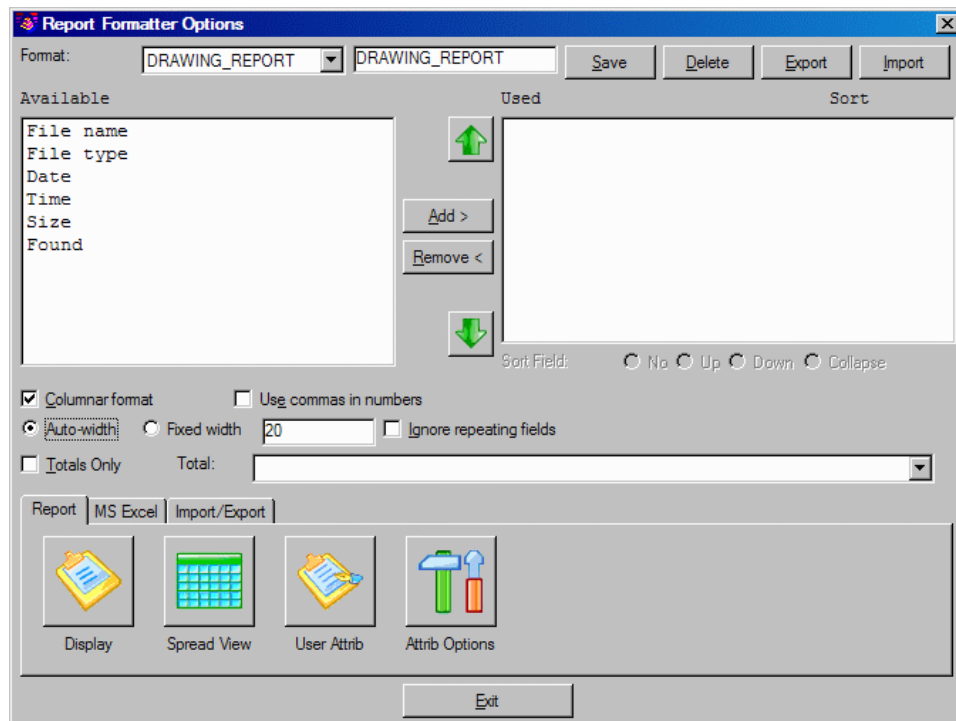
Up: This option allows you to move the position of the file up in the list.

Down: This option allows you to move the position of the file down in the list.

Change Directory: This option allows you to move the file to a different directory.

Report: This option displays the Report Formatting Options for formatting the report of the Drawing Explorer (see below).

In the Report Formatter Options dialog box, you can determine how the report is displayed.



Format: You must choose a format type for the report

The items to be included in the report are listed in the right (Used) display window. You choose the items by selecting them in the left (Available) display window and clicking the Add button. This action moves the item name the right display window. The opposite occurs with the Remove button. The sequence of the reported items can be

changed using the Move Up and Move Down buttons.

You must choose formatting options.

Columnar format: This option formats the report as columns.

Use commas in numbers: This option allows you to include commas in numbers.

Sort field: This option sorts the contents of the selected items.

Auto-width: This option sets the width of the columns automatically.

Fixed-width: This option allows you to designate the width of the columns.

Ignore repeating fields: This option does not include repetitious fields in the report.

Totals only: This option allows you to only report totals for the items in the report.

Total: This option allows you to designate the type of total to be reported.

Under Excel Export Options, you can choose options for exporting data to Excel.

New: You can choose to export to a new Excel file.

Existing: This options allows you to append data to an existing Excel file. You have the option of selecting the file with the Select button. The selected file is displayed in the field.

Sheet: You must designate the sheet of the spreadsheet on which your data will be located.

Start Row: You must designate a starting row for your data.

Col: You must designate a column for your data.

Include Totals: You can include totals in the exported report.

Include Text Lines: You can include text in the exported report.

Export to Excel: This button executes the export.

Under Access Database Export Options, you can choose options for exporting data to Access.

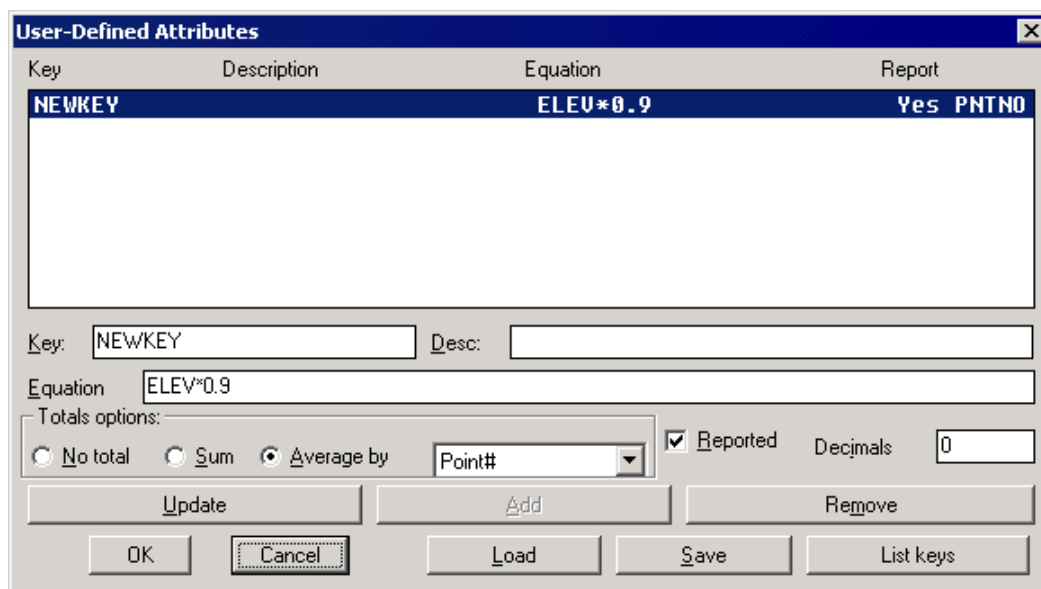
Select: You must select the file to append.

Table: You must designate a Table

Export to MDB: This button executes the export.

You can Display the report, or you can choose the Export to Text/ASCII File option to write the data to an external ASCII file.

If you choose the Edit User Attributes button, the User-Defined Attributes dialog box is displayed.



The dialog box titled "User-Defined Attributes" contains a table with the following data:

Key	Description	Equation	Report
NEWKEY		ELEV*0.9	Yes PNTNO

Below the table, there are input fields for "Key:" (containing "NEWKEY") and "Desc:". The "Equation" field contains "ELEV*0.9".

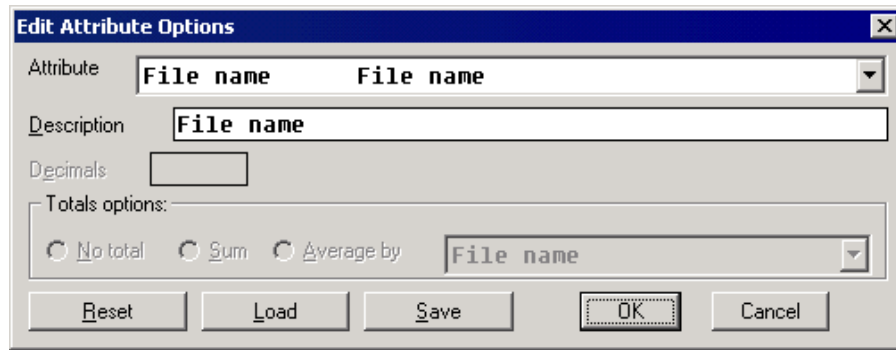
The "Totals options:" section includes radio buttons for "No total", "Sum", and "Average by" (selected). A dropdown menu next to "Average by" shows "Point#". There is a checked checkbox for "Reported" and a "Decimals" field set to "0".

At the bottom, there are buttons for "Update", "Add", "Remove", "OK", "Cancel", "Load", "Save", and "List keys".

This dialog box allows you to edit, add, and remove attributes.

Under Totals Options you can determine totals are calculated for the report.

If you choose the Attr. Options button, the Edit Attribute Options dialog box is displayed.



You can rename attributes and modify their descriptions.

Pulldown Menu Location: File > Project

Keyboard Command: DWGXPLORE

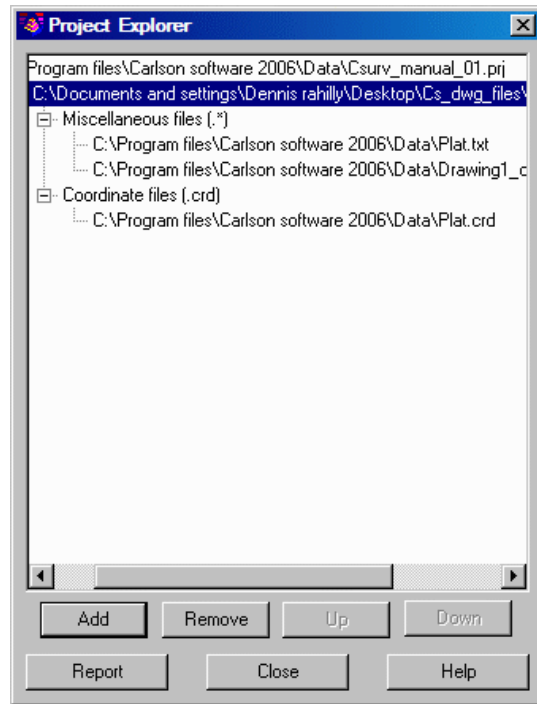
Prerequisite: None

Project Explorer

Function

This tool is used for management of a complete project. A project can contain numerous drawings, and each drawing within that project can contain numerous related files. Think of the Project Explorer as the trunk of the hierarchical tree structure that develops into a project. While you work within each drawing, Carlson Survey keeps track of the files that you create, such as grid files and coordinate files. These are related to the drawing, and you can use the Drawing Explorer to manage them. When a project involves multiple drawings, use the Project Explorer to tie them together.

When you initiate the Project Explorer, you are prompted to select an existing Project File or create a new one. Project files end with the .PRJ file extension. In the Project Explore dialog box, the display window lists the files in the project.



Add: When you choose the Add button, you are prompted to select a drawing file to add to the project. The selected drawing file is added to the project tree along with any files related to the drawing.

Remove: When any branch of the tree structure (except the top root) is selected, it is removed. Keep in mind that removing any node of a tree structure removes all nodes under it.

Up/Down: When you select a branch of the tree structure that can be moved, the Up and Down buttons become available. This allows you to rearrange the items vertically.

Report: This option displays the Report Formatting Options for formatting the report of the Drawing Explorer (see Drawing Explorer).

Pulldown Menu Location: File > Project

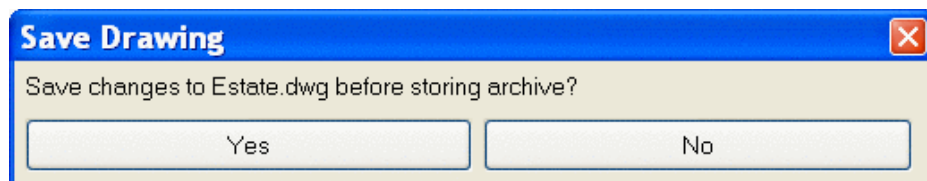
Keyboard Command: PRJXPLORE

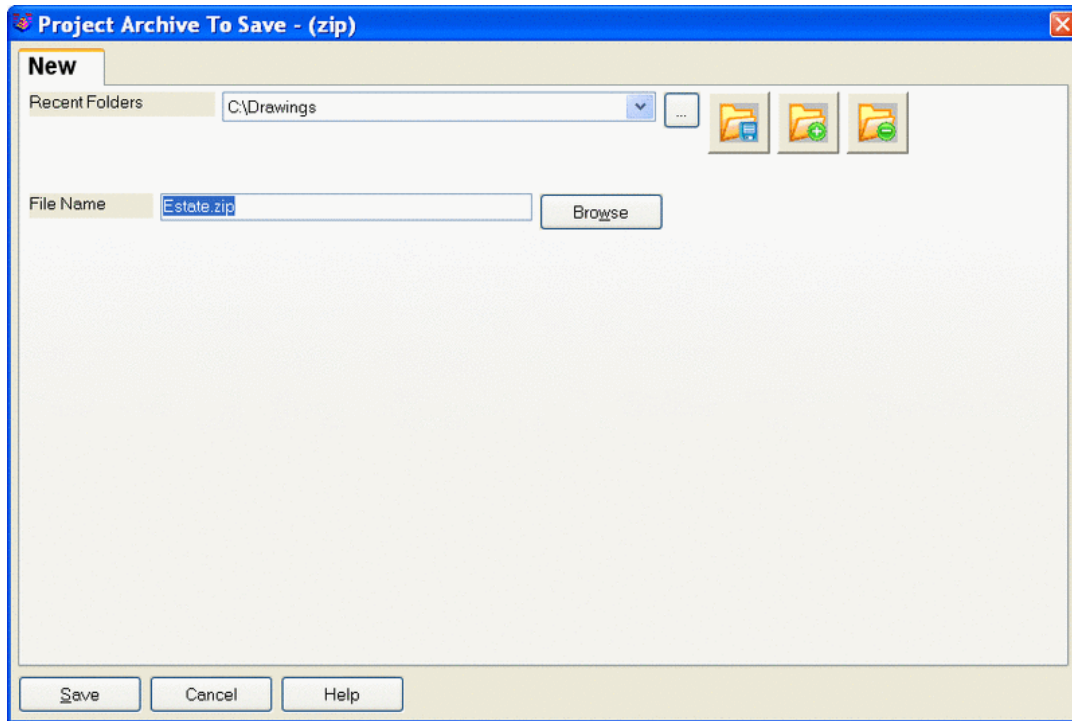
Prerequisite: None

Store Project Archive

Function

This command will zip and archive an entire project. It creates a ZIP of all files contained in the project PRJ file. This file can be sent to someone who can unzip it and use all the same files. If the drawing hasn't been saved recently, the following window appears first.





Pulldown Menu Location: File, Project

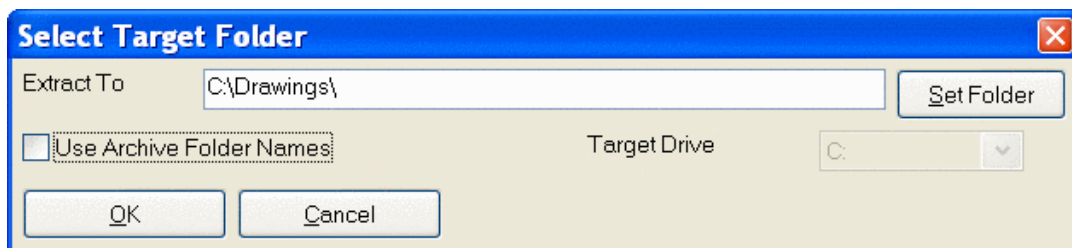
Keyboard Command: zip_project

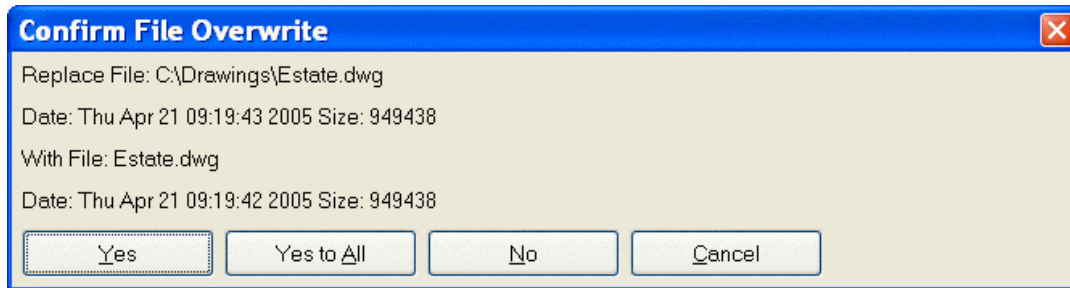
Prerequisite: A project file

Extract Project Archive

Function

This command will unzip an archive file that has been previously created with the command Store Project Archive. It prompts for the directory to unzip to. If any of the files already exist in the folder it is extracting to, there is a window prompting to overwrite the files.





Pulldown Menu Location: File, Project

Keyboard Command: unzip_project

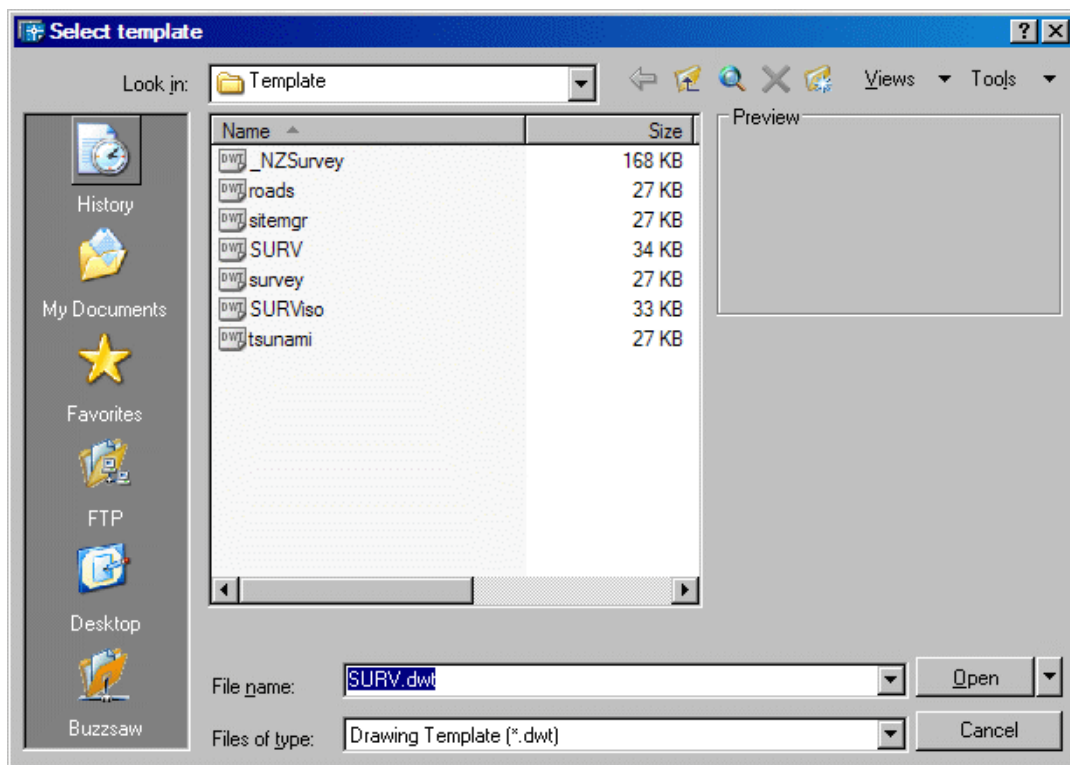
Prerequisite: A project file that has been zipped (ZIP)

New

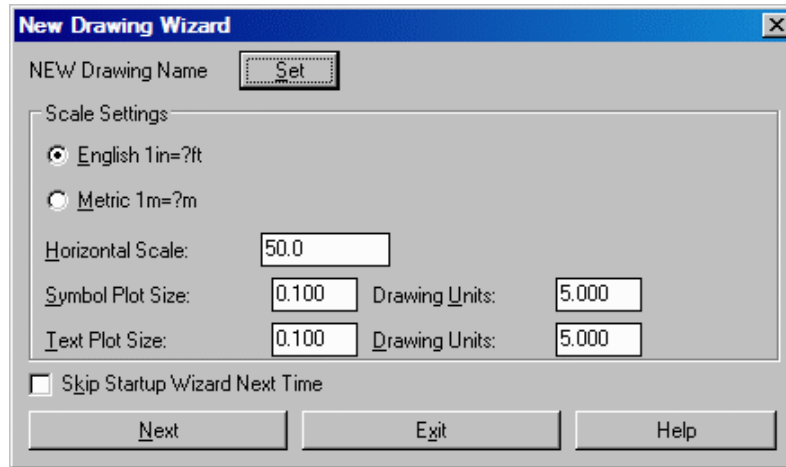
Function

This command allows you to create a new drawing file. This routine defines the settings for a new drawing. You can start a new drawing file by selecting New, and then picking a template file. SURV.DWT is the default template file for use in Carlson Survey. After choosing the template, click the Open button at the lower-right. Next, you will either see the New Drawing Wizard dialog box or you will be taken to a blank screen. Should you use the wizard, a new drawing name will need to be chosen in order to get to the next step.

There are two methods that you can use to create a new drawing. One is this New command. The other is Open, also under the File pulldown menu. If you need to open an existing drawing, use the OPEN command, under File, then choose an existing file name.



The opening dialog, Select Template, lists all template files that currently exist in the drawing template file location. Choose a file to use as a starting point for your new drawing. A preview image of the selected file is displayed to the right. If the wizard is in use, the following options will be available to you in the New Drawing Wizard dialog. The New command starts a new drawing using default settings defined in either the surv.dwt or surviso.dwt template, depending on the measurement system you've chosen. You cannot modify the surv.dwt or surviso.dwt templates. To start a new drawing based on a customized template, see Use a Template.



English: This option starts a new drawing based on the Imperial measurement system. The drawing is based on the surv.dwt template, and the default drawing boundary (the drawing limits) is 12 × 9 inches.

Metric: This option starts a new drawing based on the metric measurement system. The drawing is based on the surviso.dwt template, and the default drawing boundary (the drawing limits) is 429 × 297 millimeters.

The New command creates a new drawing using the settings defined in a template drawing you select. Template drawings store all the settings for a drawing and may also include predefined layers, dimension styles, and views. Template drawings are distinguished from other drawing files by the .DWT file extension. They are normally kept in the template directory. Several template drawings are included with Carlson Survey. You can make additional template drawings by changing the extensions of drawing file names to .DWT.

Pulldown Menu Location: File

Keyboard Command: NEW

Prerequisite: None

Open

Function

This command allows you to open an existing drawing file. Carlson Survey displays the Select File dialog box (a standard file selection dialog box). Select a file and click Open.

Pulldown Menu Location: File

Keyboard Command: OPEN

Prerequisite: None

Close

Function

This command allows you to close the current drawing. Carlson Survey closes the current drawing if there have been no changes since the drawing was last saved. If you have modified the drawing, the program prompts you to save or discard the changes. You can close a file that has been opened in read-only mode if you have made no changes, or if you are willing to discard changes. To save changes to a read-only file, you must use the SAVEAS command.

Pulldown Menu Location: File

Keyboard Command: close

Prerequisite: None

Save

Function

If the drawing is named, Carlson Survey saves the drawing without requesting a file name. If the drawing is unnamed, the program displays the Save Drawing As dialog box (see SAVEAS), and saves the drawing with the file name you specify. If the drawing is read-only, use the SAVEAS command to save the changed file under a different name.

Pulldown Menu Location: File

Keyboard Command: SAVE or QSAVE

Prerequisite: None

Save As

Function

This command allows you to save an unnamed drawing with a file name or renames the current drawing. Carlson Survey displays the Save Drawing As standard file selection dialog box. Enter a file name and type. You can select any of the following file types:

- Carlson Software 2004/AutoCAD 2004 (*.DWG)
- AutoCAD 2000/LT2000 Drawing (*.DWG)
- Carlson Software Drawing Template (*.DWT)
- Carlson Software 2004 DXF (*.DXF)
- AutoCAD 2000/LT2000 DXF (*.DXF)
- AutoCAD R12/LT2 DXF (*.DXF)

Carlson Survey saves the file under the specified file name. If the drawing is already named, the program saves the drawing to the new file name. If you save the file as a drawing template, the program displays the Template Description dialog box, where you can provide a description for the template and set the units of measurement.

Saving a drawing in AutoCAD 2000/LT2000 format is subject to the following limitations:

- Hyperlinks are converted to AutoCAD 2000 attached URLs.
- Database links and freestanding labels are converted to AutoCAD 2000 links and displayable attributes.
- Database attached labels are converted to MText and leader objects, and their link information is not available. Attached labels are restored if you open the drawing in AutoCAD 2000 or later.
- Lineweight information is not available. Lineweights are restored if you open the drawing in AutoCAD 2000 or later.

Saving a drawing in Release 12/LT2 DXF format is subject to the following limitations:

- Lightweight polylines and hatch patterns are converted to R12 polylines and hatch patterns.

- All solids, bodies, regions, ellipses, leaders, multilines, rays, tolerances, and xlines are converted to lines, arcs, and circles as appropriate.
- Groups, complex linetypes, OLE objects, and preview images are not displayed.
- Many objects are lost if you save a drawing as Release 12 and open it later in AutoCAD 2000 or later.

Pulldown Menu Location: File

Keyboard Command: SAVEAS

Prerequisite: None

Page Setup

Function

This command allows you to configure your drawing for plotting. The Page Setup dialog box has the same options as the Plot dialog box. See the PLOT command below for a detailed description of options.

Pulldown Menu Location: File

Keyboard Command: PAGESETUP

Prerequisite: None

Plot Preview

Function

This option displays the drawing as it will appear when plotted on paper. To exit the print preview, right-click and choose Exit. This command is the same as the Full Preview option under Plot.

Pulldown Menu Location: File

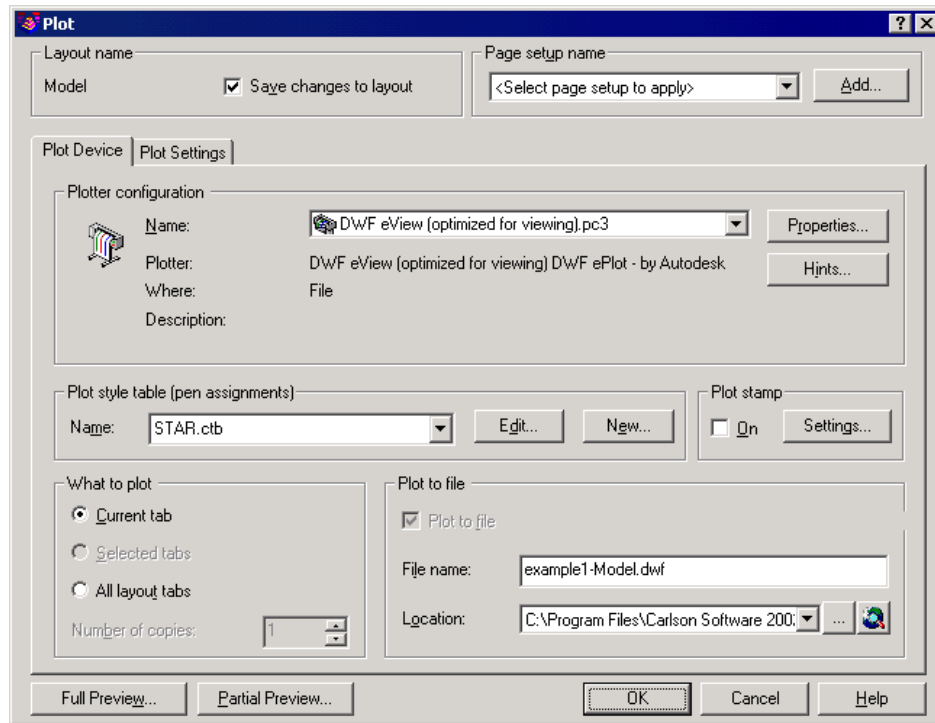
Keyboard Command: PREVIEW

Prerequisite: An assigned plotter

Plot

Function

This command allows you to plot a drawing to a plotting device or file. Carlson Survey displays the Plot dialog box. Choose OK to begin plotting with the current settings and display the Plot Progress dialog box. The Plot dialog box includes the tabs Plot Device and Plot Settings, and several options to customize the plot.



Layout Name: Displays the current layout name or displays "Selected layouts" if multiple tabs are selected. If the Model tab is current when you choose Plot, the Layout Name shows "Model."

Save Changes to Layout: Saves the changes you make in the Plot dialog box in the layout. This option is unavailable if multiple layouts are selected.

Page Setup Name: Displays a list of any named and saved page setups. You can choose to base the current page setup on a named page setup, or you can add a new named page setup by choosing Add.

Add: Displays the User Defined Page Setups dialog box. You can create, delete, or rename named page setups.

Under the Plot Device Tab you can specify the plotter to use, a plot style table, the layout or layouts to plot, and information about plotting to a file.

Plotter Configuration: This field displays the currently configured plotting device, the port to which it's connected or its network location, and any additional user-defined comments about the plotter. A list of the available system printers and PC3 file names is displayed in the Name list. An icon is displayed in front of the plotting device name to identify it as a PC3 file name or a system printer.

Properties: Displays the Plotter Configuration Editor (PC3 Editor), where you can modify or view the current plotter configuration, ports, device, and media settings.

Hints: Displays information about the specific plotting device.

Plot Style Table (Pen Assignments): Sets the plot style table, edits the plot style table, or creates a new plot style table.

Name: Displays the plot style table assigned to the current Model tab or layout tab and a list of the currently available plot style tables. If more than one layout tab is selected and the selected layout tabs have different plot style tables assigned, the list displays "Varies."

Edit: Displays the Plot Style Table Editor, where you can edit the selected plot style table.

New: Displays the Add-a-Plot-Style-Table wizard, which you can use to create a new plot style table.

Plot Stamp: Places a plot stamp on a specified corner of each drawing and/or logs it to a file.

On: Turns on plot stamping.

Settings: Displays the Plot Stamp dialog box, where you can specify the information you want applied to the plot stamp, such as drawing name, date and time, and plot scale.

What to Plot: This field defines the tabs to be plotted.

Current Tab: Plots the current Model or layout tab. If multiple tabs are selected, the tab that shows its viewing area is plotted.

Selected Tabs: Plots multiple preselected Model or layout tabs. To select multiple tabs, hold down CTRL while selecting the tabs. If only one tab is selected, this option is unavailable.

All Layout Tabs: Plots all layout tabs, regardless of which tab is selected.

Number of Copies: Denotes the number of copies that are plotted. If multiple layouts and copies are selected, any layouts that are set to plot to a file or AutoSpool produce a single plot.

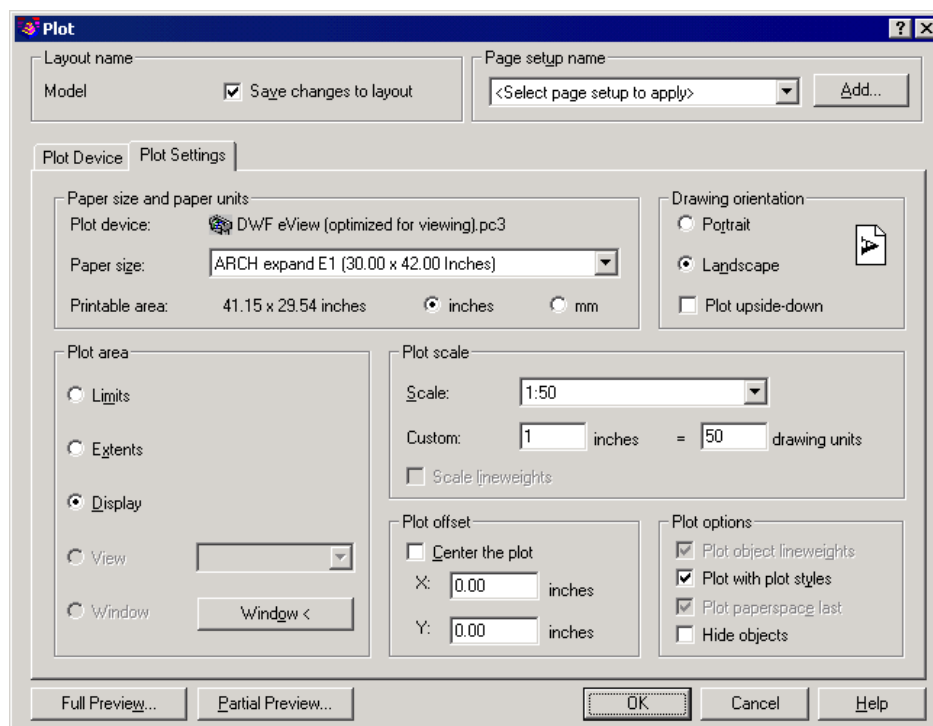
Plot to File: Plots output to a file rather than to the plotter.

File Name: Specifies the plot file name. The default plot file name is the drawing name and the tab name, separated by a hyphen, with a .plt file extension.

Location: Displays the directory location where the plot file is stored. The default location is the directory where the drawing file resides.

[...]: This option displays a standard Browse for Folder dialog box, where you can choose the directory location to store a plot file.

Under the Plot Settings Tab you specify paper size, orientation, plot area and scale, offset and other options.



Paper Size and Paper Units: This field displays standard paper sizes available for the selected plotting device. Actual paper sizes are indicated by the width (X axis direction) and height (Y axis direction). If no plotter is selected, the full standard paper size list is displayed and available for selection. A default paper size is set for the plotting device when you create a PC3 file with the Add-a-Plotter wizard. The paper size you select is saved with a layout and overrides the PC3 file settings. If you are plotting a raster image, such as a BMP or TIFF file, the size of the plot is specified in pixels, not in inches or millimeters.

Plot Device: This field displays the name of the currently selected plot device.

Paper Size: This field displays a list of the available paper sizes.

Printable Area: This field displays the actual area on the paper that is used for the plot based on the current paper size.

Inches: This option allows you to specify inches for the plotting units.

MM: This option allows you to specify millimeters for the plotting units.

Drawing Orientation: Specifies the orientation of the drawing on the paper for plotters that support landscape or portrait orientation. You can change the drawing orientation to achieve a 0-, 90-, 180-, or 270-degree plot rotation by selecting Portrait, Landscape, or Plot Upside-Down. The paper icon represents the media orientation of the selected paper. The letter icon represents the orientation of the drawing on the page.

Portrait: Orients and plots the drawing so that the short edge of the paper represents the top of the page.

Landscape: Orients and plots the drawing so that the long edge of the paper represents the top of the page.

Plot Upside-Down: Orients and plots the drawing upside down.

Plot Area: This option specifies the portion of the drawing to be plotted.

Layout: Plots everything within the margins of the specified paper size, with the origin calculated from 0,0 in the layout. Available only when a layout is selected. If you choose to turn off the paper image and layout background on the Display tab of the Options dialog box, the Layouts selection becomes Limits.

Limits: Plots the entire drawing area defined by the drawing limits. If the current viewport does not display a plan view, this option has the same effect as the Extents option. Available only when the Model tab is selected.

Extents: Plots the portion of the current space of the drawing that contains objects. All geometry in the current space is plotted. Carlson Survey may regenerate the drawing to recalculate the extents before plotting.

Display: Plots the view in the current viewport in the selected Model tab or the current paper space view in the layout.

View: Plots a previously saved view. You can select a named view from the list provided. If there are no saved views in the drawing, this option is unavailable.

Window: Plots any portion of the drawing you specify. If you select Window, the Window button becomes available. Choose the Window button to use the pointing device to specify the two corners of the area to be plotted or enter coordinate values.

Plot Scale: Controls the plot area. The default scale setting is 1:1 when plotting a layout. The default setting is Scaled to Fit when plotting a Model tab. When you select a standard scale, the scale is displayed in Custom.

Scale: Defines the exact scale for the plot. The four most recently used standard scales are displayed at the top of the list.

Custom: Creates a custom scale. You can create a custom scale by entering the number of inches or millimeters equal to the number of drawing units.

Scale Lineweights: Scales lineweights in proportion to the plot scale. Lineweights normally specify the linewidth of printed objects and are plotted with the linewidth size regardless of the plot scale.

Plot Offset: This field specifies an offset of the plotting area from the lower-left corner of the paper. In a layout, the lower-left corner of a specified plot area is positioned at the lower-left margin of the paper. You can offset the origin by entering a positive or negative value. The plotter unit values are in inches or millimeters on the paper.

Center the Plot: Automatically calculates the X and Y offset values to center the plot on the paper.

X: This field specifies the plot origin in the X direction.

Y: This field specifies the plot origin in the Y direction.

Plot Options: This field specifies options for lineweights, plot styles, and the current plot style table. You can select whether lineweights are plotted. By selecting Plot with Plot Styles, you plot using the object plot styles that are assigned to the geometry, as defined by the plot style table.

Plot object lineweights: This option plots lineweights.

Plot with Plot Styles: Plots using the plot styles applied to objects and defined in the plot style table. All style definitions with different property characteristics are stored in the plot style tables and can be easily attached to the geometry. This setting can replace pen mapping in earlier versions of AutoCAD.

Plot Paperspace Last: Plots model space geometry first. Paper space geometry is usually plotted before model space geometry.

Hide Objects: Plots layouts with hidden lines removed for objects in the layout environment (paper space). Hidden line removal for model space objects in viewports is controlled by the Viewports Hide property in the Object Property Manager. This is displayed in the plot preview, but not in the layout.

Full Preview: Displays the drawing as it will appear when plotted on paper. To exit the print preview, right-click and choose Exit.

Partial Preview: Quickly shows an accurate representation of the effective plot area relative to the paper size and printable area. Partial preview also gives advance notice of any warnings that you might encounter when plotting. The final location of the plot depends on the plotter. Changes that modify the effective plot area include those made to the plot origin, which you define under Plot Offset on the Plot Settings tab. If you offset the origin so much that the effective area extends outside the preview area, the program displays a warning.

Pulldown Menu Location: File

Keyboard Command: PLOT

Prerequisite: None

Import/Export LandXML Files

Function

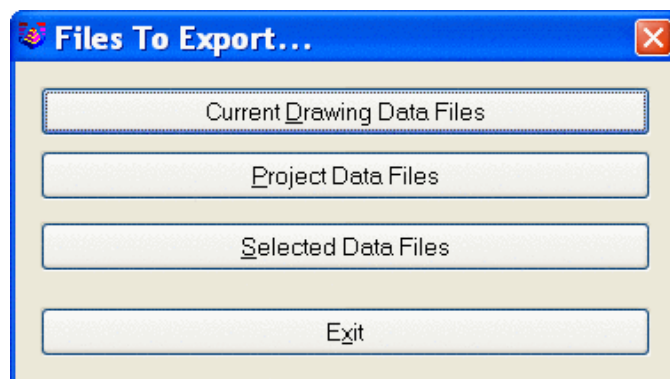
This command performs two functions: Export Carlson Survey files to LandXML and Import LandXML files into Carlson Survey. This command supports version 1.0 of LandXML and the following Carlson Survey file types: Coordinate (.CRD) files, Centerline (.CL) files, Profile (.PRO) files, Section (.SCT) files, Grid (.GRD) files, Triangulation (.FLT) files, and Lot (.LOT) files.



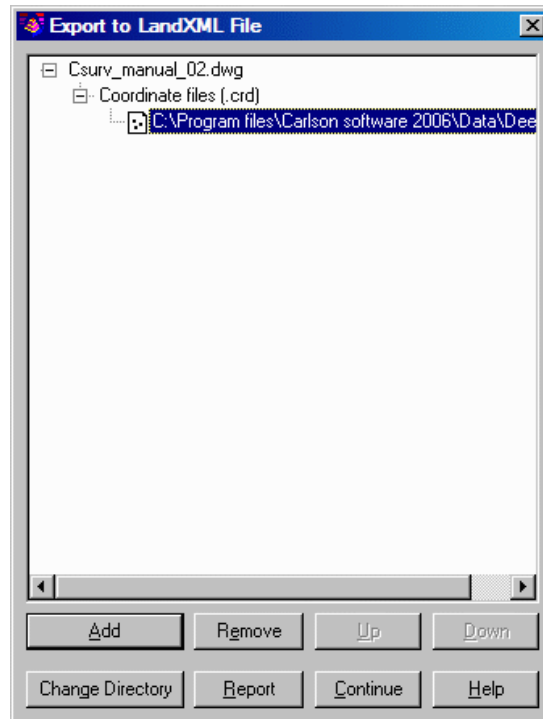
Export to LandXML: Allows you to export a Carlson Survey file to LandXML. Choose a new or existing LandXML file, then choose an existing Carlson Survey file.

Import to Carlson: Allows you to import a LandXML file into Carlson Survey. First, choose a new or existing Carlson Survey file, then choose an existing LandXML file.

You first see the Import/Export LandXML dialog. To Export, for example, first click Export to LandXML. Then click Current Drawing Data Files button. You will then see the Select LandXML File dialog box. Select an existing .XML file to be exported from the list of files on the right and click Open.



The next dialog appears, showing the new buttons to be used for the Export. Choose the Add, Remove, Change Directory and/or Report buttons, and then Continue.



Choosing the Continue button takes you further into the Export process. The Report button will give you the Report Formatter Options dialog box.

Data protection is turned on by default, meaning that if you are importing/exporting to an existing file, you will be prompted before the program overwrites existing data. There is a Point Protection option that will not allow any points to be overwritten if the same number appears more than once in the XML file being imported. If you decide to Import From LandXML, go back to the opening dialog and choose the existing LandXML file.

Pulldown Menu Location: File

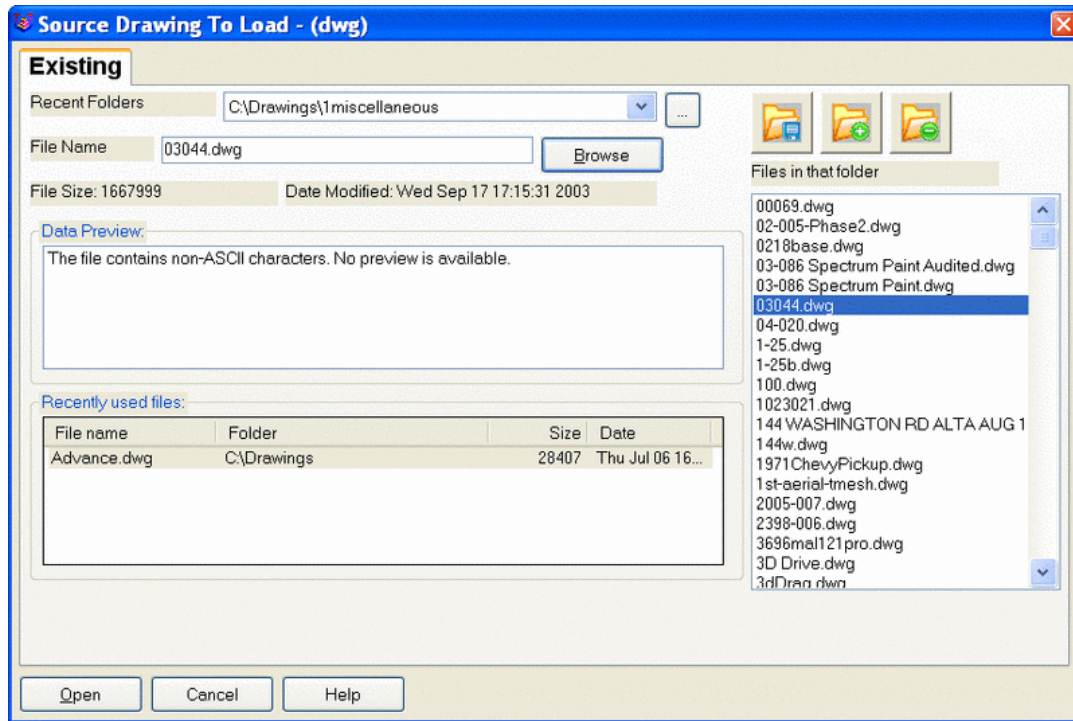
Keyboard Command: imp_exp

Prerequisite: Files to convert

Export Drawing to AutoCAD 14

Function

This command will save an existing Carlson Survey drawing to AutoCAD R14 format.

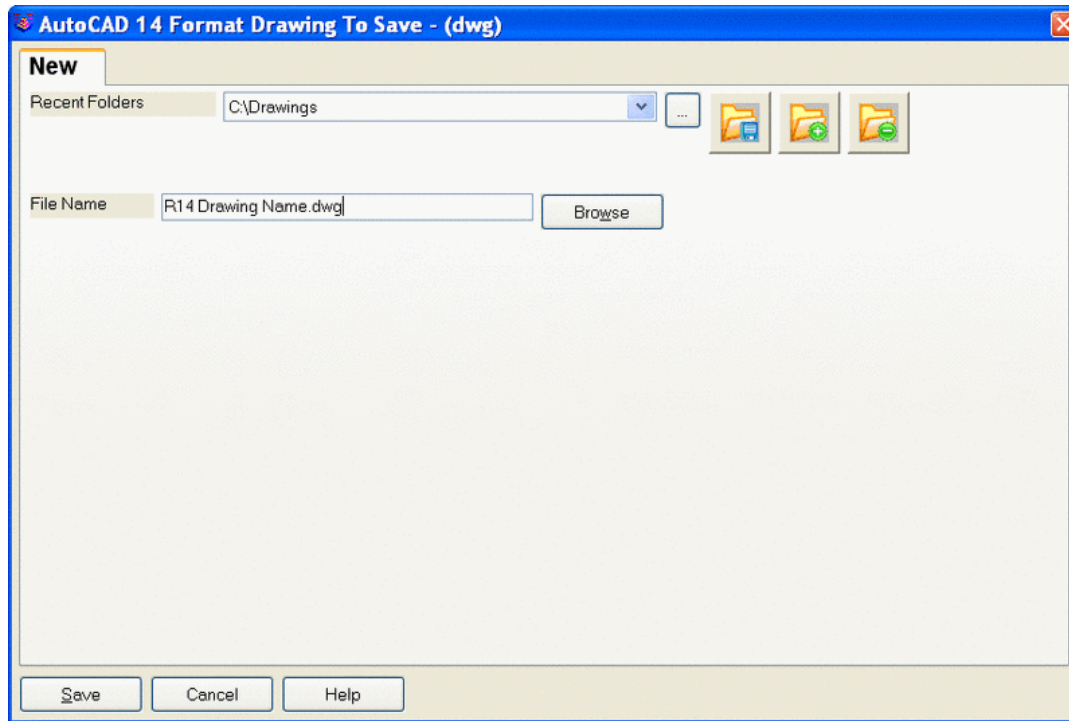


Prompts

Source Drawing To Load dialog select a .DWG file

AutoCAD R14 Format Drawing To Save dialog select name for a new .DWG file

Files saves to R14.



Pulldown Menu Location: File

Keyboard Command: dwg2r14

Prerequisite: An existing .DWG file

Write Polyline File

Function

This command creates a polyline file that contains the point data of the select polylines. The objects supported by this tool include polylines, arcs and lines. If you want to include text, you must use the *Text Explode To Polylines* command found in the Edit menu to convert the text to polylines before running this command. This polyline file is a text file that has three formats. The Carlson format (.PLN) is used by some Carlson Survey commands and by machine control (Carlson Grade, Dozer 2000, GradeStar) for the plan view. Each polyline begins with a line of "POLYLINE, Color number". Then the points for the polyline are listed on separate lines in X,Y,Z format. Here is a list of the available color numbers:

0 = Black	8 = Dark Gray
1 = Blue	9 = Light Blue
2 = Green	10 = Light Green
3 = Cyan	11 = Light Cyan
4 = Red	12 = Light Red
5 = Magenta	13 = Light Magenta
6 = Brown	14 = Yellow
7 = Light Gray	15 = White

The MicroStation format (.txt) can be imported into MicroStation. This format has the coordinates as space delimited

for each polyline point. There is an extra column with a 1 or 0 where 1 specifies the start of a new polyline.

Prompts

Polyline file format [<Carlson>/DTM/MicroStation]? *press Enter for Carlson format*

Specify File to Write dialog *create a new file or append to existing*

Polyline file for Grid File Utilities macro [Yes/<No>]? *press Enter* The option will write a polyline file that can be used with Grid File Utilities for inclusion/exclusion perimeters.

Include Z coordinate in polyline file [Yes/<No>]? *press Enter* This option controls whether the polyline vertices are written in 2D or 3D.

Specify Exclusion/Warning Polylines [Yes/<No>]? *press Enter* This option applies to machine control for warning areas.

Specify WorkZone Polylines [Yes/<No>]? *press Enter* This option applies to machine control for working areas.

Reduce Polyline Vertices [<Yes>/No]? *press Enter* This option applies Reduce Polyline to the polyline vertices before writing the file.

Enter reduce offset cutoff <0.1>: *press Enter*

Decimal places for coordinates <2>: *press Enter*

Select polylines, lines and arcs to write.

Select objects: *pick the entities to process*

Done.

Sample Polyline File:

```
POLYLINE,15
47639.82,74540.11,0.00
47670.49,74565.79,0.00
47701.08,74591.49,0.00
49375.61,76358.47,0.00
50066.86,76846.75,0.00
POLYLINE,15
47633.24,74547.97,0.00
47663.90,74573.65,0.00
etc...
```

Pulldown Menu Location: File

Keyboard Command: polywrite

Prerequisite: Polylines in the drawing

Draw Polyline File

Function

This command draws polylines from the selected polyline file. These polylines are drawn in the current layer. This command supports the following formats: Carlson (.PLN, .VEH, .VH2, .VH3), Arc Generate GIS data (.LF and .LFN), MicroStation (.TXT) and MOSS (.INP, .PRN).

Prompts

Polyline file format [<Carlson>/DTM/MicroStation/MOSS]? *press Enter to accept Carlson*

Polyline File to Read Dialog *select existing .PLN file*

Pulldown Menu Location: File
Keyboard Command: polydraw
Prerequisite: A polyline file

Display-Edit Text/ASCII File

Function

This command allows you to edit or review an ASCII/text file generated by Carlson Survey or by another program. The command prompts for the file name to edit with the File to Edit dialog box, then displays the file in the editor list box. Files are then displayed in the Standard Report Viewer.

To save your changes to the file, select the Save button. The original file is renamed to a .BAK file, and your changes are saved to the file name you originally called into the editor, which is displayed on the top line of the editor. Use the Print button to print the file.

You can search for specific characters in the file by selecting the Find button. Specify the characters to search for in the Find Text edit box.

Pulldown Menu Location: File
Keyboard Command: sedit
Prerequisite: A file to edit

Recover

Function

This command allows you to repair and recover a damaged drawing.

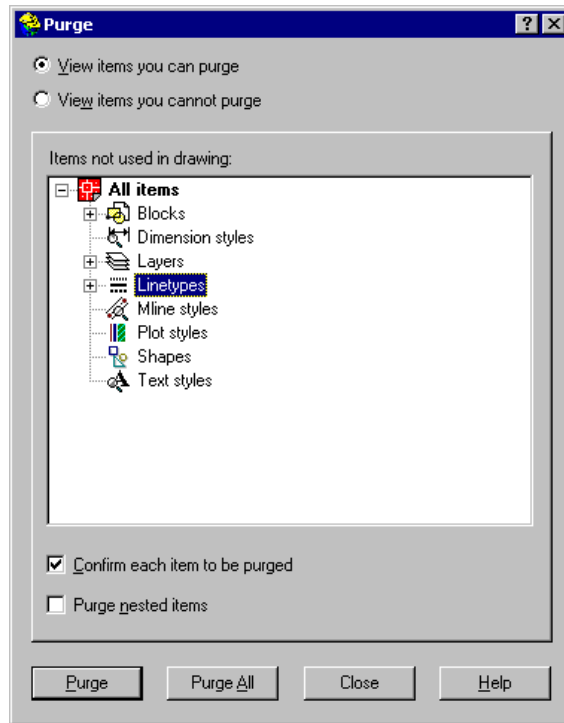
In the Select File dialog box (a standard file selection dialog box), enter the drawing file name or select the damaged drawing file. Carlson Survey begins recovery and displays the results in the text window. If the program determines that a drawing you're opening is damaged based on the drawing's header information, the Open option automatically repairs it. The RECOVER command performs recoveries or audit operations on DWG files only. Performing a recover on a DXF file will only open the file.

Pulldown Menu Location: File
Keyboard Command: RECOVER
Prerequisite: A file to edit.

Purge

Function

This command allows you to remove unused named objects, such as blocks or layers, from the drawing. The Purge dialog box displays a tree view summary of all named objects in the current drawing. The View Items You Can Purge and View Items You Cannot Purge options toggle the dialog box display between objects that can and cannot be purged.



View Items You Can Purge: This option switches the tree view to display a summary of named objects in the current drawing that you can purge.

Items Not Used in Drawing: This viewer displays a tree view of all named object categories (blocks, layers, and so on) in the current drawing. A plus sign appears next to the object category names that you can purge. Clicking the plus sign or double-clicking an object category expands the tree view, displaying all unused named objects that exist for the category. To purge all unused named objects, select All Items in the tree view, and choose Purge All. To purge a specific named object category, select the category in the tree view, and choose Purge.

View Items You Cannot Purge: This option switches the tree view to display a summary of named objects in the current drawing that you can't purge.

Items Currently Used in Drawing: This viewer displays a tree view of all named object categories (blocks, layers, and so on) in the current drawing. A plus sign appears next to the object category names that you can't purge. Clicking the plus sign or double-clicking a named object category expands the tree view, displaying all named objects that can't be purged in the category. When you select individual named objects, the reason why you can't purge the item is displayed below the tree view.

Confirm Each Item to Be Purged: This option displays the Verify Purge dialog box when you purge an item.

Purge Nested Items: Removes all unused named objects from the drawing even if they are contained within, or referenced by, other unused named objects. The Verify Purge dialog box is displayed, and you can cancel or confirm the items to be purged.

Pulldown Menu Location: File

Keyboard Command: PURGE

Prerequisite: None

Remove Reactors

Function

This command removes the reactor links from the selected points, text, polylines and lines. This disables the links for points to the coordinate (.CRD) file, annotation with linework and linework with points. Reactors can be turned off for entities created later by clicking off these three link options in *Configure*.

Prompts

Select entities to remove reactors from:

Select objects: *pick the entities*

Pulldown Menu Location: Misc

Keyboard Command: delreact

Prerequisite: Entities with reactors

Exit

Function

This command allows you to exit Carlson Survey and to quit the program if there have been no changes since the drawing was last saved. If the drawing has been modified, the program displays the Drawing Modification dialog box to prompt you to save or discard the changes before quitting.

You can close a file that has been opened in read-only mode if you have made no modifications, or if you are willing to discard them. To save modifications to a read-only drawing, use the SAVEAS command under the File menu.

Pulldown Menu Location: File

Keyboard Command: QUIT

Prerequisite: None

Edit Commands

5

This chapter provides information on using the commands from the Edit menu to modify and change entities in your drawing.

Undo

Function

This command allows you to reverse the effect of previously issued commands.

Pulldown Menu Location: Edit

Keyboard Command: U

Prerequisite: None

Redo

Function

This command allows you to reverse the effects of the previous UNDO command.

Pulldown Menu Location: Edit

Keyboard Command: REDO

Prerequisite: None

Erase (Select)

Function

This command allows you to remove objects from a drawing by selecting them.

Pulldown Menu Location: Edit > Erase

Keyboard Command: ERASE, E

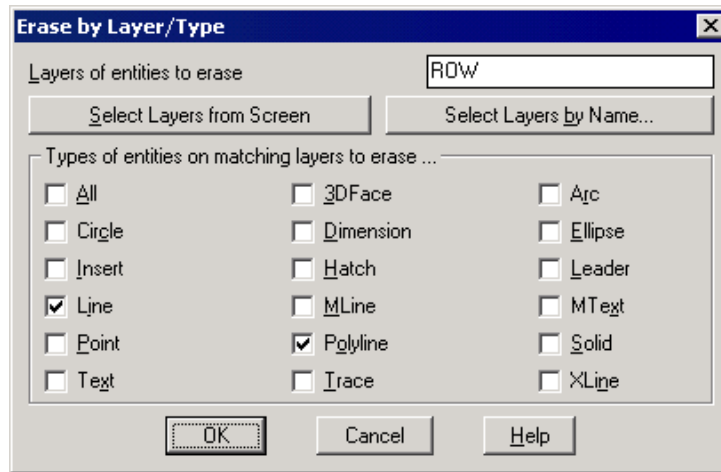
Prerequisite: None

Erase by Layer

Function

This command will ERASE all the entities on the specified layers, but will not delete these layers from the drawing. The command prompts for the layer name to erase and then erases all entities on that layer. In addition to typing in the layer name, you can also specify a layer to delete by picking an entity on that layer. To select layers by picking, first click the Select Layers from Screen button, and then select the entities on the layers to be deleted. The Select Layers by Name button allows you to choose a layer name from a list of layers in the drawing.

You can also specify which types of entities to erase. For instance, if you have both linework and points on the same layer, and you want to erase only the linework, you can click off All and check Line and Polyline.



Pulldown Menu Location: Edit > Erase

Keyboard Command: ldel

Prerequisite: Something to erase

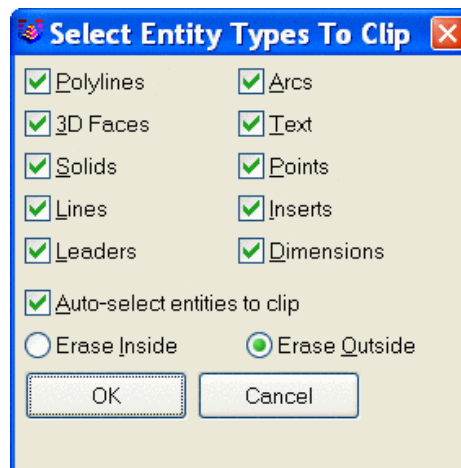
Erase by Closed Polyline

Function

This tool is used to cleanup drawing geometry at the extents of a polyline boundary. It provides options to erase adjacent geometry as well as trim geometry crossing the fence of the polyline.

First select the boundary polyline, only one can be selected. Designate the desired options in the following dialog.

The top section allows you to toggle which object types should be affected by the operation. Note that some objects such as text and inserts cannot be trimmed.



In the middle of the dialog is a toggle that determines whether to prompt for objects to process. If you want to isolate the drawings contents to that of the selected polyline, turn this toggle on. Note that all geometry in the drawing is effected, even that outside of the current viewport. Many users will prefer to turn this toggle off so they will be prompted to manipulate the geometry.

The bottom row allows you to choose whether to erase all the entities on the inside or outside of the polyline.

Pulldown Menu Location: Edit > Erase

Keyboard Command: erasepline

Prerequisite: Entities and a closed polyline

Erase Outside

Function

This command erases all the entities outside of a user specified window. This can be useful if you somehow place entities way outside your drawing limits and want to easily erase them.

Pulldown Menu Location: Edit > Erase

Keyboard Command: eraseout

Prerequisite: Entities to erase

Move

Function

This command allows you to displace objects a specified distance in a specified direction.

Pulldown Menu Location: Edit

Keyboard Command: MOVE, M

Prerequisite: None

Copy

Function

This command duplicates the selected objects. The duplicated objects can be located at a new position by specifying a base and displacement positions.

Prompts

Select objects: *pick the entities to be copied*

Specify base point or displacement: *pick a point*

Specify second point of displacement or <use first point as displacement>: *pick a point*

Pulldown Menu Location: Edit

Keyboard Command: COPY

Prerequisite: Entities to be copied

Standard Explode

Function

This command allows you to break a compound object into its component objects. Results differ depending on the type of compound object you're exploding. The following is a list of objects that can be exploded and the results for each.

All Explodable Objects: Produces object geometry that may look the same, but the color, linetype and lineweight of the object may change.

Block: Removes one grouping level at a time. If a block contains a polyline or a nested block, exploding the block exposes the polyline or nested block object, which must then be exploded to expose its individual objects. Blocks with equal X, Y, and Z scales explode into their component objects. Blocks with unequal X, Y, and Z scales (nonuniformly scaled blocks) might explode into unexpected objects. When nonuniformly scaled blocks contain objects that cannot be exploded, they are collected into an anonymous block (named with a "*E" prefix) and referenced with the nonuniform scaling. If all the objects in such a block cannot be exploded, the selected block reference will not be exploded. Body, 3D Solid, and Region entities in a nonuniformly scaled block cannot be exploded. Exploding a block that contains attributes deletes the attribute values and redisplay the attribute definitions.

2D and Lightweight Polyline: Discards any associated width or tangent information.

Wide Polyline: Places the resulting lines and arcs along the center of the polyline. Carlson Survey discards any associated width or tangent information.

3D Polyline: Explodes into line segments. Any linetype assigned to the 3D polyline is applied to each resulting line segment.

Text Explode to Polylines: Explodes polylines depending on the font used for various annotations, this can make the resulting polylines more efficient in terms of vertex count.

Leaders: Explodes into lines, splines, solids (arrow heads), block inserts (arrow heads, annotation blocks), Mtext, or tolerance objects, depending on the leader.

Mtext: Explodes into text entities

Multiline: Explodes into lines and arcs.

3D Solid: Explodes planar surfaces into regions. Nonplanar surfaces explode into bodies.

Region: Explodes into lines, arcs, or splines.

Body: Explodes into a single-surface body (nonplanar surfaces), regions, or curves.

Polyface Mesh: Explodes one-vertex meshes into a point object. Two-vertex meshes explode into a line. Three-vertex meshes explode into 3D faces.

Circle Within a Nonuniformly Scaled Block: Explodes a circle within a nonuniformly scaled block into ellipses.

Arc Within a Nonuniformly Scaled Block: Explodes an arc within a nonuniformly scaled block into elliptical arcs.

Pulldown Menu Location: Edit > Explode

Keyboard Command: EXPLODE, X

Prerequisite: None

Block Explode

Function

This command retains the values of attributes when a block is exploded. The standard *Explode* command changes the attribute values back to the attribute type. For example, using *Explode*, a Carlson point block would become PNTNO, PNTELEV, PNTDESC. *Block Explode* would keep the point attribute values such as 10, 1000.0, EP. The layer names of the exploded block attributes can be either the insert layer of the parent block or the original attribute layers from the block definition.

Pulldown Menu Location: Edit

Keyboard Command: explode2

Prerequisite: A block to be exploded

Trim

Function

This command allows you to trim objects at a cutting edge defined by other objects.

Prompts

Select cutting edges ...

Select objects: *pick entity*

Select object to trim or shift-select to extend or [Project/Edge/Undo]: *select entity to be trimmed*

Project: You can project the object to be trimmed in order to trim objects that do not intersect.

Edge: You can project the trimming edge in order to trim objects that do not intersect.

Undo: This option allows you to undo the above projections.

Pulldown Menu Location: Edit

Keyboard Command: TRIM, TR

Prerequisite: None

Clipboard

Cut

Function

This command moves the selected objects to the Clipboard, removing them from the drawing. You can paste the contents of the Clipboard into a document or drawing as an embedded OLE object (see Clipboard > Paste). CUT does not create OLE link information.

Pulldown Menu Location: Edit > Clipboard

Keyboard Command: CUTCLIP

Prerequisite: None

Copy

Function

This command copies all objects you select to the Clipboard. You can paste the contents of the Clipboard into a document or drawing as an OLE object. You can also use CTRL+C to run this command. If the cursor is in the drawing area, Carlson Survey copies the selected objects to the Clipboard. If the cursor is on the command line or in the text window, the program copies the selected text to the Clipboard.

Pulldown Menu Location: Edit > Clipboard

Keyboard Command: COPYCLIP

Prerequisite: None

Paste

Function

This command inserts data from the clipboard. If the Clipboard contains a graphic object, Carlson Survey prompts you to specify an insertion point. If the Clipboard contains an OLE text object, the OLE Properties dialog box is displayed when the text object is pasted. If the Clipboard contains ASCII text, the program inserts the text in the upper-left corner of the drawing area using the Mtext defaults. ASCII text becomes an Mtext object. All other objects, except Carlson Survey objects, are inserted as embedded or linked objects. You can edit these embedded or linked objects by double-clicking them in the drawing to open the application in which they were created.

You can also use CTRL+V to run this command. If the cursor is in the drawing area, PASTECLIP behaves as described. If the cursor is on the command line, text from the Clipboard is pasted at the current prompt.

Pulldown Menu Location: Edit > Clipboard

Keyboard Command: PASTECLIP

Prerequisite: None

Paste to Original Coordinates

Function

This command pastes a copied object in to a new drawing using the same coordinates that were used in the original drawing. For example, you can use PASTEORIG to paste an object such as a fire hydrant from a site plan to a plot plan. This command functions only when the Clipboard contains Carlson Survey data from a drawing other than the current drawing.

Pulldown Menu Location: Edit > Clipboard

Keyboard Command: PASTEORIG

Prerequisite: None

Extend To Edge

Function

This command allows you to extend an object to meet another object. You have the option of trimming or projecting objects and edges.

Prompts

Select boundary edges ...

Select objects: *pick entity*

Select object to extend or shift-select to trim or [Project/Edge/Undo]: *pick entity*

Pulldown Menu Location: Edit > Extend

Prerequisite: None

Keyboard Command: EXTEND

Extend to Intersection

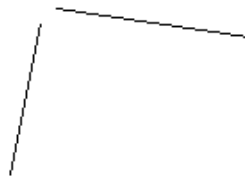
Function

This command extends the end points of two lines and/or polylines at the same time to their intersection point.

Prompts

Select first line or polyline to extend: *pick a line or polyline*

Select second line or polyline to extend: *pick another line or polyline*



Before Extend to Intersection



After Extend to Intersection

Pulldown Menu Location: Edit > Extend

Keyboard Command: extint

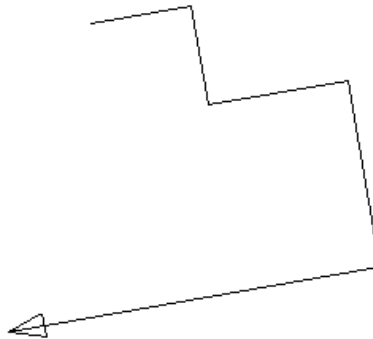
Prerequisite: Two lines or polylines

Extend by Distance

Function

This command extends a line or polyline, or creates new lines or polylines off of an existing one. By specifying a distance, a new segment of the line or polyline can be drawn from the current position. The current position and direction along the line or polyline is indicated by an arrowhead. Extend by Distance starts by selecting an existing line or polyline. Initially, the current position will be the closest vertex to where the line or polyline was selected. Extending from the endpoint of a polyline will add a new point to that polyline, while extending from any other point will create a new polyline.

There are two modes of operation: draw mode (D) and move mode (M). When in draw mode, extending will draw line or polyline segments. In move mode, the current position arrowhead can be moved without drawing segments. The orientation of the current position arrowhead can be changed with the Right, Left, and Angle commands.



The second prompt for this command offers numerous options in the form of key letters. These key letters are listed below along with their full names and actions. The list of the Extend by Distance commands are:

- Number: Distance to draw or extend

A# - Angle change: Rotates pointer by specified number of degrees

A - Align: Rotates pointer to align with segment

B - Bearing: Sets pointer direction by bearing in format: Qdd.mmss with Q- quadrant, d-degrees, m-minutes, s-seconds (e.g. 130.1005 is NE 30 degrees, 10 minutes, and 5 seconds)

C - Close: Closes the polyline

D - Draw Mode: Actions draw or extend the line or polyline

E - Extend to Edge: Extends to intersection with a selected line or polyline

I - Input mode: Toggles distance input between decimal feet and feet-inches

L - Left rotate: Rotates counterclockwise 90 degrees

M - Move Mode: Actions only move the pointer

N - Next: Moves pointer forward to next point

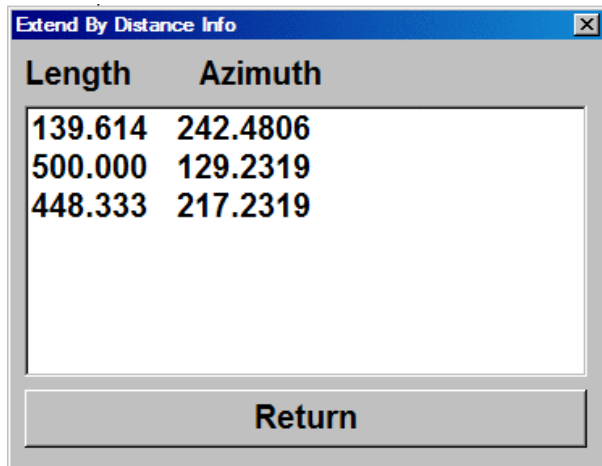
O - Open: Opens the polyline

P - Previous: Moves pointer backward to previous point

R - Right rotate: Rotates clockwise 90 degrees

S - Switch: Reverses pointer direction
T# - Total distance: Sets current segment to specified distance
U - Undo: Undo the last Extend by Distance command
Z - Zoom mode: Toggles auto-zoom between on/off
? - Info: Displays lengths of current polyline

H - Help: The Help option also displays this Extend by Distance Commands list.
Press <Enter>: Ends the routine



Length	Azimuth
139.614	242.4806
500.000	129.2319
448.333	217.2319

Return

The result of using the Info (?) feature

Prompts

Select line or polyline to extend: *select line or polyline near the place to extend*

Enter or pick distance to draw (A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): 50 The line is extended by 50 units.
Use the Pick option to pick a distance.

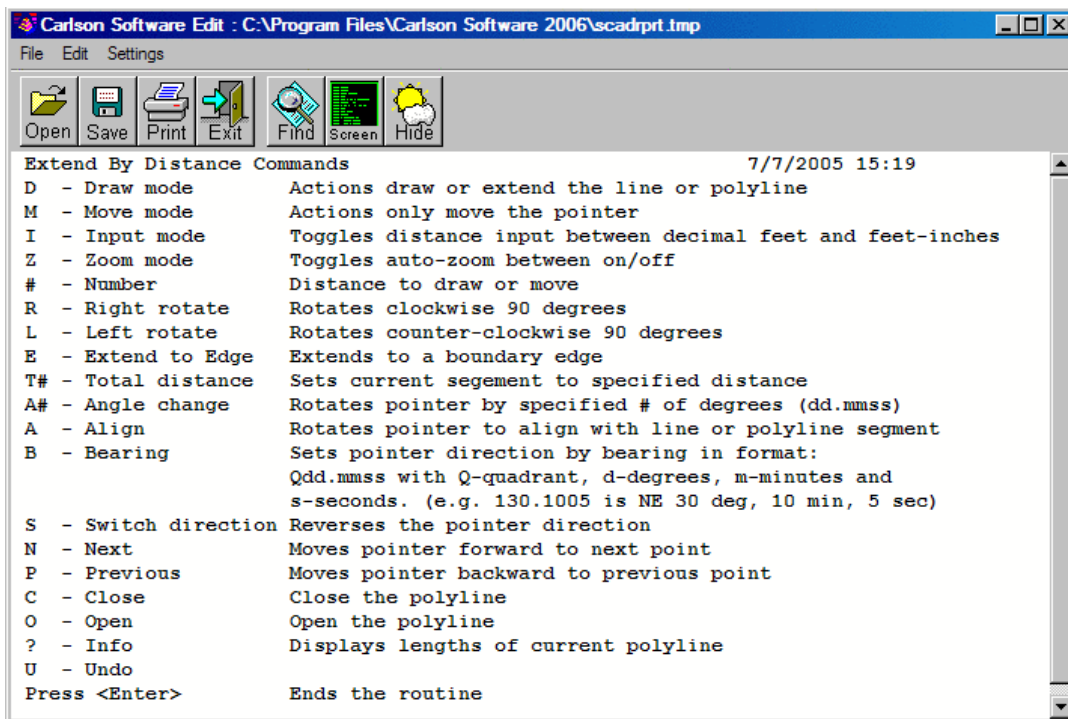
Pick/Horizontal Distance to Extend ([Enter] for new line): R Rotate right 90 degrees.

Enter or pick distance to draw (A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): 50 The line is extended by 50 units.
Use the Pick option to pick a distance.

Enter or pick distance to draw (A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): *press Enter*

Extend another (<Yes>/No)? No

Note: R50 and L10 can be used to go right 50, left 10, etc.



The result of using the Help (H) option

Pulldown Menu Location: Edit > Extend

Keyboard Command: extender

Prerequisite: An existing line or polyline with at least one segment from which to start.

Break by Crossing Polyline

Function

This tool is used to break drawing geometry at the edge of a polyline boundary. It provides options to change the layers of the interior and exterior geometry after it is broken. First, select the boundary polyline. Only one can be selected. Then select the polylines and lines to be clipped. You will be prompted for options on specifying the layers for the newly broken geometry. Respond with a "Y" if you want to specify a new layer, then enter the new layer name. If the layer name does not exist, it will be created.

Prompts

Select the clip edge polyline: *pick a closed polyline*

Select the polylines and lines to be clipped.

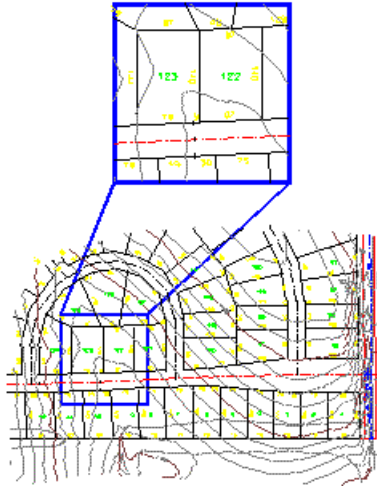
Select Objects: *pick the entities to break*

Specify layer names for inside segments (Yes/<No>)? *Yes*

Enter a layer name for the inside segments <0>: *press Enter*

Specify layer names for outside segments (Yes/<No>)? *Yes*

Enter a layer name for the outside segments <0>: *Final*



Pulldown Menu Location: Edit > Break

Keyboard Command: clipline

Prerequisite: A closed polyline

Break at Intersection

Function

This command will break a line, arc or polyline at the intersection of another line, arc or polyline. In many cases this command is used in conjunction with the *Area by Lines & Arcs* command. Many times, to get the correct area of a figure, it is necessary to break it from adjoining lines.

Prompts

Select Line, Arc, or Polyline to Break

Select object: *select object to break*

[int on] Pick Intersection to break at: *pick intersection point*

Pulldown Menu Location: Edit > Break

Keyboard Command: breakat

Break, Select Object, 2nd Point

Function

This command allows you to break an object. Carlson Survey both selects the object and treats the selection point as the first break point. At the next prompt you can specify a second break point or override the first point.

Prompts

Select object: *select entity to break*

Specify second break point or [First point]: *pick second point*

Pulldown Menu Location: Edit > Break

Keyboard Command: BREAK

Prerequisite: None

Break, Select Object, Two Points

Function

This command allows you to break an object by selecting the object, then two points. First select the object, then Carlson Survey will prompt you to select two points that define where the object will be broken.

Prompts

Select object: *select entity to break*

Specify second break point or [First point]: *First*

Specify first break point: *pick first point*

Specify second break point: *pick second point*

Pulldown Menu Location: Edit > Break

Keyboard Command: BREAK

Prerequisite: None

Break, At Selected Point

Function

This command allows you to break an object by selecting the object. Only one pick is necessary since Carlson Survey both selects the object and treats the selection point as the break point.

Prompts

Select object: *select entity to break*

Specify second break point or [First point]: *@*

Pulldown Menu Location: Edit > Break

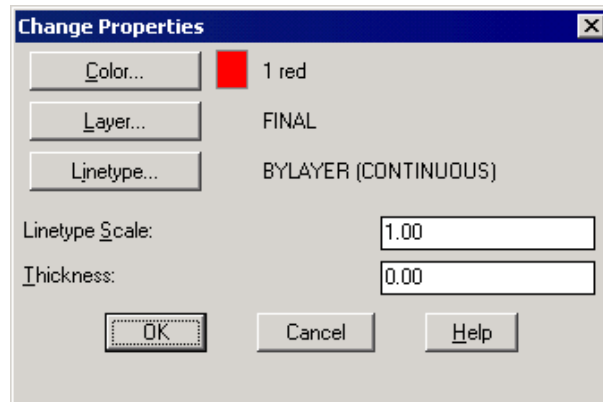
Keyboard Command: BREAK

Prerequisite: None

Change Properties

Function

This command allows you to change certain properties of existing objects. In the Change Properties dialog box, you must choose the properties to modify.



Color: This option allows you to change the color of the object.

Layer: This option allows you to change the layer of the object.

Linetype: This option allows you to change the linetype of the object.

Linetype Scale: This option specifies the linetype scale factor for the new linetype.

Thickness: This option specifies the distance to extrude the object above or below its elevation.

Note: The Properties command allows you to modify entity specific properties such as the radius of a circle or the height of a text entity.

Pulldown Menu Location: Edit > Change

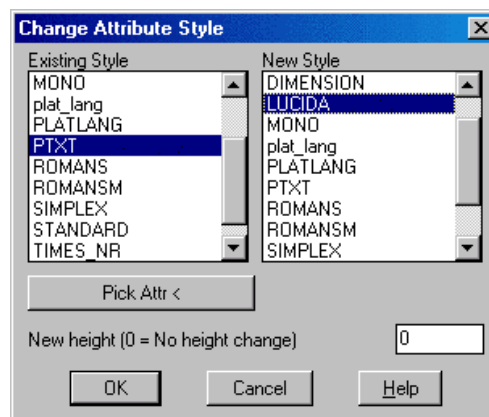
Keyboard Command: DDCHPROP

Prerequisite: None

Change Attribute Style

Function

This command will globally change the text style of attributes on the drawing. This can be very useful if all the label styles (such as the point symbol attribute labels) on a drawing must be changed to accommodate a different plotting specification. The default STYLE used for the point symbol attributes is PTXT.



Existing Style: Select the style that is currently applied to the attributes you want to change.

Pick Attr: Select this button if you are unsure of the existing text style, then pick an existing attribute on the screen. When the dialog returns, the text style applied to that attribute will be selected in the list.

New Style: Select the new style that you want to apply to the attributes.

New Height: Enter a new height for the attributes. An entry of zero (0) will not modify the existing height.

Pulldown Menu Location: Edit > Change

Keyboard Command: chgattr

Prerequisite: You may want to use the *LIST* command to check the current Text size.

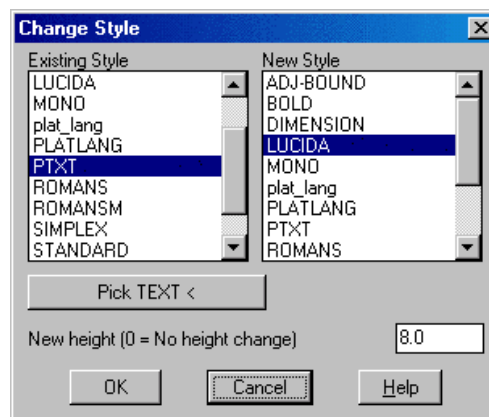
Change Style

Function

This command will globally change the style and height of text on the drawing. This can be very useful if all the text sizes on a drawing must be changed to accommodate a different plotting scale.

Under Existing Style, select the style that is currently applied to the text you want to change. If you are unsure of the existing text style, select the Pick TEXT button, then pick an existing text entity on the screen. When the dialog returns, the text style applied to that text entity will be selected in the list. Select the New Style that you want to apply to the text. Enter a New Height for the text. An entry of zero (0) will not modify the existing height.

If you are going to change the text style, the new style should be created via the Style command before you execute this command.



Pulldown Menu Location: Edit > Change

Keyboard Command: chgstyl

Prerequisite: Text entities

Change Elevations

Function

This command allows you to change the elevation of selected entities. You can move the entity to a specified elevation from its current elevation (absolute) or you can specify a differential change to be added to or subtracted from an entity's current elevation. If Carlson Survey points are selected, their attribute text and Z axis (Elevation) coordinate are changed. Elevation values are not changed in the current coordinate file. You must choose the command *Update CRD File from Drawing* under Coordinate File Utilities on the Points menu to update the elevation values in the current coordinate file.

Prompts

Type of elevation change [<Absolute>/Differential]: press *Enter*

Select/<Enter Elevation <0.0000>: 125

By using the Absolute option, all entities selected are changed to the elevation 125.

Change Layer for changed entities [Yes/<No>]: press *Enter*

Select Entities for Elevation Change.

Select objects: C

First corner: pick a point

Other corner: pick a point

Select objects: press *Enter*

Pulldown Menu Location: Edit > Change

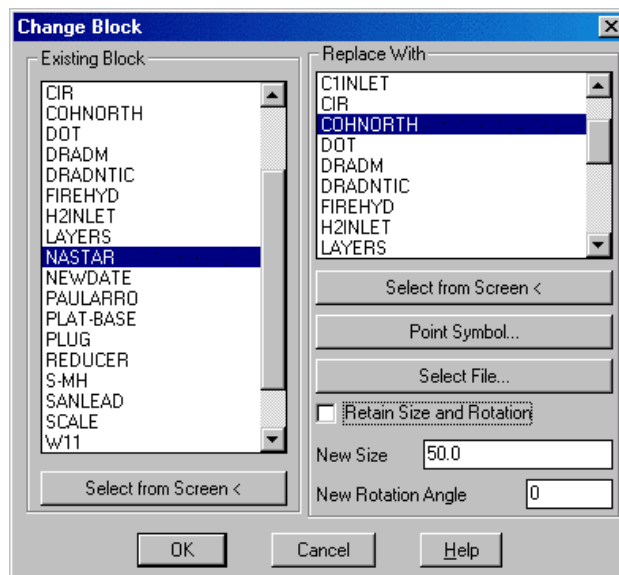
Keyboard Command: chgelev

Prerequisite: an entity with elevation

Change Block/Inserts Substitute

Function

This command is used to replace selected block(s) with a different block. The command optionally can change the size and rotation angle. This command will work with Carlson Survey point symbol blocks or any AutoCAD block. For example, you may receive an AutoCAD drawing from another firm and want to replace certain inserts with inserts of your own specification. In the dialog shown, we are going to replace the block named NASTAR with a block named COHNORTH which will be inserted at a 50 scale and zero rotation.



Existing Block: Select the block name to be replaced. If the block name is unknown, choose the Select from Screen button, then select the block from the current drawing.

Replace With: Select the block that will replace the existing block. You may choose from the list of defined blocks, select an existing block from the current drawing, choose a point symbol from the standard Carlson Survey point library, or select an AutoCAD drawing file.

Retain Size and Rotation: When checked, the new block will retain the size and rotation values from the old block.

New Size: Available if Retain Size and Rotation is not checked. Enter the size for the new block.

New Rotation Angle: Available if Retain Size and Rotation is not checked. Enter the rotation angle for the new block.

Pulldown Menu Location: Edit > Change > Block/Inserts

Keyboard Command: chgbk

Prerequisite: None

Change Block/Inserts Resize

Function

This command allows you to change the size of blocks. This command works with Carlson Survey point symbol blocks, or any AutoCAD block, and can be used when you receive an AutoCAD drawing from another firm and want to change the size of certain blocks to your own specification. For example, if you had inserted the block SPT10 several places in your drawing and decided to change its size (SPT# are the different point symbol inserts included with Carlson Survey) you would follow the prompts below.

Prompts

Scaling Multiplier <0.5>: 2

Select symbols and blocks to scale.

Select objects: *select the blocks you want to change*

The command then searches for any occurrences of the selected block(s) in the selection set and makes them 2 units in size.

Pulldown Menu Location: Edit > Change

Keyboard Command: sizeblk

Prerequisite: None

Rotate by Bearing

Function

This command allows you to move objects about a base point by a given bearing.

Prompts

Select entities to rotate.

Select objects: *pick entities*

Base pivot point?

Pick point or point number: *pick a point*

Reference Bearing point?

Pick point or point number: *pick a point*
Azimuth/<New Bearing (Qdd.mmss)>: *enter a bearing*
Pulldown Menu Location: Edit > Rotate
Keyboard Command: BROT
Prerequisite: None

Rotate by Pick

Function

This command allows you to move objects about a base point using a point as a rotation reference.

Prompts

Select objects: *pick entities*
Specify base point: *pick point on screen as reference*
Specify rotation angle or [Reference]: *rotate to desired location*
Pulldown Menu Location: Edit > Rotate
Keyboard Command: ROTATE
Prerequisite: None

Scale

Function

This command allows you to enlarge or reduce selected objects equally in the X, Y, and Z directions.

Prompts

Select objects: *pick entities*
Specify base point: *pick point on screen as reference*
Specify scale factor or [Reference]: *scale to desired size*
Pulldown Menu Location: Edit
Keyboard Command: SC
Prerequisite: None

Edit Text

Function

This command allows you to edit text and attribute labels.

Prompts

Select Text to Edit: *select the text*

You can modify the text in the provided text field dialog.

Pulldown Menu Location: Edit > Text

Keyboard Command: EDITXT

Prerequisite: Text

Text Enlarge/Reduce

Function

This command will scale text entities up or down in size. The routine prompts for a scale multiplier and a selection set of text objects. If you want to enlarge the text enter a value greater than one. If you want to reduce text enter a decimal fraction such as .5. This would reduce the text size by 50%. This command is very useful if you have set up your drawing for one plotting scale and decide to change to a new plotting scale. The Change Text Size command can alternatively be used to set the text size to a specific value.

Pulldown Menu Location: Edit > Text

Keyboard Command: txtenl

Prerequisite: Text entities to be changed

Rotate Text

Function

This command sets the rotation of the selected text to the current twist screen, an entered azimuth, or to align with a line or polyline. The text keeps the same insertion point and justification. The *Twist Screen* option sets the text rotation to align horizontal with the current twist screen. With the *Azimuth* option you can enter the angle or pick two points to define the text rotation. The *Entity Segment* aligns the text with a selected line or polyline segment. The *Follow Polyline* option aligns the text with the closest polyline segment.

Prompts

Rotate by (<Twist Screen>/Azimuth/Entity segment/Follow polyline)? *press Enter*

Select Text to rotate.

Select objects: *select the text*

Pulldown Menu Location: Edit > Text

Keyboard Command: twistxt

Prerequisite: Text

Change Text Font

Function

This command allows you to change the selected text entities to a specified style. The command prompts for a selection set of Text and/or Mtext objects. You can enter any textstyle name such as MONO or ROMANS or press enter to use the current textstyle. If you enter a style name that does not exist, it will be created for you using the font with the same name.

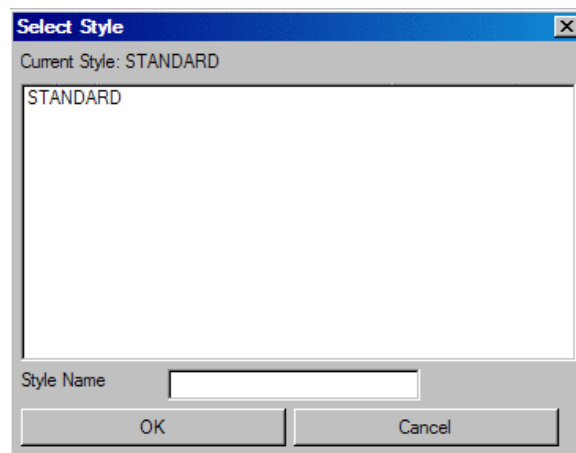
Prompts

Select Text and/or Mtext to change

Select objects: *select the text, then Enter*

Select Style dialog box *pick or enter a style name, click OK.*

Enter new text style or use the current style, then click OK.



Pulldown Menu Location: Edit > Text

Keyboard Command: chgtxtstyle

Prerequisite: Text

Change Text Size

Function

This command will change the size of the selected text objects to the user specified size. The Text Enlarge/Reduce command also changes text size. The difference is that this routine sets the text to an absolute size whereas Text Enlarge/Reduce scales or relatively changes the text size.

Prompts

Select the text to size.

Select objects: *select the text*

Enter new text size: *enter value*

Pulldown Menu Location: Edit > Text

Keyboard Command: chgtxtsize

Prerequisite: Text entities to be changed

Change Text Width

Function

This command changes the width of the selected text entities after a new width factor is entered. The insertion point of each text entity is maintained as the routine lengthens or shortens the text.

Iron Pin	Text width = 1
Iron Pin	Text width = 0.75
Iron Pin	Text width = 1.5

Prompts

Select the text to change.

Select Objects: *select text entities*

Enter new width factor <1.0>: *enter new width factor*

Pulldown Menu Location: Edit > Text

Keyboard Command: chgtxtwidth

Prerequisite: Text entities to be changed

Change Text Oblique Angle

Function

This command allows you to change the text oblique angle on existing text in the drawing. The oblique angle for a specific text style is defined during the creation of the style. The default value for the oblique angle for text styles is 0 until defined to another value by the user. When changing the oblique angle, a minus (-) sign in front of the angle indicates a backward slant and a positive value results in a forward slant. Remember that the reference base point for the oblique change is always 0 degree. This means that if an existing text string has an oblique angle of 20, changing the oblique angle to 25 will not add 25 degrees to the existing 20 degree oblique resulting in a text oblique angle of 45 degrees, but rather a 25 degree oblique will be established by referencing 0 oblique as the base and then slanting the text to 25 degrees. This works the same for slanting text backward as well as forward. Below is an example showing original text created with the default oblique angle of zero, then changed to a backward slant of 20 and a forward slant of 25 degrees.

Prompts

Select the text to change.

Select Objects: *Select text to change oblique angle on.* Note that one or more text strings can be selected. When all desired text has been selected, press Enter.

Enter new oblique angle: Enter the desired oblique angle.

Iron Pin	Oblique Angle = 0
Iron Pin	Oblique Angle = -20
<i>Iron Pin</i>	Oblique Angle = 25

Pulldown Menu Location: Edit > Text

Prerequisite: Text entities to be changed

Keyboard Command: chgtxtoblique

Flip Text

Function

This command changes the alignment of text entities by 180 degrees.

Pulldown Menu Location: Edit > Text

Keyboard Command: fliptext

Prerequisite: Text entities to be changed

Replace Text

Function

This command allows you to replace a text string with another text string. For example, if the text LEGEL is on a drawing, you could use this command to replace it with LEGAL. This command can also be used to replace a substring. For example, if a drawing has the text string TEST 12345 in several places, then select the occurrences and enter the new substring as TEST 555. All selections of TEST 12345 are changed to TEST 555.

Prompts

Select Text to Change.

Select Objects: *select the text*

Old string: *enter the string*

New string: *enter the modified string*

Replace all or prompt [All/<Prompt>]? Press Enter

Pulldown Menu Location: Edit > Text

Keyboard Command: CHGTEXT

Prerequisite: Text entities to be changed.

Text Explode To Polylines

Function

This command converts the selected text into polylines. This function is generally used when preparing a plan view file for machine control before using the *Write Polyline File* command.

Prompts

Select text to be EXPLODED.

Select objects: *select the text*

1 text object(s) have been exploded to lines.

The line objects have been placed on layer 0.

Reading the selection set ...

Joining ...

Converting ...

Pulldown Menu Location: Edit > Text

Keyboard Command: textexp

Prerequisite: Text

Spell Checker

Function

You can check the spelling of all text in your drawing, including:

Single line text

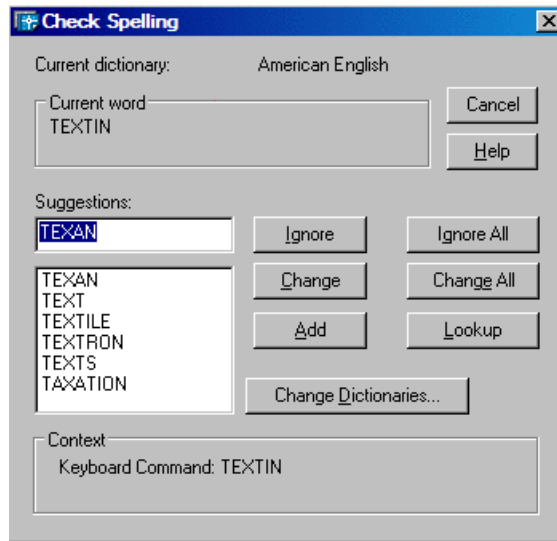
Multiline text

Text within attribute values

Text within block references and their associated block definitions

Text within nested blocks

Spelling is checked only in objects in the current selection set. If you enter the All option when selecting objects, spelling is checked in all objects in model space and in all layouts. Spelling is not checked in block definitions of unselected block references or in text within dimensions. The dictionary used by the spell checker is established in the Options dialog box. You get to this box, choose the Settings pulldown menu and then click Preferences.



The Check Spelling dialog box is displayed only if it finds a misspelled or unknown word in the specified text. Spell checking in attributes is limited to attribute values only. The spelling in text objects within block references and nested block references is checked, but spell checking in block definitions is performed only if the associated block reference has been selected.

Current Dictionary: Displays the name of the current dictionary.

Current Word: Displays the name of the word being checked.

Suggestions: Displays a list of suggested replacement words from the current dictionary. Select a replacement or enter a replacement word in the box.

Ignore: Skips the current word.

Ignore All: Skips all remaining words that match the current word.

Change: Replaces the current word with the word in the Suggestions box.

Change All: Replaces the current word in all selected text objects.

Add: Adds the current word to the current custom dictionary. The maximum word length is 63 characters.

Lookup: Lists words similar to the word selected in Suggestions.

Change Dictionaries: Displays the Change Dictionaries dialog box.

Context: Displays the phrase in which it located the current word.

Pulldown Menu Location: Edit > Text

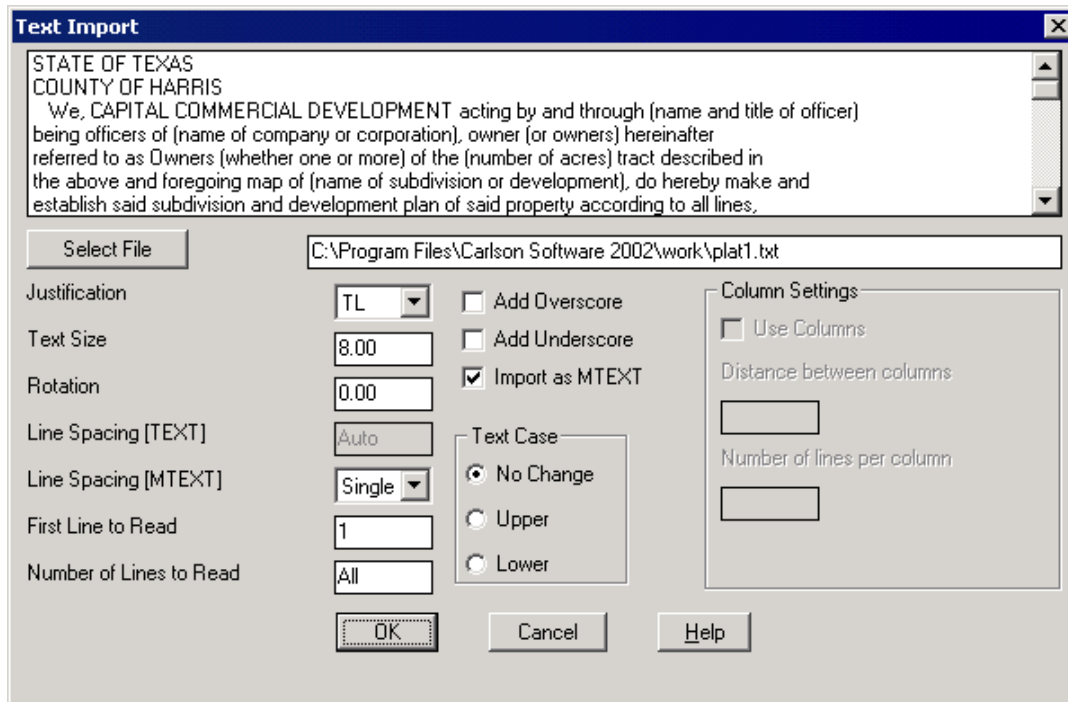
Keyboard Command: SPELL

Prerequisite: Text

Text Import

Function

This command allows you to transfer an ASCII format text file into the current drawing. The Text Import dialog is displayed as shown below.



Select File: Pick this button to select the text file using a standard windows file selection dialog. After you select the file name it will be displayed in the edit box to the right. You may also type in the file name. A preview of the selected text file will be displayed above. If you type in a file name that is not found, the preview window will report [File not found].

Justification: Specify the text justification.

Text Size: Specify the text height.

Rotation: Specify the text rotation angle.

Line Spacing [TEXT]: Specify the line spacing in AutoCAD units. The default and recommended value is Auto, which is approximately 1.71 units. This value varies depending on the font used in the current textstyle.

Line Spacing[MTEXT]: Specify the line spacing. Single spacing is 1.66 times the text height.

First Line to Read: Specify the line number of the first line to read. For example, if you are importing a file that includes 4 lines of header information that you do not want, set this value to 5.

Number of Lines to Read: Specify how many lines of the file to read. For example, if you only wanted to import the first 3 lines of a text file, set the First Line to Read (described above) to 1 and set this value to 3.

Add Overscore: If checked, all imported text will include an overscore.

Add Underscore: If checked, all imported text will be underlined.

Import as MTEXT: If checked, text will be imported as a single MTEXT entity, otherwise text will be imported as individual TEXT entities.

Text Case: Imported text can either be changed to all upper case, all lower case, or select No Change to leave text as it is.

Column Settings: Only available if Import as MTEXT is not checked. Allows you to import text into columns. Specify the distance between columns and the number of lines per column.

Note: ASCII text can also be quickly imported as MTEXT by copying the text onto the Windows clipboard, then in Carlson Survey, use the command Pasteclip.

Pulldown Menu Location: Edit > Text

Keyboard Command: TEXTIN

Prerequisites: None

Text Export

Function

This command allows you to export AutoCAD Text entities to an ASCII file. Selected text is sorted during export so you can use a window selection method.

Prompts

Text File to Export dialog Enter a file name to write.

Select text entities to write to file.

Select objects: *select the text*

3 Select objects: *Press Enter*

Menu Location: Edit > Text

Keyboard Command: TEXTOUT

Prerequisite: Text

2D Align

Function

Aligns objects with other objects in 2D and 3D

You use ALIGN to move, rotate, or scale objects into alignment with other objects. Add source points to the objects you want to align, and add destination points to the objects to which you want the source objects to align. You can add up to three pairs of source and destination points to align an object.

The first set of source and destination points defines the base point for the alignment. The second set of points defines the angle of rotation.

When you select three point pairs, you can move and rotate the selected objects in 3D to align with other objects.

If you use two source and destination points to perform a 3D alignment on nonperpendicular working planes, you get unpredictable results.

After you enter the points, Carlson Survey prompts you to scale the object. The program uses the distance between the first and second destination points as the reference length to which the object is scaled. Scaling is available only when you are aligning objects using two point pairs.

Prompts

Select entities to align.

Select objects: *pick entities to process*

First Source Point?

Pick point or point number: *pick a point*

First Destination Point?

Pick point or point number: *pick a point*

Second Source Point?

Pick point or point number: *pick a point*

Second Destination Point?

Pick point or point number: *pick a point*

Scale factor: 1.00434258

Scale objects based on alignment points [Yes/<No>]? Y

This command DOES NOT change the coordinates in the CoorDinate file!

Use Coordinate File Utilities menu, Update CRD File from Drawing.

Pulldown Menu Location: Edit > Align

Keyboard Command: scalign

Prerequisite: None

Standard Align

Function

Aligns objects with other objects in 2D and 3D. You use Standard ALIGN to move, rotate, or scale objects into alignment with other objects. Add source points to the objects you want to align, and add destination points to the objects to which you want the source objects to align. You can add up to three pairs of source and destination points to align an object.

The first set of source and destination points defines the base point for the alignment. The second set of points defines the angle of rotation. When you select three point pairs, you can move and rotate the selected objects in 3D to align with other objects. If you use two source and destination points to perform a 3D alignment on nonperpendicular working planes, you get unpredictable results. After you enter the points, Carlson Survey prompts you to scale the object. The program uses the distance between the first and second destination points as the reference length to which the object is scaled. Scaling is available only when you are aligning objects using two point pairs.

Prompts

Specify first source point: *pick point*

Specify first desitination point: *pick point*

Specify second source point: *pick point*

Specify second desitination point: *pick point*

Specify third source point or <continue>: *Press Enter*

Scale objects based on alignment points? [Yes/No] <N>: *Press Enter*

Pulldown Menu Location: Edit

Keyboard Command: align

Prerequisite: None

Mirror

Function

This command allows you to create a mirror image copy of objects. The two specified points become the endpoints of a line about which the selected objects are reflected. In 3D, this line orients a mirroring plane perpendicular to the XY plane of the user coordinate system (UCS) containing the mirror line.

Prompts

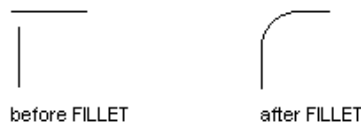
Select Objects: select objects to be mirrored
Specify first point of mirror line: *pick point*
Specify second point of mirror line: *pick point*
Delete source objects? [Yes/No] <No>: *Press Enter*

Pulldown Menu Location: Edit
Keyboard Command: MIRROR
Prerequisite: None

Fillet

Function

This command allows you to round and fillet the edges of objects. You can enter a radius for rounding (default radius is 0). You can also trim an object that extends beyond the intersection. FILLET rounds or fillets the edges of two arcs, circles, elliptical arcs, lines, polylines, rays, splines, or xlines with an arc of a specified radius. FILLET trims the intersecting lines to the endpoints of the fillet arc. If the selected lines do not intersect, Carlson Survey extends or trims them so that they do. FILLET also rounds or fillets the edges of 3D solids. If both objects you want to fillet are on the same layer, the program creates the fillet line on that layer. Otherwise, the program creates the fillet line on the current layer. The same is true for the fillet color, lineweight, and linetype.



You can fillet line segments of a polyline that are adjacent, nonadjacent, intersecting, or separated by one segment. If they are nonadjacent, the polyline segments are extended to accommodate the fillet. If they are intersecting, the polyline segments are trimmed to accommodate the fillet. To create a fillet, the polyline segments must converge within the drawing limits when limits checking is on. The result is a single polyline that includes the fillet as an arc segment. All the properties of this new polyline, such as its layer, color, and linetype, are inherited from the first polyline selected.

Filletting an associative hatch whose boundary is defined by lines removes hatch associativity. Carlson Survey maintains associativity when the boundary is a polyline.

Prompts

Select first object or [Polyline/Radius/Trim/mUltiple]: *select entity*
Select second object: *select entity*
Pulldown Menu Location: Edit
Keyboard Command: FILLET
Prerequisite: None

Offset

Function

This command creates a new object at a specified distance from an existing object or through a specified point. Offset does not support 3D polylines. Use Offset 3D Polyline to offset these entities.

Prompts

Specify offset distance or [Through] <Through>: *Press Enter*

The Through option allows you to screen pick the location of the offset. You can also enter a value for the interval of the offset.

Select object to offset or <exit>: *select entity*

Specify through point: *pick point*

Pulldown Menu Location: Edit

Keyboard Command: OFFSET

Prerequisite: None

Entities to Polylines

Function

This command converts selected lines, arcs, circles, 3DFaces, ellipses, splines, multilines, regions and solids into individual polylines. Use *Join Nearest* to convert adjoining lines and arcs into continuous polylines.

Prompts

Select lines, arcs, circles, 3DFaces, ellipses, splines, multilines, regions and solids to convert.

Select objects: *select entities*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: topline

Prerequisite: lines, arcs or other entities to convert

Reverse Polyline

Function

This command reverses the order of the line and/or arc segments of a polyline. This can be used in conjunction with the commands such as Station Polyline/Centerline or Profile from Surface Entities, since the polyline must be plotted in the direction of increasing stations. If it is more convenient to draft a polyline in one direction you may do so and then use the Reverse Polyline command to change its order. This command can also be used to reverse a 3D Polyline Breakline or a 3D Pad Template. Temporary arrows are drawn along the polyline to graphically show the new polyline direction.

Prompts

Select the polyline or line to reverse: *pick point on polyline*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: REVPLINE

Prerequisite: A polyline

Reduce Polyline Vertices

Function

This command removes points from a polyline without significantly changing the polyline. The offset cutoff is the maximum amount that the polyline can move horizontally and vertically when removing a point. For example, in a polyline with three points in a straight line, the middle point can be removed without changing the polyline.

Prompts

Enter the offset cutoff <0.1>: .5

Select polylines to reduce.

Select objects: *pick polylines*

Processed polylines: 1

Total number of vertices: 10

Number of vertices removed: 1

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: reduce

Prerequisite: A polyline

Change Polyline Elevation

Function

This command allows you to change the elevation of a 2D polyline. The command automatically increases the elevation by the contour interval on successive picks.

Prompts

Starting elevation <0.00>: 100

Contour interval (negative for down) <1.00>: *Press Enter*

Prompt for each elevation [Yes/<No>]? *Press Enter*

Change Polyline Layer [Yes/<No>]? *Press Enter*

Select polylines to set to elevation 100.00 *pick polyline*

Select objects: 1 found

Select objects:

Processed 1 polylines.

Select polylines to set to elevation 101.00 *pick polyline*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: setcelev

Prerequisite: A polyline

Set Polyline Origin

Function

This command sets the starting vertex of a closed polyline. Simply pick the polyline and then pick near the point to set as the starting point.

Prompts

Select Polyline: *pick a polyline*

Pick Near New Origin Point: *pick a point on the polyline to be the starting point*

Processing ...

Select Polyline: *press Enter*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: plchgorg

Prerequisite: A closed polyline

Add Intersection Points

Function

This command adds points into lines or polylines where there are intersections. This can be useful for other commands such as Auto-Annotate. For example in the drawing shown, Add Intersection Points adds points to the boundary polyline where the lot lines intersect. Then Auto Annotate for the boundary polyline will label the boundary distance along each lot. This routine does not add intersection points on arcs.

Prompts

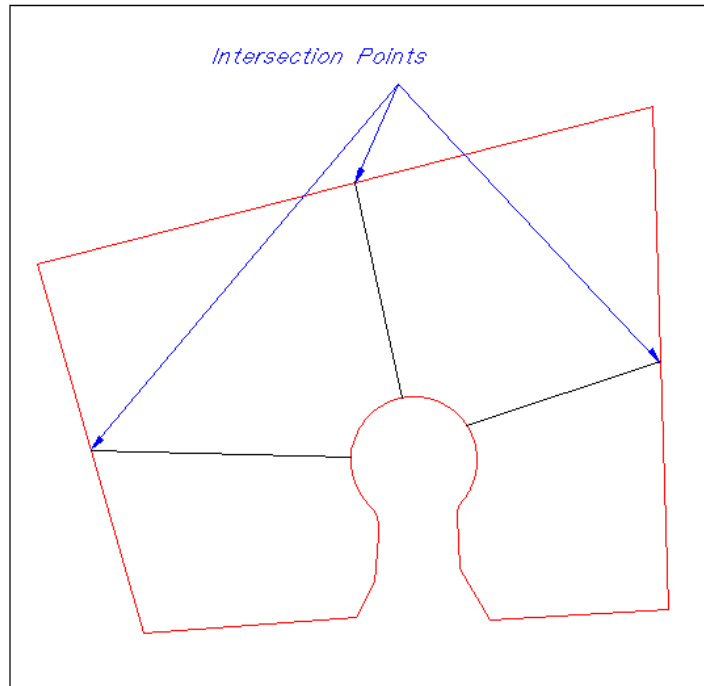
Select lines and polylines to check.

Select objects: *pick lines or polylines*

Reading the selection set ...

Adding intersection points ...

Added 3 intersection points.



Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: addint

Prerequisite: Polylines or lines

Add Polyline Vertex

Function

This command adds points into a polyline. First you select the polyline to modify. The existing polyline vertices are marked and then you can pick or enter the coordinates for the new point(s). A new point is inserted into the polyline at the nearest polyline segment. On a 3D polyline, the elevation of the new vertex will be calculated for you. You can continue to pick points to add, press Enter when you are done.

Prompts

Select polyline to add to: *pick a polyline*

Pick or enter point to add: *pick a point*

Select polyline to add to: *press Enter to end*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: addpl

Prerequisite: A polyline

Edit Polyline Vertex

Function

This tool allows you to make changes in the coordinates of vertices on all polyline types. Upon execution you will be asked to select a polyline to edit. Upon selection, a temporary marker will be placed at all of the vertices of the polyline, making them easy to distinguish. Then pick near the vertex you wish to edit, and the following dialog appears.

At the top of the dialog it identifies the type of polyline, being 2D or 3D. In the case of 2D polylines, it allows you convert the polyline. You have the ability to type in new northing, easting or elevation values. You can also determine the 3D coordinate position by using distances and slope to/from adjacent points. As you change the values in the dialog, new values for derivatives are being calculated. For example, if you change the horizontal distances, the coordinates will change.

Edit Polyline Vertex

2D Polyline

☐ Convert 2D Polyline to 3D

Pick Position

Northing: 9515.51372

Easting: 8753.92117

Elevation: 4915.00000

Station: 677.450

From Previous Point

Hz Distance: 71.5617

Slope %: 0.000

To Next Point

Hz Distance: 26.0969

Slope %: 0.000

Previous Next

OK Cancel Help

Prompts

Select polyline to edit: *pick a polyline*

Pick point on polyline to edit: *pick a point to be modified*

Edit Polyline Vertex dialog *click "Pick Position"*

Pick vertex position: *pick a new location for the vertex*

Edit Polyline Vertex dialog *click OK*

Make changes as needed. You will see the polyline vertices relocated based upon the the new picked positions and coordinate changes. Use Previous and Next to move along the polyline. Note the dialog values changing.

Select polyline to edit (Enter to end): *press Enter to end*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: editpl

Prerequisite: A polyline

Edit Polyline Section

Function

This command revises a segment of a polyline. Begin by picking a point on the polyline where you want to start editing. Then pick new points for the polyline. When finished picking new points, press Enter and then pick a point on the polyline to connect with the new points. The polyline segment between the start and end points is then replaced with the new points.

Prompts

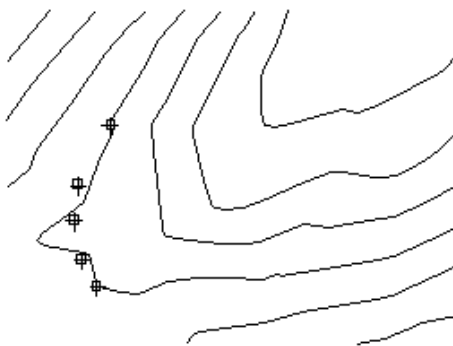
Select polyline to edit: *pick the polyline at the place to start editing*

Pick intermediate point (Enter to End): *pick a point*

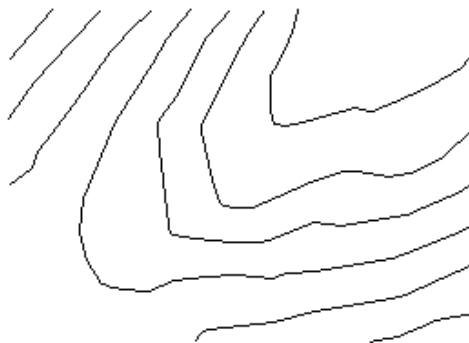
Pick intermediate point ('U' to Undo, Enter to End): *pick a point*

Pick intermediate point ('U' to Undo, Enter to End): *press Enter*

Pick reconnection point on polyline: *pick the polyline at the place to join*



Edit this contour by picking new points



Contour with segment replaced with new points

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: editpl2

Prerequisite: Polylines

Remove Duplicate Polylines

Function

This command analyzes the selected polylines and erases any duplicate polylines found. They must be exactly the same for one to be deleted.

Prompts

Select lines, arcs and polylines to process.

Select objects: *select linework to process*

Reading the selection set ...

Removed 1 duplicate linework entities.

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: rmduplwork

Prerequisite: Polylines that have duplicates

Remove Polyline Arcs

Function

This command replaces arc segments in polylines with chords. Removing arcs is a prerequisite to some Carlson Survey commands that don't handle arcs, such as Break by Closed Polyline and Make 3D Grid file. This process can add many vertices to the polyline. The Offset Cutoff is the maximum any point on the arc will be allowed to shift.

Prompts

Select polylines to remove arcs from.

Select objects: *pick polylines*

Offset cutoff <0.5>: *press Enter*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: rmarc

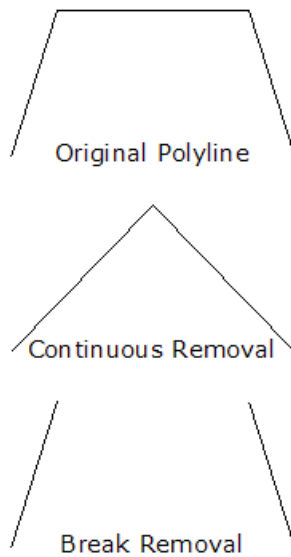
Prerequisite: polyline with arcs

Remove Polyline Segment

Function

This command removes the user specified segment from a polyline. A polyline segment is the section between two vertices of the polyline. There are two options for removing the segment. Either the two vertices of the removed segments are averaged together to keep polyline continuous, or the segment is left missing in the polyline which creates two separate polylines. The keywords Continuous and Break respectively identify these two options. The

first image is of the Original Polyline. The second is with the Continuous Removal option. The third is using the Break Removal option.



Prompts

Break polyline at removal or keep continuous (Break/<Continuous>)? *press Enter*

Select polyline segment to remove: *pick point on polyline*

Select polyline segment to remove: *press Enter to end*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: removepl

Prerequisite: A polyline

Remove Polyline Vertex

Function

This command removes vertices from a polyline. First you select the polyline to modify. The existing polyline vertices are marked and then you pick near the vertex you wish to delete. You can continue to pick vertices to delete, press Enter when you are done.

Prompts

Select polyline to remove from: *pick point on polyline*

Pick point to remove: *pick point*

Pick point to remove (Enter to end): *press Enter to end*

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: rmvertex

Prerequisite: A polyline

Smooth Polyline

Function

This command smooths the selected polylines using a modified Bezier method that makes the smooth polyline pass through all the original points and only smooths between the original points. The looping factor controls smoothing amount. A higher factor gives more looping.

Prompts

Enter the looping factor (1-10) <5>: 7

Enter the offset cutoff <0.05>: *press Enter* This is the same reducing filter described above.

Select polylines to smooth.

Select objects: *pick polylines*

Smoothed 1 PolyLines

Total original vertices: 9 Total final vertices: 50

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: smoothpl

Prerequisite: A polyline

Change Polyline Width

Function

This command sets the width of the selected polylines. You can change the width of multiple polylines at one time.

Prompts

New width <1.0>: 2

Select Contours/Plines to change width of:

Select objects: *pick polylines*

Pulldown Menu Location: Edit > Polyline Utilities

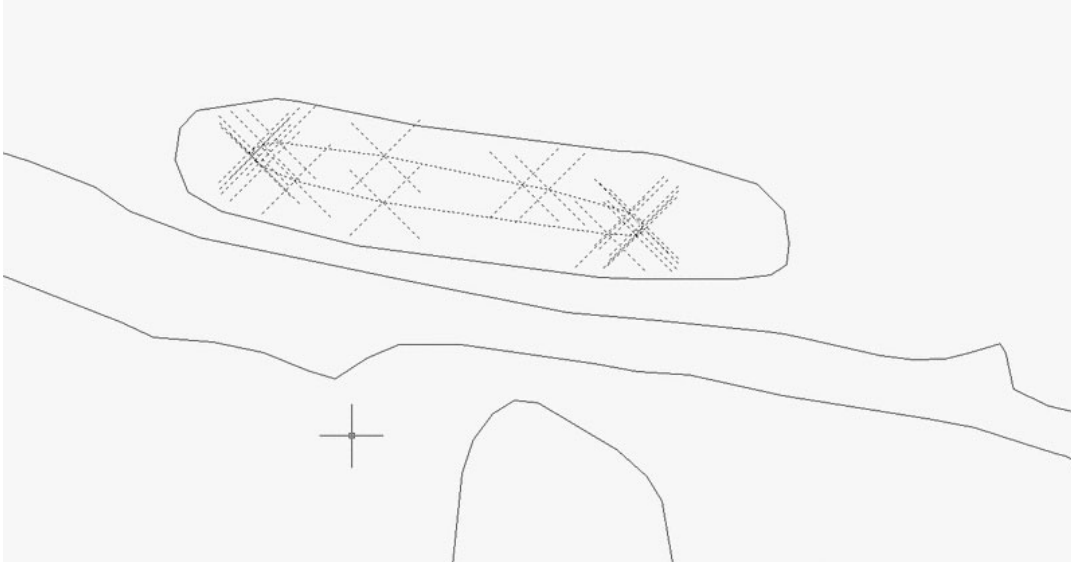
Keyboard Command: cwidth

Prerequisite: A polyline

Check Elevation Range

Function

This command analyzes a selection set of polylines and highlights the ones that fall outside of a specified range. There is an option to set the polylines that are outside the range to zero. Every polyline vertex that is outside the range will be highlighted with an X.



Prompts

Enter elevation range minimum: 0

Enter elevation range maximum: 4900

Select polylines to check.

Select objects: *pick polylines to process*

Found 1 polylines outside of elevation range.

Set polylines outside elevation range to zero elevation [Yes/<No>]? N

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: checkpl

Prerequisite: Polylines with elevations

Close Polylines

Function

This command allows you to close a selection set of open polylines.

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: CLOSEPL

Prerequisite: Open polyline(s)

Open Polylines

Function

This command allows you to open a selection set of closed polylines.

Pulldown Menu Location: Edit > Polyline Utilities

Keyboard Command: OPENPL

Prerequisite: Closed polyline(s).

Offset 3D Polyline

Function

This command allows you to offset a 3D polyline entity in both the horizontal and vertical directions. There are three offset methods. The Interval method applies one horizontal and one vertical offset to all the vertices of the polyline. The Constant method has a horizontal offset and sets the elevation of the polyline to one constant elevation. The Variable method allows you to specify each horizontal and vertical offset individually either by polyline segment or for each point. The vertical offset can be specified by actual vertical distance, percent slope or slope ratio.

Prompts

Enter the offset method [<Interval>/Constant/Variable]: *press Enter*

Vertical/<Horizontal offset amount>: *15*

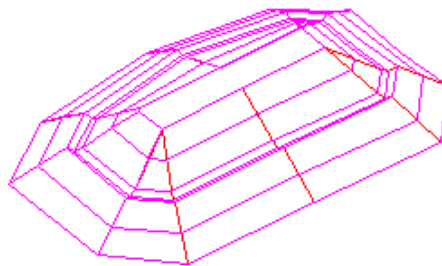
Percent/Ratio/Vertical offset amount <0>: *10*

Select a polyline to offset (Enter for none): *select a 3D poly*

Select side to offset: *pick a point*

Select a point on the graphics screen that is in the direction of the side of line to offset.

Select a polyline to offset (Enter for none): *press Enter*



Pulldown Menu Location: Edit > 3D Polyline Utilities

Keyboard Command: offset3d

Prerequisite: Plot the 3DPoly lines to use for selection.

Fillet 3D Polyline

Function

This command fillets two segments of a 3D polyline with the given radius. AutoCAD's *FILLET* command does not support 3D Polyline entities. Since 3D polylines cannot have arcs, this command draws the fillet arc as a series of short chords. The elevations along the curve are interpolated from the 3D polyline.

Prompts

Enter fillet radius <10.00>: *press Enter*

Select a corner point on polyline: *pick 3D polyline near meeting point of two segments*

Select a corner point on polyline: *pick 3D polyline near meeting point of two segments*

Select a corner point on polyline: *press Enter* (to end command)

Pulldown Menu Location: Edit > 3D Polyline Utilities

Keyboard Command: fillet3d

Prerequisite: 3D polyline

Trim 3D Polyline

Function

This command allows you to trim 3D Polylines using another polyline as the cutting edge. The AutoCAD *TRIM* command now supports 3D Polylines and other types of entities can be used as the cutting edge.

Prompts

Select trim edge polylines.

Select objects: *select polyline*

Select 3-D polyline to trim: *select 3D poly*

Select 3-D polyline to trim: *select 3D poly*

Select 3-D polyline to trim: *press Enter* Pressing Enter ends the command.

Pulldown Menu Location: Edit > 3D Polyline Utilities

Keyboard Command: trim3d

Prerequisite: Plot 2D polyline to use as trim perimeter and the *3DPoly* lines to trim.

Extend 3D Polyline

Function

This command extends 3D polylines to a boundary edge which is defined by another polyline. The *Extend By Distance* routine can be used to extend a 3D polyline incrementally. The AutoCAD *EXTEND* command supports 3D Polylines and other types of entities can be used as the boundary edge.

Prompts

Select boundary edge: *pick a line or polyline*

Select line or polyline to extend: *pick a 3D polyline*

Select line or polyline to extend: *press Enter*

Pulldown Menu Location: Edit > 3D Polyline Utilities

Keyboard Command: extend3d

Prerequisite: 3D polyline to extend and polylines to use as boundary edges.

Join 3D Polyline

Function

This command joins 3D polyline entities into a single 3D polyline entity.

Prompts

Select the 3D polyline to join: *pick a 3D polyline*

Select the other 3D polyline to join: *pick a 3D polyline that has a common endpoint with the first 3 segments added to the polyline.*

Pulldown Menu Location: Edit > 3D Polyline Utilities

Keyboard Command: join3d

Prerequisite: 3D polylines

Break 3D Polyline

Function

This command can be used to break a 3D Polyline. The regular BREAK command also supports 3D polylines and can be used.

Prompts

Select a polyline to break: *pick a 3D polyline at the point to be broken*

Select second break point (or F for First): *pick another point on the 3D polyline*

Select a polyline to break: *press Enter*

Pulldown Menu Location: Edit > 3D Polyline Utilities

Keyboard Command: break3d

Prerequisite: Plot the 3D Polylines to use for selection

3D Polyline by Slope on Surface

Function

This command creates a 3D polyline at a user-specified slope. The user picks the starting point and then the polyline continues along the surface at the slope until it reaches a point where the maximum slope at the point is less than the design slope. The surface is defined by a grid or TIN file which must be created before running this routine. Applications for this command include designing haul roads or ditches.

Prompts

Enter the polyline layer <SLOPE_ROAD>: *press Enter*

Select the Grid File dialog

Reading row > 51

Extrapolate grid to full grid size (Yes/<No>)? *Y*

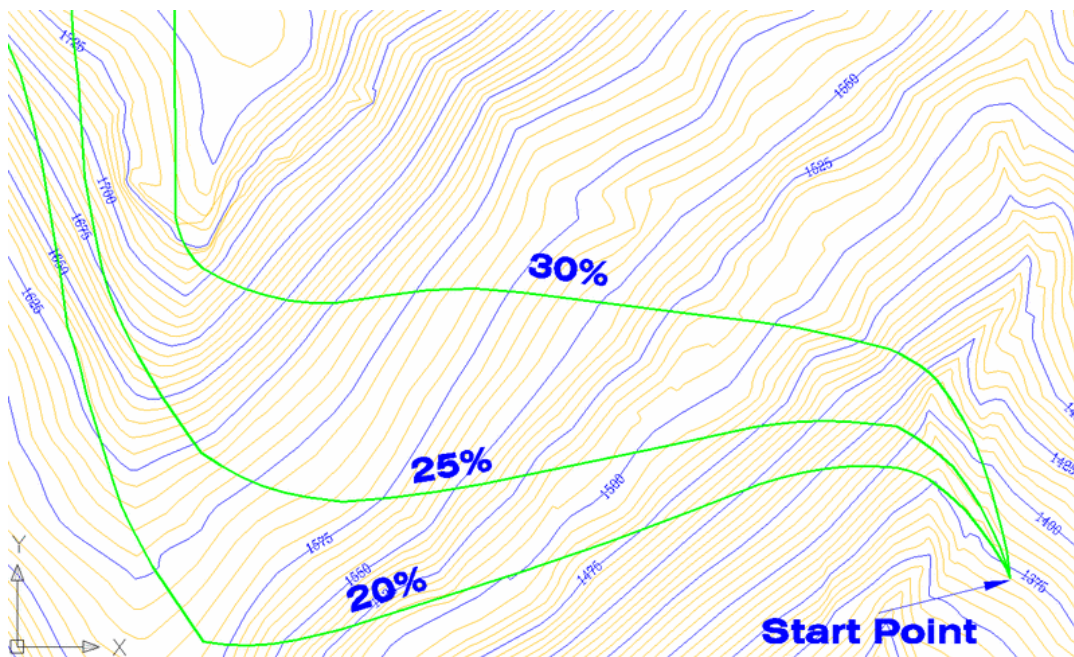
Limiting length for polyline (Enter for none):

Pick origin point of 3D polyline: *pick a starting point*

Direction of 3D Polyline (<Up>/<Down>)? *press Enter* The slope must go either uphill or downhill.

Direction of 3D Polyline facing up slope (<Left>/<Right>)? *R* Imagine facing uphill. Do you want the polyline to go to the left or right?

Enter the design slope: *10* This value is in percent slope.



Pulldown Menu Location: Edit

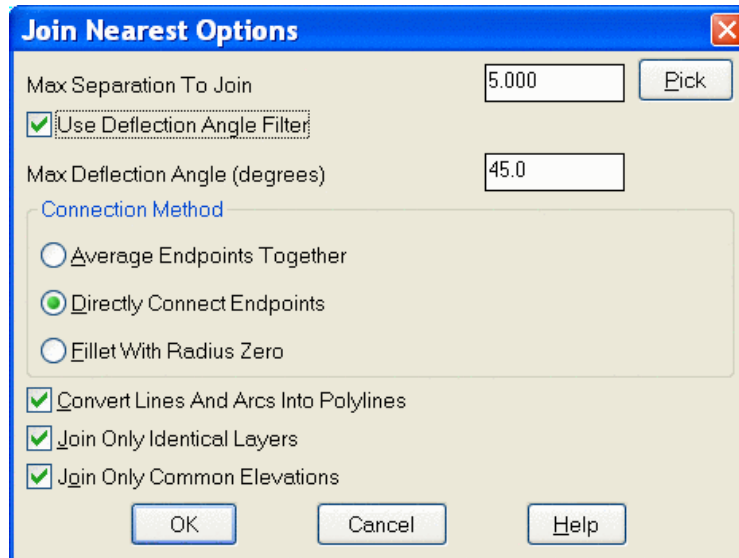
Keyboard Command: surfpl

Prerequisite: None

Join Nearest

Function

This command joins lines, arcs and/or polylines together. Join Nearest will allow you to join entities whose endpoints do not exactly meet. You specify the maximum separation distance to join, along with other options, in the dialog box shown below. You can join many entities at once.



Max Separation to Join: Entities whose endpoints are spaced apart greater than this value will not be joined. You may use the pick button to specify this value by picking two points on the screen.

Max Deflection Angle (degrees): This option will not join any lines if the angle between them is greater than this angle in degrees.

Connection Method: Determines how to connect the endpoints. See illustration.

Average Endpoints Together: New vertex will be located at midpoint between two original endpoints (see first below on left).

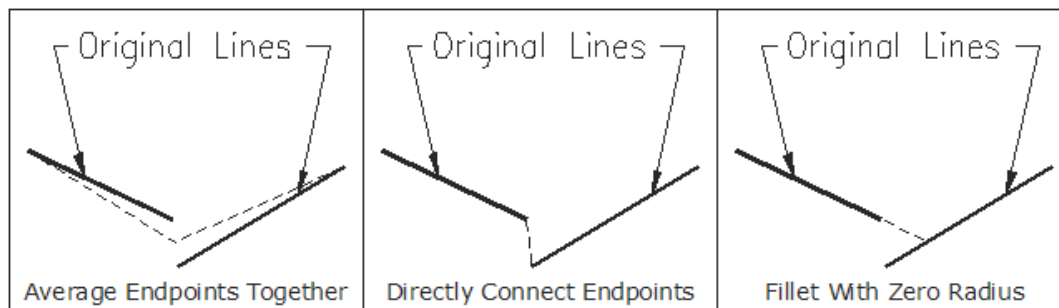
Directly Connect Endpoints: Original endpoints are connected with new segment (see first below in middle).

Fillet with Radius Zero: Same as AutoCAD *FILLET* command using zero radius (see first below on right).

Convert lines into polylines: When checked, automatically converts lines and arcs into polylines. If not checked, lines and arcs are joined but remain separate entities

Join only identical layers: When checked, only entities on the same layer will be joined.

Join only common elevations: When checked, only endpoints located on the same elevation will be joined.



Prompts

Join Nearest Options dialog box choose options

Select lines, arcs and unclosed polylines to join.

Select objects: C for crossing window

Specify first corner: Specify opposite corner: 2 found

Select objects:

Reading the selection set ...

Joining ...

Joined 2 entities.

Pulldown Menu Location: Edit

Keyboard Command: nearjoin

Prerequisite: Lines or polylines to be joined

3D Entity to 2D

Function

This command changes a 3D Arc, Line or Polyline to a 2D Line or Polyline, i.e. a line with the elevations of the endpoints at the same Z coordinate. When the program detects a 3D polyline with all vertices with the same elevation, there is an option to convert to a 2D polyline with this elevation. Otherwise the entered *New Elevation* is used.

Prompts

New Elevation <0.00>: *press Enter*

Select Lines, Arcs or Polylines for elevation change.

Select objects: *pick entities to process*

3DPOLY to 2DPOLYLINE

Number of entities changed> 1

Pulldown Menu Location: Edit

Keyboard Command: 3dto2d

Prerequisite: None

Properties Manager

Function

Carlson Survey displays the Properties window. The Properties window is the main method for viewing and modifying properties of AutoCAD objects.

There are some general properties common to all objects. These include Color, Layer, Linetype, Linetype Scale, Plot Style, Plot Style Table, Lineweight and Thickness. All other object properties are specific to the type of entity. In the example below, a line has been selected. In addition to the properties mentioned above, you may modify the X, Y, and Z coordinate for each endpoint. Notice that you may not directly modify the delta, length or angle. These are read-only properties. Obviously, modifying either end point will cause these values to change.

Properties window for a Polyline object.

General	
Color	ByLayer
Layer	0
Linetype	ByLayer
Linetype scale	1.00
Plot style	ByColor
Lineweight	ByLayer
Hyperlink	
Thickness	0.00

Geometry	
Vertex	1
Vertex X	5594.49
Vertex Y	5045.76
Start segment ...	0.00
End segment ...	0.00
Global width	0.00
Elevation	0.00
Area	7340.40
Length	324.91

Misc	
Closed	No
Linetype gener...	Disabled

Properties window for a selected object (No selection).

General	
Color	ByLayer
Layer	0
Linetype	ByLayer
Linetype scale	1.00
Lineweight	ByLayer
Thickness	0.00

Plot style	
Plot style	ByColor
Plot style table	Default R14 pen assign...
Plot table attac...	Model
Plot table type	Not available

View	
Center X	5511.25
Center Y	5121.79
Center Z	0.00
Height	465.73
Width	584.14

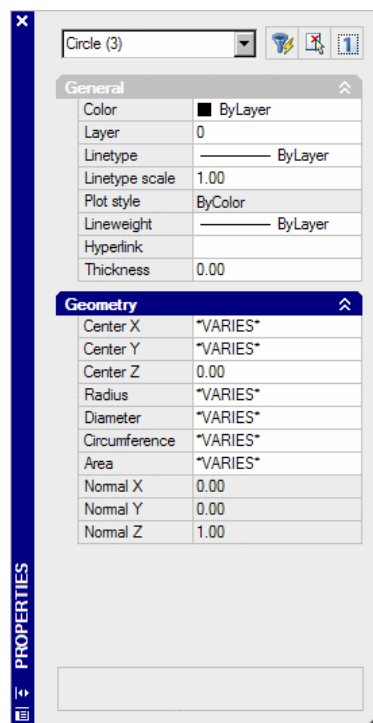
Misc	
UCS icon On	Yes
UCS icon at ori...	No
UCS per viewp...	Yes
UCS Name	

The Properties window can be docked in the drawing area. Right-click the Properties window and choose Allow Docking or Hide to undock or hide it. You can enter commands and work in Carlson Survey while the Properties window is open. When you select an object in the drawing area, the Properties window displays the properties of that object. If you select multiple objects, the Properties window displays all the properties they have in common. Object properties are displayed either alphabetically or by category, depending on the tab you choose. To modify properties using the Properties window, select the object whose properties you want to change and use one of the following methods:

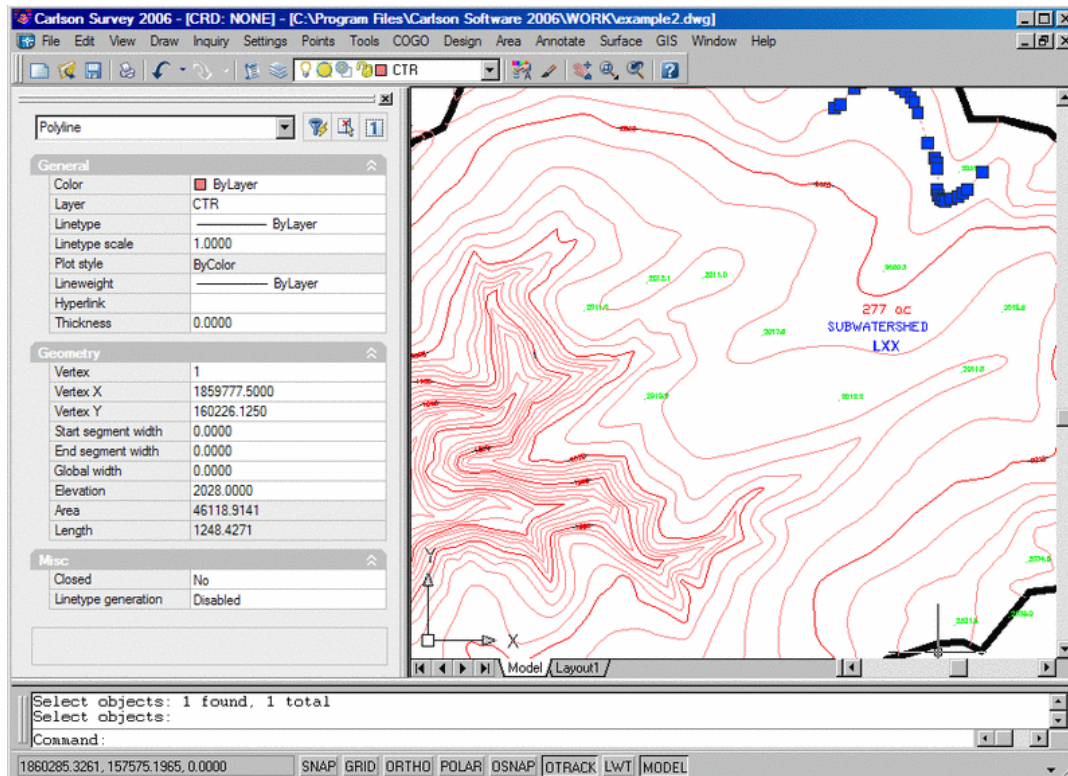
- Enter a new value
- Select a value from a list
- Change the property value in a dialog box
- Use the Pick Point button to change a coordinate value

The Select Objects button, in the upper-right corner of the Properties window, provides access to the full complement of selection methods, such as Fence and Crossing Polygon, from the Command prompt. You choose Select Objects, select the desired objects using any selection method, and press ENTER. The properties common to the selected objects are displayed in the Properties window. You can then modify the properties of the selected objects in the Properties window, or you can make other changes to the selected objects by entering an editing command.

In the next example, three circles have been selected. Each circle has a different radius, color and linetype. Notice that these three fields do not show a default value. Remember, when multiple objects are selected, only their common properties are shown.



This last illustration shows how the properties window can be docked inside the main application window.



Pulldown Menu Location: None

Keyboard Command: Properties

Prerequisite: None

Match Properties

Function

This command applies the properties of a selected object to other objects. The settings are displayed in the Property Settings dialog box in which you can control which object properties to copy to the destination objects. By default, the program selects all object properties in the Property Settings dialog box for copying.

Pulldown Menu Location: Edit

Keyboard Command: matchprop

Prerequisite: none

Image Frame

Function

This command controls whether Carlson Survey displays the image frame or hides it from view. Because you select an image by clicking its frame, setting the image frame to OFF prevents you from selecting an image.

Prompts

Enter image frame setting [ON/OFF] <ON>: enter an option or Press Enter

ON: Displays image frames so you can select images.

OFF: Hides image frames so you cannot select images.

Pulldown Menu Location: Edit > Image

Keyboard Command: IMAGEFRAME

Prerequisite: None

Image Clip

Function

This command allows you to create new clipping boundaries for an image object.

Prompts

Select image to clip: *select the edge of an image*

Enter image clipping option [ON/OFF/Delete/New boundary] <New>: *enter an option or Press Enter*

The boundary you specify must be in a plane parallel to the image object.

ON: Turns on clipping and displays the image clipped to the previously defined boundary.

OFF: Turns off clipping and displays the entire image and frame. If you reclip the image while clipping is turned OFF, the program automatically turns clipping back ON. The program prompts you to delete the old boundary even when clipping is turned OFF and the clipping boundary is not visible.

Delete: Removes a predefined clipping boundary and redisplay the full original image.

New Boundary: Specifies a new clipping boundary. The boundary can be rectangular or polygonal, and consists only of straight line segments. When defining a clipping boundary, specify vertices within the image boundary. Self-intersecting vertices are valid. Rectangular is the default option. If you use the pointing device to specify a point at the Enter Clipping Type prompt, the program interprets the point as the first corner of a rectangle.

Enter clipping type [Polygonal/Rectangular] <Rectangular>: *enter P or Press Enter*

Polygonal: Uses specified points to define a polygonal boundary.

Specify first point: *specify a point*

Specify next point or [Undo]: *specify a point or enter u*

Specify next point or [Undo]: *specify a point or enter u*

Specify next point or [Close/Undo]: *specify a point, or enter c or u*

You must specify at least three points to define a polygon. If the image already has a clipping boundary defined, Carlson Survey displays the following prompt:

Delete old boundary? [No/Yes] <Yes>: *enter N or Press Enter*

If you choose Yes, the program redraws the entire image and the command continues; if you choose No, the command ends.

Rectangular: Specifies a rectangular boundary by its opposite corners. Carlson Survey always draws the rectangle parallel to the edges of the image.

Specify first corner point: *specify a point*

Specify opposite corner point: *specify a point*

Pulldown Menu Location: Edit > Image

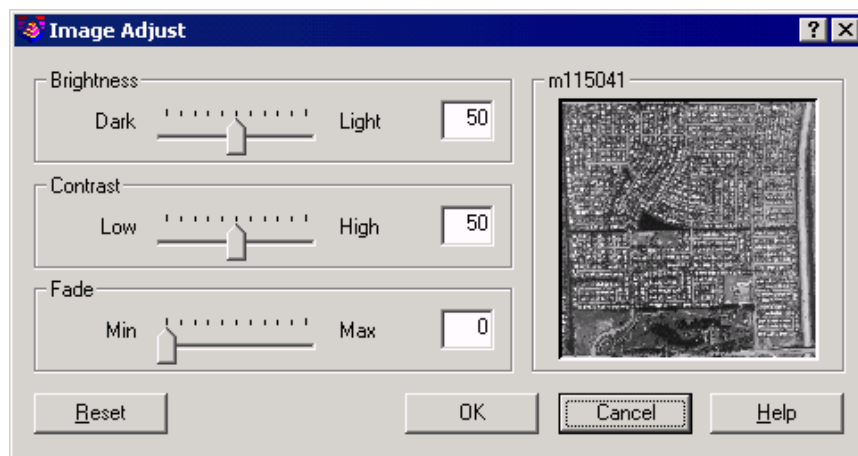
Keyboard Command: IMAGECLIP

Prerequisite: None

Image Adjust

Function

This command controls the display of the brightness, contrast and fade values of images.



The Image Adjust dialog box controls how the image is displayed by adjusting the brightness, contrast, and fade settings of the selected image. Adjusting these values changes the display of the image but does not change the image file itself.

Brightness: Controls the brightness, and indirectly the contrast, of the image. Values range from 0 through 100. The greater the value, the brighter the image and the more pixels that become white when you increase contrast. Moving the slider to the left decreases the value; moving the slider to the right increases the value.

Contrast: Controls the contrast, and indirectly the fading effect, of the image. Values range from 0 through 100. The greater the value, the more each pixel is forced to its primary or secondary color. Moving the slider to the left decreases the value; moving the slider to the right increases the value.

Fade: Controls the fading effect of the image. Values range from 0 through 100. The greater the value, the more the image blends with the current background color. A value of 100 blends the image completely into the background. Changing the screen background color causes the image to fade to the new color. In plotting, the background color for fade is white. Moving the slider to the left decreases the value; moving the slider to the right increases the value.

Image Preview: Displays a preview of the selected image. The preview image updates dynamically to reflect changes to the brightness, contrast, and fade settings.

Reset: Resets values for brightness, contrast, and fade to default settings (50, 50, and 0, respectively).

Pulldown Menu Location: Edit > Image

Keyboard Command: IMAGEADJUST

Prerequisite: None

View Commands

6

This chapter provides information on using the commands from the View menu to change the display settings of Carlson Survey, and to manage the layers of your drawing.

Redraw

Function

This command refreshes the display in the current viewport.

Pulldown Menu Location: View

Keyboard Command: R

Prerequisite: None

Regen

Function

This command regenerates the drawing and refreshes the current viewport.

Menu Location: View

Keyboard Command: REGEN

Prerequisite: None

Zoom - Window

Function

This commands zooms to display an area you specify by two opposite corners of a rectangular window.

Pulldown Menu Location: View

Keyboard Command: ZOOM, W

Prerequisite: None

Zoom - Dynamic

Function

This command zooms to display the generated portion of the drawing using a view box. The view box represents your viewport, which you can shrink or enlarge and move around the drawing. Positioning and sizing the view box pans or zooms the viewport, filling it with the image inside the view box.

Pulldown Menu Location: View

Keyboard Command: ZOOM, D

Prerequisite: None

Zoom - Previous

Function

This command zooms to display a previous view. You can restore up to ten previous views.

Pulldown Menu Location: View

Keyboard Command: ZOOM, P

Prerequisite: None

Zoom - Center

Function

This command zooms to display a window you define by picking a center point and a magnification value or height. A smaller value for the height increases the magnification. A larger value decreases the magnification.

Prompts

Specify center point: *pick a point*

Enter magnification or height <226.66>: *enter a value*

Pulldown Menu Location: View

Keyboard Command: ZOOM, C; or Z, C

Prerequisite: None

Zoom - Extents

Function

This command zooms to display the drawing extents. You can use Zoom Extents transparently, but it always regenerates the drawing.

Pulldown Menu Location: View

Keyboard Command: ZOOM, E

Prerequisite: None

Zoom IN

Function

This command increases the zoom factor of the current viewport by a factor of 2.0.

Pulldown Menu Location: View
Keyboard Command: ZOOM, 2.0x
Prerequisite: None

Zoom OUT

Function

This command decreases the zoom factor of the current viewport by a factor of 0.5.

Pulldown Menu Location: View
Keyboard Command: ZOOM, 0.5x
Prerequisite: None

Zoom Point(s)

Function

This command centers the screen to a user-specified point. The point can be specified by either the point number or description. The command searches the current coordinate (.CRD) file. Besides centering the screen, the magnification can also be changed. The default value is the current magnification. To zoom in, enter a smaller value and to zoom out, enter a greater value.

Prompts

Find by point number or description [<Number>/Desc]? *N*

Point number or range of point numbers to find <1>: 2079

We want to find point number 2079

Magnification or Height <179.50>: *press Enter*

Accept the default zoom magnification

Pulldown Menu Location: View
Keyboard Command: zoompnt
Prerequisite: a .CRD file

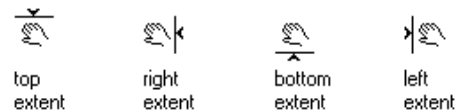
Pan

Function

This command moves the drawing display in the current viewport. The cursor changes to a hand cursor. By holding down the pick button on the pointing device, you lock the cursor to its current location relative to the viewport coordinate system. The drawing display is moved in the same direction as the cursor.



When you reach a logical extent (the edge of the drawing space), a bar is displayed on the hand cursor on the side where the extent has been reached. Depending on whether the logical extent is at the top, bottom, or side of the drawing, the bar is either horizontal (top or bottom) or vertical (left or right side).



When you release the pick button, panning stops. You can release the pick button, move the cursor to another location in the drawing, and then press the pick button again to pan the display from that location. To stop panning at any time, press Enter or ESC.

Pulldown Menu Location: View

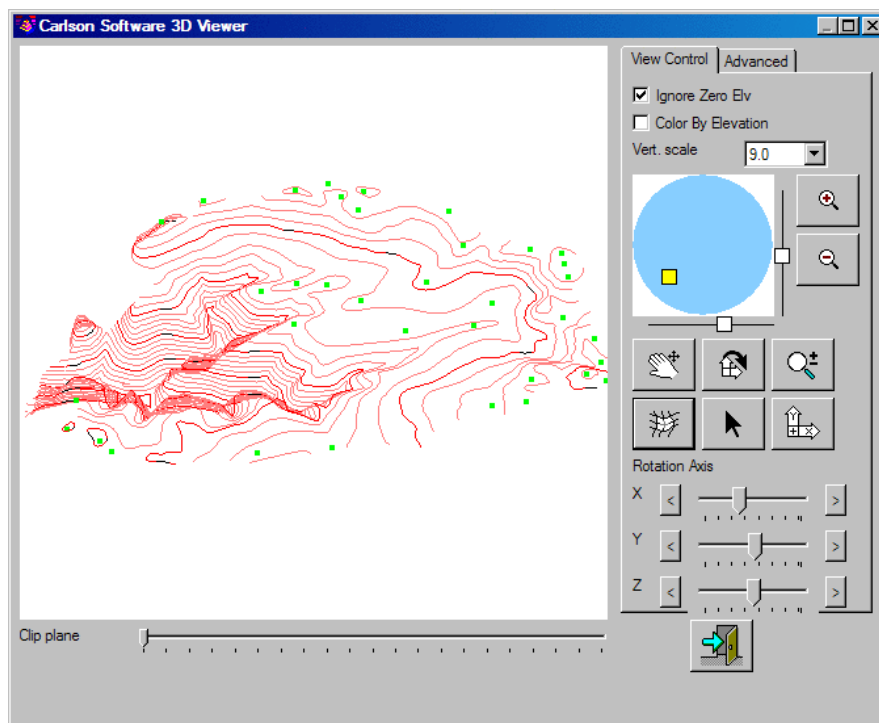
Keyboard Command: P

Prerequisite: None

3D Viewer Window

Function

This command allows you to view the selected 3D faces, polylines, lines, and points in 3D using the OpenGL graphics library for rendering, which gives it superior performance. This command gives you the ability to zoom in and out, pan, rotate around the X, Y, or Z axis, and shade in user-positioned lighting. You also have the option to export the view to a windows bitmap (.BMP) file. The window below is displayed after you select the entities to be shown. To pan the display, click on the image and drag the pointer.



Controls: Light intensity for the direction and ambient light.

Block Models: Rendering method options were added along with the ability to turn off entities by color.

Ignore Zero Elv: This option excludes entities on zero elevation from the display.

Vert. Scale: Controls the vertical exaggeration of the 3D display.

Light Position: This control represents the position of the sun in the sky looking from above. The position of the sun in the center of the control means the sun is in a zenith, and a position near the edge of the circle means the sun is near the horizon. To move the sun, simply drag it to new location or click there.

Dynamic Zoom Mode: Allows you to zoom in and out by holding the left mouse button down and moving the mouse up and down.

Zoom In: This option incrementally zooms in to the view.

Zoom Out: This option incrementally zooms out to the view.

Pan Mode: Allows you to pan the display

Shade Model: This option allows you to shade the surfaces of your view. The color of the shade depends on the lighting of the surface, which you adjust using the Light Position control in the middle of the controls window. See Light Position below.

Export to BMP: This option creates a .BMP bitmap file from your current view.

Rotation Mode: Allows you to rotate the view in the X or Y axis while the cursor is in the middle of the display. Rotates on the Z axis when the cursor is near any edge of the display. The cursor will indicate the axis.

Plan View: This option restores the X, Y, and Z axes back to zero.

Set Acad View: This option allows you to send the current 3D view back to the Carlson Survey screen when you exit the 3D Viewer window. You update the current CAD view to match the view that is displayed in the 3D viewer window.

Z-Axis: This slider rotates the view on the Z axis. The range of these sliders is -180 to +180 degrees with middle being 0, which is the default position when the viewer starts.

Y-Axis: This slider rotates the view on the Y axis.

X-Axis: This slider rotates the view on the X axis.

General: This tool uses the same background color as the AutoCAD graphics window.

Pulldown Menu Location: View > 3D Views

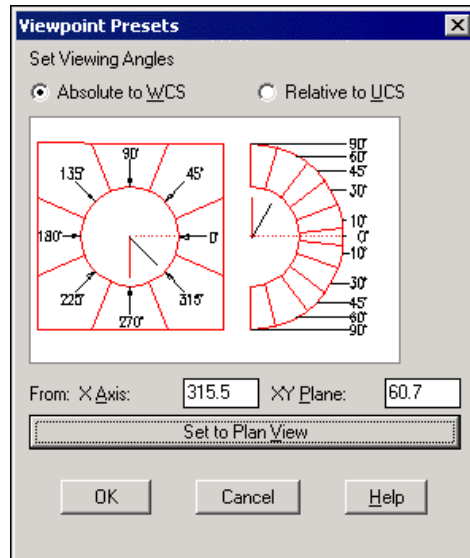
Keyboard Command: CUBE

Prerequisite: Entities to display.

Viewpoint 3D

Function

This command allows you to define 3D view settings.



Under Set Viewing Angles, you must set the direction of the view relative to either the world coordinate system (WCS) or a user coordinate system (UCS).

Absolute to WCS: This option sets the view direction relative to the WCS.

Relative to UCS: This option sets the view direction relative to the current UCS.

You must specify the viewing angles.

X Axis: This field specifies the angle from the X axis.

XY Plane: This field specifies the angle from the XY plane. You can also use the sample image to specify viewing angles. The black arm indicates the new angle. The red arm indicates the current angle. Specify an angle by selecting the inner region of the circle or half-circle. Selecting the bounded outer regions rounds off the angle to the value displayed in that region.

Set to Plan View: This option sets the viewing angles to display the plan view relative to the selected coordinate system.

Pulldown Menu Location: View > 3D Views

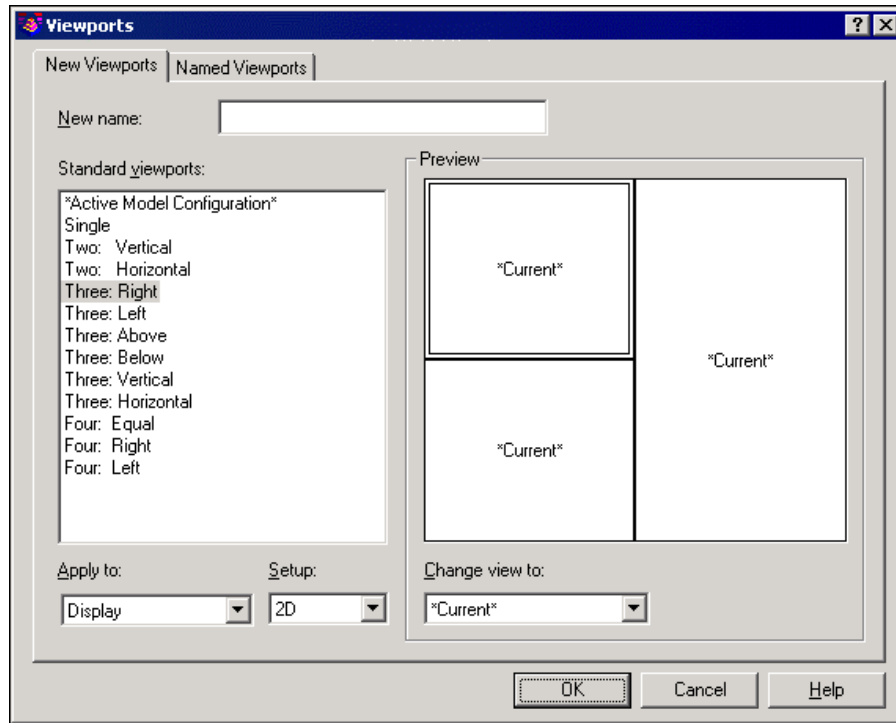
Keyboard Command: DDVPOINT

Prerequisite: None

Viewports

Function

This command creates new viewport configurations, or names and saves a model viewport configuration. The options available in this dialog box depend on whether you are configuring model viewports (on the Model tab) or layout viewports (on a layout tab).



The New Viewports Tab displays a list of standard viewport configurations and configures tiled viewports.

New Name: The field specifies a name for the new tiled viewport configuration you are creating. If you do not enter a name, the viewport configuration you create is applied but not saved. If a viewport configuration is not saved, it cannot be used in a layout.

Standard Viewports: A list of the standard viewport configurations available. It also contains a CURRENT item, the current configuration.

Preview: This window displays a preview of the viewport configuration you select and the default views assigned to each individual viewport in the configuration.

Apply To: Applies the tiled viewport configuration to the entire display or to the current viewport. Display is the default setting. It applies the viewport configuration to the entire Model tab display. The Current Viewport option applies the viewport configuration to the current viewport only.

Setup: Specifies either a 2D or a 3D setup. When you select 2D, the new viewport configuration is initially created with the current view in all of the viewports. When you select 3D, a set of standard orthogonal 3D views is applied to the viewports in the configuration.

Change View To: Replaces the selected viewport configuration with the viewport configuration you select from the list. You can choose a named viewport configuration, or, if you have selected a 3D setup, you can select from the list of standard viewport configurations. Use the Preview area to view the viewport configuration choices.

The Named Viewports Tab displays any saved viewport configurations in the drawing. When you select a viewport configuration, the layout of the saved configuration is displayed in Preview.

Menu Location: View

Keyboard Command: VPORTS

Prerequisite: None

Twist Screen Standard

Function

This command allows you to "twist" the screen's orientation so that a direction other than North is toward the top of the screen and the drawing. It does not do a coordinate rotation, and it leaves the database unchanged. The ROTATE and MOVE commands in the Edit menu can be used to do a coordinate rotation and translation. Use commands on the Points menu such as *Rotate Points* and *Translate Points* if you want to do a coordinate rotation or translation.

This command prompts you for the twist angle, then adjusts the screen and crosshairs to that angle. The twist angle is always measured counterclockwise, with 0 degrees at the east/right.

Prompts

Enter or Pick the screen rotation angle: *pick the angle*

Pulldown Menu Location: View > Twist Screen

Keyboard Command: TWIST1

Prerequisite: None

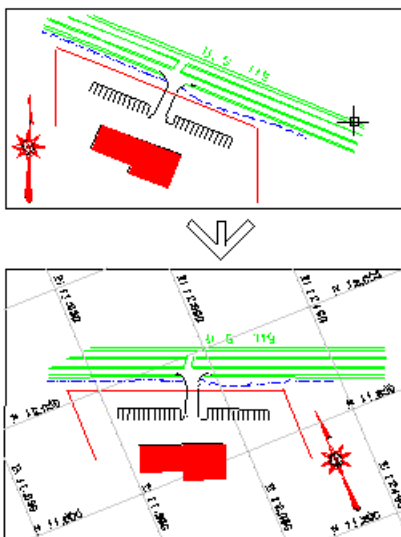
Twist Screen Line

Function

This is a variation of the previous command that allows you to select a line, polyline, or text in your drawing that you want to be aligned parallel to the east-west direction of the graphics screen. Think of the entity you select as a pointer or arrow that will point in the east direction of the screen after you select it. Select the line, polyline, or text closest to the end point which you want to be the horizontal or east direction of the screen.

Prompts

Pick a line, polyline or text to make horizontal: *pick a line or polyline*



Pulldown Menu Location: View > Twist Screen

Keyboard Command: twist2

Prerequisite: None

Twist Screen Surveyor

Function

This command is another variation of Twist Screen Standard. You enter the angle/azimuth that you want to be aligned parallel to the east-west direction of the graphics screen.

Prompts

Angle to set to horizontal (dd.mmss): 12

Pulldown Menu Location: View > Twist Screen

Keyboard Command: TWIST3

Prerequisite: None

Restore Due North

Function

This command twists the screen to make due north vertical.

Pulldown Menu Location: View > Twist Screen

Keyboard Command: TWIST4

Prerequisite: None

Display Order, Bring to Front

Function

This command allows you to change the display order of objects by repositioning an entity from the background to the forefront of the drawing view.

Pulldown Menu Location: View > Display Order

Keyboard Command: FRONTOBJ

Prerequisite: None

Display Order, Send to Back

Function

This command allows you to change the display order of objects by repositioning an entity from the forefront to the background of the drawing view.

Menu Location: View > Display Order

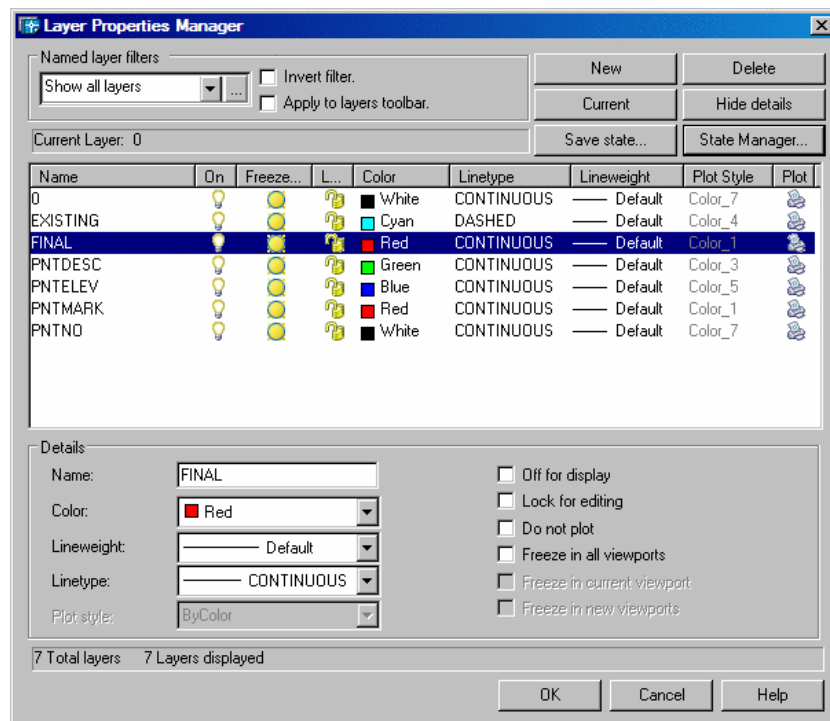
Keyboard Command: BACKOBJ

Prerequisite: None

Layer Control

Function

This command allows you to manage layers and layer properties. The Layer Properties Manager dialog box makes a layer current, adds new layers to the layer name list and renames an existing layer. You can assign properties to layers, turn layers on and off, freeze and thaw layers globally or by viewport. You can also lock and unlock layers, set plot styles for layers and turn plotting on and off for layers. You can filter the layer names displayed in the Layer Properties Manager, and you can save and restore layer states and properties settings.



Under Named Layer Filters, you determine which layers to display in the list of layers. You can filter layers based on whether they're xref-dependent, or whether they contain objects. You can also filter layers based on name, visibility, color, linetype, lineweight, plot style name, whether they are plotted, or whether they are frozen in the current viewport or in new viewports.

[...]: This button displays the Named Layer Filters dialog box.

Invert Filter: Displays layers based on the opposites of the criteria you select when you are using a named layer filter. Layers that fit the inverse criteria are displayed in the layer name list.

Apply to Object Properties Toolbar: Displays in the Object Properties toolbar only layers that match the current filter. The layer list tooltip on the Object Properties toolbar displays the filter status of layers in the drawing. (To display the layer list tooltip, position the pointing device over the layer list on the Object Properties toolbar.)

New: Creates a new layer. After you choose New, the list displays a layer named LAYER1. You can edit this layer immediately. To create multiple layers quickly, you can select a layer name for editing and enter multiple layer names separated by commas. If you create a new layer, the new layer inherits the properties of the currently selected layer in the layer list (such as Color, and On/Off state). To create layers with default settings, make sure that there are no selected layers in the list or that you select a layer with default settings before beginning layer creation.

Current: Sets the selected layer as the current layer. The CLAYER system variable stores the layer name.

Save State: Displays the Save Layer States dialog box, in which you save layer state and layer properties settings of all layers in a drawing. You can choose which layer states and properties you want to preserve. You save a layer state by assigning it a name.

Delete: Deletes selected layers from the drawing file definition. You can delete only unreferenced layers. Referenced layers include layers 0 and DEFPOINTS, layers containing objects (including objects in block definitions), the current layer, and xref-dependent layers. Layers that don't contain objects (including objects in block definitions), are not current, and are not xref-dependent can be deleted by using the PURGE command. Be careful about deleting layers if you are working on a drawing in a shared project or one based on a set of layering standards.

Show/Hide Details: This option controls whether the Details section is displayed in the Layer Properties Manager.

State Manager: This option displays the Layer States Manager, in which you can manage named layer states.

The Layer Properties Manager dialog box displays all layers and their properties. To modify a property, click its icon. To quickly select all layers, right-click your pointing device and use the shortcut menu. The following are the layer properties you can modify:

Name: This field displays the names of the layers. You can select a name, and then click and enter a new name.

On/Off: This field turns layers on and off. When a layer is on, it is visible and available for plotting. When a layer is off, it is invisible and not plotted, even if Plot is on.

Freeze/Thaw in All Viewports: This field freezes and thaws layers in all floating viewports. A frozen layer is invisible and excluded from regeneration, hiding objects, rendering, and plotting. A thawed layer is visible and available for regeneration, hiding objects, rendering, and plotting.

You can freeze layers to speed up ZOOM, PAN, and many other operations, improve object selection performance, and reduce regeneration time for complex drawings. Carlson Survey does not display, plot, or regenerate objects on frozen layers. Objects on frozen layers do not hide objects and are not rendered. You can also freeze layers in all viewports, in the current viewport, or in new viewports. Freeze layers that you want to be invisible for long periods. When you thaw a frozen layer, the program regenerates and displays the objects on that layer. If you switch between visible and invisible states frequently, use the On/Off setting.

Lock/Unlock: This field locks and unlocks the layers. You cannot select or edit objects on a locked layer. Locking a layer is useful if you want to view information on a layer for reference but do not want to edit objects on that layer.

Color: This field changes the color associated with the selected layers. Clicking the color name displays the Select Color dialog box.

Linetype: This field changes the linetype associated with the selected layers. Clicking any linetype name displays the Select Linetype dialog box.

Lineweight: This field changes the lineweight associated with the selected layers. Clicking any lineweight name displays the Lineweight dialog box.

Plot Style: Changes the plot style associated with the selected layers. If you are working with color-dependent plot styles (the PSTYLEPOLICY system variable is set to 1), you cannot change the plot style associated with a layer. Clicking any plot style displays the Select Plot Style dialog box.

Plot/Don't Plot: Controls whether the selected layers are plotted. If you turn off plotting for a layer, the objects on that layer are still displayed. Turning off plotting for a layer affects only visible layers in the drawing (layers that are on and thawed). If a layer is set to plot, but is currently frozen or off in the drawing, Carlson Survey does not plot the layer. Turning off plotting for layers containing reference information such as construction lines can be useful.

Pulldown Menu Location: View

Keyboard Command: LAYER

Prerequisite: None

Set Layer

Function

Allows the user to change the current layer to a different layer by picking an entity on that layer.

Pulldown Menu Location: View

Keyboard Command: lset

Prerequisite: None

Change Layer

Function

This command allows you to change the layer of a group of entities by selecting the group of entities. The layer name to assign can be either typed in or read from an existing entity by picking an entity that is on the layer that you want to change the group to.

Prompts

Select entities to be changed.

Select objects: *pick entities*

Enter new layer name or pick entity with layer (Enter/<Pick>)? *press Enter*

Pick entity with layer to change to: *pick another entity* This assigns the selected entities to the layer of this entity.
or

Enter new layer name or pick entity with layer (Enter/<Pick>)? *E*

Enter new layer name: *FINAL* This assigns the selected entities to the FINAL layer.

Pulldown Menu Location: View

Keyboard Command: lchg

Prerequisite: None

Freeze Layer

Function

This command will freeze layers by picking entities on that layer.

Pulldown Menu Location: View

Keyboard Command: loff

Prerequisite: None

Thaw Layer

Function

This command allows you to thaw the layers frozen by the Freeze Layer command.

Pulldown Menu Location: View

Keyboard Command: lon

Prerequisite: None

Isolate Layer

Function

This command freezes all the layers except the ones you select an entity on. The program prompts to see if you would like to retain the POINT layers which keeps the Carlson Survey point layers from freezing. By default, these layers include PNTNO, PNTMARK, PNTDESC, and PNTELEV.

Prompts

Select objects on layers to isolate.

Select objects: *pick entities*

Retain POINT layers [Yes/<No>]? Press Enter



Isolate the wall layer by picking one wall line

Pulldown Menu Location: View

Keyboard Command: isolate

Prerequisite: None

Restore Layer

Function

This command thaws the layers frozen by the Isolate Layer command.

Pulldown Menu Location: View

Keyboard Command: restore

Prerequisite: None

Draw Commands

7

This chapter provides information on using the commands from the Draw menu to create lines, polylines, circles and other entities in your drawing.

Line

Function

This command allows you to draw a line entity by picking points on the screen, or by supplying the coordinate values using the point number and associated coordinates stored in the current coordinate file. The Line command links the line with the points when the line is drawn using point numbers, if the Link Linework with Points option is turned On. This option is found in the Settings pulldown menu. Once there you choose Configure and then click General Settings. With links active, changing a point with a command like Move Points automatically updates the line. This command always draws 2D lines with a zero elevation.

Prompts

Pick point or point numbers: *1-3*

You may enter a single point number or a range of point numbers

Undo/+/-/Close/Distance/⟨Pick point or point numbers⟩: *16*

Undo/+/-/Close/Distance/⟨Pick point or point numbers⟩: *35*

Undo/+/-/Close/Distance/⟨Pick point or point numbers⟩: *+*

The + or - activates an additional prompt option that allows you to plot line segments at a 90 degree deflection angle from the last line.

Perpendicular Distance Right: *80*

Undo/+/-/Close/Distance/⟨Pick point or point numbers⟩: *-*

The + or - activates an additional prompt option that allows you to plot line segments at a 90 degree deflection angle from the last line.

Perpendicular Distance Left: *105.12*

Undo/+/-/Close/Distance/⟨Pick point or point numbers⟩: *D*

The distance option allows you to input a distance for the next line segment. The position of the cursor determines the angle.

Enter distance: *174.32*

Undo/+/-/Close/Distance/⟨Pick point or point numbers⟩: *C*

The close option draws a line segment back to the original starting point.

Pulldown Menu Location: Draw

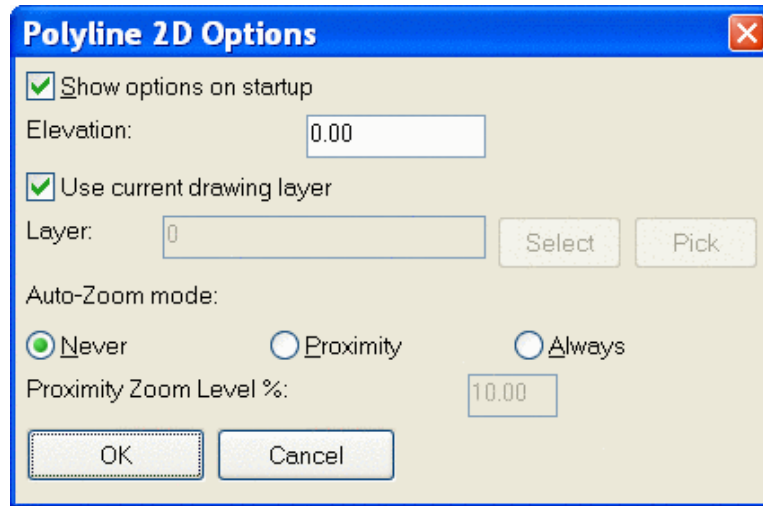
Keyboard Command: 2DLINE

Prerequisite: None

2D Polyline

Function

This command draws a polyline with a constant or zero elevation.



The **Show Options on Startup** dialog will appear every time the command is run, unless this is turned off. If it is off, then the last settings will apply. To get the box back, choose O for Options from the command line.

The **Elevation** of the polyline can be set here. The default is 0.

If **Use Current Drawing Layer** is on, the layer of the new polyline will be the current layer.

If the current layer is not used, the **Layer** option allows you to **Select** from a list or **Pick** from the screen.

There are 3 options under **Auto-Zoom Mode**. Never will not zoom to the last point picked. Proximity will zoom to the percent proximity set below. Always will always zoom center on every point.

If the Proximity Auto-Zoom mode is checked, the percent of the proximity is set in the **Proximity Zoom Level%** box.

Prompts

[Continue/Extend/Follow/Options/<Pick point or point numbers>]: *pick a point*

Segment length: 0.00, Total length: 0.00

[Arc/Direction/Close/Follow/Undo/<Pick point or point numbers>]: *pick a point*

Segment length: 3.83, Total length: 3.83

[Arc/Direction/Close/Extend/Follow/Undo/<Pick point or point numbers>]: *pick a point*

Segment length: 2.94, Total length: 6.77 *press Enter to end*

Pulldown Menu Location: Draw

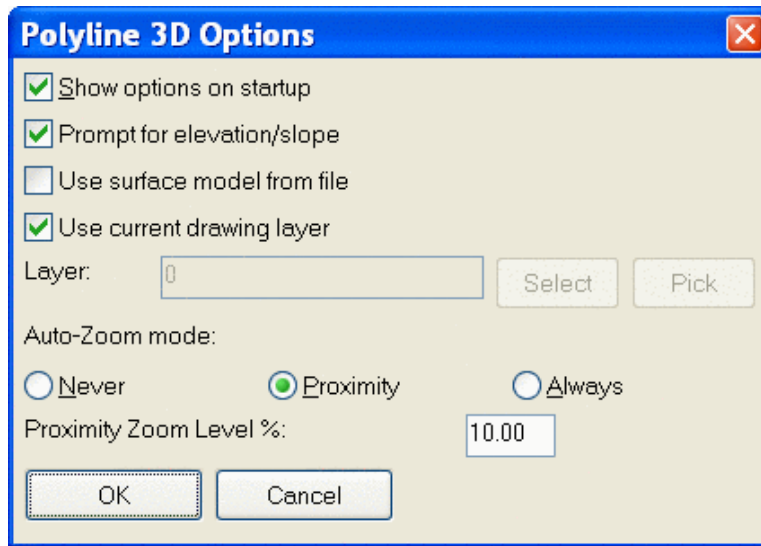
Keyboard Command: 2DP

Prerequisite: None

3D Polyline

Function

This command draws a 3D polyline.



The **Show Options on Startup** dialog will appear every time the command is run, unless this is turned off. If it is off, then the last settings will apply. To get the box back, choose O for Options.

Prompt for Elevation/Slope controls whether the elevation of each picked point will be entered in, or hit S for slope to draw a slope line.

Use Surface Model from File will use a grid or triangulation file as a surface model. Wherever the points are picked on the surface, the elevation of the surface will be assigned to the polyline.

If **Use Current Drawing Layer** is on, the layer of the new polyline will be the current layer.

If the current layer is not used, the **Layer** option allows you to **Select** from a list or **Pick** from the screen.

There are 3 options under **Auto-Zoom Mode**. Never will not zoom to the last point picked. Proximity will zoom to the percent proximity set below. Always will always zoom center on every point.

If the Proximity Auto-Zoom mode is checked, the percent of the proximity is set in the **Proximity Zoom Level%** box.

Prompts

[Continue/Extend/Follow/Options/<Pick point or point numbers>]: *pick a point*

Elevation <0.00>: 435

Z: 435.00, Hz dist: 0.00, Slope dist: 0.00, Slope: 0.0% Ratio: 0.0:1

[Arc/Direction/Close/Follow/Undo/<Pick point or point numbers>]: *pick a point*

Slope/Ratio/Interpolate/Degree/<Elevation> <0.00>: 444

Z: 444.00, Hz dist: 3.67, Slope dist: 9.72, Slope: 245.3% Ratio: 0.4:1

[Arc/Direction/Close/Extend/Follow/Undo/<Pick point or point numbers>]: *pick a point*

Slope/Ratio/Interpolate/Degree/<Elevation> <0.00>: 399

Z: 399.00, Hz dist: 3.16, Slope dist: 45.11, Slope: -1425.2% Ratio: -0.1:1

[Arc/Direction/Close/Extend/Follow/Undo/<Pick point or point numbers>]: *press Enter to end*

Pulldown Menu Location: Draw

Keyboard Command: 3DP

Prerequisite: None

Circle

Function

This command allows you to draw a circle.

Prompts

Pick center point or point number or [3P/2P/TTR]: *pick point or specify option*

Specify radius of circle or [Diameter]: *enter a value*

3P: This option draws a circle based on three points on the circumference.

2P: This option draws a circle based on two endpoints of the diameter.

TTR - Tangent, Tangent, Radius: This option draws a circle with a specified radius tangent to two objects.

Sometimes more than one circle matches the criteria specified in the command. The circle whose tangent points are closest to the selected points is drawn.

Pulldown Menu Location: Draw

Keyboard Command: SCIRCLE

Prerequisite: None

Rectangle

Function

This command creates a rectangle as a closed polyline at the specified corner points or dimensions.

Prompts

Specify first corner point or [Chamfer/Elevation/Fillet/Thickness/Width]: *pick a point*

Specify other corner point or [Dimensions]: *pick a point*

Pulldown Menu Location: Draw

Keyboard Command: rectangle

Prerequisite: None

Text, Single Line

Function

Creates a single-line text object.

You can use the DTEXT or TEXT commands to enter several lines of text that you can rotate, justify, and resize. As you type at the Enter Text prompt, the text you are typing is displayed on the screen. Each line of text is a separate object. To end a line and begin another, press Enter after entering characters at the Enter Text prompt. To end the TEXT command, press Enter without entering any characters at the Enter Text prompt.

By applying a style to the text, you can use a variety of character patterns or fonts that you can stretch, compress, make oblique, mirror, or align in a vertical column. If DTEXT or TEXT was the last command entered, pressing ENTER at the Specify Start Point of Text prompt skips the prompts for height and rotation angle and immediately displays the Enter Text prompt. The text is placed directly beneath the previous line of text. The point specified at the prompt is also stored as the Insertion Point object snap.

Prompts

Current text style: "MONO" **Text height:** 4.00

Specify start point of text or [Justify/Style]: S

The style option lets you change the textstyle on the fly

Enter style name or [?] <MONO>: STANDARD

Current text style: "STANDARD" **Text height:** 4.00

Specify start point of text or [Justify/Style]: J

The justify option lets you specify the justification for the text.

Enter an option [Align/Fit/Center/Middle/Right/TL/TC/TR/ML/MC/MR/BL/BC/BR]: BC

In this case BC = Bottom Center

Specify bottom-center point of text: pick point or enter coordinates

Specify height <4.00>: *press enter to select default or enter text height*

Specify rotation angle of text <0d0'0">: *press enter to select default or enter angle*

Enter text: Found Iron Pin

Enter text: *press enter to end*

Pulldown Menu Location: Draw

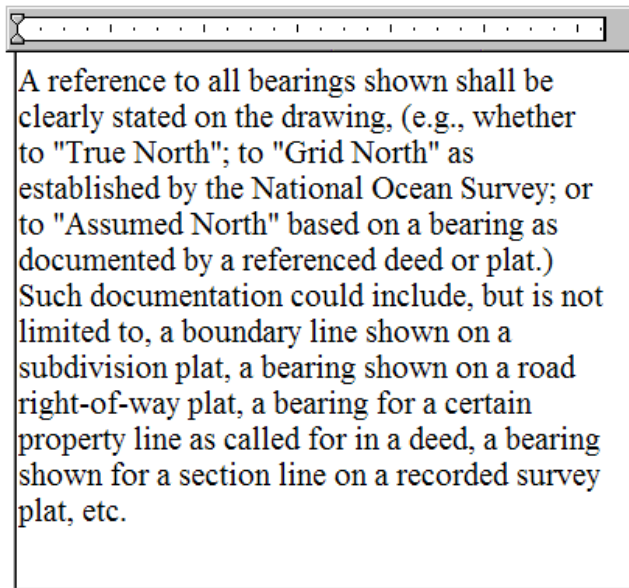
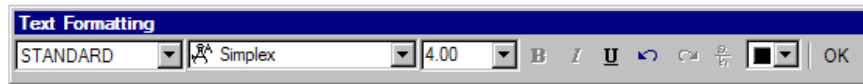
Keyboard Command: DTEXT, TEXT

Prerequisite: None

Text, Multiline

Function

MTEXT creates paragraphs that fit within a nonprinting text boundary. You create the text boundary to define the width of the paragraph. You can also specify the justification, style, height, rotation, width, color, spacing, and other text attributes using MTEXT. Each multiline text (mtext) object is a single object, regardless of the number of lines it contains. The text boundary, although not plotted, printed, or displayed, remains part of the object's framework. Note that you can specify a different text editing tool (for example, Notepad) in the Files tab of the Options dialog. See the Options command in the Settings chapter. After you specify the point for the opposite corner, the Multiline Text Editor is displayed.



Style: Applies an existing style to new or selected text. The current style (saved in the TEXTSTYLE system variable) is applied to new text.

Controls character formatting for text entered at the keyboard or imported into the Multiline Text Editor. To change the current formatting of multiline text (mtext), select the pulldown arrows you want to change. To select characters, click and drag the pointing device over the characters. To select a word, double-click the word. To select a paragraph, triple-click the paragraph.

Font: Specifies a font for new text or changes the font of selected text. TrueType® fonts are listed by font family name. AutoCAD compiled shape (SHX) fonts are listed by the name of the file in which the fonts are stored. Custom fonts or third-party fonts are substituted with Autodesk-supplied proxy fonts. A custom SHX font is available for character formatting overrides only if it is defined for a text style in the drawing. A sample drawing (truetype.dwg) showing the character map for each font is provided in the autocad 2002/sample directory.

Height: Sets the character height in drawing units. Each multiline text object can contain characters of varying multiline text heights. All heights used in the current session of AutoCAD are listed in the height box. However, when editing text, you can enter a new height in addition to those listed. The default value for the text height is based on the current style. If the height for the style is 0, the value is based on the value stored in the TEXTSIZE system variable. A multiline text object can contain characters of various heights. The text displayed in the text editor is scaled in proportion to the text height. For example, if the style of the character has a current height of 2 inches, and you change the value to 1 inch, the text in the dialog box changes from its default size of 16 points to 8 points. Dialog box text is displayed at a minimum size of 4 points and a maximum size of 100 points. Text that is proportionally larger or smaller may cause word wrapping to be displayed incorrectly.

Bold: Turns on and off bold formatting for new or selected text. This option is available only for characters using TrueType fonts.

Italic: Turns on and off italic formatting for new or selected text. This option is available only for characters using TrueType fonts.

Underline: Turns on and off underlining for new or selected text.

Undo: Undoes the last editing action in the Multiline Text Editor, including changes to either text content or text formatting. You can undo the most recent change made by pressing CTRL+Z.

Redo:

Stack: Turns on and off stacking for selected text. To create stacked text, use a carat (^), forward slash (/), or pound sign (#) character between the characters you want stacked. Text to the left of the character is stacked on top of the text to the right of the character. Select the text to be stacked and then choose the Stack button.

Text Color: Specifies a color for new text or changes the color of selected text. You can assign text the color associated with the layer it is on (BYLAYER) or the color of the block it is contained in (BYBLOCK). You can also choose one of the colors in the color list or choose Other to open the Select Color dialog box.

By default, text that contains a carat converts to left-justified tolerance values. Text that contains the forward slash converts to center-justified fractional numbers; the slash is converted to a horizontal bar the length of the longer text string. Text that contains the pound sign converts to a fraction separated by a diagonal bar the height of the two text strings. The characters above the diagonal fraction bar are bottom-right aligned; the characters beneath the diagonal bar are top-left aligned. To unstack stacked text, select it and choose the Stack button. To edit stacked text, or change the stack type, alignment, and size, select the stacked text, right-click, and choose Properties. The Stack Properties dialog box is displayed.



Appears when you right-click in editor or on text

Right-clicking anywhere in the Multiline Text Editor displays a shortcut menu. The first few options on the shortcut menu are basic editing options. The following options are specific to the Multiline Text Editor.

Justification: Sets justification and alignment for new or selected text. The current setting (Top Left, by default) is applied to new text. Spaces entered at the end of a line are included as part of the text and affect the justification of the line. Text is center-, left-, or right-justified with respect to the left and right text boundaries. Text is middle-, top-, or bottom-aligned with respect to the top and bottom text boundaries.

Change Case: Changes the case of selected text. Options are Uppercase or Lowercase.

AutoCAPS: Converts all newly typed and imported text to uppercase. AutoCAPS does not affect existing text. To turn AutoCAPS on or off, double-click the AutoCAPS control, located at the bottom of the Multiline Text Editor. To change the case of existing text, select the text, right-click, and choose Change Case from the shortcut menu.

Remove Formatting: Removes bold, italic, or underline formatting applied to selected text.

Combine Paragraphs: Combines selected paragraphs into a single paragraph.

Symbol: Inserts a listed symbol or nonbreaking space at the cursor position. Symbols can also be inserted manually. See Unicode Strings, Control Codes, and Special Characters.

Import Text:

Stack: Stacks text if any of the stack characters are contained in the selected text. This option appears on the shortcut menu only if a stack character is contained in the selected text.

Unstack: Unstacks text if stacked text is selected. This option appears on the shortcut menu only if stacked text is contained in the selected text.

Choosing Other in the Symbols list displays the Character Map dialog box, which contains the entire character set for the current font. To insert a character from the dialog box, select it and choose Select. Select all the characters you want to use and then choose Copy. Right-click in the Multiline Text Editor and choose Paste from the shortcut menu. The circle diameter dimensioning symbol appears as %%c in the Multiline Text Editor but converts to the special character in your drawing.

Character formatting for font, height, and bold or italic attributes is overridden if you apply a new style to an existing multiline text object. Stacking, underlining, and color attributes are retained in characters to which a new style is applied.

Styles that have backward or upside-down effects are not applied. If a style defined with a vertical effect is applied to an SHX font, the text is displayed horizontally in the Multiline Text Editor.

Width: Applies a specified paragraph width to new or selected text. If you select the No Wrap option, the resulting mtext object appears on a single line. The width of individual characters is not affected by this option.

Rotation: Sets the rotation angle for the text boundary in the current unit of angle measurement (degrees, radians, or grads).

The Multiline Text Editor automatically sets the text color to BYLAYER. When black characters are inserted and the background color is black, the Multiline Text Editor automatically changes to white or the current color. If AutoCAPS is on, imported text is capitalized.

Pulldown Menu Location: Draw

Keyboard Command: MTEXT

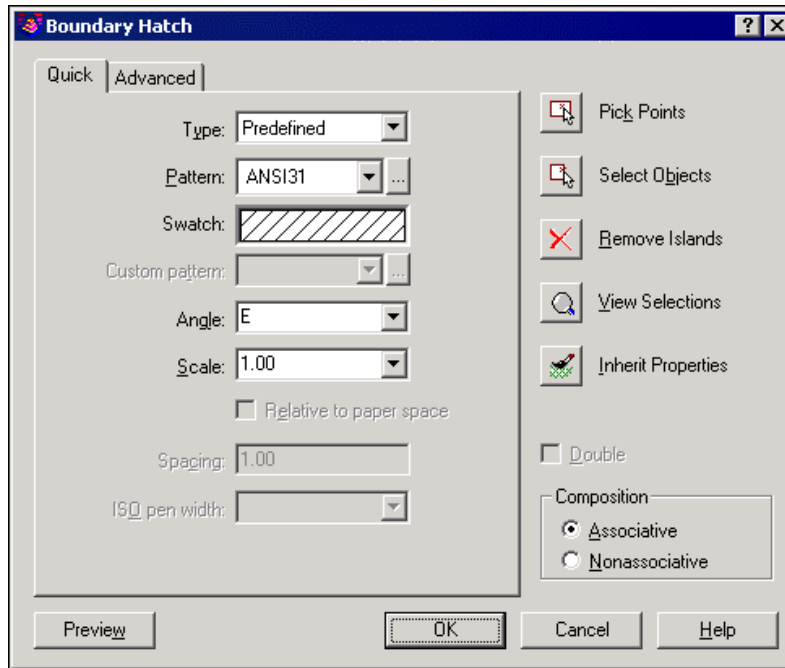
Prerequisite: None

Hatch

Function

This command allows you to fill an enclosed area or selected objects with a hatch pattern.

The Hatch command first defines the boundaries of the area you want to hatch, either by computing a region or polyline boundary from a specified point within an enclosed area, or by using selected objects as boundaries. It then fills the boundaries with a hatch pattern or a solid color. You can create an associative hatch, which updates when its boundaries are modified, or a nonassociative hatch, which is independent of its boundaries. You can preview any hatch and adjust the definition. Due to the large number of combinations of geometry that you can hatch, editing hatched geometry can produce unexpected results. In this event, delete the hatch object and rehatch.



The Boundary Hatch dialog box defines the boundary, pattern type, pattern properties, and attributes for hatch objects. Use the Quick Tab to work with hatch patterns and quickly create a hatch. Use the Advanced Tab to customize how Carlson Survey creates and hatches boundaries.

Under the Quick Tab you define the appearance of the hatch pattern to be applied.

Type: This field sets the pattern type.

Pattern: This field lists the available predefined patterns. The six most recently used predefined patterns appear at the top of the list. The Pattern option is available only if you set Type to Predefined.

[...]: This button displays the Hatch Pattern Palette dialog box, in which you can view preview images for all predefined patterns at once to help you make a selection.

Swatch: This field displays a preview of the selected pattern. You can click the swatch to display the Hatch Pattern Palette dialog box.

Custom Pattern: This field lists the available custom patterns. The six most-recently used custom patterns appear at the top of the list. The Custom Pattern option is available only if you set Type to Custom.

Angle: This field specifies an angle for the hatch pattern relative to the X axis of the current UCS.

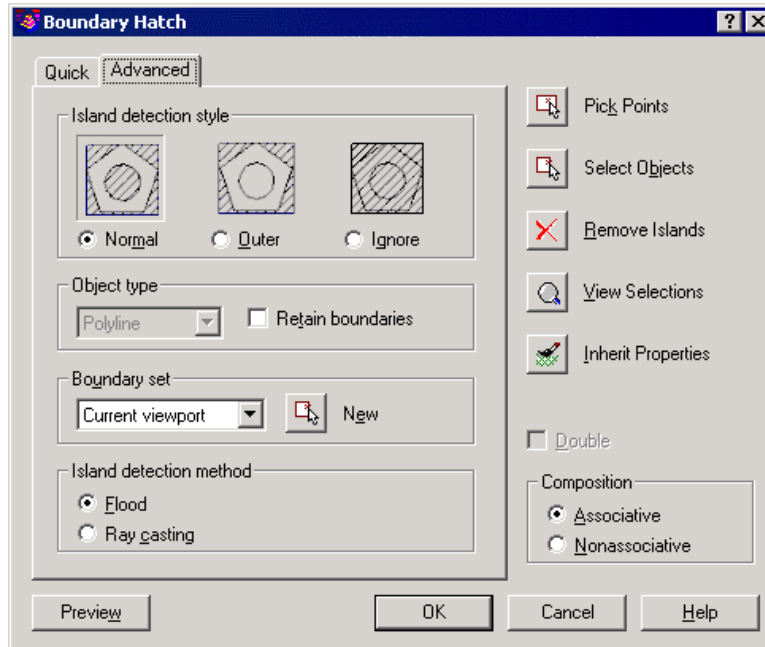
Scale: This option expands or contracts a predefined or custom pattern. This option is available only if you set Type to Predefined or Custom.

Relative to Paper Space: This option scales the hatch pattern relative to paper space units. Using this option, you can easily display hatch patterns at a scale that is appropriate for your layout. This option is available only from a layout.

Spacing: This option specifies the spacing of lines in a user-defined pattern. This option is available only if you set Type to User Defined.

ISO Pen Width: This option scales an ISO predefined pattern based on the pen width you choose. This option is available only if you set Type to Predefined and set Pattern to one of the available ISO patterns.

Under the Advanced Tab you define how Carlson Survey creates and hatches boundaries.

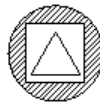


Island Detection Style: This option allows you to specify the method for hatching objects within the outermost hatch boundary. If no internal boundaries exist, specifying an Island Detection style has no effect. Because you can define a precise set of boundaries, it's often best to use the Normal style. The illustrations that accompany each style show how the program hatches a group of three nested boundary objects in each case.



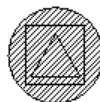
Normal

Hatches inward from the outer boundary. If the program encounters an internal intersection, it turns off hatching until it encounters another intersection. Thus, areas separated from the outside of the hatched area by an odd number of intersections are hatched, and areas separated by an even number of intersections are not.



Outer

Hatches inward from the outer boundary. The program turns hatching off if it encounters an internal intersection. Because this process starts from both ends of each hatch line, the program hatches only the outermost level of the structure and leaves the internal structure blank.



Ignore

The Ignore style ignores all internal objects and hatches through them.

Hatching concave curves with the Outer and Ignore styles can cause hatching discrepancies. The Normal, Outer, and Ignore options are also available from a shortcut menu by right-clicking in the drawing area while you specify

points or select objects to define your boundaries.

Object Type: This option allows you to specify whether to retain boundaries as objects, and specifies the object type Carlson Survey applies to those boundary objects. Object Type controls the type of the new boundary object. Carlson Survey creates the boundary as a region or a polyline. This option is available only if you select Retain Boundaries.

Retain Boundaries: This option adds the temporary boundary objects to the drawing.

Boundary Set: This field defines the set of objects Carlson Survey analyzes when defining a boundary from a specified point. The selected boundary set has no effect when you use Select Objects to define a boundary. By default, when you use Pick Points to define a boundary, the program analyzes all objects visible in the current viewport. By redefining the boundary set, you can disregard certain objects when defining boundaries without having to hide or remove those objects. For large drawings, redefining the boundary set can also produce the boundary faster because the program examines fewer objects.

New: This option prompts you to select the objects that define the boundary set. When you choose this option, the dialog box temporarily closes, prompting you to select objects. Carlson Survey includes only the hatchable objects you select when it constructs the new boundary set. Carlson Survey discards any existing boundary set, replacing it with the new boundary set defined by the objects you select. If you don't select any hatchable objects, the program retains any current set. Until you exit the Hatch command or create a new boundary set, Carlson Survey ignores objects that do not exist in the boundary set when you define your boundaries using Pick Points.

Island Detection Method: This option allows you to specify whether to include objects within the outermost boundary as boundary objects. These internal objects are known as islands.

Flood: This option includes islands as boundary objects.

Ray Casting: This option runs a line from the point you specify to the nearest object and then traces the boundary in a counterclockwise direction, thus excluding islands as boundary objects.

In the Boundary Hatch dialog box, you set the options that define the selection set.

Pick Points: This option determines a boundary from existing objects that form an enclosed area. How Carlson Survey detects objects using this option depends on the selected Island Detection Method on the Advanced tab. For example, if the Island Detection Method is Flood, the program detects objects within the outermost boundary as islands and includes them in the boundary definition. The Island Detection Style (which you also set on the Advanced tab) then determines how to hatch the detected islands. When you choose Pick Points, the dialog box closes temporarily, and the program prompts for point specification.

Select Objects: This option allows you to select specific objects for hatching. The dialog box closes temporarily, and the program prompts you for object selection. When you define your boundaries using Select Objects, the program does not detect interior objects automatically. You must select the objects within the selected boundary to hatch those objects according to the current Island Detection Style (which you set on the Advanced tab). Each time you choose Select Objects, the program clears the previous selection set. While selecting objects, you can right-click at any time in the drawing area to display a shortcut menu. You can undo the last or all selections, change the selection method, change the island detection style, or preview the hatch.

Remove Islands: This option removes from the boundary definition any of the objects that the program detects as islands when you use Pick Points. You cannot remove the outer boundary.

View Selections: This option temporarily dismisses the dialog box and displays the currently defined boundaries with the hatch settings that you last previewed. This option is unavailable when you have not yet specified points or selected objects.

Inherit Properties: This option hatches specified boundaries using the hatch properties of one object. After selecting the associative hatch object whose properties you want the hatch to inherit, you can right-click in the drawing

area and use the shortcut menu to toggle between the Select Objects and Pick Internal Point options to create boundaries.

Double: For user-defined patterns, this option draws a second set of lines positioned at 90 degrees to the original lines, creating a crosshatch. This option is available only if you set Type to User Defined on the Quick tab.

Associative: This option creates an associative hatch, meaning that the hatch is updated when you modify its boundaries.

Nonassociative: This option creates a nonassociative hatch, meaning that it is independent of its boundaries.

Preview: This option temporarily dismisses the dialog box and displays the currently defined boundaries with the current hatch settings. This option is not available when you have not yet specified points or selected objects to define your boundaries.

Pulldown Menu Location: Draw

Keyboard Command: BHATCH

Prerequisite: None

Curves

2 Tangents, Radius

Function

This command fits a curve between two tangent lines by entering a known radius. It prompts for the radius and then prompts to pick points on the two tangent lines.

Prompts

Radius of Arc <300.000>: *press Enter*

[nea] Pick Point on 1st Tangent Line: *pick a point*

[nea] Pick Point on 2nd Tangent Line: *pick a point*

Pulldown Menu Location: Draw > Curves

Keyboard Command: 2tanlin

Prerequisite: Tangent lines should be drawn before execution

2 Tangents, Arc Length

Function

This command fits a curve between two tangent lines and a known arc length. It prompts for the arc length then pick the P.I. (intersection of tangent lines) and points on the two tangent lines.

Prompts

Arc Length <100.00>: *press Enter or enter distance*

[int on] Pick P.I. of curve: *pick intersection of tangent lines*

[nea on] Pick pnt on 1st Tangent Line: *pick a point*

[nea on] Pick pnt on 2nd Tangent Line: *pick a point*

Pulldown Menu Location: Draw > Curves

Keyboard Command: 2tanlal

Prerequisite: Tangent lines should be drawn before execution

2 Tangents, Chord Length

Function

This command fits a curve between two tangent lines and a known chord length. It prompts for the chord length, the P.I. and points on the two tangent lines.

Prompts

Chord Length <100.00>: *press Enter*

[int on] Pick P.I. of curve: *pick a point*

[nea on] Pick Point on 1st Tangent Line: *pick a point*

[nea on] Pick Point on 2nd Tangent Line: *pick a point*

Pulldown Menu Location: Draw > Curves

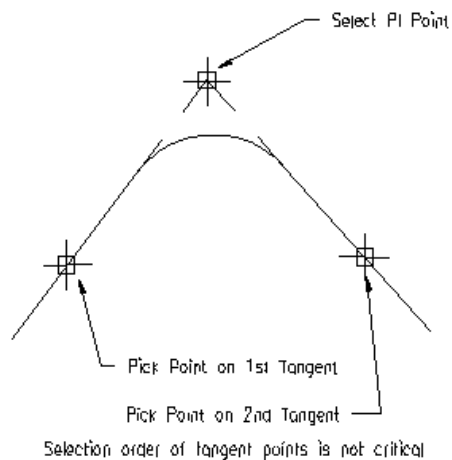
Keyboard Command: 2tanlcl

Prerequisite: Tangent lines should be drawn before execution

2 Tangents, Mid-Ordinate

Function

This command fits a curve between two tangent lines and a known middle ordinate. It prompts for the middle ordinate length, the Point of Intersection and points on the two tangent lines.



Prompts

Middle Ordinate <50.00>: *press Enter*

[int on] Pick P.I. of curve: *pick a point*

[nea on] Pick Point on 1st Tangent Line: *pick a point*

[nea on] Pick Point on 2nd Tangent Line: *pick a point*

Pulldown Menu Location: Draw > Curves

Keyboard Command: 2tanlmo

Prerequisite: Tangent lines should be drawn before execution

2 Tangents, External

Function

This command fits a curve between two tangent lines and a known external secant distance. It prompts for the P.I. and points on the two tangent lines then the external distance.

Prompts

[int on] Pick P.I. of curve: *pick a point*

[nea on] Pick Point on 1st Tangent Line: *pick a point*

[nea on] Pick Point on 2nd Tangent Line: *pick a point*

External Distance <50.00>: *press Enter*

Pulldown Menu Location: Design > Curves

Keyboard Command: 2tanlex

Prerequisite: Tangent lines should be drawn before execution

2 Tangents, Tangent Length

Function

This command fits a curve between two tangent lines and a known curve tangent length. It prompts for the tangent length, P.I. and points on the two tangent lines.

Prompts

Tangent Length <50.00>: *press Enter*

[int on] Pick P.I. of curve: *pick a point*

[nea on] Pick Point on 1st Tangent Line: *pick a point*

[nea on] Pick Point on 2nd Tangent Line: *pick a point*

Pulldown Menu Location: Draw > Curves

Keyboard Command: 2tanltl

Prerequisite: Tangent lines should be drawn before execution

2 Tangents, Degree of Curve

Function

This command fits a curve between two tangent lines by entering a known degree of curve. It prompts for the degree of curve and then prompts to pick points on the two tangent lines.

Prompts

Degree of Curve (ddd.mmss) <5.0000>: *press Enter*

Define by [C]hord or [A]rc length <A>: *press Enter*

[nea on] Pick Point on 1st Tangent Line: *pick a point*

[nea on] Pick Point on 2nd Tangent Line: *pick a point*

Pulldown Menu Location: Draw > Curves

Keyboard Command: 2tanldo

Prerequisite: Tangent lines should be drawn before execution

Tang, PC, Radius, Arc Length

Function

This command draws a curve from a perpendicular tangent line with a known radius and arc length. It prompts for the radius, the arc length and then to pick the P.C. start point of the curve (endpoint of previously drawn tangent line) and a point along the tangent line.

Prompts

Precede radius with - sign for curve to the right.

Radius of Arc <15.00>: *55*

Arc Length <25.00>: *30*

PC Start Point ?

Pick point/<point Number>: *14*

PtNo. North(y) East(x) Elev(z) Desc

14 4869.06 4390.3 10.00

[nea on] Pick point along perpendicular tangent line: *pick a point on tangent line*

Radius Point Coordinates: (4355.2 4911.4 0.0)

Pulldown Menu Location: Draw > Curves

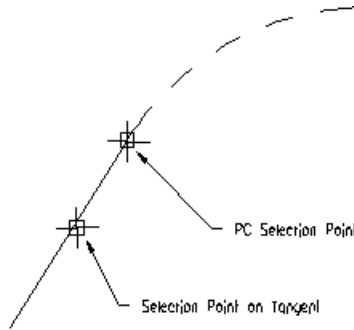
Keyboard Command: sral

Prerequisite: Tangent lines should be drawn before execution

Tang, PC, Radius, Tang Length

Function

This command draws a curve from a perpendicular tangent line with a known radius and tangent length. It prompts for the radius, the tangent length and then to pick the P.C. start point of the curve and a point along the tangent line.



Prompts

Precede radius with - sign for curve to the right.

Radius of Arc <300.0000>: *press Enter*

Tangent Length <236.0000>: *press Enter*

PC Start Point ?

Pick point or point number: *pick a point*

[nea on] Pick point along perpendicular tangent line: *pick a point*

(5270.39 4840.36 0.0)

Radius Point Coordinates: (5251.37 4534.71 0.0)

Pulldown Menu Location: Draw > Curves

Keyboard Command: srl

Prerequisite: Tangent lines should be drawn before execution

Tang, PC, Radius, Chord Length

Function

This command draws a curve from a perpendicular tangent line with a known radius and chord length. It prompts for the radius, the chord length and then to pick the P.C. start point of the curve and a point along the tangent line.

Prompts

Precede radius with - sign for curve to the right.

Radius of Arc <300.0000>: *press Enter*

Chord Length <25.0000>: *press Enter*

PC Start Point ?

Pick point or point number: *pick a point*

[nea on] Pick point along perpendicular tangent line: *pick a point*

(5142.38 4911.57 0.0)

Radius Point Coordinates: (5221.51 5209.63 0.0)

Pulldown Menu Location: Draw > Curves

Keyboard Command: SRCL

Prerequisite: Tangent lines should be drawn before execution

Tang, PC, Radius, Delta Angle

Function

This command draws a curve from a perpendicular tangent line with a known radius and delta angle. It prompts for the radius, the delta angle and then to pick the P.C. start point of the curve and a point along the tangent line.

Prompts

Precede radius with - sign for curve to the right.

Radius of Arc <300.00>: *press Enter*

Enter Delta Angle <90.00>: *press Enter*

PC Start Point ?

Number/<Pick point>: *pick a point*

[nea on] Pick point along perpendicular tangent line: *pick a point*

Pulldown Menu Location: Draw > Curves

Keyboard Command: srda

Prerequisite: Tangent lines should be drawn before execution

3 Point Curve

Function

This command draws an arc between three points. The first point is the PC, the second is a point on the arc and the third is the PT. The points can either be picked on-screen or specified by point number.

Prompts

Pick PC point or point numbers: *101* (For point number 101.)

Pick Second point or point number: *102*

Pick PT point or point number: *103*

Pulldown Menu Location: Draw > Curves

Keyboard Command: 3PA

Prerequisite: None

PC, PT, Radius Point

Function

This command draws an arc between the PC point, radius point and PT point. The points can either be picked on-screen or specified by point number. Given these points, the arc can be drawn clockwise or counterclockwise. The program shows one direction and asks if it is correct. If you need the arc to go the other direction, enter No.

Prompts

Pick PC point or point number: 101
Pick Radius point or point number: 102
Pick PT point or point number: 103
Is the direction of this arc correct ? No/<Yes>: N

Pulldown Menu Location: Draw > Curves
Keyboard Command: pca
Prerequisite: None

PC, Radius, Chord

Function

This command draws an arc, given the PC point, radius length, chord length and chord bearing. The PC point can either be picked on-screen or specified by point number. Given these points, the arc can be drawn clockwise or counter-clockwise. The program shows one direction and asks if it is correct. If you need the arc to go the other direction, enter No.

Prompts

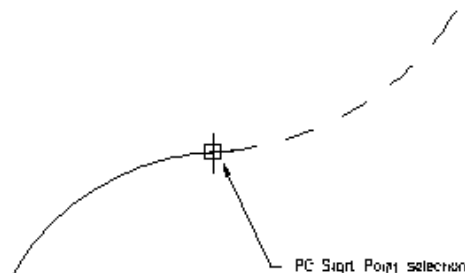
Radius of Arc <-40.00>: 500
PC Start Point ?
Pick point or point number: *pick a point*
Chord bearing or chord endpoint (<Bearing>/Point)? *Press Enter*
Enter Bearing (Qdd.mmss) <90.0000>: 145.1041 (for NE 45d10'41")
Chord Length <200.46>: 200
Is this arc in the correct direction (<Yes>/No)? *Press Enter*

Pulldown Menu Location: Draw > Curves
Keyboard Command: srcb
Prerequisite: None

Compound or Reverse

Function

This command draws a reverse or compound curve off an existing curve. It prompts whether the curve is reverse or compound, for the P.C. start point (endpoint of an existing arc) and the known radius. Then the user selects the other known from the choices of tangent length, arc length, chord length or delta angle and enters that value. This command can be confused and malfunction if there is another entity such as a point symbol at the P.C. (If this happens, freeze the PNTMARK layer or temporarily erase the point symbol.)



Prompts

[end on] Select ARC at PC Start point of the curve: *pick a point*

Type of curve [<Compound>/Reverse]: *press Enter*

Enter the Radius: *300*

Define arc method [Tangent/Chord/Delta/<Length>]: *press Enter*

Enter the arc length: *236*

Pulldown Menu Location: Draw > Curves

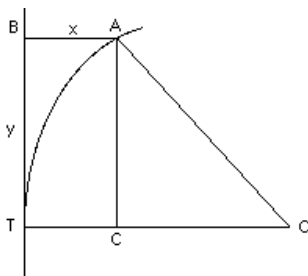
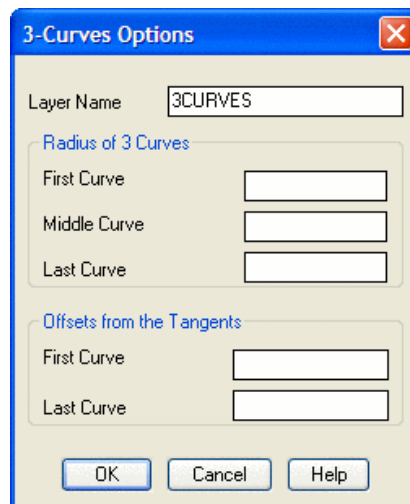
Keyboard Command: srcr

Prerequisite: Tangent arc should be drawn before execution

3-Radius Curve Series

Function

This command is used to best fit a series of three curves with different radii between 2 tangents. The "Offsets from the Tangents" is the distance perpendicular to the tangent from both ends of the second curve.



Offset from the tangents is the x value

Prompts

Please pick two tangents...

Pick first tangent: *pick a point*

Pick second tangent: *pick a point*

Pulldown Menu Location: Draw > Curves

Keyboard Command: 3curves

Prerequisite: Two tangents

Extend Arc

Function

This command extends an ARC entity.

Prompts

Pick arc to extend: *select an ARC entity*

Break Arc at Extension [Yes/<No>]? *N* Answering *Yes* will create a new arc starting at the end of the existing arc.

Enter or pick the distance to extend: *5* This extends the arc 5 units

Enter or pick the distance to extend ('U' to Undo): *press Enter to end*

Pulldown Menu Location: Draw > Curves

Keyboard Command: extarc

Prerequisite: An arc

Best Fit Curve

Function

This command draws an arc between two endpoints with a radius that is derived from sampling points and averaging the radius of an arc that passes through these points.

Prompts

Starting Point ?

Pick point or point number: *pick a point*

Ending point ?

Pick point or point number: *pick a point*

Select points from screen or by point number [<Screen>/Number]: *press Enter*

Select Points to sample.

Select objects: *W* Use window to select a group of points. After selecting all the points to sample, end selection by pressing Enter.

Pulldown Menu Location: Draw > Curves

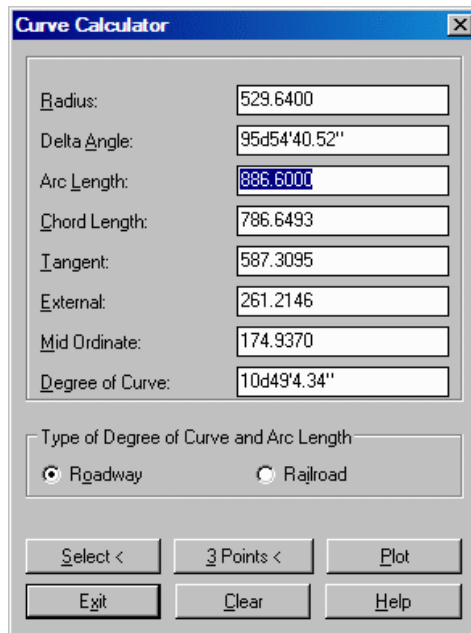
Keyboard Command: bfitcrv

Prerequisite: Points for sampling should be drawn before execution.

Curve Calc

Function

This curve calculator command displays a dialog box with a series of edit boxes that are filled in with the values of a curve. You can input two known values and the program calculates the other values. One of the known values must be the radius or the delta angle. The 3 Points option allows you to simply select three on-screen point location. All field will immediately be filled in after the picking of the third point. Optionally, you can also input point numbers from a coordinate file.



Roadway or Railroad: Allows you to choose which type of curve you would like information on. Toggling between the two, after data is entered, will reveal different values.

Select: Allows you to select an arc from the drawing. The information for the selected arc is displayed in the dialog box.

3 Points: Allows you to specify 3 points on the screen to define an arc. The information for this defined arc is displayed in the dialog box.

Plot: Allows you to plot the currently defined arc in the drawing. See the prompts below.

Clear: Clears all edit boxes in the dialog.

Prompts

Curve Calculator dialog *Enter at least two values, as described above*

The above dialog box graphic is a result of entering in the radius and the arc length values of a known curve.

Pulldown Menu Location: Draw > Curves

Keyboard Command: curvcalc

Prerequisite: None

Spiral Curve

Function

This command plots a spiral curve. The user must provide the P.I. (point of intersection), the length of spiral and the radius length of the simple curve. The command will plot a symmetrical spiral or a spiral in or spiral out (choose the S option for the first prompt if you only want to plot a spiral out). If you have an unsymmetrical spiral then plot a spiral in using the T or P option then use the S option to plot the spiral out. The command plots a polyline to represent the spiral as line segments at the resolution specified by the user. You can use the *Calculate Offsets*, *Station Polyline* or *Offset Point Entry* to calculate points and/or stations and offsets from the spiral.

Prompts

Spiral method [TS/ST/<PI>] *press Enter*

PI Point ?

Pick point or point number: *pick intersection of tangent lines*

TS Direction point (tangent in) ?

Pick point or point number: *pick point along tangent in line*

ST Direction point (tangent out) ?

Pick point or point number: *pick point along tangent out line*

Tangent in direction= N 56d24'9" E **Azimuth=** 56d24'9"

Tangent out direction= S 65d9'1" E **Azimuth=** 114d50'59"

Overall Delta= 58d26'50"

Point calculating distance resolution <10.0>: *press Enter*

Length of Spiral <350.0>: *press Enter*

Radius of simple curve (precede with - sign if curve to left) <954.93>: 954.93

Degree of curve: 6d0'0"

Theta of Spiral= 0.18325951 (radians) 10d30'0" (dd.mmss)

Distance along tangent line from TS to SC= 348.82

Distance offset from tangent line to SC= 21.33

(k) Shift along tangent line of PC= 174.80

(p) Shift offset from tangent line of PC= 5.34

Distance from PI to TS= 712.00

North(Y) of TS= 4583.08 **East(X) of TS=** 4244.46

North(Y) of SC= 4758.34 **East(X) of SC=** 4546.82

North(Y) of Offset PC= 4675.36 **East(X) of Offset PC=** 4393.02

[P]lot spiral or

[I]ntermediate distances for staking (deflection angle calc) <P>: *press Enter*

Point calculating distance resolution <10.0>: 5 *Enter the resolution at which you would like the line segments of the representative polyline plotted.*

North(Y) of Radius Pt= 3879.96 **East(X) of Radius Pt=** 4921.44

<press [Enter] for symmetrical spiral out>/[D]elta of simple curve: *press Enter* *If you want a spiral in only enter D then input the delta angle of the curve.*

Simple Curve Delta= 37d26'50" **Length of Arc=** 624.12

North(Y) of CS= 4805.10 **East(X) of CS=** 5158.11

Pulldown Menu Location: Draw > Curves

Keyboard Command: spiral

Prerequisite: For a symmetrical spiral, draw the tangent in and tangent out lines. For spiral in or out only, draw the tangent line in or out.

Draw By Example

Function

This command prompts you to pick an entity and then starts the appropriate draw command to begin creating another one of the selected type of entity. The properties such as layer and color of the original entity are used for creating the new one. For example, if you pick a polyline, this command will start the *Pline* command. Likewise if you pick text, this command will begin the *Text* command using the layer and style of the selected text.

Prompts

Pick Object for Command: *pick an entity*

The remaining prompts depend on the type of the selected entity.

Pulldown Menu Location: Draw

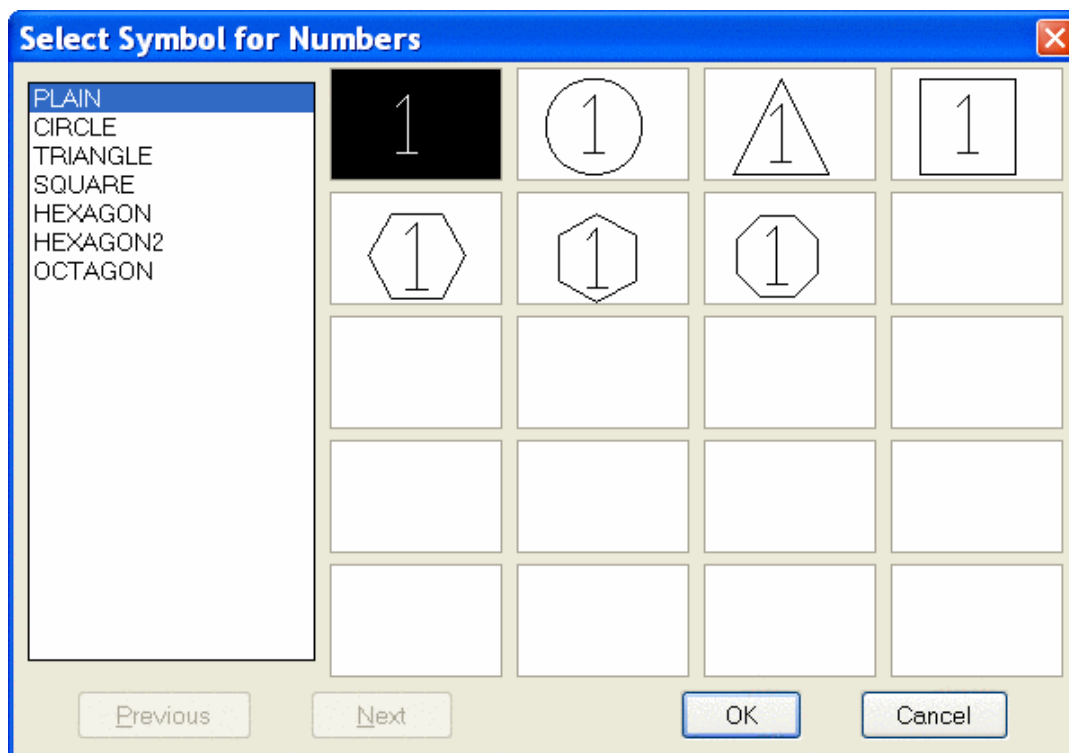
Keyboard Command: drawbyex

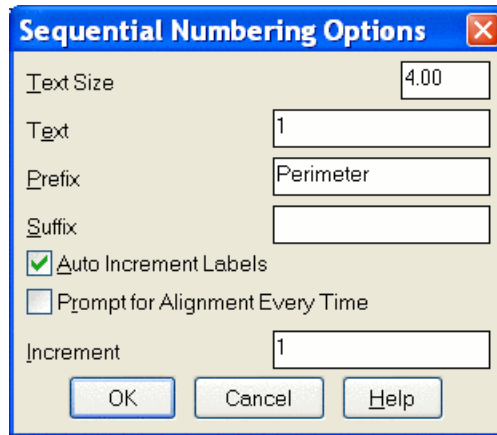
Prerequisite: Entities

Sequential Numbers

Function

This command draws a text label the increments to the next value for additional labels. It can be optionally inside a circle, square, or other symbol. The size of the symbol adjusts to fit the label size. First, pick one of the seven formats.





Specify the **Text Size** (height). Defaults to size set in *Drawing Setup*.

Specify the **Text** label.

Specify an optional text **Prefix**.

Specify an optional text **Suffix**.

When **Auto Increment Labels** is checked, the value entered in the Text field will be incremented by the value in the Increment field.

When **Prompt for Alignment Every Time** is checked, you will be prompted for the alignment angle for each label, otherwise the alignment from the first label is automatically used for the other labels.

If Auto Increment Labels is checked, Text value is incremented by the **Increment** value.

The label is drawn by combining the Prefix, Text and then Suffix into one text label. When placing multiple labels, the text portion of the label will increment by the value in the Increment field. For example, this command could be used to quickly label a series of boundaries by setting the Prefix to "Perimeter" and the Text field to the starting number. Then pick points inside the boundaries to label as "Perimeter 1", "Perimeter 2", etc.

Prompts

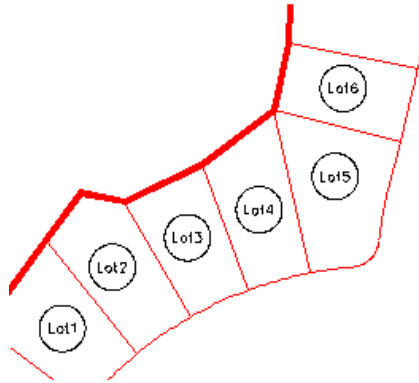
Symbol Selection dialog

Sequential Numbers Options dialog

Pick point at beginning of label: *pick a point*

Pick point for label alignment: *pick a point to the right of the first point*

Pick point at beginning of label: *press Enter to end the routine*



Pulldown Menu Location: Draw

Keyboard Command: numbers

Prerequisite: None

Arrowhead

Function

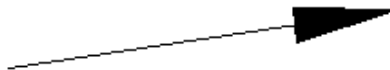
This command draws an arrowhead at the end of the selected line or polyline.

Prompts

Enter the arrow size <5.00>: *press Enter*

Pick a line or pline to add arrow: *pick a line or polyline*

Pick a line or pline to add arrow (Enter to End): *press Enter*



Pulldown Menu Location: Draw

Keyboard Command: arrowhd

Prerequisite: None

Curve - Arrow

Function

Curve - Arrow can be used to draw a section of contour line or create leader pointer lines. Curve - Arrow draws a Bezier curve through user specified points. After choosing endpoints, each time an intermediate points is picked the curve will be redrawn through all the points. There is an option to draw an arrowhead at the starting point. The arrowhead size is determined by the AutoCAD system variable "DIMASZ". In order to change this size, type DIMASZ at the AutoCAD command prompt. This routine also has a Zorro option which creates a Z leader curve.

Prompts

Do the zorro (Yes/<No>)? *N*

Include an arrow (Yes/<No>)? *Y*

Enter the arrow head size <4.00>: *press Enter* This defaults to the DIMASZ system variable.

Pick a starting point: *pick a point*

Pick an ending point: *pick a point*

Pick an intermediate point (U to Undo): *pick a point*

Pick an intermediate point (U to Undo): *press Enter*



Examples of Curve - Arrow

Pulldown Menu Location: Draw

Keyboard Command: carrow

Prerequisite: None

Boundary Polyline

Function

This is a streamlined analog of the AutoCAD command *Boundary*. The Carlson Survey version is faster and works in many cases where *Boundary* fails. *Boundary Polyline* supports a snap tolerance, which means that you may specify a maximum gap to close when creating a closed polyline.

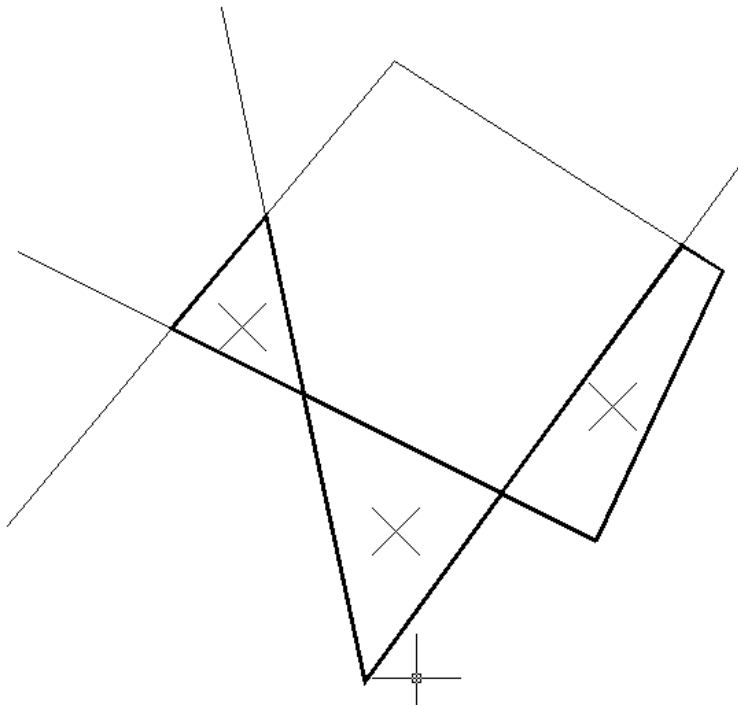
To create closed polylines from any existing linework, simply select all entities you would like to use and specify desired snap tolerance. Then click inside openings you would like to trace and the routine will generate corresponding closed polylines. The duplicate polylines are detected and not created, so that clicking more than once in the same area does not change anything. These new polylines are always created in the current layer. Layers of the original linework do not matter.

Prompts

Select polylines: *pick an entities to be used*

Enter snap tolerance or press Enter for none:

Pick an internal point: *pick the points to enclose*



These three polylines are created from original linework by clicking at shown locations

Pulldown Menu Location: Draw

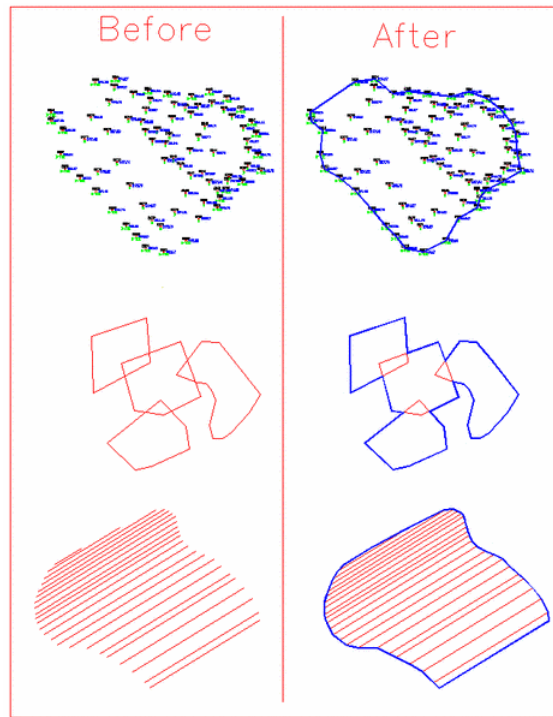
Keyboard Command: boundpl

Prerequisite: Entities

Shrink-Wrap Entities

Function

This command creates a closed polyline which encloses a given set of entities. The resulting polyline is created in the current layer. The program works on either point entities or polylines. For points, the program creates a closed polyline through the points around the perimeter of the area defined by the points. For polylines, the shrink-wrap polyline follows the outside border of the selected polylines. The polylines that are processed have to be connected to be shrink-wrapped. The snap tolerance is the maximum gap that will be joined to make the closed polyline. For open polylines, as in the bottom figure, the Gap method works better, as it jumps across the gaps and connects the end points.



Prompts

Shrink-wrap across gaps or bounded linework only [<Gap>/Bound]? *G*

Shrink-wrap layer <FINAL>:

Select points and linework to shrink-wrap.

Select objects: *select entities to process*

Reading points... 46

Inserted 46 points.

Inserted 23 breakline segments

Perimeter reduction level 0-3 (0=None, 3=Most) <2>: 2

Reduce Perimeter Pass: 1 Removed: 5

Reduce Perimeter Pass: 2 Removed: 3

Reduce Perimeter Pass: 3 Removed: 4

Reduce Perimeter Pass: 4 Removed: 2

Reduce Perimeter Pass: 5 Removed: 1

Reduce Perimeter Pass: 6 Removed: 0

Create 2D or 3D Polyline [<2D>/3D]? *2D*

Pulldown Menu Location: Draw

Keyboard Command: swplines

Prerequisite: Entities

Polyline by Nearest Found

Function

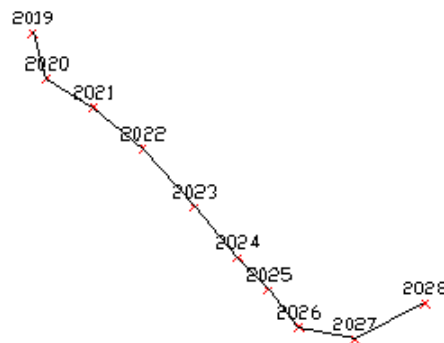
This command draws a polyline by connecting points using a nearest found method. The points to connect can be specified either by entering point numbers or picking POINT entities on the screen. The nearest found method draws a polyline by starting at one of the points and then connecting to the closest of the remaining points. Then a remaining point that is closest to one of the polyline end points is added until all points are part of the polyline.

Prompts

Select point from screen or by point number (<Screen>/Number)? *press Enter*

Select points.

Select objects: *pick points*



Pulldown Menu Location: Draw

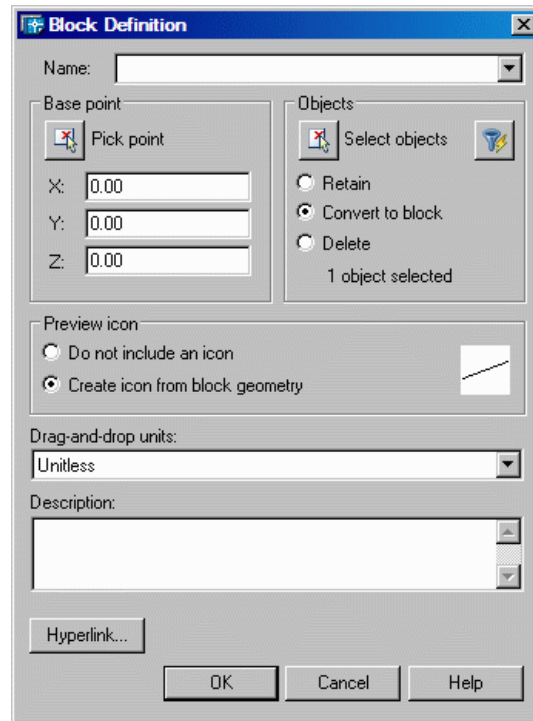
Keyboard Command: plnear

Prerequisite: None

Drawing Block

Function

This command allows you to create a block definition from objects you select. In the Block Definition dialog box, you must first name the block. The Name field, names the block. The name can have up to 255 characters and can include letters, numbers, blank spaces, and any special character not used by Microsoft® Windows® and Carlson Survey for other purposes. The block name and definition are saved in the current drawing. You cannot use DIRECT, LIGHT, AVE_RENDER, RM_SDB, SH_SPOT, and OVERHEAD as valid block names.



Under Base Point, you must specify a base point for the block. The default value is 0,0,0.

X: This field specifies the X coordinate value.

Y: This field specifies the Y coordinate value.

Z: This field specifies the Z coordinate value.

Pick Point: This option allows you to temporarily close the dialog box so that you can specify an insertion base point in the current drawing.

Under Objects, you specify the objects to include in the new block and whether to retain or delete the selected objects or convert them to a block instance after you create the block.

Retain: This option retains the selected objects as distinct objects in the drawing after you create the block.

Convert to Block: This option converts the selected objects to a block instance in the drawing after you create the block.

Delete: This option deletes the selected objects from the drawing after you create the block.

Select Objects: This option dismisses the Block Definition dialog box temporarily while you select the objects for the block. When you finish selecting objects, press Enter to redisplay the Block Definition dialog box.

Quick Select: This option displays the Quick Select dialog box, which defines a selection set.

Objects Selected: This option displays the number of selected objects.

Under Preview Icon, you determine whether to save a preview icon with the block definition and specify the source of the icon.

Do Not Include an Icon: This option specifies that no icon is created.

Create Icon from Block Geometry: This option creates a preview icon to be saved with the block definition from the geometry of the objects in the block.

In the Block Definition dialog box, you must describe and link the block.

Drag-and-Drop Units: This field specifies the units to which the block is scaled when it is inserted.

Description: This field specifies the text description associated with the block definition.

Hyperlink: This button opens the Insert Hyperlink dialog box, which you can use to associate a hyperlink with the block definition.

Pulldown Menu Location: Draw

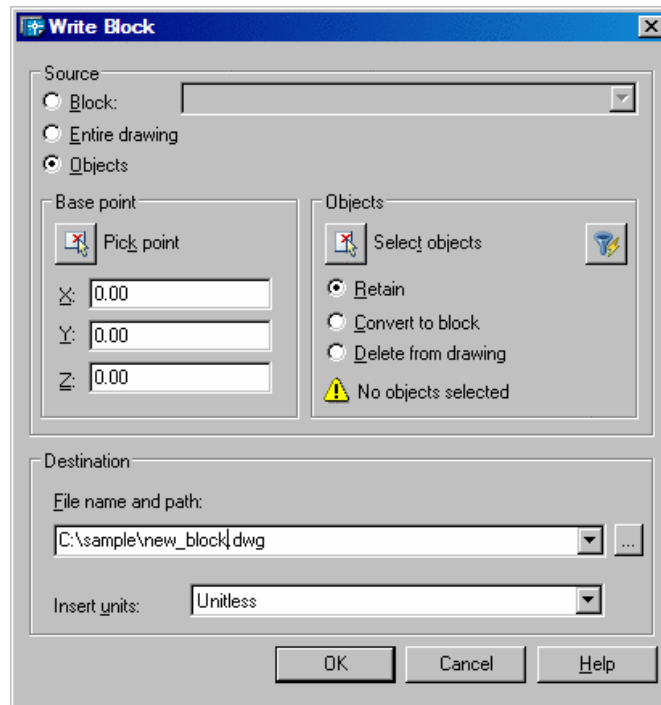
Keyboard Command: BLOCK

Prerequisite: Drawing entities

Write Block

Function

This command allows you to write objects or a block to a new drawing file.



The Write Block dialog box displays different default settings depending on whether nothing is selected, a single block is selected, or objects other than blocks are selected. For example, if you have a single block selected when you open the Write Block dialog box, the Source radio button is set to Block.

Under Source, you write selected blocks and objects out as a file, and specify insertion points.

Block: This option specifies an existing block to save as a file. Select a name from the list.

Entire Drawing: This option selects the current drawing as a block.

Objects: This option specifies objects to be saved as a file.

Under Base Point, you must specify a base point for the block. The default value is 0,0,0.

X: This field specifies the X coordinate value.

Y: This field specifies the Y coordinate value.

Z: This field specifies the Z coordinate value.

Pick Point: This option allows you to temporarily close the dialog box so that you can specify an insertion base point in the current drawing.

Under Objects, you specify the objects to include in the new block and whether to retain or delete the selected objects or convert them to a block instance after you create the block.

Retain: This option retains the selected objects as distinct objects in the drawing after you create the block.

Convert to block: This option converts the selected objects to a block instance in the drawing after you create the

block.

Delete from drawing: This option deletes the selected objects from the drawing after you create the block.

Select objects: This option dismisses the Block Definition dialog box temporarily while you select the objects for the block. When you finish selecting objects, press Enter to redisplay the Block Definition dialog box.

Quick Select: This option displays the Quick Select dialog box, which defines a selection set.

Objects Selected: This option displays the number of selected objects.

Under Destination, specify the name, location, and unit value used for the objects in the file.

File Name and Path: This field specifies a file name that the block or objects will be saved to, and also the drive and directory path for the file.

Insert Units: This field specifies the unit value to be used when the new file is inserted as a block. Enter 0 (zero) if you do not want to scale the drawing to a specific value as you insert it.

Pulldown Menu Location: Draw

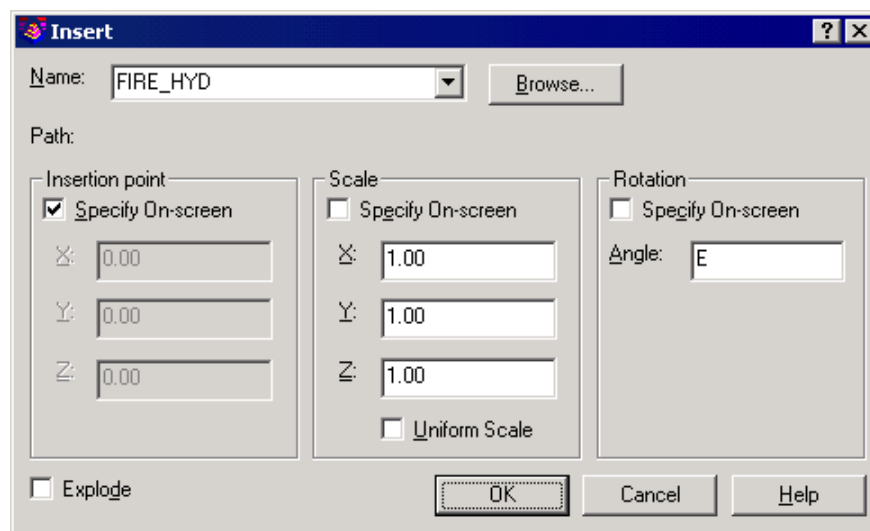
Keyboard Command: WBLOCK

Prerequisite: Drawing entities

Insert

Function

This command allows you to place a named block or drawing into the current drawing.



In the Insert dialog box, you specify the block to insert and define the position for the inserted block. The last block you insert during the current editing session becomes the default block for subsequent uses of this command.

Name: This field specifies the name of a block to insert or the name of a file to insert as a block.

Browse: This button opens the Select Drawing File dialog box (a standard file selection dialog box) where you can select a block or a file to insert.

Under Insertion Point, you specify the insertion point for the block.

Specify On-Screen: This option specifies the insertion point of the block using the pointing device.

X: This field sets the X coordinate value.

Y: This field sets the Y coordinate value.

Z: This field sets the Z coordinate value.

Under Scale, you specify the scale for the inserted block. Specifying negative values for the X, Y, and Z scale factors inserts a mirror image of a block.

Specify On-Screen: This option specifies the insertion point of the block using the pointing device.

X: This field sets the X coordinate value.

Y: This field sets the Y coordinate value.

Z: This field sets the Z coordinate value.

Uniform Scale: This option specifies a single scale value for X, Y, and Z coordinates. A value specified for X is also reflected in the Y and Z values.

Under Rotation, you specify the rotation angle for the inserted block.

Specify On-Screen: This option specifies the rotation angle of the block using the pointing device.

Angle: This field sets a rotation angle for the inserted block.

You can explode the block and inserts to the individual parts of the block. When you select Explode, you specify only an X scale factor.

Pulldown Menu Location: Draw

Keyboard Command: DDINSERT

Prerequisite: None

Buffer Offset

Function

This command offsets a polyline and maintains a fixed distance from the original polyline by placing an arc on convex corners. The standard AutoCAD *Offset* command can actually have a distance greater than the offset at corners. In the example shown, the distance between the corners of the original and offset polylines is 70.01 while the offset distance is 50.0. Buffer Offset makes an offset polyline that doesn't exceed the offset distance. This is useful when you want an offset that goes no further than the offset distance such as wetland offsets. Later versions of AutoCAD can achieve the same effect using the standard *Offset* command by changing the system variable OFFSETGAPTYPE to 1.

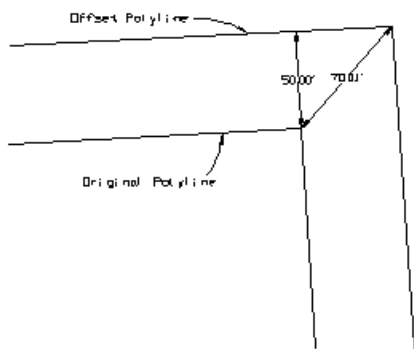
Prompts

Enter the offset amount: 50

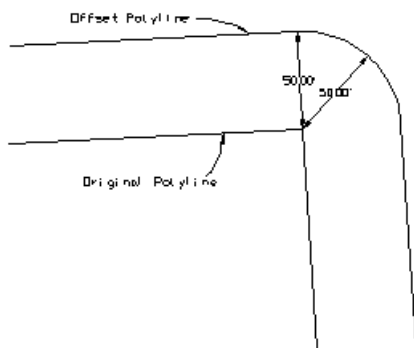
Select a polyline to offset (Enter for none): *pick the original polyline*

Select side to offset: *pick a point on the side to offset to*

Select a polyline to offset (Enter for none): *press Enter*



Regular Offset



Buffer Offset

Pulldown Menu Location: Draw

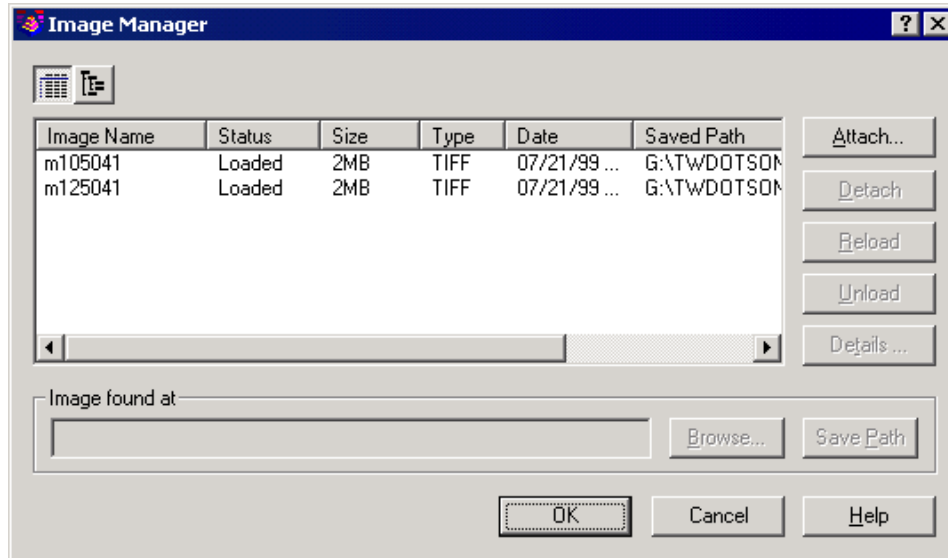
Keyboard Command: boffset

Prerequisite: A polyline to offset

Raster Image

Function

This command allows you to manage raster images.



The Image Manager dialog box lists all the image files attached to the current drawing. You can view the parameters and details for selected images. You can attach new image files and detach, locate, reload, and unload existing images.

List View: This button lists the image definitions attached to the drawing. Each image name appears only once regardless of how many times you attach (insert) the image. You can sort the list of images by name, status (loaded, unloaded, or not found), size, type (TIFF, for example), date, or the saved path and file name. By default, Carlson Survey displays the list alphabetically by image name.

To select multiple images, hold down SHIFT or CTRL while selecting items. To sort the list alphabetically or numerically by a specific column, click that column's heading. To change the width of the column, drag the line between the column headings to the right or left. The program saves and restores the settings when you reopen the dialog box. To change an image name, select it and then click it again, or select it and then press F2. You cannot edit names of images that reside in external references (xrefs). Image names can include up to 255 characters and can contain letters, digits, spaces, and any special characters not used by Microsoft® Windows® or Carlson Survey. The image name can be identical to the file name, but changing the image name does not change the file name.

Tree View: This button displays all the image definitions and the levels of nesting of images within xrefs. The top level of the tree view shows images that you attached directly to the drawing, images nested in block references, and the names of externally referenced drawings containing images. The names of the images attached to the externally referenced drawings appear nested within the drawing at the next tree level. To insert a copy of an already attached image, select it, and then choose Attach. Tree view lists the image names only (not file names) and lists the image name just once, regardless of how many times you attach (insert) the image. You can edit an image name by selecting it and then clicking it again, or by selecting it and then pressing F2. However, you cannot select more than one image at a time.

Attach: This option displays the Select Image File dialog box. When you unload and then reload an image, the program draws that image on top. Images remain loaded or unloaded from one drawing session to the next.

Detach: This option removes the selected image definitions from the drawing database and erases all the associated image objects from the drawing and from the display.

Reload: This option loads the most recent version of an image or reloads an image that was previously unloaded. Reloading does not control whether the image is displayed, but it ensures display of the most current image.

Unload: This option unloads image data from working memory without erasing the image objects from the drawing. It is recommended that you unload images no longer needed for editing to improve performance. An unloaded image cannot be displayed or plotted. You can selectively load and unload individual images from a working list of images

associated with the drawing file.

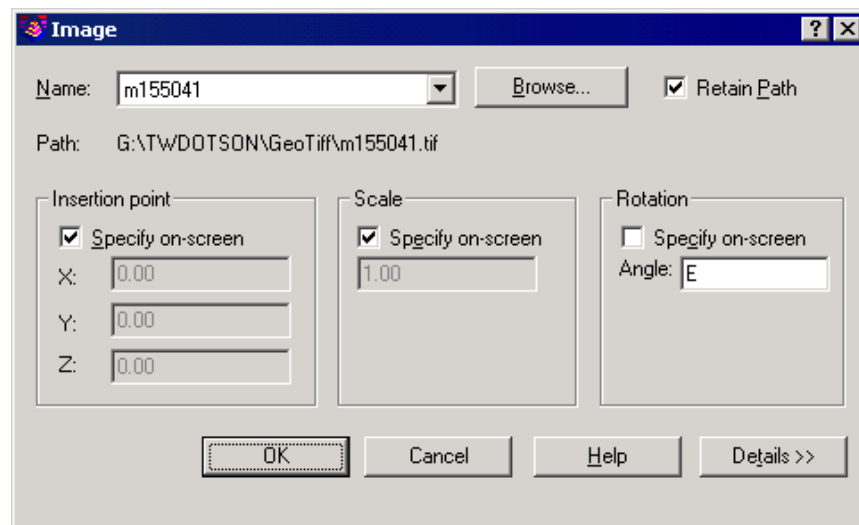
Details: This option opens the Image File Details dialog box, which displays the image name, saved path, active path, file creation date and time, file size and type, color system, color depth, width and height in pixels, resolution, default size in units, and a preview image.

Image Found At: This field shows the path of the selected image. If you select multiple images, this field remains blank. The path shown is the actual path where the image resides.

Browse: This option opens the Select Image File dialog box (a standard file selection dialog box). The path you select appears under Image Found At.

Save Path: This option stores the new path information. Press ESC while editing the path to restore the old path. If the program cannot find the referenced image in the new path, the image's status changes to Not Found. If you do not choose Save Path after editing the path, the program uses the original image path the next time you load the drawing.

Under the Image dialog box, you can attach an image.



In the Image dialog box, you must first identify the image and the path.

Name: This field identifies the image you have selected to attach, either from the Select Image File dialog box (an unattached image) or from the list of previously attached images. To add another instance of an image file that is already attached, select the image name from the list and choose OK.

Browse: This option opens the Select Image File dialog box (a standard file selection dialog box). If Show Preview is selected, the program displays a preview of the selected file.

Retain Path: This option saves the path of the image file with the image definition. If Retain Path is not selected, only the image name is saved and Carlson Survey searches the Support File Search Path.

Under Insertion Point, you must specify the insertion point for the selected image. Specify On-Screen is the default. The default insertion point is 0,0.

Specify On-Screen: This option directs input to the command line or the pointing device. If Specify On-Screen is cleared, enter the insertion point in X, Y, and Z.

X: This field sets the X coordinate value.

Y: This field sets the Y coordinate value.

Z: This field sets the Z coordinate value.

Under Scale, you must specify the scale factor of the selected image. Specify On-Screen directs input to the command line or the pointing device. If Specify On-Screen is cleared, enter a value for the scale factor. The default scale factor is 1.

Under Rotation, you must specify the rotation angle of the selected image. If Specify On-Screen is selected, you may wait until you exit the dialog box to rotate the object with your pointing device or enter a rotation angle value on the command line. If Specify On-Screen is cleared, enter the rotation angle value in the dialog box. The default rotation angle is 0.

Pulldown Menu Location: Draw

Keyboard Command: IMAGE

Prerequisite: Raster image

Place Image by World File

Function

This function allows you to insert Geo-Referenced raster images into Carlson Survey drawings. This command will first prompt you to select a world file with a file extension of .TFW or .JGW. If a .TFW file is chosen, this routine searches for a .TIF file with the same name. If a .JGW file is chosen, then this routine searches for a .JPG file with the same name.

The raster image (.TIF or .JPG) must be in the same directory as the world file or it must be in a directory included in the support file search path. If the correct raster image file is found, it is inserted using the location and scaling information contained in the world file.

Prompts

Select World File: *choose existing .TFW or .JGW file*

Pulldown Menu Location: Draw

Keyboard Command: geotiff

Prerequisite: Raster image and its corresponding world file.

Inquiry Commands

8

This chapter provides information on using the commands from the Inquiry menu to obtain information and specifications about entities in your drawing.

List

Function

This command lists the object type, object layer, and X,Y,Z position relative to the current user coordinate system (UCS) and whether the object is in model space or paper space. LIST reports color, linetype, and lineweight information if these items are not set to BYLAYER. The thickness of an object is displayed if it is nonzero. Z coordinate information defines the elevation. If the extrusion direction of the entry differs from the Z axis (0,0,1) of the current UCS, LIST also reports the extrusion direction in UCS coordinates. LIST reports additional information related to the specific object selected.

Pulldown Menu Location: Inquiry

Keyboard Command: List

Prerequisite: None

Point ID

Function

This command allows you to display, at the command line, the coordinate values of a point you pick on the screen or a point number you enter.

Prompts

Pick point or point number: *pick point*

N: 5397.64 E: 5274.09 Z: 0.00

Pulldown Menu Location: Inquiry

Keyboard Command: PT_ID

Prerequisite: None

Layer ID

Function

This command reports the layer name of the selected entity.

Prompts

Pick entity to read layer: *pick an entity*

Layer: FINAL

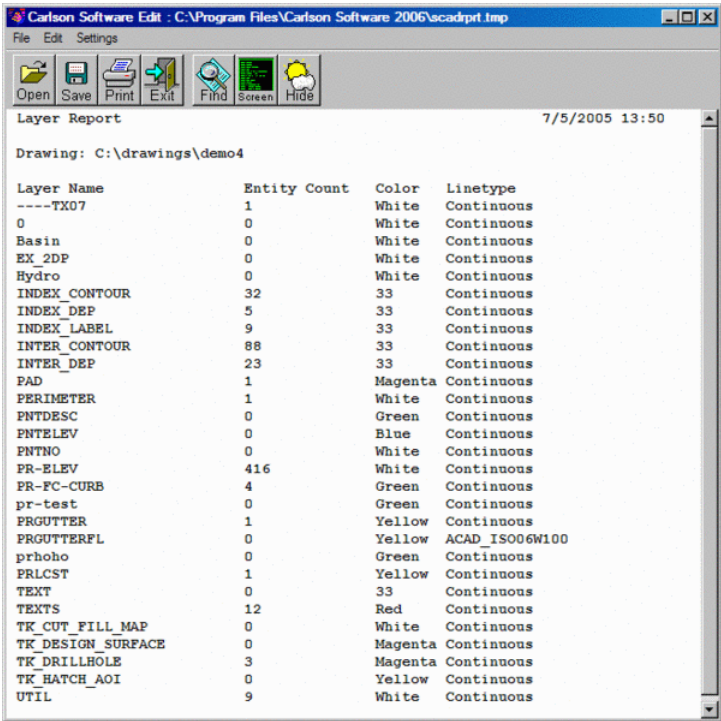
Pick entity to read layer: *press Enter to end*

Pulldown Menu Location: Inquiry
Keyboard Command: LAYERID
Prerequisite: None

Layer Report

Function

This command generates a report containing each layer name, the number of entities on each layer, as well as the color and linetype applied to each layer entity in the drawing. There are no prompts, and when you invoke the command it immediately begins evaluating the current drawing. Please be patient in very large drawings with numerous layers, especially with a slower computer. All layers, and the total number of objects contained on each layer, are displayed in the Standard Report Viewer upon completion.



Carlson Software Edit : C:\Program Files\Carlson Software 2006\scadpnt.tmp

File Edit Settings

Open Save Print Exit Find Screen Hide

Layer Report 7/5/2005 13:50

Drawing: C:\drawings\demo4

Layer Name	Entity Count	Color	Linetype
----TX07	1	White	Continuous
0	0	White	Continuous
Basin	0	White	Continuous
EX_2DP	0	White	Continuous
Hydro	0	White	Continuous
INDEX_CONTOUR	32	33	Continuous
INDEX_DEP	5	33	Continuous
INDEX_LABEL	9	33	Continuous
INTER_CONTOUR	88	33	Continuous
INTER_DEP	23	33	Continuous
PAD	1	Magenta	Continuous
PERIMETER	1	White	Continuous
PNTDESC	0	Green	Continuous
PNTLEV	0	Blue	Continuous
PNTNO	0	White	Continuous
PR-ELEV	416	White	Continuous
PR-FC-CURB	4	Green	Continuous
pr-test	0	Green	Continuous
PROUTTER	1	Yellow	Continuous
PROUTTERFL	0	Yellow	ACAD_ISO06W100
prhoho	0	Green	Continuous
PRLCST	1	Yellow	Continuous
TEXT	0	33	Continuous
TEXTS	12	Red	Continuous
TK CUT_FILL MAP	0	White	Continuous
TK DESIGN SURFACE	0	Magenta	Continuous
TK DRILLHOLE	3	Magenta	Continuous
TK HATCH_AOI	0	Yellow	Continuous
UTIL	9	White	Continuous

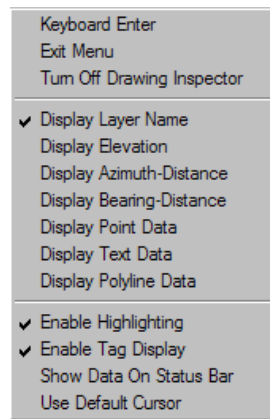
Pulldown Menu Location: Inquiry
Keyboard Command: REPORTLAYER
Prerequisite: None

Drawing Inspector

Function

This command reports object properties to you as you move the cursor over an entity. Once the Drawing Inspector is activated by running the Drawing Inspector command, you can display one of several properties of an object. The available properties are: Layer Name, Elevation, Bearing-Distance, Azimuth-Distance, Point Data, Text Data, and Polyline Data. You can simply move the pointer over an entity and the selected property will be displayed either in

a pop-up window next to the pointer and/or on the status bar, depending on the selected option. The options for this command are set in the menu that pops up by clicking the right mouse button.



In the Drawing Inspector menu, you can choose one or more properties to display.

Display Layer Name: Allows you to display the layer name of the entity.

Display Elevation: Allows you to display the elevation of the entity.

Display Azimuth-Distance: Allows you to display the azimuth and distance of a line.

Display Bearing-Distance: Allows you to display the bearing and distance of a line.

Display Point Data: Allows you to display the coordinate data of point.

Display Text Data: Allows you to display the attributes of text.

Display Polyline Data: Allows you to display the end point elevations, horizontal distance, slope distance and slope ratios.

In the Drawing Inspector menu, you can also choose how the property information is reported.

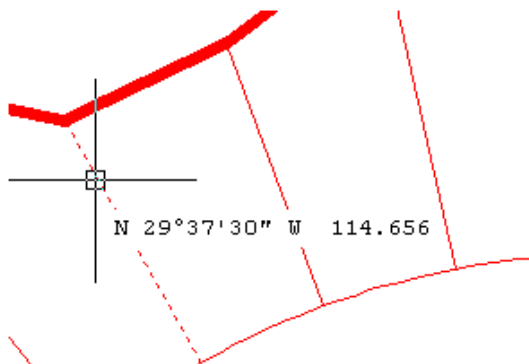
Enable Highlighting: Allows you to highlight the object that the Drawing Inspector is reporting.

Enable Tag Display: Enables you to view the information next to the cursor on the screen.

Show Data On Status Bar: Enables you to view the information on the status bar, in the lower corner of the screen.

Use Default Cursor: When enabled, only the AutoCAD cursor shows. When disabled, the mouse pointer is also shown.

Other commands can be run as usual while Drawing Inspector is active. Other ways to turn off the Drawing Inspector are to pick the Drawing Inspector command from the pulldown menu a second time, or use the keyboard command a second time.



Example of Drawing Inspector reporting Bearing-Distance using the Tag Display

Pulldown Menu Location: Inquiry

Keyboard Command: inspector

Prerequisite: None

Bearing & 3D Distance

Function

This command reports the slope distance, slope ratio, bearing, azimuth and vertical angle between two 3D points. Pick or enter the coordinates of two points or select a line or polyline segment to calculate between the segment endpoints.

Prompts

Specify bearing-distance from (Line/PLine/<Points>)? *press Enter*

Pick point or enter point number: *pick a point*

Pick second point or enter point number: *pick a point*

Horiz Dist: 233.4 **Slope Dist:** 233.4 **Elev Diff:** 0.0 **Vert Ang:** 0d0'0"

Slope: 0.0% 0.0:1 **Bearing:** S 71d15'37" **W Azimuth:** 198d44'23"

Pulldown Menu Location: Inquiry

Keyboard Command: 3DIST

Prerequisite: None

Find Point(s)

Function

This command is used to find a point with a specified point number or description. The command searches the current coordinate file. For example, if you entered RAD* the command would plot a preview arrow at all the points that have the letters RAD as part of the description. i.e. RADPT1, RADPT2, RADPT3, etc. This command is not case sensitive (test is considered the same as TEST). Points that match the point number or description are highlighted on the graphics screen with the preview arrow and listed on the text screen.

Prompts

Find by point number or description [<Number>/Desc]: *press Enter*

Point number or range of point numbers to find <1>: 8-12

8 4856.75 4747.20 0.00

9 4909.25 4648.37 0.00

10 4223.30 4545.46 0.00 RADPT

11 4111.32 4532.98 0.00

12 4142.92 4624.43 0.00

or

2 Find by point number or description [<Number>/Desc]: D

3 Point Description(s) text to search for: rad*

1 4252.76 4158.32 0.00 RADPT

4 4558.06 4950.80 0.00 RADPT
7 4817.02 4662.73 0.00 RADPT
104223.30 4545.46 0.00 RADPT

Pulldown Menu Location: Inquiry

Keyboard Command: fpnt

Prerequisite: None

Curve Info

Function

This command displays information about a curve/arc. The curve can be defined by an arc entity or polyline arc segment or by selecting three points on the arc. The three points can be defined by point number or picked on the screen. The curve data is displayed in the text window with an option to be displayed in the Standard Report Viewer. Click Exit to return to the graphics window.

Prompts

Define arc by, Points/<select arc or polyline>: *select the arc entities*

Endpoint: (5409.16 5086.78 0.0)

Other Endpoint: (5553.49 5096.7 0.0)

Radius Point Coords: (5488.16 4992.27 0.0)

Chord Bearing: N 86d4'17" E

Chord Azimuth: 86d4'17"

Delta angle in radians: 1.2552957107

RoadWay Degree of Curve: 46d30'43"

RailRoad Degree of Curve: 47d53'40" **Chord Crv Length:** 150.17 **Excess:** 4.46

External: 29.01 **Mid Ord:** 23.48 **Tangent:** 89.37

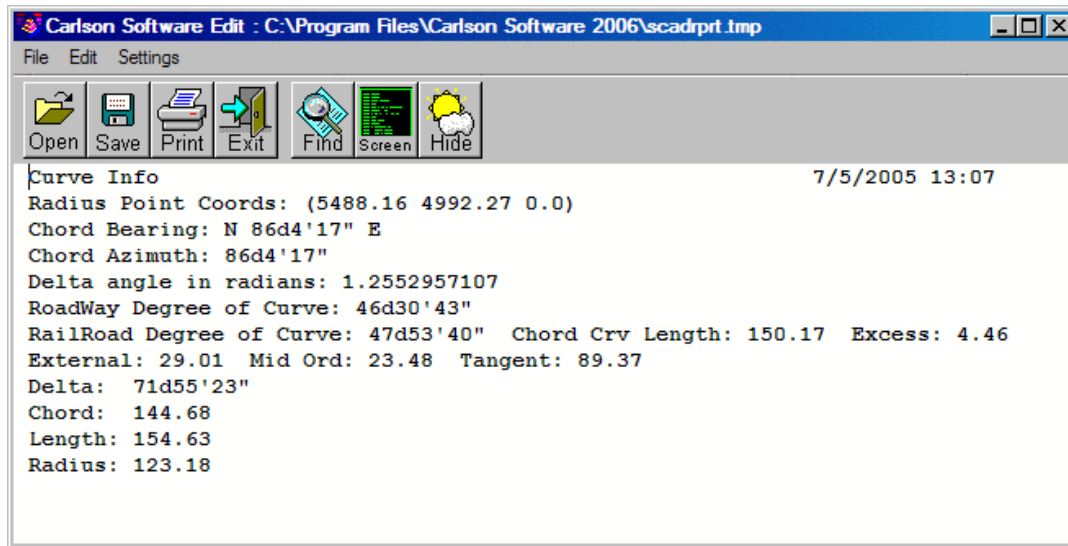
Delta: 71d55'23"

Chord: 144.68

Length: 154.63

Radius: 123.18

Display curve data in report viewer [Yes/<No>]? Y



Pulldown Menu Location: Inquiry

Keyboard Command: cinfo

Prerequisite: None

Polyline Info

Function

This command reports the length and elevation of the selected line or polyline.

Prompts

Pick Polyline or Line: *pick a polyline*

Polyline length: 145.43 **Elevation:** 100.0

Pulldown Menu Location: Inquiry

Keyboard Command: polylen

Prerequisite: None

Settings Commands

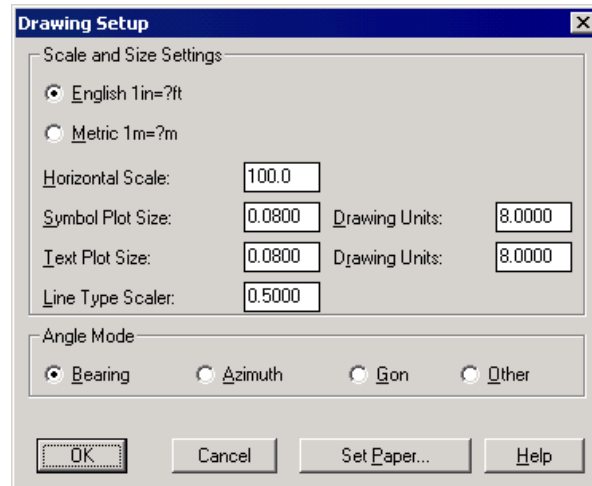
9

This chapter provides information on using the commands from the Settings menu to configure options and settings in your drawing.

Drawing Setup

Function

This command displays a dialog box for setting drawing parameters, including the plotting scale, size of symbols, label annotation size, and the drawing mode.



Specify **English 1in=?ft** or **Metric 1m=?m** as the unit mode to use. This affects the prompting and reports. When you are working on a drawing in English units, one unit equals one foot. In metric, one unit equals one meter. Specify the **Horizontal Scale** of the drawing. For example, if the horizontal scale is set to 50, then 1" = 50' is your drawing scale.

The **Symbol Plot Size** value is a scaler that represents the size on the plot. The Drawing Units are determined by multiplying the scaler by the horizontal scale. In English mode the scaler represents the plotted size in inches. In Metric mode, this value is the plotted size in centimeters. The **Drawing Units** field shows the result of the Symbol Plot Size value (the scaler) multiplied by the horizontal scale.

The **Text Plot Size** value is a scaler that represents the size on the plot. The Drawing Units are determined by multiplying the scaler by the horizontal scale. In English mode the scaler represents the plotted size in inches. In Metric mode, this value is the plotted size in centimeters. The Text Plot Size is not entered in Drawing Units. The **Drawing Units** field shows the result of the Text Plot Size value (the scaler) multiplied by the horizontal scale.

The **Line Type Scaler** option sets the linetype scale by multiplying this scaler by the horizontal scale.

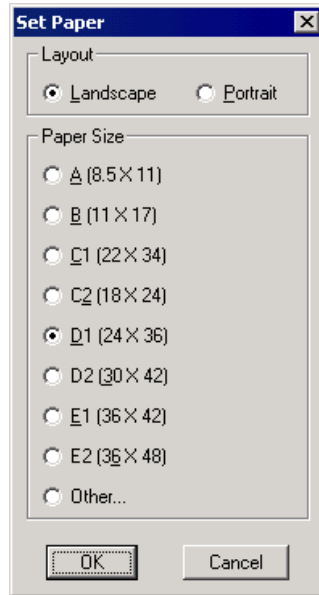
Angle Mode-Bearing sets reporting to bearing mode for any of the inquiry commands. (Modifies the settings in the AutoCAD *UNITS* command.)

Angle Mode-Azimuth sets reporting to north based azimuth mode for any of the inquiry commands. (Modifies the settings in the AutoCAD *UNITS* command.)

Angle Mode-Gon sets reporting to gon mode for any of the inquiry commands. (Modifies the settings in the AutoCAD *UNITS* command.)

Angle Mode-Other lets the user determine angle mode by using the AutoCAD *UNITS* command.

The **Set Paper** button allows you to draw a rectangle on the screen that represents the edge of your paper. After you have set the horizontal scale, press the Set Paper button and the Set Paper dialog appears.



The **Layout** option lets you specify landscape or portrait paper orientation. Landscape layout is where the width of the page is greater than the height of the page. Portrait layout is the opposite. The **Paper Size** option allows you to specify the paper size. The numbers in parenthesis represent drawing units and will be multiplied by the horizontal scale to determine the rectangle to be drawn. If you select the Other option, you will be prompted on the command line for the horizontal and vertical sizes of the paper.

Prompts (for Set Paper)

Pick or Type lower left corner point for border <(5000.00 5000.00 0.0)>: *pick a point*

Erase existing Set Paper boundary [<Yes>/No]? *Y* This prompt only appears if there is an existing paper boundary in this drawing.

Set Limits [Yes/<No>]? *Y* If you answer Yes to Set Limits, drawing limits are enabled, and AutoCAD restricts the coordinates you can enter to within the paper boundary. Drawing limits also determines the area of the drawing that can display grid dots, and the minimum area displayed by the Zoom All command on the View menu. To turn drawing limits off, type in LIMITS on the command line and set to Off.

Drawing Setup also sets the AutoCAD dimension scale (DIMSCALE) and linetype scale (LTSCALE) to the Horizontal Scale.

Pulldown Menu Location: Inq-Set

Keyboard Command: setup

Prerequisite: None

Title Block

Function

This command draws a border and title block for the selected sheet size.

In the Title Block dialog box, you must set paper size and margins, and provide notes for the document.

Under Paper Size you must select the size of the sheet. Click the User Defined radio button to set a custom sheet size. The default user defined size can be stored in the Configure command under the General Settings option.

In the Layer field, you may provide a layer name for the title block.

You can provide notes to be included in the title block.

You must provide a scale. To select a scale, click on the Change Scale button. This changes the scale for the title block and for the drawing as well.

You must specify the size of the margins. Margins are needed so that the border fits in the plotter's plotable area. For sheet 11x17 or smaller, a 1/2 inch margin is typical. For larger sheets, a typical margin is 3/4 inch.

To change the title block, edit the drawing TBLOCK.DWG in the \SUPPORT directory. After the title block is drawn, the contents can be edited using the Attribute Edit command under the Edit menu.

Pulldown Menu Location: Settings

Keyboard Command: TBLOCK

Prerequisite: None

Mortgage Block

Function

This command draws a personalized title block for a mortgage survey. The output yields a $3\frac{3}{4} \times 2$ block placed in the right corner of the sheet with optional text for a Special Flood Hazard Area.

The Mortgage Block dialog box allows you to edit all block information and input unique data for every field.

Enter the relevant information into each specified field in the Title Block section of the dialog box.

Under Paper Size you must choose the paper size to determine the output size of the drawing.

You have the option of including Flood notes. An example is shown below.

- **Select Flood Note:** Allows you to specify a special flood note, you will be prompted to select a drawing file that contains your flood note. If you specify your own flood note, the other options are not available.
- **Zone:** Enter the zone, not available unless you use the default flood note.
- **Panel:** Enter the panel, not available unless you use the default flood note.
- **Effective Date:** Enter the date, not available unless you use the default flood note.
- **Special Flood Hazard Area:** Indicates that the property is in a special flood hazard area, not available unless you use the default flood note.

FLOOD INSURANCE NOTE: By graphics plotting only,
this property is in ZONE 100 YR
of the Flood Insurance Rate Map, Community Panel No.
48201C1085J.P effective date of 10/10/1998
Exact designations can only be determined by an Elevation
Certificate. Based on the above information, this property
IS in a Special Flood Hazard Area.

The mortgage block drawing is called from the mortgage.dwg file located in the \SUPPORT directory and can easily be opened and edited within the program, allowing you to alter the size, text, or any other aspect of the drawing to fit your needs. However, changes are usually unnecessary since the original .dwg file places this block to fit a standard $8\frac{1}{2} \times 11$ or $8\frac{1}{2} \times 14$ drawing.

Menu Location: Settings

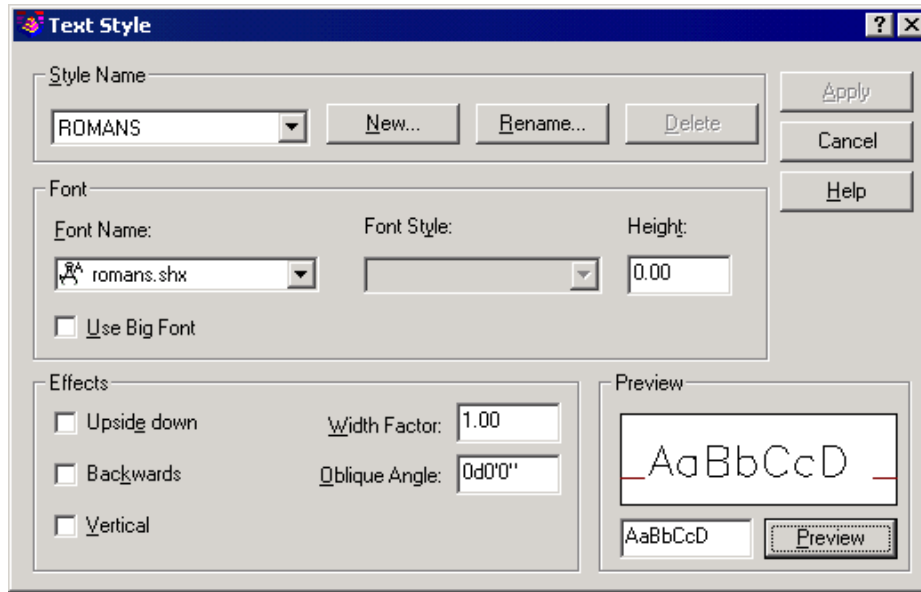
Keyboard Command: MORTGAGE

Prerequisite: None

Text Style

Function

This command creates or modifies named styles and sets the current style for text in your drawing



Under Style Name, you can display text style names, add new styles, and rename and delete existing styles. The list contains defined style names and displays the current style by default. To change the current style, select another style from the list, or choose New to create a new style.

- **New:** This option displays the New Text Style dialog box and automatically supplies the name "stylen" (where n is the number of the supplied style) for the current settings. You can accept the default or enter a name and choose OK to apply the current style settings to the new style name.
- **Rename:** This option displays the Rename Text Style dialog box. The text style listed is renamed when you enter a new name and choose OK.
- **Delete:** This option deletes a text style. Select a name from the list to make it current, and then choose Delete.

Under Font you can change the style's font.

- **Font Name:** This field lists the font family name for all registered TrueType fonts and all compiled shape (SHX) fonts in the Carlson Survey Fonts directory. When you select a name from the list, the program reads the file for the specified font. The file's character definitions are loaded automatically unless the file is already in use by another text style. You can define several styles that use the same font.
- **Font Style:** This field specifies font character formatting, such as italic, bold, or regular. When Use Big Font is selected, this option changes to Big Font Name and is used to select a Big Font file name.
- **Height:** This field sets the text height based on the value you enter. If you enter 0.0, the program prompts for the text height each time you enter text using this style. Entering a height greater than 0.0 sets the text height for this style. TrueType fonts can be displayed at a smaller height than SHX fonts with the same height setting. The text

height you specify may not be accurately represented by uppercase letters in TrueType fonts supplied with Carlson Survey.

- **Use Big Font:** This option specifies an Asian-language Big Font file. Use Big Font is available only if you specify an SHX file under Font Name. Only SHX files are valid file types for creating Big Fonts.

Under Effects, you modify characteristics of the font, such as its height, width factor, and obliquing angle and whether it is displayed upside down, backwards, or vertically aligned. TrueType fonts using the effects described in this section might appear bold on the screen. Onscreen appearance has no effect on plotted output. Fonts are plotted as specified by applied character formatting.

- **Upside Down:** This option displays the characters upside down.
- **Backwards:** This option displays the characters backwards.
- **Vertical:** This option displays the characters aligned vertically. Vertical is available only if the selected font supports dual orientation. Vertical orientation is not available for TrueType fonts.
- **Width Factor:** This option sets the character spacing. Entering a value less than 1.0 condenses the text. Entering a value greater than 1.0 expands it.
- **Oblique Angle:** This option sets the obliquing angle of the text. Entering a value between -85 and 85 makes the text oblique.

Under Preview, you can display sample text that changes dynamically as you change fonts and modify the effects. To change the sample text, enter characters in the box below the character preview image.

- **Preview:** This field updates the sample text in the character preview image according to any changes you've made in the dialog box. Height has no effect in the character preview image because a very large text height might show little or no text.

Pulldown Menu Location: Settings

Keyboard Command: STYLE

Prerequisite: None

Set X-Hairs

Function

This command sets the crosshairs either to align with the selected line or polyline or to a user-specified slope.

Prompts

Select First Point or [Type slope/select Entity]: *pick a point*

- **Type Slope:** This option allows you to type in a percent slope to set the crosshair angle
- **Select Entity:** This option allows you to select a line or polyline. The crosshairs will be aligned to the entity that you select.

Note: You may also set the crosshair angle by modifying the system variable SNAPANG.

Pulldown Menu Location: Settings

Keyboard Command: SETXHAIRS

Prerequisite: None

Reset X-Hairs

Function

This command sets the crosshairs alignment to horizontal.

Note: You may also set the crosshair angle to horizontal by setting the system variable SNAPANG to zero.

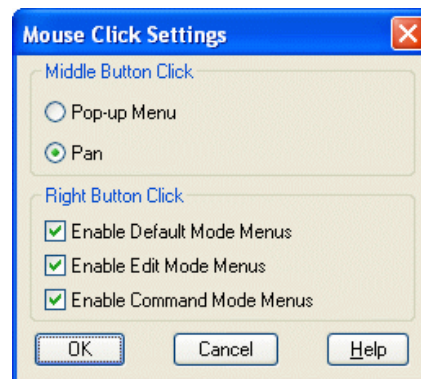
Pulldown Menu Location: Settings

Keyboard Command: RESETXHAIRS

Prerequisite: None

Mouse Click Settings

This command can be used to make custom mouse click preferences. The Middle Button Click applies to a 3-button mouse and chooses between using the middle button for real-time pan or to show an Object Snap pop-up menu. For the right mouse button, there are different levels of pop-up menus that can be activated. With all these menus off, the right button will be used like the Enter keyboard.



Pulldown Menu Location: Inquiry

Keyboard Command: CLICKSET

Prerequisite: none

Set UCS to World

Function

This command sets the UCS (user coordinate system) to the world coordinate system (WCS). Carlson Software works exclusively in the world coordinate system and there is no way to change this setting. In AutoCAD, it is possible to change the coordinate system from WCS. If you receive a drawing in which the coordinate system is not set to world, use this command to restore the UCS.

Pulldown Menu Location: Settings

Keyboard Command: UCS_WORLD

Prerequisite: None

Tablet On/Off

Function

This command toggles the tablet use on and off. Your tablet becomes the pointing device if toggled on.

Pulldown Menu Location: Settings

Keyboard Command: TABLET

Prerequisite: None

Tablet - Calibrate

Function

This command calibrates the digitizer to the coordinate system of a paper drawing or photograph. Calibration digitizes points on a drawing or photograph into X,Y coordinates. Calibration can be performed in model space or paper space.

The paper should be flat, with no bumps or wrinkles, and securely fastened to the digitizing tablet. The paper can be oriented at any angle.

Prompts

Digitize point #1: digitize a point on the paper drawing

Enter coordinates for point #1: specify an X,Y coordinate at the digitized point

Digitize point #2: digitize a point on the paper drawing

Enter coordinates for point #2: specify an X,Y coordinate at the digitized point

Digitize point #3 (or RETURN to end): digitize a point on the tablet or press Enter to end

Enter coordinates for point #3: specify an X,Y coordinate in the drawing

The points you enter cannot be duplicates. The points need not be the origin on either axis, and you can enter as many points as you like. The more points you enter, the more accurate the drawing will be.

If you enter only two points, Carlson Survey automatically computes an orthogonal transformation. If it is successful, the command ends.

If you enter three or more points, Carlson Survey computes the transformation in each of the three transformation types (Orthogonal, Affine, and Projective) to determine which best fits the calibration points. If you enter more than four points, computing the best-fitting projective transformation can take a long time. You can cancel the process by pressing ESC.

When the computations are complete, the program displays a table with the number of calibration points and a column for each transformation type. For a description of the information contained in the table, see Section 8 below.

If there have been no failures of projection transformation, the program prompts you to choose a transformation type.

Enter transformation type [Orthogonal/Affine/Projective/Repeat table] <Repeat>: **enter an option or press Enter**

Only transformation types for which the outcome was Success, Exact, or Canceled are included in this prompt. A projective transformation can be specified even if it was canceled. Carlson Survey uses the result computed at the time you canceled.

- **Orthogonal:** Specifies translation, uniform scaling, and rotation with two calibration points. Use Orthogonal for dimensionally accurate paper drawings and paper drawings in which the portion to be digitized is long and narrow, with most points confined to single lines.
- **Affine:** Specifies arbitrary linear transformation in two dimensions consisting of translation, independent X- and Y-scaling, rotation, and skewing with three calibration points. Use Affine when horizontal dimensions in a paper drawing are stretched with respect to vertical dimensions, and lines that are supposed to be parallel actually are parallel. The RMS (root mean square) error reported after calibration measures how close the program has come to making a perfect fit. Affine should be used if the RMS is small.
- **Projective:** Specifies a transformation equivalent to a perspective projection of one plane in space onto another plane with four calibration points. A projective transformation provides a limited form of what cartographers call rubber sheeting, in which different portions of the tablet surface are stretched by varying amounts. Straight lines map into straight lines. Parallel lines do not necessarily stay parallel. Projective transformation corrects parallel lines that appear to converge.
- **Repeat Table:** Redisplays the computed table, which rates the transformation types.

The Transformation Table reports the number of calibration points and provides information about each transformation type.

- **Outcome of Fit:** Reports the outcome of fit for each of the transformation types. If the outcome of fit is not Success or Exact for any of the transformation types, the program reports failure of the entire calibration process and ends the command. The remaining entries in each column are blank unless Outcome of Fit is Success.
- **Exact:** Indicates the correct number of points for a valid transformation.
- **Success:** Indicates more than enough points, thus the program succeeded in fitting a transformation to the data.
- **Impossible:** Indicates not enough points.
- **Failure:** Indicates enough points, but the program was unable to fit a transformation to the points, usually because some points were colinear or coincident.
- **Canceled:** Indicates that the fit process was canceled. This outcome occurs only with the projective transformation.
- **RMS Error:** Reports the RMS (root mean square) error, which measures how close the program has come to finding a perfect fit. The goal is the smallest possible RMS error.
- **Standard Deviation:** Reports the standard deviation of the residuals. If it is near zero, the residual at each calibration point is about the same.
- **Largest Residual/At Point:** Reports the point at which the mapping is least accurate. The residual is the distance between where the point was mapped during transformation and where it would be mapped if the fit were perfect. The distance is given in the current linear units.
- **Second-Largest Residual/At Point:** Reports the point at which the mapping is second-least accurate. The residual is the distance between where the point was mapped during transformation and where it would be mapped if the fit were perfect. The distance is given in the current linear units.

Pulldown Menu Location: Settings

Keyboard Command: TABLET

Prerequisite: Tablet driver installed and tablet turned on

Tablet - Configure

Function

This command designates or realigns the tablet menu areas or designates a small portion of a large tablet as a screen pointing area.

Prompts

Enter number of tablet menus desired (0-4) <current>: *Enter a value or press Enter*

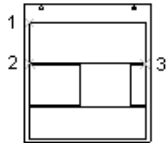
If tablet menus are in use and the same number of menus is selected, the program prompts:

Do you want to realign tablet menus? [Yes/No] <N>: *enter y or n or press Enter*

Digitize upper-left corner of menu area n: *digitize a point (1)*

Digitize lower-left corner of menu area n: *digitize a point (2)*

Digitize lower-right corner of menu area n: *digitize a point (3)*



In the prompt, n is the menu number (1-4).

The printed menu form must be affixed to the tablet surface, and the requested points must be digitized. The set of three points must form a 90-degree angle. Tablet menu areas can be skewed at any angle.

Enter the number of columns for menu area n: *enter a positive value*

Enter the number of rows for menu area n: *enter a positive value*

After all interaction concerning tablet menus is complete, the program displays the following prompt:

Do you want to respecify the screen pointing area? [Yes/No] <N>: *enter y or n or press Enter*

If you enter y, the program displays the following prompts:

Digitize lower-left corner of the pointing area: *digitize a point*

Digitize upper-right corner of the pointing area: *digitize a point*

A small portion of the tablet's surface is designated as the fixed screen pointing area. The program displays the following prompt:

Do you want to specify the Floating Screen Pointing area? [Yes/No] <N>: *enter y or n or press Enter*

If you responded y to the previous prompt, respond to the following prompt:

Do you want the Floating Screen Area to be the same size as the Fixed Screen Pointing Area? [Yes/No] <Y>:
enter y or n or press Enter

If you responded n to the previous prompt, respond to the following prompts:

Digitize lower-left corner of the Floating Screen pointing area: *digitize a point*

Digitize upper-right corner of the Floating Screen pointing area: *digitize a point*

Respond to the following prompt:

The F12 Key will toggle the Floating Screen Area ON and OFF. Would you also like to specify a button to toggle the Floating Screen Area? [Yes/No] <N>: *enter y or n or press Enter*

If you responded y to the previous prompt, respond to the following prompt:

Press any non-pick button on the digitizer puck that you wish to designate as the toggle for the Floating Screen Area.

Pulldown Menu Location: Settings

Keyboard Command: TABLET

Prerequisite: Tablet driver installed and tablet turned on

Save/Load Tablet Calibration

Function

A common problem with calibrating maps on a large format digitizer is that if you leave the current drawing session, AutoCAD forgets the tablet calibration. Tablet save can be used to save the calibration when a drawing is taped down properly. This calibration file can be restored at any time later and be accurate so long as the drawing did not move on the tablet.

Save Configuration Procedure:

- 1) Command: TABSAVE
- 2) Designate filename (*.TCF) to save configuration into.

Restore Configuration Procedure:

- 1) Command: TABREST
- 2) Select filename (*.TCF) to restore configuration from.

Pulldown Menu Location: Settings

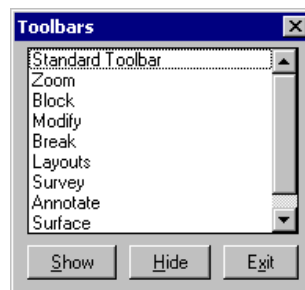
Keyboard Commands: tablet1, tablet2

Prerequisite: None

Toolbars

Function

This command allows you to display and hide toolbars. Click on a toolbar name and press the Show or Hide button.



- **Show:** Turns on the selected toolbar. If the toolbar is already visible, then this does nothing.
- **Hide:** Turns off the selected toolbar. If the toolbar is already hidden, then this does nothing. If the toolbar is floating, you can also turn it off by clicking the x in the upper right corner.
- **Exit:** Exits this command

Menu Location: Settings

Keyboard Command: TBARCFG

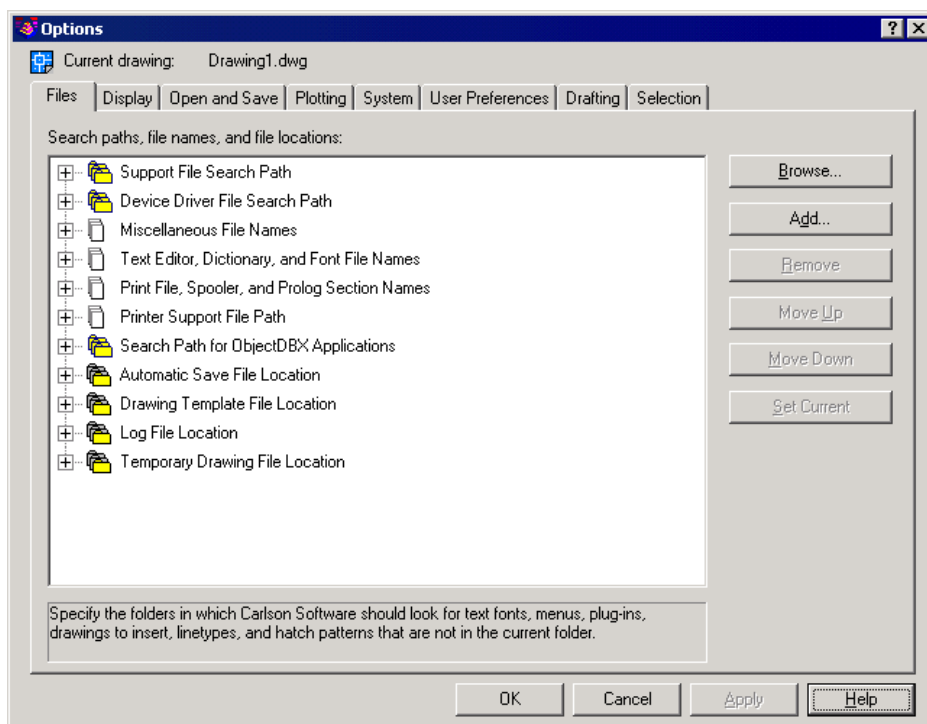
Prerequisite: None

Preferences

Function

This command allows you to customize the Carlson Survey settings.

Files Tab



Under the Files Tab, you specify the directories in which the program searches for support, driver, menu, and other files. You can also specify optional, settings such as which dictionary to use for checking spelling. Each option under the Files Tab displays a list of the directories and files used by Carlson Survey. To specify a location for a directory or file, double-click the directory or file from the list. Choose Browse and use the Browse for Folder dialog box (a standard file selection dialog box) to locate the directory or file you want to use.

1 Support File Search Path: Specifies the directories in which Carlson Survey searches for support files. In addition to the files required to run the program, you can include files for fonts, menus, drawings to insert, linetypes, and hatch patterns in the support file search path.

2 Device Driver File Search Path: Specifies where the program looks for device drivers for the video display, pointing devices, printers, and plotters.

3 Miscellaneous File Names: Specifies the names and locations of various types of files.

- **Menu File:** Specifies the location of the menu file.
- **Default Internet Location:** Specifies the default Internet location used by both the Connect to Internet option on the Help menu, and the Launch Browser button on the Standard toolbar.

4 Text Editor, Dictionary, and Font File Names: Specifies a number of optional settings.

- **Text Editor Application:** Specifies the text editor application to use for editing mtext objects.
- **Custom Dictionary File:** Specifies a custom dictionary to use (if you have one).

- **Alternate Font File:** Specifies the location of the font file to use if Carlson Survey cannot locate the original font and an alternate font is not specified in the font mapping file. If you choose Browse, the program displays the Alternate Font dialog box, from which you can choose an available font.
- **Font Mapping File:** Specifies the location of the file that defines how Carlson Survey should convert fonts it cannot locate.

5 **Print File, Spooler, and Prolog Section Names:** Specifies settings related to plotting.

- **Plot File Name For Legacy Plotting Scripts:** Specifies a default name for the temporary plot files used with plotting scripts created with earlier versions of Autodesk products. The default name is the drawing name plus .plt file name. The default name used with Carlson Survey drawings is the drawing name-layout name plus the .plt file name extension. Some plotting device drivers, however, use a different plot file extension name. This option only affects the default plot file name used for plotting scripts created with earlier versions of Autodesk products.
- **Print Spool Executable:** Specifies the application to use for print spooling. You can enter the executable file name as well as any command line arguments you want to use. For example, you can enter `myspool.bat %s` to spool plot files to `myspool.bat` and have a unique plot file name automatically generated.

6 **Printer Support File Path:** Specifies search path settings for printer support files.

- **Print Spooler File Location:** Specifies the path for print spool files. Carlson Survey writes the plot to this location.
- **Printer Configuration Search Path:** Specifies the path for printer configuration files (PC3 files).
- **Printer Description File Search Path:** Specifies the path for files with a .pmp file extension, or printer description files.
- **Plot Style Table Search Path:** Specifies the path for files with an .stb or .ctb extension, or plot style table files (both named plot style tables and color-dependent plot style tables).

7 **Search Path for ObjectDBX Applications:** Specifies the path for ObjectDBX™ application files. You can enter multiple URL addresses under this option. (Multiple URLs should be separated by a semi-colon.) Carlson Survey searches the specified URLs when an associated ObjectDBX application cannot be located. Only URL addresses can be entered in this option.

8 **Automatic Save File Location:** Specifies the path for the file created when you select Automatic Save on the Open and Save tab.

9 **Drawing Template File Location:** Specifies the path for the template files used by the setup wizards.

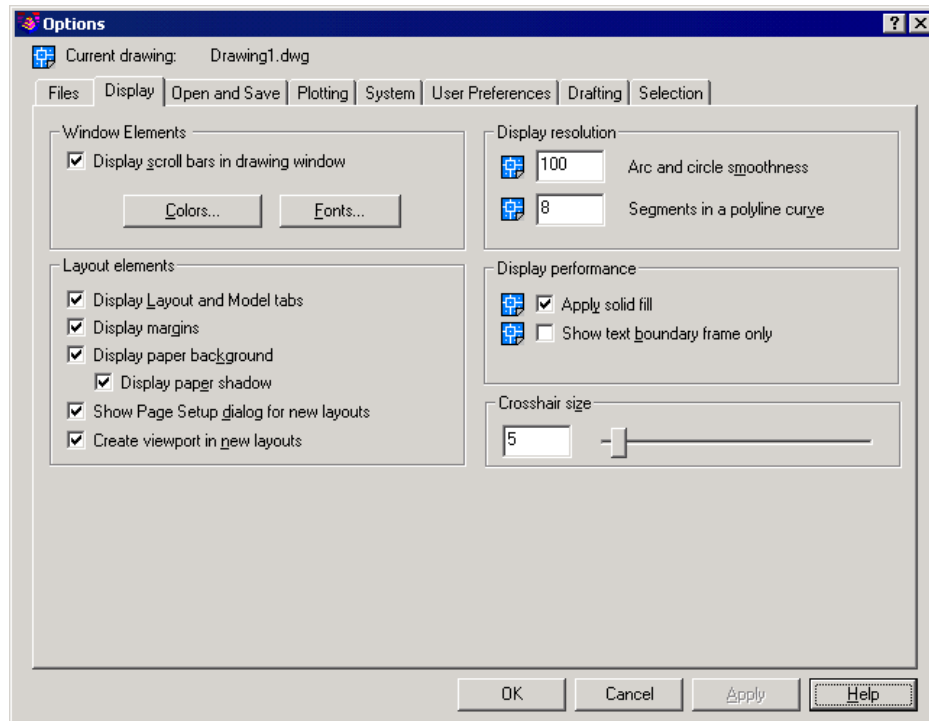
10 **Log File Location:** Specifies the path for the log file created when you select Maintain a Log File on the Open and Save tab.

11 **Temporary Drawing File Location:** Specifies the location Carlson Survey uses to store temporary files. The program creates temporary files on disk and then deletes them when you exit the program. If you plan to run the program from a write-protected directory (for example, if you are working on a network or opening files from a CD), specify an alternate location for your temporary files. The directory you specify must not be write-protected.

12 **Buttons:** You use the following buttons to manipulate the files and paths.

- **Browse:** Displays the Browse for Folder or Select a File dialog box, depending on what you selected in the List of Folders and Files.
- **Add:** Adds a search path for the selected directory.
- **Remove:** Removes the selected search path or file.
- **Move Up:** Moves the selected search path above the preceding search path.
- **Move Down:** Moves the selected search path below the following search path.
- **Set Current:** Makes the selected project or spelling dictionary current.

Display Tab



1 Under Window Elements, you control display settings specific to the Carlson Survey drawing environment.

- **Display Scroll Bars in Drawing Window:** Specifies whether to display scroll bars at the bottom and right sides of the drawing area.
- **Colors:** Displays the Color Options dialog box. Use this dialog box to specify the colors of elements in the window.
- **Fonts:** Displays the Command Line Window Font dialog box. Use this dialog box to specify the font for the command line text.

2 Under Layout Elements, you control options for existing and new layouts. A layout is a paper space environment in which you can set up drawings for plotting.

- **Display Layout and Model Tabs:** Specifies whether to display the layout and Model tabs at the bottom of the drawing area.
- **Display Margins:** Specifies whether margins are displayed in a layout. Margins appear as dashed lines. Objects drawn outside of the margins are clipped or omitted when the drawing is plotted.
- **Display Paper Background:** Specifies whether a representation of the specified paper size is displayed in a layout. The paper size and plot scale determine the size of the paper background.
- **Display Paper Shadow:** Specifies whether a shadow is displayed around the paper background in a layout.
- **Show Page Setup Dialog for New Layouts:** Specifies whether the Page Setup dialog box is displayed when you create a new layout. Use this dialog box to set options related to paper and plot settings.
- **Create Viewport in New Layouts:** Specifies whether a viewport is created when you create a new layout.

3 Under Display Resolution, you control the quality of the display of objects. If you set high values to improve display quality, the impact on performance is significant.

- **Arc and Circle Smoothness:** Controls the smoothness of circles, arcs, and ellipses. A higher number produces smoother objects, but requires more time to regenerate, pan, and zoom the objects. You can improve performance by setting this option to a low value such as 100 for drawing, and increasing the value for ren-

dering. The valid range is 1 to 20,000. The default setting is 100. This setting is saved in the drawing. To change the default for new drawings, consider specifying this setting in the template files on which you base your new drawings.

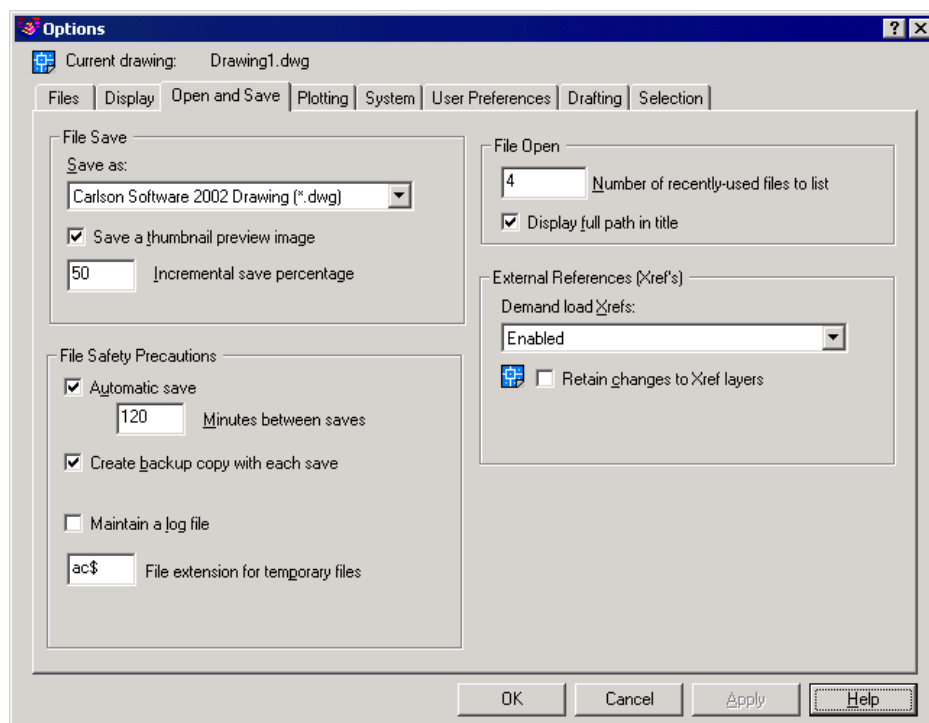
- **Segments in a Polyline Curve:** Sets the number of line segments to be generated for each polyline curve. The higher the number, the greater the performance impact. Set this option to a low value such as 4 to optimize performance for drawing. Values range from -32767 to 32767. The default setting is 8. This setting is saved in the drawing.

4 Under Display Performance, you control display settings that affect Carlson Survey performance.

- **Apply Solid Fill:** Controls whether solid fills in objects are displayed. Objects with solid fill include multi-lines, traces, solids, all hatches (including solid-fill), and wide polylines. You must regenerate the drawing by using REGEN for this setting to take effect. This setting is saved in the drawing. Clear this option to optimize performance.
- **Show Text Boundary Frame Only:** Displays the frames for text objects instead of displaying the text objects. After you select or clear this option, you must use REGEN to update the display. This setting is saved in the drawing. Select this option to optimize performance.

5 Under Crosshair Size, you control the size of the crosshairs. The valid range is from 1 to 100 percent of the total screen. At 100 percent, the ends of the crosshairs are never visible. When the size is decreased to 99 percent or below, the crosshairs have a finite size, and the ends of the crosshairs are visible at the edge of the drawing area. The default size is 5 percent.

Open and Save Tab



Under the Open and Save Tab, you control options that relate to opening and saving files.

1 Under File Save, you control settings related to saving a file in Carlson Survey.

- **Save As:** Displays the valid file formats used when saving a file with SAVE and SAVEAS. The file format selected for this option is the default format that all drawings are saved as when you use SAVE or SAVEAS.

Saving an Carlson Survey file to any DXF format affects performance. Set the Save As option to Carlson Survey 2000 Drawing to optimize performance while saving.

- **Save a Thumbnail Preview Image:** Specifies whether an image of the drawing should be displayed in the Preview area of the Select File dialog box.
- **Incremental Save Percentage:** Sets the percentage of potential wasted space in a drawing file. When the specified percentage is reached, the program performs a full save instead of an incremental save. Full saves eliminate wasted space. If you set Incremental Save Percentage to 0, every save is a full save. Although incremental saves increase the size of your drawing, avoid setting a very low value. Low values degrade performance because the program performs time-consuming full saves more often. For optimum performance, set the value to 50. If hard disk space is scarce, set the value to 25. If you set the value to 20 or less, performance of the SAVE and SAVEAS commands slows significantly.

2 File Safety Precautions settings help you avoid data loss and detect errors.

- **Automatic Save:** Saves your drawing automatically at the interval you specify. You can specify the location of all Autosave files by using the SAVEFILEPATH system variable. SAVEFILE (read-only) stores the name of the Autosave file.
- **Minutes Between Saves:** Specifies how often the drawing is saved when using Automatic Save. The value is stored in SAVETIME.
- **Create Backup Copy with Each Save:** Specifies whether a backup copy of a drawing is created when you save the drawing. The backup copy is created in the same location as the drawing. The ISAVEBAK system variable controls whether a backup copy of the drawing is created.
- **Maintain a Log File:** Specifies whether the contents of the text window are written to a log file. To specify the location and name of the log file, use the Files tab in the Options dialog box.
- **File Extension for Temporary Files:** Specifies a unique extension that allows you to identify your temporary files in a network environment. The default extension is .ac\$.

Retrieving Autosave (backup) Files

If you experience a system crash, it is possible to retrieve the last Autosave file and continue working from this last save. *Retrieving Autosave files is not a substitute for regularly saving your work manually!* Autosave files have the extension .sv\$. To locate these files, use the Windows Search routine to locate files with this extension (e.g. search *.sv\$). The most recently modified .sv\$ file will likely have your most recent work.

Once you locate the .sv\$ file, navigate to its location using Windows Explorer. Rename the file extension to .dwg, and open the file using your Carlson Software. Once the file is opened, confirm that it is your drawing and then use the SaveAs command (described above) to save the drawing to the location of your choosing.

3 Under File Open, you control settings that relate to recently used files and open files.

- **Number of Recently Used Files to List:** Controls the number of recently used files that are listed in the File menu for quick access. Valid values are 0 to 9.
- **Display Full Path In Title:** Displays the full path of the active drawing in the drawing's title bar, or in the Carlson Survey title bar if the drawing is maximized.

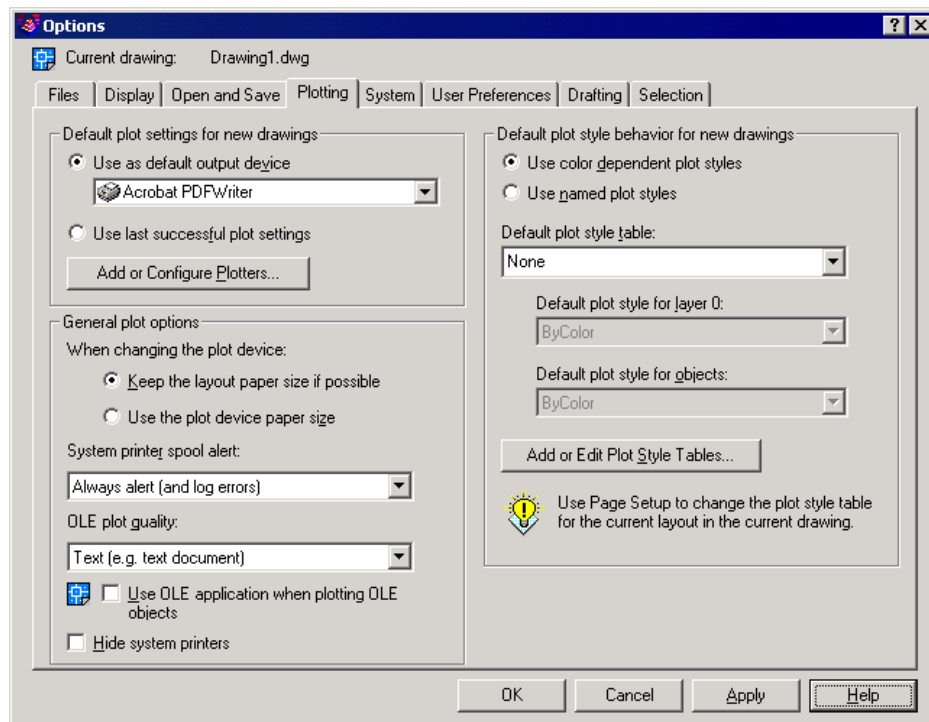
4 Under External References (Xrefs), you control the settings that relate to editing and loading external references.

- **Demand Load Xrefs:** Controls demand loading of xrefs. Demand loading improves performance by loading only the parts of the referenced drawing needed to regenerate the current drawing. External Reference File Demand Load is also controlled by the XLOADCTL system variable.
- **Disabled:** Turns off demand loading.
- **Enabled:** Turns on demand loading and improves performance. Select the Enabled setting to enhance the loading process when you are working with clipped xrefs that contain a spatial or layer index. When this

option is selected, other users cannot edit the file while it is being referenced.

- **Enabled with Copy:** Turns on demand loading but uses a copy of the referenced drawing. Other users can edit the original drawing.
- **Retain Changes to Xref Layers:** Saves changes to layer properties and states for xref-dependent layers. When the drawing is reloaded, the properties currently assigned to xref-dependent layers are retained. This setting is saved in the drawing.

Plotting Tab



Under the Plotting Tab, you control options related to plotting.

1 Under Default Plot Settings For New Drawings, you control default plotting settings for new drawings or drawings created in AutoCAD Release 14 or earlier that have never been saved in Carlson Survey 2000 format.

- **Use As Default Output Device:** Sets the default output device for new drawings and for drawings created in AutoCAD Release 14 or earlier that have never been saved in Carlson Survey 2000 format. The list displays any plotter configuration files (PC3) found in the plotter configuration search path and any system printers that are configured in the system.
- **Use Last Successful Plot Settings:** Sets the plotting settings according to the settings of the last successful plot.
- **Add or Configure Plotters:** Displays the Autodesk Plotter Manager (a Windows system window). You can add or configure a plotter with the Autodesk Plotter Manager.

2 Under General Plot Options, you control options that relate to the general plotting environment including paper size settings, system printer alert behavior, and OLE objects in an Carlson Survey drawing.

- **Keep the Layout Paper Size If Possible:** Uses the paper size specified on the Layout Settings tab in the Page Setup dialog box under the File menu as long as the selected output device can plot to this paper size. If the selected output device cannot plot to this paper size, the program displays a warning message and uses the paper size specified either in the plotter configuration file (PC3) or in the default system settings if the output

device is a system printer. You can also set Keep the Layout Paper Size If Possible by setting PAPERUPDATE to 0.

- **Use the Plot Device Paper Size:** Uses the paper size specified either in the plotter configuration file (PC3) or in the default system settings if the output device is a system printer. You can also set Use the Plot Device Paper Size by setting PAPERUPDATE to 1.
- **System Printer Spool Alert:** Determines whether to alert you if the plotted drawing is spooled through a system printer because of an input or output port conflict.
- **Always Alert (And Log Errors):** Alerts you and always logs an error when the plotted drawing spools through a system printer.
- **Alert First Time Only (And Log Errors):** Alerts you once and always logs an error when the plotted drawing spools through a system printer.
- **Never Alert (And Log First Error):** Never alerts you and logs only the first error when the plotted drawing spools through a system printer.
- **Never Alert (Do Not Log Errors):** Never alerts you or logs an error when the plotted drawing spools through a system printer.
- **OLE Plot Quality:** Determines the quality of plotted OLE objects. The values are Line Art, Text, Graphics, Photograph, and High Quality Photograph.
- **Use OLE Application When Plotting OLE Objects:** Launches the application used to create the OLE object when plotting a drawing with OLE objects. You can use this option if you want to optimize the quality of plotted OLE objects. This setting is saved in the drawing. You can also control this option by using the OLESTARTUP system variable.
- **Hide System Printer:** Controls whether Windows system printers are displayed in the Plot and Page Setup dialog boxes under the File menu. This option hides standard Windows system printers only. You can control the size of the list of devices in the Plot and Page Setup dialog boxes by moving a device's PC3 file out of the Plotters directory and its subdirectories.

3 Under Default Plot Style Behavior, you control options related to plot style behavior in all drawings. Changing the default plot style behavior using the Options dialog box does not affect the current drawing. A plot style is a collection of property settings defined in a plot style table and applied when the drawing is plotted. The default setting is Use Color Dependent Plot Styles. The plot style list on the Object Properties toolbar is disabled by default. You enable the list after you select the Use Named Plot Styles option and open a new drawing. You can also control Default Plot Style Behavior by using the PSTYLEPOLICY system variable.

- **Use Color Dependent Plot Styles:** Uses color-dependent plot styles in both new drawings and drawings created in earlier versions of Autodesk products. Color-dependent plot styles use the numbers from the color index to create a plot style table with a .ctb file extension. Each color is defined by a name or number ranging from 1 to 255. You can assign each color number to a different pen on a pen plotter to achieve different property settings in the plotted drawing. If this option is selected, a plot style is created for each color setting. You can also control Use Color Dependent Plot Styles by setting the PSTYLEPOLICY system variable to 1.

If you want to change the default plot style behavior for a drawing, select this option or Use Named Plot Styles before opening or creating a drawing. Changing the default plot style behavior using the Options dialog box affects only new drawings or drawings created in an earlier release of an Autodesk product that have never been saved in Carlson Survey 2000 format. This setting is saved with the drawing. Once a drawing is saved with Use Color Dependent Plot Styles as the default, you can change the default to Use Named Plot Styles with a migration utility with a migration utility. However, once a drawing is saved with Use Named Plot Styles as the default, you cannot change it to Use Color Dependent Plot Styles.

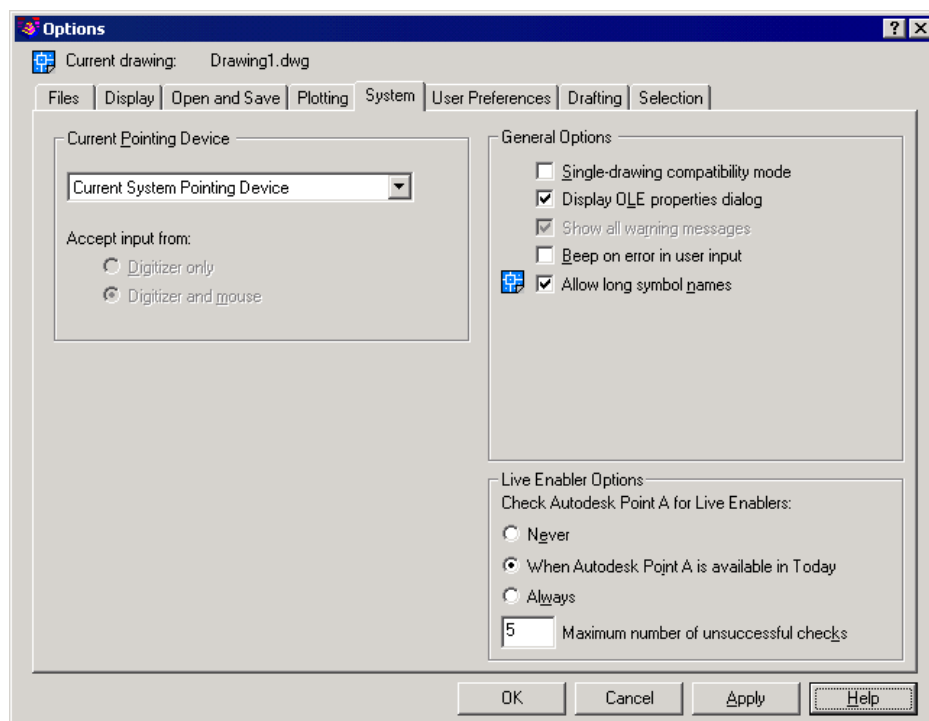
- **Use Named Plot Styles:** Uses named plot styles in both new drawings and drawings created in earlier versions of Autodesk products. Carlson Survey plots the drawing according to the property settings you specify in the plot style definition. The plot style is defined in the plot style table attached to the layout or viewport. Named plot style tables are files with the file extension .stb. You can also control Use Named Plot Styles by setting

the PSTYLEPOLICY system variable to 0.

If you want to change the default plot style behavior for a drawing, select this option or Use Color Dependent Plot Styles before opening or creating a drawing. Changing the default plot style behavior using the Options dialog box affects only new drawings or drawings created in an earlier release of an Autodesk product that have never been saved in Carlson Survey 2000 format. This setting is saved with the drawing. Once a drawing is saved with Use Color Dependent Plot Styles as the default, you can change the default to Use Named Plot Styles with a migration utility. However, once a drawing is saved with Use Named Plot Styles as the default, you cannot change it to Use Color Dependent Plot Styles.

- **Default Plot Style Table:** Specifies the default plot style table to attach to new drawings. A plot style table is a file with a .ctb or an .stb extension that includes and defines plot styles. If you are using color-dependent plot styles, this option lists all color dependent plot style tables found in the search path as well as the value of None. If you are using named plot styles, this option lists all named plot styles tables.
- **Default Plot Style for Layer 0:** Sets the default plot style for Layer 0 for new drawings or drawings created with earlier releases of an Autodesk product that have never been saved in Carlson Survey 2000 format. The list displays the default value Normal and alphabetically displays any plot styles defined in the currently loaded plot style table.
- **Default Plot Style for Objects:** Sets the default plot style that is assigned when you create new objects. The list displays a BYLAYER, BYBLOCK, and Normal style, and it alphabetically displays any plot styles defined in the currently loaded plot style table.
- **Add or Edit Plot Style Tables:** Displays the Autodesk Plot Style Table Manager (a Windows Explorer window). You can create or edit plot style tables with the Autodesk Plot Style Table Manager.

System Tab



Under the System Tab, you control Carlson Survey system settings.

1 Under Current Pointing Device, you control options that relate to the pointing device. This field displays a list of the available pointing device drivers.

- **Current System Pointing Device:** Sets the system pointing device as current.
- **Wintab Compatible Digitizer:** Sets the Wintab Compatible Digitizer as current.
- **Accept Input From:** Specifies whether the program accepts input from both a mouse and a digitizer or ignores mouse input when a digitizer is set.

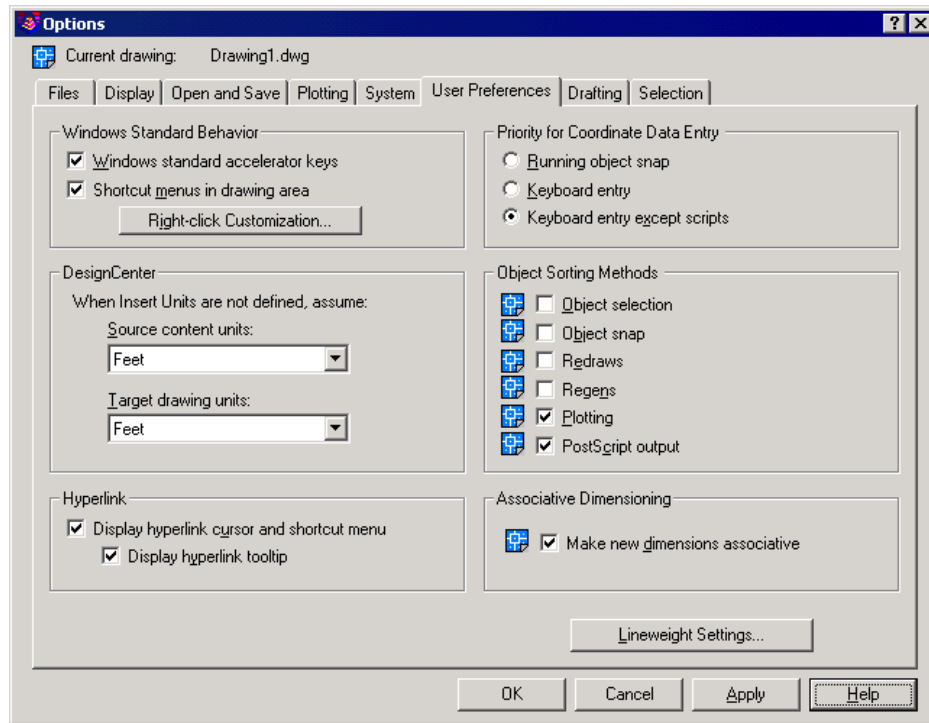
2 Under General Options, you control general options that relate to system settings.

- **Single-Drawing Compatibility Mode:** Specifies whether a single-drawing interface (SDI) or a multi-drawing interface (MDI) is enabled. If you select this option, Carlson Survey opens only one drawing at a time. If you clear this option, the program can open multiple drawings at once.
- **Display OLE Properties Dialog:** Controls the display of the OLE Properties dialog box when inserting OLE objects into a drawing.
- **Show All Warning Messages:** Displays all dialog boxes that include a Don't Display This Warning Again option. All dialog boxes with warning options are displayed regardless of previous settings specific to each dialog box.
- **Beep on Error in User Input:** Specifies whether the program should sound an alarm beep when it detects an invalid entry.
- **Allow Long Symbol Names:** Determines whether long symbol names are enabled. Named objects can include up to 255 characters. Names can include letters, numbers, blank spaces, and any special character not used by Windows and Carlson Survey for other purposes. When this option is enabled, long names can be used for layers, dimension styles, blocks, linetypes, text styles, layouts, UCS names, views, and viewport configurations. This option is saved in the drawing.

3 Under Live Enabler Options, you specify how Carlson Survey checks for Object Enablers. Using Object Enablers, you can display and use custom objects in Carlson Survey drawings even when the ObjectARX application that created them is unavailable.

- **Never:** Prevents the program from checking for Object Enablers regardless of your settings in the Today window.
- **When Autodesk Point A is Available in Today:** Carlson Survey checks for Object Enablers only if Autodesk Point A is open in the Today window. It is not necessary for the Today window to be open. However, the program checks for Object Enablers only if a live Internet connection is present.
- **Always:** Carlson Survey always checks for Object Enablers regardless of your settings in the Today window.
- **Maximum Number of Unsuccessful Checks:** Specifies the number of times Carlson Survey will continue to check for Object Enablers after unsuccessful attempts.

User Preferences Tab



Under the User Preferences Tab, you control options that optimize the way you work in Carlson Survey.

1 Under Windows Standard Behavior you specify whether Windows behavior is applied when working in Carlson Survey.

- **Windows Standard Accelerator Keys:** Follows Windows standards in interpreting keyboard accelerators (for example, CTRL+C equals COPYCLIP). If this option is cleared, the program interprets keyboard accelerators by using Carlson Survey standards rather than Windows standards (for example, CTRL+C equals Cancel, CTRL+V toggles among the viewports).
- **Shortcut Menus in Drawing Area:** Controls whether right-clicking in the drawing area displays a shortcut menu or issues ENTER.
- **Right-Click Customization:** Displays the Right-Click Customization dialog box. You can also set Shortcut Menus in Drawing Area and the right-click customization settings by using the SHORTCUTMENU system variable.

2 DesignCenter - this section does not apply to Carlson Survey.

3 Under Hyperlink, you control settings that relate to the display properties of hyperlinks.

- **Display Hyperlink Cursor and Shortcut Menu:** Controls the display of the hyperlink cursor and shortcut menu. The hyperlink cursor appears alongside the crosshairs whenever the pointing device moves over an object that contains a hyperlink. The hyperlink shortcut menu provides additional options when you select an object that contains a hyperlink and then right-click in the drawing area. If this option is cleared, the hyperlink cursor is never displayed and the Hyperlink option on shortcut menus is not available (if shortcut menus are enabled).
- **Display Hyperlink Tooltip:** Controls the display of the Hyperlink tooltip. If this option is selected, a hyperlink tooltip is displayed when the pointing device moves over an object that contains a hyperlink. Display Hyperlink Cursor and Shortcut Menu must be selected to enable this option

4 Under Priority for Coordinate Data Entry, you control how Carlson Survey responds to input of coordinate data.

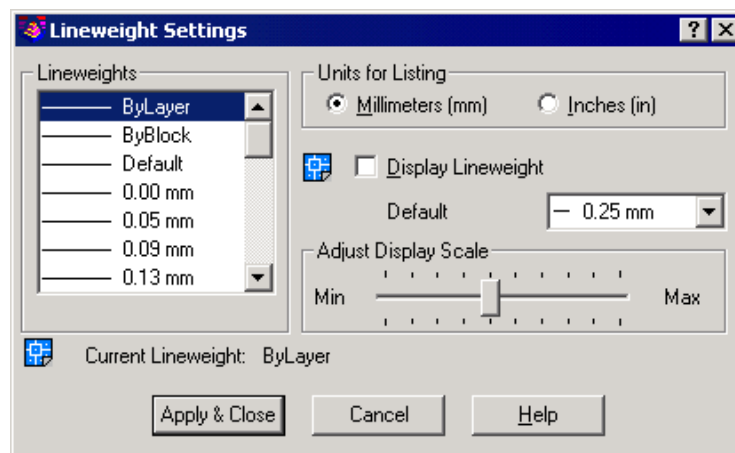
- **Running Object Snap:** Specifies that running object snaps override coordinate entry at all times. You can also set OSNAPCOORD to 0 to enable Running Object Snap.
- **Keyboard Entry:** Specifies that coordinate entry overrides running object snaps at all times. You can also set OSNAPCOORD to 1 to enable Keyboard Entry.
- **Keyboard Entry Except Scripts:** Specifies that coordinate entry overrides running object snaps, except in scripts. You can also set OSNAPCOORD to 2 to enable Keyboard Entry Except Scripts.

5 Under Object Sorting Methods, you determine the sort order of objects.

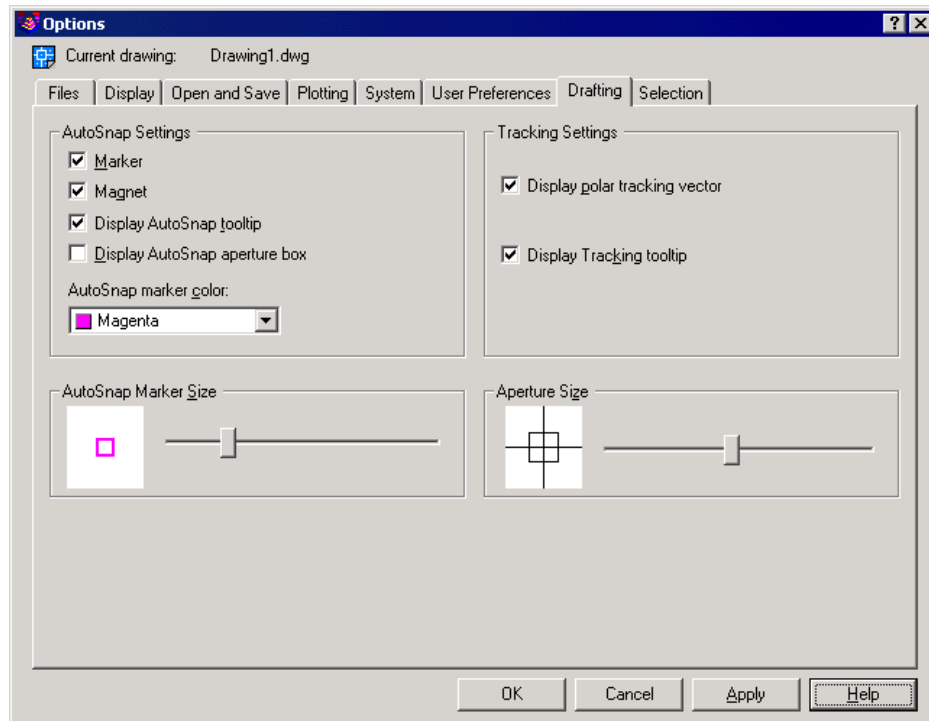
- **Object Selection:** Controls how objects are sorted during selection. If this option is selected, Carlson Survey sorts objects available for selection from those created first to those created last. If two overlapping objects are chosen during object selection, the program recognizes the newest object as the selected object. If this option is cleared, object selection is determined by a random sort order. This setting is saved in the drawing.
- **Object Snap:** Controls how objects are sorted when using Object Snap. If this option is selected, Carlson Survey sorts objects available for selection from those created first to those created last. If two overlapping objects are chosen when using Object Snap, the program recognizes the newest object as the object to snap to. If this option is cleared, Object Snap is determined by a random sort order. This setting is saved in the drawing.
- **Redraws:** Controls how objects are sorted when using the REDRAW command. If this option is selected, the program sorts and redraws objects in the drawing from those created first to those created last. If this option is cleared, the redrawing of objects is determined by a random sort order. This setting is saved in the drawing.
- **Regens:** Controls how objects are sorted when using the REGEN command. If this option is selected, the program sorts and regenerates objects in the drawing from those created first to those created last. If this option is cleared, the regeneration of objects is determined by a random sort order. This setting is saved in the drawing.
- **Plotting:** Controls how objects are sorted during plotting. If this option is selected, the program sorts and plots objects in the drawing from those created first to those created last. If this option is cleared, the plotting of objects is determined by a random sort order. This setting is saved in the drawing.
- **PostScript Output:** Controls how objects are sorted in PostScript output. If this option is selected, the program sorts and exports objects in the drawing from those created first to those created last. If this option is cleared, the exporting of objects is determined by a random sort order. This setting is saved in the drawing.
- **Lineweight Settings:** Displays the Lineweight Settings dialog box. Use this dialog box to set lineweight options, such as display properties and defaults, and also to set the current lineweight.

6 Associative Dimensioning - this section does not apply to Carlson Survey.

7 Lineweight Settings - Displays the Lineweight Settings dialog box. Use this dialog box to set lineweight options, such as display properties and defaults, and also to set the current lineweight.



Drafting Tab



Under the Drafting Tab, you specify a number of general editing options.

1 Under AutoSnap Settings, you control settings that relate to object snaps. Using object snaps, you can locate exact points and planes including endpoints, midpoints, centers, nodes, quadrants, intersections, insertion points, and perpendicular and tangent planes.

- **Marker:** Controls the display of the AutoSnap™ marker. The marker is a geometric symbol that displays the object snap location when the crosshairs move over a snap point on an object. You can also enable the Marker by setting AUTOSNAP to 1.
- **Magnet:** Sets the AutoSnap magnet on or off. The magnet is an automatic movement of the crosshairs that locks the crosshairs onto the nearest snap point. You can also enable the Magnet by setting AUTOSNAP to 4.
- **Display AutoSnap Tooltip:** Controls the display of the AutoSnap tooltip. The tooltip is a text flag that describes which part of the object you are snapping to. You can turn object snaps on and off from the Object Snap tab in the Drafting Settings dialog box. You can also enable the Display AutoSnap tooltip option by setting AUTOSNAP to 2.
- **Display AutoSnap Aperture Box:** Controls the display of the AutoSnap aperture box. The aperture box is a box that appears inside the crosshairs when you snap to an object. You can also set the Display AutoSnap Aperture Box by using the APBOX system variable.
- **AutoSnap Marker Color:** Specifies the color of the AutoSnap marker.

2 Under AutoSnap Marker Size, you set the display size for the AutoSnap marker. Values range from 1 to 20 pixels.

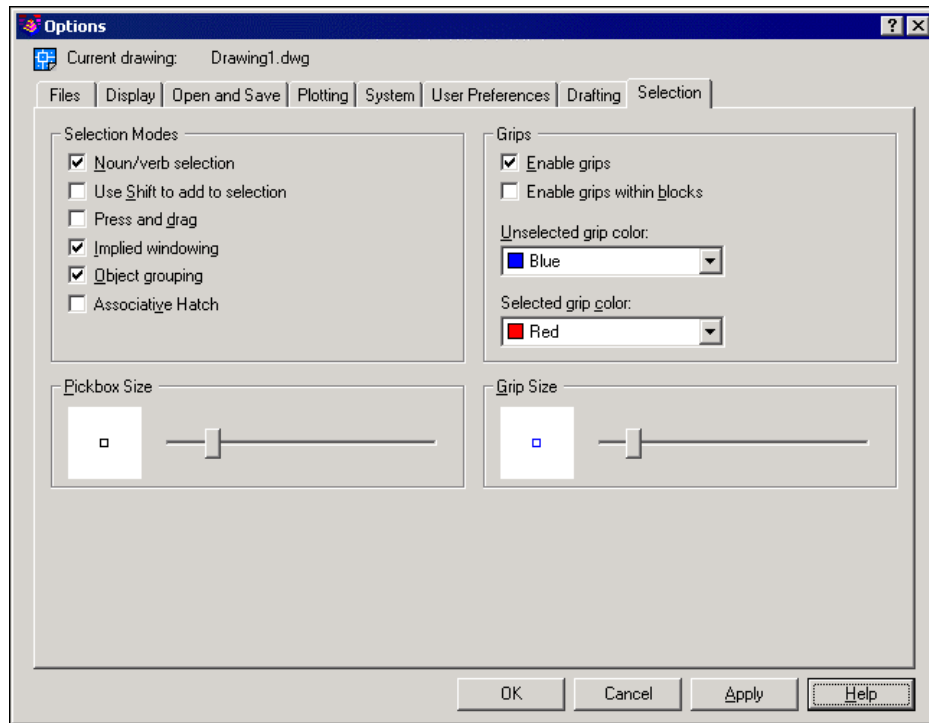
3 Under Tracking Settings, you control the settings that relate to tracking behavior.

- **Display Polar Tracking Vector:** Sets polar tracking behavior on or off. With polar tracking, you can draw lines along angles relative to a drawing command From or To point. Polar angles are 90-degree divisors, such as 45, 30, and 15 degrees.
- **Display AutoTrack Tooltip:** Controls the display of the AutoTrack tooltip. The tooltip is a text flag that displays the tracking coordinates. You can turn Object Snap Tracking on and off on the Object Snap tab in the

Drafting Settings dialog box. You can also enable the AutoTrack tooltip by setting AUTOSNAP to 32.

4 Under Aperture Size, you set the display size for the Autosnap aperture. When Display AutoSnap Aperture Box is selected (or when APBOX is set to 1), the aperture box is displayed in the center of the crosshairs when you snap to an object. The size of the aperture determines how close to a snap point you can be before the magnet locks the aperture box to the snap point. The smaller the aperture, the closer you must be to the snap point to activate the magnet. Values range from 1 to 50 pixels. You can also set Aperture Size by using the APERTURE system variable.

Selection Tab



Under the Selection Tab, you control settings that relate to object selection methods.

1 Under Selection Modes, you determine the methods of selecting objects.

- **Noun/Verb Selection:** Allows you to select an object before starting a command. The command affects the previously selected object or objects. You can also set this option by using the PICKFIRST system variable.
- **You can use many editing and inquiry commands with noun/verb selection, including:** ALIGN, DVIEW, PROPERTIES, ARRAY, ERASE, ROTATE, BLOCK, EXPLODE, SCALE, CHANGE, LIST, STRETCH, CHPROP, MIRROR, WBLOCK, COPY, and MOVE.
- **Use Shift to Add to Selection:** Adds or removes an object to the selection set when you press SHIFT and select an object. To clear a selection set quickly, draw a selection window in a blank area of the drawing. You can also set this option by using the PICKADD system variable.
- **Press and Drag:** Draws a selection window by selecting a point and dragging the pointing device to a second point. If this option is not selected, you can draw a selection window by selecting two separate points with the pointing device. You can also set this option by using the PICKDRAG system variable.
- **Implied Windowing:** Initiates the drawing of a selection window when you select a point outside an object. Drawing the selection window from left to right selects objects inside the window's boundaries. Drawing from right to left selects objects within and crossing the window's boundaries. You can also set this option by using the PICKAUTO system variable.
- **Object Grouping:** Selects all objects in a group when you select one object in that group. With GROUP you

can create and name a set of objects for selection. You can also set this option by setting the PICKSTYLE system variable to 1.

- **Associative Hatch:** Determines which objects are selected when you select an associative hatch. If this option is selected, boundary objects are also selected when you select an associative hatch. You can also set this option by setting the PICKSTYLE system variable to 2.

2 Under Pickbox Size, you control the display size of the Carlson Survey pickbox. The pickbox is the object selection tool that appears in editing commands. The default size is set to 3 pixels; values range from 0 to 20. You can also set the Pickbox Size by using the PICKBOX system variable. If you use the command line to set Pickbox Size, values range from 0 to 32767.

3 Under Grips, you control the settings that relate to grips. Grips are small squares displayed on an object after it has been selected.

- **Enable Grips:** Controls whether grips are displayed on an object after you select it. You can edit an object with grips by selecting a grip and using the shortcut menu. Enabling grips in a drawing significantly affects performance. Clear this option to optimize performance.
- **Enable Grips within Blocks:** Controls how grips are displayed on a block after you select it. If this option is selected, Carlson Survey displays all grips for each object in the block. If this option is cleared, the program displays one grip located at the insertion point of the block. You can edit an object with grips by selecting a grip and using the shortcut menu.
- **Unselected Grip Color:** Determines the color of an unselected grip. If you choose Other from the color list, Carlson Survey displays the Select Color dialog box. the program displays an unselected grip as the outline of a small square. You can also set Unselected Grip Color by using the GRIPCOLOR system variable.
- **Selected Grip Color:** Determines the color of a selected grip. If you choose Other from the color list, Carlson Survey displays the Select Color dialog box. The program displays a selected grip as a filled small square. You can also set Selected Grip Color by using the GRIPHOT system variable.

4 Under Grip Size, you control the display size of grips. The default size is set to 3 pixels; values range from 1 to 20. You can also set the Grip Size by using the GRIPSIZE system variable. If you use the command line to set Grip Size, values range from 1 to 255.

Menu Location: Settings

Keyboard Command: PREFERENCES

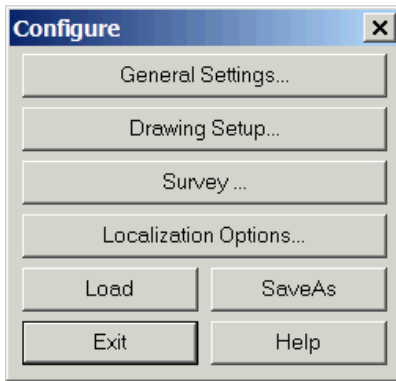
Prerequisite: None

Configure

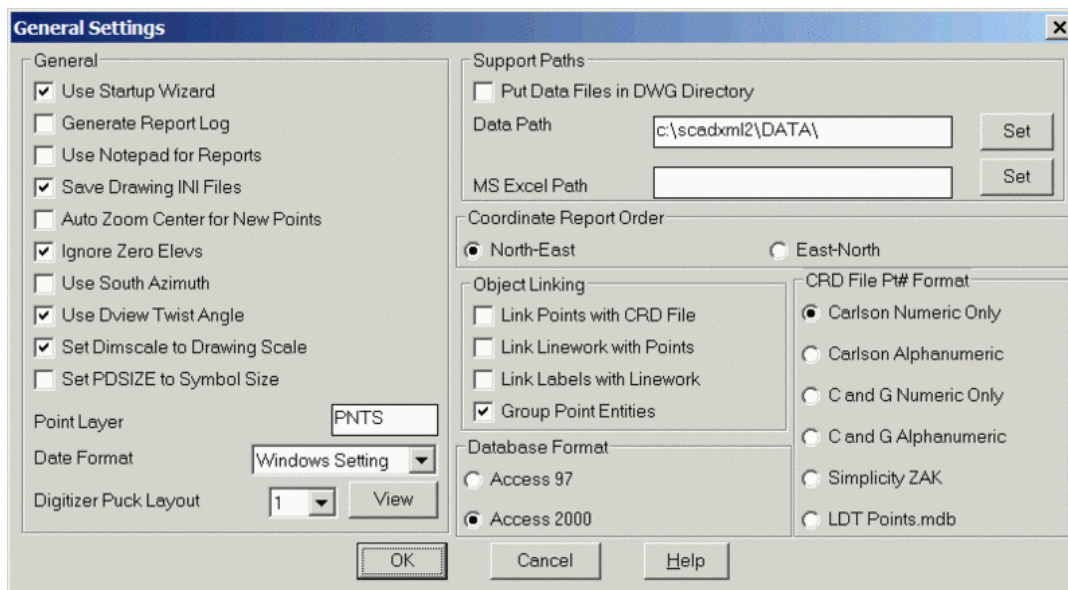
Function

This command allows you to set the default settings that are used each time you start a new drawing or load an existing drawing. These settings are stored in *.ini files in the Carlson Survey directory. Configure restores the current drawing settings to these default settings.

In the Configure dialog box you choose between General Settings, Survey Settings, and Drawing Setup.



In the General Settings dialog box you can set options for Carlson Survey.



Under General, you can choose options relevant to points, angles, and start up.

- **Use Startup Wizard:** This option controls whether the wizard appears when you create a new drawing.
- **Generate Report Log:** This option allows output from several commands to be accumulated in a report buffer. Any report that is displayed in the standard report viewer is also added to the report log. While activated, the report log resides in the lower left corner of the desktop as a minimized title bar displaying the number of lines in the report buffer. To view the report log, pick the maximize icon on this title bar. You can edit the report log, save it to a file, or print it. To quickly turn the report log on and off, you can type REPORT at the command prompt, which toggles the report log on/off.
- **Use Notepad for Reports:** When this toggle is turned on, whenever a report is generated, it will appear in a Windows Notepad instead of the Carlson Survey Report Viewer.
- **Save Drawing INI Files:** This option creates an .ini file with the same name as the .dwg file to store the project data files for the drawing.
- **Put Data Files in DWG Directory:** This option sets the Data Path to the directory of the drawing. The Data Path is the default directory for data files such as the coordinate file (.crd).
- **Auto Zoom Center for New Points:** This option will zoom center on new points.
- **Ignore Zero Elevs:** This option causes entities with zero elevations to be excluded from calculations, etc.

- **Use South Azimuth:** This option allows you to use a south azimuth for calculations.
- **Use Dview Twist Angle:** This option keeps text horizontal to a twist screen view.
- **Set PDSIZE to Symbol Size:** When checked, the system variable PDSIZE will be set to the same size as the symbol size that you set in Drawing Setup. PDSIZE controls the display size of AutoCAD point entities. Normally AutoCAD point entities are displayed as a dot, and the size does not apply. You may modify the point display type by changing the system variable PDMODE. For example, if you set PDMODE to 64, point entities are displayed as a square regardless of the Carlson Survey symbol type used.
- **Point Layer:** You can assign a layer name for points.
- **Date Format:** You can control the display of dates in Carlson Survey reports with this popdown menu. The default is 'Windows Setting' which allows you to control it with Windows Control Panel. Several other common formats are available.



- **Coordinate Report Order:** You can choose whether coordinates are reported in northing-easting or easting-northing order.

B Under Support Paths, you must determine paths for file allocation and retrieval.

- **Data Path:** You determine where data files (*.crd, *.grd, etc.) are stored.
- **LSP Path:** You determine where command files (*.dcl, *.arx, etc.) are stored. Warning: Changing this path can render Carlson Survey non-functional
- **Program Path:** You determine where *.exe files are located. Warning: Changing this path can render Carlson Survey non-functional
- **Support Path:** You determine where auxiliary *.dwg files (point symbols, linetypes, etc.) are stored
- **MS Excel Path:** You determine the path for the *.exe file for MS Excel is located.

C Under Object Linking, you can set reactors to the drawing entities.

- **Link Points with CRD File:** This option attaches a reactor to the point entities so that any change to the entities such as MOVE or ROTATE will update the coordinates in the coordinate file.
- **Link Linework with Points:** This option attaches reactors to line and polyline entities that are drawn by point number so that moving the points automatically moves the linework.
- **Link Labels with Linework:** This option applies to bearing/distance annotation. This link updates the annotation when the linework is modified.
- **Group Point Entities:** This option joins the three entities of a point (attribute block, symbol, node). For each point, selecting any one of these entities selects all three entities for the point.

D Under CRD File Pt# Format, you can set the point number format for coordinate files.

- **Carlson Numeric Only:** This is the default format upon installation. Point numbers cannot contain letters and must be in the range from 1 to 32767.

- **Carlson Alphanumeric:** This native Carlson Survey format allows letters in the point numbers, and the point name can be up to 10 characters. Any combination of letters and numbers is acceptable.
- **C&G Numeric:** This format of the C&G division supports up to 5 digits, with a 65000 point limit.
- **C&G Alphanumeric:** This format of the C&G division supports up to 10 characters, with no limit to the number of points.
- **LDD Points.mdb:** This is a Microsoft Access database used by Autodesk Land Desktop. The file is typically named "points.mdb" and is found in a projects \COGO directory. The number limitation is established by the database structure, but is frequently numeric and allows unlimited point numbers.

E Under Database Format you choose between Microsoft Access 97 or 2000 format. This only applies to new .MDB files created by Carlson Survey

F Under Report Print Specifications, you determine formatting for the Standard Report Viewer.

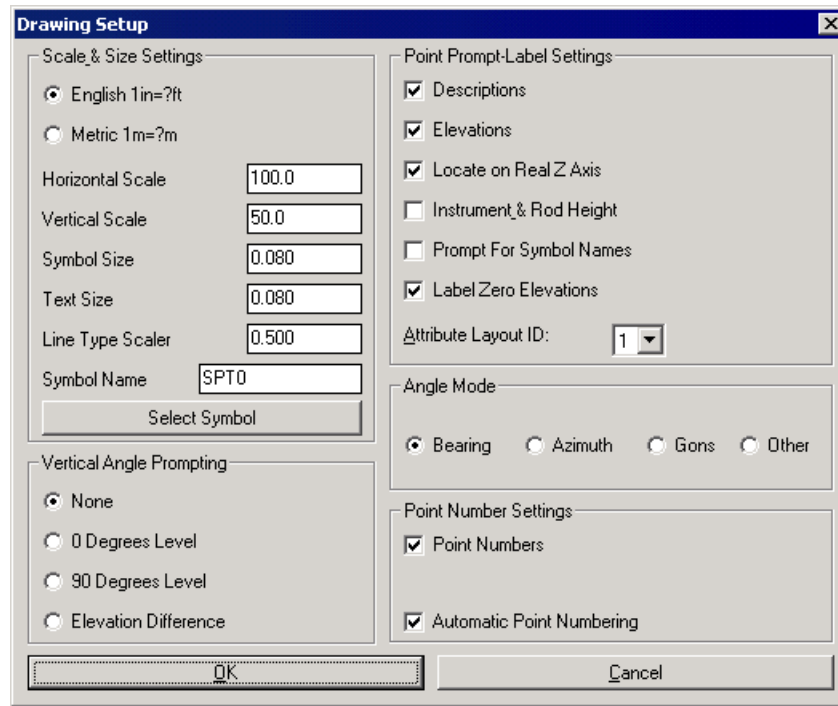
- **Use Degree Symbol in Reports:** This option lets you choose between using the degree circle symbol and a "d" for degree angles in the report. The "d" can be used for printers that don't handle the degree circle symbol.
- **Use Print Settings:** This option allows you to use settings on the Plot Settings Tab under Plot in the File menu.
- **Use Page#:** This option adds a page number to the bottom of each page in the report.
- **Text Size:** This option specifies text size for the reports.
- **Lines/Page:** This option specifies the number of lines per page of the report viewer.
- **Left Margin:** This option specifies the left margin of the report.
- **Top Margin:** This option specifies the top margin of the report.
- **Bottom Margin:** This option specifies the bottom margin of the report.

G Under Title Block, you set the height and width of the title block.

H Under Contour Options, you set the smoothing and offset parameters.

- **Smooth Contours:** This option automatically applies a smoothing factor to the calculated contour line.
- **Low/High slider:** This slider bar determines the amount of smoothing to be applied.
- **Reduce Vertices:** This option automatically applies a reduction to the number of vertices created in the calculating the contour lines.
- **Offset Distance:** This option determines offset distance of the contour lines.

In the Drawing Setup dialog box you have options for setting drawing parameters, including the plotting scale, size of symbols, label annotation size, and the drawing mode.



A Under Scale and Size Settings, you can determine scale and size of drawing entities.

- **English 1in=?ft:** This option tells the program which unit mode to use. This affects the prompting and reports. When you are working on a drawing in English units, one unit equals one foot.
- **Metric 1m=?m:** This option sets the metric scale to meters only.
- **Horizontal Scale:** This option allows you to set the horizontal scale of the drawing. For example, if the horizontal scale is set to 50, then 1" = 50' in your drawing.
- **Vertical Scale:** This option allows you to set the vertical scale of the drawing.
- **Symbol Size:** This value is a scaler that represents the size on the plot. The Drawing Units are determined by multiplying the scaler by the horizontal scale. In English mode the scaler represents the plotted size in inches. In Metric mode, this value is the plotted size in centimeters. The Symbol Plot Size is not entered in Drawing Units
- **Text Size:** This value is a scaler that represents the size on the plot. The Drawing Units are determined by multiplying the scaler by the horizontal scale. In English mode the scaler represents the plotted size in inches. In Metric mode, this value is the plotted size in centimeters. The Text Plot Size is not entered in Drawing Units.
- **Line Type Scaler:** This option sets the linetype scale by multiplying this scaler by the horizontal scale.
- **Symbol Name:** This option allows you to set the default symbol name for points.
- **Select Symbol:** Click this button to graphically select the default symbol.

B Under Point Prompt-Label Settings, select the options that determine how the points are to be labeled and how you will be prompted for point entry.

- **Descriptions:** Determines whether you are prompted for a point description when creating points and whether the point descriptions are labeled in the point block.
- **Elevations:** Sets prompting and labeling for point elevations.
- **Locate on Real Z Axis:** Switches between locating points at zero elevation and at the actual stored elevations.
- **Instrument & Rod Height:** Turns on prompting for instrument and rod heights when creating points.

- **Prompt for Symbol Name:** When checked, the program will prompt for a symbol name as each point is drawn. Otherwise, the default symbol name set in this dialog box will be used.
- **Attribute Layout ID:** Controls the location of the point number, elevation, and description. These attribute layouts are defined in drawings that are stored in the Carlson Survey Support directory with the file name of SRVPNO plus the ID number (i.e. SRVPNO1.DWG, SRVPNO2.DWG, etc.). If you want to change the attribute positions for a layout ID, then edit the associated SRVPNO drawing.

C Under Angle Mode, you determine how angles are entered and displayed.

- **Bearing:** This option sets reporting to bearing mode for any of the Inquiry commands.
- **Azimuth:** This option sets reporting to north based azimuth mode for any of the Inquiry commands.
- **Gon:** This option sets reporting to gon mode for any of the Inquiry commands.
- **Other:** Allows you to set a custom angle mode by using the Units Control command (described later in this chapter).

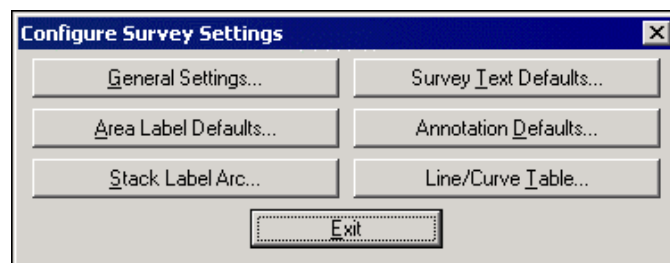
D Under Vertical Angle Mode select an option to determine how the vertical angle is calculated. Vertical Angle Prompt applies to creating points with commands such as Traverse.

- **None:** The vertical angle will not be used to calculate point elevations.
- **0 Degrees Level:** The vertical angle is used to calculate elevation and horizontal distance.
- **90 Degrees Level:** The zenith angle is used to calculate elevation and horizontal distance.
- **Elevation Difference:** Use the elevation difference to calculate the elevation.

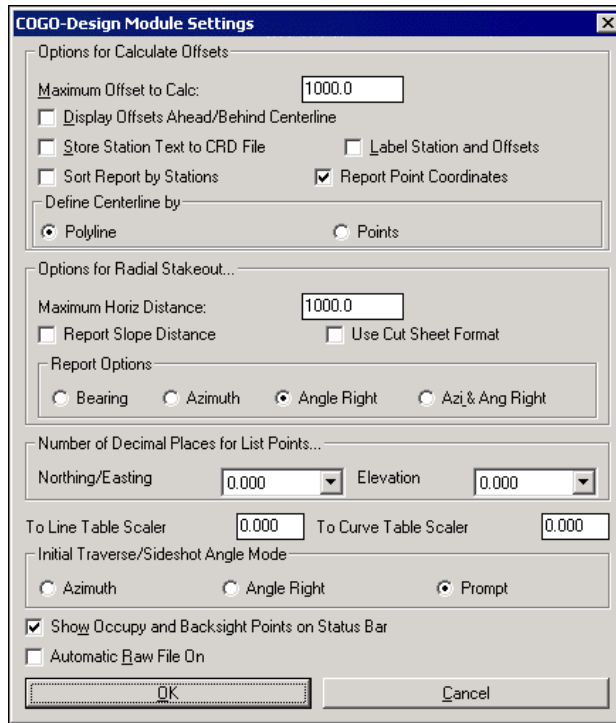
E Under Point Number Settings, select the options that determine whether you will be prompted for point numbers by the commands that locate points.

- **Point Numbers:** When this toggle is checked on, points that are inserted by Carlson Survey commands are shown with a point number, and a coordinate is stored in the current coordinate (.crd) file. When this toggle is off, points are shown with no point number plotted and no coordinate is stored in the current coordinate (.CRD) file.
- **Automatic Point Numbering:** If this toggle is checked on, commands that locate a point will automatically insert a point number for each point drawn on the screen. If Automatic Point Numbering toggle is off, commands that locate a point will prompt for a point number.

In the Configure survey Settings dialog box, you set defaults for coordinate geometry calculations and design work.



In the General Settings dialog box under COGO-Design, you can set defaults for offsets and stakeout.



A Under Options for Calculate Offsets, you must set defaults for offsets.

- **Maximum Offset to Calc:** This option allows you to set the maximum distance an offset will be calculated from an origin.
- **Display Offsets Ahead/Behind Centerline:** This option allows you to display the calculated offsets apart from the centerline.
- **Store Station Text to CRD File:** This option allows you to save station text in the coordinate file with the points.
- **Label Station and Offsets:** This option allows you to label the generated stations and offsets.
- **Sort Report by Stations:** This option allows you to sort the output report by generated stations.
- **Report Point Coordinates:** This option allows you to report coordinates for all points generated.

B Under Define Centerline by, you must determine if centerlines are picked as polylines or as points.

C Under Options for Radial Stakeout, you must set defaults for the report, including angle format.

- **Maximum Horiz Distance:** This option allows you to define the maximum horizontal distance.
- **Report Slope Distance:** This option allows you to include the slope distance in the report.
- **Use Cut Sheet Format:** This option allows you to use the cut sheet format in the report.
- **Azimuth:** This option reports azimuth for radial stakeout.
- **Angle Right:** This option reports angle right for radial stakeout.
- **Both:** This option reports both azimuth and angle right for radial stakeout.

D Under Number of Decimal Places for List Points, you can set the precision for both Northing/Easting and elevation. You also set scale factors for line and curve tables.

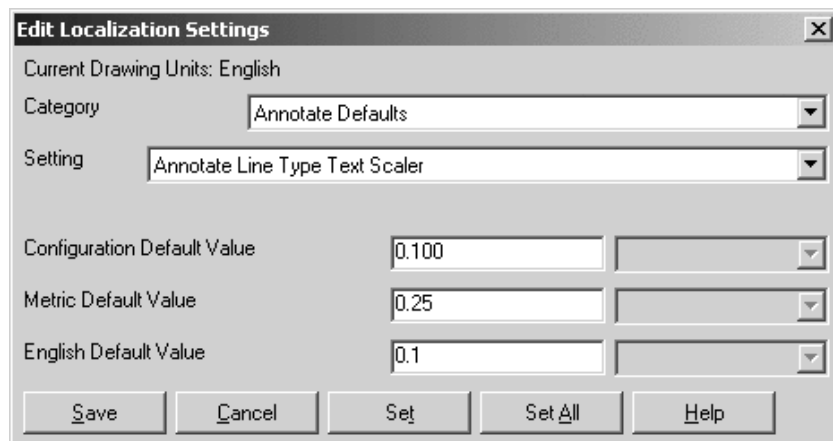
E Under Initial Traverse/Sideshot Angle Mode you can determine if angles are represented as azimuth or angle right. Alternatively, you can set the default to prompt you each time.

F Show Occupy and Backsight Points on Status Bar: When checked, the current occupied and backsight point numbers are visible in the program status bar.

G Automatic Raw File On: When checked, a raw (.RW5) file is automatically created during any of the following commands: Locate Point, Traverse, Sideshot, and Inverse.

Localization Options

The ability to maintain two different sets of defaults (english and metric) has been added, so that user can maintain a comfortable set of settings for either unit system, especially if he constantly switches back and forth. Also added was support for meters/metres, tons/tonnes and various date representation.



This dialog is accessed from the Configure Carlson menu choice, using the Localization Settings button.

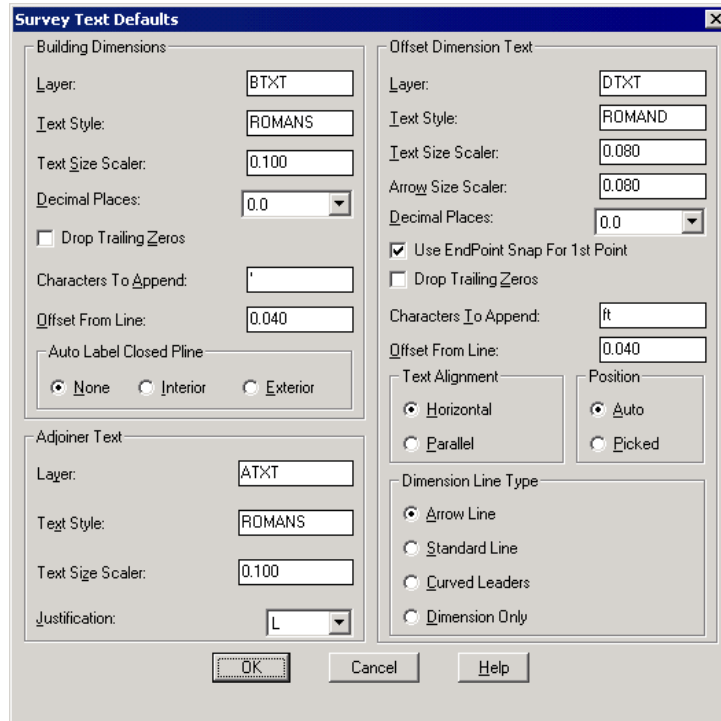
Categories include:

- Annotate Defaults
- Area Defaults
- COGO Design
- Drawing Setup
- DTM Contour
- General
- Line/Curve Table
- Maximum Label Length
- Section Profile
- Stack Label Arc
- Survey Text Defaults

Once a category has been chosen, the Setting pulldown will be populated with fields relative to that category. When you choose the field to change, the three edit fields at the bottom of the dialog will display the values for that field.

First is the configuration default value, followed by Metric and English defaults when using this dual defaults system.

8 In the Survey Text Defaults dialog box, you can set defaults for building, dimension, and adjoiner text.



A Under Building Dimensions, you set text specification for building dimensions.

- **Layer:** This option allows you to set the layer for the building text.
- **Text Style:** This option allows you to set the text style for the building text.
- **Text Size Scaler:** This option allows you to set the text scaler to determine text size.
- **Decimal Places:** This option allows you to set the precision for the building dimensions.
- **Drop Trailing Zeros:** This option allows you to truncate trailing zeros from dimensions.
- **Characters To Append:** This options allows you to set characters to add to reported dimensions.
- **Offset From Line:** This option sets the offset distance from the line to the dimension text.
- **Auto Label Closed Pline:** This option specifies whether a closed polyline is labeled on the interior or exterior.

B Under Offset Dimension Text, you can set text specifications for offset dimensions.

- **Layer:** This option allows you to set the layer for the offset text.
- **Text Style:** This option allows you to set the text style for the offset text.
- **Text Size Scaler:** This option allows you to set the text scaler to determine text size.
- **Arrow Size Scaler:** This option allows you to set the arrow scaler to determine arrowhead size.
- **Decimal Places:** This option allows you to set the precision for the offset dimensions.
- **Drop Trailing Zeros:** This option allows you to truncate trailing zeros from dimensions.
- **Characters To Append:** This options allows you to set characters to add to reported dimensions.
- **Offset From Line:** This option sets the offset distance from the line to the dimension text.
- **Text Alignment:** This options allows you to align text either parallel to the line, or horizontally in the drawing.
- **Position:** This options allows you to determine if you will pick the location of the text, or if it is automatically positioned in the drawing.

C Under Adjoiner Text you can set text specifications for adjoiner text.

- **Layer:** This option allows you to set the layer for the adjoiner text.
- **Text Style:** This option allows you to set the text style for the adjoiner text.
- **Text Size Scaler:** This option allows you to set the text scaler to determine text size.
- **Justification:** This option allows you to set the text justification.

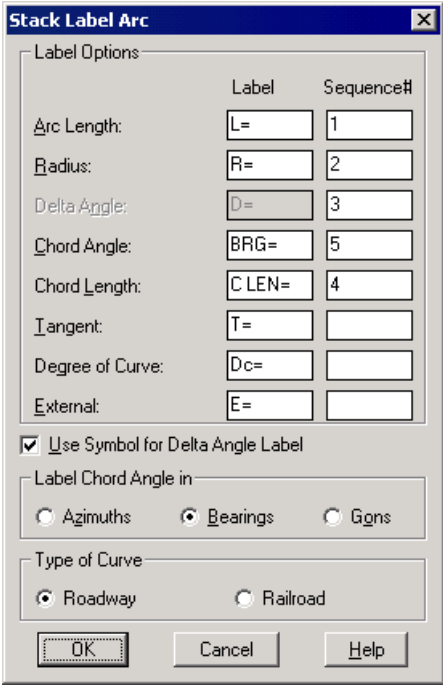
D Under Dimension Line Type, you can determine the line style to use for dimensions.

- **Arrow Line:** This option draws a line with an arrowhead from the dimension text to the figure.
- **Standard Line:** This option draws a line with no arrowhead from the dimension text to the figure.
- **Curved Leaders:** This option draws a curved line with an arrowhead from the dimension text to the figure.
- **Dimension Only:** This option draws the dimension text with no line.

In the Area Label Defaults dialog box you can set parameters for labeling area calculations. See the Area Label Defaults command in the Area chapter of this manual for a complete description of this dialog box.

In the Annotation Defaults dialog box you can set parameters for displaying annotation text. See the Annotate Defaults command in the Annotate chapter of this manual for a complete description of this dialog box.

In the Stack Label Arc dialog box, you can set parameters for the labeling of arcs.

The image shows a dialog box titled "Stack Label Arc" with a close button (X) in the top right corner. The dialog is divided into several sections. The "Label Options" section contains a table with three columns: "Label", "Sequence#", and an unlabeled column for the attribute name. The rows are: "Arc Length:" with "L=" and "1"; "Radius:" with "R=" and "2"; "Delta Angle:" with "D=" and "3"; "Chord Angle:" with "BRG=" and "5"; "Chord Length:" with "C LEN=" and "4"; "Tangent:" with "T=" and an empty box; "Degree of Curve:" with "Dc=" and an empty box; and "External:" with "E=" and an empty box. Below this is a checked checkbox "Use Symbol for Delta Angle Label". The "Label Chord Angle in" section has three radio buttons: "Azimuths", "Bearings" (which is selected), and "Gons". The "Type of Curve" section has two radio buttons: "Roadway" (which is selected) and "Railroad". At the bottom are three buttons: "OK", "Cancel", and "Help".

	Label	Sequence#
Arc Length:	L=	1
Radius:	R=	2
Delta Angle:	D=	3
Chord Angle:	BRG=	5
Chord Length:	C LEN=	4
Tangent:	T=	
Degree of Curve:	Dc=	
External:	E=	

☒ Use Symbol for Delta Angle Label

Label Chord Angle in

☐ Azimuths ☒ Bearings ☐ Gons

Type of Curve

☒ Roadway ☐ Railroad

OK Cancel Help

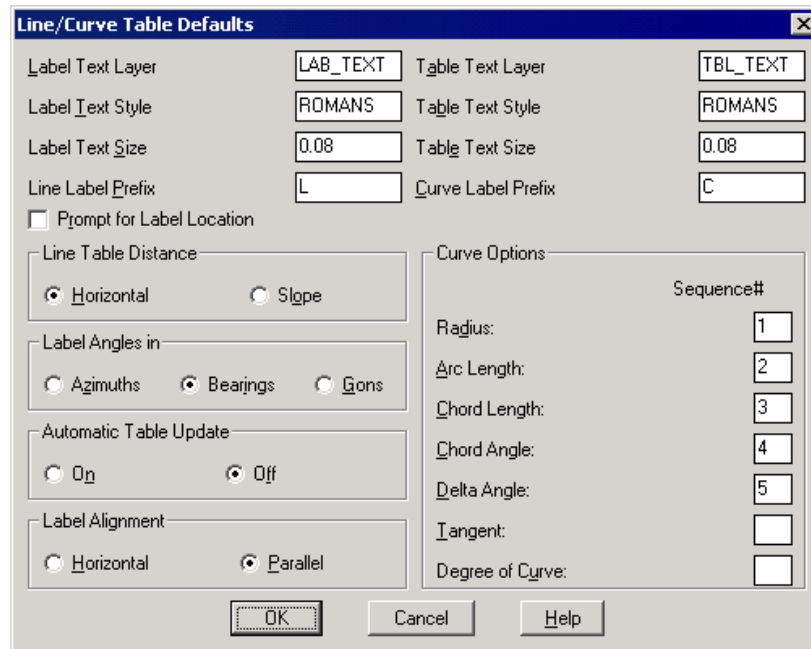
A Under Label Options, you can determine the label abbreviations and sequence in the label stack.

- **Options:** You must set the sequence and the label abbreviations for all the attributes of the arc label.
- **Use Symbol for Delta Angle Label:** This option inserts a symbol to denote the delta angle. If this option is unchecked, then you may specify the prefix for Delta Angle above.

B Under Label Chord Angle in, you can determine if the chords of the arc are labeled as azimuths, bearings, or gons.

C Under Type of Curve, you can specify if the arc is a roadway or railway curve.

In the Line/Curve Table defaults dialog box, you can set parameters for producing line and curve tables.



A In the Line/Curve Table dialog box, you must assign text size and layers.

- **Label Text Layer:** This option sets the layer for the label text.
- **Label Text Style:** This option sets the text style for label text.
- **Label Text Size:** This option sets the text size for label text.
- **Line Label Prefix:** This option sets the label prefix for lines.
- **Table Text Layer:** This option sets the layer for the table text.
- **Table Text Style:** This option sets the text style for table text.
- **Table Text Size:** This option sets the text size for table text.
- **Curve Label Prefix:** This option sets the label prefix for curves.
- **Prompt for Label Location:** This option prompts you for label position.

B Under Line Table Distance, you can choose between slope or horizontal distance.

C Under Curve Options, you can determine sequence of the curve table.

D Under Label Angles in, you determine if angles are labeled in azimuths, bearings, or gons.

E Under Automatic Table Update, you determine if the table is automatically updated when lines or curves are modified.

F Under Label Alignment, you set the label as horizontal or parallel.

Menu Location: Settings

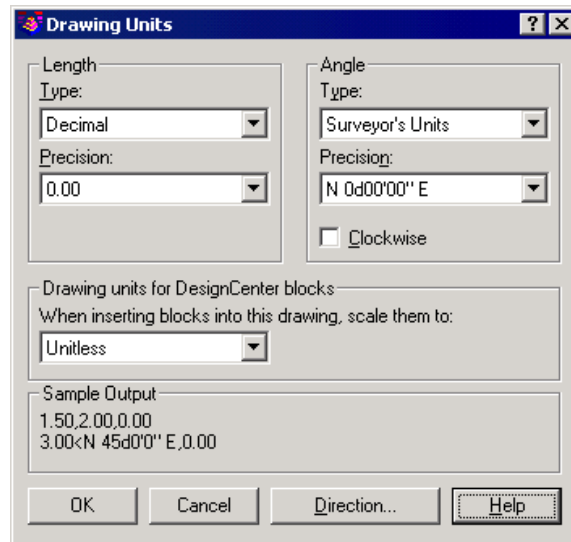
Keyboard Command: CONFIG_SCAD

Prerequisites: None

Units Control

Function

The Drawing Units dialog box controls coordinate and angle display formats and determines precision.



Under Length, you specify the current unit of measurement and the precision for the current units.

- **Type:** This field sets the current format for units of measure. The values include Architectural, Decimal, Engineering, Fractional, and Scientific. The Engineering and Architectural formats produce feet-and-inches displays and assume that each drawing unit represents one inch. The other formats can represent any real-world unit.
- **Precision:** This field sets the number of decimal places for the current units display.

Under Angle you specify the current angle format and the precision for the current angle display.

- **Type:** This field sets the current angle format.
- **Precision:** This field sets the precision for the current angle display.

Carlson Survey uses the following conventions for the various angle measures: decimal degrees appear as decimal numbers, grads appear with a lowercase g suffix, and radians appear with a lowercase r suffix. The degrees/minutes/seconds format uses d for degrees, ' for minutes, and " for seconds, for example:

123d45'56.7"

Surveyor's units show angles as bearings, using N or S for north or south, degrees/minutes/seconds for how far east or west the angle is from direct north or south, and E or W for east or west, for example:

N 45d0'0" E

The angle is always less than 90 degrees and is displayed in the degrees/minutes/seconds format. If the angle is precisely north, south, east, or west, only the single letter representing the compass point is displayed.

- **Clockwise:** This option calculates positive angles in the clockwise direction. The default direction for positive angles is counterclockwise.

When the program prompts for an angle, you can point in the desired direction or enter an angle regardless of the setting specified for Clockwise.

Under Drawing Units for Carlson Survey blocks, you can control the unit of measurement used for block insertions. A block created in units that differ from the units specified in this option is scaled and inserted in the specified units. Select Unitless to insert the block as is and not scale the block to match the specified units. Source content units and Target drawing units settings in the User Preferences tab of the Options dialog box under the Settings menu are used when Insert Units are not defined.

Sample Output displays an example of the current settings for units and angles.

Direction displays the Direction Control dialog box described below.



A The Base Angle determines where 0 degrees is located when the program calculates angles. The base angle sets the direction of the base angle. These options affect the entry of angles, object rotation angles, the display format, and the entry of polar, cylindrical, and spherical coordinates. Choose East, North, West, or South, or choose Other to indicate an alternative direction. The default direction for the zero angle is East. In Carlson Survey, the base angle is relative to the orientation of the user coordinate system.

- **East:** Sets the base angle to east (default is zero degrees).
- **North:** Sets the base angle to 90 degrees north.
- **West:** Sets the base angle to 180 degrees west.
- **South:** Sets the base angle to 270 degrees south.
- **Other:** Sets a direction different from the points of the compass.
- **Angle:** Sets the angle. Available only when Other is selected.
- **Pick an Angle:** Uses the pointing device to define the angle based on the angle of an imaginary line connecting any two points you specify. Available only when Other is selected.

Pulldown Menu Location: Settings

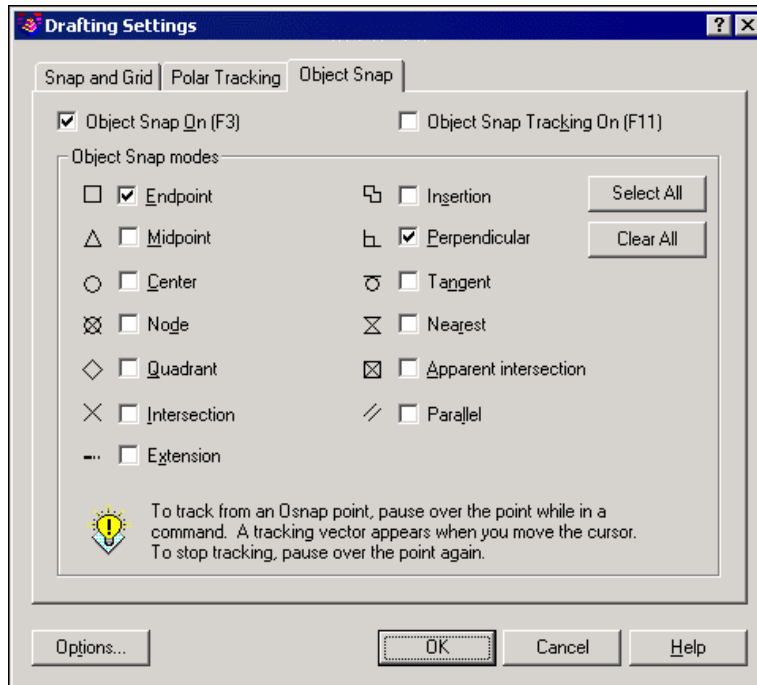
Keyboard Command: UNITS

Prerequisite: None

Object Snap

Function

The Drafting Settings dialog box sets object snap modes.

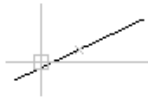


1 Under Object Snap, you set object snaps.

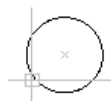
- **Object Snap On:** This option turns running object snaps on and off. The object snaps selected under Object Snap Modes are active while object snap is on. This setting is also controlled by the OSMODE system variable.
- **Object Snap Tracking On:** This option turns object snap tracking on and off. With object snap tracking the cursor can track along alignment paths based on other object snap points when specifying points in a command. To use object snap tracking, you must turn on one or more object snaps.

2 Under Object Snap Modes, you turn on running object snaps.

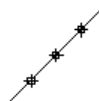
- **Endpoint:** Snaps to the closest endpoint of an arc, elliptical arc, line, multiline, polyline segment, spline, region, or ray or to the closest corner of a trace, solid, or 3D face.
- **Midpoint:** Snaps to the midpoint of an arc, ellipse, elliptical arc, line, multiline, polyline segment, solid, spline, or xline.



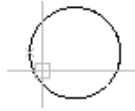
- **Center:** Snaps to the center of an arc, circle, ellipse, or elliptical arc.



- **Node:** Snaps to a point object.



- **Quadrant:** Snaps to a quadrant point of an arc, circle, ellipse, or elliptical arc.



- **Intersection:** Snaps to the intersection of an arc, circle, ellipse, elliptical arc, line, multiline, polyline, ray, spline, or xline. Intersection snaps to the edges of regions and curves, but does not snap to the edges or corners of 3D solids.

Extended Intersection snaps to the imaginary intersection of two objects that would intersect if the objects were extended along their natural paths. Carlson Survey automatically turns on Extended Intersection when you select the Intersection object snap mode. You might get varying results if you have both the Intersection and Apparent Intersection running object snaps turned on at the same time. Intersection and Extended Intersection work with edges of regions and curves, but not with edges or corners of 3D solids.



- **Extension:** Causes a temporary extension line to display when you pass the cursor over the endpoint of objects, so you can draw objects to and from points on the extension line.
- **Insertion:** Snaps to the insertion point of an attribute, a block, a shape, or text.
- **Perpendicular:** Snaps to a point perpendicular to an arc, circle, ellipse, elliptical arc, line, multiline, polyline, ray, solid, spline, or xline. Carlson Survey automatically turns on Deferred Perpendicular snap mode when the object you are drawing requires you to complete more than one perpendicular snap. You can use a line, arc, circle, polyline, ray, xline, multiline, or 3D solid edge as an object from which to draw a perpendicular line. You can use Deferred Perpendicular to draw perpendicular lines between such objects. When the aperture box passes over a Deferred Perpendicular snap point, the program displays a Snaptip and marker.



- **Tangent:** Snaps to the tangent of an arc, circle, ellipse, or elliptical arc. Carlson Survey automatically turns on Deferred Tangent snap mode when the object you are drawing requires you to complete more than one tangent snap. For example, you can use Deferred Tangent to draw a line that is tangent to two arcs, polyline arcs, or circles. When the aperture box passes over a Deferred Tangent snap point, the program displays a marker and Snaptip. If you use the From option in conjunction with the Tangent snap mode to draw objects other than lines from arcs or circles, the first point drawn is tangent to the arc or circle in relation to the last point selected in the drawing area.



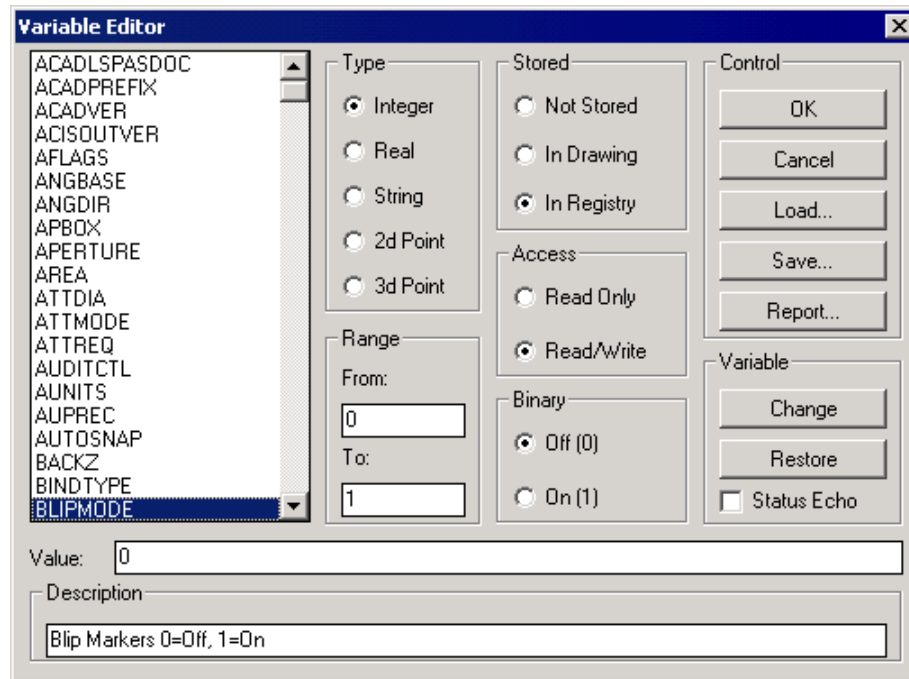
- **Nearest:** Snaps to the nearest point on an arc, circle, ellipse, elliptical arc, line, multiline, point, polyline, spline, or xline.
- **Apparent Intersection:** Apparent Intersection includes two separate snap modes: Apparent Intersection and Extended Apparent Intersection. You can also locate Intersection and Extended Intersection snap points while running Apparent Intersection object snap mode is on. Apparent Intersection snaps to the apparent intersection of two objects (arc, circle, ellipse, elliptical arc, line, multiline, polyline, ray, spline, or xline) that do not intersect in 3D space but may appear to intersect in the drawing display. Extended Apparent Intersection snaps to the imaginary intersection of two objects that would appear to intersect if the objects were extended along their natural paths. You might get varying results if you have both the Intersection and Apparent Intersection running object snaps turned on at the same time. Apparent and Extended Apparent Intersection work with edges of regions and curves but not with

- Menu Location:** Settings
Keyboard Command: OSNAP
Prerequisite: None

Function

Function

The AutoCAD engine stores the values for its operating environment and some of its commands in system variables. Each system variable has an associated type: integer, real, point, switch, or text string. This command allows you to list or change the values of system variables.



- **List Box:** Contains a list of the variables associated with the currently running version of AutoCAD. There are more items than will display on the list box, use the scroll bar to move up and down through the list. Picking on an item in the list box makes it the current item, causing the information about the item to be displayed, and can be affected by most of the edit commands explained below.
- **Edit Field:** When an item on the list box is picked, its current setting is displayed in the edit field. If you intend to make changes in an item, use standard editing procedures including the use of arrow keys and/or pointer movements to make changes. Once changes have been made, you must use the CHANGE options explained below to effect changes. Pressing enter at the edit field will have no effect on the item in the list. If the item selected is a read-only variable, the edit field will be grayed-out and will not allow input.
- **Description:** When an item on the list box is picked, its definition is referenced and displayed in this field. This can be a benefit in learning the uses of the assorted system variables. This is a display only field, so you can't change the description given.

Under Type Group, the type of variable will be displayed indicated by one of the radio buttons. Each of these types are explained below for your benefit. For additional information on variable types used by AutoCAD, obtain and consult a source of AutoCAD documentation.

- **Integer:** Defined as a whole number in the range from -32767 to +32768, no decimal value accepted.
- **Real:** Defined as a real number in the range from -1.797E+308 to +1.797E+308, with extreme decimal accuracy maintained.. Some real variables have a smaller range than previously stated.
- **String:** Defined as a sequential array of characters in the range from 0 to 65535 characters, with a range of ASCII (0-255). Numbers can be included in strings, even though they have no mathematical significance.
- **2D Point:** Defined as a list of two real numbers in the range from -1.797E+308 to +1.797E+308 separated by a comma, having extreme decimal accuracy maintained. Always maintain the X,Y format, one (and only one) comma must be used, separating the X and Y.

- **3D Point:** Defined as a list of three real numbers in the range from -1.797E+308 to +1.797E+308 separated by commas. While editing a 3D point, you must always maintain the X,Y,Z format, two (no less or no more), commas must used, separating the X and Y and Z values.

Under Range Group, the variable displayed will usually have a range displayed. The FROM value indicating the minimum, and the TO value being the maximum value accepted.

Under the Store Group, depending on the type of variable, AutoCAD may store the value in the drawing or the configuration file, or it may not be stored. Each of these types are explained below for your benefit.

- **Not Stored:** Some variables, such as PLATFORM and CDATE, are not stored because they are system interdependent.
- **In Drawing:** Most variables are stored in the drawing, making the drawing format more personal than just a database of objects. This allows you to open a drawing and have it behave just as though you had never left it.
- **In Config:** These are variables that remain the same regardless of the drawing opened. APERTURE and PICK-BOX are just two examples of variables stored in the configuration file.

Under Access Group, depending on the type of variable, AutoCAD may not allow you to make changes to it. Each of these types are explained below.

- **Read Only:** Some variables, such as PLATFORM and CDATE, are read-only and therefore cannot be changed. Read-Only variables are marked and the edit field will be grayed indicating that you can't change the variable.
- **Read/Write:** Most variables are read/write and can be changed. These variables are marked and the edit field will be active so you can change the variable.

Under Binary Group, depending on the type of variable, the value may be off or on, yes or no. If the variable type is not binary, this group will be grayed out entirely.

- **Off (0):** Indicate an off condition. Some variables, such as ATTREQ, are simply on or off toggles. You may change a binary item by clicking in this group to change the variable, or changing the value in the edit field.
- **On (1):** Indicate an on condition. Binary variables are simply on or off toggles. Their range is from 0 to 1. You may change a binary item by clicking to change the variable, or changing the value in the edit field.

Control Buttons - These buttons are the main controls in the use of the Variable Editor. Each buttons purpose is explained below.

- **OK:** Used to accept the changes made during the variable editing process, returning you to the command prompt with changes in effect.
- **Cancel:** Used to cancel the changes made during the variable editing process, returning you to the command prompt without the changes in effect.
- **Load:** Used to load a saved set of system variables. This allows you to create a drawing, save the system variables, open a second drawing, and load those variables into that drawing. Read-only variables are skipped.
- **Save:** Used to save the current system variables to a disk file. All system variables are stored to the file, even those that are marked as read-only.
- **Print:** Used to print the current system variables. After choosing this option, you will prompted for an output filename, then the program will proceed to write the system variables to the file. This file can be loaded into any editor or word processor, edited and printed.

Variable Buttons - These buttons are used to control the changes in variables, while using the Variable Editor. Each buttons purpose is explained below.

- **Change:** Used to execute the changes typed into the edit field. You must use this button, simply pressing enter will not make the change.

- **Restore:** Used to cancel the changes typed into the edit field. If you make a mistake or change your mind while making changes in the edit field, press this button to restore the edit field to the value before editing.
- **Status:** Used to determine if the program will echo the status of changes being made to the command area. If this toggle is on, any changes made from the dialog will echo the change. Also if a stream of change commands is being read from a file, and the toggle is on, the changes taking place will be displayed.

Note: This command displays many more system variables than are found in the Systems Variable Chapter, which contains a list of **supported** system variables. Modification of any system variable other than the supported ones found in the Systems Variable Chapter is done at your own risk, and may result in program errors requiring a re-installation of Carlson Survey.

Pulldown Menu Location: Settings

Keyboard Command: VAREEDIT

Prerequisite: None



Points Commands

10

This chapter provides information on using the commands from the Points menu to manipulate coordinate points and point attributes in your drawing.

Point Defaults

Function

This command sets Carlson Survey point options.

Descriptions: Specify whether you are prompted for a point description when creating points and whether the point descriptions are labeled in the point block.

Elevations: Specify whether you are prompted for a point elevations when creating points and whether the point elevations are labeled in the point block.

Locate on Real Z Axis: When checked, points are located at their actual elevation, otherwise points will be located zero elevation.

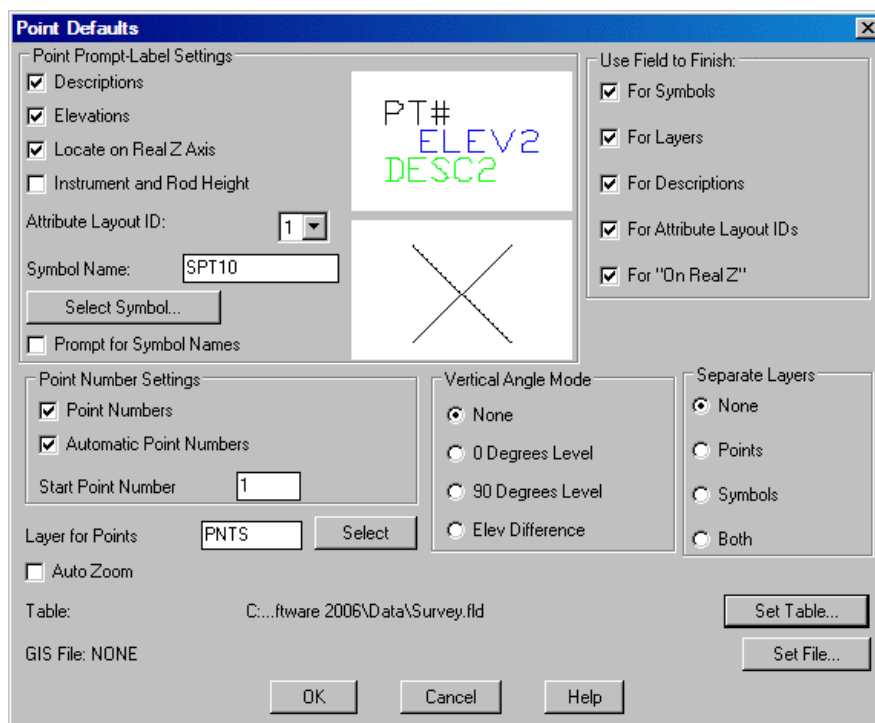
Attribute Layout ID: Controls the location of the point number, elevation and description. These attribute layouts are defined in AutoCAD drawings that are stored in the Carlson Survey SUP directory with the file name of SRVPNO plus the ID number (i.e. SRVPNO1.DWG, SRVPNO2.DWG, etc.). If you want to change the attribute positions for a layout ID, then open and edit the associated SRVPNO drawing.

Symbol Name: Enter the default symbol name to use. You may also pick the Select Symbol button to select a symbol from the symbol library.

Prompt for Symbol Names: When checked, you will be prompted for each symbol name instead of using the default symbol.

Point Numbers: When this toggle is OFF, no point number will be created and no points will be stored in the coordinate (.CRD) file.

Automatic Point Numbers: When this toggle is OFF, commands that locate a point will prompt for a point number. Otherwise, point numbers are numbered sequentially. If the Start Point Number field is set to 0, no point will be plotted. An exception to this is when you use the *Draw-Locate Points* command and use the Range option, then a point entity is plotted.



The following table illustrates the effects of elevation settings:

	<u>Elevations Yes</u>	<u>Real Z No</u>
Picked Point	Labels point, Prompts for elevation, uses 0 for z coordinate	
Point Number	Labels point, No Prompt, uses 0 for z coordinate	

	<u>Elevations Yes</u>	<u>Real Z Yes</u>
Picked Point	Labels point, Prompts for elevation for z coordinate	
Point Number	Labels point, No Prompt, uses z coordinate from file	

	<u>Elevations No</u>	<u>Real Z No</u>
Picked Point	No Label, No Prompt, uses 0 for z coordinate	
Point Number	No Label, No Prompt, uses 0 for z coordinate	

	<u>Elevations No</u>	<u>Real Z Yes</u>
Picked Point	Labels point, No Prompt, uses z coordinate of picked point	
Point Number	Labels point, No Prompt, uses z coordinate from file	

Start Point Number: Specify the next point number to use.

Vertical Angle Mode: Specify how Carlson Survey should prompt you for vertical angles. None means no prompt. Applies to creating points with commands such as *Traverse*. The vertical angle is used to calculate the point elevation.

Separate Attribute Layers: Specify settings for point attribute layers.

None: The point symbol, point number, elevation and description use the layer names PNTMARK, PNTNO, PN-TELEV and PNTDESC. **Points:** The point number, elevation and description layers are composed by concatenating the point layer and the string NO, ELEV, and DESC respectively. For example, if the point layer is UTIL then the attribute layers will be UTILNO, UTILELEV and UTILDESC.

Symbols: The point symbol layer is composed by concatenating the point layer and the string MARK. For example, if the point layer is UTIL then the symbol layer will be UTILMARK.

Both: The point symbol, point number, elevation and description layers are composed by concatenating the point layer and the string MARK, NO, ELEV, and DESC respectively. For example, if the point layer is UTIL then the symbol/attribute layers will be UTILMARK, UTILNO, UTILELEV and UTILDESC.

Layer for Points: Specify the layer name for Carlson Survey points.

Auto Zoom: When checked, AutoCAD will perform a Zoom—Center around new points to keep the display centered around current working area. This only applies during commands such as *Traverse*. This setting is also available in *Configure Carlson Survey* under General Settings where it is called Auto Zoom Center for New Points.

Use Field to Finish For: Allows you to use the code definitions from Field to Finish for the Point Symbols, Layers, Descriptions, Attribute Layout IDs and whether to locate the point on the "Real Z" and whether to Separate Attribute Layers when creating new points. For example, when creating a point with description "EP", Carlson Survey would look up "EP" in the Field to Finish table and will use the field code definitions to establish the point instead of the definitions defined in Point Defaults.

GIS File: This option lets you specify a GIS file to be used when creating new points. The GIS file contains a list of fields to prompt for. For each point that is created, the program will prompt for these fields and store the results to the note file (.not) associated with the current CRD file.

Pulldown Menu Location: Points

Keyboard Command: ptsetup

Prerequisite: None

Draw-Locate Points

Function

The Draw-Locate Points dialog box allows you to insert either new or existing points into the drawing. You can create new points either by picking points on the screen, or by entering northing and easting coordinates. You can also place existing points by entering point numbers which reference the current coordinate file. You are prompted to choose a coordinate file if no coordinate file is current.

Draw-Locate Points

Symbol Name: SPT10 [Select...]

Symbol Rotation Azimuth: 0.0000

☐ Layer by Desc Layer Prefix: PT_

☐ Draw Nodes Only ☐ Elev Text Only

Locate within: ☐ Polyline ☐ Distance ☐ Window/Coord Range

Point Prompt-Label Settings

☒ Descriptions ☐ Notes

☒ Elevations ☐ Use '+' ☒ Use 'L' ☒ Label Zeros

☒ Locate on Real Z Axis Decimals: 0.00

Point Number Settings

☒ Point Numbers ☒ Automatic Point Numbering

Starting Point Number: 1

Wildcard match of pt description: * ☒ Erase Duplicates

Layer Name: PNTS [Select Layer...]

[Draw Range] [Draw All] [Draw Point Group]

[Enter and Assign] [Screen Pick] [Cancel] [Help]

The name of the symbol file is displayed in **Symbol Name**. You can choose a different symbol by clicking Select. The selected point symbol is displayed on the right.

Symbol Rotation Azimuth is the rotation angle that is used for the point symbols. This angle is used in a counter-clockwise direction relative to the current twist screen.

Layer by Desc inserts the points in the layer named by the point description. Using Layer by Desc organizes the points by description and allows for layer management. For example, you can use the Isolate Layers command to show only points on a certain layer. If you include an invalid layer character in the description, the layer name stops at the bad character. A point description of "UP / 105" would use layer "UP", for example. The Layer Prefix is added to the beginning of the layer name. For example, a Layer Prefix of "PT_" and a point with the description "EP" would use the layer "PT_EP". Layer Prefix is optional. It allows all the point layers to be grouped.

Draw Nodes Only inserts only a point entity (the node) and not the point block and symbol. This option is most useful when you have a lot of points to insert, because inserting only the nodes is faster than inserting nodes with the point block and symbol. Commands such as Triangulate & Contour and Make 3D Grid File can use these points, and do not need the point block and symbol.

Selecting **Elev Text Only** draws text of the point elevation without the point block, symbol, or node. The decimal place of elevation text is placed at the northing and easting point location.

Locate within Polyline inserts only the points that are inside a closed polyline. The command prompts you to select a closed polyline. All the points in the current coordinate file are checked. Any points that are located within the closed polyline are drawn.

Locate within Distance inserts only the points that are within a specified distance from a reference point. The command asks you for the reference point and the search distance. All the points in the current coordinate file are checked. Any points that are located within the search distance of the reference point are drawn.

Locate within Window/Coord Range inserts only the points that are within the specified window or range of northing, easting, and elevation. The command prompts for the minimum and maximum northing, easting, and elevations. These values default to the actual minimum and maximum in the coordinate file. Then the command prompts for the point number range of points to check. The points that fall in both the point number range and the coordinate range are drawn.

Under Point Prompt-Label Settings, you determine attributes for which you will be prompted.

Descriptions determines whether you are prompted for descriptions for each point when creating new points. When you are placing both new and existing points, Descriptions determine whether this attribute is labeled with the point inserts.

Notes works with the note file (.not) associated with the current coordinate file. The note file contains unlimited point descriptions in addition to the fixed 32-character point descriptions in the coordinate file. When you create points with Notes on, the command will prompt for point notes to be stored with the point. When you draw existing points with Notes on, any notes for the points are drawn as text entities below the point description.

Elevations determines whether you are prompted for elevations for each point when creating new points. When you are placing both new and existing points, Elevations determine whether this attribute is labeled with the point inserts.

Use '+' labels the positive elevations with a leading '+'. For example, "+159.43".

Use '-' labels the negative elevations with a leading '-'.

Locate on Real Z Axis determines if the points are placed at their elevations or at zero elevation.

Label Zeros will label points with zero elevation when the Elevations option is on. Otherwise only points with nonzero elevation will be labeled.

Under Point Number Settings, you determine how points will be numbered.

Point Numbers determines whether the complete point block is drawn or just the symbol and node. When you create new points with Point Numbers off, no points are stored in the current coordinate file, and only the point symbol and node are drawn. When you draw existing points with Point Numbers off, the point attribute block is not drawn and only the point symbol and node are drawn.

Automatic Point Numbering applies to creating new points. With this option active, the command will use the **Starting Point Number** for the first new point. The next point number is automatically incremented. Before storing the point, the command checks whether the point number is used. If the point number is used and point protect is on (set in the Coordinate File Utilities command), then the command will prompt for another point number or to overwrite the point. With Automatic Point Numbering off, the command will prompt for the point numbers.

Determine how the points are to be displayed and in what layer.

With **Wildcard match of pt description**, you can display only points with specific descriptions. This can be thought of as a filter. For example, entering IP would display only points that are labeled with the description IP, or Iron Pin. The default is the asterisk (*). This will display all points regardless of description.

Layer Name allows you to designate a layer for the points to be displayed. You can enter a new name or choose an existing layer by clicking **Select Layer**. A Carlson Survey point consists of a block insert with attributes, a point symbol, and a point entity. The point entity is used for picking the point by OSNAP Node in other commands. The block insert includes a point number, elevation, and description. These attributes are in the PNTMARK, PNTNO, PNTELEV, and PNTDESC layers. The points are also in an overall layer as specified in this dialog box. This layer setup allows you to freeze a group of points by the main layer name or freeze point attributes for all the points in the drawing. For example, freezing layer "PNTS" would freeze all the points in this layer. Freezing layer "PNTELEV" would freeze the point elevation attribute for all the points.

Draw Range will draw existing points from the current coordinate file. The Draw Range button will prompt for the point numbers to draw.

Draw All will draw all the points in the coordinate file, and then zoom the extents of the display to show the points.

Draw Point Group will draw a point group with settings that are established in the Point Group Manager.

Enter and Assign can be used to create new points using the point northing and easting.

Screen Pick allows you to create points by picking the point coordinate on the screen. For example, you could set the Object Snap to EndPoint and pick the end point of a building polyline to create a point at the building corner.

Prompts

To create a new point:

Draw-Locate dialog *choose Screen Pick*

Pick point to create: *pick a point*

Select/**<Enter Point Elevation <0.00>:** *Enter elevation Press S to select text to set elevation.*

Enter Point Description <>: *press Enter*

N: 5106.57 E: 4901.96 Z: 0.00

Enter/**<Select text of elevation>:** *Select text entity that defines elevation of point.*

To locate a point in the coordinate file (point number 3 in this example):

Draw-Locate Point dialog *choose Draw Range*

Point numbers to draw: 3

Points Drawn> 1

Locates point 3.

Point numbers to draw: 1-2

Points Drawn> 2

Locates a range of points. From 1 to 2.

Point numbers to draw: *press Enter*

Pulldown Menu Location: Points

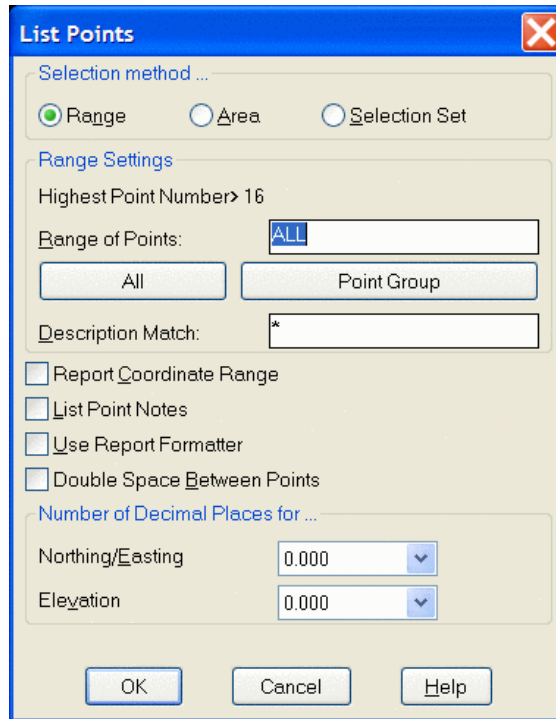
Keyboard Commands: lpoint, lp

Prerequisite: A CRD file. You may want to execute *Drawing Setup* (see the Setting menu) to set the scale and size.

List Points

Function

This command generates a report of point numbers, northings, eastings, elevations and descriptions.



List Points

Selection method ...

☒ Range ☐ Area ☐ Selection Set

Range Settings

Highest Point Number > 16

Range of Points:

Description Match:

☐ Report Coordinate Range

☐ List Point Notes

☐ Use Report Formatter

☐ Double Space Between Points

Number of Decimal Places for ...

Northing/Easting

Elevation

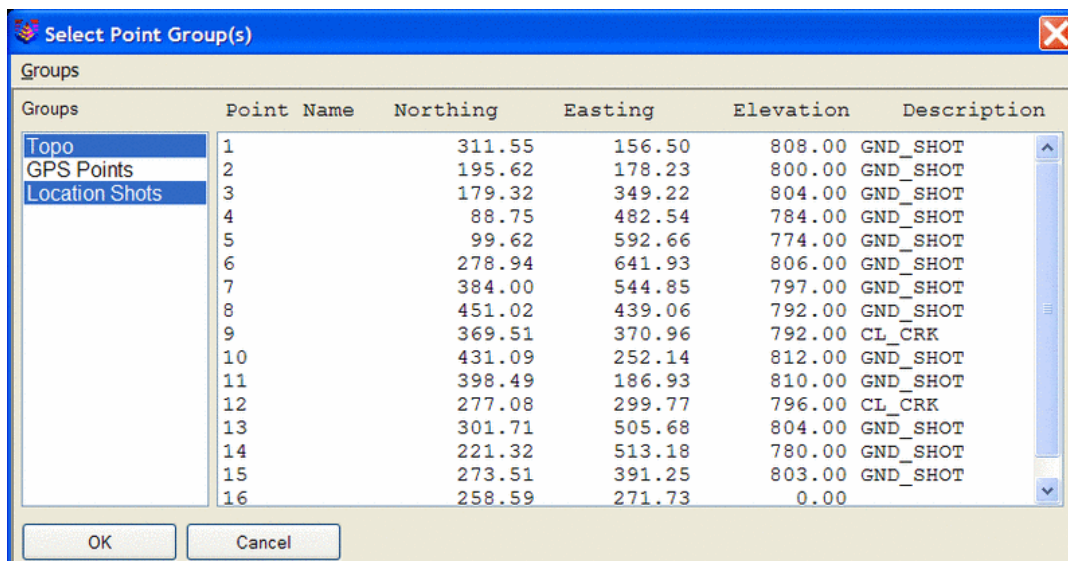
Selection Method-Range allows you to specify the points to list by point number range

Selection Method-Area allows you to select a closed polyline to list all of the points inside of that polyline.

Selection Method-Selection Set allows you to specify the points to list by selecting them from the drawing.

Range of Points: If you are using the Range method, specify the range of points to list here. To quickly specify all points, click the **All** button.

Point Group allows for the selection of a specified group or multiple groups for listing. Standard windows selection tools, ctrl and shift keys, can be utilized for selecting groups.



Select Point Group(s)

Groups

Groups	Point Name	Northing	Easting	Elevation	Description
Topo	1	311.55	156.50	808.00	GND_SHOT
GPS Points	2	195.62	178.23	800.00	GND_SHOT
Location Shots	3	179.32	349.22	804.00	GND_SHOT
	4	88.75	482.54	784.00	GND_SHOT
	5	99.62	592.66	774.00	GND_SHOT
	6	278.94	641.93	806.00	GND_SHOT
	7	384.00	544.85	797.00	GND_SHOT
	8	451.02	439.06	792.00	GND_SHOT
	9	369.51	370.96	792.00	CL_CRK
	10	431.09	252.14	812.00	GND_SHOT
	11	398.49	186.93	810.00	GND_SHOT
	12	277.08	299.77	796.00	CL_CRK
	13	301.71	505.68	804.00	GND_SHOT
	14	221.32	513.18	780.00	GND_SHOT
	15	273.51	391.25	803.00	GND_SHOT
	16	258.59	271.73	0.00	

Description Match: Can be used to filter the point list. For example, entering "EP" for the Description Match would only list those points with a description of "EP". An asterisk (*) is the default setting, it matches any character sequence, meaning no filtering occurs.

Report Coordinate Range: When checked, the point list will include the minimum and maximum northing, easting

and elevation.

List Point Notes: When checked, any additional point notes assigned to the points will be included in the point list. Point notes can be entered using the *Input-Edit Point* command found in *Coordinate File Utilities*.

Use Report Formatter: When checked, you may customize the fields and layout of the point report using the Report Formatter. The Report Formatter can also be used to export the point report to Excel or Access.

Double Space Between Points: When checked, the report will be double spaced.

The point list report is displayed in the Standard Report Viewer which can print, draw and save the report file. This report viewer cannot be used to edit the coordinate file. Instead use the *Edit Points* command in the *Points* menu.

Example of List Points Report:

```
List Points Report
File> C:\DATA\POINTS.CRD
Job Description>
Job Number> 0.000 Job Date> 06/01/2002
PointNo. Northing(Y) Easting(X) Elev(Z) Description

1          5355.240      5000.000    91.8    CP2
2          5000.000      5000.000    90.0    CP2
1000       5355.236      5000.000    91.8    CK
1001       4941.911      4622.029    91.4    FPC
1002       4952.629      4642.818    90.6    FH
1003       4959.931      4634.440    89.8    TOE1
```

Pulldown Menu Location: Points

Keyboard Command: listpt

Prerequisite: Points in a coordinate file or on the screen

Import Text/ASCII File

Function

This command converts point data from an ASCII text file into the current Carlson Survey coordinate (.CRD) file.

Each line of the text file can contain any combination of point number, northing, easting, elevation and description. All point information should be on one line with the values separated by a comma, space or other delimiter. Under the Source File Format setting you can choose from some specific formats or User-Defined. For User-Defined, the format of the text file is specified in the Coordinate Order field where the value identifiers are listed with the appropriate delimiters. For example:

For a text file with northing, easting, elevation and comma delimiters:

5100.0,5150.5,485.1

5127.1,5190.3,487.3

The Coordinate Order would be:

Y,X,Z

For a text file with point number, easting, northing, elevation, description and space delimiters:

1 5000.0 5000.0 490.3 TRAV

2 5030.4 4930.5 495.5 TRAV

The Coordinate Order would be:

P X Y Z D

Common formats can be selected from the Common Format List. All the lines in the text file should contain only point data and any header lines should be removed. To read the text file, pick the Select Text/ASCII File button and choose the file to read. Then the selected file is displayed in the Preview Window to help with filling out the Coordinate Order. When the Coordinate Order is set, click OK to read the text file. The Wild Card Descriptions Match allows for only point with matching descriptions to be imported. With Point Protect active, the program will check if a point number already exists in the CRD before importing the point. If a point conflict is found, you can either assign a new point number or overwrite the old point. The Value to Add to Point Numbers allows you to renumber the points as they are imported. The Header Lines to Skip value is the number of lines not to be processed at the start of the text file.

Multiple files can be imported at once. To do this toggle on the Enable Process Multiple Files option. After selecting the Text/ASCII Files button, you can select multiple files by using the Shift or Ctrl keys while picking files. You can also run Select Text/ASCII Files multiple times allowing for selection of files located in different locations. The

files to import are listed in the top scroll display window. The point data from all the import files can be stored to the current CRD file or to separate files for each import file. The separate file option will name the resulting CRD files with the same name as the import file with a .CRD file extension. For example, the import file job125.txt would create job125.crd. The CRD file will be created in the same location as that of the selected text file to import.

The special formats of Leica .gsi files, TDS .cr5 files, Geodimeter .obs/.raw files, Laser Atlanta .txt files, Trimble .pos files, Zeiss .txt files, Traverse PC .trv files, Maptech, Benchmark .dat files and Cadvantage .cog files can be directly imported by choosing that File Format at the top of the dialog.

Pulldown Menu Location: Points

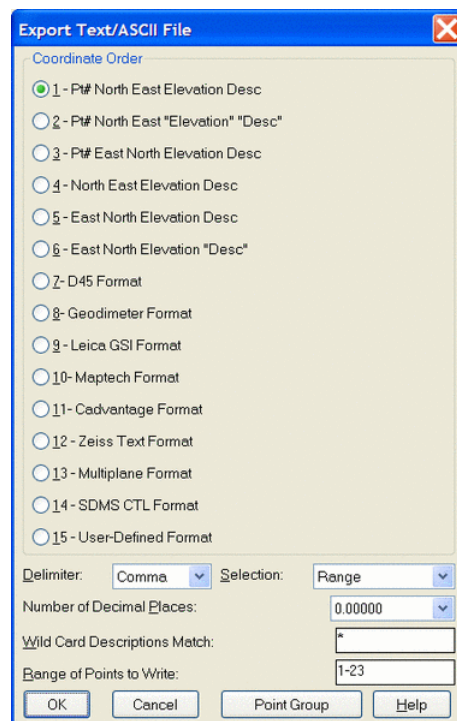
Keyboard Command: readpt

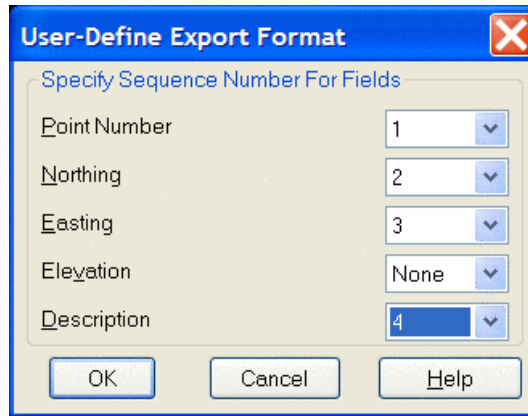
Prerequisite: A text file to read

Export Text/ASCII File

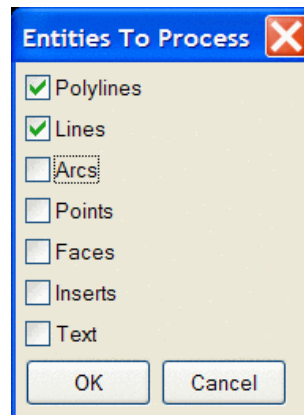
Function

This command outputs point data from the current Carlson Survey coordinate file to an ASCII text file. Specify the type of file to write with the Coordinate Order radio buttons. There are several variations on point number, northing, easting, elevation and descriptions as well as specific formats for Leica, Geodimeter, Zeiss, Maptech, D45, Cadvantage, Multiplane and SDMS CTL formats. In addition there is an option, User-Defined Format, to define the order of the fields output. When using the User-Defined format, after selecting OK, the User-Define Export Format dialog will appear. On this dialog, specify the order of the fields by defining a number sequence in each field. You can skip fields and omit data in the output file by leaving None in the sequence field for this data.





Specify the Delimiter of the export file as either Comma or Space in the Delimiter field. There are three Selection Methods provided for the data to export. Specify either Range, Screen Points or Screen Entities in the Selection Field. A Range selection is a user specified range such as 1-10,30-50. A Screen Points selection is made by selecting points from the screen area. The Screen Entities option allows for selection of polylines, lines, arcs, points, faces, inserts and text to export point data from. When the Screen Entities option is selected, the following dialog box will display allowing for the specification of the type of entity to export data from.



A description filter is also available for exporting only points from the range or selection set with certain descriptions. After selecting the OK button, another dialog appears that allows you to specify a new text?ASCII file or to append data into an existing file. The standard file selection dialog allows you to specify the export file name.

Pulldown Menu Location: Points

Keyboard Command: writetp

Prerequisite: A Coordinate File (.CRD)

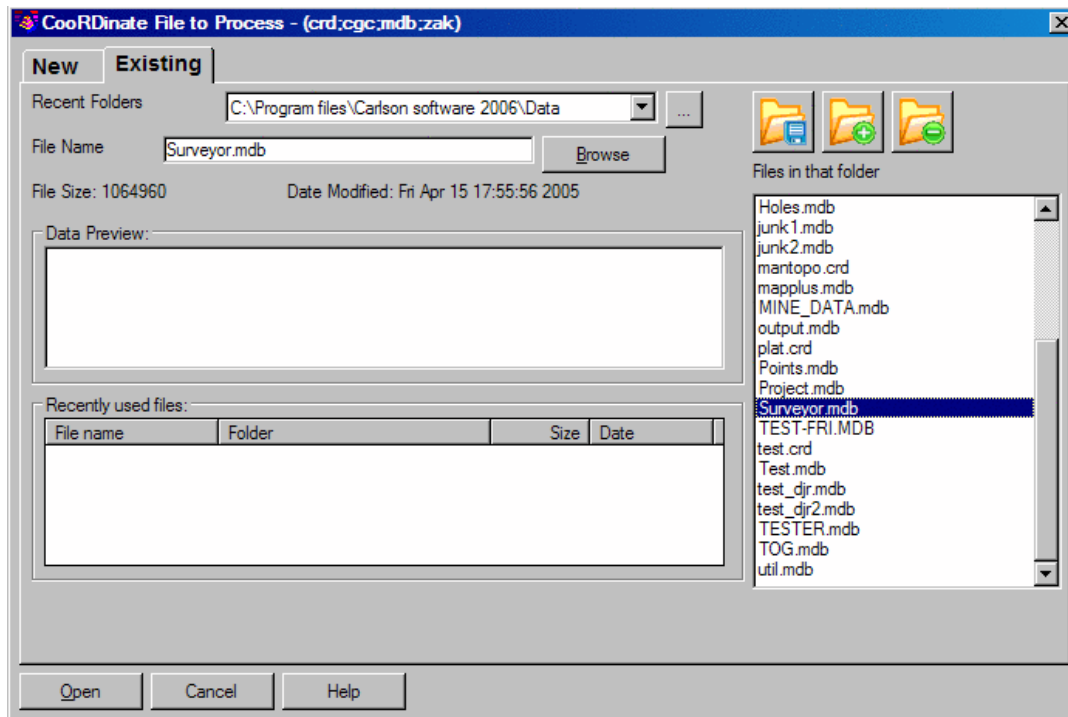
Set Coordinate File

Function

This command allows the user to set the name of the active coordinate file. This file is used by different commands that compute, store and recall point coordinates. Carlson Survey Coordinate (.CRD) files are binary files that contain point numbers, northings, eastings, elevations and descriptions. Alternately, C&G CRD & CGC files, LandDesktop MDB files or Simplicity Systems ZAK files can be used in place of the Carlson Survey CRD file. These files are

stored by default in the configured data subdirectory. When prompted for the name, if you type in a path name the file will be stored in the specified path. If you don't specify a path then the default path that is configured in the *Configure* command will be used.

When executed, the command defaults to the Existing tab for selection of an existing file. You may select a file from the list of Recent Folders or choose the Browse button to go to a specific location on your computer. To create a new file, select the New tab and enter the name of the file in the file name field provided. Use the Browse button to specify the desired location to save the file.



Pulldown Menu Location: Points

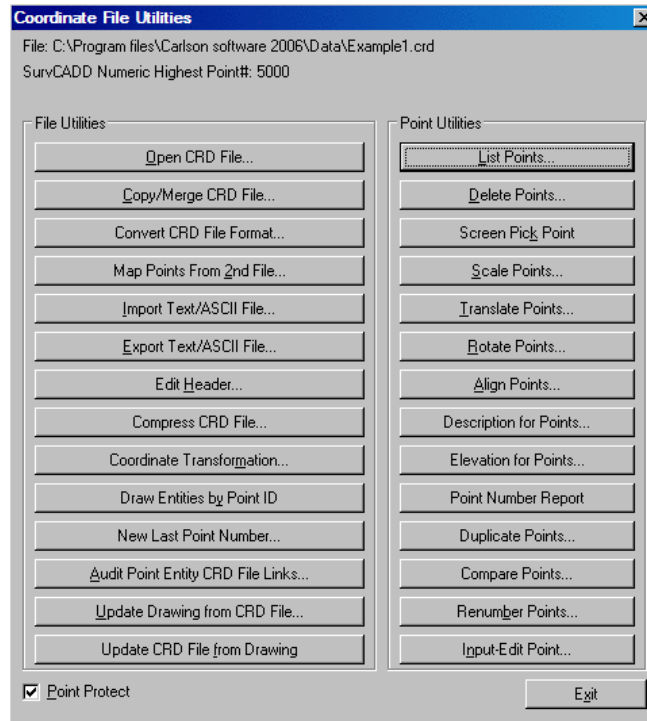
Keyboard Command: setcrd

Prerequisite: None

Coordinate File Utilities

Function

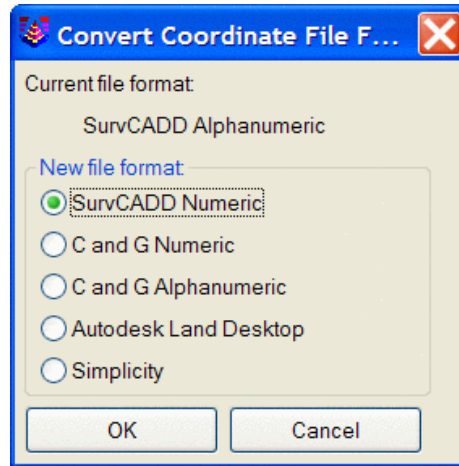
This command allows you to manipulate the coordinates stored in a coordinate (.CRD) file. One of the most important commands is the Update CRD File from Drawing which allows you to update the file after editing the drawing with commands such as *Erase*, *Move*, *Rotate* or *Change Elevations*. Another handy option is the *Draw Entities by Point Number* which allows the user to input point number ranges and plot Lines, Arcs, Polylines or 3D polylines. Coordinate files have either numeric or alphanumeric point numbers. Alphanumeric point numbers consist of nine or less digits and letters (i.e. point number 7A). The type of point number format is displayed at the top title bar of the main dialog.



Open CRD File: Allows the user to switch to another file. When you exit Coordinate File Utilities this will be the current file that you work with in Carlson Survey.

Copy/Merge CRD File: This command allows for the copying of entire crd files or parts of crds file to new or existing files. This can be used to make a backup of your coordinate file and can also be very valuable in coordinate file manipulation. For example if a certain range of points from one crd file was also required in the active crd file this command would be used to simply copy the required range into the active crd file. There are two options when first executing the command. These options are whether to Copy points From another file to the current (active) crd file or to copy the current (active) coordinate file To another file. Once this option has been decided, a prompt for the file to copy From or TO, will be displayed. Here simply specify the correct file. Next a prompt for the Point Number to Copy will be displayed. Here specify the points to copy. Point numbers and ranges can be entered together, for example, 1-3,10,15 would result in points 1 through 3 and points 10 and 15 being copied. The next prompt is whether to renumber the points. If you choose Yes, which should be the choice if points with the same number already exist in the file you are copying to, you will be prompted for a number to begin renumbering. This number should be higher than any existing point number in the file. In addition you will be prompted to Compress the points if renumbering. This option removes points number gaps and renumbers the points sequentially beginning at the first number selected. If the point number order and value contain number gaps and it is crucial to keep this order DO NOT compress the points when promoted.

Convert CRD File Format: Allows you to convert the current CRD file from numeric format to alphanumeric format or visa versa. This routine will also change crd files to and from different software formats. These formats include C&G, AutoDesk Land Desktop and Simplicity. The current format of the active coordinate file will be displayed as well as the options for the new file format. This command only changes the format of the active coordinate file.

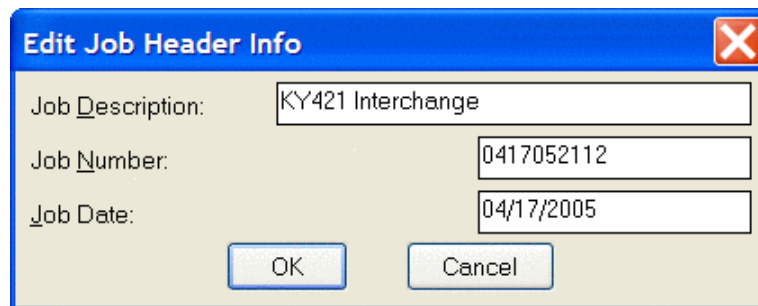


Map Points from 2nd File: This routine adds point to the current CRD file from points stored in a second CRD file. The points to copy are specified by numbers one at a time. Prompts for the destination point number (number to create in current crd file) and source point number (point number to be copied from second crd file) will be displayed.

Import Text/ASCII File: This routine converts point data from a text file into the current coordinate (.CRD) file. See the *Import Text/ASCII File* command in this chapter for more information.

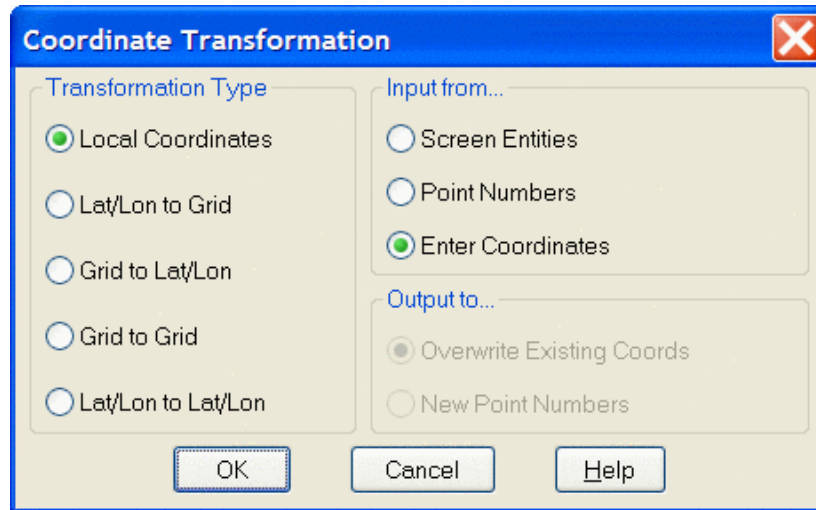
Export Text/ASCII Text File: This routine outputs point data from the current coordinate (.CRD) file to a ASCII Text file. See the *Export Text/ASCII File* command in this chapter for more information.

Edit Header: Enter or edit the job information associated with the coordinate file. Fields include Job Description, Job Number and Job Date. This information will appear on the List Point report. Non-digit characters are not allowed in the Job Number field.

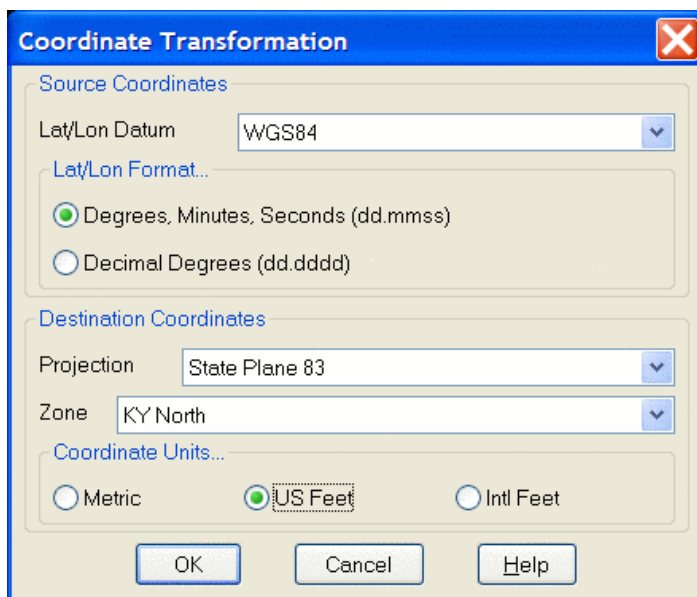


Compress CRD File: Removes unused point numbers by renumbering high point numbers into the unused spaces. For example, for an original file with points 1,2,105,107,108,109 would be compressed to 1,2,3,4,5,6.

Coordinate Transformation: Transforms coordinates between local, state plane 27, state plane 83, latitude/longitude, and Universal Transverse Mercator (UTM). Works on individually entered coordinates, by range of point numbers and with on-screen entities. For converting between state plane 27 and 83, Carlson Survey calls upon NADCON from the National Geodetic Survey to apply the latitude/longitude adjustment. The NADCON program, ndcon210.exe, is stored in the Carlson Survey EXEC directory.

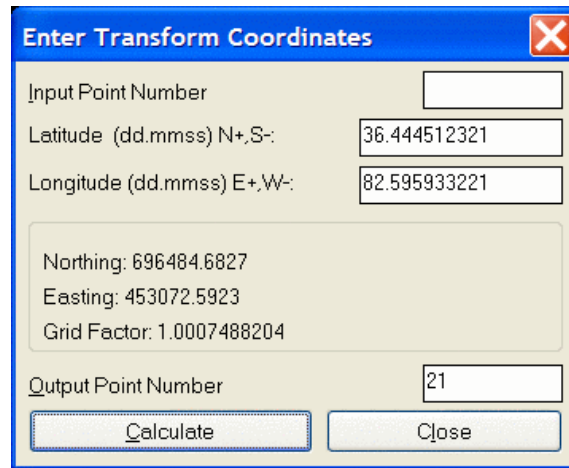


The Transformation Type is used to define the Source Coordinate and Destination Coordinate formats. Settings for Lat/Long Datum, Lat/Long formats (dd.mmss or dd.dddd), Projections, State Plane Zones and coordinate units are defined in the Transformation Type dialog. The format of this dialog will change depending upon the type of transformation requested.



Example Lat/Long to Grid dialog

For all Transformation types there are three options for inputting the data to be transformed. Data can be selected from the screen by using the **Screen Entities**. If a range of points or a particular point is desired, the **Point Numbers** option would be used. Manual entry of coordinates to transform one at a time is accomplished with the **Enter Coordinates** option. The coordinates can be typed in or use the Input Point Number option. Output Point Number is an option to store the results in the coordinate file.



Enter Transform Coordinates

Input Point Number:

Latitude (dd.mmss) N+,S-:

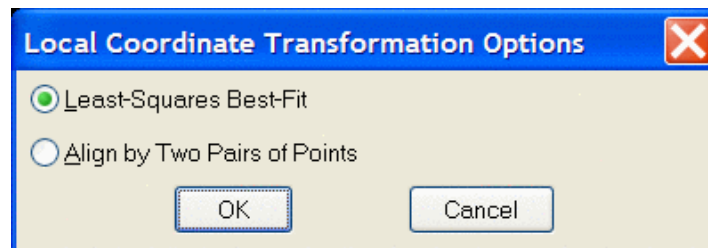
Longitude (dd.mmss) E+,W-:

Northing: 696484.6827
 Easting: 453072.5923
 Grid Factor: 1.0007488204

Output Point Number:

For all transformations there are 2 Output options when using point numbers as the input data. **Overwrite Existing Coords** replaces the original coordinate values with the new coordinate values after transformation. **New Point Numbers** will retain the original coordinate data and point numbers and create new point numbers with the revised coordinate data after transformation.

When transforming a **Local Coordinate System**, there are two options for defining the transformation as shown in the next dialog.



Local Coordinate Transformation Options

☒ Least-Squares Best-Fit
☐ Align by Two Pairs of Points

The **Align by Two Pairs of Points** option uses two pairs of source and destination coordinates. The first pair defines the translation as the difference between the source and destination northing and easting.

Local Coordinate Transformation

Translation Points

First Source Point

Northing: 4768.07489136 Easting: 4942.62719383 Point#: 12

First Destination Point

Northing: 3998.58691151 Easting: 4085.35992418 Point#: 33

Rotation Points

Degrees of Rotation (dd.mmss): 86.205224280

Second Source Point

Northing: 4763.58402514 Easting: 4304.29082980 Point#: 44

Second Destination Point

Northing: 4661.03001519 Easting: 4038.39555830 Point#: 129

☐ Scale Points: Scale: 1.04034394

OK Cancel Help

This destination point is also the pivot point for rotation. Rotation can be entered directly or defined by a second pair of points where the bearing between the first and second source points is rotated to align with the bearing from the first and second destination points. There is an option to also apply scaling. The scaling holds the angle between points and adjusts the distances by the scale factor. The scale factor is calculated for each point as the elevation factor at the first source point times the grid factor at the first destination point averaged with the elevation factor at the transform point times the grid factor at the transform point.

The **Least-Squares Best-Fit** option is used when there are more than two pairs for translation points. Since two pairs of points are sufficient to define the translation and rotation, more than two pairs of points provides more than enough information.

Align Local Coordinates

Scale: 8.762119 Avg Residual: 6126.8287

Source			Destination			Res	On
PT#	NORTHING	EASTING	PT#	NORTHING	EASTING		
	4768.075	4942.627		600521.877	2145455.344	4864.070	N
	4720.630	4943.015		600322.675	2145543.876	4538.116	N
126	4648.071	4050.126		600887.453	2154654.222	8528.721	Y
161	4767.112	5009.758		600453.888	2144876.357	5461.190	Y
187	3940.510	4226.451		600564.000	2133432.876	7242.046	Y

Transformation Method

☒ Over Determination by Plane Similarity ☐ Rigid Body Transformation (No Scale Factor)

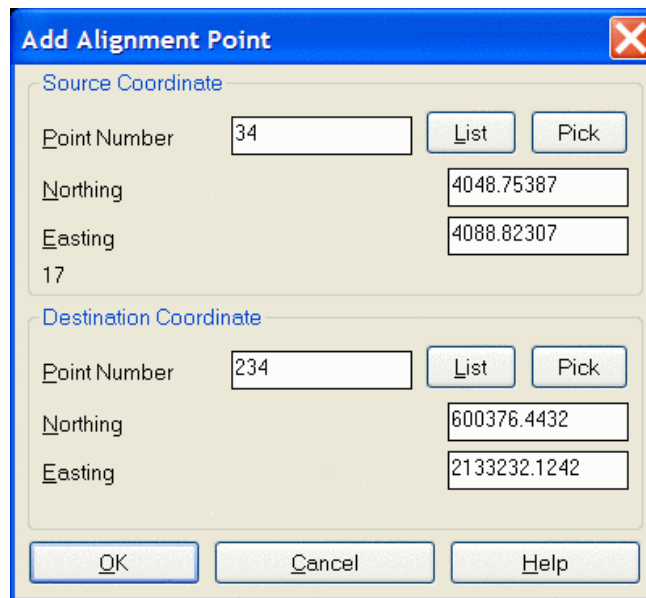
Add Edit Delete Process On/Off Optimize Report

OK Cancel Load Save Help

Over **Determination by Plane Similarity** is used to find the least squares best fit transformation for all the given source and destination points. Besides doing a translation and rotation, this option will also scales the points during the transformation. The **Rigid Body Transformation** also does a best fit least squares transformation but applies

only translation and rotation with no scale.

The **Add** button is used to define the source and destination coordinates for the points that define the transformation. Pressing this button brings up the following dialog box.



The dialog box is titled "Add Alignment Point" and contains two sections: "Source Coordinate" and "Destination Coordinate". Each section has a "Point Number" field, a "List" button, a "Pick" button, and "Northing" and "Easting" coordinate fields. The "Source Coordinate" section shows Point Number 34, Northing 4048.75387, and Easting 4088.82307. The "Destination Coordinate" section shows Point Number 234, Northing 600376.4432, and Easting 2133232.1242. At the bottom are "OK", "Cancel", and "Help" buttons.

Source Coordinate	
Point Number	34
Northing	4048.75387
Easting	4088.82307

Destination Coordinate	
Point Number	234
Northing	600376.4432
Easting	2133232.1242

The **Edit** button is used to edit existing data.

The **Delete** button removes the source and destination pairing from the transformation setup.

The **Process On/Off** button allows source and destination pairings to be turned on and off. This is useful when wanting to inspect different results using different pairings.

The **Optimize** option chooses which point pairings would yield the best transformation results by turning off the processing of pairings with higher residuals. This minimizes the average residual for the control points.

The **Report** option displays a report of the transformation point pairings, their residuals, processing status, transformation scale and avg. residual.

The **Load** and **Save** options allow for saving and recalling local coordinate transformation pairings and settings.

Draw Entities by Point ID: Draw Lines, Arcs, 3DLines, Polylines or 3DPolys by defining a range of point numbers.

Prompts

Enter Menu Option? <L>: *P*

Plot Entities by Point Number

Type of entity, Arc/Polyline/3dpoly/2dline/Exit/<Line>: *P* This response causes the program to plot polylines.

Example: '1*4-7-10*12-5-8' would draw lines from point numbers 1 through 4 then to 7, to 10 through 12, then to 5 to 8. (limit 132 characters)

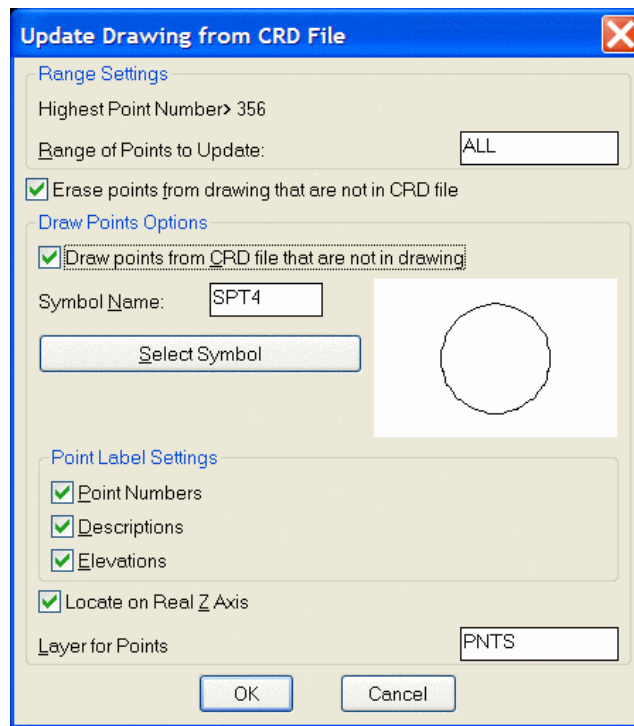
Undo/<Enter point numbers or ranges>: *1*10-20*30*

The program draws a polyline from point number 1 through 10 to point number 20 through 30.

New Last Point Number: This option sets the highest point number in the CRD file. All points above this number are erased.

Update Drawing from CRD File: This function updates the position of Carlson Survey points in the drawing to match the position stored in the coordinate file. This command also has options to erase and draw points. For the

erase option, points are erased from the drawing if the point number does not exist in the coordinate file. For the draw option, if a point number in the CRD file does not exist in the drawing, then this point is drawn using the settings from the dialog. The number of points modified, erased and drawn is reported at the end of the command.



Update CRD File from Drawing: This function allows you to select all or some of the points in the drawing and add or update them to the .CRD file. The points can be filtered with AutoCAD's Select Objects: selection mechanism and/or wild card matching of the point descriptions. The Update Point Descriptions option determines whether the point descriptions from the drawing will be stored to the CRD file. Use this command to update the file after a global edit such as *Move*, *Rotate*, *Renumber Points*, *Change Elevations*, *Erase*, etc. This routine directly reads Leica (Wildsoft), Softdesk, Geodimeter, InRoads, Land Development Desktop, and Eagle Point point blocks.

List Points: List the points stored in the .CRD file. See the *List Points* command in this chapter for more information.

Delete Points: Deletes points in the coordinate (crd) file by point number or description.

Screen Pick Point: Pick a point on the graphics screen and its coordinate values are added to the coordinate (crd) file. Prompts for point number, elevation and description will be displayed. This command does not plot a point, point attributes or point symbol. Use the command *Draw-Locate Points* command to do this.

Scale Points: This option multiplies the point northing, easting, and elevation by the scale conversion factor. You can use this routine for metric-English conversion. See the *Scale Points* command in this chapter for more information.

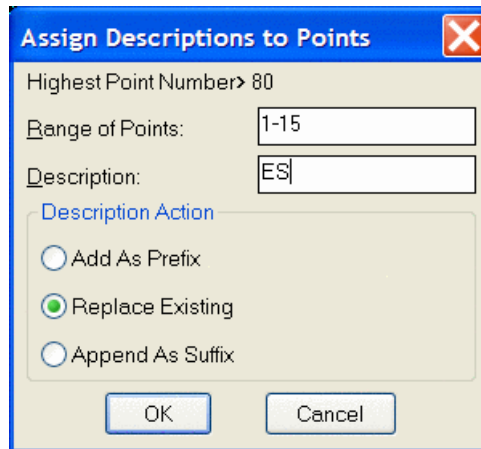
Translate Points: This option translates a range of points based on entered delta x and delta y, entered coordinates or translation point numbers. See the *Translate Points* command in this chapter for more information.

Rotate Points: This option rotates a range of points based on entered degrees or rotation, entered azimuths, entered bearings or rotation point numbers. See the *Rotate Points* command in this chapter for more information.

Align Points: This option does a translate based on a source point and destination point and then rotates to align the first source point and a second source point with the first destination point and a second destination point. See the *Align Points* command in this chapter for more information.

Description for Points: This option sets the point description field with the user-specified text for a range of point

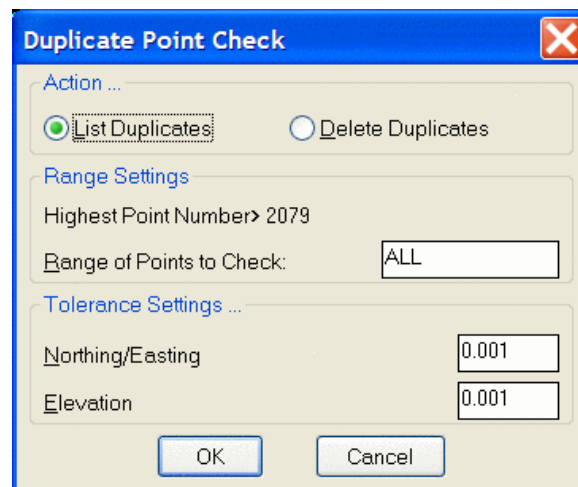
numbers.



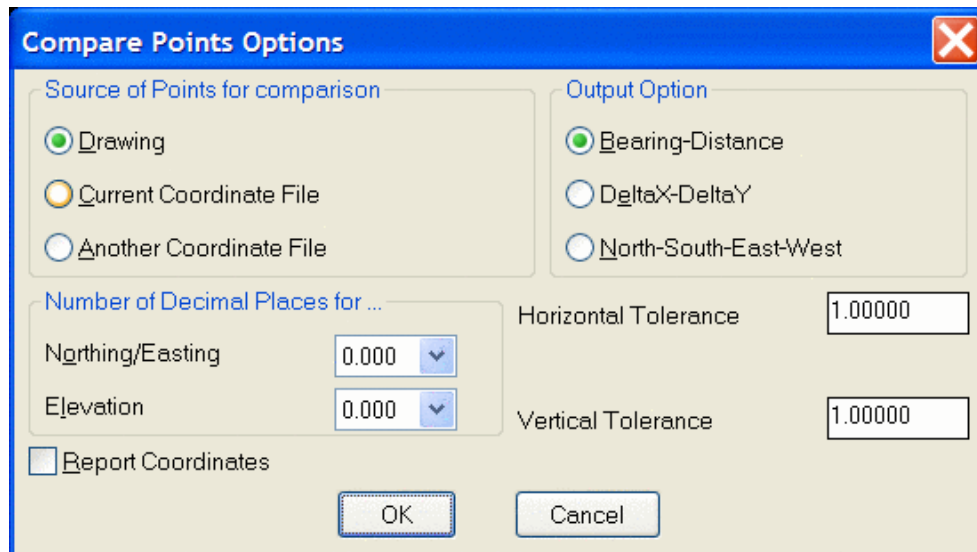
Elevation for Points: This option sets the elevation of a specified point or range of points.

Point Number Report: This routine list the used and unused point numbers in the .CRD file.

Duplicate Points: This function searches the CRD file for points with the same northing, easting and elevation. The tolerances for considering points to have the same coordinate are set in the dialog separately for northing/easting and elevation. To be counted the same coordinate, both the northing/easting and elevation must be within the tolerance distance. The duplicate points can be erased or only reported. For the erase option, the first point number is kept and any higher point numbers with duplicate coordinates are erased from the CRD file.



Compare Points: This function compares the coordinates in the .CRD file with either the coordinates for the matching point numbers in the drawing file, with matching point numbers from another CRD file or with different point numbers from the same CRD file. A report is created for any differences that shows the point numbers and the differences. The difference can be reported as a bearing and distance between the two points, as distance North/South and East/West or as the delta-X and delta-Y. There is an option whether to include the point coordinates in the report.



Compare Points Options

Source of Points for comparison:

- ☒ Drawing
- ☐ Current Coordinate File
- ☐ Another Coordinate File

Output Option:

- ☒ Bearing-Distance
- ☐ DeltaX-DeltaY
- ☐ North-South-East-West

Number of Decimal Places for ...

Northing/Easting: 0.000

Elevation: 0.000

☐ Report Coordinates

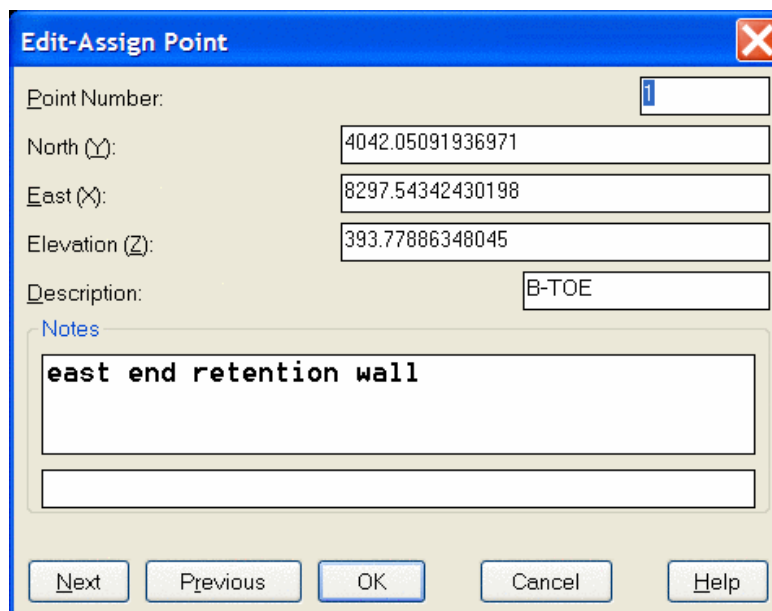
Horizontal Tolerance: 1.00000

Vertical Tolerance: 1.00000

OK Cancel

Renumber Points: This option renumbers points in the user-specified range starting from a new point number. The old point numbers are erased. The condense points will renumber such that there are no unused point numbers in the renumbered range. Otherwise the spaces between the points is maintained. In the example shown, renumbering 1-25 with points 1,2,24,25 to starting point number 101 will result in points 101,102,103,104 if condense is on or 101,102,124,125 if condense is off.

Input-Edit Point: Enter or edit the coordinate values or the description of a point. The Notes section is for adding optional point notes which are additional point descriptions. The standard description field is limited to 32 characters. Under notes, any number of lines of text can be assigned to the point. A list box shows the lines of notes. To add a note line, pick a blank line in the list box and then type in the note in the edit box below the list box and press Enter. To edit a note, highlight the line in the list box and edit the text in the edit box.



Edit-Assign Point

Point Number: 1

North (Y): 4042.05091936971

East (X): 8297.54342430198

Elevation (Z): 393.77886348045

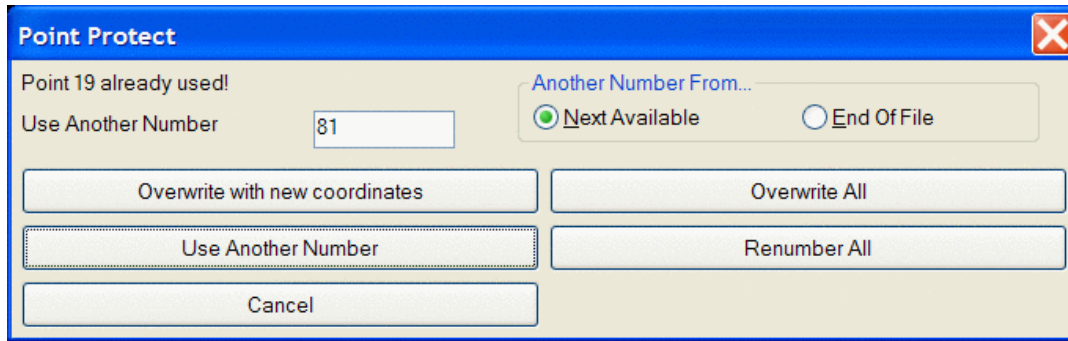
Description: B-TOE

Notes

east end retention wall

Next Previous OK Cancel Help

Point Protect Toggle: Toggles point protection on and off. With this option on when attempting to store a point with a point identifier (point number) that already exists in the current coordinate file the following dialog will be displayed.



Overwrite with new coordinates will update the existing point number with the new location of the point.

The **Use Another Number** field displays the point number that will be used if the Use Another Number option is selected. This number will depend upon the option chosen from the **Another Number From** settings. If **Next Available** is chosen, the next available number will be displayed in the Use Another Number Field. If there are number gaps in the coordinate file this number will not be the next highest number in the file. For example if points 1-10 and 20-30 exist in the crd file leaving a gap from 11-19, the Next Available number would be 11. If the desired point number, in this example, is 31, then the option of **End of File** would be selected.

The **Overwrite All** and **Renummer All** options apply when more than one point with the same number exists in the coordinate file. These options are helpful when importing points into existing crd files.

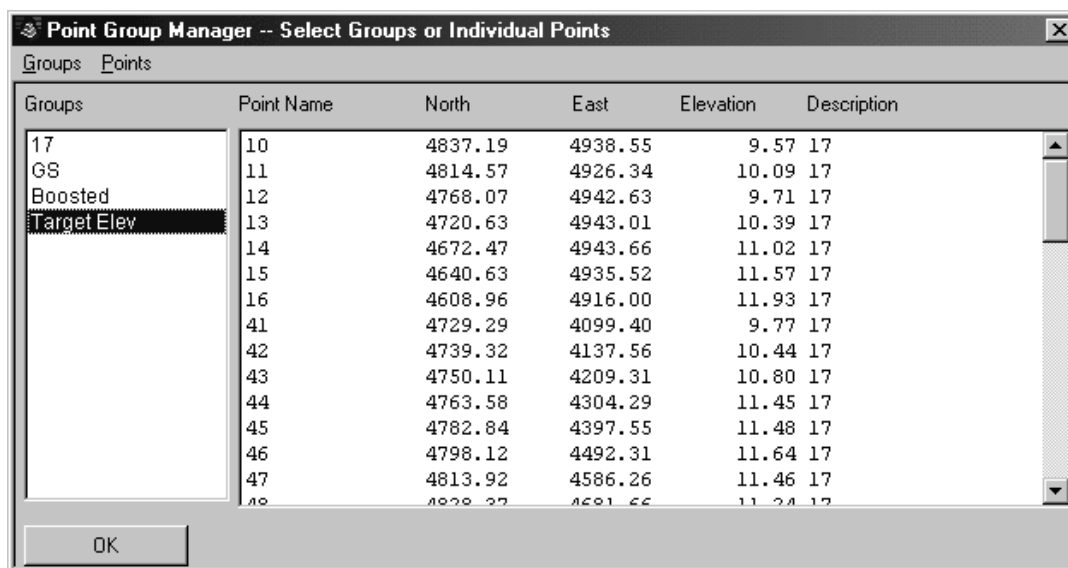
Pulldown Menu Location: Points

Keyboard Command: cfu

Prerequisite: None

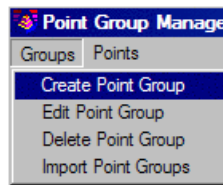
Point Group Manager

This command is used to create point groups based on inclusion and exclusion filters. The manager can perform various functions on these point groups. Also point groups can be referenced by group name in other commands such as Field to Finish and Data Collection.



Groups Pulldown

Create Point Group: This option creates point groups. When selected, the New Point Group dialog box is displayed.

The image shows the "New Point Group" dialog box. It has a title bar with a close button. Inside, there are two text input fields: "Group Name:" with the value "Topo" and "Description:" with the value "Topography Shots". Below these are two tabs: "Include" (selected) and "Exclude". A note states: "Inclusion rules are applied before exclusion rules. A point that meets all of following rules is included." There are two checkboxes: "Include All" (unchecked) and "Point List" (unchecked). Below "Point List" is a text input field. There are six buttons arranged in two rows: "DWG: Select", "DWG: Add Within Circle", "DWG: Add Within Polyline" in the top row, and "CRD: Select", "CRD: Add Within Circle", "CRD: Add Within Polyline" in the bottom row. Below these is a section for "Elevation Range" with an unchecked checkbox, "Minimum" and "Maximum" input fields (values 0.00 and 10000.00), and "Set By Selection" and "Set From List" buttons. At the bottom of this section is a "Description" checkbox (checked) with a text input field containing "GROUND/SHOT" and "Set By Selection" and "Set From List" buttons. At the very bottom are "Save Changes" and "Cancel Changes" buttons.

Group Name is the name of Point Group to create.

Description is the description of Point Group to create.

Use the **Include Tab** to define the filters to be applied when creating the point group. Inclusion rules are applied before the exclusion rules.

When **Include All** is toggled on, all points in the coordinate file will be included in the selection.

When **Point List** is toggled on, an option of defining the point list must be selected.

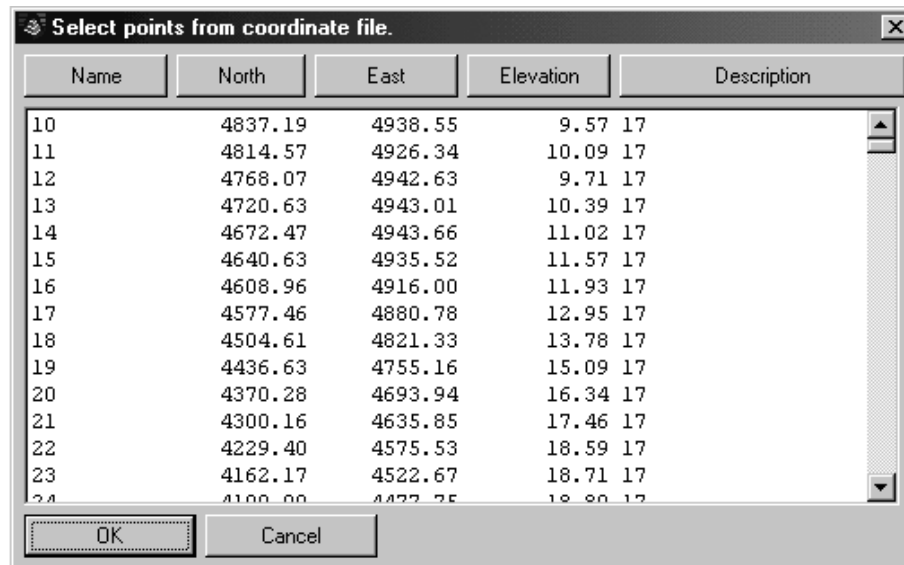
DWG: Select allows for manual selection of the points to include from the drawing. The points must be drawn on the screen prior to using this option. All standard AutoCAD selection tools, are available for selection of the points.

DWG: Add Within Circle allows for selection of the points to include by a user defined circle. The circle is defined by specifying the center and radius of the circle. The radius can be defined by entering in a numeric value or by picking on the screen. Points must be drawn to the screen prior to using this option.

DWG: Add Within Polyline allows for the selection of points to include by referencing a closed polyline. All points located within the closed polyline will be included in the selection. Prompts for the inclusion polyline and the

exclusion polyline will display. The inclusion polyline limits of the selection area. The exclusion polyline defines the area to exclude within the inclusion polyline. Points must be drawn to the screen prior to using this option.

CRD: Select allows for manual selection of the points to include from a point list. Standard window selection tools are available for selecting the points to include.



Name	North	East	Elevation	Description
10	4837.19	4938.55	9.57	17
11	4814.57	4926.34	10.09	17
12	4768.07	4942.63	9.71	17
13	4720.63	4943.01	10.39	17
14	4672.47	4943.66	11.02	17
15	4640.63	4935.52	11.57	17
16	4608.96	4916.00	11.93	17
17	4577.46	4880.78	12.95	17
18	4504.61	4821.33	13.78	17
19	4436.63	4755.16	15.09	17
20	4370.28	4693.94	16.34	17
21	4300.16	4635.85	17.46	17
22	4229.40	4575.53	18.59	17
23	4162.17	4522.67	18.71	17
24	4100.00	4472.25	18.80	17

CRD: Add Within Circle allows for selection of the points to include by a user defined circle. The circle is defined by specifying the center and radius of the circle. The radius can be defined by entering in a numeric value or by picking on the screen. The points do NOT have to be drawn to the screen prior to selection.

CRD: Add Within Polyline allows for the selection of points to include by referencing a closed polyline. All points located within the closed polyline will be included in the selection. Prompts for the inclusion polyline and the exclusion polyline will display. The inclusion polyline limits of the selection area. The exclusion polyline defines the area to exclude within the inclusion polyline. The points do NOT have to be drawn to the screen prior to selection.

Elevation Range allows for the selection of points within a specified elevation range to be included in the group. The minimum and maximum elevations can be entered manually in their respective data fields. The minimum and maximum values can also be specified by the Set By Selection and Set From List options.

Set By Selection allows for selection of points to include in the group from the drawing. The points must be drawn to the screen prior to using this selection method. Standard AutoCAD selection methods are available.

Set From List allows for selection of points to include in the group from a point list. Standard Windows selection tools are available with this option.

Edit Point Group

Group Name:

Description:

Include | **Exclude**

Inclusion rules are applied before exclusion rules.
A point that meets all of following rules is included.

☐ Include All

☒ Point List

☒ Elevation Range Minimum Maximum

☐ Description

The **Description** option allows for a selection of points to include based upon the description of the point. The description to filter for can be entered in the data field or by using the Set By Selection and/or the Set From List options described above.

New Point Group

Group Name:

Description:

Include | **Exclude**

Inclusion rules are applied before exclusion rules.
A point that meets all of following rules is included.

☐ Include All

☒ Point List

☐ Elevation Range Minimum Maximum

☒ Description

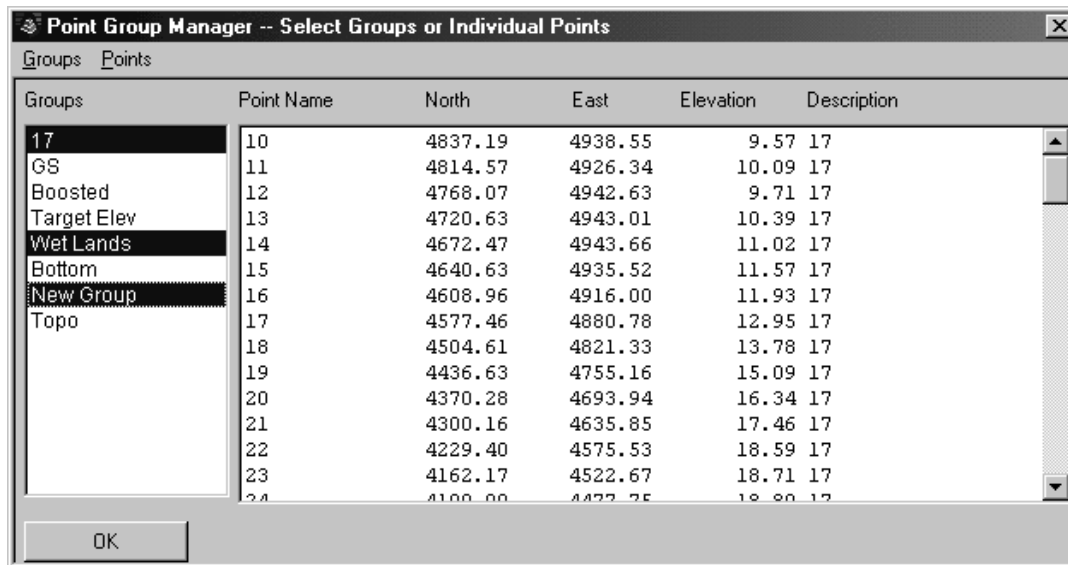
The **Exclude Tab** allows for defining rules that pertain to the points to be excluded from the Inclusion selection. After defining the inclusion rules for the group, the options on the Exclude tab can be used to filter for points to exclude from the group. For example, if the inclusion rules call for all points within the elevation range of 8 to 12,

an exclusion rule can be set to exclude the points on elevation 9 or with the description tree. The options on this tab work exactly like the options on the Include tab. Please refer to the Include tab definitions for further instruction.

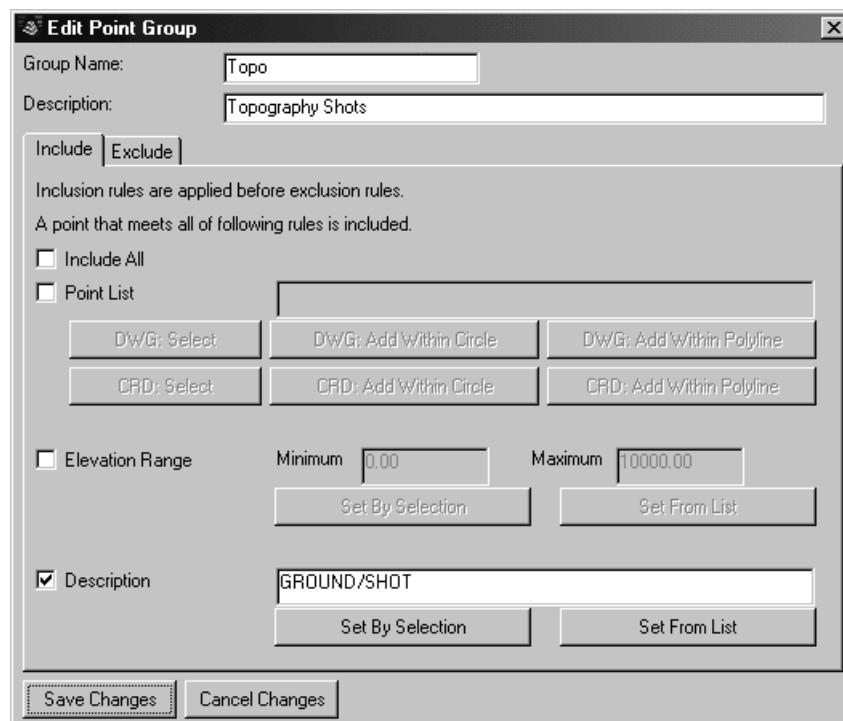
Save Changes saves the point group to the group name specified based upon the Inclusion and Exclusion rules specified.

Cancel Changes discards specified rules and changes and goes back to the Point Group Manager dialog.

Edit Point Group allows for editing of existing point groups. From the list of available groups, highlight the group or groups to edit. When complete with the first group, if more than one is selected, selecting the Save Changes option will save the changes to the active group and switch to the next group in the selection set.



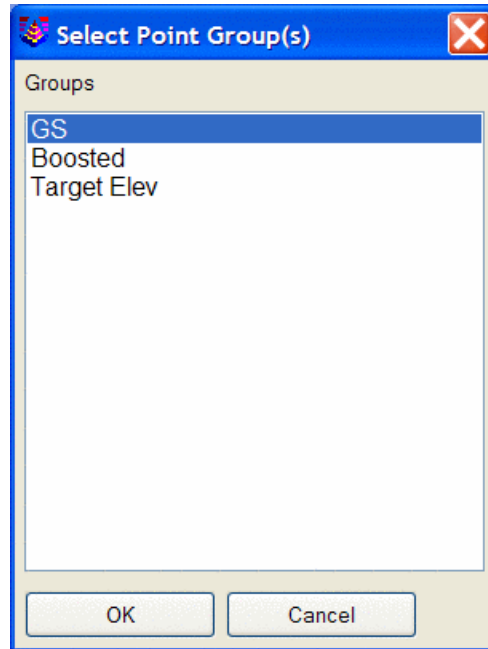
From the Groups pulldown, select Edit Groups, the Edit Group dialog box will now appear.



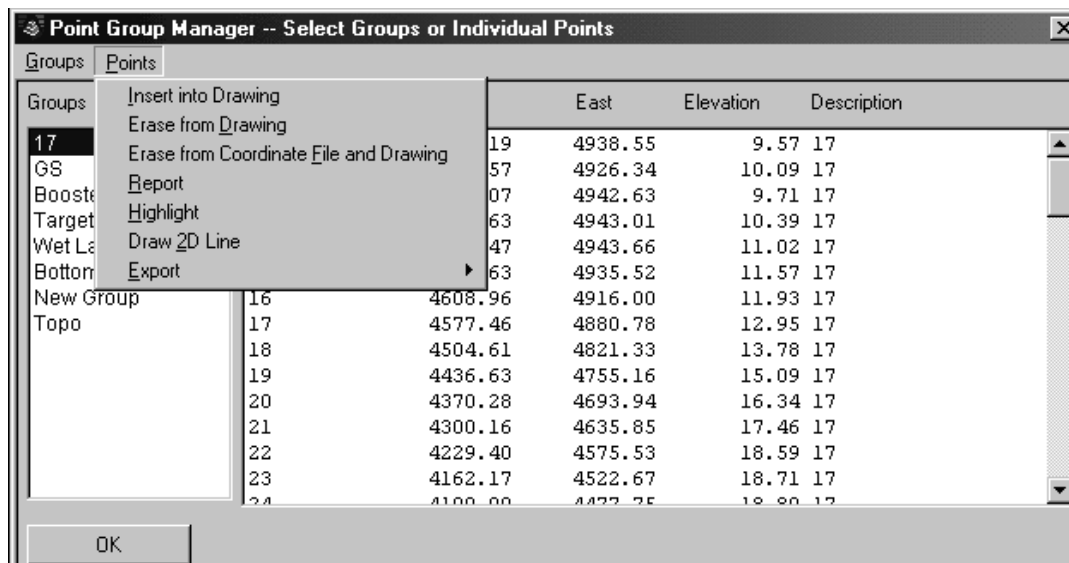
See Create Point Groups for further definitions of the available options.

Delete Point Groups deletes specified groups for the existing group list. One or more groups can be deleted at one time.

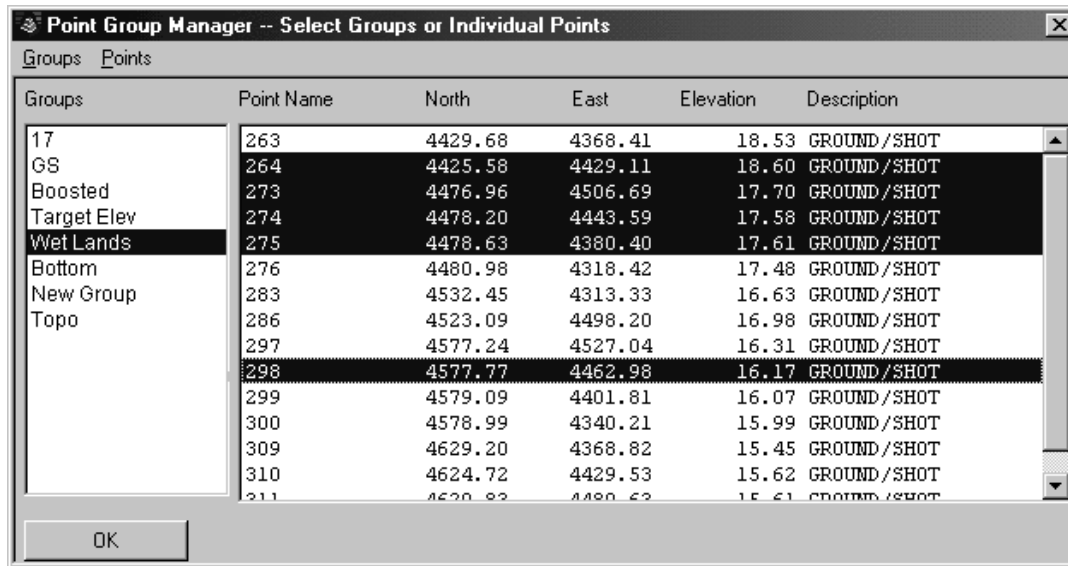
Import Point Groups allows for importing filters from point group manager settings of other coordinate files. This is a useful option when coordinate files are going to contain same point group names with the same filters. This option only brings in the filters into the point group manager, it does not import actual points into the coordinate file by group name. Existing points in the active coordinate file that meet the filter definitions of the imported point groups will automatically be added to the corresponding group.



Points Pulldown



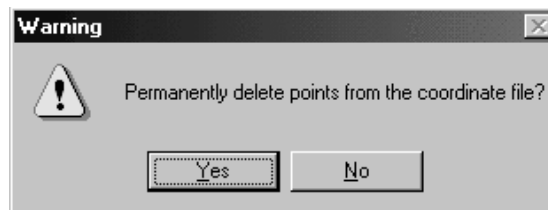
The **Insert into Drawing** option draws the points in the group in the drawing. Individual points or point ranges can be selected from the group to be erased from the drawing. For example points 264-275 and point 298 contained in group Wet Lands are tagged to be erased from the drawing in the following figure.



The symbol to be used and the attribute layout are determined by the Point Default Settings. The symbol size and the point attribute size are determined by the settings in the Drawing Setup routine.

Erase from Drawing erases specified point group/groups or specified points from within the group from the drawing.

Erase from Coordinate File and Drawing erases the points in the specified group/groups or specified points from within the group from the drawing and will also permanently delete the points from the CRD file. You will be prompted with a warning as follows:



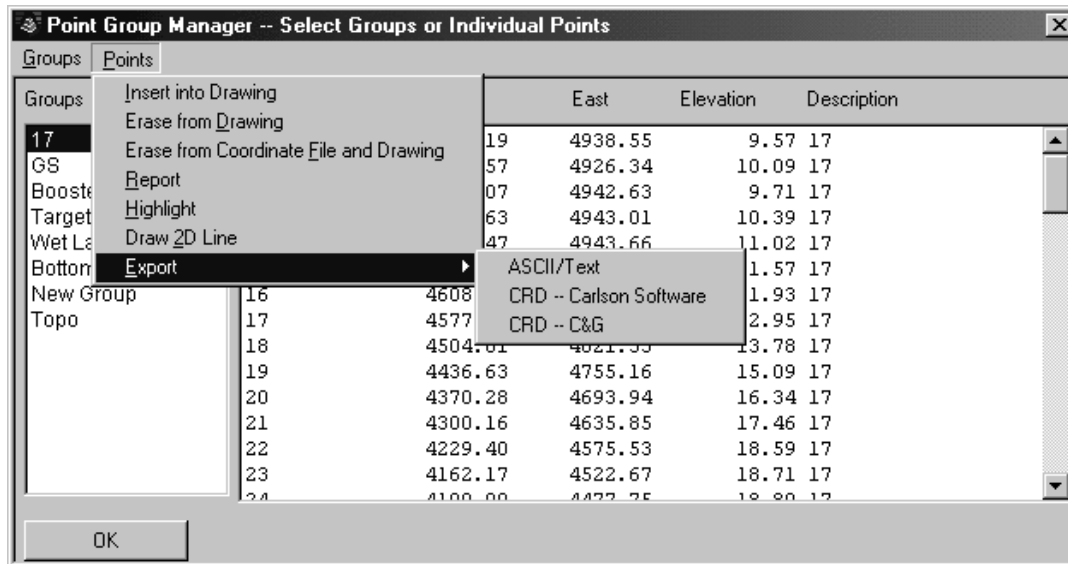
Selecting **Yes** will complete the command and erase the points from the screen and also the coordinate file. Selecting **No** will cancel the command leaving the drawing and the coordinate file unchanged.

The **Report** option will generate a point list of the points contained in the selected group/groups or specified points from within the group.

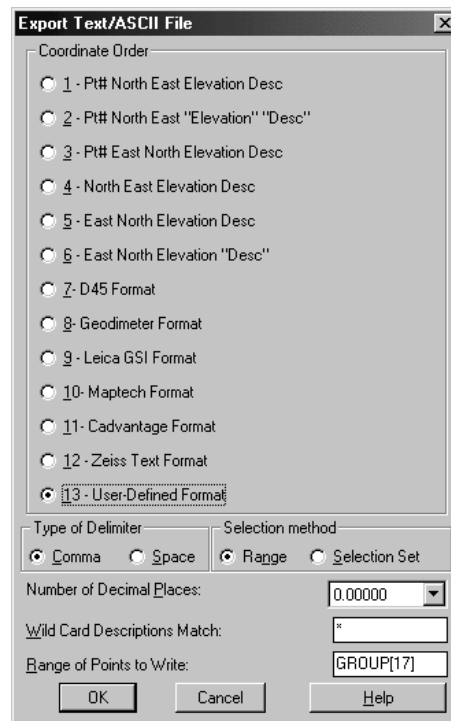
The **Highlight** option highlights the specified objects in the drawing. This makes them distinguishable from the other points on the screen.

The **Draw 2D Line** option draws a 2d polyline between the points contained in the group/groups or between specified points in a group.

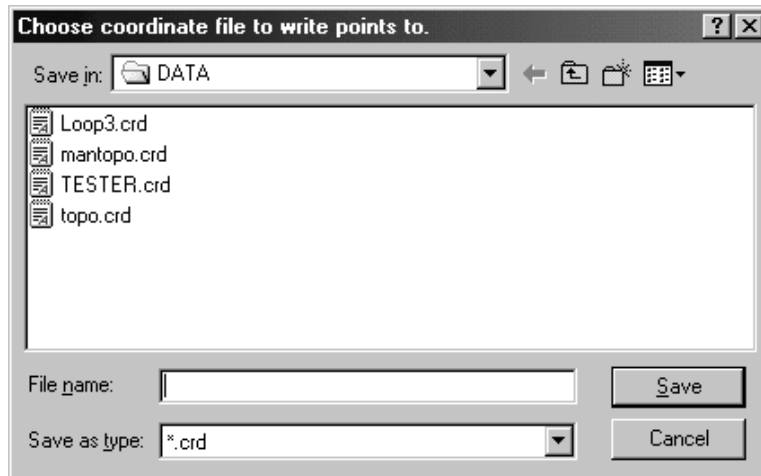
The **Export** command exports the selected group/groups or the specified point(s) or range of points from within the group to various formats. The available formats are ASCII/Text, Carlson Software CRD and C&G CRD files.



When **ASCII/Text** is selected, the Export Text/ASCII File dialog box will be displayed. Please refer to the Export Text/ASCII File section of the manual for more information.



The **CRD-Carlson software** command writes the selected group/groups or the specified point(s) or range of points within the group to a new Carlson formatted CRD file.



Specify the file name of the CRD file to create and press save.

CRD-C&G writes the selected group/groups or the specified point(s) or range of points within the group to a new C&G formatted CRD file.

Specify the file name of the CRD file to create and press save.

Pulldown Menu Location: Points

Keyboard Command: PGM

Prerequisite: points in a coordinate file

Edit Points

Function

This command edits point data in the current coordinate file or within a point range. The current coordinate file can be set with the Set Coordinate File command. Edit Points shows all the points in the coordinate file. New points can be added and points can be deleted by using the Insert and Delete keys.

This tool also lets you edit notes associated with each point. While the standard point description is limited to 32 characters, the drawing notes are not. When you click on a given point, you can add numerous lines of notes about that point in the bottom of the dialog. Keep in mind that these notes are stored in a separate file with the extension ".not" having the same name as the CRD and residing in the same folder.

Coordinate Data Sheet					
File Edit Search					
	Point#	Northing	Easting	Elevation	Description
1	1	79409.6709485	15565.2755448	1357.0000000	IP/EDGE ROAD
2	2	79257.0511942	15502.9397236	1452.0000000	T/H CL DITCH
3	6	79613.6619975	15619.7250234	1481.1700000	
4	7	79658.3581236	15636.0962271	1498.3700000	
5	8	79703.1481491	15652.5018241	1530.4500000	
6	9	79744.4638959	15667.6348696	1545.9700000	
7	45	79547.4889989	15488.9903904	1434.6000000	
8	46	79579.8843004	15500.8560738	1457.3500000	
9	47	79576.7856194	15499.7210954	1452.1500000	
10	48	79637.1629494	15521.8359777	1460.0500000	
11	49	79683.6431645	15538.8606539	1489.7300000	
12	50	79768.9977415	15570.1241501	1543.2000000	

Point 1 Notes	
1	A lengthy note about the first point goes here.
2	You can add as many lines as you would like.
3	

Search and Replace

Find What:

Replace With:

Column to Search

☐ Point#
☐ North
☐ East
☐ Elev
☐ Desc
☒ All

Range of Points to Process:

1-295

☐ Match Whole Word Only

☐ Match Case

Replace

Replace All

Cancel

Help

Pulldown Menu Location: Points

Keyboard Command: editpt

Prerequisite: None

Erase Points

Function

This command erases Carlson Survey points inserts from the drawing. The points to erase can either be selected from the screen or specified by point number, point number range or by point group. Erasing a Carlson Survey point will erase the point symbol, point attributes, and point node. The points may optionally be erased from the coordinate file. As long as the points are not deleted from the coordinate file, they can be redrawn with *Draw-Locate Points*.

Prompts

simply type in 25 in the Angle (dd.mmss) field, choose NE in the Type field and then enter the distance of 100 in the Distance field.

With **Process Elevations** checked, all elevations will be translated by the specified or calculated Delta Z value. This option is very useful in correcting point elevations after performing a survey with assumed elevations and then later surveying into a benchmark with known true elevation. In this case only the Delta Z value, use (-) to indicate a lower correction, and the range of points to translate would be required for a translation. For example if the entire job needed to be lowered by 5', the Delta Z would be defined as -5 and the Range of Points defined as ALL.

Ignore Zero Elevations is only available when Process Elevations has been chosen. With this option checked ON, all points with an elevation of 0 will be ignored resulting in no translation taking place on these points.

With **Translate Screen Entities** checked ON, after specifying the point range or group to translate and selecting OK on the dialog box the following command line prompt is displayed:

Select objects to rotate (points excluded):

At this prompt select the objects on the screen, polylines, lines, arc etc., to also translate and press enter. The translation of the points and screen entities will be completed.

Various **Output Options** for the translated points are available.

Overwrite Existing Coordinates will overwrite the existing coordinate points with the new translation coordinates thus changing the coordinate values in the existing crd file.

New Point Numbers will assign new point numbers to the translated coordinate points and leave the original coordinate points unchanged and present in the coordinate file. When using this option, on the Range of Points to Translate dialog, there is a Value to add to point numbers field. In this field, enter the value to add to the point numbers. For example if the existing point numbers are 1-20, and the value to add is 100, the resulting new point numbers will begin at 101 and end at 120.

New CRD File will place the translated coordinates in a new crd file. After selecting OK to the range of points to translate dialog, the Coordinate File to Create dialog will appear. On this dialog enter the name of the new crd file and select save. The original crd file will remain unchanged and the new file will contain the points with the translated coordinates.

Specifying the points to be translated is accomplished either by specifying a **Range of Points** (1-20,33,36-40....) or by **Point Groups**. If using the Point Group option, the Select Point Group(s) dialog box will be displayed allowing for the selection of the Group(s) to rotate.

The **Description Match** option only translates points with the description(s) specified in this field.

Undo Last Translation restores the points to their previous location before translation. It is important to note that if Translate Screen Entities has been checked to restore the translated objects to their previous location will require the use of the undo command located in the Edit pulldown.

The AutoCAD command *MOVE* can be used to translate points on the screen but this does not update the coordinate file unless you have the option Link Points with CRD File turned ON in *Configure > General Settings*. The dialog box can be found in the Settings pulldown menu (Note: This toggle must have been turned ON prior to locating the points). If you do use the *MOVE* command and the CRD file needs updating, run the command *Update CRD file From Drawing* found in *Coordinate File Utilities*.

Pulldown Menu Location: Points

Keyboard Command: transpt

Prerequisite: points in a coordinate file

Rotate Points

Function

This command rotates points in a coordinate file. The degrees of rotation can be entered directly or calculated from original and destination bearings or azimuths.

The **Rotation Point** will remain unchanged while the points specified for rotation rotate around it. This point can be specified by using the **List** button to pick from a list of points contained in the coordinate file, or from the screen by using the **Pick** button. The rotation point can also be defined by a coordinate value by manually entering in the X and Y values of the point. This point must be defined before the rotation will take place.

The **Original Bearings/Azimuths** and **Destination Bearings/Azimuths** can be entered directly or specified by point numbers. If using a pair of points to define the original bearing and then specifying the destination bearing by entering in the desired Bearing/Azimuth, the From and To Pt# fields should be left blank in the destination bearing/azimuth settings. Use the From and To Pt# fields in the Destination Bearing/Azimuth when you want to make a direction or Bearing/Azimuth between two existing points match the Bearing/Azimuth between two other existing points within the file. For example, to make the bearing between points 10-12 match the bearing between points 25-26, the Original Bearing/Azimuth could be defined as From Pt#10 To Pt#12 with the Destination Bearing/Azimuth defined as From Pt#25 To Pt#26.

With **Rotate Screen Entities** checked ON, after specifying the point range or group to rotate and selecting OK on the dialog box the following command line prompt is displayed:

Select objects to rotate (points excluded):.

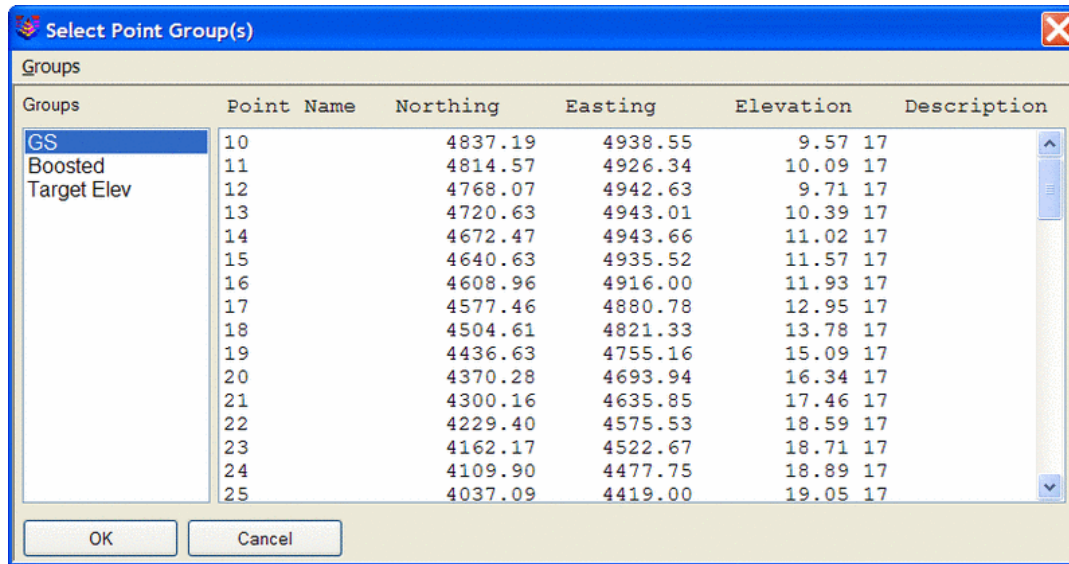
At this prompt select the objects on the screen, polylines, lines, arc, etc., to also rotate and press enter. The rotation of the points and screen entities will be completed.

Various **Output** options for the rotated points are available.

Overwrite Existing Coordinates will overwrite the existing coordinate points with the new translation coordinates thus changing the coordinate values in the existing crd file.

New Point Numbers will assign new point numbers to the translated coordinate points and leave the original coordinate points unchanged and present in the coordinate file. When using this option, on the Range of Points to

Translate dialog, there is a Value to add to point numbers field. In this field, enter the value to add to the point numbers. For example if the existing point numbers are 1-20, and the value to add is 100, the resulting new point numbers will begin at 101 and end at 120.



Specifying the points to be rotated is accomplished either by specifying a Range of Points (1-20,33,36-40....) or by Point Groups. If using the Point Group option, the Select Point Group(s) dialog box will be displayed allowing for the selection of the Group(s) to rotate.

The **Description Match** option only rotates points with the description(s) specified in this field.

The points that have been specified for rotation that are present in the drawing will be graphically updated to their new location in addition to an automatic update of the coordinate file.

Undo Last Rotate restores the points to their previous location before rotation. It is important to note that if Rotate Screen Entities has been checked to restore the rotated objects to their previous location will require the use of the undo command located in the Edit pulldown.

Pulldown Menu Location: Points

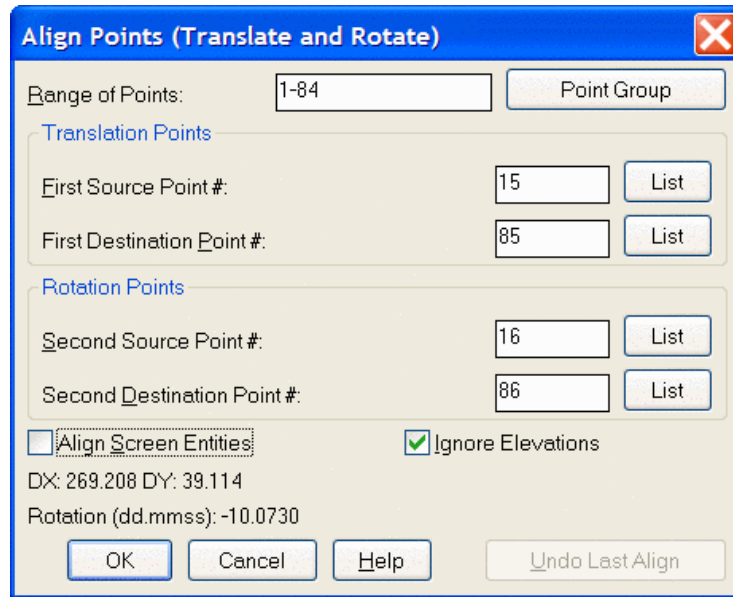
Keyboard Command: rotatept

Prerequisite: points in a coordinate file

Align Points

Function

This command translates a specified Range of Points or Points Group(s) based on a source point and destination point, and then rotates to align the first source point and a second source point with the first destination point and a second destination point. The command basically combines the Translate and Rotate Point commands. To specify a Range of Points to align, enter the range to align or select a point group(s) by selecting the Point Group button. Each of the Translation and Rotation points, both Source and Destination points, can be entered manually or picked from the point list by selecting the List button.



When **Align Screen Entities** is checked, after specifying the point range or group to align and selecting OK on the dialog box the following command line prompt is displayed:

Select objects to rotate (points excluded): At this prompt select the objects on the screen, polylines, lines, arc etc., to also align and press Enter. The alignment of the points and screen entities will be completed.

When **Ignore Zero Elevations** is checked, all points with an elevation of 0 will be ignored in the alignment.

Undo Last Align restores the points to their previous location before alignment. It is important to note that if Align Screen Entities has been checked to restore the aligned objects to their previous location will require the use of the undo command located in the Edit pulldown.

Pulldown Menu Location: Points

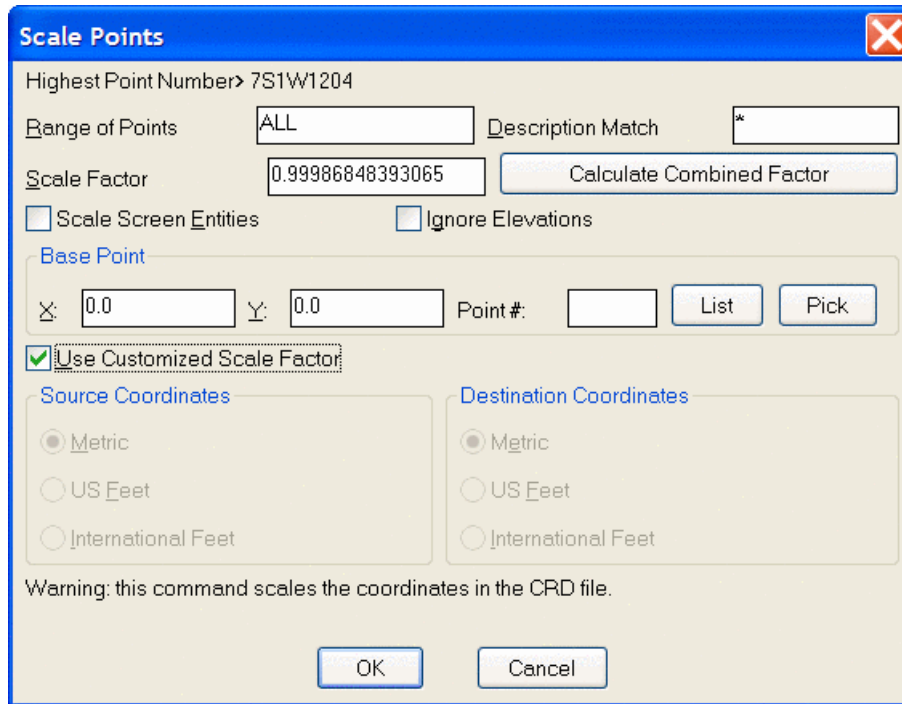
Keyboard Command: alignpt

Prerequisite: Points in a coordinate file

Scale Points

Function

This command scales points in a coordinate file. The northing, easting and optionally the elevation are multiplied by the specified scale factor. You can use this routine for Metric-English conversion or a specific conversion by choosing the Use Customized Scale Factor option and specifying the desired Scale Factor in the edit box.



The image shows a software dialog box titled "Scale Points". It contains several input fields and checkboxes. At the top, "Highest Point Number" is set to "7S1W1204". Below this, "Range of Points" is set to "ALL" and "Description Match" is set to "*". The "Scale Factor" field contains the value "0.99986848393065", and a "Calculate Combined Factor" button is next to it. There are two checkboxes: "Scale Screen Entities" (unchecked) and "Ignore Elevations" (unchecked). A "Base Point" section has X and Y coordinates both set to "0.0" and a "Point #" field. Below this, the "Use Customized Scale Factor" checkbox is checked. At the bottom, there are two sections: "Source Coordinates" and "Destination Coordinates", each with radio buttons for "Metric", "US Feet", and "International Feet". A warning message at the bottom states: "Warning: this command scales the coordinates in the CRD file." At the very bottom are "OK" and "Cancel" buttons.

Highest Point Number: Displays the highest point number in the current coordinate (.CRD) file.

Range of Points: You must enter a range of points to scale or a group to scale. You can access the group dialog box by typing "group" in the range of points field. You may enter ALL to scale all of the points from the coordinate file.

Description Match: This option only scales points with the description(s) specified in this field. Allows you to filter points by the description field. The default is the asterisk (*), which will match all points.

Scale Factor: This is to be entered in manually when using a customized scale factor. If converting from standard measurement units, feet to meters, meters to feet, US Feet to International Feet etc..., the scale factor will be calculated and entered automatically. Available only when Use Customized Scale Factor is checked.

Calculate Combined Factor: If a combined scale factor is required for converting from ground to grid and grid to ground coordinates, this value can be calculated by using the Calculate Combined Factor option. This calculation process begins with the Calculate Scale Factor dialog shown below.

Ignore Elevations: Check this if you do not want to scale the elevations.

Base Point: Enter point to used as origin for scale. You may enter coordinates or a point number.

Use Customized Scale Factor: When checked, the Scale Factor field is enabled allowing you to enter a custom scale factor. Disables the Source Coordinates and Destination Coordinates fields.

Source Coordinates: Select the format of the existing coordinate values. Available only when Use Customized Scale Factor is not checked.

Destination Coordinates: Select the format of the desired coordinate values. Available only when Use Customized Scale Factor is not checked.

Calculate Scale Factor

Projection Type: State Plane 83

Zone: OR North

Coordinate Units...

☐ Metric ☒ US Feet ☐ Intl Feet

Range of Point Number To Process: 7S1E0602

Scale Direction...

☒ Ground To Grid ☐ Grid To Ground

Combined Scale Factor: 0.99986209195301

Projection Type: This must be specified as either State Plane 83 or State Plane 27 as well as what state plane **Zone** is required.

Coordinate Units: Available are Metric, US Feet and International (Intl) Feet. The correct unit must be specified before calculating the combined scale factor.

Range of Numbers: The Range of Numbers to Process should be used to select the points to be used in order to calculate the combined scale factor. This does not specify what points are going to be scaled by the resulting scale factor.

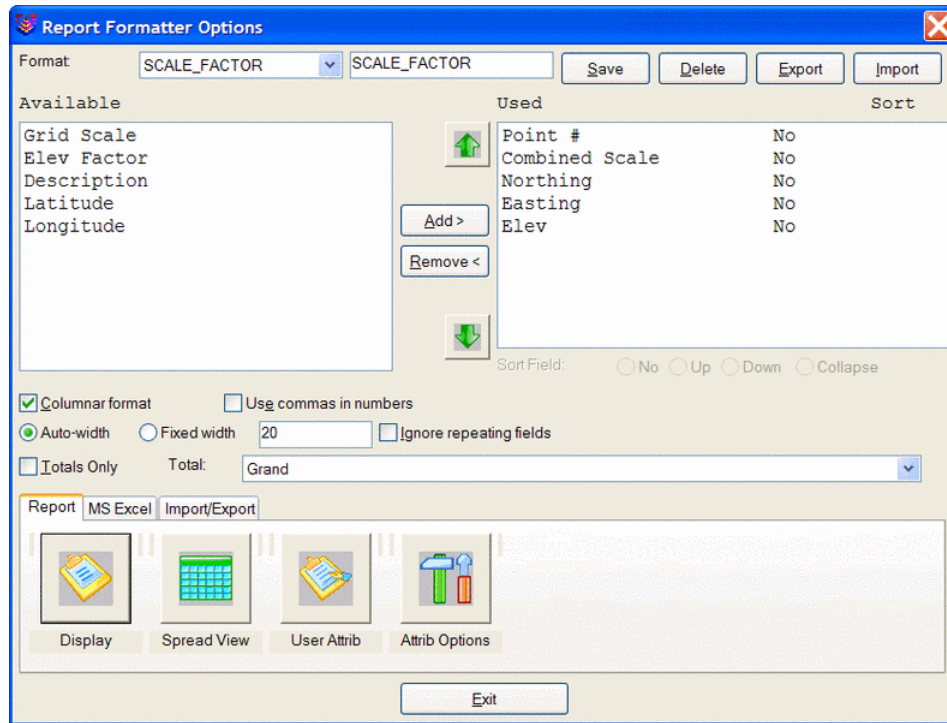
List: These points can be selected from a list by selecting the List button.

Scale Direction: Determines which way the scale factor will be calculated.

Ground to Grid/Grid to Ground: A scale for either can be calculated and applied.

Calculate: Pressing this button will calculate and then display the combined scale factor on the dialog box. To accept this value as the customized scale factor to use to scale the points in the coordinate file, press the **OK** button.

Report: This option displays a report showing specified information. This information is specified by using the report formatter found throughout the program. Simply choose the information you wish to display and the order to be displayed. For further instruction and information on the Report Formatter please refer to the Report Formatter section of this manual.



With **Align Scale Entities** checked ON, after specifying the point range or group to scale and selecting OK on the dialog box, the following command line prompt is displayed:

Select objects to scale (points excluded):

At this prompt, select the objects on the screen, polylines, lines, arc etc., to also scale and press enter. The points and screen entities will now be scaled and updated graphically and in the active coordinate file.

With **Use Customized Scale Factor** Off, various conversions can be performed by specifying the Source Coordinate units and the Destination Coordinate units. This is a quick and easy way to perform Metric/English conversions.

Pulldown Menu Location: Points

Keyboard Command: scalept

Prerequisite: points in a coordinate file

Move Points

Function

This command moves an entire Carlson point when you select any part of the point. Each Carlson point is made up of three entities: a point entity, a symbol, and a point block with the point number, elevation, and description. All these parts of the point are moved together with this command. The point is moved only in the drawing, and the coordinate file is not updated unless Link Points with CRD File is turned on under General Settings in the Configure command found in the Settings menu. Without this link turned on, you can update the coordinate file with the new point position in the drawing by using the Update from Drawing function in Coordinate File Utilities described earlier in this chapter.

Prompts

Select Point: pick a point on the screen

Select Second Point: pick a destination location on the screen

Pulldown Menu Location: Points

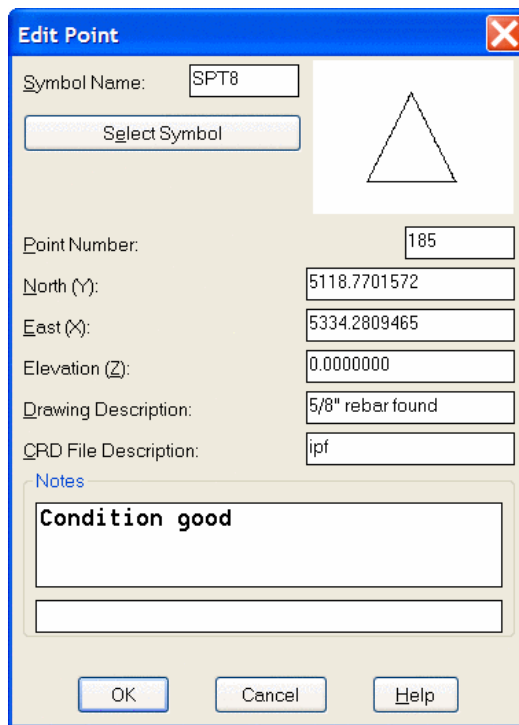
Keyboard Command: MPNT

Prerequisite: Carlson points

Edit Point Attributes

Function

This command will edit the attributes of a Carlson point such as the symbol type, point number, elevation and description. When this command is invoked, the command line will prompt the user: **Select point to edit (Enter to end)**. At this point, you can select any part of the point including the symbol, elevation, point number or the description. Next, a dialog will appear as shown.



To change the symbol, either type in a new symbol name in the edit box, or choose the "Select Symbol" button where you can choose from a list of symbols. To change any of the other properties of the point, simply change or replace the contents of the edit box with the new information. Both Drawing Description and CRD File Descriptions are displayed. When a change to the Drawing description is made this change will not be reflected in the coordinate file. This allows the change of a description that is defined in the field to finish (fld) table for a particular code. If a change is made in the CRD File description it will be reflected in the coordinate file. Take note that if the crd file description is changed running field to finish will change the definitions for the point(s) changed. If you change the point number to a number that already exists in the current CRD file, and point protect is ON, you will be prompted **[O]verwrite w/new coordinates, overwrite [A]ll, or use number <1000>:.** You can choose to use the next available point number in the CRD file (this is the default) or overwrite the point number. The properties that you modify with the exception of Drawing Description will update the current CRD file. All modifications will update screen entities.

You may also choose to use the AutoCAD *DDATTE* command to change the attributes of a point. If you do this, then the CRD file will not be updated and if you change the elevation attribute, the point will not change its current Z location.

Pulldown Menu Location: Points

Keyboard Command: editpnt

Prerequisite: Carlson points

Edit Multiple Point Attributes

Function

This function allows you to modify the properties of multiple point attributes at the same time. For example, you could rotate the elevation text of some points to 45 degrees, change the height of the description text for all the points in the drawing or change the layer for a particular attribute. This command give you complete control over the Carlson point attributes that are present in the drawing.

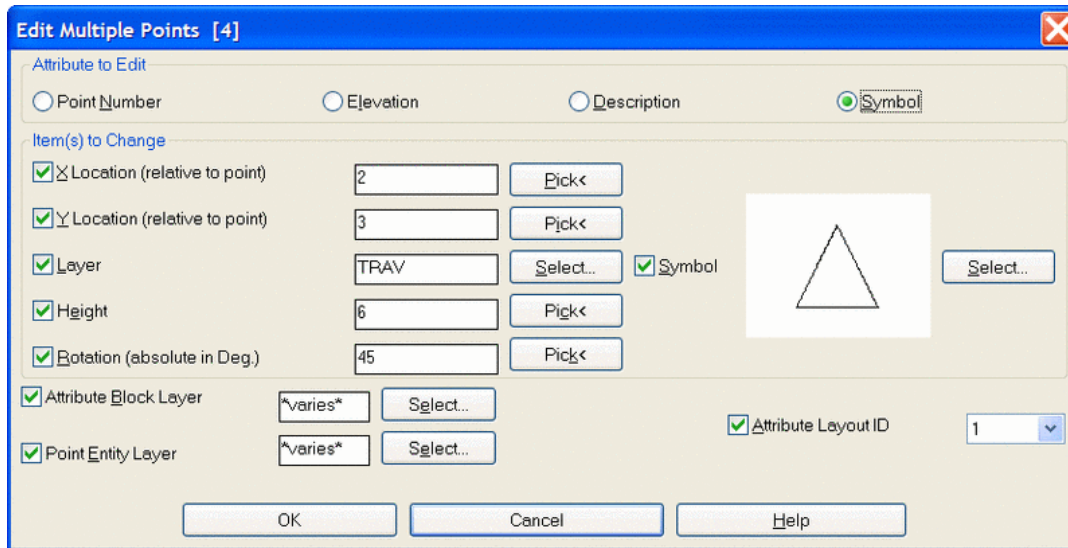
Changes can be made to each attribute, the point number, elevation, description or symbol, all at the same time. For each attribute, you can also change any number of the properties, layer, height, etc.. The dialog will reflect the current status of each attributes properties. If you select 10 points and 5 of them have the elevation rotation set at 45 degrees and the other 5 are set at 0 (zero) degrees, then the rotation edit field will say *varies* to let you know that the properties of the points you selected are not the same.

The **X location** refers to the distance in the X direction from the center (or insertion point) of the point symbol. The **Y location** refers to the distance in the Y direction from the center (or insertion point) of the point symbol.

The **Layer** refers to the layer of the individual attribute, not the entire attribute block. To change the layer of the entire attribute block, use the **Attribute Block Layer** option. The **Point Entity Layer** refers to the layer that the node of the point resides. The required layers can either be typed in manually or the Select button can be used to pick from the existing layers in the drawing. If a new layer is desired, simply type in the name of the new layer and it will be created automatically. Use the layer property manager to edit the properties of this new layer if required.

The **Height** is expressed in real units (generally feet or meters), not plotted size. The **Rotation angle** is expressed in absolute decimal degrees. To change a point symbol check on the **Symbol** option and use the select button to choose the desired symbol. The **Attribute Layout ID** refers to the attribute layout style defined in Point Defaults or Field to Finish code definitions. This option allows you to change the particular layout with one of the other available styles or to a customized style if defined.

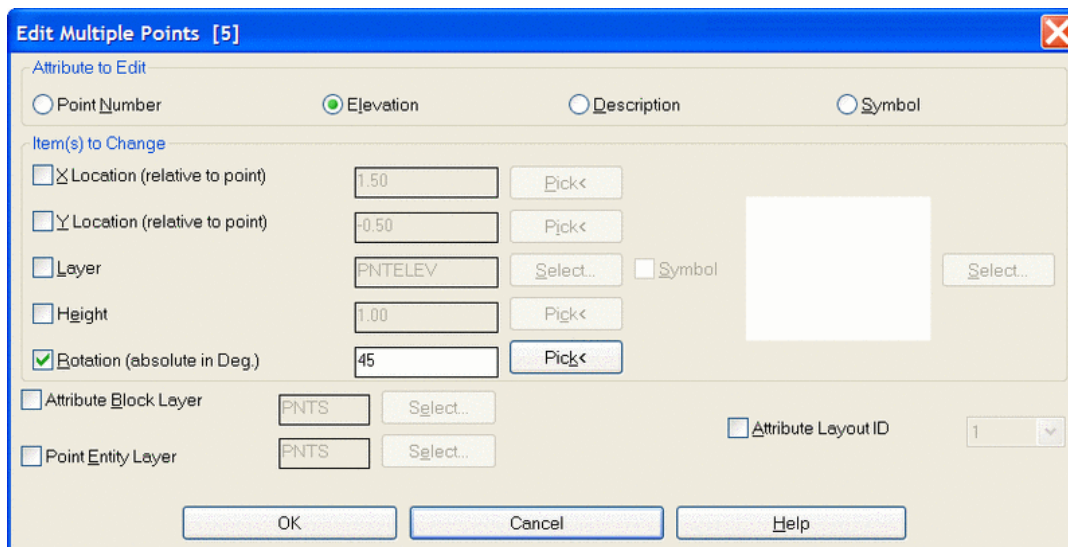
The Pick buttons allow you to pick two points to define a distance (or angle in the case of Rotation). If you want to select a line to define a distance or angle, select two points on the line with the appropriate OSNAP.



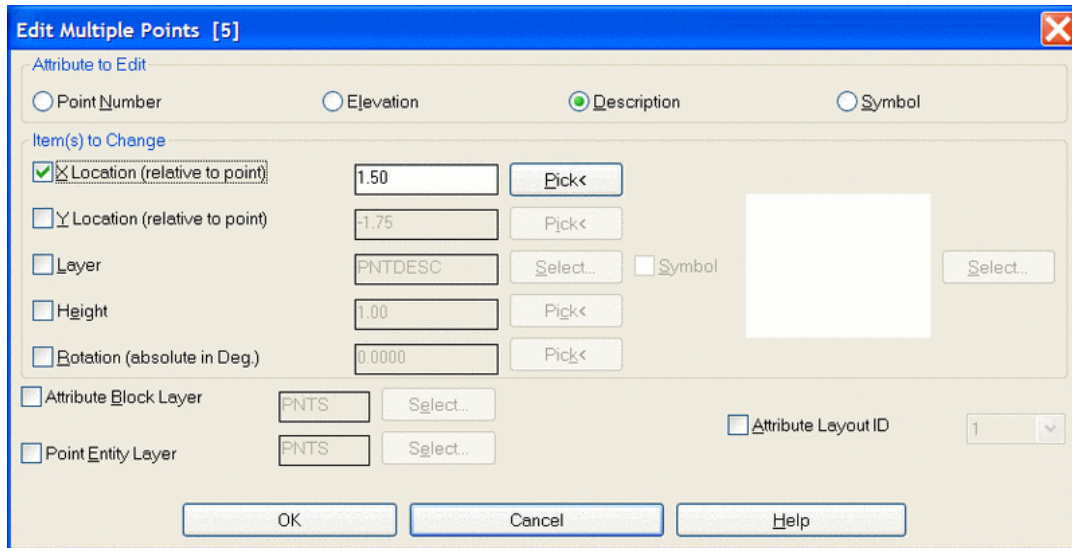
After selection of the points to change, the number of points selected will be shown at the top of the dialog box. Each change to an attribute is defined separately. Select the attribute to edit, make the necessary changes to this attribute and then move on to the next attribute if required. Changes made to the attributes are remembered individually which allows for switching back and forth through the attributes until the command is completed. After completion the new settings for the point attributes will be retained until changed or redrawn on the screen.

Edit Multiple Points dialog

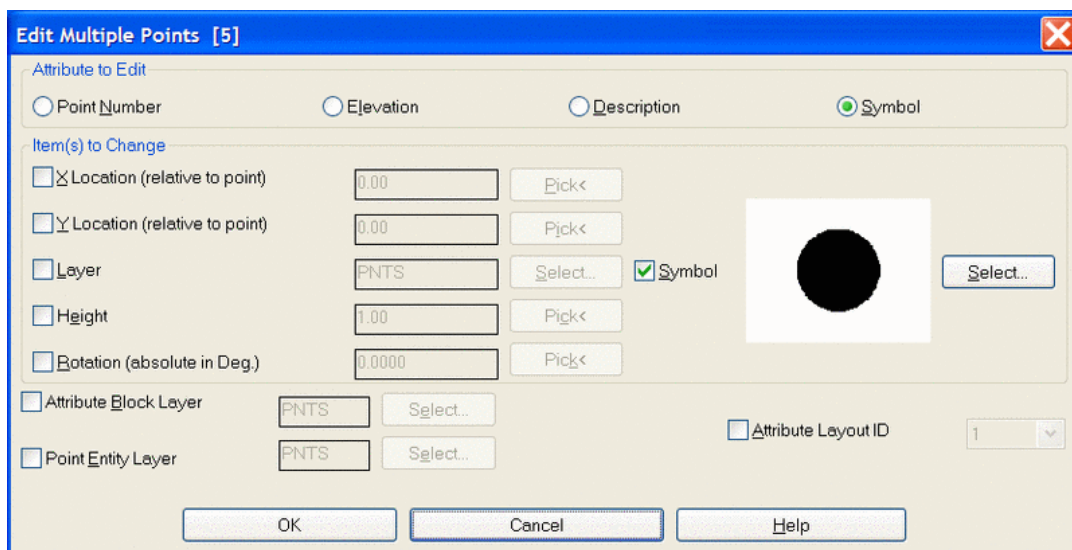
The number of points selected will be shown in the dialog title. Define the changes for each attribute individually. In the following example, suppose we want to rotate the elevation text to a 45 degree angle, move the description to the right and change the symbol. First click on the Elevation for the Attribute to edit. Now select the Rotation option and type in 45. The dialog box should be as below.



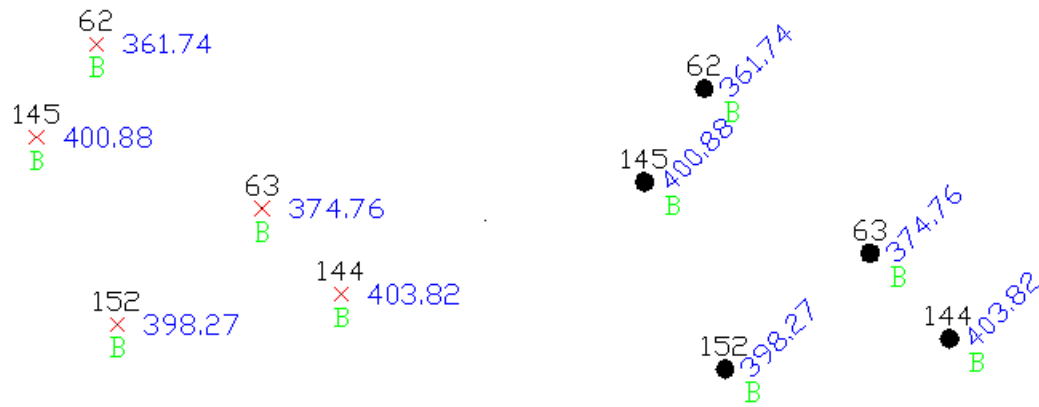
Now select the Description option for the Attribute to Edit. Select the X location from the Items to Change. Enter 1.50 in the box. This value makes the description line up better with the rotated elevation. The dialog should be as below:



Now for the final change. Select the Symbol for the attribute to edit. We want to actually change the point symbol. To do this toggle on the option to change the symbol by clicking in the box beside the word Symbol. Next press the Select button and select symbol SPT5. The dialog should be as below:



At this point we are ready to select the OK button to perform the changes. The following image shows the points before and after the changes.



Before and After changes

Pulldown Menu Location: Points

Keyboard Command: modpnts

Prerequisite: Points drawn on the screen

Move Point Attributes

Function

This command allows the user to move Carlson point attributes (including the point number, elevation or description) one at a time.

Prompts

Select Point Number, Elevation, or Description to Move: *select point attribute*

Pick new location: *pick point*

Pick new angle: *pick new angle or press Enter*

Pulldown Menu Location: Points

Keyboard Command: movepnt

Prerequisite: Carlson points

Scale Point Attributes

Function

This command will scale point attribute text (number, elevation and descriptions) and point symbols up or down in size. The routine prompts for a scale multiplier and a selection set of objects. If you want to enlarge, enter a value greater than one. If you want to reduce, enter a decimal fraction such as .5. This would reduce the text size by 50%. This command is very useful if you have set up your drawing for one plotting scale and decide to change to a

new plotting scale. This command has the added benefit that it will adjust the point attributes and symbols to a new screen twist angle.

Prompts

Scaling Multiplier <0.5>: 2.5 This response would enlarge the point attributes and symbols by 250 percent.

This command will adjust the point attributes to the current screen twist !

Select Carlson Software Point Attributes & Symbols to Enlarge/Reduce.

Select objects: *C*

First corner: *pick a point*

Other corner: *pick a point*

Select objects: *press Enter*

Number of entities changed 30

Pulldown Menu Location: Points

Keyboard Command: pntentl

Prerequisite: Carlson points

Erase Point Attributes

Function

This command allows you to erase point attributes like the number, elevation or description individually by picking on the attribute to erase.

Prompts

Select Point No., Elev, or Desc to Erase: *select point attribute*

Pulldown Menu Location: Points

Keyboard Command: erasepnt

Prerequisite: Carlson points

Twist Point Attributes

Function

This command will rotate the orientation of the text of Carlson Survey point attributes (point #, elevation, description) and point symbols. The Twist Screen option aligns the point attributes to appear horizontal in the current twist screen. The Azimuth option allows you to enter an azimuth or pick two points to align the point attributes. The Entity Segment option aligns the point attributes by the selected line or polyline segment in the direction the entity is drawn. The Follow Polyline option aligns the point attributes by the polyline segment that is closest to the point.

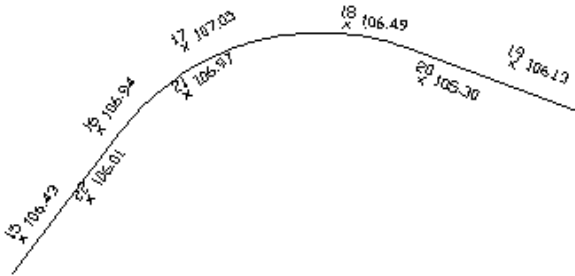
Prompts

Twist by (<Twist Screen>/Azimuth/Entity segment/Follow polyline): *F*

Select polyline to follow: *pick a polyline*

Select Carlson Survey Point Attributes & Symbols to Rotate.

Select objects: *pick the Carlson Survey point inserts*



Point attributes aligned by Follow Polyline option of Twist Point

Pulldown Menu Location: Points

Keyboard Command: twistpts

Prerequisite: None

Resize Point Attributes

Function

This command sets the size of the selected point attributes (point number, elevation, description) and point symbols. This command is similar to Scale Point Attributes but instead of scaling the size by a factor, all the select points are set to the same specified size.

Prompts

Enter point attribute and symbol size <4.0>: *press Enter*

Select Carlson Software Point Attributes & Symbols to resize.

Select objects: *pick the point entities*

Finding Carlson Software Point Attributes

Number of entities changed> 39

Pulldown Menu Location: Points

Keyboard Command: sizepnt

Prerequisite: Carlson points

Trim by Point Symbol

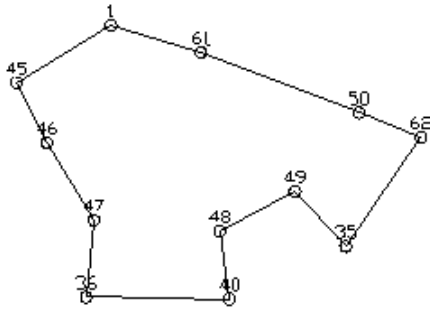
Function

This command will trim lines and polylines that pass through the selected Carlson point symbols such that the lines do not appear within the symbol. This should be a last step because this routine explodes the Carlson points and modifies the lines and polylines by trimming which makes these entities unusable by some of the other COGO routines.

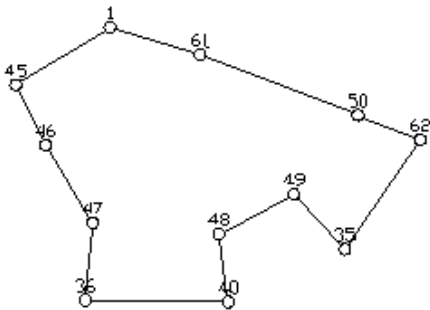
Prompts

Select Carlson Software point symbols to trim against.

Select objects: *select the point symbols*



Before Trim by Point Symbol



After Trim by Point Symbol

Pulldown Menu Location: Points

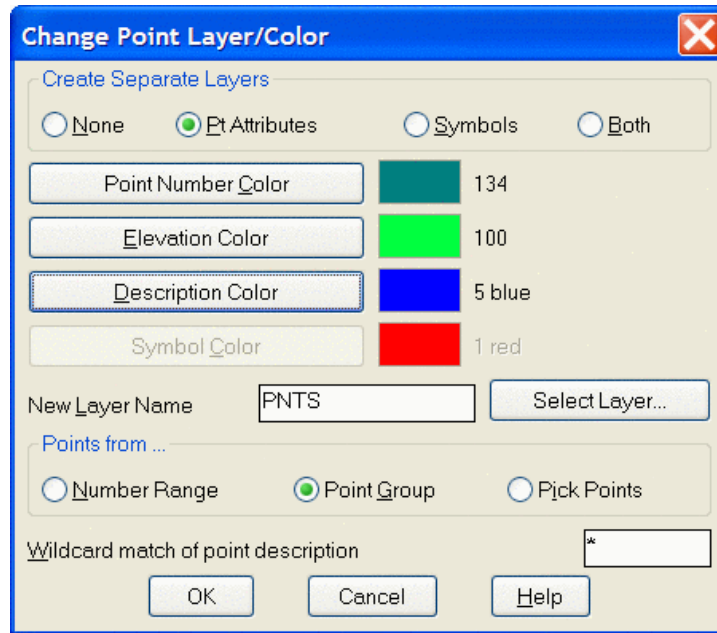
Keyboard Command: trimpts

Prerequisite: Carlson point symbols

Change Point Layer/Color

Function

This command changes the layer and optionally the color of Carlson points. The points are initially put in the layer set in Point Defaults. The symbol, point number, elevation and description are in the layers PNTMARK, PNTNO, PNTLEV, and PNTDESC. To change the point attribute colors, this routine creates new attribute layers based on the new layer name. For example if the new layer name was TRAV, then the resulting layers would be TRAVMARK, TRAVNO, TRAVELEV and TRAVDESC. These new layers can be given different colors. To select an attribute color, pick on the color button. To permanently change attribute colors, edit the drawing SRVPNO1.DWG in the Carlson Survey SUP directory. To permanently change a symbol color, edit the symbol drawing itself.



The selection of the points to change can be accomplished in three ways. A number range selection would require the input of the range of points to change. An example would be 1-20,25,30, 32-36. Points groups can also be used as a selection method. Simply specify the point group name to change, when prompted, and all the points included in that group will be changed. The final selection method is that of Pick Points. Using this method a prompt to select objects is displayed. When prompted select the points to change from the screen.

Pulldown Menu Location: Points

Keyboard Command: pntchg

Prerequisite: Carlson points displayed in the graphic drawing window

Renumber Points

Function

This command will edit the point number attributes of a group of Carlson points. The command prompts for the user to enter the point number difference. Enter the positive or negative amount you would like to have added/subtracted from the current value. After selecting the point to change, a prompt to delete the old point number is displayed. If yes is chosen the old point number is deleted from the crd file, if no is selected the old and new point numbers are retained in the file. This results in one coordinate position represented by two point numbers.

Prompts

The following illustrates a number change from point 1 to 101. This prompt sequence retains both numbers in the crd file. If the intent is to renumber and delete the original point #1 then Yes would be selected when prompted to Delete old point numbers.

Point Number difference <1>: 100 This response would add 100 to the current point number value.

Select Carlson Software Points for Number change.

Select objects: select a point number or a group of points by window or crossing

Delete old point numbers from file [<Yes>/No]? Choose correct response. In this example the response was N, leading to the following.

PT#: 1 changed to PT#: 101.

Number of entities changed: 1

Pulldown Menu Location: Points

Keyboard Command: renump

Prerequisite: Carlson points

Convert Point Format

Explode Points

Function

This command can be useful if you need to send your drawing to another firm who does not have AutoCAD/Carlson Survey. Drawing transfer problems occur when the recipient does not have the same block/inserts defined or available. This command explodes all blocks and replaces the Carlson Survey point attributes with TEXT entities of the same value. After the points have been selected a prompt for the layer name for each point attribute will be displayed. Point Numbers, Point Elevations and Point Descriptions can be put on user specified layers or the default for each prompt can be selected. **Caution:** After using this command, the link between the points and the coordinate file are destroyed and you can no longer extract the attributes from the drawing. If you want to use this command but retain your point information, follow these steps:

Save your drawing

Run this command to explode the points

Execute the SAVEAS command and save the drawing as a different name (you can also choose DXF format if you wish).

Exit the drawing **without** saving.

Prompts

This command will explode selected Carlson Software point blocks and replot the attributes as Text entities!

The resulting points will NOT be useable by most Carlson Software commands!!!!

Select Carlson Software Points to Explode.

Select objects: *Choose points*

Specify opposite corner: 115 found

36 were filtered out.

Select objects:

Layer Name for Point Numbers <PNTNO>: *Press Enter*

Layer Name for Point Elevations <PNTELEV>: *Press Enter*

Layer Name for Point Descriptions <PNTDESC>: *Press Enter*

Number of entities changed> 43

Pulldown Menu Location: Points > Convert Point Format

Keyboard Command: explode_scad

Prerequisite: Carlson points

Convert CRD to TDS CR5 / TDS CR5 to CRD

Function

These commands convert coordinate file formats between a Carlson CRD file and a TDS CR5 file. Both of these file formats are binary which require these special routines. These commands will prompt for the file names to process.

Pulldown Menu Location: Points > Convert Point Format

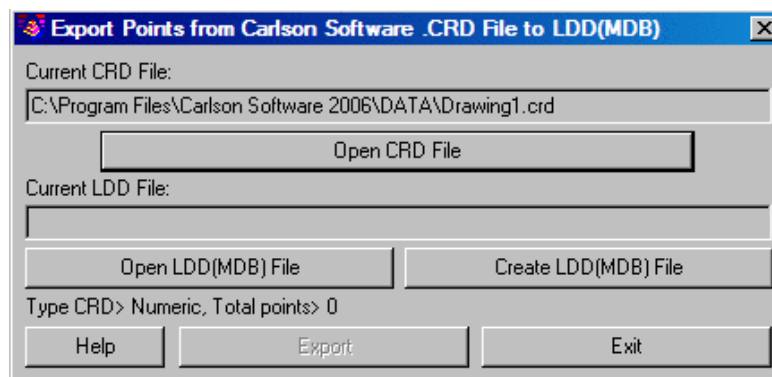
Keyboard Commands: crd_cr5, cr5_crd

Prerequisite: A CRD or CR5 file

Convert CRD to LDD MDB

Function

This command converts a Carlson Survey CRD file into an Autodesk Land Development Desktop (LDD) point database file in Access MDB format. The LDD point database always has the file name of POINTS.MDB. So to specify the LDD file to create, you only need to specify the directory/path and not the file name. This path corresponds to the LDD project directory. The conversion program has point protect so that if a point number from the CRD file already exists in the LDD file then you will be prompted to skip or replace the point. Once the command is executed, the following dialog is displayed. On this dialog specify the Carlson Survey CRD file to convert as well as the LDD(MDB) file to append, if existing, or create if creating a new LDD(MDB) file.



Pulldown Menu Location: Points > Convert Point Format

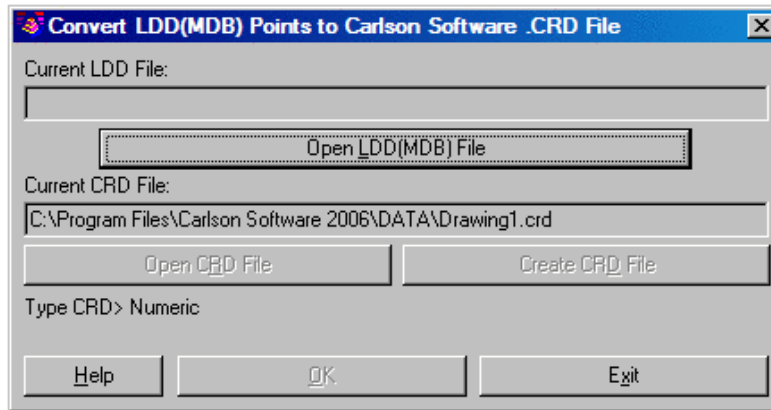
Keyboard Command: crd_ldd

Prerequisite: A .CRD file

Convert LDD MDB to CRD

Function

This command converts an Autodesk Land Development Desktop (LDD) point database file into a Carlson Survey CRD file. The LDD point database always has the file name of POINTS.MDB and is stored in the LDD project directory. Once the command is executed, the following dialog is displayed. On this dialog specify the LDD file to convert as well as the Carlson Survey CRD file to append, if existing, or create if creating a new CRD file.



Pulldown Menu Location: Points > Convert Point Format

Keyboard Command: ldd_crd

Prerequisite: An LDD point database file

Convert Points to Land Desktop

Function

This command converts Carlson Survey points to the AECC_POINT format used by Autodesk Land Development Desktop (LDD). Requires successful installation of the proper Autodesk Object Enabler. This component can be downloaded from the Autodesk web site at <http://pointa.autodesk.com/>.

Converting Points to Land Desktop Prompts:

Convert all or selected points [All/<Selected>]? press Enter

Select Carlson Survey Points to convert

Select objects: *pick points to convert*

Processing Carlson Surveypoint...

Pulldown Menu Location: Points > Convert Point Format

Keyboard Command: pt_aec

Prerequisite: Carlson Survey points or AECC_POINT objects

Convert Land Desktop to Points

Function

This command converts AECC_POINT objects to the Carlson Survey format. AECC_POINT objects are used by Autodesk Land Development Desktop (LDD). Requires successful installation of the proper Autodesk Object Enabler. This component can be downloaded from the Autodesk web site at <http://pointa.autodesk.com/>

Prompts

Convert all or selected points [All/<Selected>]? A

Locate points on Real-Z Axis [Yes/<No>]? Y

Creating Carlson Software Points

Pulldown Menu Location: Points > Convert Point Format

Keyboard Command: AEC_PT

Prerequisite: AECC_POINTS on the screen

Convert Points to Softdesk

Function

This command converts the Carlson Survey point blocks in the drawing to Softdesk point blocks. These point block formats are similar and conversion only reorders and renames the attributes.

Pulldown Menu Location: Points > Convert Point Format

Keyboard Command: 2soft

Prerequisite: Carlson Survey points

Convert Softdesk to Points

Function

This command converts the Softdesk point blocks in the drawing to Carlson Survey point blocks. These point block formats are similar and conversion only reorders and renames the attributes. The Update from Drawing option in the Coordinate File Utilities command can be used directly on Softdesk points without using this command.

Pulldown Menu Location: Points > Convert Point Format

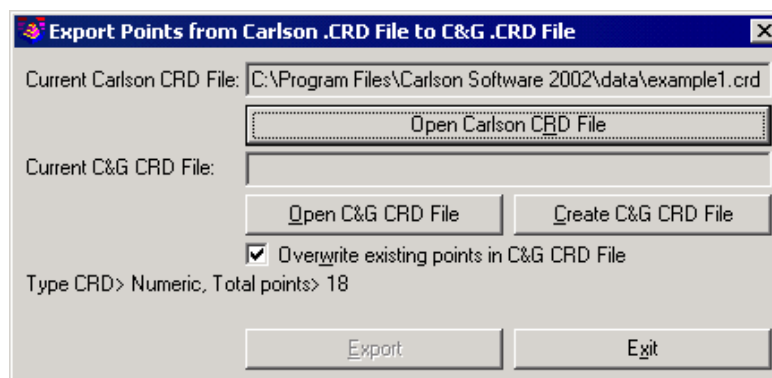
Keyboard Command: 2surv

Prerequisite: Softdesk points

Convert Points to C&G

Function

This command converts a Carlson Survey coordinate file into a C&G coordinate file.



Start by selecting the Carlson Survey coordinate file. After you complete this, the type of coordinate file and total number of points are shown at the bottom. Next, choose an existing C&G coordinate file by clicking Open C&G

CRD file, or click the Create C&G CRD file button to create a new C&G coordinate file. The last step is to click the Export button.

Menu Location: Points > Convert Point Format

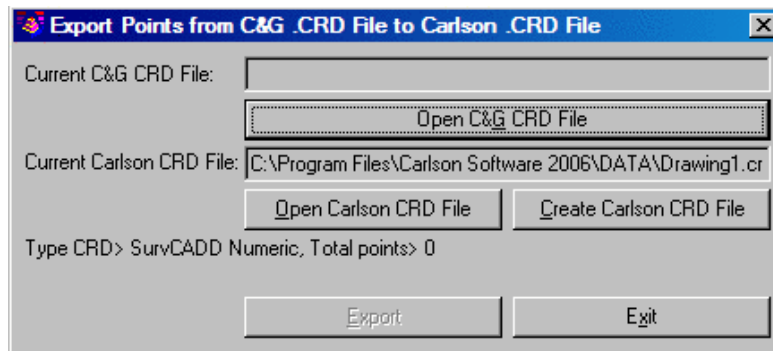
Keyboard Command: CRD2CG

Prerequisite: Coordinate file

Convert C&G to Points

Function

This command converts a C&G coordinate file into a Carlson Survey coordinate file.



Start by selecting the C&G coordinate file. Next choose an existing Carlson Survey coordinate file by clicking Open Carlson CRD file, or click the Create Carlson CRD file button to create a new Carlson Survey coordinate file. The last step is to click the Export button.

Pulldown Menu Location: Points > Convert Point Format

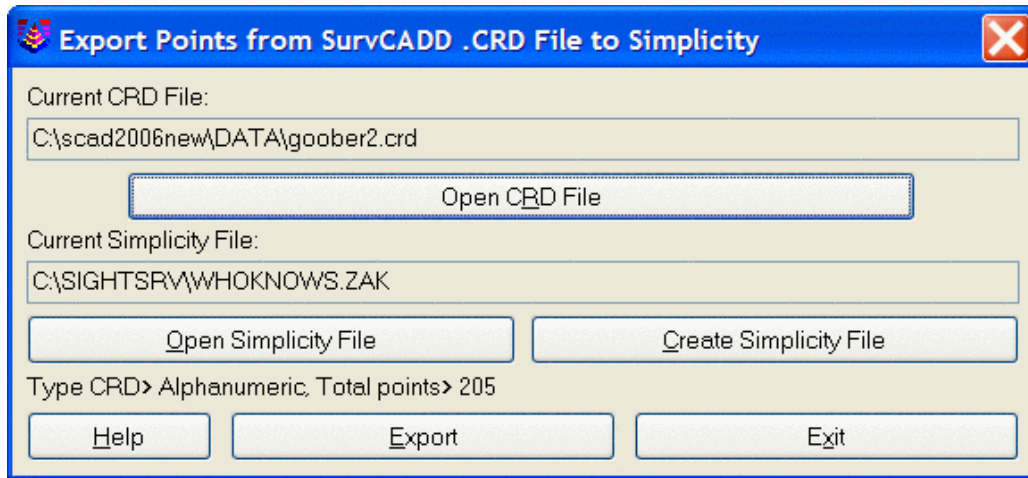
Keyboard Command: CG2CRD

Prerequisite: C&G Coordinate file

Convert Points to Simplicity

Function

This command will convert Carlson points to Simplicity.



Select Carlson CRD file to convert by selecting the Open CRD file button.

Specify the existing simplicity file to write to or the new simplicity file to create by selecting either Open Simplicity File or Create Simplicity File. Press Export and the conversion is completed.

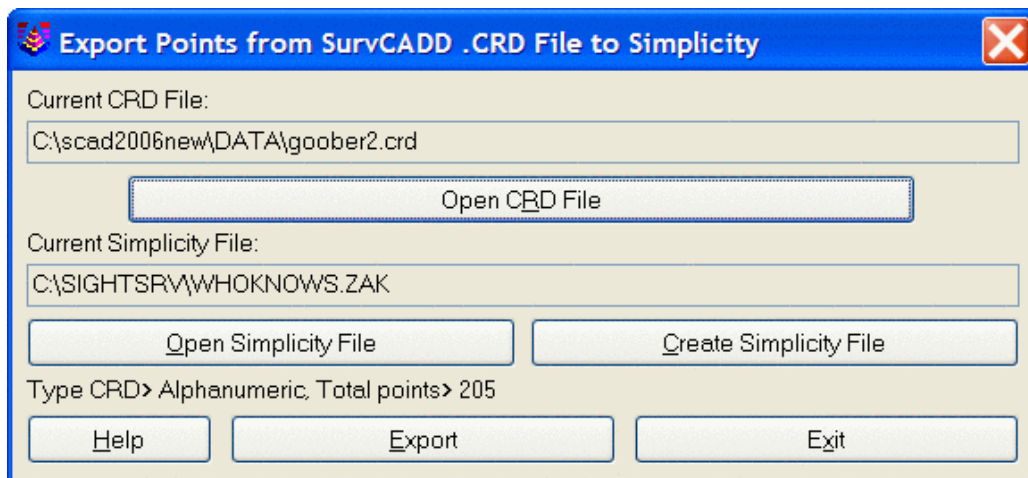
Pulldown Menu Location: Points

Keyboard Command: crd_zak

Prerequisite: A Simplicity point file

Convert Simplicity to Points

This command converts Simplicity Points into a Carlson .CRD file.



Specify the existing Simplicity File to convert by selecting the Open Simplicity File button. Specify the existing Carlson CRD file to write to or the New Carlson CRD file to create by selecting either Open CRD file or Create CRD file. Press OK and the conversion is completed.

Pulldown Menu Location: Points

Keyboard Command: zak_crd

Prerequisite: A Simplicity point file

Convert Leica to Points

Function

This command converts LisCad or Leica point blocks in the drawing to Carlson point blocks. These point block formats are similar and converting only requires reordering and renaming the attributes. Leica points can also be read into the current CRD file by using the command *Update CRD from Drawing* in *Coordinate File Utilities*, this updates the CRD file without modifying the screen entities.

Pulldown Menu Location: Points

Keyboard Command: 2surv3

Prerequisite: Leica points

Convert Geodimeter to Points

Function

This command converts the Geodimeter point blocks in the drawing to Carlson Survey point blocks. These point block formats are similar and conversion only reorders and renames the attributes. The Update CRD file from Drawing option in the Coordinate File Utilities command can be used on Geodimeter points to store the point coordinates to the coordinate file.

Pulldown Menu Location: Points > Convert Point Format

Keyboard Command: 2SURV4

Prerequisite: Geodimeter points

Convert Points to Ashtech GIS

Function

This command converts Carlson point blocks in the drawing to Ashtech GIS point blocks. After executing the command you will be prompted to select the points to convert. When using this command, the setting to "Group Point Entities" found under General Settings of the Carlson Configuration menu should be unchecked (turned off).

Pulldown Menu Location: Points

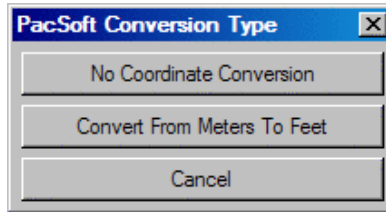
Keyboard Command: 2ashtech

Prerequisite: Carlson Points

Convert PacSoft CRD to Carlson CRD

Function

This command converts PacSoft point database file to a Carlson Survey CRD file. The PacSoft file is a CRD file, and while the formats are similar, converting will require you to choose a conversion type. This is done by using the PacSoft Conversion Type dialog.



Pulldown Menu Location: Points > Convert Point Format

Keyboard Command: pacsoft2crd

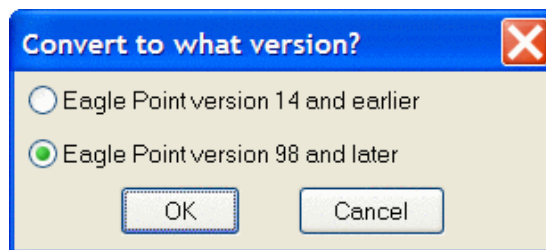
Prerequisite: PacSoft .CRD point file

Convert Points to Eagle Point

Function

This command converts Carlson Survey point blocks in the drawing to Eagle Point point blocks. A prompt for the Eagle Point version to convert to will be displayed.

Specify the appropriate version and then select the OK button. You will then be prompted to Select the Carlson Survey points to convert. These point block formats are similar and converting only requires reordering and renaming the attributes.



Pulldown Menu Location: Points

Keyboard Command: 2eds

Prerequisite: Carlson Survey points

Convert Eagle Point to Points

Function

This command converts the Eagle Point point blocks in the drawing to Carlson Survey point blocks. These point block formats are similar and conversion only reorders and renames the attributes. The Update CRD file from Drawing option in the Coordinate File Utilities command can be directly used on Eagle Point points without using this command.

Pulldown Menu Location: Points > Convert Point Format

Keyboard Command: 2SURV2

Prerequisite: Eagle Point points



Tools Commands

11

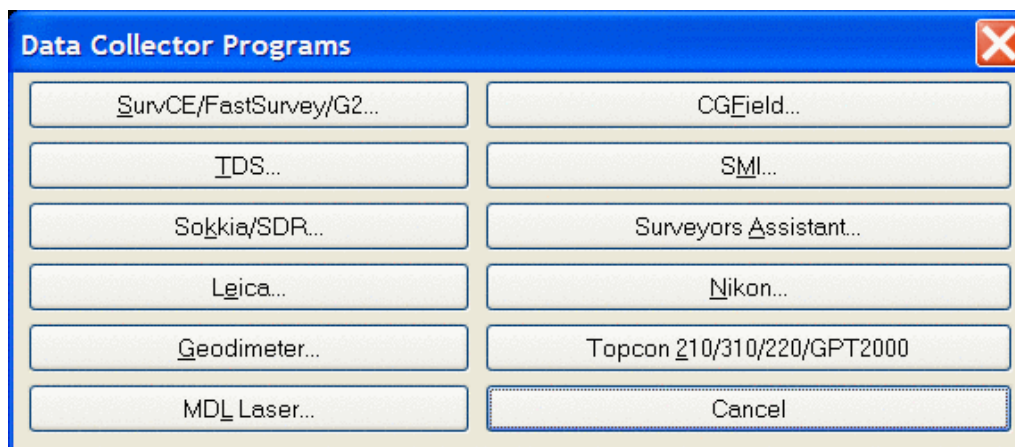
This chapter provides information on using the commands from the Tools menu to download data from data collectors and process raw data. This chapter also provides information on the Field to Finish command and other utilities for preparing a plat.

Data Collectors

Function

This command does two main functions for a variety of popular data collectors. First this command transfers (upload and download) data between the data collector and Carlson Survey. Second this command converts data formats between the data collector format and Carlson format. So if you already have the data file on the computer, you can skip the transfer function and just perform the conversion function.

The transfer function does the conversion at the same time. In most cases the download from the data collector produces a raw (.RW5) file (field notes) and/or a coordinate (.CRD) file (coordinate points). Several of the download programs have an option to automatically run the *Edit-Process Raw Data* command after downloading raw data. You can also send or upload a coordinate (.CRD) file. The dialog shown here appears when the menu command is selected.



SurvCE/SurvStar/G2: For Carlson Software data collection programs SurvCE and SurvStar. Also works with Sokkia G2.

TDS: For data collectors that use TDS software (Ranger, HP48, HP95, Husky FS-2 & FS-3, Corvallis MC-V and TOPCON FS2, FC95 and FC48).

SMI: For SMI data collectors on the HP48.

Leica: For Leica GIF-10 module and Leica instruments.

Sokkia/SDR: For SDR2 through SDR 33 and other collectors that have a SDR format like the Trimble.

Nikon: For Nikon DTM and DR-48 total stations.

MDL Laser: For MDL Laser instruments.

Geodimeter: For the Geodimeter Geodat collector.

Surveyors Assistant: For data collectors running Surveyors Assistant software (Corvallis MC2, MC5 and Pentax SC5).

Topcon 210/310/220/GPT2000: Supports these Topcon models.

Zeiss: For transferring from Zeiss total stations.

SurvCE/SurvStar/Sokkia G2

Note: In the following text, the term SurvCE will apply to SurvCE, SurvStar, and Sokkia G2

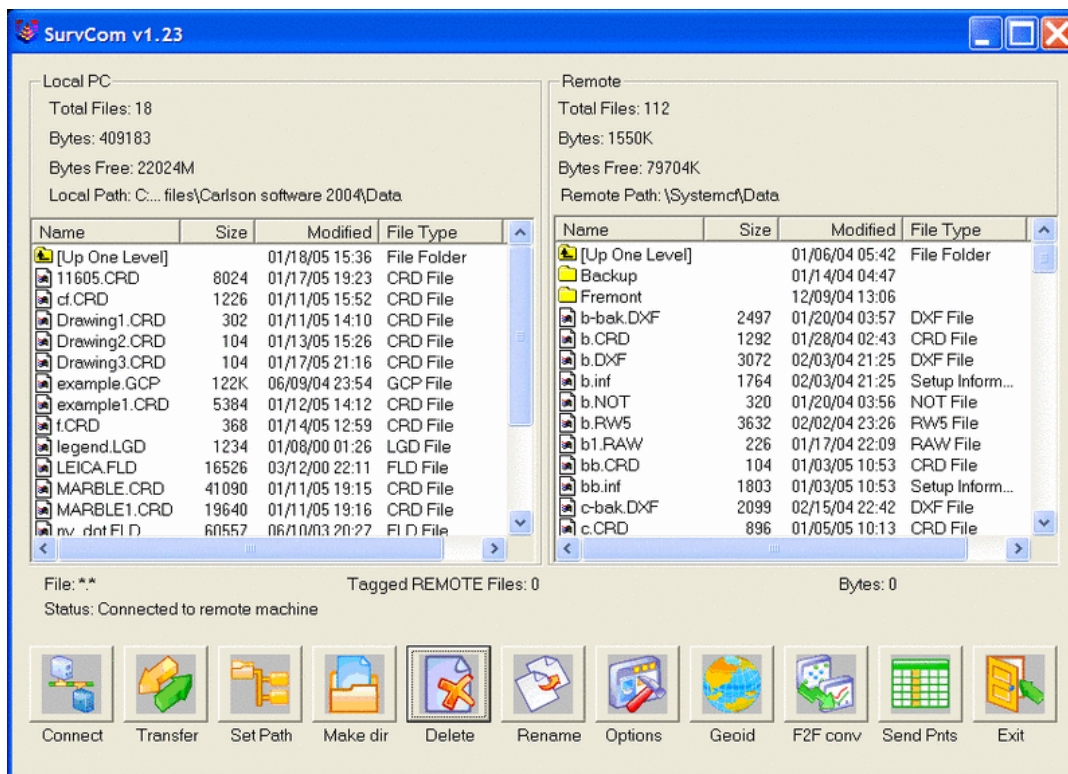
Connect the serial cable. Select Data Transfer from the on the handheld. Choose SurvCADD/Carlson Survey Download. This leads to a File Transfer screen on SurvCE, which says "Awaiting Connection". All the action is on the PC side. There is no time delay in this handshake. It will wait for the PC program to catch up. When you connect the cable from SurvCE to the PC, Microsoft ActiveSync may interfere and say "Connect to PC?" If you get

this question, say No or otherwise terminate the Microsoft ActiveSync linkage. Start the Carlson Survey portion of this link by choosing Tools, Data Collectors, then the SurvCE option. If connection is automatically established, SurvCE will display, "Connected to PC".

If only the left side of the screen displays data, then you do not yet have a connection. Press the Connect button located at the bottom left of the file transfer dialog. The transfer program will respond with Retrieving File List. Once the file list has been retrieved, the left side of the dialog box will show files located in the specified path on the PC and the right side of the dialog displays the files located in the designated path on the remote. You can change directories by scrolling to the top of the file list and choosing Up One Level (just like in Windows).

To transfer one or more files, simply select or highlight the desired files and select the transfer button. More than one file can be transferred from the remote to the PC or from the PC to the remote during the transfer process. Standard Windows selection options apply. For example, selecting one file and then while pressing the shift key on the PC, selecting another file deeper on the list will select all the files in between the first and last selected. You can also select the first file to transfer and press and hold down the shift key and use the down arrow to specify the range of files to transfer. Pressing and holding the control key on the keyboard allows for the selection of multiple files in any selection order, by picking the files with the left mouse button.

After the files have been selected, press the transfer button. When the transfer is complete, the program will return a "Transfer Complete" message and will then proceed to update the file lists on the PC and the Remote.

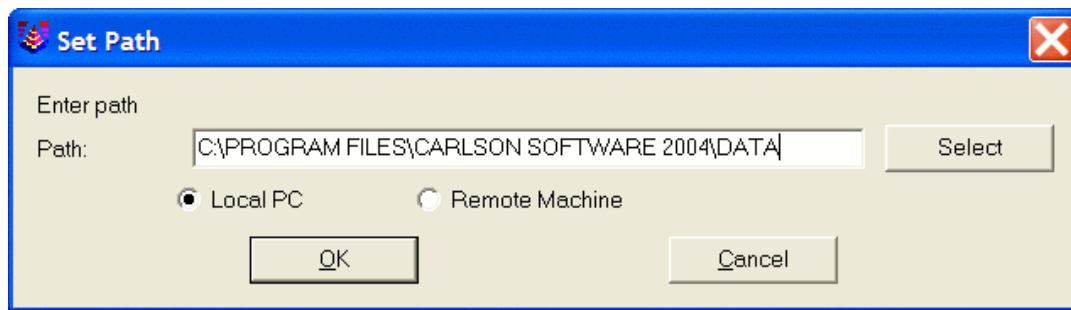


Connect: After selecting Data Transfer in SurvCE, press this button to start the connection. Once connection is made, the status line on the file transfer utility dialog box will show Connected to the remote machine.

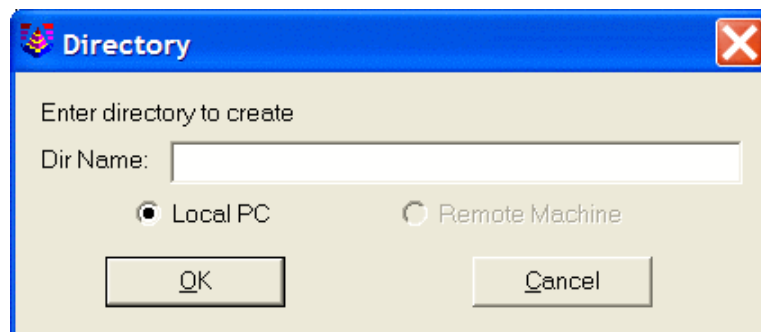
Transfer: Pressing this button transfers selected files from either the Remote to the PC, or the PC to the Remote.

Set Path: This option allows for the specification of the desired source and destination drives and folders for both the PC and the Remote device. For example, if you were downloading, or copying files from the Remote device to the PC, to specify a source path on the remote device, select the Remote Machine toggle and then type in the desired

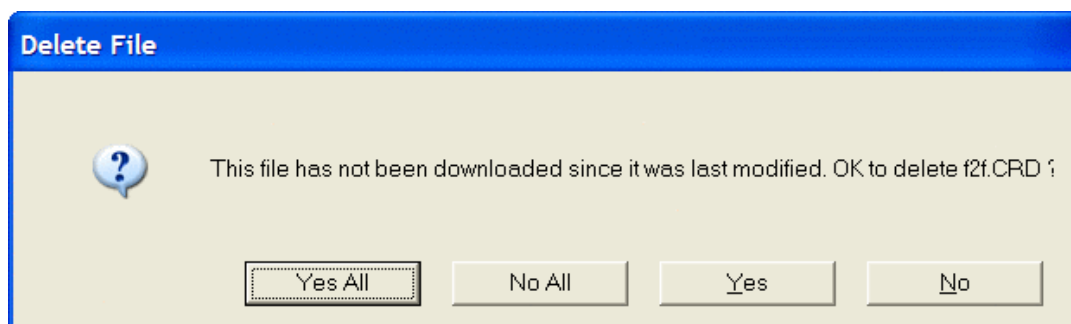
path in the path field. To specify a destination path on the PC, select the Local PC toggle and type in the desired path the path field. When a change to either path is made, the transfer utility will retrieve a new file list from the specified paths.



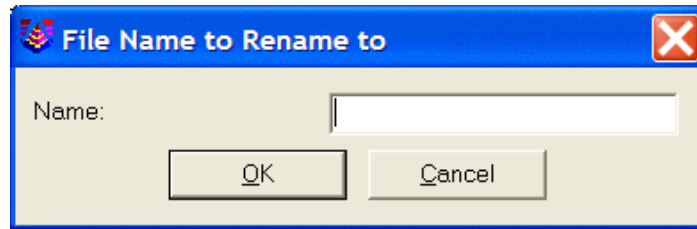
Make Dir: This option allows for creation of directories on both the PC and the Remote device. Specify the hardware on which to create the directory and then enter the directory name.



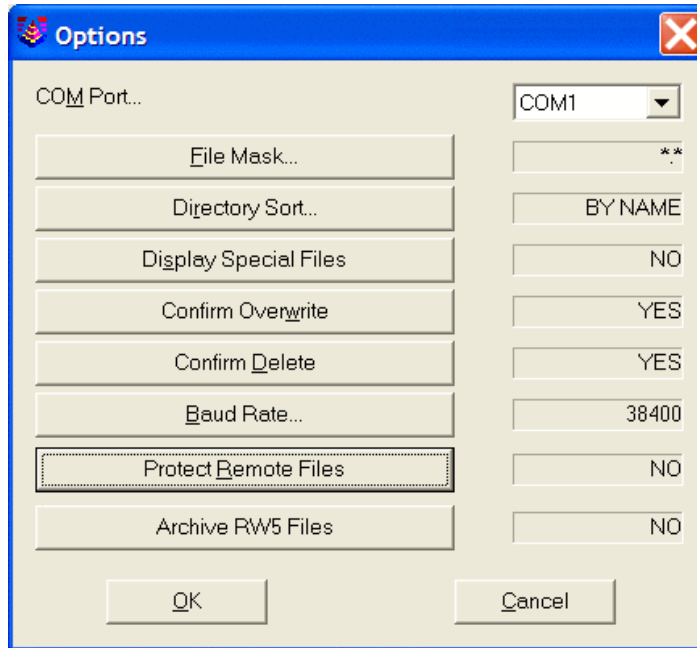
Delete: This option allows you to delete the tagged files. To delete a file, select the file to delete by clicking on the file, press the delete button at the bottom of the dialog. Confirm deletion by selecting the appropriate response on the Delete File dialog.



Rename: To rename a file, click on the file to rename and select the rename button at the bottom of the dialog. On the dialog that displays type in the new name and press the OK button.

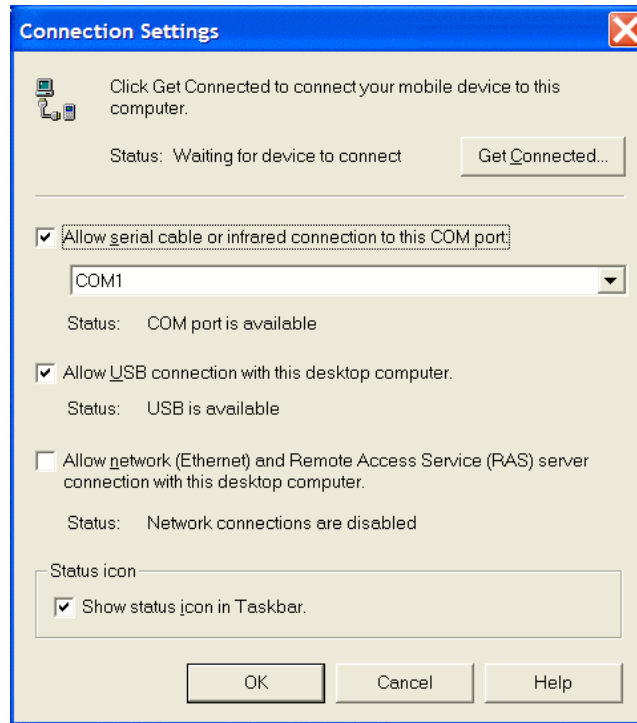


Options: This command allows you to set various options for data transfer. The dialog shown below will appear.



Com Port: You must select which com port on the PC to use.

If you are transferring data via a USB port, set the com port to ActiveSync, see the Options section below for procedures to change com ports. To transfer data using an USB port a connection between the Remote and PC using ActiveSync is required. In ActiveSync verify that the "Connect Settings" have been set to "Allow serial cable or infrared connection to this Com port" and Allow USB connection with this desktop computer. This will allow for connection using an USB port or a COM port connection. Both will use ActiveSync to transfer data between devices.



File Mask: You must select a file filtering syntax. This filter allows for the setting of specific file types to display. For example if you only wanted to see CRD files the filter would be *.crd.

Directory Sort: You must select how to sort the list of files.



Display Special Files: Toggle whether or not you should see special files.

Confirm Overwrite: Check this to confirm before overwriting files.

Baud Rate: You must choose the baud rate for transferring data.

Protect Remote Files: Check this to protect files on the mobile device.

Archive RW5 Files: With this option set to YES, when downloading rw5 files, a second copy of the file will be made with a .SC5 extension to serve as an archive of the original rw5 file.

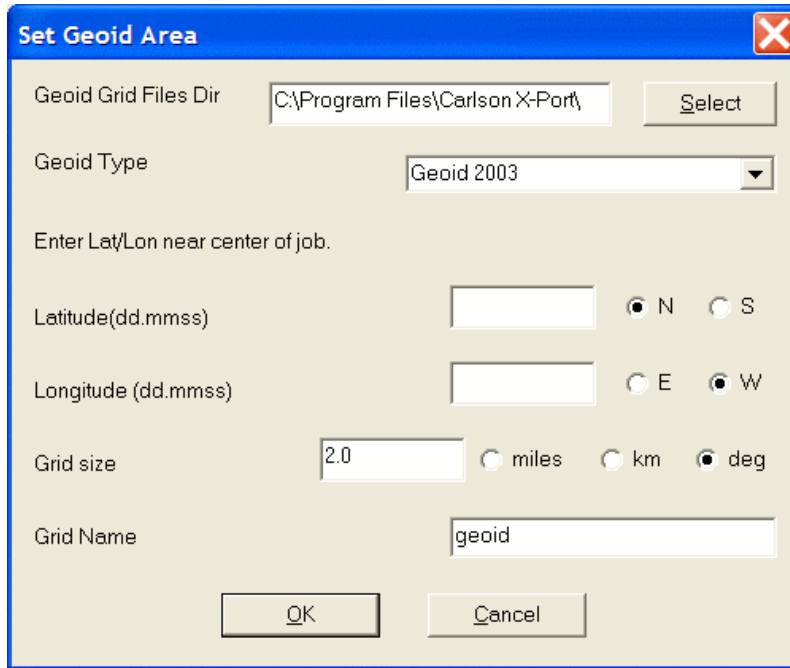
Geoid Files: This command will carve out a portion of the Geoid 99, EGM96, Canadian CGC2000, Canadian HT2.0, Canadian HT 1.01, Australian GDA94, Great Britain OSG-MO2 and Geoid 2003 grid file and send it to SurvCE. Since these geoid grids are very large, this carves out a precise portion of it and avoids overloading the memory on the remote device running SurvCE. You will be prompted for the directory, on the PC, of the source

Geoid grid file, and the approximate latitude and longitude of the job, and the size of the area desired in miles, kilometers or degrees of latitude and longitude. To define a Geoid area, pick on the

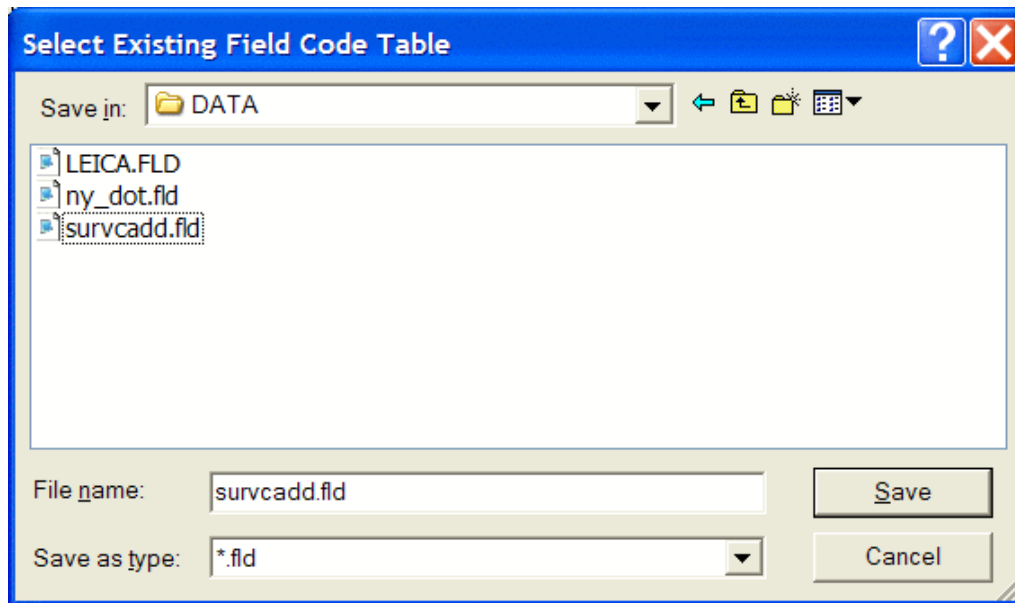
Geoid Button at the bottom of the dialog box.

1. Specify the location of the geoid grid files.
2. Specify the geoid type.
3. Enter the latitude and longitude near the center of the job area.
4. Specify the Grid size either in miles, km (kilometers), or deg (degrees).
5. Name the grid file.

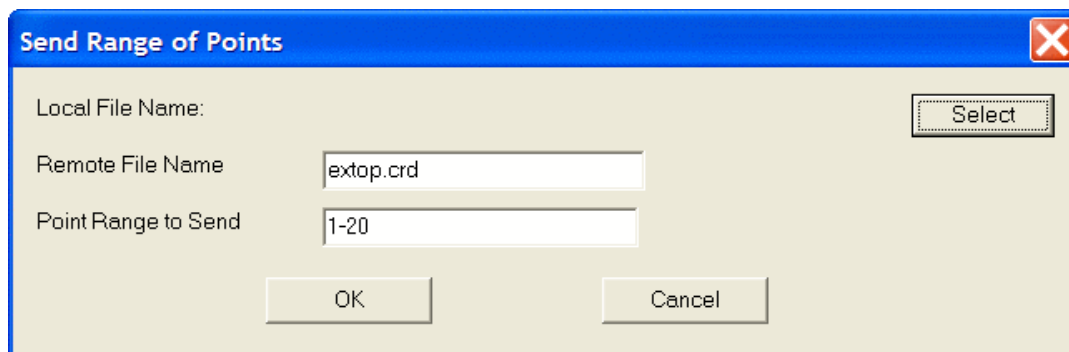
The file will be transferred to the data collector and place in the appropriate place for use.

A screenshot of a software dialog box titled "Set Geoid Area". The dialog has a blue title bar with a close button (X) in the top right corner. The main area is light beige. It contains several input fields and radio buttons. At the top, "Geoid Grid Files Dir" is followed by a text box containing "C:\Program Files\Carlson X-Port\" and a "Select" button. Below this, "Geoid Type" is followed by a dropdown menu showing "Geoid 2003". A label "Enter Lat/Lon near center of job." is centered. Then, "Latitude(dd.mmss)" is followed by a text box and two radio buttons, "N" (selected) and "S". "Longitude (dd.mmss)" is followed by a text box and two radio buttons, "E" and "W" (selected). "Grid size" is followed by a text box containing "2.0" and three radio buttons, "miles", "km", and "deg" (selected). Finally, "Grid Name" is followed by a text box containing "geoid". At the bottom are "OK" and "Cancel" buttons.

F2F Conversion: This converts the more thorough and detailed Carlson Survey field code file (for field-to-finish work, *.fld) to the more simplified Feature Code List that runs in SurvCE (*.fcl). The Feature Code List in SurvCE (not SurvStar or Field) handles Linework (on or off), Line Type (2D or 3D), Layer (= Code) and Full Text (Description). Select the Carlson Survey field code (*.fld) to convert, the conversion takes place and the file is transferred and located in the correct location for use in the data collector.



Send Points: This option allows for the uploading of a user specified point number range out of the selected crd file to unload. Use the Select button to specify the crd file to upload. The Remote File Name will default to the name of the crd file selected to upload. You can change this name if needed. Specify the Point Range to Send and select the OK button.



Exit: This command will exit the File Transfer Utility

CGField

To transfer data to and from data collectors using CGField software, first make sure that the Baud Rate is set to 9600 and the Parity is set to NONE then follow the steps outlined below.

Receiving a Coordinate File from CGField

CGField:

- 1) Go to the UTILS menu and select Option 1, C&G Transfer.
- 2) Select Option 4, "Send Coords"
- 3) Select the Coordinate file to send.

Stop here in CGField and go to Carlson Survey.

Carlson Survey:

Leave the FILE fields blank.

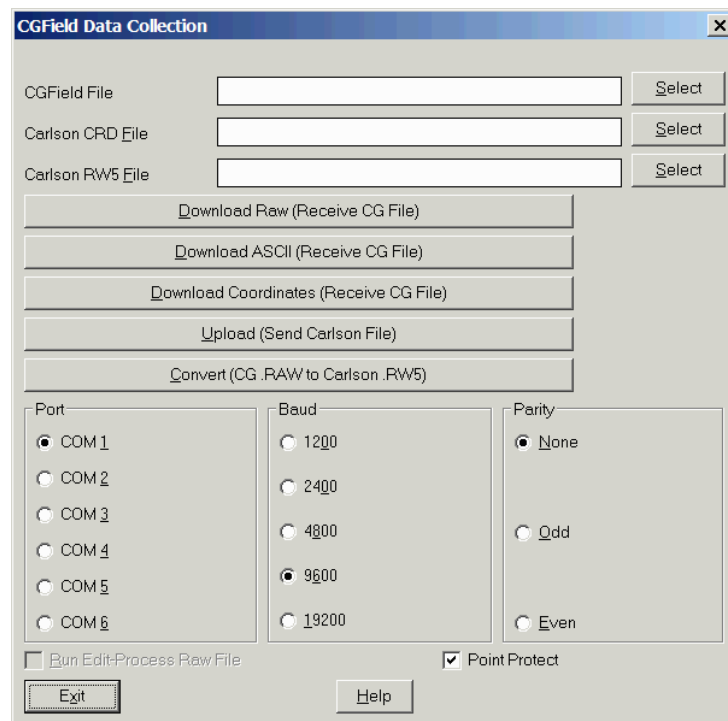
Press the "Download Coordinates" button to ready Carlson Survey to receive the file.
Stop here in Carlson Survey and go back to CGField to complete the transfer process.

CGField:

Select the points to send

- 1) For All points
- 2) To select Blocks of points.
- 3) From .PTS file (the set of points in a Batch Point File).

The coordinates will be transferred. After the transfer is complete, you will be asked for the CRD file name. The C&G CRD file will automatically be converted to a Carlson CRD file. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector.



Receiving a Raw data File from CGField

CGField:

- 1) Go to the UTILS menu and select Option 1, C&G Transfer.
- 2) Select Option 2, "Send Raw Data". Stop here in CGField and go to Carlson Survey.

Carlson Survey:

Leave the FILE fields blank.

Press the "Download Raw" button to ready Carlson Survey to receive the file. Stop here in Carlson Survey and go back to CGField.

CGField:

Select the raw data file to be sent. The transfer will begin.

The C&G .RAW file will be transferred and saved in the data folder. After the transfer is complete, you will be asked for the RW5 file name. The RAW file will be automatically converted to a Carlson RW5 file.

Receiving an ASCII file from CGField

This will allow you to transfer a C&G report file (RPT) or an ASCII NEZ file to Carlson Survey.

CGField:

- 1) Go to the UTILS menu and select Option 1, C&G Transfer.
- 2) Select Option 6, "Send ASCII". Stop here in CGField and go to Carlson Survey.

Carlson Survey:

Leave the FILE fields blank.

Press the "Download ASCII" button to ready Carlson Survey to receive the file. Stop here in Carlson Survey and go back to CGField.

CGField:

Select the ASCII file to send.

After the transfer is complete, you will see the file in the Carlson Survey editor. You can then select FILE and SAVE (or SAVEAS) to save the ASCII file.

Sending a Coordinate File to CGField

CGField:

- 1) Go to the UTILS menu and select Option 1, C&G Transfer.
- 2) Select Option 3, "Receive Coords" to ready the data collector. Stop here in CGField and go to Carlson Survey.

Carlson Survey:

Leave the FILE fields blank.

- 1) Press the "Upload (Send Carlson File)" button.
- 2) Select the Coordinate file.
- 3) Select the points to send.
- 4) Press the "Start Transfer" button.

CGField:

Carlson Survey will send the file name to CGField and a coordinate file with the same name will be automatically created or opened in CGField.

If the file exists you will be asked how you want to handle duplicate points:

- 1) Overwrite
- 2) Don't Overwrite
- 3) Ask for each Point

The point transfer will begin.

Convert CG .RAW to Carlson .RW5

This utility allows you to convert a C&G raw data file to a Carlson raw data file. Select the C&G .RAW file to convert. Then enter the file name of the destination Carlson RW5 file.

TDS

Download [HP-48 and Husky]

In the TDS program, go to the File Transfer routine. Choose the type of data to transfer (CRD or RAW). Next pick

the Send function key. Stop here on the TDS and go to Carlson Survey to run *Data Collection* in the Tools menu and pick TDS. Make sure that the COM port and baud rate are set correctly. Then pick the Download button. The Carlson Survey program will now wait to receive the TDS file. Within 10 seconds select the file to send on the TDS. The file should be transferred now. When the transfer is complete, the program will ask you for the Carlson Survey file to create if you haven't already specified a file name in the dialog. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector.

Download [Ranger and Windows CE]

In the TDS program, go to the Transfer routine and pick the Send File function. Set the "Connecting To" field to HP-48. Make sure that the COM port, baud rate and parity are set correctly and then pick OK. In the Type field of the file selection dialog, choose Coordinate Files or Raw Files. Stop here on the TDS and go to Carlson Survey to run *Data Collection* in the Tools menu and pick TDS. Make sure that the COM port and baud rate are set correctly. Then pick the Download button. The Carlson Survey program will now wait to receive the TDS file. Within 10 seconds select the file to send on the TDS and pick OK in the TDS dialog. The file should be transferred now. When the transfer is complete, the program will ask you for the Carlson Survey file to create if you haven't already specified a file name in the dialog. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector.

Upload [HP-48 and Husky]

A Carlson coordinate (.CRD) file can be converted to a CR5 file and uploaded into TDS. Start in the TDS program, by going to the File Transfer routine. Then move back to Carlson Survey and run *Data Collection* in the Tools menu and pick TDS. In the Carlson Survey dialog, enter a TDS File name. This name should not include the drive and directory path or file extension. For example, if the coordinate (.CRD) file is c:\scadxml\data\simo2.crd then the TDS File name could be just SIMO2. Next pick the Select File button next to the Carlson coordinate (.CRD) File edit box and choose the coordinate (.CRD) file to send. Check that the COM port and baud rate are set correctly. Now pick the Carlson Survey Upload button. A dialog now allows you to specify the range of point numbers to upload. Enter the range of points but before clicking the Start Transfer button go to TDS and hit the Receive function key. Within 10 seconds go back and click the OK button on the range of points. The file should then transfer.

Upload [Ranger and Windows CE]

A Carlson coordinate (.CRD) file can be converted to a CR5 file and uploaded into TDS. Start in the TDS program, by going to the Transfer routine and pick the Receive File function. Set the "Connecting To" field to HP-48. Make sure that the COM port, baud rate and parity are set correctly and then pick OK. Then move back to Carlson Survey and run *Data Collection* in the Tools menu and pick TDS. In the Carlson Survey dialog, enter a TDS File name. This name should not include the drive and directory path or file extension. For example, if the coordinate (.CRD) file is c:\scadxml\data\simo2.crd then the TDS File name could be just SIMO2. Next pick the Select File button next to the Carlson coordinate (.CRD) file edit box and choose the coordinate (.CRD) file to send. Check that the COM port and baud rate are set correctly. Now pick the Carlson Survey Upload button. A dialog now allows you to specify the range of point numbers to upload. Enter the range of points and click the Start Transfer button.

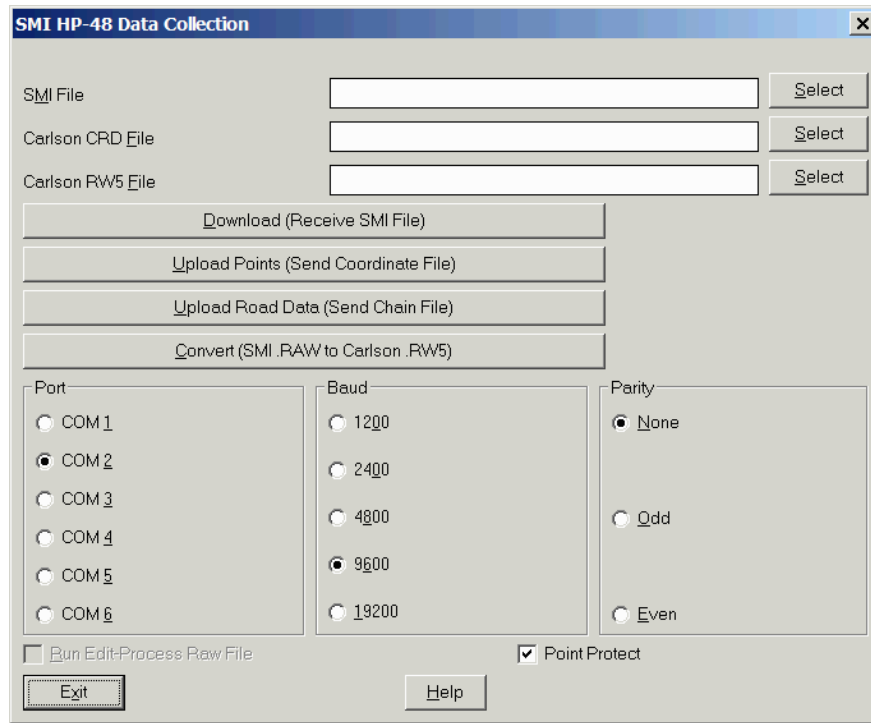
SMI

Download

To send point data from the SMI data collector, go to the file transfer routine by typing [More] [NXT] [TOPC] [COMM]. In SMI version 6 or later, type [Job][KERM][SEND]. Also in version 6, make sure that the first function key reads [NE] and not [XY] in the [Job][KERM] screen. Otherwise the coordinate northing and easting will be reversed. The [NE] stands for North-East coordinate order which is the format that Carlson Survey expects. Also in the [Job][KERM] screen, make sure that the second function key reads [COMM] and not [SPACE]. The [COMM] stands for comma separators. Then enter the first point to send followed by the last point to send but before pressing Enter for the last point go to Carlson Survey. Run *Data Collection* in the Tools menu and choose SMI. Check that the COM port and baud rate are set correctly. Then click the Download button and within 10 seconds go back to SMI and press Enter for the last point to send. The file transfer should now go. When the transfer is complete, the program will ask you for the Carlson coordinate (.CRD) file to create if you haven't already specified a file name in the dialog. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector. To send raw data, use the [Print][Raw] routine in SMI along with the same Carlson Survey procedure used for point data.

Upload

From the SMI data collector, go to the file transfer routine by typing [More] [NXT] [TO48] [COMM]. In SMI version 6 or later, type [Job][KERM][RECV]. Also in version 6, make sure that first function key reads [NE] and not [XY] in the [Job][KERM] screen. Otherwise the coordinate northing and easting will be reversed. Then enter the first point to send followed by the last point to send. Next enter the job name but before pressing Enter go to Carlson Survey and run SMI under *Data Collection* in the Tools menu. In the Carlson Survey dialog, specify the same job name as entered in SMI. Next pick the Select File button next to the Carlson CRD File edit box and choose the coordinate (.CRD) file to send. Check that the COM port and baud rate are set correctly. Then click the Upload button. A dialog now allows you to specify the range of point numbers to upload. Enter the same range of points as entered on the SMI. Go back to SMI and hit Enter for job name followed by clicking the OK button for range of points in Carlson Survey. The file transfer should now go.



Leica

There are two types of Leica transfers: GIF-10 and GeoCom for all other Leica instruments. The type is set in the Equipment Type field on the main dialog. For transferring with the Leica instruments, the GeoCom program shows a dialog of the available COM ports on your computer. On the first time that you transfer to an instrument, you will need to pick the Instruments button and register the instrument from the list. Pick the Port Settings button to make sure that the communication settings match the instrument.

To download a file with GeoCom, make sure that the instrument is ON and connected to the computer by serial cable. The instrument also needs to be in GeoCom mode. Then pick the Download in the Carlson Survey dialog. In the GeoCom program, open the computer COM port that the instrument is connected to by picking the '+'. Then open the Memory Card and GSI folders. Next select the file to transfer and click the OK button. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector.

To upload a file with GeoCom, specify the file name to be created on the instrument in the Leica File field and pick the Upload button in the Carlson Survey dialog. Then the program will prompt for the range of points to transfer. Fill out the range and pick the Start Transfer button. Then the GeoCom program will start. Open the computer COM port by picking the '+'. Then open the Memory Card folder and highlight the GSI folder and click OK.

The upload and download file transfer works with the GIF-10 data collector. The GIF-10 communication settings should be the following:

Baud: 9600

Parity: NONE

Protocol: NONE

Stop Bit: 1

End Mark: CR/LF

Connected As: Some computers use DCE and others use DTE

Download

From the GIF-10, go to the file transfer routine. Then go to Carlson Survey and run *Data Collection* in the Tools menu and choose Leica. Check that the COM port and baud rate are set correctly. Then click the Download button and within 10 seconds go back to GIF-10 and select the file to send. The file transfer should now go. When the transfer is complete, the program will ask you for the Carlson coordinate (.CRD) file to create if you haven't already specified a file name in the dialog. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector.

Upload

From the GIF-10 data collector, go to the file transfer routine. Then go to Carlson Survey and run Leica under *Data Collection* in the Tools menu. In the Carlson Survey dialog, specify the job name in the Leica File field. Next pick the Select File button next to the Carlson coordinate (.CRD) File edit box and choose the coordinate (.CRD) file to send. Check that the COM port and baud rate are set correctly. Then click the Upload button. A dialog now allows you to specify the range of point numbers to upload. Before clicking the OK button for range of points, go to GIF-10 and start the receive by highlighting Receive and pressing the Run button. The GIF-10 now shows the available job numbers. Choose a job to receive the transfer using the arrow buttons and then press the Run button.

Converting

Carlson Survey supports raw and coordinate data collected using three different Leica Operation Codes: Wildsoft and 10-20-30-40 as well as the newer LISCAD. Moreover, data could be in the GSI8 format or the newer GSI16 format. Some example files are shown here.

GSI8 format data file using LISCAD Operation codes:

WILD GIF-12

```
410149+00000001 42....+00005003 43....+00005.42 44....+00005.25 45....+00005000
110150+00005000 21.324+35959480 22.324+09238590 31..01+00228271
410151+00000005 42....+00010100
110152+00005001 21.324+35156390 22.324+09303500 31..01+00133532
410153+00000005 42....+00070100
410154+00000014 42....+00000ELM
110155+00007082 21.324+34739450 22.324+09322050 31..01+00137685
```

410156+00000005 42....+00070102

GSI16 format data file using LISCAD Operation codes:

*110001+0000000000000001 84..11+0000010000000000 85..11+0000003000000000
86..11+0000000001000000 87..11+0000000000005170
*410002+0000000000000009 42....+0000000000000001 43....+000010000000.000 44....+000003000000.000
45....+000000001000.000
*410003+0000000000000001 42....+0000000000000001 43....+000000000005.330 44....+000000000000.000
*410004+0000000000000004 42....+00000000178.1530
*410005+0000000000000003 42....+0000000000000002 43....+0000000000000001
*110006+0000000000000000RO 21.324+0000000017815300 22.324+0000000008424260
31..01+0000000000000000
*410007+00000000000000100
*410008+0000000000000012 42....+000000000005.090
*110009+0000000000000002 21.324+0000000000831230 22.324+0000000008130270
31..01+0000000000089996
*110010+0000000000000002 21.324+0000000018831230 22.324+0000000027829250
31..01+0000000000089996
*110011+0000000000000000RO 21.324+0000000035815170 22.324+0000000027539300
31..01+0000000000000000

GSI8 format data file using Wildsoft Operation codes:

410001+00000001 42....+00000013 43....+00000000 44....+00000012 45....+00981101
410002+00000002 42....+00000013 43....+00005.42 44....+00000012 45....+00000000
410003+00000032 42....+00000500 43....+00004.26 44....+00000012 45....+00000000
410004+000000TP 42....+00000000 43....+00000000 44....+00000000 45....+00000000
110005+00000501 21.124+00000000 22.104+09136260 31...1+00000000 51..0.+0012+000
110006+00000502 21.124+03741320 22.104+08915570 31...1+00246818 51..0.+0012+000
110007+00000503 21.124+03915180 22.104+08919040 31...1+00251956 51..0.+0012+000
110008+00000504 21.124+06530420 22.104+08839360 31...1+00113998 51..0.+0012+000

Leica raw files usually have a .RAW or .GSI extension. The primary difference in the GSI8 and GSI16 formats is that information is contained in data blocks of 16 characters in the GSI16 format, while it is contained in blocks of 8 characters in the GSI8 format. Leica instruments make it possible to have both the GSI8 as well as GSI16 data formats in the same raw file. However, lines with the GSI16 format data will always start with an asterisk (*) character, to distinguish them from the GSI8 format. There is no distinction between Leica raw files collected in the Wildsoft and LISCAD operation codes.

Supported LISCAD codes:

- 1: New instrument setup
- 2: New target height
- 3: Sets of directions
- 4: Fixed azimuth
- 5: Feature code
- 6: Measured offset
- 8: Line creation for sub-codes 1 (straight string), 2 (curved string) and 6 (arc by 3 points)
- 9: Fixed coordinates
- 11: Close string
- 14: Additional description
- 20: Start of job
- 27: Feature code

90: Split feature code

100+: Descriptions

The Convert button can be used to convert any Leica format file into a Carlson format file. For example, if you have a Leica PCMCIA card then there is no serial cable transfer to do. Instead use the Convert routine to make the Carlson raw data (.RW5) and coordinate (.CRD) files. Since there is no distinction between Wildsoft and LISCAD files, the user must know in advance which format has been used in the file. Then, select that particular option (Wildsoft, 10-20-30-40 or LISCAD) under the "Coding System" option at the bottom of the dialog box, as shown in the previous page. Another option that the user needs to choose is the order in which foresight-backsight readings have been recorded in the raw file, BFFB or BFBB, as explained in the dialog box. Then, the user can simply pick the "Convert" button and the program prompts for the input "Wild/Leica File" (raw file), and the output "Carlson RW5 file" and "Carlson CRD file", if they are not already filled.

Sokkia/SDR

This routine applies to the Sokkia SDR-20, SDR-22, SDR-31 and SDR-33 as well as other collectors that have SDR format transfer such as the Trimble and C & G.

Download

From the SDR data collector, go to the Communications routine from the main menu. Choose Data Format SDR. Next hit the Send function key. Then choose Select Jobs. From the list of jobs, highlight the job to transfer and set it to Yes with the arrow keys. Now in Carlson Survey, run *Data Collection* in the Tools menu and choose Sokkia/SDR. Check that the COM port and baud rate are set correctly. Then click the Download button and within 10 seconds go back to SDR and press OK. The file transfer should now go. The SDR format contains both coordinate and raw data. The coordinate data is converted to a Carlson coordinate (.CRD) file and the raw data is converted to a Carlson raw data (.RW5) file. The original SDR transfer file is stored on the computer as a RAW file. When the transfer is complete, the program will ask you for the Carlson coordinate (.CRD) file to create if you haven't already specified a file name in the dialog. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector.

The SDR-33 has different modes for storing and transferring data. In coordinate mode, the download will create points in the coordinate (.CRD) file and the raw data (.RW5) file will only contain some basic header lines. In the raw data mode, the download will create all the measurement data in the raw file and no points will be created in the coordinate (.CRD) file. For this raw data mode, you will need to run *Edit-Process Raw Data* in the Tools menu to calculate the points from the raw data. The third mode in the SDR-33 creates both raw data in the raw data (.RW5) file and points in the coordinate (.CRD) file. The Include Time Stamps in Notes option sets whether all the date-time records for each point are put in the raw data (.RW5) file as description records. The Include Point Attributes in Notes option will store SDR code 13(AT) codes to the point note (.NOT) for the coordinate (.CRD) file.

Upload

Point data from the Carlson coordinate (.CRD) file can be uploaded into the SDR. First go to the Communications routine on the SDR main menu. Choose Data Format SDR. Go back to Carlson Survey and choose Sokkia/SDR from the *Data Collection* command in the Tools menu. Check that the COM port and baud rate are set correctly. In the Carlson Survey dialog, pick the Select File button next to the Carlson CRD File edit box and choose the coordinate (.CRD) file to send. Then click the Upload button. Then a Sokkia Options dialog appears for setting the job parameters for the file to be created on the collector. Be sure to choose the Distance Unit that matches your coordinate (.CRD) file (meters, US feet or international feet). Click OK and the next dialog now allows you to specify the range of point numbers to upload. Before clicking the Start Transfer button for range of points, go to the SDR and hit the Receive function key. The SDR is now waiting to receive so return to Carlson Survey and click Start Transfer on the range of point dialog. The file transfer should now go.

Communication Settings

Besides matching the baud rate between Carlson Survey and the collector, make sure that the collector is set to word length of 8 and 1 stop bit under the communication settings.

Print File

The Receive Sokkia Print File downloads a print report from the SDR33 data collector. This file is only used for printing report purposes in Carlson Survey. This file is not used by Carlson Survey to generate coordinate (.CRD) files or raw files. The first step is to choose Data format=Printed in the Communications menu of the SDR33. Next pick the Receive Print File button in Carlson Survey. Then on the SDR33 choose the Send function and select a job to send. At this point the file is transferred. After downloading, the job report is displayed in the Carlson Survey standard report viewer.

Example of Sokkia Printed Format:

```
SDR33 V04-04.25 (C) Copyright 1998 Sokkia May-29-80 23:39 01/29/1999
Angle Degrees          Dist Feet
```

JOB	Temp Farenht	Coord N-E-Elev	
	TRAV	Point Id Alpha (14)	
	Atmos crn No	C and R crn No	
	Record elev Yes	Sea level crn No	
POS TP 1	North 10050.000	East 10000.000	Elev 0.000
POS TP 2	North 10000.000	East 10000.000	Elev 0.000
POS TP 3	North 9515.636	East 9551.975	Elev 37.611
	Code T3		
POS TP 403	North 4967.527	East 5074.632	Elev 0.000
NOTE TS	Jan-01-80 00:14		

Nikon

Download

First choose the equipment and data type under the Transfer Type list. Also check that the communication and data format settings match your collector. Then click the Download button and follow the on-screen directions. When the transfer is complete, the program will ask you for the Carlson coordinate file (.CRD) and raw file (.RW5) to create if you haven't already specified a file name in the dialog. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector. The original data from the collector is stored in a file name with the same name as the coordinate file except with a .TRN extension. For example, job5.crd would have job5.trn.

Upload

Pick the Select File button next to the Carlson CRD File edit box and choose the CRD file to send. Check that the COM port and baud rate are set correctly and then click the Upload button. A dialog now allows you to specify the range of point numbers to upload. Set the points and then click the Start Transfer button. The file transfer should now go.

Convert

The Convert button will translate the Nikon raw file format (.TRN or .RAW) into Carlson coordinate (.CRD) and raw (.RW5) files.

Portion of typical Nikon file format:

MP,1,,5000.0000,5000.0000,0.0000,T/1

CO,31-Oct-1999 11:42:38

ST,1,,2,,0.0000,0.00000,0.00000

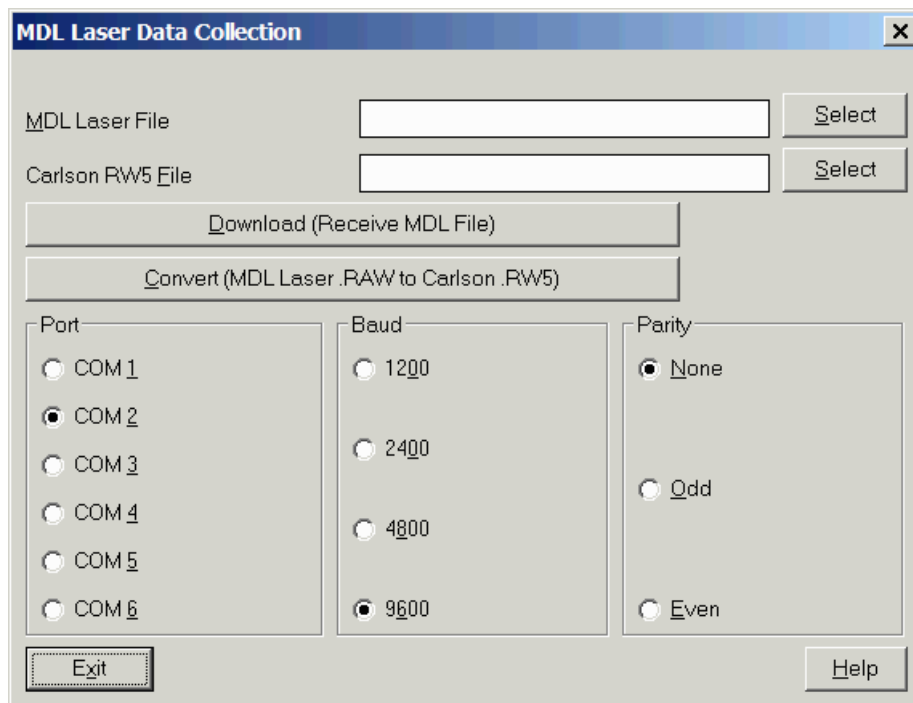
SS,3,0.0000,152.1510,359.59590,90.44100,11:43:38,T/2

SS,4,0.0000,127.5560,0.06040,90.40110,11:44:45,CON

SS,5,0.0000,97.1820,2.19580,90.52460,11:45:43,CON

MDL Laser

The MDL Laser outputs a raw file of angles, distances and codes as one long string of data which can be converted into a Carlson raw data (.RW5) file. There is no coordinate data in the MDL raw file. So you need to run *Edit-Process Raw File* to calculate coordinates from the raw data. The Download button will transfer the MDL raw data from a BDI logger.



Geodimeter

Download

From the Geodimeter data collector, go to the file transfer routine by pressing the PRG (Program) key and entering program 54. Then choose Imem (option 1) as the source. Next choose the file type to send as either Job (measurement data) or Area (point data). The Geodimeter will then prompt for the job name. Next enter Serial (option 3) as the destination. A confirmation screen appears showing the serial port settings. Here are some typical settings:

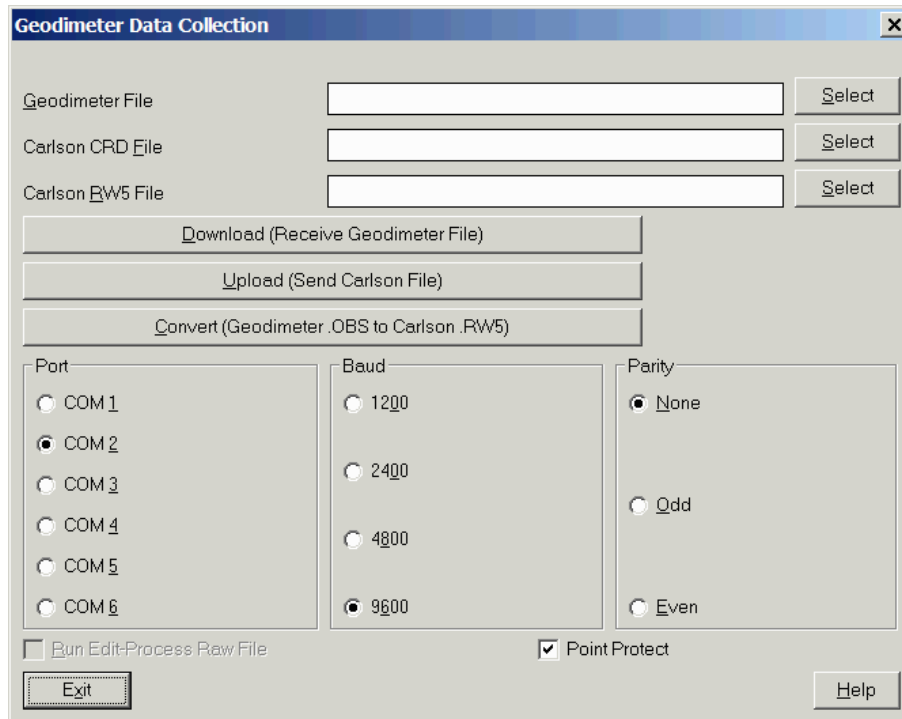
COM=1,8,0,9600

Before pressing enter (ENT key), go to Carlson Survey and run *Data Collection* in the Tools menu and choose Geodimeter. Then click the Download button and within 15 seconds, go back to the Geodimeter and press Enter. The file transfer should now go. When the transfer is complete, the program will ask you for the Carlson coordinate

file and raw file to create if you haven't already specified a file name in the dialog. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector.

Upload

In Carlson Survey, run Geodimeter under *Data Collection* in the Tools menu. Pick the Select File button next to the Carlson CRD File edit box and choose the CRD file to send. Check that the COM port and baud rate are set correctly and then click the Upload button. A dialog now allows you to specify the range of point numbers to upload. Enter the points to send but before clicking OK, go to the Geodimeter data collector. Start the file transfer routine by pressing the PRG key and entering program 54. Then choose Serial (option 3) as the source. The Geodimeter will display the serial port settings. Check these values and press enter. Next choose Area (option 2) as the destination. Then enter the job name. The Geodimeter is now listening for data. Quickly go back to Carlson Survey and click OK on the points to send dialog. The file transfer should now go



The image shows a Windows-style dialog box titled "Geodimeter Data Collection". It contains three file selection fields at the top: "Geodimeter File", "Carlson CRD File", and "Carlson RW5 File", each with a "Select" button to its right. Below these are three large buttons: "Download (Receive Geodimeter File)", "Upload (Send Carlson File)", and "Convert (Geodimeter .OBS to Carlson .RW5)". The bottom section contains three groups of radio buttons: "Port" with options COM 1 through COM 6 (COM 2 is selected), "Baud" with options 1200, 2400, 4800, and 9600 (9600 is selected), and "Parity" with options None, Odd, and Even (None is selected). At the bottom left is a checkbox labeled "Run Edit-Process Raw File" which is unchecked. At the bottom right is a checkbox labeled "Point Protect" which is checked. There are "Exit" and "Help" buttons at the very bottom.

Communication Settings

If the Geodimeter is not communicating with Carlson Survey, run function 79 on the Geodimeter and make sure that it is set to 4. This setting is for the transfer message end of sequence format.

Supported Geodimeter Codes

The following Geodimeter codes are processed when converting the Geodimeter raw file. All other codes are recorded as descriptions in the Carlson rw5 file.

- 0=Info
- 1=Data
- 2=Station No
- 3=Instrument Height
- 4=Point Code
- 5=Point Number
- 6=Signal Height
- 7=Horizontal Angle
- 8=Vertical Angle
- 9=Slope Distance

11=Horizontal Distance
17=Horizontal Angle
18=Vertical Angle
21=Horizontal Reference Angle
30=Atmospheric Correction
37=Northing
38=Easting
39=Elevation
40=Delta North
41=Delta East
42=Delta Elevation
45=Correction To Bearing
46=Standard Deviation
50=Job Number
51=Date
52=Time
53=Operator
54=Project Id
55=Instrument Id
56=Temperature
60=Shot Id
61=Activity Code
62=Reference Object
70=Entered Radial Offset
71=Entered Angle Offset
72=Calculated Radial Offset
73=Calculated Angle Offset
74=Air Pressure

Portion of typical Geodimeter file format

5=108
4=13POC
6=5.000
7=238.0708
8=89.2236
9=440.39
37=767.42
38=4626.07
39=699.795

Surveyor's Assistant

Download

From the Surveyor's Assistant data collector, go to the Transfer routine from the main menu. Fill out the transfer screen as follows:

Direction: OUTPUT

Format: LIETZ

Data: Coordinate or All Data

Port: COM1 or COM2 Ckh Hold: NO

Protocol: NONE

You should also check the settings under the PORT menu. Typical port settings are baud=9600, parity=none, data=8, stop=1 and handshake=XON/XOFF. Now in Carlson Survey, run *Data Collection* in the Tools menu and choose Surveyor's Assistant. Check that the COM port and baud rate are set correctly. Then click the Download button and within 10 seconds go back to Surveyor's Assistant and press GO. The file transfer should now go. If the All Data option is used, then the Leitz format will contain both coordinate and raw data. The coordinate data is converted to a Carlson coordinate (.CRD) file and the raw data is converted to a Carlson raw data (.RW5) file. When the transfer is complete, the program will ask you for the Carlson coordinate (.CRD) file to create if you haven't already specified a file name in the dialog. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector.

Upload

Point data from the Carlson coordinate (.CRD) file can be uploaded into the Surveyor's Assistant. First go to the Transfer routine on the main menu. Fill out the screen as follows:

Direction: INPUT

Format: LEITZ

Port: COM1 or COM2

Protocol: NONE

Go back to Carlson Survey and choose Surveyor's Assistant from the *Data Collection* command in the Tools menu. Check that the COM port and baud rate are set correctly. In the Carlson Survey dialog, pick the Select File button next to the Carlson coordinate (.CRD) File edit box and choose the coordinate (.CRD) file to send. Then click the Upload button. A dialog now allows you to specify the range of point numbers to upload. Before clicking the OK button for range of points, go to the Surveyor's Assistant and hit the GO function key. The Surveyor's Assistant is now waiting to receive so return to Carlson Survey and click OK on the range of point dialog. The file transfer should now go.

The screenshot shows the 'Surveyor's Assistant Data Collection' dialog box. It has a title bar with a close button. The dialog contains several sections: three file selection fields at the top labeled 'Surveyor's Assistant File', 'Carlson CRD File', and 'Carlson RW5 File', each with a 'Select' button. Below these are three large buttons: 'Download (Receive Surveyor's Assistant File)', 'Upload (Send Carlson CRD File)', and 'Convert RAW (Surveyor's Assistant to Carlson)'. The 'Horizontal Angle Format' section has two radio buttons: 'Decimal Degrees' (selected) and 'DD MMSS'. The 'Port' section has a list of COM ports from COM 1 to COM 6, with 'COM 2' selected. The 'Baud' section has radio buttons for 1200, 2400, 4800, and 9600, with 9600 selected. The 'Parity' section has radio buttons for 'None' (selected), 'Odd', and 'Even'. At the bottom, there are two checkboxes: 'Run Edit-Process Raw File' (unchecked) and 'Point Protect' (checked). There are 'Exit' and 'Help' buttons at the bottom corners.

Pulldown Menu Location: Tools

Keyboard Command: datacolt

Prerequisite: None

Edit-Process Raw Data File

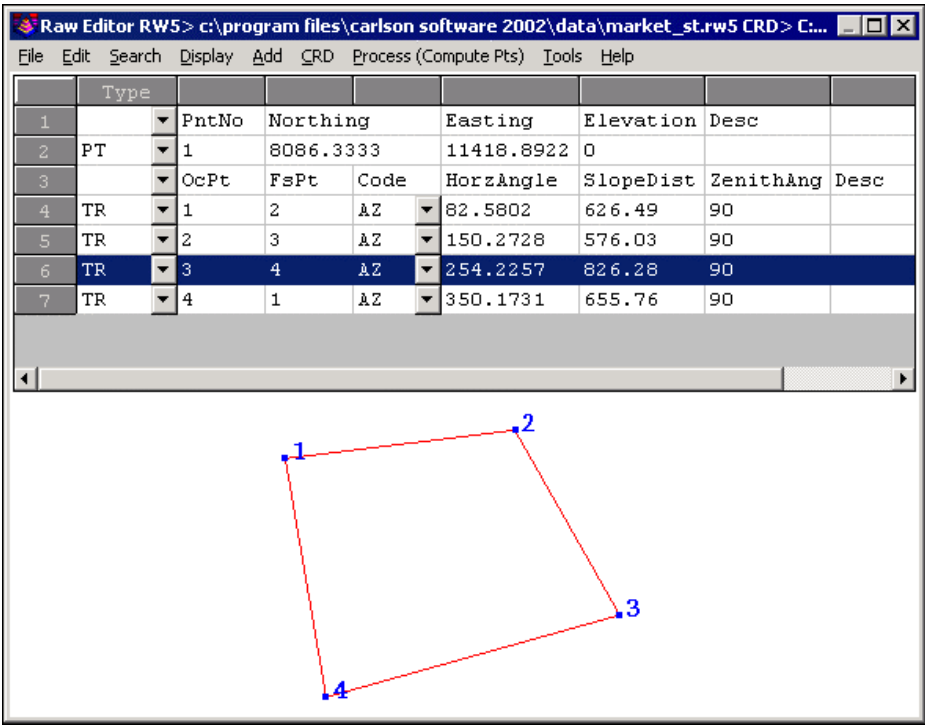
Function

This program reads or creates a raw data (.RW5) file that contains various lines of data (records) that could be likened to a surveyor's field book. You can specify point coordinates, job information, notes, and the angles and distances that make up traverse or sideshots records. Once the raw data is created or read it can be processed/reduced to coordinates that are stored in the current coordinate (.CRD) file.

The raw file can also be created or appended using the Locate Point, Traverse, Sideshot, and Inverse commands on the Cogo menu. To store the data inputs from these commands into a raw file, first toggle on the Raw File ON/OFF command on the Cogo menu. It is possible to always have the raw data file open to store data inputs. To enable this option, choose Configure from the Settings menu, then choose Survey Settings, then choose General Settings. Turn on the Automatic Raw File toggle in this dialog.

The raw files created by TDS data collector programs are also compatible without conversion. The command Data Collectors on the Tools menu has options for reading other data collectors native file formats and converting them to raw data (.RW5) format. Within the raw data editor, the File menu includes an import menu for converting raw data from other formats.

When you select the Edit-Process Raw Data File command you are prompted to specify the name of the raw data (.RW5) file. The current coordinate file is used automatically. To change the current coordinate file, use the Set Coordinate File command in the Points menu before starting this command. If no coordinate file is current, the program will prompt you to set the current coordinate (.CRD) file.



Edit-Process Raw Data File uses an optional graphics window to display the points and traverse lines in real time. As data is entered or edited, the graphics window will be updated to show the configuration or new configuration of the traverse. The graphics window is toggled on or off from the Display — Graphics Window menu inside the raw file editor. Within the graphics window, real time zoom and pan are available. You may select whether to zoom or pan from the Display — Graphics Window menu also. To zoom in press and hold the left mouse button and drag in

the direction of the + symbol. To zoom out, press and hold the left button and drag in the direction of the - symbol. To pan, set the graphics window to pan mode, then press and hold the left mouse button and then drag to desired position. With the Resize Text option on the text becomes smaller/larger in the view when you zoom in/out.

Edit-Process Raw Data File uses a spreadsheet for editing the raw data as shown. Each row of the spreadsheet represents one record of data. There are 14 types of data records. The type of data record is shown in the first column. Different record types use different numbers of columns. Whenever the data record type changes between rows, a record header is added to the spreadsheet that describes each column of data in the following row.

To edit the raw data, simply highlight the cell and type in the new value. To change the type of record, pick on the down arrow in the first column and choose a new data type from the list. To delete a row, highlight any cell in the row and hit the Delete key or choose Delete Row from the Edit menu. Records can be added pressing the Insert key, pressing the down arrow key from the last line in the spreadsheet, or by choosing one of the add records from the Add menu.

Record Types

TR (Traverse)

The traverse record contains the occupied point number, foresight point number, angle mode, horizontal angle, distance, vertical angle and description. When processed, this record will calculate and store the coordinates for the foresight point. Traversing also moves the setup by making the traverse foresight point the next occupied point and the traverse occupied point becomes the next backsight point. The different angle modes are NE for northeast bearing, SE for southeast, SW for southwest, NW for northwest, AZ for azimuth, AL for angle left, AR for angle right, DL for deflection angle left and DR for deflection angle right. To set the angle code, pick on the Code down arrow and choose from the list. The horizontal and vertical angles should be entered as dd.mmss. For example, 45.2305 is 45 degrees, 23 minutes and 5 seconds. The vertical angle can be shown as vertical angle (0 degrees level), zenith angle (90 degrees level) or elevation difference. The vertical angle mode is set in the Display menu. The distance mode is also set in the Display menu as either slope or horizontal distance. The description field is used as the foresight point description.

SS (SideShot)

The sideshot record is the same as the traverse record except that sideshot does not move the setup.

HI (Instrument and Rod Height)

This record sets the instrument and rod heights used in elevation calculations. This record should precede any traverse and sideshot records that you want the heights applied to.

BK (BackSight)

The backsight record contains the occupied point number, backsight point number, backsight azimuth and the set azimuth. This record should precede any traverse and sideshot records that use this setup. If no backsight point is entered, the program uses the backsight azimuth to turn angles from. The Set Azimuth is the circle reading of the instrument when sighting the backsight. A Set Azimuth of zero is the default.

PT (Store Point)

The store point record consists of a point number, northing, easting, elevation and description. When processing, this data will be stored as a point in the coordinate file.

DS (Description)

The description record is an additional note appears in the spreadsheet editor and printouts. This record is not used in processing.

CL (Closing Shot)

The closing shot record is the traverse record where the foresight point is the closing point for the traverse. This record is used by the adjustment commands in the Process menu. There should be only one CL record in each Traverse loop (Name Record) in the raw file. If there is no CL record, the process adjustment routines will prompt for which shot is the closing shot.

AB (Angle Balance)

The Angle Balance is the traverse record that the Angle Balance routine in the Process menu uses to compare the angle between the occupied point and foresight point of this record with a user-specified reference angle. There should be only one AB record in the raw file. If there is no AB record, then the Angle Balance routine will prompt for which shot to use as the angle balance.

CL + AB (Closing Shot and Angle Balance)

This record is used as both the closing shot and angle balance records.

FD (Foresight Direct)

The foresight direct is a traverse record used in a direct and reverse set. When the program finds one the of direct-reverse measurement records, it will look for the other three records to complete the set.

FR (Foresight Reverse)

The foresight reverse is a traverse record used in a direct and reverse set.

BD (Backsight Direct)

The backsight direct is a traverse record used in a direct and reverse set.

BR (Backsight Reverse)

The backsight reverse is a traverse record used in a direct and reverse set.

NAME (Traverse Name)

This record acts as an identifier for the group of records that make up a traverse. All the records after the NAME record belong to that traverse up to the next NAME record or the end of the file. This record allows you to have multiple traverses in one raw file. When running one of the Process commands, the program will bring up a list of all the traverse names. Simply choose which traverse to process. If you have only one traverse in the raw file, then you don't need the NAME record.

Menus

File

The File menu of the Raw Editor dialog box contains commands for printing, importing, exporting, and saving files.

- **Print:** This command displays the raw file data using the standard report viewer. You can print the report, draw it in the drawing, or save it to a file.
- **Import:** These routines convert raw data from other formats into the current Carlson Survey RW5 format. The converted raw data will be added to the end of any existing data in the editor. In many cases, the raw data file to import can be downloaded directly from the data collector or instrument using the Data Collectors command. The following supported formats (along with their standard file extension) are listed here.
- **Sokkia/Leitz (.RAW):** Several data collectors generate this format including the SDR series collectors.
- **Wild/Leica (.GSI or .RAW):** This reads the Leica raw file in Wildsoft, Liscad or 10-20-30-40 format. There is an option to specify for direct-reverse shot order if any.
- **SMI: (.RAW)**
- **Geodimeter: (.OBS or .RAW)**
- **Geoid Support:** When processing GPS data, there is additional support for geoids of Great Britain (OSGM02), Australia (GDA94) and Canada (CGG2000, HT 2.0, HT 1.01)

- **Nikon: (.RAW)**
- **MDL Laser: (.CDS)**
- **Fieldbook (.FBK):** From Softdesk or Land Development Desktop.
- **SurvCOGO: (.RAW or .TXT)**
- **PC Cogo: (.BAT)**
- **Survis: (.RAW)**
- **C&G: (RAW)**
- **Caice: (.DMP)**
- **Carlson: (.RW5)**
- **LandXML**

- **Maptech:** (.FLD)
- **Sokkia SDR:** (.SDR or .RAW)
- **TDS:** (.RW5)
- **3TA5:** (.TXT)
- **Export:** These routines convert the Carlson Survey raw data (.RW5) file to other formats. The following file formats are supported.
- **Caice:** (.DMP)
- **Fieldbook:** (.FBK)
- **LandXML**
- **Sokkia:** (.SDR)
- **Save/Save As:** These commands save the raw data as a *.RW5 file.
- **Exit:** This command exits the raw file editor.

Edit

Under the Edit menu of the Raw Editor are basic cut, copy, and paste commands for editing. To edit the raw data, simply highlight the cell and type in the new value. To change the type of record, pick on the down arrow in the first column and choose a new data type from the list. To delete a row, highlight any cell in the row and press the Delete key, or choose Delete Row from the Edit menu. Data can be hidden from view with the Hide and Show commands.

- **Modify Measurements:** This functionality can change distance, horizontal angle or vertical angle by a specified amount for the entire file or for a specified point number or line number range. The Modify Measurements command is found under the Edit pulldown with the Raw File Editor.

To modify a measurement, choose which field to modify, enter the change in either distance or angle in dd.mmss format. Next choose how to apply the modification. If all is selected, the change will be applied to all records in the specified field. If By Point Number is chosen, enter the point number or range of numbers in the Range of Points field. If by Line Number is chosen, then define the area for the change by specifying the Starting and Ending line.

- There is also a Spreadsheet Controller which includes support for the undo command and improved copy, paste and cut functions. These commands are found under the Edit pulldown within the Raw File Editor.

Raw Editor RW5> C:\Temp\Today\1105.RW5 CRD> c:\scadxml2\DATA\Drawing1.crd

File Edit Display Add Process (Compute Pts) Tools Help

Undo

Cut

Copy

Paste

Find

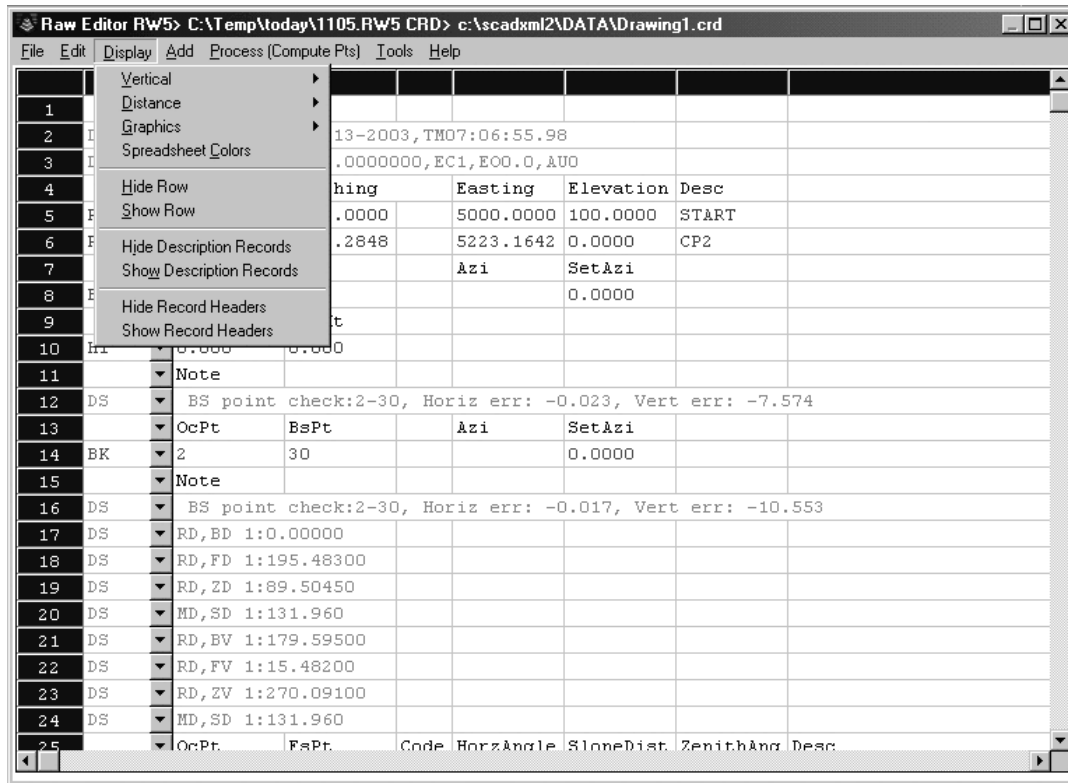
Replace

Delete Row

Modify Measurements

		Northing	Easting	Elevation	Desc
1					
2					DS, DTS-13-2003, TMO7:06:55.98
3					UNO, SF1.0000000, EC1, EOO.0, AUO
4					
5		5000.0000	5000.0000	100.0000	START
6		5129.2848	5223.1642	0.0000	CP2
7		BsPt	Azi	SetAzi	
8		30		0.0000	
9	▼	InstHt	RodHt		
10	HI	▼	0.000	0.000	
11		▼	Note		
12	DS	▼	BS point check:2-30, Horiz err: -0.023, Vert err: -7.574		
13		▼	OcPt	BsPt	Azi
14	BK	▼	2	30	0.0000
15		▼	Note		
16	DS	▼	BS point check:2-30, Horiz err: -0.017, Vert err: -10.553		
17	DS	▼	RD, BD 1:0.00000		
18	DS	▼	RD, FD 1:195.48300		
19	DS	▼	RD, ZD 1:89.50450		
20	DS	▼	MD, SD 1:131.960		
21	DS	▼	RD, BV 1:179.59500		
22	DS	▼	RD, FV 1:15.48200		
23	DS	▼	RD, ZV 1:270.09100		
24	DS	▼	MD, SD 1:131.960		
25		▼	OcPt	FsPt	Code
					HorzAngle SlopeDist ZenithAng Desc

The new spreadsheet controller allows for scrolling with the mouse wheel. It also includes options to hide the in-line headers such as the PntNo, OcPt, FsPt etc. Visibility control of the Description records (DS) in the spreadsheet has also been added. The description record is an additional note used to store useful information in addition to typical point data. Sometimes these records clutter the raw file and make it hard to review actual survey data. The ability to control the description record visibility is a useful tool when reviewing survey data.



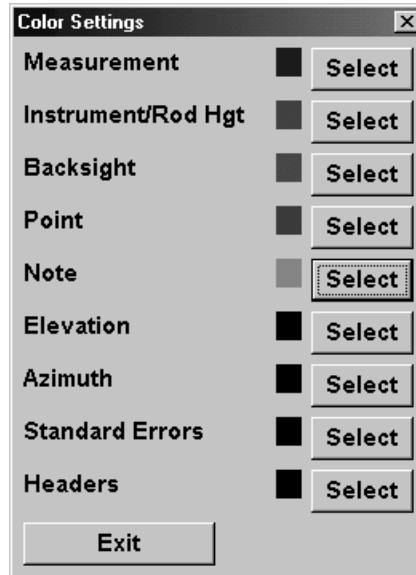
Search

Under the Search menu of the Raw Editor are basic Find and Replace commands. You enter in a string you want to find and, optionally, what you want to replace it with.

Display

The Display menu of the Raw Editor contains settings to control how the information is displayed.

- **Vertical:** Vertical can be shown as Vertical Angle, Zenith Angle, Elevation Difference, or None. You pick the item off the menu list, and a check mark is placed in front of the selection.
- **Distance:** There are two choices for showing distance in the Raw Editor, slope and horizontal. You pick the item off the menu list, and a check mark is placed in front of the selection.
- **Graphics:** There are three toggles in this menu.
- **On/Off:** Toggle whether the graphics mode is available.
- **Zoom/Pan:** Toggles whether the cursor will zoom or pan
- **Text Resize:** Toggles whether text in the graphics screen should resize when zoom factor changes.
- **Spreadsheet Colors:** Is a functionality to assign colors to records by record type. To change/define the color for a particular record, select Spreadsheet Colors from the Display pulldown within the raw editor. From the Color Settings dialog select the record to edit by clicking on the select button next to the desired record.



The color slide beside the select button shows the current setting for the record. After selecting the record, the Select Color dialog box will be display. Select the Set button next to the desired color for the record.



Add

You can add records by pressing the Insert key, pressing the down arrow key from the last line in the spreadsheet, or by choosing one of the add records from the Add menu of the Raw Editor. Record types are shown above in this section.

CRD

The CRD menu of the Raw Editor contains commands for manipulating points in a coordinate file.

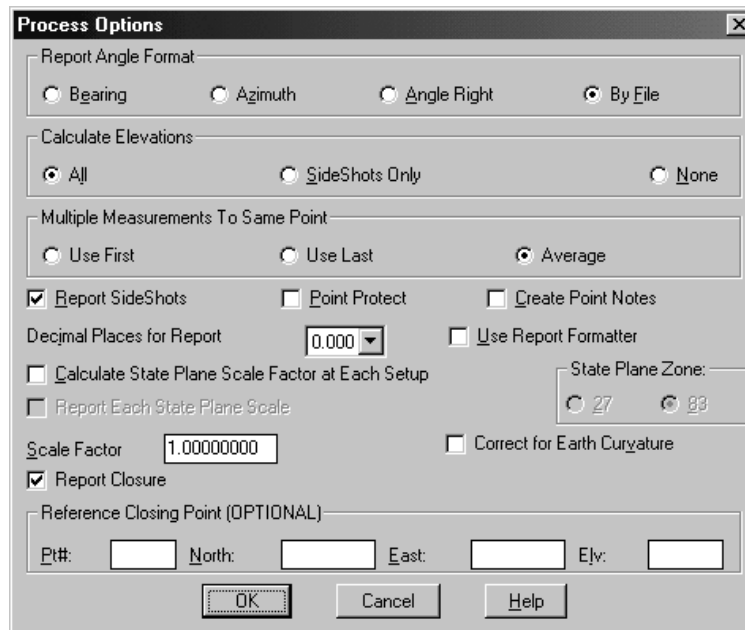
- **Edit Point:** This command creates new points in the coordinate file, or edits existing points.
- **List Points:** This command generates a list of points from the coordinate file. The dialog box gives the total number of points, and allows for listing a certain range of points. The list is displayed in the report viewer. See List Points in the Points chapter for more details.
- **Set Coordinate File:** Allows you to change the current coordinate (.CRD) file

Process (Compute Points)

The commands under the Process (Compute Points) menu of the Raw File Editor provide various methods for processing the raw file and for storing the calculated points in the coordinate file. The different types are described separately for each adjustment.

No Adjust

This command processes the raw file and stores the calculated coordinates to the coordinate file. The name No Adjust means that no angle balance or traverse adjustment will be applied.



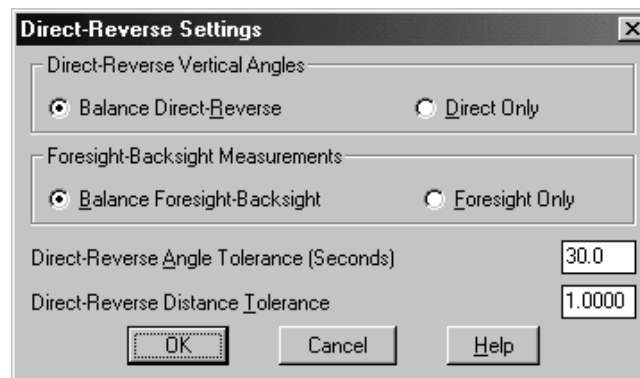
The **Process Options** dialog box contains the following settings:

- Report Angle Format:** Radio buttons for Bearing, Azimuth, Angle Right, and By File (selected).
- Calculate Elevations:** Radio buttons for All (selected), SideShots Only, and None.
- Multiple Measurements To Same Point:** Radio buttons for Use First, Use Last, and Average (selected).
- Checkboxes:** Report SideShots (checked), Point Protect (unchecked), Create Point Notes (unchecked), Use Report Formatter (unchecked), Calculate State Plane Scale Factor at Each Setup (unchecked), Report Each State Plane Scale (unchecked), and Correct for Earth Curvature (unchecked).
- Decimal Places for Report:** A dropdown menu set to 0.000.
- State Plane Zone:** Radio buttons for 27 and 83 (selected).
- Scale Factor:** A text box containing 1.00000000.
- Report Closure:** Checked.
- Reference Closing Point (OPTIONAL):** Fields for Pt#, North, East, and Elev.

Buttons at the bottom: OK, Cancel, Help.

The dialog box prompts for the following options.

- **Direct-Reverse Vertical Angles:** For any direct-reverse raw data, you can choose to process the direct-reverse shots using only the foresight direct shot, or to balance foresight-backsight shots.



The **Direct-Reverse Settings** dialog box contains the following settings:

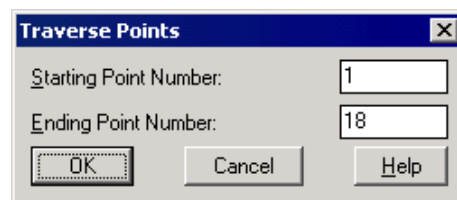
- Direct-Reverse Vertical Angles:** Radio buttons for Balance Direct-Reverse (selected) and Direct Only.
- Foresight-Backsight Measurements:** Radio buttons for Balance Foresight-Backsight (selected) and Foresight Only.
- Direct-Reverse Angle Tolerance (Seconds):** A text box containing 30.0.
- Direct-Reverse Distance Tolerance:** A text box containing 1.0000.

Buttons at the bottom: OK, Cancel, Help.

- **Report Angle Format:** This setting specifies the angle format for the report. The By File option specifies that the report should use the angle format in the RW5 file.
- **Calculate Elevations:** The Calculate Elevations option controls for which points elevations will be calculated. For example, if the traverse point elevations have already been adjusted and you need to recalculate the sideshot elevations, then use the SideShots Only option.
- **Elevation Only Record:** An option to set the elevation in the CRD file for the specified point number.

- **Reference Azimuth Record:** This functionality is to be used with the Network Least Squares program.
- **Multiple Shots to Same Point:** For multiple shots to the same point number, options to average the coordinates, to use only the first shot, or to use only the last shot.
- **Report SideShots:** This option specifies whether to include the sideshot data in the process results report.
- **Point Protect:** This option will check the coordinate file for existing point data before processing. If the foresight point number for any traverse or sideshot record is already a stored coordinate in the coordinate file, then the program shows a list of conflicting point numbers. You can either continue processing and overwrite the coordinate file coordinates with the calculated raw file coordinates, or you can cancel the processing to go back to the editor to change foresight numbers.
- **Create Point Notes:** This option will generate a note file (.NOT) named after the coordinate file. The note file contains additional descriptions for points. With this option active, the text from all note records (DS records) will be stored to the note file for the foresight point number preceding the note records.
- **Decimal Places for Report:** Controls the number of decimals used in the report, ranging from zero to four.
- **Use Report Formatter:** Allows you to customize the process results report by selecting the layout of the fields to display. The report formatter can also output the report to Microsoft Excel and Access. Without the report formatter, the program generates a standard results report.
- **Calculate State Plane Scale Factor at Each Setup:** This will calculate a scale factor for each TR and SS record. This scale factor is calculated as the average of the scale factors at the occupied and foresights points. At these points, the scale factor is calculated as the state plane grid factor minus the elevation divided by the earth radius [$SF = \text{Grid Factor} - (\text{Elev}/\text{Earth Radius})$]. In order to calculate the state plane scale factors, the traverse coordinates must be in state plane coordinates. When this option is selected, the program will prompt for the state plane zone to use. Select either Zone 27 or 83.
- **Scale Factor:** This factor is multiplied by the slope distance for the traverse and sideshot records.
- **Correct for Earth Curvature:** This adjusts the calculated points for the effect of the Earth's curvature. Typically this adjustment is small and adjusts the elevation more than the horizontal.
- **Reference Closing Point (OPTIONAL):** This is an optional field for entering the coordinates to compare the ending traverse point with. This reference closing point is used to calculate the closure. If you do not specify this option the command will use the starting coordinate as the reference closing point.

After you select OK for the first dialog box, the Traverse Points dialog box appears. Enter the starting and ending point numbers.



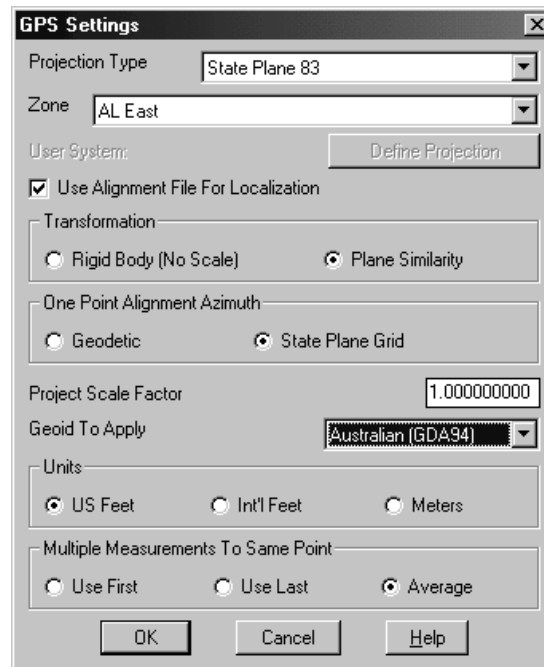
The image shows a dialog box titled "Traverse Points" with a standard Windows-style title bar (minimize, maximize, close buttons). Inside the dialog, there are two text input fields. The first is labeled "Starting Point Number:" and contains the value "1". The second is labeled "Ending Point Number:" and contains the value "18". Below these fields are three buttons: "OK", "Cancel", and "Help". The "OK" button is highlighted with a dashed border.

The command reads the raw file to set the defaults for these point numbers, which are used to calculate the closure. The difference between the ending point and the reference closing point is the closure error. The sum of the traverse distances from the starting to the ending point is used as the total distance traversed.

After you pick OK for the second dialog box, the program starts processing the raw file from the top record down. The result is displayed in the standard report viewer, which you can use to save, print, or draw the report.

Stadia Processing Method: Processes Stadia surveying notes. Stadia sighting depends on two horizontal cross-hairs, known as stadia hairs, within the telescope. These hairs are parallel to the horizontal cross-hair and are equally

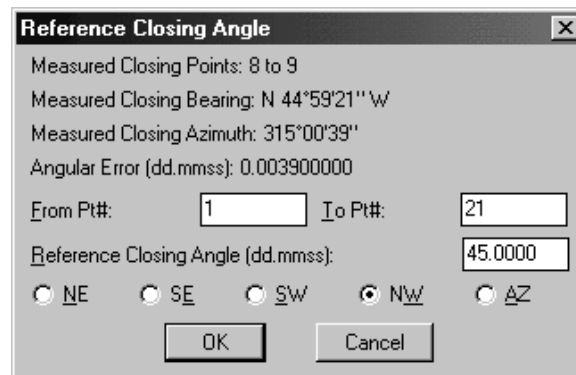
spaced above and below it. The distance between the two stadia hairs is known as the intercept. The distance from the instrument to the rod is 100 times the intercept. For example, an intercept of 3.10 would represent a distance of 310 (3.10 X 100). For entering in stadia notes, you would enter the horizontal angle, the distance (entered as the intercept X 100) and the vertical angle.



The GPS Settings dialog box contains the following fields and options:

- Projection Type: State Plane 83
- Zone: AL East
- User System: Define Projection
- ☒ Use Alignment File For Localization
- Transformation:
 - ☐ Rigid Body (No Scale)
 - ☒ Plane Similarity
- One Point Alignment Azimuth:
 - ☐ Geodetic
 - ☒ State Plane Grid
- Project Scale Factor: 1.00000000
- Geoid To Apply: Australian (GDA94)
- Units:
 - ☒ US Feet
 - ☐ Int'l Feet
 - ☐ Meters
- Multiple Measurements To Same Point:
 - ☐ Use First
 - ☐ Use Last
 - ☒ Average
- Buttons: OK, Cancel, Help

Angle Balance



The Reference Closing Angle dialog box contains the following fields and options:

- Measured Closing Points: 8 to 9
- Measured Closing Bearing: N 44°59'21" W
- Measured Closing Azimuth: 315°00'39"
- Angular Error (dd.mmss): 0.003900000
- From Pt#: 1
- To Pt#: 21
- Reference Closing Angle (dd.mmss): 45.0000
- Direction:
 - ☐ NE
 - ☐ SE
 - ☐ SW
 - ☒ NW
 - ☐ AZ
- Buttons: OK, Cancel

This process command applies an angle balance to the traverse lines when calculating the coordinates. This command displays the same dialog box as No Adjust. The angle balance takes the angular error divided by the number of traverse lines and adjusts the angle of each traverse line by that amount. The angular error is the difference between the angle balance shot and a reference angle. The angle balance shot is specified as a type AB or CL+AB record in the raw file. If no AB record is found in the raw file, then the command prompts for which traverse shot to use as the angle balance shot. The angle from the angle balance shot is calculated as the angle from the occupied point to the foresight point. The reference angle can be specified as a bearing, as an azimuth, or by two point numbers in the dialog box shown. The angle balance report shows the unadjusted points, the unadjusted closure, the angular error, the adjusted points, and the adjusted closure. Typically, but not always, applying the angle balance correction improves the traverse closure.

Compass, Crandall, Transit

These process commands apply the selected rule of Compass, Crandall, or Transit, to the traverse lines when calculating the coordinates. The dialog box is the same for all three methods.

- **Reference Closing Point:** This is the field for entering the point number and coordinates to compare the ending traverse point with. The reference closing point is used to calculate the closure.
- **Direct-Reverse Vertical Angles:** For any direct-reverse raw data, you can choose to process the direct-reverse shots using only the foresight direct shot, or to balance all shots.
- **Report Angle Format:** This setting specifies the angle format for the report. The By File option specifies that the report should use the angle format in the RW5 file.
- **Calculate Elevations:** The Calculate Elevations option controls for which points elevations will be calculated. For example, if the traverse point elevations have already been adjusted and you need to recalculate the sideshot elevations, then use the SideShots Only option.
- **Create Point Notes:** This option will generate a note file (.NOT) named after the coordinate file. The note file contains additional descriptions for points. With this option active, the text from all note records (DS records) will be stored to the note file for the foresight point number preceding the note records.
- **Report Unadjusted Points:** Includes the unadjusted points in the report.
- **Vertical Error Adjustment:** Adjusts the vertical error for elevation difference.
- **Report Point Adjustments:** Reports the adjustment of each point.
- **Apply Angle Balance:** Applies the Angle Balance method to the traverse lines for calculating coordinates.
- **Point Protect:** This option will check the coordinate file for existing point data before processing. If the foresight point number for any traverse or sideshot record is already a stored coordinate in the coordinate file, then the program shows a list of conflicting point numbers. You can either continue processing and overwrite the coordinate file coordinates with the calculated raw file coordinates, or you can cancel the processing to go back to the editor to change foresight numbers.
- **Report SideShots:** This option specifies whether to include the sideshot data in the process results report.

- **Decimal Places for Report:** Controls the number of decimals used in the report, ranging from zero to four.
- **Use Report Formatter:** Allows you to customize the process results report by selecting the layout of the fields to display. The report formatter can also output the report to Microsoft Excel and Access. Without the report formatter, the program generates a standard results report.
- **Calculate State Plane Scale Factor at Each Setup:** This will calculate a scale factor for each TR and SS record. This scale factor is calculated as the average of the scale factors at the occupied and foresights points. At these points, the scale factor is calculated as the state plane grid factor minus the elevation divided by the earth radius [$SF = \text{Grid Factor} - (\text{Elev}/\text{Earth Radius})$]. In order to calculate the state plane scale factors, the traverse coordinates must be in state plane coordinates. When this option is selected, the program will prompt for the state plane zone to use. Select either Zone 27 or 83.
- **Scale Factor:** This factor is multiplied by the slope distance for the traverse and sideshot records.
- **Correct for Earth Curvature:** This adjusts the calculated points for the effect of the Earth's curvature. Typically this adjustment is small and adjusts the elevation more than the horizontal.

After the command adjusts the traverse, it also recalculates the sideshots. The closure error is calculated as the difference between the closing shot and a reference point. The closing shot is specified as a type CL or CL+AB record in the raw file. If no CL record is found in the raw file, then the command prompts for which traverse shot to use as the closing shot. The foresight point is used as the closing coordinate. The reference point can be specified by point number or by entering the northing, easting, and elevation. The process results report shows the unadjusted points, closure error, adjustments to each traverse point, and adjusted points.

Prepare Least Squares Data

From the raw file data, this command makes initial calculations for the coordinate points in the traverse. This data, along with the control point coordinates and angle and distance measurements, is stored to a data file with the same name as the current RW5 file using a .LSQ extension (for example, survey.lsq goes with survey.rw5). The constraints of the command are:

All angle readings must be in "angle right" mode. The coordinates of the starting and the ending points must be known.

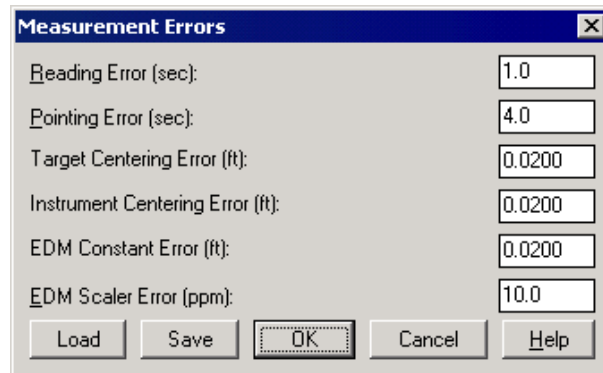
The command begins with a dialog box where you specify the reference closing coordinates and any scale factors to apply to the distance measurements. The Reference Closing Point is the last point in the traverse, whose coordinates must be known. If an angle balance shot is used in the traverse, the Reference Angle Balance Angle must also be specified, either as a value or as the angle between known points.

- **Reference Closing Point:** Enter the point number and coordinates to be compared to the ending traverse point. This reference closing point is used to calculate the closure.
- **Calculate State Plane Scale Factor at Each Setup:** This will calculate a scale factor for each TR and SS record. This scale factor is calculated as the average of the scale factors at the occupied and foresights points. At these points the scale factor is calculated as the state plane grid factor minus the elevation divided by the earth radius [$SF = \text{Grid}$

Factor - (Elev/Earth Radius)]. In order to calculate the state plane scale factors, the traverse coordinates must be in state plane coordinates. When this option is selected, the program will prompt for the state plane zone to use. Select either Zone 27 or 83.

- **Scale Factor:** This factor is multiplied by the slope distance for the traverse and sideshot records.
- **Correct for Earth Curvature:** This adjusts the calculated points for the effect of the Earth's curvature. Typically this adjustment is small and adjusts the elevation more than the horizontal.

Since angles and distances have errors of different magnitudes, they are normalized using weights, based on the accuracy and confidence with which these quantities have been measured. Below is the dialog box for specifying the estimated measurement errors.

A screenshot of a software dialog box titled "Measurement Errors". It contains six input fields with the following labels and values: "Reading Error (sec):" with value "1.0", "Pointing Error (sec):" with value "4.0", "Target Centering Error (ft):" with value "0.0200", "Instrument Centering Error (ft):" with value "0.0200", "EDM Constant Error (ft):" with value "0.0200", and "EDM Scaler Error (ppm):" with value "10.0". At the bottom of the dialog are five buttons: "Load", "Save", "OK", "Cancel", and "Help". The "OK" button is highlighted with a dashed border.

- **Reading Error:** The horizontal angular error in the instrument. For example, for a "5-second" instrument, this error would be 5.
- **Pointing Error:** Accounts for several factors in the horizontal angle reading, including accuracy lining up the crosshairs on the target, the target size, and the optical quality of the instrument.
- **Target and Instrument Centering Errors:** The distance off the point due to faulty centering of both the target and instrument.
- **EDM Constant Error:** The accuracy of the instrument distance measurements.
- **EDM Scaler Error:** Entered in parts per million for the increased error in longer measurements.

The command calculates the weights for each distance and angle measurement using these measurement errors. The control points, points to adjust, distance, and angle measurements with weights are reported. You can edit these measurements and weights using the Edit Least-Squares Data command or go directly to the Process Least-Squares Data command.

Edit Least Squares Data

This command edits the points, measurements, and weights stored in the .LSQ file associated with the current RW5 file, using the dialog box shown. You can edit, add, or remove the control points. You can also adjust points, angle measurements, or distance measurements. The command does not check that the editing is valid, so you need to make sure that you keep a good set of least-squares data and don't delete a needed control point.

Edit Least-Squares Data

Control Points

Point#	North	East
15	319970.27076	1351114.14764
13	317730.94778	1352012.60747
2	313966.03960	1356358.92500

Adjust Points

Point#	North	East
3	315053.15552	1355328.63065
4	315174.11656	1354069.00943
5	315113.40670	1353857.99961

Distance Observations

From	To	Distance	Std-Error
14	15	719.78997	0.03538
12	13	493.30605	0.03499
1	3	1701.65976	0.03859

Angle Observations

From	At	To	Angle	Std-Error
12	14	15	204.0730	9.47526"
11	12	13	60.3849	14.61450"
18	1	3	317.4513	4.07050"

Distance Error Angle Error **OK** Cancel Help

- **Edit:** Brings up one of the three following dialog boxes for modifying any values. The first two, Control and Adjust Points use the first Edit Point dialog box, the other two observation settings have their own.
- **Add:** Uses one of the three dialog boxes for adding in new data.

Edit Point

Point# 15

Northing 319970.27076

Easting 1351114.14764

OK Cancel

Edit Distance Observation

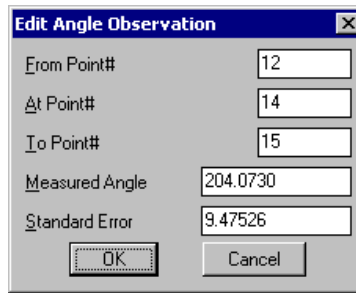
From Point# 14

To Point# 15

Measured Distance 719.78997

Standard Error 0.03538

OK Cancel

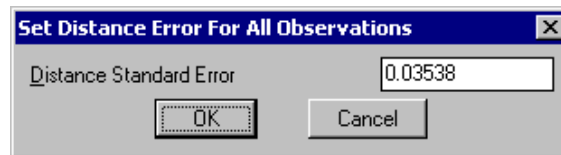


Edit Angle Observation

From Point#	12
At Point#	14
To Point#	15
Measured Angle	204.0730
Standard Error	9.47526

OK Cancel

- **Remove:** Removes the selected line of data from the dialog box.
- **Distance Error:** Allows you to set the distance standard error weights for all the distance measurements to the same value.

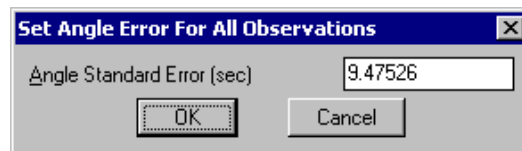


Set Distance Error For All Observations

Distance Standard Error	0.03538

OK Cancel

- **Angle Error:** This option sets the standard error weights for all the angle measurements.



Set Angle Error For All Observations

Angle Standard Error (sec)	9.47526

OK Cancel

Process Least Squares Data

This command applies a least-squares adjustment to the data stored in the .LSQ file associated with the current .RW5 file. The closing errors are distributed among the other points, using the "Method of Least Squares" (Ref : Wolf, P.R. and Ghilani, C.D., 1996, "Adjustment Computations", John Wiley and Sons, NY, Third Edition). After the adjustment, the rest of the raw file is processed to recalculate the sideshots. You can choose to draw standard error ellipses around the adjusted points. The ellipse axes are multiplied by Ellipse Scale Factor to make the ellipse larger for easier viewing.

The least-squares process report shows the input data and the results. For each point, the amount adjusted and the standard error in X and Y are reported. The Reference Standard Deviation is based on the sum of the residuals and the initial estimated standard errors. The Chi-Squares test is a goodness-of-fit test that checks the reference standard deviation with the least squares model. If this test fails, there may be a blunder in the measurement data or the initial estimated standard errors were too low or too high. The following is a sample Least Squares Data report.

Control Points		
Point#	Northing	Easting
1	5000.000	5000.000
8	5000.000	5000.000

Distance Observations			
Occupy	FSight	Distance	StdErr
1	2	711.409	0.018
2	3	457.745	0.017
3	4	201.295	0.017
4	5	497.024	0.018
5	6	223.972	0.017
6	7	233.872	0.017
7	8	387.073	0.017

Angle Observations				
BSight	Occupy	FSight	Angle	StdErr
7	1	2	268d53'30"	7.617"
1	2	3	262d54'48"	6.869"
2	3	4	208d57'10"	15.194"
3	4	5	247d16'57"	14.222"
4	5	6	277d48'35"	12.262"
5	6	7	92d41'13"	15.818"
6	7	8	261d27'56"	12.991"
7	1		S01d59'18"E	0.001"

Adjusted Point Comparison

Point#	Original		Adjusted		Dist	Bearing
	Northing	Easting	Northing	Easting		
2	5038.431	5710.370	5038.431	5710.372	0.002	S 87d33'04" E
3	4587.896	5791.299	4587.893	5791.306	0.008	S 65d24'21" E
4	4397.306	5726.530	4397.297	5726.545	0.017	S 59d17'31" E
5	4363.085	5230.685	4363.045	5230.704	0.044	S 25d10'33" E
6	4586.548	5245.769	4586.505	5245.775	0.043	S 07d59'10" E
7	4613.220	5013.423	4613.164	5013.430	0.056	S 07d16'24" E

Adjusted Points

Point#	Northing	Easting	N-StdErr	E-StdErr
2	5038.431	5710.372	0.012	0.008
3	4587.893	5791.306	0.015	0.010
4	4397.297	5726.545	0.015	0.012
5	4363.045	5230.704	0.012	0.011
6	4586.505	5245.775	0.010	0.008
7	4613.164	5013.430	0.009	0.000

Solution Converged in 2 Iterations

Reference Standard Deviation: 0.520

Chi-Square statistic: 0.811

Adjustment Passes Chi-Square test at 95% confidence level

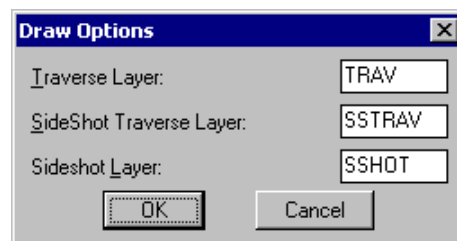
Tools

The Tools menu of the Raw Editor contains commands to help you manage points and angles in the raw file.

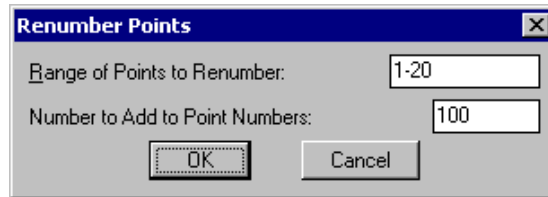
- **Direct-Reverse Report:** This command creates a report of direct and reverse shots along with the resulting averaged shots. The residuals are the difference between the measurement and the final average. A sample report is shown below.

Observations					
Type	Setup	FSight	HorzAngle	Distance	Vertical
BD	2	1	359.5950	173.8240	89.5308
BR	2	1	180.0000	173.8310	270.0654
FR	2	3	84.3443	176.9730	269.2822
FD	2	3	264.3439	177.0150	90.3142
BD	2	1	359.5953	173.8290	89.4920
BR	2	1	179.5957	173.8500	270.1059
FR	2	3	84.3536	177.0080	269.3238
FD	2	3	264.3524	177.0190	90.2722
Reduced Sets					
HorzAngle	Residual	FS Diff.	BK Diff.		
264.3446	0.0024	0.0004	0.0010		
264.3535	0.0024	0.0012	0.0004		
Vertical	Residual	Diff.	Distance	Residual	Diff.
90.3140	0.0209	0.0004	176.9940	0.0098	0.0420
90.2722	0.0209	0.0000	177.0135	0.0097	0.0110
Means					
HorzAngle	SD	Distance	SD	Vertical	SD
264.3510	0.0024	177.0038	0.0098	90.2931	0.0209

- **Reduce Direct-Reverse:** This command processes the direct and reverse shots and simplifies the raw file by replacing the sets of direct and reverse shots with the resulting average traverse record.
- **Update Raw from Points:** This command updates the horizontal angle, distance, and vertical angle data in the raw file using the coordinates from the coordinate file. This command can be used to generate a raw file from point numbers only. To create raw data from points, first create rows of Traverse and/or SideShot records in the spreadsheet containing only the occupied and foresight point numbers. Set the angle code to the desired format, then run Update Raw from Points. All the angles and distances will be filled in.
- **Find Bad Angle:** This command applies the angular error to each traverse record one at a time. The adjusted traverse record that improves the closure the most is reported as the Bad Angle. The angular error is the difference between the angle balance shot and a reference angle.
- **Append Another Raw File:** This command prompts for a raw file (.RW5). The file is read and its data is added to the end of the existing raw file. For example, if you are editing the raw file from a first day's work, and you have a separate raw file containing a second day's work, you can use this routine to add the second raw data file to the first.
- **Draw Traverse-Sideshot Lines:** This command draws lines for all the traverse and sideshot records. Sideshot Traverses are traverses that do not lead to the closing or ending point. You can specify different layers so that you can draw different lines with different colors. This command does not process the raw file. Instead it reads the raw file, and, for each traverse and sideshot record, it looks up the coordinates for the occupied and foresight points in the CRD file. You may need to run the No Adjust command under Process (Compute Points) menu of the Raw Editor before you run this command.



- **Renumber Points:** This command rennumbers points in the raw file. This applies to all point numbers including: TR, SS, and PT records. You specify the range of point numbers to change and the amount to change in the dialog box.



Format of the Raw File (.RW5 extension)

The following are supported record header codes with their field headers.

BK Backsight

OP Occupy Point Number

BP Backsight Point Number (if 0 the next field's azimuth will be used for)

BS Back Azimuth

BC Back Circle

DS Description

LS Line of Sight

HI Height of Instrument

HR Height of Rod/Target

SP Store Point

PN Point Number

N North Coordinate

E East Coordinate

EL Elevation

- Point Description/Note

TR Traverse

SS Side Shot

CL Closure Record

AB Angle Balance Record

OP Occupy Point Number

FP Foresight Point Number

(one of the following 6)

AZ Azimuth (angle code 5)

BR Bearing (angle code 1 = NE, 2 = SE, 3 = SW, 4 = NW)

AR Angle Right (angle code 7)

AL Angle Left (angle code 6)

DR Deflection Angle Right (angle code 9)

DL Deflection Angle Left (angle code 8)

(one of the following 3)

ZE Zenith Angle (90 degrees level)

VA Vertical Angle (0 degrees level)

CE Change/Difference in Elevation from Instrument Point

SD Slope Distance (if ZE or VA above)

HD Horizontal Distance (if CE above)

Menu Location: Tools

Prerequisite: None

Keyboard Command: RAWEDIT

Network Least-Squares Adjustment program is one of the available programs produced by Carlson Software. The Network Least Squares Adjustment program (NLSA) will perform a mathematically rigorous least squares adjustment and statistical analysis of a network of raw traverse field data.

The NLSA program will simultaneously adjust a network of interconnected traverses with any amount of redundancy. The raw data can contain any combination of traverse (angle and distance), and triangulation (angle only) measurements. It can also calculate resections, where any combination of distances and angles can be measured from an unknown point to known points (points located in the traverse). The raw data does not need to be in a linear format, and individual traverses do not have to be defined using any special codes. All measurements will be used in the adjustment. The NLSA program can adjust both 3D and 2D traverses, as well as 3D traverses that contain some 2D data. If you have Vertical Adjustment turned ON in the project settings, elevations will be calculated and adjusted only if there is enough information in the raw data file to do so. Least squares adjustment is used for elevation adjustment as well as the horizontal adjustment.

The NLSA program can also automatically reduce field measurements to State Plane coordinates in either the NAD 83 or NAD 27 coordinate systems. A grid factor is computed for each individual line during the reduction. The elevation factor is computed if the data is 3D. If the raw data has only 2D data, the user has the option of defining a project elevation to be used to compute the elevation factor.

A full statistical report containing the results of the least squares adjustment is provided.

Please contact Carlson Software for further information on this additional module.

Pulldown Menu Location: Tools

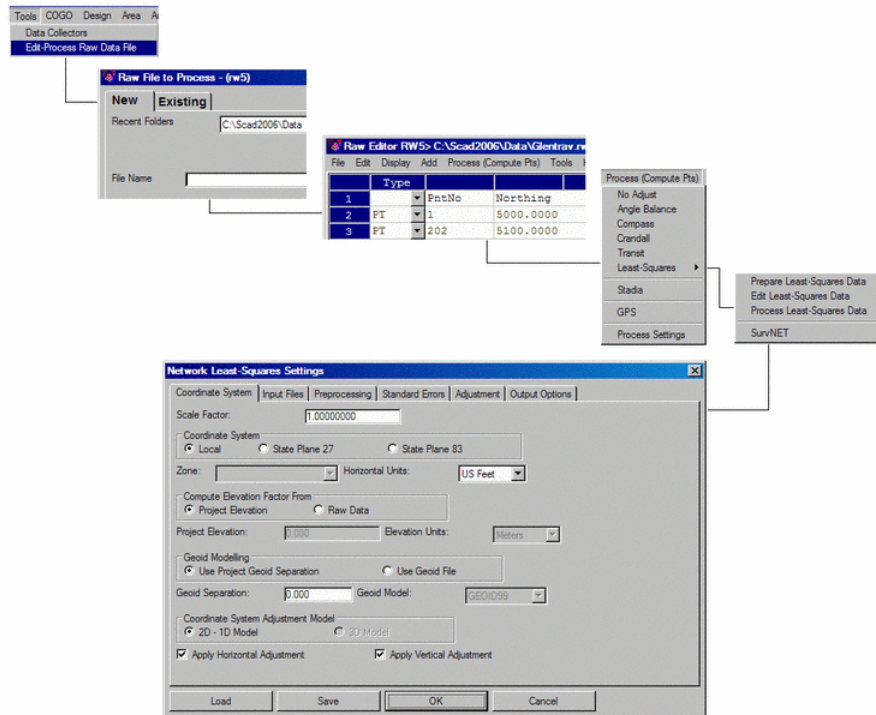
Keyboard Command: rawedit

Prerequisite: None

SurvNET

Carlson SurvNET is a Network Least Squares Reduction (NLSA) program. This module will perform a least squares adjustment and statistical analysis of a network of raw survey field data, including both total station measurements and GPS vectors. SurvNET will simultaneously adjust a network of interconnected traverses with any amount of redundancy. The raw data can contain any combination of traverse (angle and distance), triangulation (angle only) and trilateration (distance only) measurements, as well as GPS vectors. It can also calculate resections, where any combination of distances and angles can be measured from an unknown point to known points (points located in the traverse). The raw data does not need to be in a linear format, and individual traverses do not have to be defined using any special codes. All measurements are used in the adjustment. SurvNET gives the user the option to choose one of two mathematical model options when adjusting raw data, the 3D model of least squares adjustment and the 2D/1D model. The 3D model reduces numerous networks using both the 2D/1D model.

The SurvNET Module is located inside of the Tools menu. To access SurvNET, go to the Tools pulldown, select Edit-Process Raw Data File and choose a .RW5 file. You will now see the Raw Editor. Selecting the editors' Process (Compute Pts) pulldown. While in this menu select Least-Squares, then SurvNET. There are six tabbed sections.



Key Features of SurvNET

SurvNET can automatically reduce field measurements to State Plane coordinates in either the NAD 83 or NAD 27 coordinate systems. In the 2D/1D model, a grid factor is computed for each individual line during the reduction. The elevation factor is computed for each individual line if the data is 3D. If the raw data has only 2D data, the user has the option of defining a project elevation to be used to compute the elevation factor. A full statistical report containing the results of the least squares adjustment is produced and written to the report (.RPT) file. An error report (.ERR) file is created and contains any error messages that are generated during the adjustment.

Coordinates can be stored in either a Carlson (.CRD) file, a C&G (.CRD) file or an ASCII (.NEZ) file. A file with the extension .OUT will be created and contains an ASCII formatted coordinate list. There is an option to compute traverse closures during the preprocessing of the raw data. Traverse closures can be computed for both GPS loops and total station traverses. This option has no effect on the computation of final least squares adjusted coordinates. It is useful for surveyors who, due to statutory requirements, are still required to compute traverse closures, and for those surveyors who still like to view traverse closures prior to the least squares adjustment.

The 3D model of least squares adjustment model, supported here in SurvNET, is the preferred method of adjusting GPS vectors with total station data. GPS vector data can be incorporated with total station data in a single adjustment. Vector files from Leica and Thales can be input, as can GPS files in the StarNet format. As part of the preprocessing process, traverse closures can be computed. Closures for loop traverses and point to point traverses, with or without angle closures, can also be computed. And multiple loops in the same raw file can be computed. As part of preprocessing, GPS loop closures can be computed as well. The user has the option to compute unadjusted preliminary coordinates.

There is a blunder detection method that is effective in detecting if the same point number has been used for two different points. This method will also flag other raw data problems. Another blunder detection method included in

SurvNET is very effective in isolating a single blunder, distance or angle in a network. This method does not require that there be a lot of redundancy, but is effective if there is only one blunder in the data set. Additionally, SurvNET includes a blunder detection method that can isolate multiple blunders, distance or angle in a network. This method does require that there be a lot of redundancy in the network to effectively isolate the multiple blunders.

Other key features: Differential level networks and loops can be adjusted using the network least squares program. Geoid modeling is used in NLSA, allowing the users to choose between the Geoid99 or the Geoid03 model. The user can alternately enter the project geoid separation. The separation is used when combining GPS vectors with total station data, and is also used in the computation of the elevation factor in the 2D model adjustment. There are description codes to identify duplicate points with different point numbers. The user can specify the confidence interval from 50 to 99.

SurvNET: Network Least Squares

Function

The Network Least Squares Adjustment program (NLSA) performs a mathematically rigorous least squares adjustment and statistical analysis of a network of raw traverse field data. The NLSA program simultaneously adjusts a network of interconnected traverses with any amount of redundancy. The raw data can contain any combination of traverse (angle and distance), triangulation (angle only) and trilateration (distance only) measurements. It can also calculate resections, where any combination of distances and angles can be measured from an unknown point to known points (points located in the traverse). The raw data need not be in linear format, and individual traverses do not have to be defined using any special codes. All measurements will be used in the adjustment.

The NLSA program also adjusts both 3D and 2D traverses. This includes 3D traverses that contain some 2D data. If you have Vertical Adjustment turned ON in the project settings, elevations will be calculated and adjusted only if there is enough information in the raw data file to do so. Least squares adjustment is used for elevation adjustment as well as the horizontal adjustment. To compute elevations, the instrument record must have a HI, and the foresight record must have a rod height, slope distance and vertical angle. A 0.0 (zero) HI or ROD HEIGHT is valid (only when the field is blank will it be considered a 2D measurement). A 3D traverse must also have adequate elevation control in order to process the elevations. Elevation control can be obtained from the Control File, Coordinate records in the raw data file, or Elevation records in the raw data file. The NLSA program can also automatically reduce field measurements to State Plane coordinates in either the NAD 27 or NAD 83 coordinate systems. A grid factor is computed for each individual line during the reduction. The elevation factor is computed for each individual line if the data is 3D. If the raw data has only 2D data, the user has the option of defining a project elevation to be used to compute the elevation factor.

A full statistical report containing the results of the least squares adjustment is produced. Coordinates will be written to the current coordinate (.CRD) file. Although the NLSA program does not output the standard "Error of Closure" statement, it produces statistical information that allows a much more effective way to evaluate the strength of your traverses, and the precision of your measurements. See details of this statistical report later in this section.

Network Least Squares Settings dialog Choosing SurvNET from the pulldown menu displays the Network Least-Squares Settings dialog box.

Network Least-Squares Settings

Coordinate System | Input Files | Preprocessing | Standard Errors | Adjustment | Output Options

Scale Factor: 1.00000000

Coordinate System: ☒ Local ☐ State Plane 27 ☐ State Plane 83

Zone: Horizontal Units: US Feet

Compute Elevation Factor From: ☒ Project Elevation ☐ Raw Data

Project Elevation: 0.000 Elevation Units: Meters

Geoid Modelling: ☒ Use Project Geoid Separation ☐ Use Geoid File

Geoid Separation: 0.000 Geoid Model: GEOID99

Coordinate System Adjustment Model: ☒ 2D - 1D Model ☐ 3D Model

☒ Apply Horizontal Adjustment ☒ Apply Vertical Adjustment

Load Save OK Cancel

Coordinate System

Scale Factor: Enter a value.

Coordinate System: Select Local (assumed coordinate system), SPC 1927 (State Plane NAD27) or SPC 1983 (State Plane NAD83).

Zone: If you choose SPC 1927 or SPC 1983, you can select the State and Zone you are in. The grid scale factor is computed for each measured line using the method described in section 4.2 of NPAA Manual NOS NGS 5, "State Plane Coordinate System of 1983", by James E. Stem.

Horizontal Units: Applies to the input/output of coordinate values (Meters, US Feet or International Feet).

Compute Elevation Factor From: When you select SPC 1927 or SPC 1983, in order to calculate the combined scale factor (so as to adjust distances to sea-level), you will be given the choice of either entering a Project Elevation, or using the elevations of the calculated coordinate points (Raw Data). If you are reducing a 2D network, select Project Elevation, since none of the calculated points will have elevations. For most survey projects it is sufficient to use an approximate elevation such as can be obtained from a Quad Sheet. For 3D networks, the elevation factor is computed for each individual line.

Geoid Modeling: You can choose either Use Project Geoid Separation or Use Geoid File.

Geoid Separation: This feature is dependent upon which Geoid Modeling option you decide to use.

Coordinate System Adjustment Model: Pick between 2D - 1D Model or 3D Model.

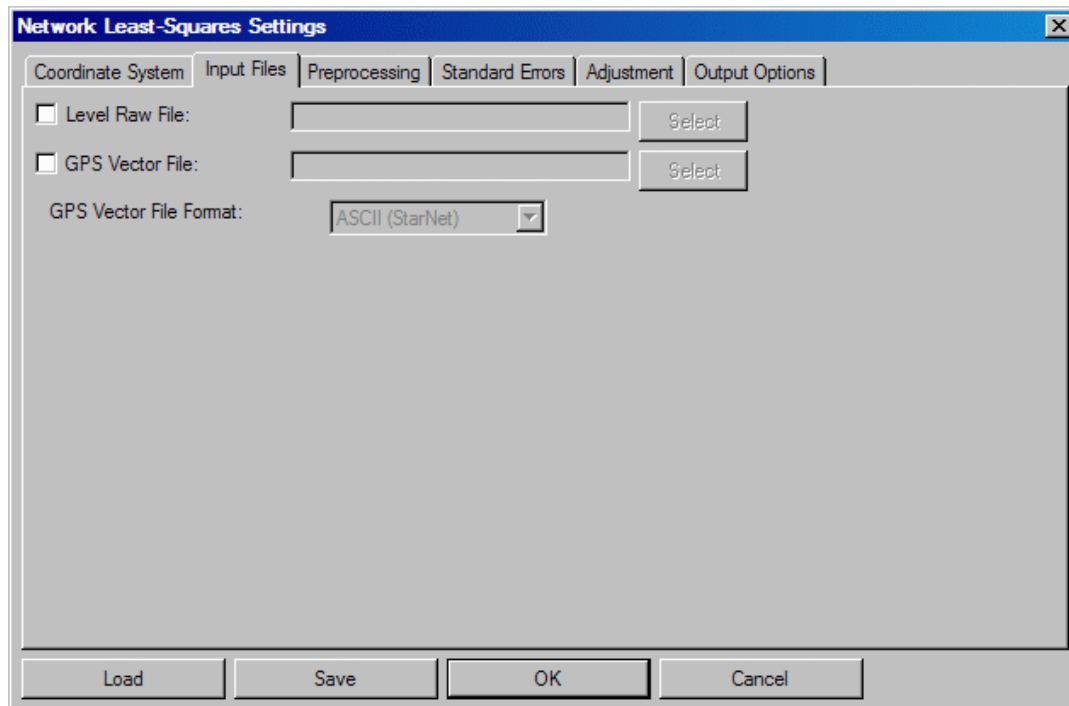
Apply Horizontal Adjustment: Check box for adjustment of North/East values.

Apply Vertical Adjustment: Check box for adjustment of elevations. You can adjust either horizontal and vertical data, horizontal data only, or vertical data only. If Vertical Adjustment is not checked, elevations will not be

calculated.

Load: Common option included in all tabbed dialogs described below. Click this button to load an existing .NLQ file.

Input Files



Level Raw File: Click to include existing .LEV file for input.

GPS Vector File: Click to include and existing GSPS vector file for input.

GPS Vector File Format: Select from ASCII (StarNET), Thales or Leica.

Preprocessing

Network Least-Squares Settings

Coordinate System | Input Files | **Preprocessing** | Standard Errors | Adjustment | Output Options

Raw Data Preprocessing

☒ Apply Curvature and Refraction Correction

Horz Dist/Slope Dist Tolerance: 0.020 Vert Dist Tolerance: 0.030

Horz Angle Tolerance (DD.MMSS): 0.0005 Vert Angle Tolerance (DD.MMSS): 0.0005

Tie Point Code: =

☐ Compute Traverse Closures:

When multiple angles or distances are measured to a point, a single average angle, horizontal distance component, and vertical difference component will be calculated for use in the least-squares adjustment. You may set the tolerances so that you are warned if any angle or distance exceeds these values. Tolerance warnings will be shown in the report after processing the data.

Horz. Dist/Slope Tolerance: Display a warning if the difference between highest and lowest horizontal distance component exceeds this value.

Horz. Angle Tolerance: Display a warning if the difference between the highest and lowest horizontal angle exceeds this value.

Tie Point Code: Enter code.

Edit/Create Closure File: With this feature, you can edit an existing or create a new .CLS closure file.

Standard Errors

Network Least-Squares Settings

Coordinate System | Input Files | Preprocessing | **Standard Errors** | Adjustment | Output Options

Distance Standard Errors
 Dist Std Err: 0.010
 PPM: 5

Angle Standard Errors
 Horiz Pointing (sec): 3 Reading (sec): 3
 Vert Pointing (sec): 3 Reading (sec): 3

Instrument and Target Standard Errors
 Target Centering: 0.005 Instrument Centering: 0.005
 Target Height: 0.100 Height of Instrument: 0.100

Direction (Azimuth) Standard Error (sec): 5
 North: 0.010 East: 0.010 Elev.: 0.020

GPS Standard Errors
 GPS Centering Error: 0.000 Vector Std. Err Factor: 1.000

Differential Leveling Standard Errors
 Avg Dist to BS/FS: 50.000 Rod Read Err per 100 ft/m: 0.000
 Collimation Err (sec): 3.000

Load Save OK Cancel

Standard errors (SE) are basically realistic errors you would expect to obtain, based on the type equipment and field procedures used to take your measurements (e.g. if you are using a 5 second theodolite, you could expect the angles to be measured within +/- 5 seconds). The Distance, Angle Reading (Vertical and Horizontal) and PPM settings should be based on the equipment being used. Check the published specifications for your total station. Survey methods should also be taken into account when setting standard errors (e.g. you might set the Target Centering standard error higher when you are sighting a held prism pole than you would if you were sighting a prism set on a tripod). If the generated report shows that generally you have consistently high Standard Residuals for a particular measurement value (angles, distances, etc.), then there is the chance that you have selected standard errors that are better than your instrument and methods can obtain. (See explanation of report file).

Note: The settings from this dialog box will be used for the project default settings. These default standard errors can be overridden for specific measurements by placing SE records directly into the Raw Data File (see the above documentation on raw data files).

Distance Standard Error: Precision of distance measurements, obtain from EDM specs.

PPM: Parts per Million, obtain from EDM specs.

Horizontal Pointing (sec): Atmospheric conditions, optics, experience and care taken by instrument operator.

Horizontal Reading (sec): Precision of horizontal angle measurements, obtain from theodolite specs.

Vertical Pointing (sec): Atmospheric conditions, optics, experience and care taken by instrument operator.

Vertical Reading (sec): Precision of vertical angle measurements, obtain from theodolite specs.

Target Centering: Location of target (prism) relative to the point.

Instrument Centering: Location of instrument relative to the point.

Target Height: Accuracy of target height.

Instrument Height: Accuracy of instrument height.

Direction (Azimuth) Standard Error (sec): Precision of bearing/azimuth records.

North Coordinate, East Coordinate: Precision of horizontal coordinate records.

GPS Standard Errors: A GPS Centering Error value and a Vector Std. Err Factor value may be entered.

Differential Leveling Standard Errors: Values for Average Distance to BS/FS, Rod Read Err per 100 ft/m and Collimation Err (sec) may be entered in these three fields.

Adjustment

The screenshot shows a software window titled "Network Least-Squares Settings" with a blue title bar and a close button. It contains several tabs: "Coordinate System", "Input Files", "Preprocessing", "Standard Errors", "Adjustment" (which is selected), and "Output Options". The "Adjustment" tab is active, showing "Least Squares Adjustment Options". This section includes four input fields: "Maximum Iterations" with the value "10", "Convergence Threshold" with the value "0.001", "Confidence Interval" with the value "95.0" and a note "(valid entry is between 50-99.9)", and two unchecked checkboxes: "Enable sideshots for relative error ellipses" and "Use Initial Backsight As Reference Azimuth". At the bottom of the dialog are four buttons: "Load", "Save", "OK", and "Cancel".

Least Squares Adjustment Options: These two options are describe here.

Maximum Iterations: Number of iterations allowed for convergence. Select how many places you want to see after the decimal.

Convergence Threshold: Stop when the corrections to the adjustment are less than this value. Select how many places you want to see after the decimal.

Enable sideshots for relative error ellipses: Check box for sideshot relative error ellipses.

Use Initial Backsight As Reference Azimuth: Reported directions can be output in Bearing or Azimuth.

Coordinate Interval: Reported coordinates can be output in either North-East or East-North.

Output Options

The image shows a software dialog box titled "Network Least-Squares Settings" with a close button (X) in the top right corner. The dialog has six tabs: "Coordinate System", "Input Files", "Preprocessing", "Standard Errors", "Adjustment", and "Output Options". The "Output Options" tab is currently selected. Inside the tab, there are several settings:

- North/East Precision:** A dropdown menu showing "0.00".
- Elevation Precision:** A dropdown menu showing "0.00".
- Distance Precision:** A dropdown menu showing "0.00".
- Direction Precision:** A dropdown menu showing "0.0 sec".
- Direction Format:** A dropdown menu showing "Bearing".
- Coordinate Display:** A dropdown menu showing "North,East".
- Null Elevation:** A text input field containing "-99999999.0".

At the bottom of the dialog, there are four buttons: "Load", "Save", "OK", and "Cancel".

These settings apply to the output of data to the report and coordinate files. If coordinate points already exist in the coordinate file, they will be overwritten and updated with the new coordinate values.

North/East Precision: Select how many places you want to see after the decimal.

Elevation Precision: Select how many places you want to see after the decimal.

Distance Precision: Select how many places you want to see after the decimal.

Direction Precision: Angular output of nearest second, tenth of second, or hundredth of second for directions (Azimuths or Bearings).

Direction Format: Reported directions can be output in Bearing or Azimuth.

Coordinate Display: Reported coordinates can be output in either North-East or East-North.

Null Elevation: Value to be reported for elevations that were not calculated.

Process Network

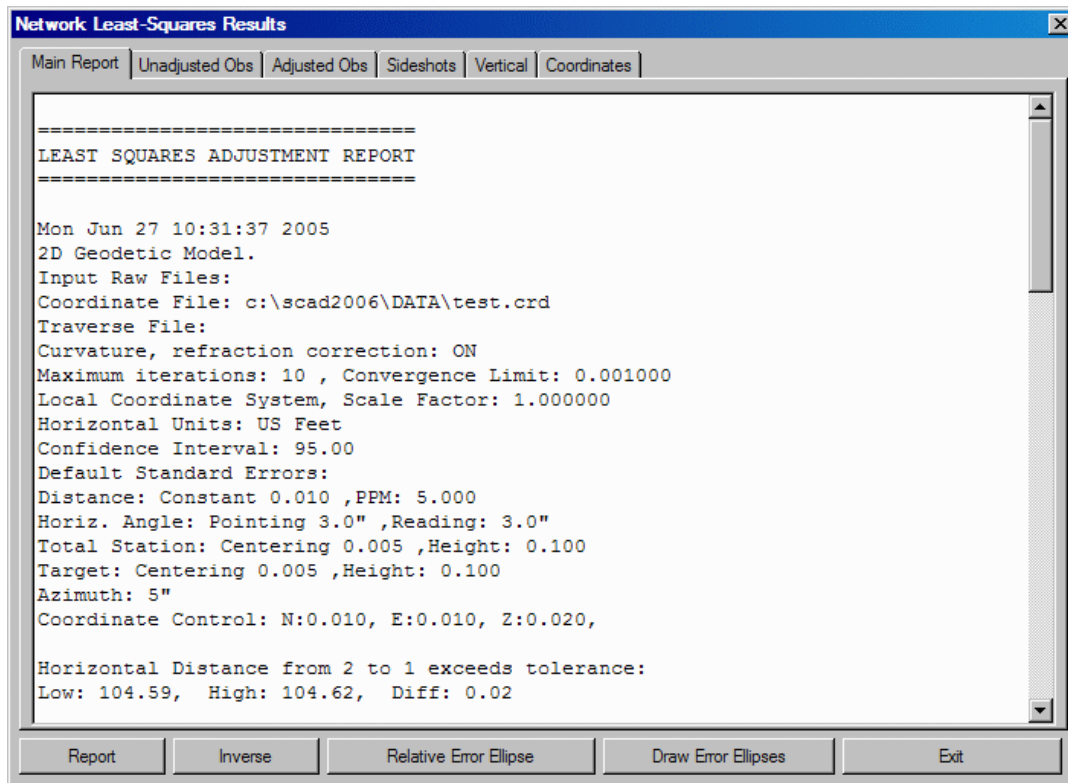
If there is a problem with the reduction, you will be shown error messages that will help you track down the problem. The data is preprocessed to calculate averaged angles and distances for sets of data. For a given setup, all multiple angles and distances to a point will be averaged prior to the adjustment. The standard error as set in the Project Settings dialog box is the standard error for a single measurement. Since the average of multiple measurements is more precise than a single measurement the standard error for the averaged measurement is computed using the standard deviation of the mean formula. During the preprocessing, approximate coordinate values for each point will also be calculated. This saves the user from having to come up with a list of approximate coordinate values prior to processing. Sideshots are separated from the raw data and processed after the adjustment. If the raw data processes properly, a report file will be displayed and the coordinate file will be populated with the adjusted coordinates.

Once you have clicked OK, you will see the full statistical report produced by this routine in its own dialog box. This displayed dialog is titled Network Least Squares Results. It, too, is categorized with the use of six tabs.

Network Least Squares Results dialog

Main Report

The main contain the Least Squares Adjustment Report, the Horizontal Adjustment Report and the Statistics. This last Statistics section displays some statistical measures of the adjustment including the number of iterations needed for the solution to converge, the degrees of freedom of the network, the reference variance, the standard error of unit weight, and the results of a Chi-square test. The degree of freedom is an indication of how many redundant measurements are in the survey. Degree of freedom is defined as the number of measurements in excess of the number of measurements necessary to solve the network. The standard error of unit weight relates to the overall adjustment and not an individual measurement. A value of one (1) indicates that the results of the adjustment are consistent with a priori standard errors. The reference variance is the standard error of unit weight squared. The chi-square test is a test of the "goodness" of fit of the adjustment. It is not an absolute test of the accuracy of the survey. The a priori standard errors, which are defined in the project settings dialog box or with the SE record in the raw data file, are used to determine the weights of the measurements. These standard errors can be thought of as an estimate of how accurately the measurements were made. The Chi-square test only tests whether the results of the adjusted measurements are consistent with the a priori standard errors. Note that if you change the project standard errors and then reprocess the survey, the results of the Chi-square test change.



Unadjusted Observations

This tabbed section lists the reduced and averaged measurements that contribute to the network. When multiple measurements are used, the standard error for the averaged measurement will be computed using the average of the mean formula. There is a list included of the control coordinates used in the network adjustment. These coordinates have been read from the raw data file. Note that the standard errors for the control points are displayed. This section shows the azimuths and azimuth standard errors used in the adjustment. Azimuths can only be defined as a direction record in the raw data file. This section also shows the distances and distance standard errors used in the adjustment.

These distances are horizontal distances derived from all slope distance and vertical angles for that line, including all foresight and backsight distances. The standard error settings used to calculate the final distance standard error include the distance standard error, the PPM standard error, the target centering standard error and the instrument centering standard errors. The techniques and formulas used to calculate the final distance standard error are found in section 6.12 of the textbook "Adjustment Computations, Statistics and Least Squares in Surveying and GIS", by Paul Wolf and Charles Ghilani. You also will see the angles and angle standard errors used in the adjustment. These angles are the averaged angle value for all the multiple angles collected. The standard error settings used to calculate the final angle standard error include: the pointing standard error, the reading standard error, the target centering standard error and the instrument centering standard errors. (For the techniques and formulas used to calculate the final angle standard error, please reference section 6.2 of: Wolf, P.R. and Ghilani, C.D., 1997, "Adjustment Computations: Statistics and Least Squares in Surveying and GIS", Interscience, Third Edition.)

Adjusted Observations

This sections lists the adjusted horizontal distance, horizontal angle, and azimuth measurements. In addition to the adjusted measurement, the residual, standard residual and the standard deviation of the adjusted measurement are displayed. The residual is defined as the difference between the unadjusted measurement and the adjusted measurement. The residual is one of the most useful and intuitive measures displayed in the report. Large residuals in relation to the standards of the survey are indications of problems with the data. The standard residual is the a priori standard error divided by the computed standard deviation of a measurement. A standard residual of one (1) indicates that the adjusted measurement is consistent with the standard errors defined for the measurement. One (or a few) measurements having high standard residuals, in relation to the rest of the standard residuals, may be an indication of an error in the survey. When all standard residuals are consistently large, an inconsistency in the a priori standard errors and the adjustment is likely. In other words, the standard errors defined for the project are too small, in relation to the survey methods used. The standard deviation of the measurement indicates a 68% probability that the adjusted measurement is within (plus or minus) the standard deviation of the measurement's true value.

This tabbed section displays the computed sideshots of the network. Sideshots are filtered out of the network adjustment as part of the preprocessing process. Least squares adjustment requires a lot of computer resources. Sideshots are filtered out to minimize the computer resources needed in a large network adjustment. The sideshots are computed from the final adjusted network points. The results of the sideshot computations are the same whether they are reduced as part of the least squares adjustment or from the final adjusted coordinates.

Vertical

This tabbed portion of the report displays the results of the vertical adjustment. The horizontal and the vertical adjustments are separate least squares adjustment processes. As long as there are redundant vertical measurements the vertical component of the network will be reduced and adjusted using least squares. The first part of the vertical adjustment results displays the fixed vertical benchmarks used in the vertical adjustment. These points are fixed and will not be adjusted vertically. Next, the points that will be adjusted as part of the vertical adjustment are listed. The third part of the vertical adjustment report displays the measurements used. The measurements consist of the vertical elevation difference between points in vertical adjustment. The lengths between these points are used to determine the weights in the vertical adjustment. Longer length lines are weighted less in the vertical adjustment than shorter length lines.

Coordinates

If the adjustment of the network converges, this tabbed section displays a list of the final adjusted coordinates and the computed standard X, Y standard error. The X, Y standard error signifies that there is a 68% probability that the adjusted X, Y is within plus or minus the standard error of the X, Y of its true value. This section displays the error ellipses for the adjusted coordinates. The error ellipse is a truer representation of the error of the point than the X, Y standard error. The error ellipses are calculated to a 95% confidence interval. The error ellipse axis is larger than the X, Y standard errors because the error ellipses in this report are calculated at a 95% probability level. The maximum error axis direction is along the axis of the semi-major axis. The direction of the minimum error axis direction is along the semi-minor axis and is perpendicular to the semi-major axis. If a point is located from a variety of stations,

you will see the error ellipse approach a circle, which is the strongest geometric shape.

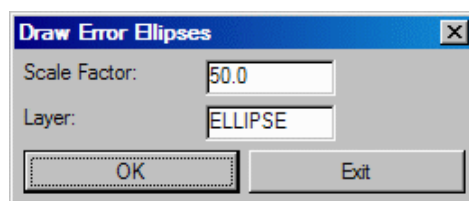
The following four buttons are located at the bottom of the Network Least Squares Results dialog box.

Report: This report information will be shown in a Standard Report Viewer so that you can analyze the data. Select the Printer icon if you want a hard copy. The first section of the report displays the primary settings used when the project was adjusted. The second section of the report displays warning and error messages generated during the preprocessing of the raw data. The primary messages displayed will be warnings when multiple angles, horizontal distances, and vertical differences exceed the tolerance settings as set in the project settings. The low and high measurement and the difference are displayed.

Inverse: The Inverse button is only active after a network has been processed successfully. Inverse can be used to obtain the bearing and distance between any two points in the network. Additionally, the standard deviation of the bearing and distance between the two points is displayed. This information can be used to determine the relative precision between any two points in the network. If you need to certify the Positional Tolerances of your monuments, per the ALTA Standards, use this function to determine these values (e.g. if you must certify that all monuments have a positional tolerance of no more than 0.07 feet, inverse between the monuments in as many combinations as you deem necessary, and make note of the standard deviations of the distances. If none of them are larger than 0.07 feet, you have met the standards).

Relative Error Ellipse: Reports the relative error ellipse from one point to another.

Draw Error Ellipses: Draws the error ellipse from one point to another.



Exit: Ends your session in the Network Least Squares Settings dialog and brings you back to the Raw Editor.

Pulldown Menu Location: Tools in COGO & Design

Keyboard Command: rawedit

File Name: \lsp\rawedit.arx

Field to Finish

Function

This command turns data collector field notes into a final drawing by matching the descriptions of the field points with user-defined codes. The points are brought into the drawing with attributes defined by the code including layer, symbol, size, linetype, etc. Field to Finish replaces PointCAD. Field to Finish uses an improved coding method but still handles the PointCAD method which should make switching to Field to Finish easier for PointCAD users.

Two files are used in Field to Finish - a data file and a code file. The data file consists of x,y,z points with text description fields. The description fields contain codes for the Field to Finish processing. The data file can be either a Carlson coordinate (.CRD) file or an ASCII file. Alternately, C&G CRD & CGC files, LandDesktop MDB files or Simplicity Systems ZAK files can be used in place of the Carlson CRD file. The code file defines the layer, symbol, size and other actions to apply with each code. These file names are displayed at the top line of the Field to Finish dialog box.

Field to Finish can translate the field points into Carlson points with a symbol, layer, and size defined by the code. The point settings of whether to label the description, point number, and elevation and whether to locate the point at zero or at the real Z are defined in the Point Defaults routine under the Points menu. The *Draw-Locate Points* command provides a simpler method for drawing points compared with *Field to Finish*.

There are two different methods for connecting linework. One method creates line work by connecting points with the same code. The linetype is defined by the code as either points only (no line work), lines, 2D polylines, or 3D polylines (breaklines). Distinct lines with the same code are defined by adding a group number to the end of the code name in the data file. With this method, all points with the description CODE1 will be one line while points with CODE2 will be another line. Both CODE1 and CODE2 use the definition for CODE. For example, the code EP could be a code for edge of pavement that is to be connected as 3D polylines. If there are two separate edge of pavement lines on the left and right sides of a road, all the points for the left side could have the description EP1 and the points on the right side could be EP2.

The second method is the PointCAD format. This method also connects points with the same code. The difference is that instead of using a number after the code for distinct lines, you use the same code with an additional code for starting and ending the line. For example, +0 is used to start a line and -0 to end. So the coding for a segment of edge of pavement could be EP+0, EP, EP, EP-0. Another special code that has been added to Field to Finish is +7, -7. This 7 code will use the linetype definition of line, 2D polyline or 3D polyline defined by the Field to Finish code. For example, if EP is defined as a 3D polyline, then the coding EP+7, EP, EP, EP-7 will create a 3D polyline. Otherwise codes like +0, -0, which is defined as start and end line, will draw EP as a line.

The advantage to the PointCAD method is that you don't have to keep track of line numbers. For example, if you are surveying 50 curb lines, the first method would require you to use 50 distinct curb numbers. The advantage to the first method is that you don't have to use the start and end codes. Also the Nearest Found connection option applies to the first method.

The main Field to Finish dialog box allows you to load the data and code files, view and edit the code definitions, and then process the files. The top section displays the code definitions. The bottom section has three columns of functions each pertaining to controls for different elements of the command. The **Code Table** section provides controls for settings, sorting and reporting of codes. The **Code Definitions** section provides tools for the creation and editing of codes. The **Coordinate File** section provides controls for coordinate files and points. It also contains the Draw controls which starts the processing of the data using field to finish.

Field to Finish

DATA: C:\Sc2k6ac2k6\Data\Drawing1.crd. CODE: C:\Sc2k6ac2k6\Data\Survadd.fld

CODE	FULL NAME	DESC	SYMBOL	LINETYPE	ENTITY	TIE	LAYER	ON/OFF
---> SET CONTROL <---								
HUB	HUB & TACK	H&T SET	spt8	continuous	Line	Open	TRAVERSE	On
IPS	IRON PIN	S IP SET	spt5	continuous	Line	Open	TRAVERSE	On
MONS	MONUMENT	S MON SET	spt13	continuous	Line	Open	TRAVERSE	On
CM	CONCRETE	M CONCRET	SPT6	CONTINUOUS	Point	Open	MONUMENT	On
PK	PK NAIL	SE PK SET	spt3	continuous	Line	Open	TRAVERSE	On
START	START	START	spt46	BYLAYER	Point	Open	CONTROL	On
STK	STAKE	STK	spt31	continuous	Line	Open	TRAVERSE	On
RD	Road				Sequence			
XC	CROSS CUT	X-CUT	spt10	BYLAYER	Point	Open	CONTROL	On
---> MOUNMENTS <---								

Code Table

Code Table Settings...

Sort Table...

Report Codes/Points...

Code Table by CRD...

Save Save As

Code Definitions

Edit...

Select All

Add... Copy...

Cut Paste

Search...

Coordinate File

Set CRD File...

Edit Points...

Draw...

Exit Help

Code Table

Code Table Settings: These options provide tools for defining the coding method to be used for processing of the point data. Various import tools allow for the importing of codes from different software packages. Controls for handling multiple codes are located on this dialog. All special codes can be replaced to other characters defined by the user. The special codes are listed and edited on this dialog.

Code Table Settings

Select Code File: C:\sc2k6ac2k6\DATA\survadd.fld

☒ Process Carlson Coding
 ☐ Process Eagle Point Coding
 ☐ Process CAICE Coding

☐ Draw Field Codes Without a Suffix as Points Only
 ☐ Use Multiple Codes for Linework Only

☐ All
 ☐ None
 ☒ Prompt

Max Delta-Height for Linework: 1000.00
 Max Length for Linework: 5000.00

Special Codes

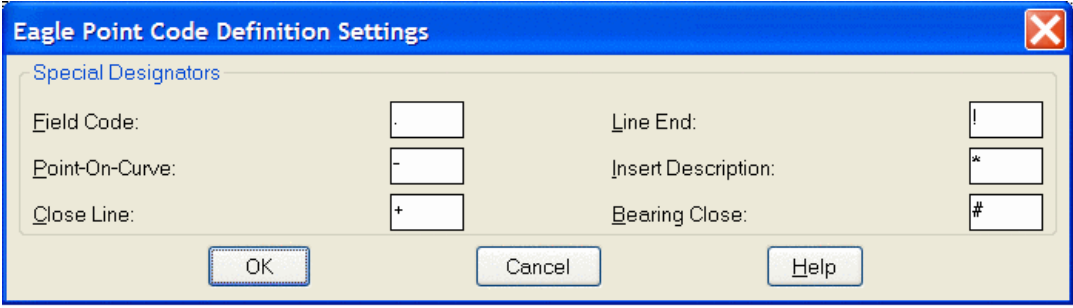
For * Character:	*	For + Character:	+
For - Character:	-	For / Character:	/
For NE Code (No Elevation):	NE	For _ Character (Underscore):	_
For OH Code (Offset Horiz):	OH	For OV Code (Offset Vertical):	OV
For JOG code:	JOG	For JPN Code (Join to Point Name):	JPN
For SZ Code (Symbol Size):	SZ	For SMO Code (Smooth):	SMO
For ROT Code (Rotate):	ROT		
For CLO Code (Close):	CLO	For RECT Code (Close Rectangular):	RECT
For AZI Code (Azimuth):	AZI	For DIST Code (Distance):	DIST
For PC Code (Start Curve):	PC	For PT Code (End Curve):	PT
For +Z Code (Start Linework):	+Z	For -Z Code (End Linework):	-Z
For Multi-Point 2ND Code:	2ND	For Multi-Point 3RD Code:	3RD

OK Cancel Help

Select: Choose this button to specify a new code table. The name of the current table is shown in the field to the right of this button.

Process Carlson Coding: When checked, this option interprets and processes coordinate files based upon the Carlson Coding method and data collection method.

Process Eagle Point Coding: When checked, this option allows the user to switch from interpreting coordinate files based on the Carlson Coding method to interpreting coordinate files where the field coding was entered using the Eagle Point Data Collection method. When selected the **Eagle Point Codes** button becomes available for selection and displays the following dialog. This dialog allows for customization of the eagle point special designators.

The image shows a dialog box titled "Eagle Point Code Definition Settings" with a blue header bar and a close button (X) in the top right corner. The dialog has a tab labeled "Special Designators". Inside the tab, there are six input fields arranged in two columns. The left column contains "Field Code:" with a text box containing a period ".", "Point-On-Curve:" with a text box containing a hyphen "-", and "Close Line:" with a text box containing a plus sign "+". The right column contains "Line End:" with a text box containing the letter "I", "Insert Description:" with a text box containing an asterisk "*", and "Bearing Close:" with a text box containing a hash symbol "#". At the bottom of the dialog, there are three buttons: "OK", "Cancel", and "Help".

Currently the supported designators include, "Line", "Curve", "Close Line", "Stop Line", "Insert Description" and "Bearing Close". Also supported is the ability to recognize overwriting of descriptions just as Eagle Point does by using the space separator instead of the "Insert Description" designator. Examples of supported coding are as follows:

.TC Places a node and or line per the field code library.

TC Places a node and or line per the field code library.

-TC Specifies a point on a curve.

TC- Specifies a point on a curve.

..TC Stops the line.

TC! Stops the line.

.TC+ Closes the line back to the starting point.

TC+ Closes the line back to the starting point.

.TC# Typically coded on the third corner of a rectangle to close the figure with having to locate the fourth corner.

TC# Typically coded on the third corner of a rectangle to close the figure with having to locate the fourth corner.

WV.W1 Places a node as specified by the code "WV" in the field code library and then begins a line as specified by code "W" in the field code library.

.TC.EP.FL Results in three lines coming together.

TC1.TC2.TC3 Results in three lines coming together. All three lines are specified by the definition of the single code "TC" in the field code library.

TC.TC1 When used in conjunction with the "Draw Field Codes Without a Suffix as Points Only" toggle, "TC" will be recognized as the node and "TC1" will be recognized as the line so that if the code "TC" in the field code library is defined as a polyline, line or 3D polyline, duplicate lines will not be unintentionally placed when this shot only pertains to a single element. Keep in mind that all line work must have a numeric suffix when using this toggle.

TREE * OAK Result on screen would be: TREE OAK

TREE OAK * Result on screen would be: OAK TREE

TREE OAK Result on screen would be: OAK

TC1!.TC2-.VLT6# Stops "TC1", continues "TC2" as a point on a curve and closes VLT6 as a rectangle using the "Bearing Close" code.

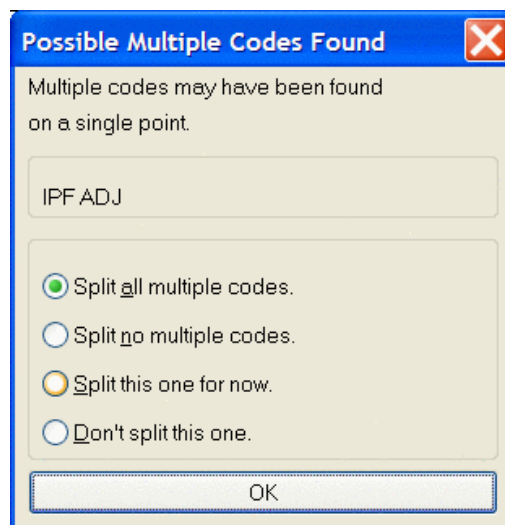
Note: The use of the "Use Multiple Codes for Linework Only" toggle is recommended when using Eagle Point Coding.

Process CAiCE Coding: When checked, this option allows the user to switch from interpreting coordinate files based on the Carlson Coding method to interpreting coordinate files where the field coding was entered using the CAiCE Data Collection method.

Split Multiple Codes

Multiple codes are defined by including each code in the point description field separated by a space. A single data point can be used in different lines by assigning it multiple codes. For instance, a point might be part of both a curb line and a driveway line with a description of "CURB DRW". Field-to-Finish uses spaces as the delimiter for multiple codes. You should avoid spaces in the descriptions except for where multiple codes are intended or after the "/" character. For example, a code for light post should not be "LGT POST" but instead should be "LGTPOST".

There are three options for the handling of multiple codes when encountered. The **All** option will split all multiple codes and process each code based upon their code definition. When **None** is select both codes will be processed based upon their code definition. If the Prompt option is checked on, when Field-to-Finish detects multiple codes on a point the following dialog will be displayed with options for handling the codes.



Import Land Desktop Desc Key: This option imports and converts a Land Desktop Description Key into a Carlson field to finish (fld) code definition file. The Land Desktop Description Key file is a mdb file and is found in the Land Desktop Project file path. It is located in the under the COGO/DescKey directory.

Import TDS Codes: This option imports TDS codes into the Carlson field to finish (fld) code definition file.

Draw Field Codes Without a Suffix as Points Only: This option is useful for when wanting to use a field code sometimes for linework and sometimes for just points but it is preferred to number the lines rather than using start and stop codes. For example, if the field code EP is defined to use the Line Entity type, then EP25 will be drawn as a Line, however if just EP is used, no linework will connect to that COGO point.

Use Multiple Codes for Linework Only: When checked, and multiple codes are detected, only linework will be drawn for the secondary codes. Points are only created based on the primary code. If you want symbols for all multiple codes, then this setting should not be checked.

Max Delta-Height for Linework: Use this option to specify the maximum elevation difference that Field to Finish should draw any section of linework. This option is for use with 3d polylines and lines.

Max Length for Linework: Specify the maximum length that Field to finish should draw any section of linework.

Special Codes: This section allows you to substitute the existing predefined special codes and character suffixes with your own suffixes. Field to Finish recognizes several special code suffixes. A special code is placed after the regular code with a space separating the code and special code suffix. Here is a listing of the default special codes and Characters.

Special Characters

The characters (*, -, +, /, and _) can be used and substituted in Field to Finish. The way these characters are used is that when the file is processed the description field is searched for these characters. If the "+" symbol was changed to "-" then the program would look for "-" and change it to "+". This is useful when a particular data collector may not have all the symbols available. With these substitutions you can make a character that is provided on the data collector generate the symbol needed. Multiple characters can also be used. For example "-" can be used to in order to produce a "/" character or any of the characters listed above.

"/"

Carlson points in the drawing have point attributes including a description. When Field-to-Finish draws the points, the point description from the data file is processed to match a code. The code then defines the description that is drawn with the point. For example, consider a code of "UP" with a description of "POLE" and a data point with the description "UP". The data point description "UP" would be matched with the code "UP" and the point would end up being drawn with the description "POLE". A special character "/" (the divide key) can be used for an unprocessed description to append. Everything after the "/" is added directly to the point description and is not considered a code. For example, a data point with the description "UP / 150" with the same code "UP" definition above would be drawn with the description "POLE 150".

"/"

This special character, causes text after the "/" to be interpreted as a field code. That field code's description is then used as the comment for that COGO point. For example, if TC has the description "top of curve" and EP has the description "edge of pavement", then point # 10: 10 EP//TC will result in the COGO point having the description attribute of "edge of pavement top of curve". If the "/" character has been replaced with a different character, for example with a & character, then the "/" code would become "&&".

Special Codes

PC

This code begins a three point arc. The point with this special code is the first point on the arc. The next point with the code is considered a point on the arc, and third point with the code is the arc endpoint. For example (in point number, X, Y, Z, description format),

10, 500, 500, 0, EP PC - start curve

11, 525, 527, 0, EP - second point on curve

12, 531, 533, 0, EP - end point of curve

PT

This is a special code that can be used with "PC" to define a curve with more than three points. Starting at the point with the "PC", the program will look for a "PT". If the "PT" is found, all the points between the "PC" and "PT" are used for the curve which is drawn as a smoothed polyline that passes through all points and only curves the polyline between points. If no "PT" is found, then the regular three point arc is applied as explained above.

CLO

This code forces the lines drawn between a series of points with the same code to close back to the first point with the same code. For example, shots 1-4 all have the BLD description with the exception of point 4. Its description is BLD CLO. This will force the linework drawn for the BLD code to close back to point 1 which is the first point with the description of BLD.

NE

This code represents no elevation. A point with this special code is located at zero elevation.

OH & OV

The codes "OH" and "OV" stand for offset horizontal and offset vertical. These offset codes apply to 2D and 3D polylines. A single set of offset codes can be used to offset the polyline a set amount. For example,

10, 500, 500, 100, EP OH2.5 OV-.5
11, 525, 527, 101, EP
12, 531, 533, 103, EP

This would create a polyline connecting points 10,11 and 12 and an offset polyline with a 2.5 horizontal and -0.5 vertical offset. The direction of the horizontal offset is determined by the direction of the polyline. A positive horizontal offset goes right from the polyline direction and a negative goes left. The horizontal and vertical offset amounts apply starting at the point with the offset codes until a new offset code or the end of the polyline. Only one horizontal and vertical offset can be applied to 2D polylines. For 3D polylines, multiple offset codes can be used to make a variable offset. For example,

10, 500, 500, 100, EP OH2.5 OV-.5
11, 525, 527, 101, EP OH5.5 OV-.75
12, 531, 533, 103, EP OH7.5

This would offset the first point horizontal 2.5 and vertical -0.5, the second point horizontal 5.5 and vertical -0.75 and the third point horizontal 7.5 and vertical -0.75.

SZ

This code is used to set a different symbol size. The value of the new symbol size is specified after the SZ (example SZ0.2). This value is a size scaler that is multiplied by the current drawing scale to determine the actual drawn size. For example, a drawing scale of 50 and a symbol size scaler of 0.2 would make the drawn symbol size 10. Two dimensional scales can be accomplished by using an 'X' between the horizontal and vertical scales (e.g., "SZ0.2X3.5"). If no number follows the SZ special code, then the next point with the same field code as the current point will be used to determine the scale factor.

ROT

This code is used to set the rotation of the point symbol. If a point number follows the ROT code, then angle from the current point to this point number is used for the rotation. For example, "ROT45" would rotate the symbol towards point number 45. If there is no point number after the ROT code, then the rotation point is the next point number with the same code as the current point. ROT can also be used to rotate towards an angle clockwise from north by using '+' or '-' in front of the number. For example ROT+45 rotates the point symbol to the northeast and ROT-90 rotates the point symbol to the west.

SMO

This code is used to smooth the polyline.

AZI & DIST

The AZI and DIST codes are used together to locate an offset point. The AZI sets the offset azimuth and DIST sets the distance. The values should directly follow the code. For example, AZI25 DIST4.2 would draw the point offset 4.2 at an azimuth of 25 degrees.

JOG

The "JOG" special code allows for additional points to be inserted into the line work at perpendicular offsets. Only offsets should follow the JOG code. Positive numbers indicate a jog to the right and negative numbers indicate a jog to the left. Alternatively, "R#" and "L#" can be used where # is the distance to either the right or the left. For example, "BLDG JOG R5 L12.2 L5 L12.2" or equivalently "BLDG JOG 5 _12.2 _5 _12.2" draws a closed rectangle on the right hand side of an existing line. The offsets are always done in the X-Y plane. If the current line is vertical, an offset to the right is along the positive X-axis.

JPN

The "JPN" (Join to Point Name) special code joins to the point named immediately after the code. For example, "JPN205" causes a line to be drawn from the current point to the point "205".

RECT

The "RECT" special code causes a rectangle to be formed on a 2D or 3D polyline using one of two different methods. If a number follows "RECT" (e.g., "RECT10"), a rectangle will be drawn 10 units to the right of the last two points ending on the point with the "RECT" code. Use a negative offset to place the rectangle on the left side (e.g., "RECT-2.5"). For example if locating the left side of a 10' rectangular concrete pad using the code conc for concrete, the description of the two left points would be (conc) for the first point and (conc rect10) for the second. If no number follows "RECT", then the polyline will be closed by shooting right angles from the first point of the polyline and the current point and creating a new point where those two lines cross. This method requires three points be established on the pad.

For Multi-Point 2ND Code

The "2ND" code is used to specify the second symbol insertion point for a multi-point symbol. Please refer to Symbol Points in the Edit Field Code Definition section below.

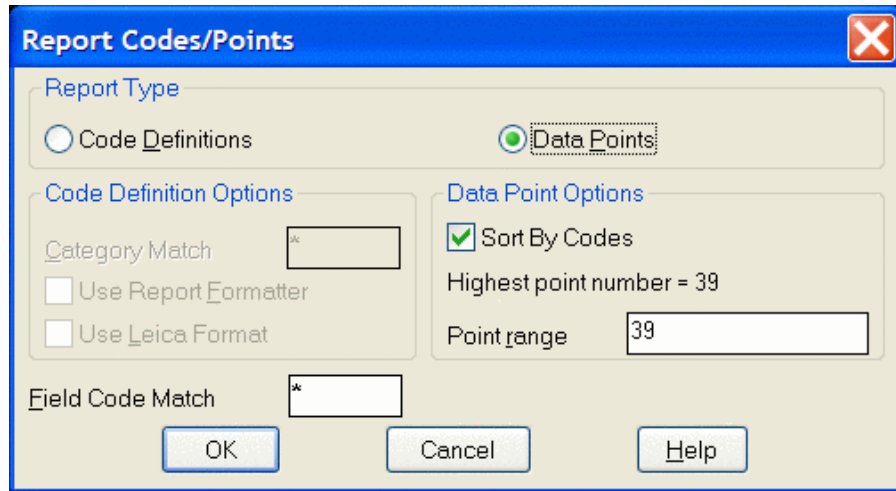
For Multi-Point 3RD Code

The "3RD" code is used to specify the third symbol insertion point and similar to the "2ND" code. Please refer to Symbol Points in the Edit Field Code Definition section below.

All of these special codes can be replaced to use other characters.

Sort Table - This sorts the code table by either code name or layer.

Report Codes/Points - This routine prints the code table or the data file to the screen, file, or printer. A useful option here is to print the data file (CRD Points) and choose Sort by Codes which will group the data points by distinct codes.

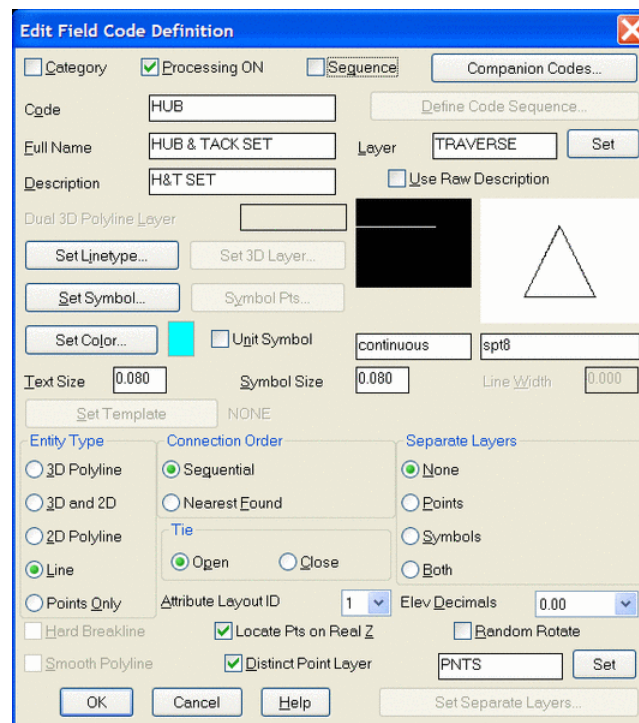


Code Table by CRD - This command will create code table definitions based on the data file field descriptions. This is useful when creating a code table from scratch.

Save: Saves the Field to Finish code list (.FLD) file.

Save As: Reacts the same as Save but allows for specification of file name and location to save to.

Edit: This command opens the Edit Field Code Definition dialog box. The currently highlighted code will be edited.



Field-to-Finish will layerize the points and linework according to the code definitions. If the layers to use are not already defined, Field-to-Finish will create the necessary layers and assign different colors. To have the same colors for these layers in all your drawings, define the layers in the prototype drawing. The prototype drawing is the default drawing that is loaded whenever a new drawing is created. To define layers in the prototype drawing, save your current drawing and then start a new drawing with the New command. Don't give the new drawing a name, just click OK. Then define the layers as desired with the *Layer* command. When you are done creating layers, use the Save As command and change to Drawing Template (.DWT) under Save as Type. In Carlson Survey, the default drawing

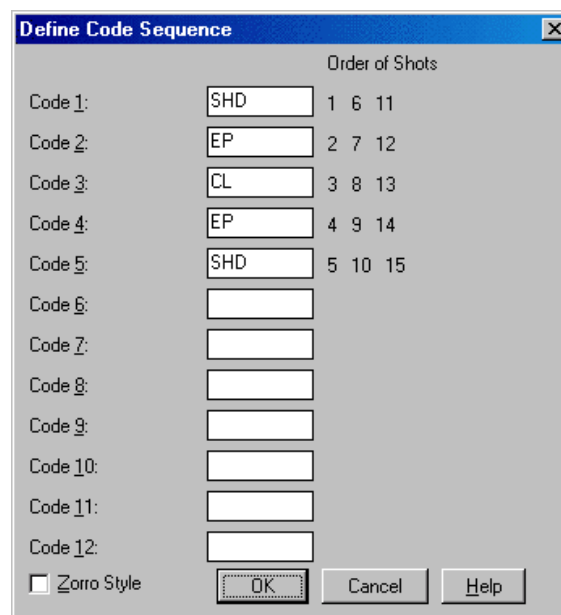
template that is used is named survey.dwt. You can overwrite this default template or make a new drawing template. If you make a new one, you may want to edit the Carlson Survey icon to use the new one. To edit the icon, highlight the icon with one click and then click the right mouse button. Choose Properties and then Shortcut and change the drawing template name.

Category: This is an optional field that can be used to help organize your codes. A category is not used for processing and only is useful in viewing and printing.

Processing ON: This toggle controls whether this code will be processed.

Sequence: This specifies a sequence type code. Sequences are a way to simplify field entry of a sequence of codes. For example, a road cross-section could be SHD1 EP1 CL EP2 SHD2. Instead of entering these different descriptions, one sequence definition can store these descriptions in order. Then just the sequence code (such as RD) is used in the field. The cross-section can be shot in left to right then left right order, right to left then right to left order, or alternating left to right then right to left order. The alternating method is known as the Zorro style. The one restriction is that the shots always start from a right or left edge.

To set up a sequence, choose the Sequence toggle in the Edit Code dialog. Then pick the Define Code Sequence button. This brings up a dialog for entering the sequence codes in order. These sequence codes should be defined as normal codes somewhere else in the Field to Finish code table (ie SHD as a 3D polyline). In the field, the one template code is used for all the cross-sections shots (ie RD for all the points). Then Field to Finish will substitute this template code with the sequence codes (ie substitute RD with SHD).

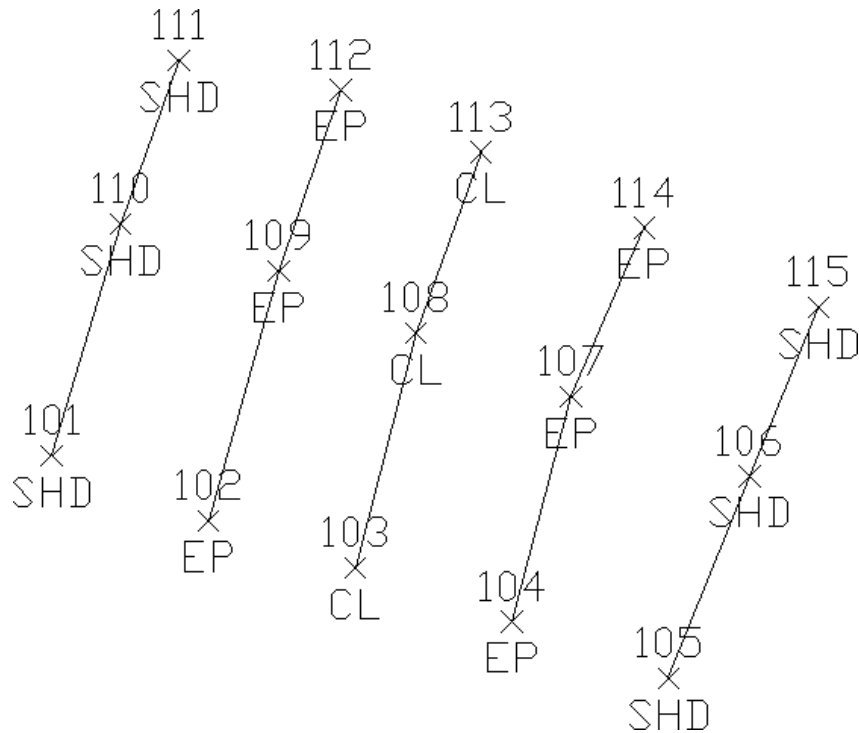


The 'Define Code Sequence' dialog box is used to define a sequence of codes for field entry. It features a table with columns for 'Code' and 'Order of Shots'. The 'Order of Shots' column is divided into three sub-columns: 1, 6, 11; 2, 7, 12; and 3, 8, 13. The dialog also includes a 'Zorro Style' checkbox and 'OK', 'Cancel', and 'Help' buttons.

Code	Order of Shots
Code 1: SHD	1 6 11
Code 2: EP	2 7 12
Code 3: CL	3 8 13
Code 4: EP	4 9 14
Code 5: SHD	5 10 15
Code 6:	
Code 7:	
Code 8:	
Code 9:	
Code 10:	
Code 11:	
Code 12:	

☐ Zorro Style

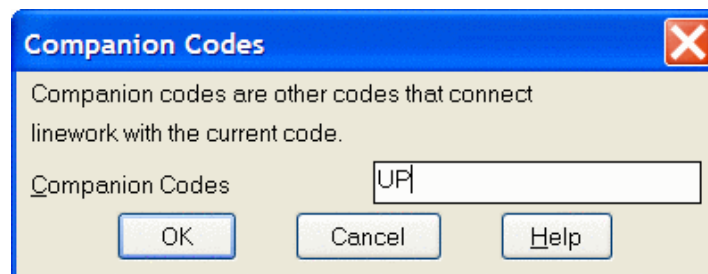
OK Cancel Help



Resulting points and linework showing Zorro style template

Define Code Sequence: This sets the code names that make up the sequence.

Companion Codes: This option allows different codes to connect when defined as line, polyline or 3d polyline. For example, a main line power pole code may be defined as PP while a service utility pole may be defined as UP. When processing field to finish, it may be desired to connect all PP and UP codes together. This could be accomplished by defining a companion for UP as PP and a companion code for PP as UP. Each code needs to reference the other as a companion code.



Code: This is the key name that identifies the code and is matched with the field data descriptions. It is important to note that the * character, used in this field, is regarded as a wildcard or "match anything" code. For example, a field code definition with the code defined as TREE* will be used for any raw description of TREE. Raw descriptions of TREEA, TREE12, TREE, etc. will match the TREE code definition. This will always be the case unless there is a more specific code is found. For example is there was a code TREEA in the code definition file, then that code would be used instead of the TREE code.

Full Name: This is an optional field that describes the code for viewing.

Layer: The point and line work for the code will be created in this layer.

Description: This value is assigned to the point description attribute when drawn to the display screen. This description can be different than the field description. An additional description can be added to a point by entering it after a forward slash in the data description field.

Use Raw Description: This option turns off the Description field described above. Instead the points will be drawn with their original unprocessed descriptions.

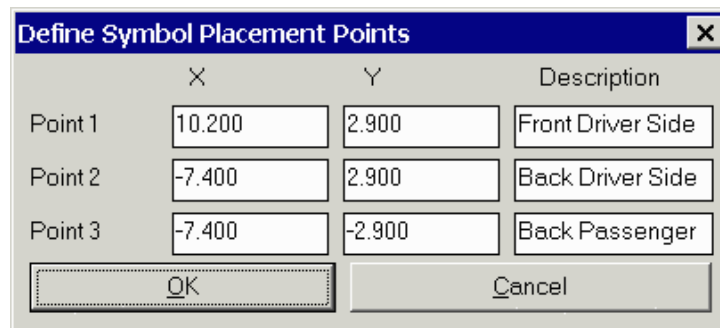
Dual 3D Polyline Layer: Displays the layer that the 3d polyline will draw on when using an Entity Type of 3D and 2D. The layer name can be typed in this field.

Set 3D Layer: Sets the layer that the 3d polyline will draw on when using an Entity Type of 3D and 2D. The layer can be selected from the list or typed in at the bottom of the dialog box.

Set Linetype: Line work can be drawn in any of the special linetypes or with the linetype for the layer ("BY-LAYER"). The spacing and size of the special linetypes is determined by the LTSCALE system variable and by the linetype settings from the *Annotate Defaults* command. The special linetype "hedge" is drawn with a user specified width. The special linetype "userdash" is drawn with user specified distances for the length of the dash and the length of the gap between dashes. You will be prompted for this information when you select that linetype.

Set Symbol: This is the point symbol for the code. To avoid drawing a symbol, use the Carlson symbol named SPT0.

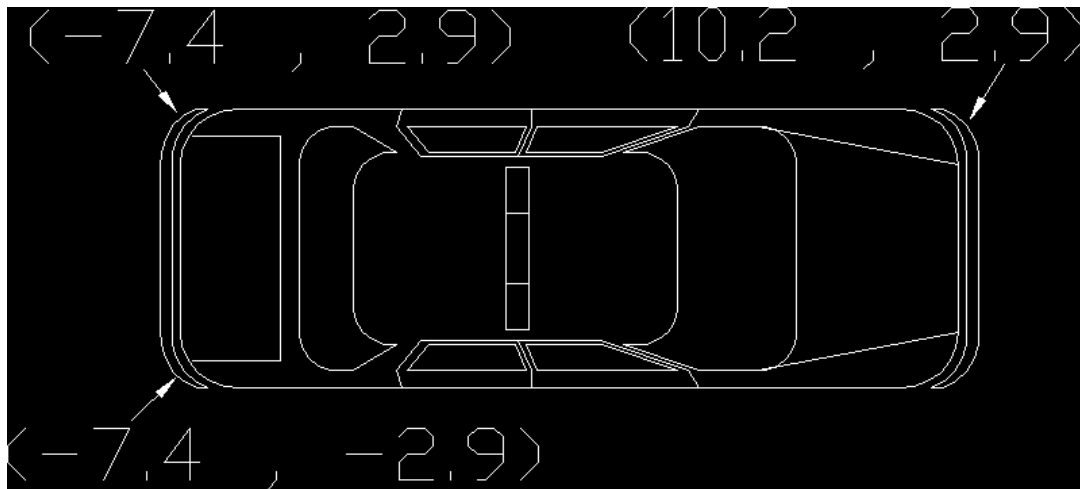
Symbol Pts: For each code definition, the symbol insertion points can be defined with up to three points. To define the symbol insertion points, choose the Symbol Pts button in the Edit Code Definition dialog box. By default, the symbol insertion is defined by one point at the symbol center (0,0). A one point insertion definition can be used to insert a symbol offset from the center. With a two insertion point definitions, the program will rotate and scale the symbol. For example, two insertion points can be used to insert a tree symbol to size the tree, where the first point is for the tree center and the second is for the drip line. With three insertion point definitions, the program will rotate and scale the symbol in both X and Y. For example, three points can be used to insert a car symbol with the first point being the front drivers side, the second point as the back driver side (to rotate and scale the length) and the third as the back passenger side (to scale the width). Besides the insertion point coordinates, you can define a description for each point which is used for the drawn point description and is used for prompting in the Insert Multi-Point Symbol command and in Carlson Field data collection.



The dialog box titled "Define Symbol Placement Points" contains a table with three columns: X, Y, and Description. It lists three points with their respective coordinates and descriptions. At the bottom, there are "OK" and "Cancel" buttons.

	X	Y	Description
Point 1	10.200	2.900	Front Driver Side
Point 2	-7.400	2.900	Back Driver Side
Point 3	-7.400	-2.900	Back Passenger

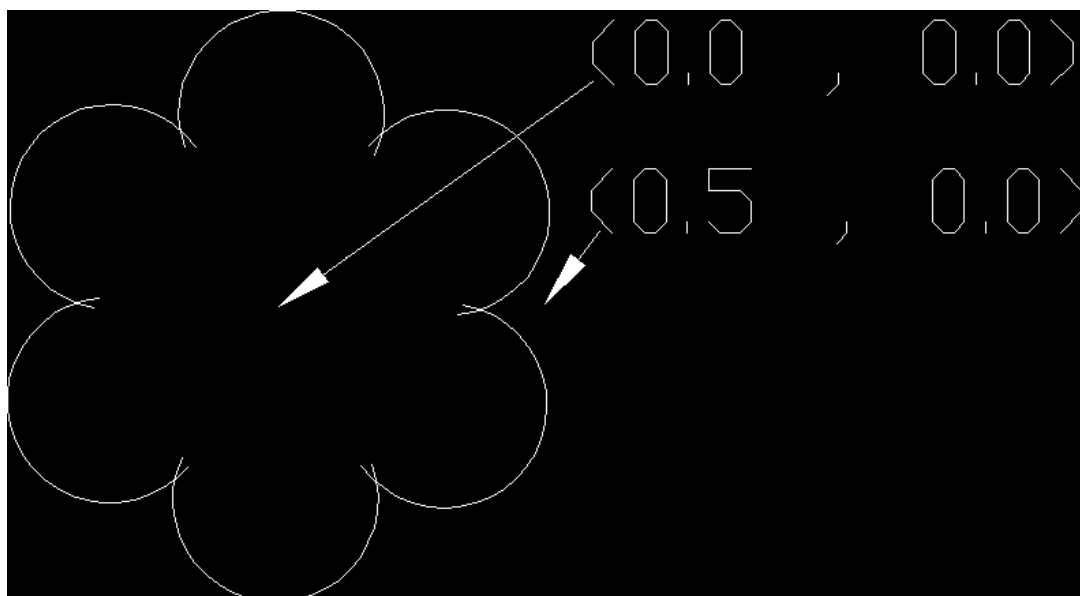
OK Cancel



Three Point Symbol Drawing

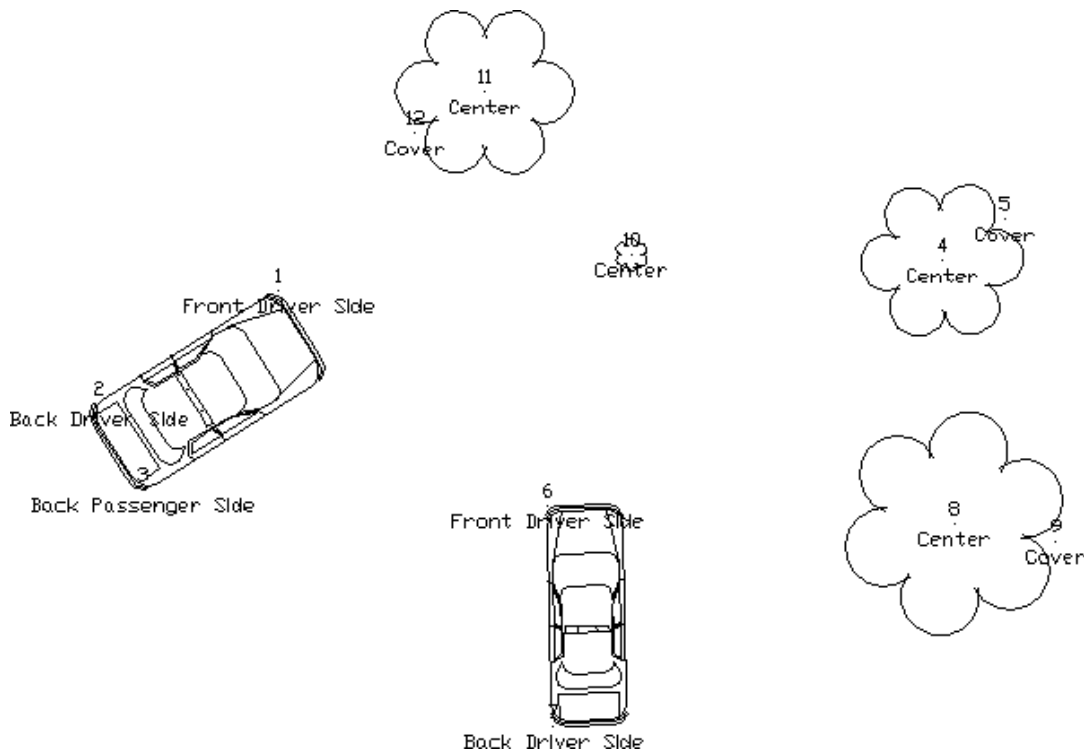
The coordinates for the insertion point definitions are for the symbol at unit size. To figure these coordinates, you will need to open the symbol drawing (.DWG) file. By default, the symbols are located in the Carlson Survey SUP directory. For example to make an insertion point for the tree drip line, open the tree symbol drawing and find the coordinate at the edge of the tree symbol (in this case 0.5,0.0).

Define Symbol Placement Points			
	X	Y	Description
Point 1	0.000	0.000	Center
Point 2	0.500	0.000	Drip/Cover
Point 3			
OK		Cancel	



Two Point Symbol Drawing

Not all of the symbol insertion points need to be used when drawing the points. If a code definition has a three insertion points, it is possible to use just the first two or first one. There are special codes to associate multiple points to the same symbol. The first code point is used as the first symbol insertion point. The "2ND" code is used to specify the second symbol insertion point. A point number can follow the "2ND" to identify a specific point. Otherwise without the point number, the program will use the next point with the current code. The "3RD" code is used to specify the third symbol insertion point and similar to the "2ND" code, a point number after the "3RD" is optional. The "2ND" and "3RD" codes should be assigned to the first point. For example, consider a code of "CAR" with a three point symbol insertion definition. If point #1 has a description of "CAR 2ND 3RD", then point #1 will be used as the first symbol insertion point and the next two points with the "CAR" description will be used as the second and third symbol insertion points.



Multi Point Symbol Drawing

Set Color: The line work will be drawn in this color. The default is BYLAYER.

Text Size: This is a scalar value that is multiplied by the horizontal scale to obtain the actual size.

Symbol Size: This is a scalar value that is multiplied by the horizontal scale to obtain the actual size in the drawing. The horizontal scale can be set in *Drawing Setup*.

Line Width: This controls the width for the linework. Only applies to 2D polylines.

Unit Symbol: This option will draw the point symbol at unit (1:1) scale. For example, this option could be used for a symbol that is already drawn to actual dimensions such as a car symbol.

Set Template: For 3D polyline codes, this option allows you to assign a template (.TPL) file to the code. The code points act as the centerline for the template and the program will draw parallel 3D polylines for each break point (grade ID) in the template. The template file is defined in the Section-Profile module.

Entity Type: This defines the line entity to be created. Points only does not create any line work. 3D Polyline can be used for breaklines. 3D and 2D entity type selection creates a 3d polyline in the layer specified in the Dual 3d polyline layer setting and a 2d polyline in the layer identified in the Layer setting. Since 3d polylines do not display linetypes, this is useful when needing linework in 3d for design work while also needing to display linetypes for final plotting of the drawing. This provides an easy and quick way to turn off all 2d polylines or all 3d polylines by using the layer control dialog or the appropriate toggles in the Draw Points dialog.

Hard Breakline: This will tag the 3D polylines created with this code as hard breaklines. In *Triangulate & Contour*, contours are not smoothed as they cross hard barriers.

Separate Layers: This controls the layers of the point and symbol attributes. With "None" the point layers are the standard layers, "PNTNO", "PNTELEV" and "PNTDESC", and the symbol layer is "PNTMARK". With "Points" or "Both" the point attribute layers begin with the layer for the code followed by the attribute type. For example, the "DWL" code shown in this dialog has a layer name "DRIVEWAY". The point attributes would then be "DRIVEWAYNO", "DRIVEWAYELEV" and "DRIVEWAYDESC". With "Symbols" or "Both" the symbol attribute layer begins with the layer for the code followed by "MARK".

Smooth Polyline: This applies a modified Bezier smoothing to the polyline. The smoothed polyline will pass through all the original points.

Connection Order: The points of a distinct code can be connected in their point number order or by nearest found which makes the line by adding the next closest point.

Tie: When checked the linework drawn with this code will always close. For example if you have points 1, 2, 3, and 4 with the code BLDG and Tie is checked on for the code BLDG, then the linework will be drawn from point 1 to 2 to 3 to 4 and then back to point 1, closing the figure

Elev Decimals: This controls the display precision for the elevation label.

Attribute Layout ID: Controls the location of the point number, elevation and description. These attribute layouts are defined in drawings that are stored in the Carlson Survey SUP directory with the file name of SRVPNO plus the ID number (i.e. SRVPNO1.DWG, SRVPNO2.DWG, etc.). If you want to change the attribute positions for a layout ID, then open and edit the associated SRVPNO drawing.

Locate Pts on Real Z Axis: This option will draw the points at the actual point elevation. Otherwise the points are drawn at zero elevation. For example, you could turn this option off for the FH for fire hydrant code to draw them at zero. Then the GND code could have this option on to draw the ground shots at their elevations.

Random Rotate: This option will randomly rotate the symbol. For example, this option could be used for tree symbols to have the trees drawn in various orientations.

Distinct Point Layer: When this toggle is selected, the line work is created in the layer defined in the Layer field and the points are created in the specified distinct point layer. For example, you could have DRIVEWAY for linework and DRIVEWAY_PNT for the points.

Select All: This option selects all the codes. This can be used when only wanting to process a couple of codes. For example, use the select all option to select all the codes and then turn them off. Now select the codes for processing and turn them on. Also it can be used to make a global change to all the codes.

Add: The new code definition is inserted in the list in the position after the currently selected one. If none are selected for positioning, the new code is placed at the top. Only one code definition may be highlighted before running this routine.

Copy: This option copies the definition of a selected code. It opens the Edit Field Code Definition dialog and copies the definition of the selected code to the appropriate settings. It does not copy the name of the code. It is a time saving tool to use when creating codes that are similar with only a couple of differences.

Cut: This command will remove the highlighted code definitions from the list and puts them in a buffer for retrieval with Paste.

Paste: This command will insert the code definitions put in the buffer by the Cut command. These codes will be inserted after the row of the currently highlighted code or at the top.

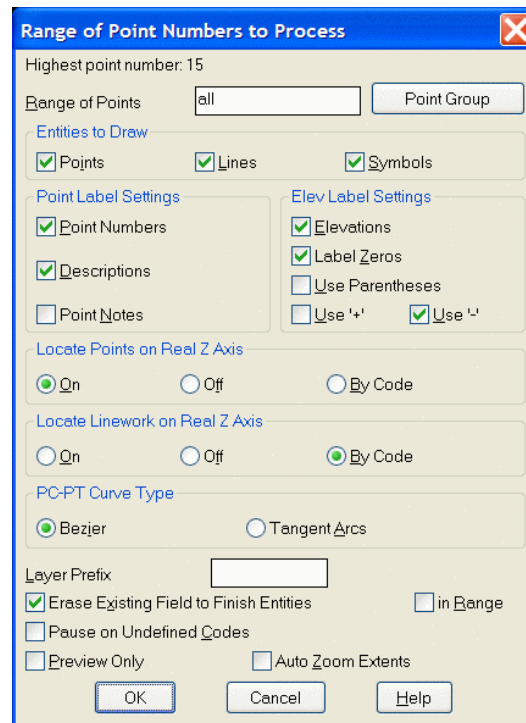
Search: Allows you to search for a specific code in the list.

Coordinate File

Set CRD File: This command allows you to specify a coordinate (.CRD) file to process.

Edit Points: This command opens the *Edit Points* spreadsheet editor. See *Edit Points* for more details.

Draw: This command applies the code table definitions to the data file to create the points and line work.



The dialog box titled "Range of Point Numbers to Process" contains the following settings:

- Highest point number: 15
- Range of Points: all (with a "Point Group" button)
- Entities to Draw: ☒ Points, ☒ Lines, ☒ Symbols
- Point Label Settings: ☒ Point Numbers, ☒ Descriptions, ☐ Point Notes
- Elev Label Settings: ☒ Elevations, ☒ Label Zeros, ☐ Use Parentheses, ☐ Use '+', ☒ Use '-'
- Locate Points on Real Z Axis: ☒ Qn, ☐ Off, ☐ By Code
- Locate Linework on Real Z Axis: ☐ Qn, ☐ Off, ☒ By Code
- PC-PT Curve Type: ☒ Bezier, ☐ Tangent Arcs
- Layer Prefix: (empty text box)
- ☒ Erase Existing Field to Finish Entities, ☐ in Range
- ☐ Pause on Undefined Codes
- ☐ Preview Only, ☐ Auto Zoom Extents
- Buttons: OK, Cancel, Help

Range of Points: Specify the range of points to draw.

Point Group: Specify the point group(s) to process.

Entities To Draw: The Points option draws only the points and point attributes. The Lines option draws only the linework and the Symbols draws only the symbols. Any combination of these options can be processed as well as individual processing of each entity.

Point Label Settings: Specify whether you want Field to Finish to label the Point Numbers, Descriptions, and/or Points Notes which are contained in the note (.NOT) file that is associated with the coordinate (.CRD) file.

Elev Label Settings: Specify the elevation labeling options. The Label Zeros option will label the elevations of points with z=0. Use Parentheses will place parenthesis around the elevation text. Use '+' and Use '-' will place the appropriate symbol in front of the elevation.

Locate Points on Real Z Axis: Choose between locating all the points at real Z elevation, all at zero elevation or to use the real Z setting as defined in the individual codes.

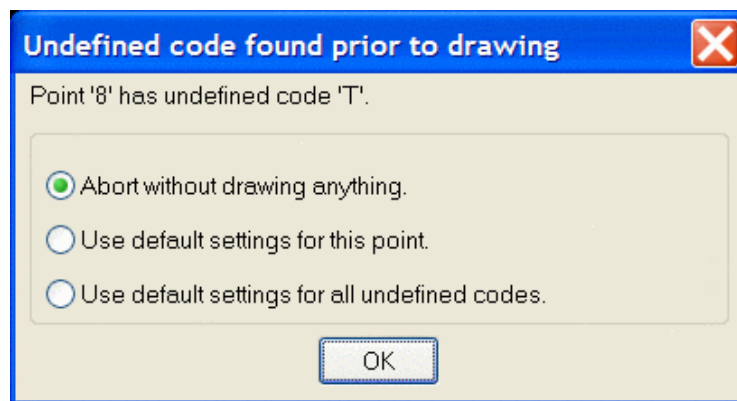
PC-PT Curve Type: Sets the method for drawing curves with more than 3 points. The Bezier option draws a smooth polyline through all the curve points. The Tangent Arcs method draws multiple arcs with arc end points at each of the curve points. These arcs are tangent to the preceding line segment.

Layer Prefix: Optional layer prefix added to all entities drawn with Field to Finish.

Erase Existing Field to Finish Entities: When checked, this option will erase from the drawing any old entities created by previous Field-To-Finish runs before drawing the new entities.

In Range: This option only erases and redraws those field to finish entities that are within the specified range of points to process.

Pause on Undefined Codes: When checked, Field to Finish will pause if it encounters a description that is not defined in the code table.



Abort without drawing anything: This stops the command. Run Field to Finish again to correct the code table.

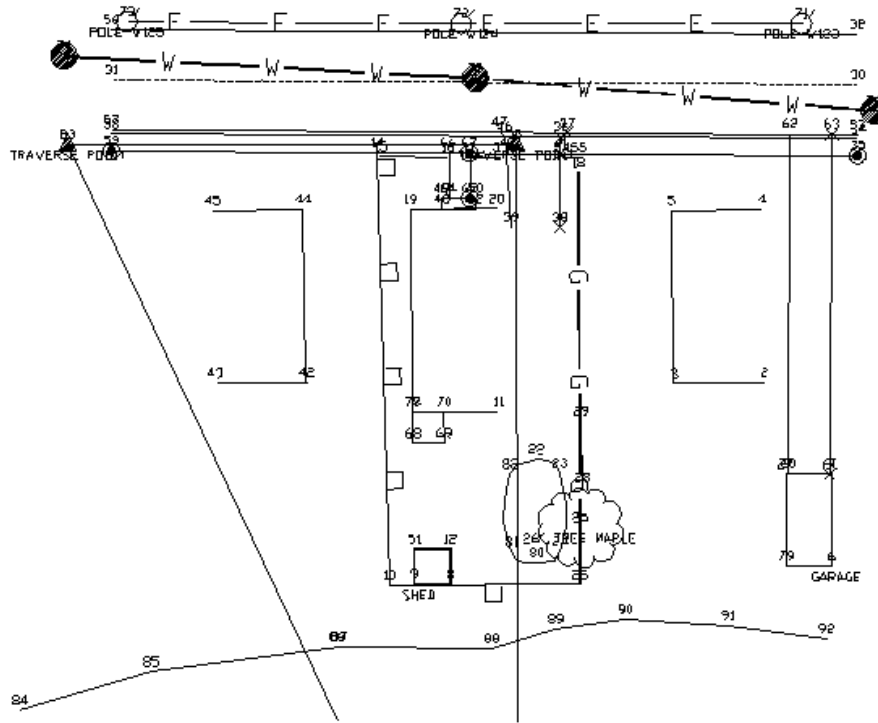
Use the default settings for this point: This option draws a point in the "MISC" layer with no linework. To set your own default, define a code called "SC_DFLT".

Use default settings for all undefined codes: This option will draw all undefined codes in the "MISC" layer by default or a user specified layer as defined in the "SC_DFLT" code. A good way to check the data file for unmatched descriptions is to use the Print Table command and choose the Data Points and Distinct Code options. This command will print the different codes in the data file and identify any undefined codes.

Draw (continued)

Preview Only: When checked, this option will temporarily draw the points and linework and allow you to review it with zoom and pan.

Auto Zoom Extents: When checked, this will force a zoom extents after Field to Finish is done.



Example drawing results using the example points and example code definitions

Pulldown Menu Location: Tools

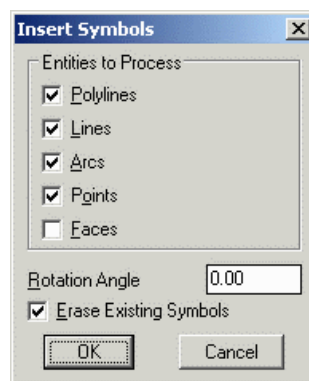
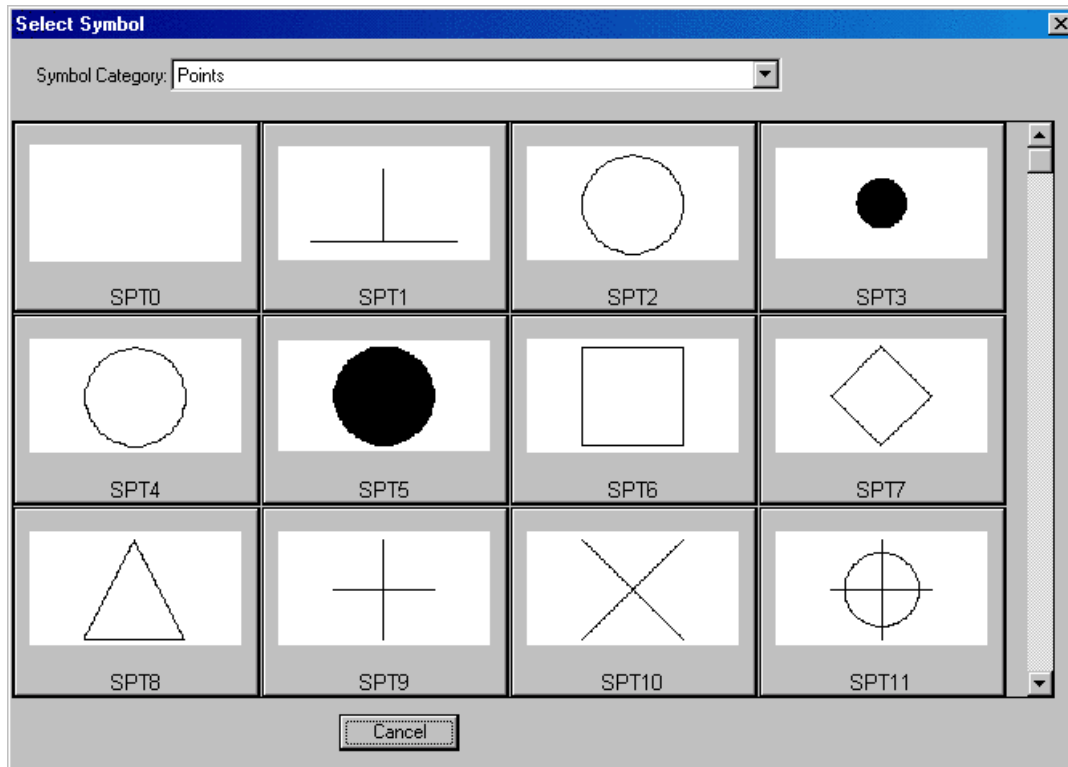
Keyboard Command: fld2fin

Prerequisite: A data file of points with descriptions

Insert Symbols

Function

This command inserts symbols from the symbol library into the drawing. The symbol library may be edited using the *Edit Symbol Library* command. The locations for the symbols can be specified by picking points, specifying point numbers in the current coordinate (.CRD) file or by entering the northing and easting. If you specify a point number, and that point number already has a symbol on it, you will be prompted whether or not to replace the existing symbol. Selecting the Enter coords option allows you to insert the symbol by entering a northing, easting and elevation. Using the Select entities option, symbols can also be placed on arcs, faces, points, text, lines and polylines. Under the Options command, you can turn prompting for rotation on or off. With rotation off, the symbol will be inserted horizontal to the current twist screen. Choose a symbol from the Select Symbol dialog by clicking on it. The Symbol Category choices are Points, Trees and Map Symbols. You may select a category by choosing the Symbol Category drop down list. Within each category, use the scroll bar to view all of the symbols.



Prompts

Layer name for symbols <PNTS>: *press Enter*

Symbol Size <4.0>: *press Enter*

Options/Select entities/Enter coords/<Pick point or point numbers>: *pick a point*

Options/Select entities/Enter coords/<Pick point or point numbers>: *5-10 Inserts symbols at points 5-10 from the current coordinate file.*

Options/Select entities/Enter coords/<Pick point or point numbers>: *S*

Insert Symbols dialog

Select arcs, faces, points, text, lines and polylines. *select objects*

Options/Select entities/Enter coords/<Pick point or point numbers>: *press Enter to end*

Pulldown Menu Location: Tools

Keyboard Command: ptsym

Prerequisite: None

Insert Multi-Point Symbols

Function

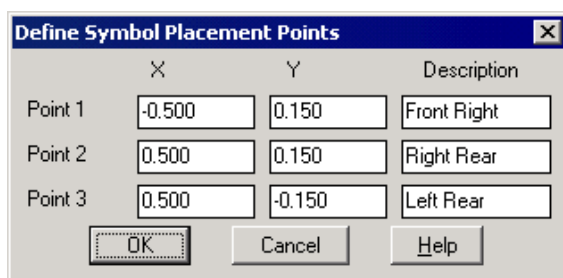
This command allows you to locate symbols using multiple insertion points. Up to three insertion points can be defined for an individual symbol. When defining only two insertion points for a particular symbol, the symbol will be scaled and rotated. With three insertion points defined, the symbol is rotated and scaled in both the X and Y directions. The two point insertion definition will aid with the drawing of tree symbols with a specific drip line width. For instance a surveyor could locate the tree and then locate the drip line, two shots for each tree, and allow the program to size the tree symbol accordingly so that the map will have various tree symbol sizes that reflect the actual field conditions.

The multiple insertion points are defined in the Field to Finish codes. The Insert Multi-Point Symbol command reads the Field to Finish code table and finds all the codes with multi-point symbol definitions. Then you can select from these codes for the symbol to draw. Both the two and three point insertion definitions, can aid with the insertion of concrete pads and buildings symbols during final drawing preparations and design phases of a project.

Here are the various steps to define two point and three point insertion point symbols. First you must decide on the symbol to use for the desired code as well as the specific placement points for the symbol. Once a symbol has been chosen, open the desired symbol drawing. To do this, identify the symbol name and then locate the symbol by its drawing name under the SUP sub-directory found under the Carlson Survey installation directory. Next determine the placement points for the symbol. As shown below, the placement points for the BLD code symbol, which will be explored later in this section, were determined by identifying X and Y values of the desired placement points by using the id command and specifying the end points of the lines.

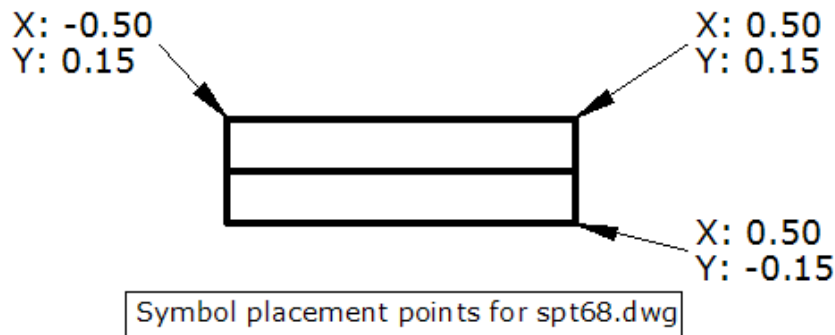
Next the symbol insertion points must be defined in the Field to Finish code table (.FLD) file. To do this open your FLD file by choosing Field to Finish under the Tools pulldown. Then select a particular code from the list of codes displayed in the Field to Finish dialog box to edit by highlighting the code and picking the Edit button, or define a new code with the New button. This will display the Edit Field Code Definition dialog box (shown on page 261).

In the Edit Code Definition dialog, choose the desired symbol for the code by pressing the Set Symbol button and selecting the desired symbol. Now pick the Symbol Pnts button. This brings up a dialog box to define the symbol insertion points. Let's look at a three point insertion definition for the BLD code symbol. The placement points for this symbol were determined earlier in this example when the symbol drawing was opened.



The dialog box titled "Define Symbol Placement Points" contains a table with three columns: "X", "Y", and "Description". It lists three points for a symbol. At the bottom are "OK", "Cancel", and "Help" buttons.

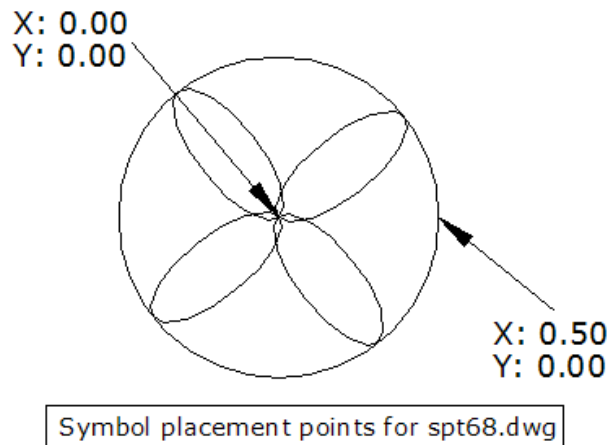
	X	Y	Description
Point 1	-0.500	0.150	Front Right
Point 2	0.500	0.150	Right Rear
Point 3	0.500	-0.150	Left Rear



Enter the X and Y values for each placement point into the appropriate fields. The description fields are used as the prompts when placing the symbol in the drawing. A two insertion point symbol is defined in the same way. Lets look at the Symbol Pnts definition for the code TREE.

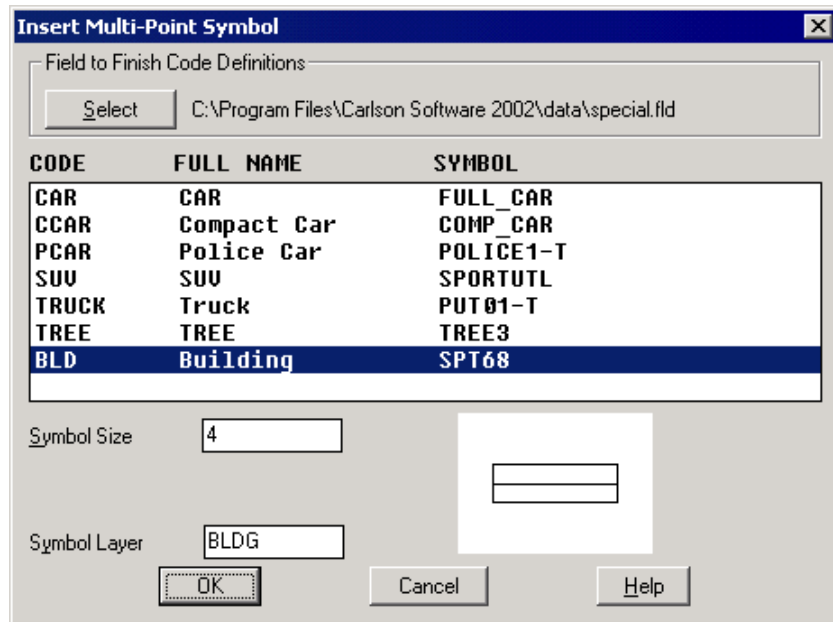
Define Symbol Placement Points			
	X	Y	Description
Point 1	0.0	0.0	Tree
Point 2	0.5	0.0	Drip
Point 3			

OK Cancel Help



The placement points for the Tree code symbol were determined by opening the symbol drawing and finding the X and Y values at the insertion points. The center of the large circle was chosen for Point 1 and the East Quadrant was chosen for point 2. In both cases, Object Snap was used in picking the points.

Now that we have the codes defined, lets go through the Insert Multi-Point Symbol command and see the results. The command starts with a dialog that lists all the codes with Multi-Point Symbols defined. At this point you can select the symbol to draw. The symbol size applies only to using one point to place the symbol. When two or more points are used, the symbol is scaled to fit the points. Lets look at the BLD code three point insertion definition. Shown below are three points that represent a building. In this example, we want the building to be exactly the same dimensions defined by the point locations.



Prompts

Specify Front Right point.

Pick point or point number (Enter to End): **15**

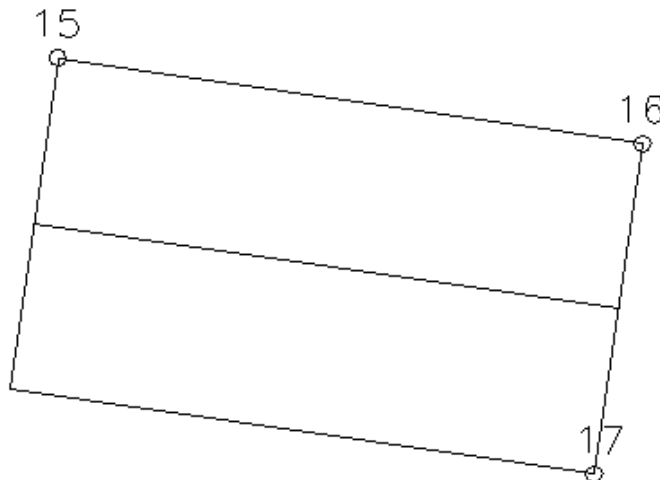
Specify Right Rear point.

Pick point or point number (Enter to End): **16**

Specify Left Rear point.

Pick point or point number (Enter to End): **17**

Insert another BLD symbol [<Yes>/No]? **N**



Pulldown Menu Location: Tools

Keyboard Command: MULTSYM

Prerequisite: Field to Finish file with codes defined with Multi-Point Symbols

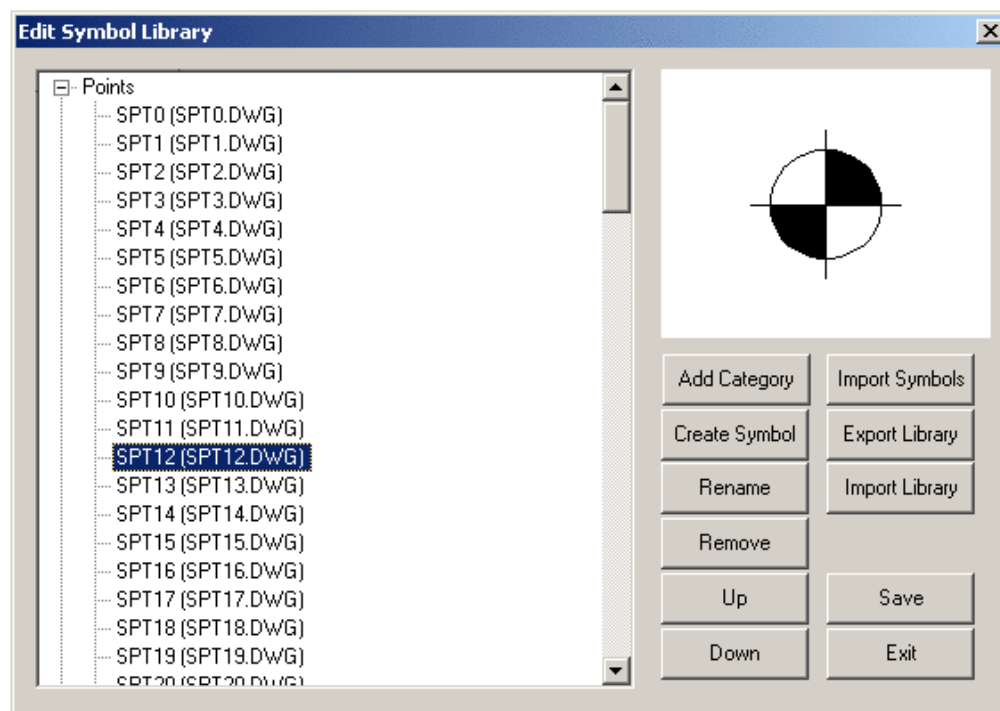
Edit Symbol Library

Function

This command allows you to customize the symbol library. Categories are a way for grouping symbols by type for your own convenience in symbol selection. A new category is added by clicking on the "Add Category" button. An edit field then appears in the tree view on the left and waits for you to enter the category name. The input is finished by pressing the Enter key. The category may be populated by creating a new symbol from selected entities in the drawing, by specifying drawing (.DWG) files, or by moving existing symbols from one category to another.

To create a new symbol, open a drawing which has the entities to be used in the symbol. The symbol should be drawn at unit size (scale 1:1) because Carlson Survey will scale the symbol by the current drawing scale when the symbol is used. Highlight the category for the symbol and click on the "Create Symbol" button. A dialog appears for entering the new symbol name. Next, specify the file name for the symbol. The file name has a .DWG extension and would usually reside in the Carlson Survey SUP directory, but you may use another path. Then the program will prompt you to select the entities from the drawing for the symbol. An insertion point for the symbol must also be picked.

The "Import Symbols" button brings up a file selection dialog which allows you to select multiple files to be added to the current category (to select multiple files use Shift or Control keys along with the mouse). If the files you select are not in the Carlson Survey SUP directory, the program will offer an option of copying them there. There are also Import Library and Export Library buttons.



Add Category: Categories are a way for grouping symbols by type for your own convenience in symbol selection. A new category is added by selecting this button. An edit field then appears in the tree view on the left and waits for you to enter the category name. Pressing the Enter key finishes the input.

Create Symbol: Allows you to select drawing entities to create a new symbol. The symbol should be drawn at unit size (scale 1:1) because Carlson Survey will scale the symbol by the current drawing scale when the symbol is used.

Rename: Select the category or symbol that you want to rename and press this button. By default, the symbol description is the same as file name.

Remove: Select the category or symbol that you want to remove and press this button

Up: If a symbol is selected, this moves the symbol up into the next category. If a category is selected, this moves the category up in the list.

Down: If a symbol is selected, this moves the symbol down into the next category. If a category is selected, this moves the category down in the list.

Import Symbols: Allows you to select existing drawing (.DWG) files to populate the selected category. If the files you select are not in the Carlson Survey SUP directory, the program will offer an option of copying them there.

Export Library: Exports to a new .SLI file.

Import Library: Imports an existing symbol library.

Save: Saves the symbol library list.

Exit: Exit the dialog. If there are unsaved changes, you will be prompted to save.

By default, the symbol description is the same as file name. The description for the symbol or category name may be changed by highlighting that name and clicking on "Rename" button, the name being edited is then placed into edit mode. To move a symbol into a different category, select the symbol to be moved on the tree and click an "Up" or "Down" button as many times as needed to reach the desired category. The symbols are sorted alphabetically within each category, while categories are remaining in the order placed to allow the more frequently accessed categories be on top.

Note: The symbol library is stored in an ASCII file named symbols.dta in the Carlson Survey \USER directory.

Pulldown Menu Location: Tools

Keyboard Command: editptsym

Prerequisite: Field to Finish file with codes defined with Multi-Point Symbols.

Enter Deed Description

Function

This command lets you enter line and curve data which is drawn and annotated as entered. When entering in data, the bearing quadrant and bearing value is input on the same line. For example a bearing of N45-10-30E would be entered as 145.1030, where (1) represents the NE quadrant. The numeric codes for the quadrants are 1-4 beginning with NE as (1) and continuing sequentially in a clockwise direction to the NW quadrant (4). Distance data can be entered in Varas, Meters, Poles, Chains or US Feet. Curve data can be entered for Non-Tangent, Reverse-Tangent and Tangent curves. Data used to define curves include but are not limited to Tangent Out Bearing, Radius data, Chord Bearing, DeltaAng and Tangent Length. Prompting for curve data is determined by what curve definition data is used. When you are finished, the closure and area of the figure is reported. The command starts with the dialog shown here.

Line and Curve Layer: Specify the layer name for lines and arcs.

Annotations Layer: Specify the layer name for the annotation text.

Points Layer: Specify the layer name for the points.

Traverse by: Select between entering bearings, azimuth, gons or point numbers. The points option recalls points from the current coordinate (.CRD) file.

Point Format: Choose between creating Carlson Survey points in the coordinate (.CRD) file at each point in the figure, drawing descriptions only or having no point labels.

Line-Curve Annotations: Specify whether the annotation should be drawn on the lines and arcs or should be added to line and curve tables.

To Table Scaler: Used only when the above setting is set to On Lines. If the line or arc length is less than this value multiplied by the horizontal scale, then that annotation will be entered in the line or curve table. For example, if the horizontal scale is 50 and you enter a table scaler of 1.5, then all short curve and line annotation less than 75' (1.5*50) will go to the table.

Draw Linework: Specify whether or not to draw linework, if this is disabled then all annotation options are disabled also.

Prompt for Descriptions: Specify whether or not the program should prompt you for point descriptions. If this is not checked, then point descriptions are blank.

Prompt for Elevations: Specify whether or not the program should prompt you for point elevations. If this is not checked, then point elevations are set to zero.

Plot Point Symbols: If the Point Format is set to Descriptions Only or None, this option is available. It will place point symbols without creating points in the coordinate (.CRD) file.

Create Radius Points: When checked, radius points will be created for arcs. Radius points are given the description RADPT.

Store to Raw Data (.RW5) File: When checked, data entered will also be written to a raw data (.RW5) file that can be opened using the *Edit Process Raw Data File* command. This file can be used to perform coordinate adjustments. The compass rule, crandall rule, transit rule, angle balance adjustment and least square adjustment routines are all available. See *Edit Process Raw Data File* for more information.

Store to Deed File: When checked, data entered will be written to a deed (.PDD) file. This file can be processed later to correct errors, create deed reports or to redraw the deed. To use this option, set the deed file name by picking the Specify File Name button. Also set the Deed Name field.

Deed Name: Specify the beginning deed name. Only available when Store to Deed File is checked on.

Specify Deed File Name: Before specifying the deed (.PDD) file name, choose New or Append/Revise from the Deed File Parameters below. Only available when Store to Deed File is checked on.

Prompts

Pick point or point Number: 1

PtNo.	North(y)	East(x)	Elev(z)	Description
1	8000.00	12000.00	0.00	

In this example the coordinate for point number one has already been stored in the current coordinate (.CRD) file with the *Draw-Locate Points* command.

Undo/Exit/Curve/<Bearing (Qdd.mmss)>: 145.3035

Varas/Meters/Poles/Chains/<Distance(ft)>: 210.5 Enter P to input a distance in Pole format or C for Chains format.

Undo/Exit/Curve/<Bearing (Qdd.mmss)>: C Enter C to traverse through a curve.

Tangent-out/Radius: R

Radius: 1103.5

Curve direction (Left/<Right>)? press Enter for right

Non-tangent/Reverse-tangent/Chord/Delta angle/Tangent/<Arc length>: N If the curve is tangent to the previous leg then enter the arc length, enter C for a chord length, D to enter the delta angle or T to enter the tangent distance. In this example we have a non tangent curve so we entered N.

Curve direction input [<Chord>/Radial]?: C

Chord Bearing (Qdd.mmss): 245.2341

Length of Chord: 201.22

Undo/Exit/Curve/<Bearing (Qdd.mmss)>: 345.3218

Varas/Meters/Poles/Chains/<Distance(ft)>: 209.28

Undo/Exit/Curve/<Bearing (Qdd.mmss)>: 445.2348

Varas/Meters/Poles/Chains/<Distance(ft)>: 200.54

Undo/Exit/Curve/<Bearing (Qdd.mmss)>: E Enter E to end the prompting and calculate the closure error.

Closure error distance> 1.35251089 Error Bearing> N 70d41'35" E

Closure Precision> 1 in 607.63 Total Distance Traversed> 821.82

Pulldown Menu Location: Tools

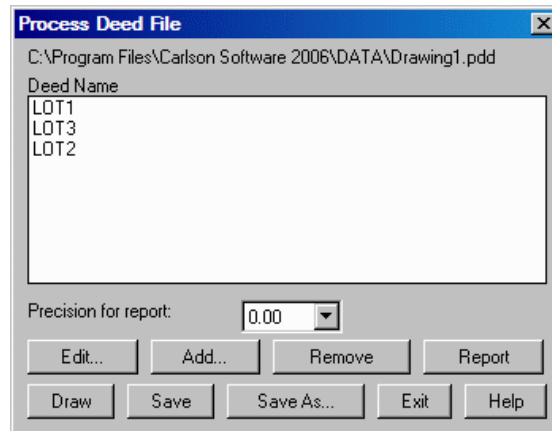
Keyboard Command: PDD

Prerequisite: None

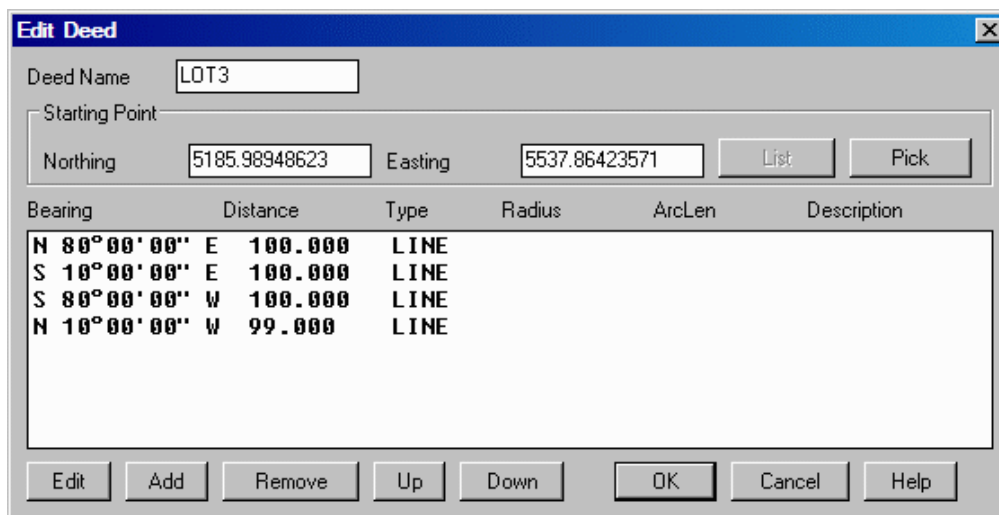
Process Deed File

Function

This command contains several functions for deed files (.PDD). A deed file consists of one or more deed descriptions. Each deed description includes a deed name, starting coordinate, and line and curve data. This deed data can be created with the Enter Deed Description command.



In Process Deed File command you can edit or input deed data. To edit a deed, highlight the deed name and pick the Edit button. This brings up a dialog box you can use to edit the deed name and the starting coordinate. To edit any of the line or curve data, highlight the data row and pick the edit button.



Picking the Edit button displays the Edit Deed dialog box

Edit the angle and distance of a line segment
or edit the curve parameters of an arc

To generate a deed report, highlight the deed name on the Process Deed File dialog box, and pick the Report button. This displays the report in the standard report viewer, which you can use to print or save the report. The report includes the closure error distance and bearing. To draw the deed linework, highlight the deed name and pick the Draw button. The draw function draws only the lines and curves of the deed. To annotate the linework, run the Auto Annotate command.

Pulldown Menu Location: Tools

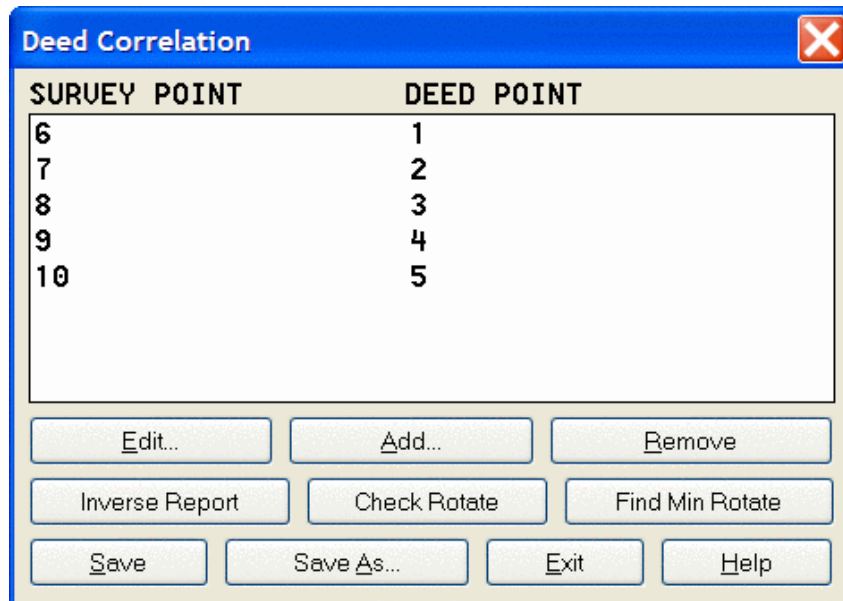
Keyboard Command: DEED

Prerequisite: None

Deed Correlation

Function

This command takes a set of field and design/deed points and creates an inverse report, such as radial stakeout, for each pair of points. It includes a routine to find the best point to hold and the best point to rotate to. This command provides tools for the correlation of surveyed points with that of deed input points. Different points can be specified as hold points, or rotation points, and provide a report showing the bearing and distance of all sides of the traverse/deed, based upon the hold and rotation points. This allows for the review of different scenarios based upon hold and rotation points. Perhaps two points in the field are in good shape, and seem to meet all the descriptions thereof. You decide to hold these two points as good, but you would like to see what holding these points will do to each side/call of the tract/description. This is what this routine is designed to do. In addition to allowing user specified trials of different hold and rotation points, the routine also provides a Find Minimum Rotation option that will report which points specified as the hold and rotation points will result in the minimum rotation of all sides of the tract/description. All points must be contained in the same coordinate file, and the points to be used in the correlation must be specified as either Survey points or Deed points.



The Deed Correlation dialog box features a table with two columns: SURVEY POINT and DEED POINT. The table contains five rows of data. Below the table are several buttons for editing and saving the data.

SURVEY POINT	DEED POINT
6	1
7	2
8	3
9	4
10	5

Buttons: Edit..., Add..., Remove, Inverse Report, Check Rotate, Find Min Rotate, Save, Save As..., Exit, Help.

Edit: This button allows for editing of the highlighted/selected Survey and Deed point. Once selected the dialog above is displayed allowing for changes to be made.

Add: Click this button to specify the points as either Survey or Deed points. Then fill out the Edit Points dialog as desired.

Remove: This button will remove the highlighted/selected Survey and Deed points from the correlation setup. This does not delete the points from the coordinate file.

Inverse Report: This generates a report showing the inverse data from each point, both survey and deed, to every other point specified in the correlation set up. For example if there were four points in the survey points (1-4) then the report would show inverse data from 1 to 2, 3,4; from 2 to 1,3,4; from 3 to 1,2,4 and from 4 to 1,2,3. This would be the same for the corresponding deed points.

Check Rotate: This option that allows for user specified hold and rotation points, and then reports the inverse data of each side of the tract/description. The hold point and rotation point must be points from the specified survey point group.

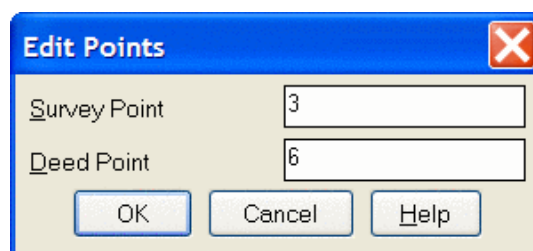
Find Min Rotate: Determines the hold and rotation points that would result in the minimum rotation to each side of the tract/description. When selected the Minimum Deed Rotation Report is displayed.

Save: Performs a quick save if the file has previously been saved.

Save As: This option prompts for a user specified file name and allows for a user specified location to save the file. The file extension for the deed correlation file is dcf. When executing the program you have the option of using an existing file or creating a new file for the deed correlation.

Exit: This button end the routine.

Help: This button displays the help topics relating to the Deed Correlation routine.



The Edit Points dialog box has two input fields: Survey Point and Deed Point. The Survey Point field contains the value 3, and the Deed Point field contains the value 6. Below the fields are three buttons: OK, Cancel, and Help.

Survey Point: 3

Deed Point: 6

Buttons: OK, Cancel, Help.

After specifying the hold and rotation points, the deed correlation report will display again, showing the bearing and distance of each side of the tract/description.

SurvCADD Edit : C:\scad2006new\USER\scadrprt.tmp

File Edit Settings

Open Save Print Exit Find Screen Hide

Deed Correlation Report 2/23/2005 14:11

Survey Points				Deed Points			
To Point	Bearing	Distance	Desc	To Point	Bearing	Distance	Desc
7	N62°41'33"E	478.353	sur	2	N62°38'22"E	481.363	deed
8	N87°21'09"E	784.656	sur	3	N87°16'09"E	787.390	deed
9	S69°32'02"E	919.915	sur	4	S69°41'09"E	921.341	deed
10	S28°24'42"E	597.129	sur	5	S28°42'56"E	597.605	deed

Survey Points				Deed Points			
To Point	Bearing	Distance	Desc	To Point	Bearing	Distance	Desc
6	S62°41'33"W	478.353	sur	1	S62°38'22"W	481.363	deed
8	S62°56'56"E	402.846	sur	3	S62°53'55"E	403.259	deed
9	S38°54'44"E	695.407	sur	4	S38°53'41"E	695.218	deed
10	S10°42'59"W	757.876	sur	5	S10°40'01"W	758.444	deed

Survey Points				Deed Points			
To Point	Bearing	Distance	Desc	To Point	Bearing	Distance	Desc
6	S62°41'33"W	478.353	sur	1	S62°38'22"W	481.363	deed
8	S62°56'56"E	402.846	sur	3	S62°53'55"E	403.259	deed
9	S38°54'44"E	695.407	sur	4	S38°53'41"E	695.218	deed
10	S10°42'59"W	757.876	sur	5	S10°40'01"W	758.444	deed

Check Deed Rotation

Hold/Pivot Point

Rotation Point

OK Cancel Help

SurvCADD Edit : C:\scad2006new\USER\scadrprt.tmp

File Edit Settings

Open Save Print Exit Find Screen Hide

Check Deed Rotation Report 2/24/2005 14:34

Hold Pivot Point

Survey: 6 Deed: 1

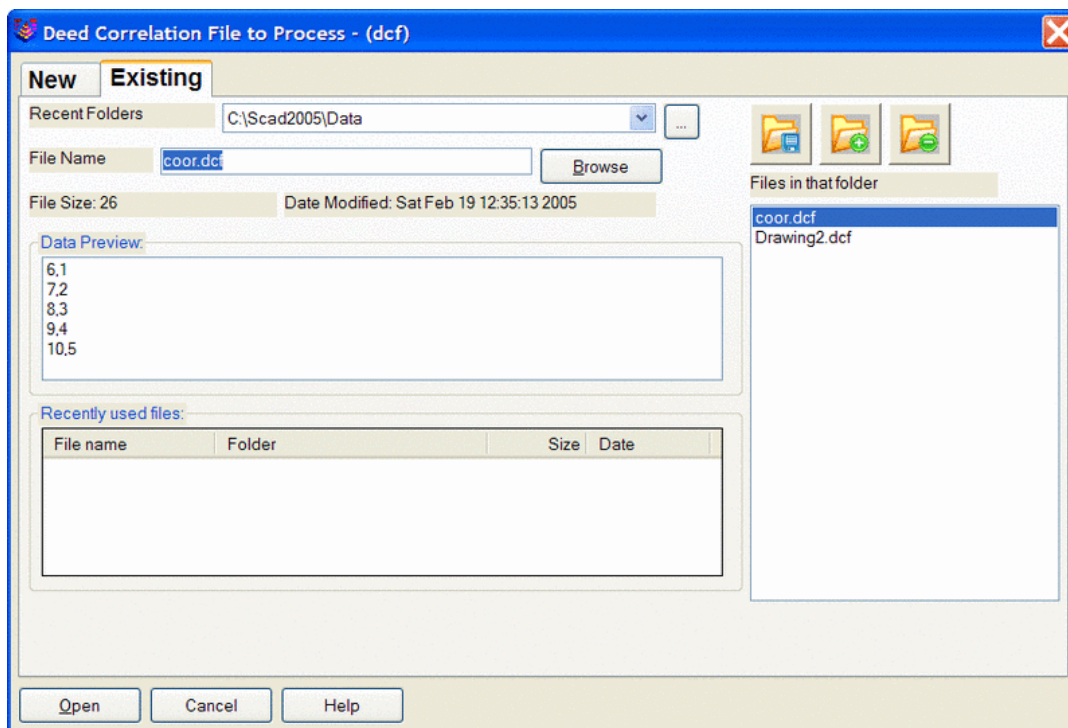
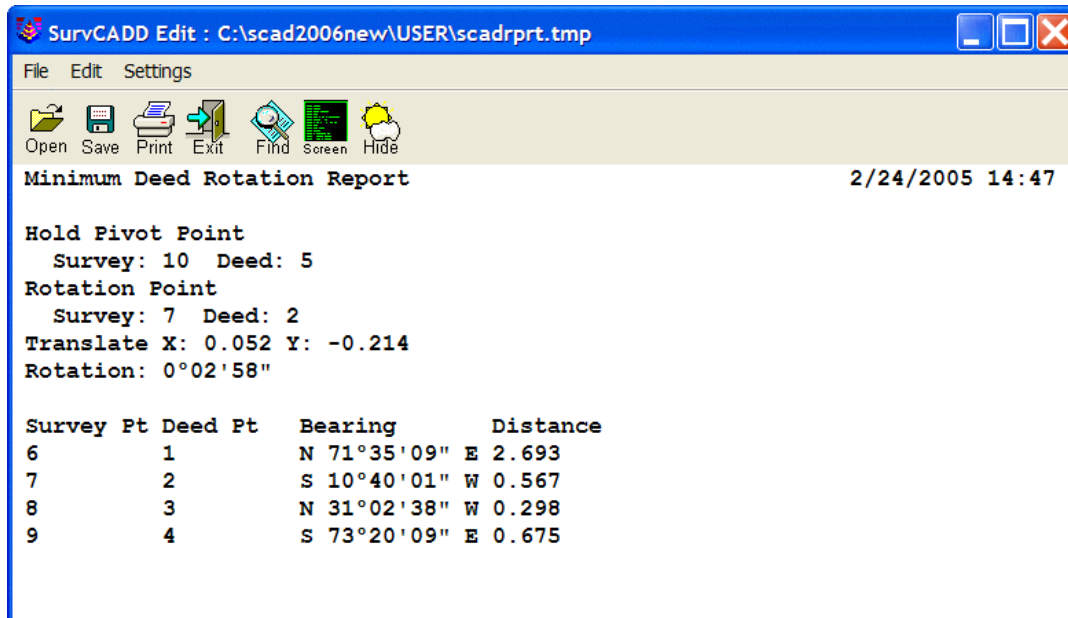
Rotation Point

Survey: 7 Deed: 2

Translate X: -2.956 Y: -1.310

Rotation: 0°03'10"

Survey Pt	Deed Pt	Bearing	Distance
7	2	S 62°38'22" W	3.009
8	3	S 78°33'32" W	2.766
9	4	S 62°16'06" W	2.134
10	5	S 71°43'06" W	2.658

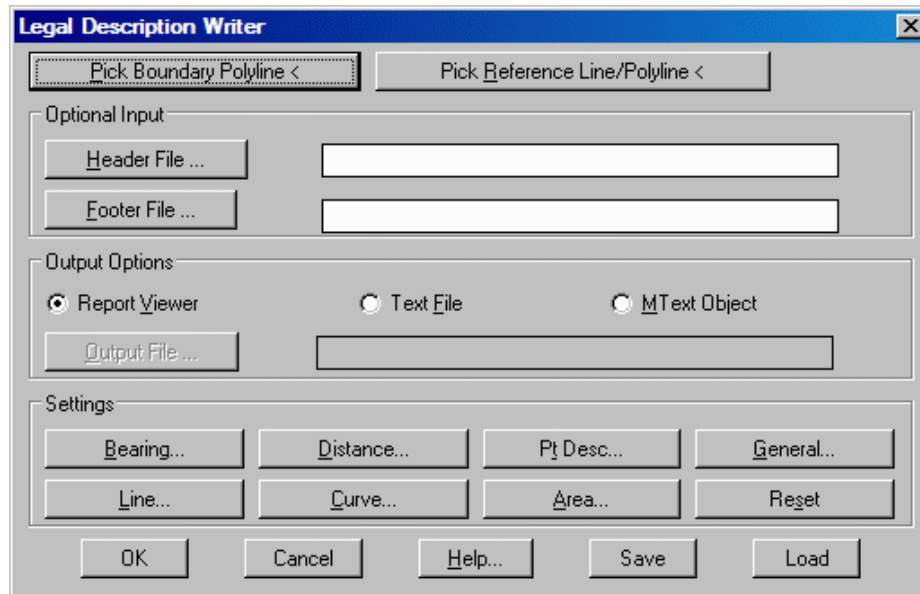


Pulldown Menu Location: Tools
Keyboard Command: deed_align
Prerequisite: A coordinate file (.CRD)

Legal Description

Function

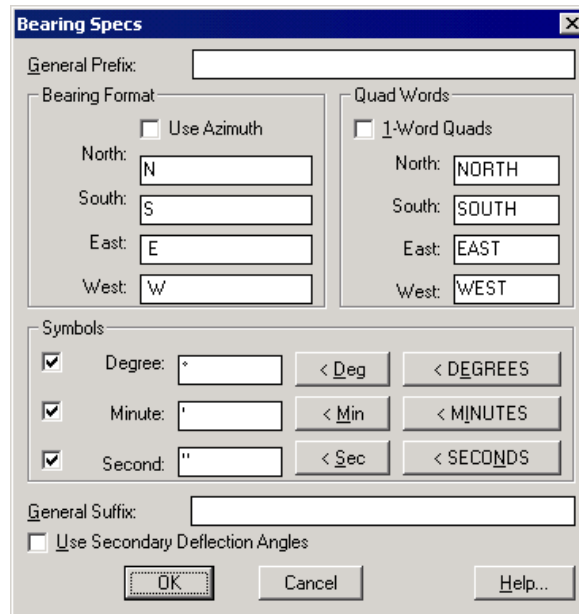
The Legal Description Writer allows you to create a detailed legal description from a polyline. This description consists of calculated calls, point descriptions from Carlson Survey points, and numerous terms you can define. You can easily change the values associated with these terms. You can store the new values as defaults. The initial dialog box is shown below.



- **Pick Boundary Polyline:** Select this button to designate the polyline boundary to use. The boundary should be a closed polyline drawn in the direction of advance.
- **Pick Reference Lines:** This button is used to select lines that tie into the polyline boundary for the legal description. These should be line entities with one endpoint that is exactly the same as the beginning point of the boundary polyline. If a Carlson Survey point exists at the end of the line away from the boundary, the command picks up its description. If not, you are prompted for the description. You can choose any number of reference lines. Press enter to conclude the selection of reference lines.
- **Header File:** This button and its edit field are used to designate the optional header text file. If a valid file name is entered, it will be written into the top of the output file.
- **Footer File:** This is used for the optional footer text file, which is written into the bottom of the output file.
- **Report Viewer:** The output is sent to the standard report viewer.
- **Text File:** The output is sent to an external text file as designated in the output file section described below.
- **Mtext Object:** This creates an Mtext object in the current drawing. Upon choosing OK you will be prompted for a starting point (which is the upper left corner) and well as a second point that determines the width and angle. By default, Ortho is turned on for the second point. Press the F8 key to toggle Ortho off.
- **Output File:** This button and its edit field are used to designate the output text file. This file can then be brought into your word processor and edited. Note that the appearance of the output file can be affected by the status of the Use Paragraph Format toggle described below under Legal Descriptions.

Buttons in the Settings group initiate additional options that are explained in detail in the following sections.

1 **Bearing:** This option is used to establish the appearance of the bearings that are drawn with the description.



Bearing Specs

General Prefix:

Bearing Format

☐ Use Azimuth

North:

South:

East:

West:

Quad Words

☐ 1-Word Quads

North:

South:

East:

West:

Symbols

☒ Degree:

☒ Minute:

☒ Second:

General Suffix:

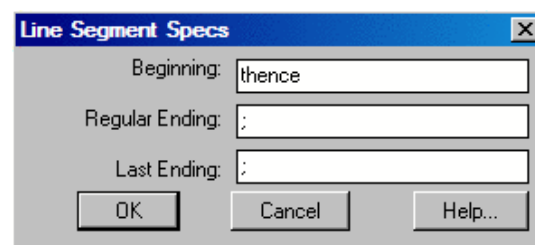
☐ Use Secondary Deflection Angles

- **Bearing Format:** Designate the character or word used in each bearing direction. Standard values are the letters N, S, E, or W. One possible option is the entire words NORTH, SOUTH, EAST, and WEST. It is important to keep in mind that spaces must be included. If you don't enter a space after N/S, and before E/W, a space will not be formatted into the bearing.

- **Words Quads:** For example, for bearings that are due NORTH, the default is to generate N 00. 00' 00 E. If the 1-Word Quads toggle is turned on, the program will substitute the single word (which you can change) for the direction, usually NORTH, or DUE NORTH.

- **Symbols:** This option allows you to designate the precision for bearings, as well as the symbols used. Turn on/off the toggles for degrees, minutes, and seconds to control the precision. For example, if you wish to round to the nearest minute, simply clear the toggle from the second field. For each field (degrees, minutes, seconds), you can supply the character or word to be used. You can quickly fill in these fields with the two buttons to the right of each field.

2 **Line:** This option is used to establish the terms used when the course of a call is a line segment, as is often the case. Simply supply the beginning and ending terms for these line calls.



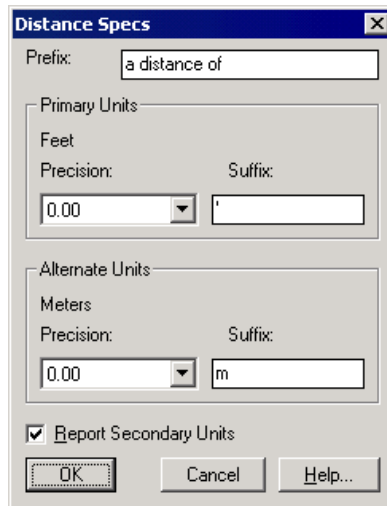
Line Segment Specs

Beginning:

Regular Ending:

Last Ending:

3 **Distance:** This dialog box is used to establish the terms and precision used when creating a distance for the course of a call. The precision and suffix apply to curves as well. Choose the desired distance precision from the window, and supply the beginning and ending terms for the line calls.



Distance Specs

Prefix: a distance of

Primary Units

Feet

Precision: 0.00 Suffix: '

Alternate Units

Meters

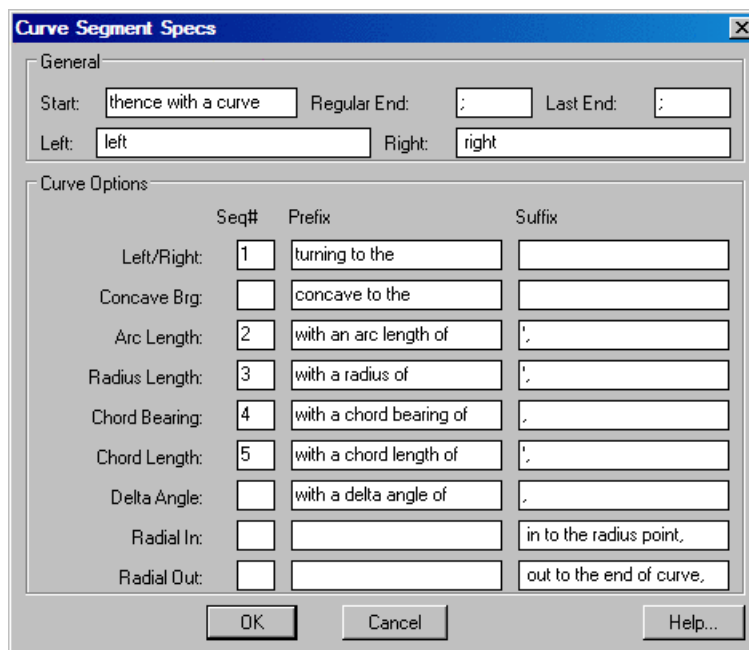
Precision: 0.00 Suffix: m

☒ Report Secondary Units

OK Cancel Help...

If you would like to report dual distances such as feet/metric, turn on the toggle in the lower left corner of the dialog box. Note that the primary units are the units set in the Settings menu, Drawing Setup. If you have English set as your units in Drawing Setup, then the alternate units will be metric. The opposite also applies. If your units in Drawing Setup are set to metric, then the alternate units will be English.

4 Curve: This option is used to establish the terms and options used when creating the course of a curve. Basic options include beginning and ending terms, as well as the words for left and right if chosen. In the large table of curve options, choose the items you wish to report, in the order you want them to appear, by placing a number in the sequence field indicating the desired order. Make sure you do not enter duplicate numbers.



Curve Segment Specs

General

Start: thence with a curve Regular End: ; Last End: ;

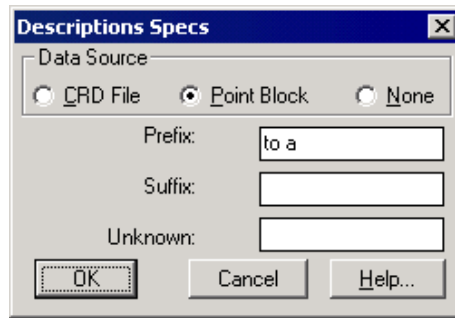
Left: left Right: right

Curve Options

	Seq#	Prefix	Suffix
Left/Right:	1	turning to the	
Concave Brg:		concave to the	
Arc Length:	2	with an arc length of	'
Radius Length:	3	with a radius of	'
Chord Bearing:	4	with a chord bearing of	.
Chord Length:	5	with a chord length of	'
Delta Angle:		with a delta angle of	.
Radial In:			in to the radius point,
Radial Out:			out to the end of curve,

OK Cancel Help...

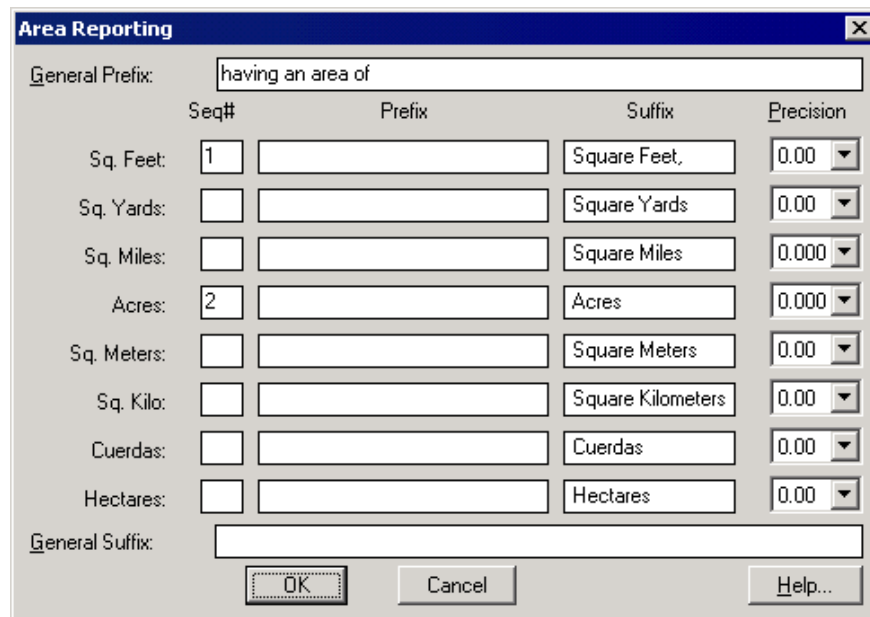
5 Pt Description: In the process of following the polyline definition for a boundary, the Legal Description Writer can look for descriptions of the points at the endpoints of the polyline. These can be extracted by setting the data source to the corresponding point from the coordinate file, meaning the points do not have to be plotted on the screen. A second option is Point Block, in which the command reads the information from the drawing, instead of a coordinate file.



The 'Descriptions Specs' dialog box has a title bar with a close button. It contains a 'Data Source' section with three radio buttons: 'CRD File', 'Point Block' (which is selected), and 'None'. Below this are three text input fields: 'Prefix' (containing 'to a'), 'Suffix' (empty), and 'Unknown' (empty). At the bottom are three buttons: 'OK', 'Cancel', and 'Help...'.

- **Data Source:** Choose the source for the point data, either a coordinate (.CRD) file, point blocks from in the drawing, or none.
- **Prefix:** General term applied before the actual description.
- **Suffix:** General term applied after the actual description.
- **Unknown:** The text designated here will be placed in the description if the program does not find a valid description at that coordinate location. The words Unknown Point may be used.

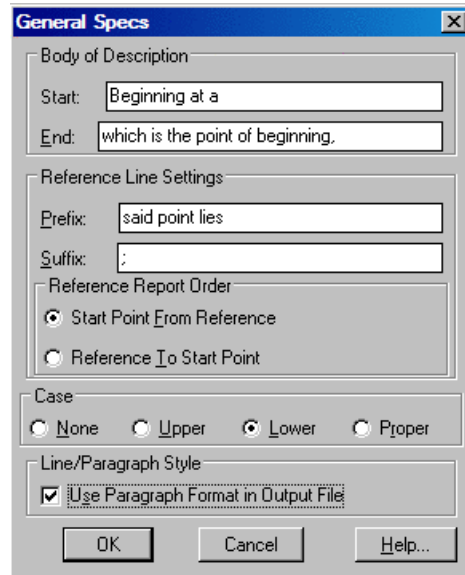
6 Area Reporting: The Legal Description Writer can output several types of areas. Basic options include beginning and ending terms. In the large table of area options, choose the items you wish to report, in the order you want them to appear, by placing a number in the sequence field indicating the desired order. Make sure you do not enter duplicate numbers. You can edit the prefix/suffix for each, and control decimal precision of each field output.



The 'Area Reporting' dialog box has a title bar with a close button. It features a 'General Prefix' text field at the top containing 'having an area of'. Below this is a table with five columns: 'Seq#', 'Prefix', 'Suffix', and 'Precision'. The table contains eight rows of area units. At the bottom is a 'General Suffix' text field and three buttons: 'OK', 'Cancel', and 'Help...'.

	Seq#	Prefix	Suffix	Precision
Sq. Feet:	1		Square Feet.	0.00
Sq. Yards:			Square Yards	0.00
Sq. Miles:			Square Miles	0.000
Acres:	2		Acres	0.000
Sq. Meters:			Square Meters	0.00
Sq. Kilo:			Square Kilometers	0.00
Cuerdas:			Cuerdas	0.00
Hectares:			Hectares	0.00

7 General: This option controls general specifications, which can affect the entire description. Each item is explained in detail below.



- **Body of Description:** Enter the beginning and ending terms for the description.
- **Reference Line General Prefix:** Specify the prefix string when a reference line is selected.
- **Case:** Choose the button corresponding to the string case conversion desired. If you want no changes to be made, choose none. Choosing upper, lower, or proper case conversion will affect the case of all text throughout the description, except bearing letters.
- **Line/Paragraph Style:** If this toggle is on, the program will output the description without carriage returns after each line. This approach makes a nice paragraph style when brought into a word processor with word wrap. If the toggle is cleared, the program will place carriage returns at the end of each call.

8 **Reset:** This option resets the entire dialog box back to the original settings from the installation.

Minimum Procedure Outline:

- Initiate Legal Description from the Tools menu.
- Choose the Pick Boundary Polyline button and select desired polyline.
- Choose OK, and the boundary description will appear in the Report Viewer.

Standard Procedure Outline:

- Initiate Legal Description from the Tools menu.
- Choose the Pick Boundary Polyline button and select desired polyline.
- Designate the Header, Footer, and Output file names.
- Choose the appropriate button for the output you desire.
- Choose OK to generate the boundary description.

Pulldown Menu Location: Tools

Keyboard Command: LEGAL

Prerequisite: closed polyline boundary

Deed By Screen Entities

Function

This command allows you to check the closure of a figure and produce a report from Distance and Bearing labels in the drawing.

Prompts

Follow Polyline or Pick Individuals P/<I>: *press Enter*

[endp on] Starting Point: *select a point*

Undo/Pick Bearing Text: S 48d43'58"

Undo/Pick Distance Text: 136.21

Undo/Pick Bearing Text: S 13d07'04"

Undo/Pick Distance Text: 155.56

Undo/Pick Bearing Text: S 73d55'04"

Undo/Pick Distance Text: 165.34

Undo/Pick Bearing Text: N 17d16'54"

Undo/Pick Distance Text: 301.93

PointNo.	Northing(Y)	Easting(X)	Elev(Z)	Description
910	4941.88	2492.50	0.00	
BEARING> N 17d16'54'' W Hz DIST> 301.93				

eXit/Curve/<point number>: *E*

Closure error distance> 2.39476609 **Error Bearing>** N 61°10'45" E

Closure Precision> 1 in 316.96 **Total Distance Traversed>** 759.04

SQ. METERS: 30403.0 **SQ. KILOMETERS:** 0.03

HECTARES: 3.04 **CUERDAS:** 7.74 **PERIMETER:** 759.04

Lot Description <8>: *press Enter to accept default*

Pick area label centering point: *pick point on screen for label text*

Erase Polyline Yes/No <Yes>: *N*

Pulldown Menu Location: Area

Keyboard Command: textdeed

Prerequisite: Distance and Bearing labels

Design Centerline

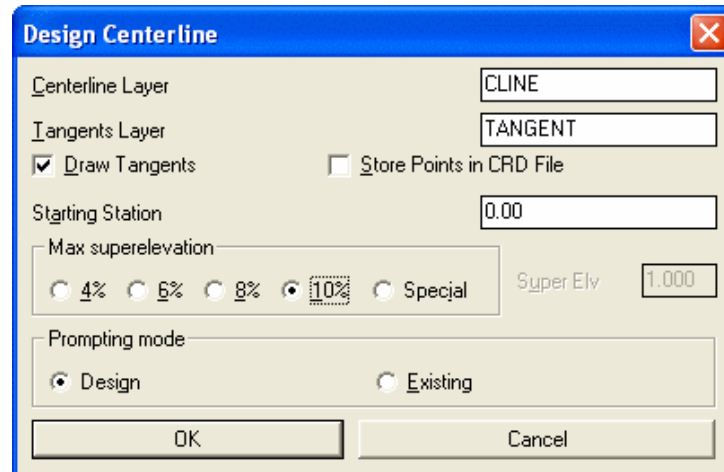
Function

This command draws a centerline polyline and writes the centerline data in a centerline file. The first step is to specify a centerline (.CL) file name. Next in the Design Centerline dialog you can specify several options. Centerline Layer is the layer name for the polyline. Tangents Layer is the layer name for the tangent lines drawn from the centerline to the curve center. Max superelevation is used for determining the minimum recommended radius. Setting the Prompting mode to Existing skips design questions such as design speed.

After the Design Centerline dialog, the program cycles through curve prompting until End is selected. There are PC and PI modes for curve entry. In PC mode the arc's PC points are entered followed by the curve data. The

PC points can be specified by either picking the point, entering a distance or entering a station. In PI mode, the arc's PI points are entered. Once the PI points determine two tangents, the program prompts for curve data for the previous PI. Spirals can only be entered in PI mode. You can switch between arc and PI mode between curves on the polyline. The arc curvature can be specified by degree of curve or radius. The minimum recommend radius is based on Aashto. The arc length can be specified by PT station, tangent length or arc length.

The Store Points in CRD File will create points in the current coordinate file for each design point on the centerline. This option is also used for creating the SMI chain file within Centerline Utilities, since the SMI chain file requires point numbers. To specify the coordinate file, choose *Set Coordinate File* in the Points menu.



The image shows a 'Design Centerline' dialog box with the following fields and options:

- Centerline Layer:** CLINE
- Tangents Layer:** TANGENT
- Draw Tangents:** ☒ (checked)
- Store Points in CRD File:** ☐ (unchecked)
- Starting Station:** 0.00
- Max superelevation:**
 - 4% ☐
 - 6% ☐
 - 8% ☐
 - 10% ☒ (selected)
 - Special ☐
- Super Elv:** 1.000
- Prompting mode:**
 - Design ☒ (selected)
 - Existing ☐
- Buttons:** OK, Cancel

Prompts

Centerline file to design Enter the .CL file name to create.

Design Centerline Dialog Choose your options and click OK.

Pick Point or Point number: *pick a starting point or enter the starting point coordinates*
For PC mode design.

Bearing/PI/End/Undo/<Pick Point or Point number>: *Pick the PC point*

Bearing/PC/PI/End/Undo/<Pick Point or Point number>: *PC*

Enter Design Speed for curve <55.00>: *40*

Minimum Recommended Radius = 426.67

View/Point/Degree of Curve/<Radius>: *500*

Curve direction (Left/Right)? *Press Enter for right*

Length to use (Station/Tangent/<Arc>)? *Press Enter for arc*

Point/Station/Tangent/<Arc Length>: *200*

Reverse/Compound Curve (Yes/No)? *Press Enter*

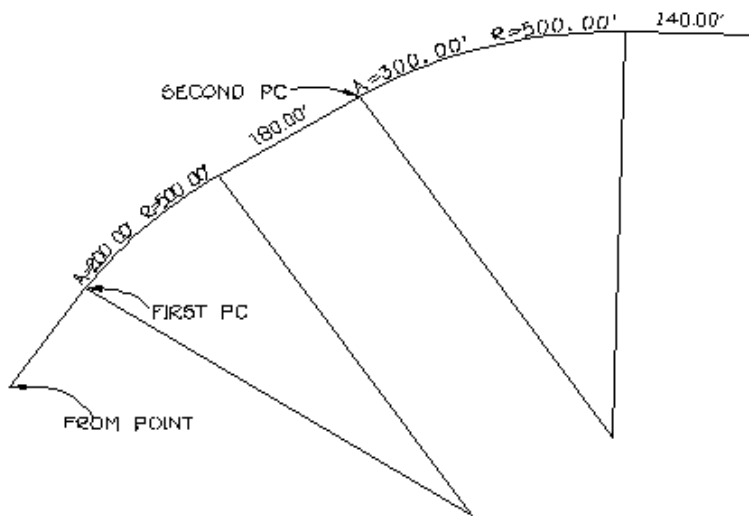
PI/Distance/Station/<Pick PC or Point number>: *D for distance*

Point/Enter Distance: *180*

Bearing/Line/Undo/End/<Continue PC>: *Press Enter*

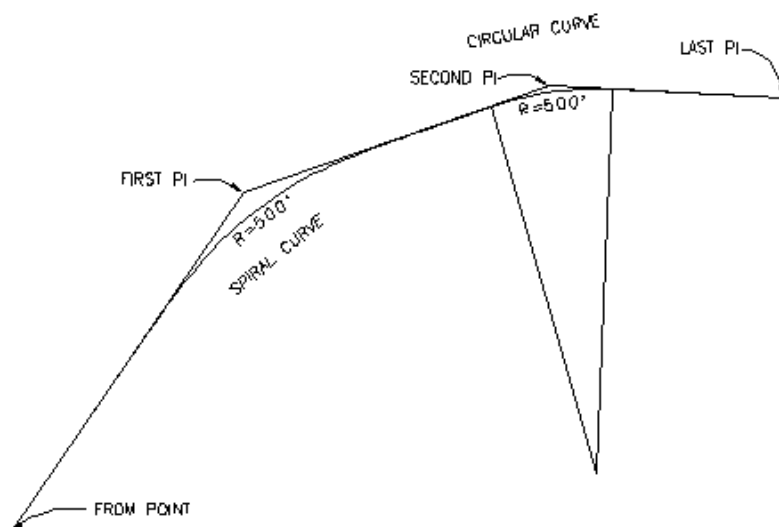
Enter Design Speed for curve <40.00>: *Press Enter*

Minimum Recommended Radius = 426.67



Example of PC mode centerline design

View/Point/Degree of Curve/<Radius>: 500
Curve direction (Left/<Right>)? *Press Enter*
Point/Station/Tangent/<Arc length>? 300
Reverse/Compound Curve (Yes/<No>)? *Press Enter*
PI/Distance/Station/<Pick point or Point number>: D *for distance*
Point/Enter Distance: 140
Bearing/Line/Undo/End/<Continue PC>: E *to end*
 For PI mode design.
Bearing/PI/End/Undo/<Pick Point or Point number>: pi
Pick Point or Point number (PI)<5098.50,3509.11>: *Pick the first PI point*
Type of curve [Spiral/<Circular>]? s *for spiral*
Enter Design Speed for curve <55.00>: 40
Minimum Recommended Radius = 426.67
View/Point/Degree of Curve/<Radius>: 500
Enter Number of Lanes <2>:
View/Enter Spiral Length In <204.8000>: 210
View/Enter Spiral Length Out <210.0000>: *Press Enter*
Bearing/Pick next Point or Point number (PI): *Pick the next PI point*
 TS: 1+33.280
 SC: 3+43.280
 CS: 6+39.364
 ST: 8+49.364
Bearing/Line/PC/Undo/End/<Continue PI>: *Press Enter*
Type of curve [Spiral/<Circular>]? *Press Enter for circular*
Enter Design Speed for curve <40.00>: *Press Enter*



Example of PI mode centerline design

Minimum Recommended Radius = 426.67

View/Point/Degree of Curve/<Radius>: 500

Bearing/Pick next Point or Point number (PI): *Pick the last PI*

PC : 9+35.900

PT : 16+34.283

Reverse/Compound Curve [Yes/<No>]: *Press Enter*

Bearing/Line/PC/Undo/End/<Continue PI>: *E to end*

EndPoint : 18+37.121

Stations are printed for every PC, PT and end point in the design process.

Pulldown Menu Location: Tools

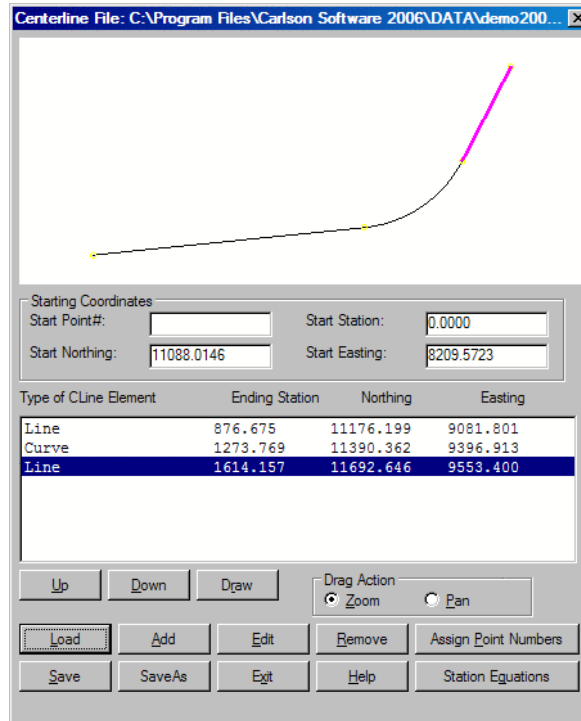
Keyboard Command: centerln

Prerequisite: None

Input-Edit Centerline File

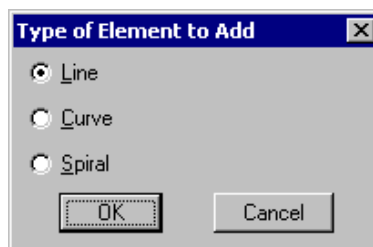
Function

This command can be used to input a new centerline (.CL) file or edit an existing one. It is a dialog box-based alternative to the Design Centerline command and has the advantage of accepting whatever information you have on your centerlines (coordinates, stationing, length of tangents and arcs, etc.). It is ideal for entering data straight from highway design plans to create a new centerline. This command allows you to change any of the geometric properties of any of the elements of the centerline (lines, curves, and spirals), including the starting coordinates and station. The program starts by asking for a coordinate file if one is not already specified. This is the file from which coordinates of points are read when point numbers are entered in the program. New point numbers are created and stored in this file by the command. After you specify a coordinate file, the main dialog box appears, displaying a list of the centerline elements.



- **Load:** The Load button loads an existing .CL file for review or editing. The list box in the dialog box shows a list of all the elements in the centerline, identifying them as either a line, curve, or spiral element and reporting the ending station, northing, and easting of the element.
- **Add:** The Add button adds a new element after the highlighted element.
- **Edit:** The Edit button edits the highlighted element.
- **Remove:** The Remove button removes the highlighted element from the centerline.
- **Save:** The Save button allows you to save the .CL file currently being edited. The Save button always prompts you for the file name to save; hence, it works like the Save As button in most commands.
- **Quit:** The Quit button checks whether the file currently being edited is saved or not and quits the command.

When the Add button is clicked, the command prompts you for the type of the element to be added. There are three choices available: a Line, a Curve or a Spiral.



The dialog box for every type of element shows the point ID, the northing, easting, and station of the start point of the element. It then allows you to modify or define the parameters specific to the type of element. The following are the rules regarding data entry in the centerline editor, which apply regardless of the entity type you are editing.

- Wherever the length of the element is to be entered, you can enter an expression of the type "123.5 - 93.7" and the command will evaluate the difference of the values. This is particularly convenient when only the stations of the start and end points of the element are known.

- When the station is specified, the program takes the length of the element as the difference between the station of the start point of the element and the station specified.
- All bearings are to be specified by entering the angle between 0 and 90 degrees (in dd.mmss format) and selecting the quadrant.
- When entering the delta angle of a curve, only the absolute value (between 0 and 360 degree) is to be entered. The direction of the curve is to be explicitly set as "right" or "left", the default being "left". All angles are entered in degrees, minutes, and seconds as dd.mmss.
- Point numbers, when used, access their coordinates in the current coordinate file. If the point number specified has no coordinates stored in the coordinate file, the point number is remembered for that location (for example, the radius point of a curve or the SC point of a spiral). Then, when the .CL file is saved, the program creates points for that location and stores them to the coordinate file with the specified point number.

Line Element

1 In the Line Element dialog box, the starting point coordinates and station is displayed at the top.

The image shows a 'Line Element' dialog box with the following fields and values:

- Start Point#: (empty)
- Start Point Easting: 5115.8596
- Start Point Northing: 5799.6396
- Start Point Station: 932.6779
- End Point#: (empty)
- Endpoint Northing: 4999.9999
- Endpoint Easting: 5000.0005
- Length: 807.9895
- Station to: 1740.6674
- ☒ Not Tangential to Previous Element
- Bearing Quadrant:
 - ☐ NE
 - ☐ SE
 - ☒ SW
 - ☐ NW
- Bearing(DD.MMSS): 8.1439
- Buttons: OK, Cancel, Help

2 The end point of the line is specified primarily by its length, or its station and bearing. The line can also be defined by its ending point number, or its coordinates.

- **End Point #:** This is the ending point number of the line segment.
- **Endpoint Northing:** This is the endpoint northing coordinate.
- **Endpoint Easting:** This is the endpoint easting coordinate.
- **Length:** This is the length of the line segment.
- **Station to:** This is the ending station number of the line segment.

3 The bearing of a line can be changed if the Non-tangential to Previous Element option is checked. By default, any line that follows a curve element is defaulted to be tangential to it (the check box is turned off); otherwise, the checkbox is on.

4 Under Bearing Quadrant, select one of the four standard quadrants.

5 The Bearing of the segment is entered in as DD.MMSS.

Curve Element

The dialog box for a Curve allows you to define the curve primarily by its radius and delta angle. The other parameters of the curve that you can edit are the arc length and the bearing of tangent-out. You can also specify the curve by entering the coordinates or point numbers of its end point (PT) and the radius point. Another way to specify the curve is to enter the chord length or PT point station and chord bearing.

Curve Element

PC Point#: PC Point Northing: 5215.2119
PC Point Station: 299.9960 PC Point Easting: 5025.9076

Curve Edit Mode
☒ Hold PC Point ☐ Hold PI Points

Radius: 500.0000 Station To: 932.6779
Delta Ang.(DD.MMSS): 72.300001 Chord Length: 591.30969
Arc Length: 632.6819 Chord Bearing Quadrant
☒ NE ☐ SE ☐ SW ☐ NW
Chord Bearing (DD.MMSS): 8.4459990
Curve Direction
☒ Left ☐ Right

PT Point
Point#: Northing: 5799.6396 Easting: 5115.8596
Radius Point
Point#: Northing: 5568.7653 Easting: 4672.3542

Central PI Point
Point#: Northing: Easting: Length (Ts):
Bearing Quadrant
☐ NE ☐ SE ☐ SW ☒ NW
Point on Forward Tangent
Point#: Northing: Easting: Length:
Bearing of Tangent-Out(DD.MMSS): 27.3000019

OK Cancel Help

If the central PI point and a point on the forward tangent are known, you can define the curve by entering both of these points and at least one other property of the curve (such as radius, arc length, delta angle). The point on the forward tangent can be any point that defines the tangent-out direction, including the next PI point. If only the central PI point is known, then the tangent-out can be entered by bearing instead of by forward tangent point. Central PI and forward tangent points are not read from the .CL file. You must enter them, and they are valid only for the current edit session. They are not remembered the next time the file is loaded.

1 The PC, point of curvature, point number, station, northing and easting are displayed at the top of the dialog box.

2 Under the Curve Edit Mode option, you define how the curve is accepted in the centerline.

- **Hold PC Point:** If this is checked on, the radius is taken as fixed and the delta angle of the curve is calculated based on additional parameters listed below. Hence, the extent of the curve is unlimited.
- **Hold PI Points:** If this option is checked on, the bearing of tangent-out of the curve is taken as fixed, and the radius is calculated based on other parameters listed below. In this case, the curve is completely restricted within the central PI point and the bearing of tangent out. Hence, when the Hold PI Points option is checked on, the additional parameters must also be defined (as described below) so calculations can be carried out.

3 Additional curve elements must be defined.

- **Radius:** This is the radius of the curve.
- **Station To:** This is the ending station along the centerline

- **Delta Ang. (DD.MMSS):** This is the decimal delta angle.
- **Arc Length:** This is the length along the arc of the centerline.
- **Chord Length:** This is the length of the incoming segment.

4 Under Chord Bearing Quadrant, you select the standard quadrant for the chord.

5 The Curve Direction is either Left or Right.

6 Under PT Point, the location of the point of tangent is defined.

- **Point#:** This is the point number of the PT.
- **Northing:** This is the northing of the PT.
- **Easting:** This is the easting of the PT.

7 Under Radius Point, the location of the point is defined.

- **Point#:** This is the point number of the radius point.
- **Northing:** This is the northing of the radius point.
- **Easting:** This is the easting of the radius point.

8 Under Central PI Point, the location of the point of intersection is defined.

- **Point#:** This is the point number of the PI point.
- **Northing:** This is the northing of the PI point.
- **Easting:** This is the easting of the PI point.
- **Length (Ts):** This is length of the segment.

9 Under the Point on Forward Tangent option, the location of the point is defined.

- **Point#:** This is the point number of the forward tangent point.
- **Northing:** This is the northing of the forward tangent point.
- **Easting:** This is the easting of the forward tangent point.
- **Length:** This is length of the segment.

10 The Bearing Quadrant of the Tangent Out option is at the bottom of the dialog box. After you select the quadrant, enter in the bearing in the format of DD.MMSS.

Spiral Element

Spiral Element

Spiral In Point#:
Spiral In Point Station: 932.6779
Spiral In Point Northing: 313674.8322
Spiral In Point Easting: 1356326.5639

Data for Simple Curve

Radius: 789.0000
Arc Length: 1618.7684
Curve Direction: ☐ Left ☒ Right
Delta Angle: 117.33075039

Central PI Point

Point#: 6
Northing: 315383.617
Easting: 1353547.36
Station: 4195.1790
Length: 3262.5011

Length of Spiral-In: 196.0000
Point on Forward Tangent:
Length of Spiral-Out: 654.0000
Tangent-Out:
Bearing Quadrant: ☒ NE ☐ SE ☐ SW ☐ NW
Bearing(DD.MMSS): 90.00000000

Tangent-to-Spiral Pt

Pnt#: 1 Sta:1261.425
Northing: 313847.018
Easting: 1356046.51

Spiral-to-Curve Pt

Pnt#: 2 Sta:1457.425
Northing: 313956.423
Easting: 1355884.05

Curve-to-Spiral Pt

Pnt#: 3 Sta:3076.194
Northing: 315294.370
Easting: 1356059.67

Spiral-to-Tangent Pt

Pnt#: 4 Sta:3730.194
Northing: 315383.617
Easting: 1356702.52

Simple Curve Radius Pt

Pnt#:
Northing: 314572.168
Easting: 1356377.38

End Point

Pnt#:
Northing: 315383.617
Easting: 1356702.52

OK Cancel Help

The dialog box for a Spiral allows you to define the spiral by entering either the various parameters of the spiral (such as the angles and lengths) or the coordinates or point numbers of its defining points: the TS (Tangent-to-Spiral), SC (Spiral-to-Curve), Radius point, CS (Curve-to-Spiral), ST (Spiral-to-Tangent) and end point (optional). While defining the spiral by its geometric properties, the command will accept the data even if the information for the simple curve is given with zero spiral lengths. However, the central PI point of the spiral must be specified (that is, the command is always in Hold PI Points mode). The tangent-out can be defined by entering a bearing or by specifying a point on the forward tangent. The forward tangent point can be the next PI coordinates. The direction of the spiral-in and spiral-out elements is the same as the direction of the simple curve (left or right).

The spiral can be defined by several different parameters, and the order that you enter data into the spiral dialog box can be important. There are two main sequences for entering data, depending on the spiral data that you have. The first method is to enter the radius of the simple curve, the spiral in and out lengths, the tangent bearing out, and the PI station. The second method is to make a Line segment coming up to the TS (tangent to spiral) point. This Line segment should be added before creating the Spiral element. Then, with the Spiral In point set to the TS point, enter the radius of the simple curve, the spiral in and out lengths, the curve direction (left or right), and the arc length of the simple curve. The rest of the spiral points will be calculated.

1 In the Spiral Element dialog box, the Spiral In Point information is displayed at the top.

2 Under the Data for Simple Curve option, the parameters for the curve are defined.

- **Radius:** This is the radius of the simple curve.
- **Arc Length:** This is the length along the curve.
- **Curve Direction:** This is the direction of the curve, either Left or Right.
- **Delta Angle:** This is the angle defined as DD.MMSS.

3 Under the Central PI Point, the point location of the intersection is entered.

- **Point#:** This is the point number of the PI.
- **Northing:** This is the northing of the PI.

- **Easting:** This is the easting of the PI.
 - **Station:** This is the station along the centerline for the PI.
 - **Length:** This is the length of the centerline between points.
- 4 The Length of the Spiral-In portion of the centerline is entered.
- 5 The Length of the Spiral-Out portion of the centerline is entered.
- 6 Under the Point on Forward Tangent option, the location of the point is defined.
- **Point#:** This is the point number of the Point on Forward Tangent.
 - **Northing:** This is the northing of the Point on Forward Tangent.
 - **Easting:** This is the easting of the Point on Forward Tangent.
 - **Length:** This is the station along the centerline for the Point on Forward Tangent.
- 7 Under the Tangent-Out option, the bearing and quadrant are defined.
- **Bearing Quadrant:** This is standard quadrant for the bearing.
 - **Bearing:** This is the bearing of the Tangent-out in DD.MMSS format.
- 8 Under the Tangent-to-Spiral Pt option, the point is identified.
- **Point#:** This is the point number of the point.
 - **Northing:** This is the northing of the point.
 - **Easting:** This is the easting of the point.
- 9 Under the Spiral-to-Curve Pt option, the point is identified.
- **Point#:** This is the point number of the point.
 - **Northing:** This is the northing of the point.
 - **Easting:** This is the easting of the point.
- 10 Under the Curve-to-Spiral Pt option, the point is identified.
- **Point#:** This is the point number of the point.
 - **Northing:** This is the northing of the point.
 - **Easting:** This is the easting of the point.
- 11 Under the Spiral-to-Tangent Pt option, the point is identified.
- **Point#:** This is the point number of the point.
 - **Northing:** This is the northing of the point.
 - **Easting:** This is the easting of the point.
- 12 Under the Simple Curve Radius Pt, the point is identified.
- **Point#:** This is the point number of the point.
 - **Northing:** This is the northing of the point.
 - **Easting:** This is the easting of the point.
- 13 Under the End Point option, the point is identified.
- **Point#:** This is the point number of the point.
 - **Northing:** This is the northing of the point.

- **Easting:** This is the easting of the point.

Once all the elements of the centerline are defined, the file can be saved and then plotted using the "Centerline File to Polyline" command.

Prompts

Here is an example of a highway interchange ramp that involves a starting tangent and a spiral curve that goes abruptly into a simple curve followed by a final tangent.

In the Centerline File dialog box, enter a starting Northing and Easting and starting Station. The Start Point# is optional. Click Add to add a line segment.

You want to enter the tangent segment length up to the TS (tangent to spiral). Enter the length (200.0), bearing

(88.0732), and then the bearing quadrant (NW). Since the next spiral element has a PI station, it is not necessary for this line segment to go up to the TS point. The purpose of this line segment is to establish the tangent-in direction. When you click OK, the command will add the Line element as the first in the list of complete centerline elements.

Next, to add a spiral segment, click Add.

Though the dialog box is complex (for total flexibility), enter the four items shown, which can be done in the clockwise order shown. On a typical spiral curve, enter four things: (1) the radius of the simple curve, (2) the spiral in and out lengths, (3) the tangent bearing and (4) the PI station. Everything else will be calculated when you press Enter for the PI station. Click OK to add the spiral element.

Next, click Add to add a curve segment.

Select curve. The Curve dialog box appears.

Curve Element

PC Point#: PC Point Northing: 5154.3641
 PC Point Station: 1707.0593 PC Point Easting: 4721.5229

Curve Edit Mode
☒ Hold PC Point ☐ Hold P_I Points

Radius: 255.0000 Station To: 1857.0593
 Delta Ang.(DD.MMSS): 33.421223 Chord Length: 147.84670
 Arc Length: 150.0000 Chord Bearing Quadrant
☒ NE ☐ SE ☐ SW ☐ NW
 Curve Direction
☐ Left ☒ Right Chord Bearing (DD.MMSS): 86.195011

PT Point
 Point#:
 Northing: 5163.8262
 Easting: 4869.0665

Radius Point
 Point#:
 Northing: 4915.5456
 Easting: 4810.9138

Central P_I Point
 Point#:
 Northing:
 Easting:
 Length (Ts):
 Bearing Quadrant
☐ NE ☒ SE ☐ SW ☐ NW Bearing of Tangent-Out(DD.MMSS): 76.4903761

Point on Forward Tangent
 Point#:
 Northing:
 Easting:
 Length:

OK Cancel Help

Enter the Radius Length (255), the Arc Length (150) and the Curve Direction. Everything else will be calculated. Click OK to add the curve element.

Click Add to add the final line segment.

Line Element

Start Point# :
 Start Point Easting : 4869.0665
 Start Point Northing : 5163.8262
 Start Point Station: 1857.0593

End Point# :
 Endpoint Northing : 5141.0212
 Endpoint Easting : 4966.4315
 Length : 100.0000
 Station to : 1957.0593
☐ Not Tangential to Previous Element
 Bearing Quadrant
☐ NE ☒ SE ☐ SW ☐ NW
 Bearing(DD.MMSS): 76.490376103

OK Cancel Help

All you need to enter in the final dialog box for the line (tangent) segment is its length. All other items will be calculated when you press Enter.

Centerline File: [none]

Start Point Info.

Start Point# :

Start Northing :

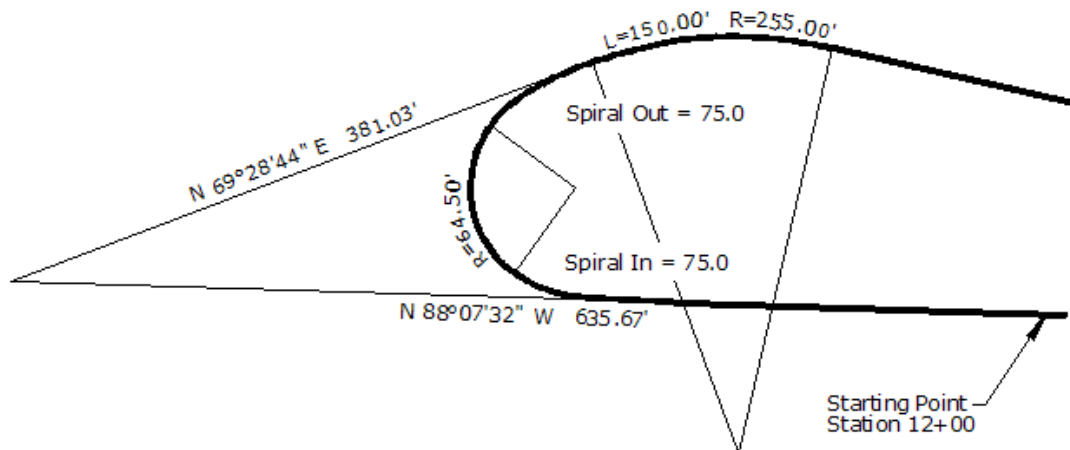
Start Easting :

Start Station :

Type of CLine Element	Ending Station	Northing	Easting
Line	1400.000	5006.542	4800.107
Spiral	1707.059	5154.364	4721.523
Curve	1857.059	5163.826	4869.067
Line	1957.059	5141.021	4966.431

Load... Add... **Edit...** Remove Save... Quit Help

The completed centerline will appear as shown in the dialog box, and each element can be edited. Pick the Save button to store this centerline data to a .CL file. A graphic representation of the centerline is shown below.



Pulldown Menu Location: Tools

Keyboard Command: CLEDIT

Prerequisite: A CRD file to put points into or take points from.

Polyline to Centerline File

Function

This command writes a centerline (.CL) file from a polyline. The northing and easting for each vertex of the polyline is written to the centerline file and each arc in the polyline becomes a circular curve.

Prompts

Centerline file to Write dialog Enter the .CL file name to create.

Beginning station <0+00>: *press Enter* Or, type in the beginning station then press Enter.

Select polyline that represents centerline: *pick the polyline that represents your centerline*

Centerline data is displayed in the text screen and a .CL file is created.

Pulldown Menu Location: Tools

Keyboard Command: clpline

Prerequisite: A polyline

Draw Centerline File

Function

This command reads a .CL file and plots it as a 2D polyline in your current drawing at the proper coordinates. You will be prompted at the command line for the layer where you would like the polyline to reside. The default layer name is CLINE. Once you press Enter, you will be prompted to enter the file name of the centerline in the Centerline File to Plot dialog box.

If a spiral exists in the .CL file, the spiral will be represented by polyline segments. A centerline (.CL) file can be created with the Polyline to Centerline File, Input-Edit Centerline or Design Centerline commands. Drawing the centerline file is a way to check the centerline (.CL) file data graphically for correctness. Also, several commands, such as Station Polyline/Centerline, allow you to pick a polyline to define the centerline instead of selecting a centerline (.CL) file. The centerline (.CL) file should be used when using the commands in the Tools menu if a spiral exists in the centerline file.

Prompts

Layer Name for Centerline <CLINE>: *Enter*

Enter the layer name to plot the polyline on.

Centerline File to Plot file selection dialog

Select the .CL file name to read and plot.

Pulldown Menu Location: Tools

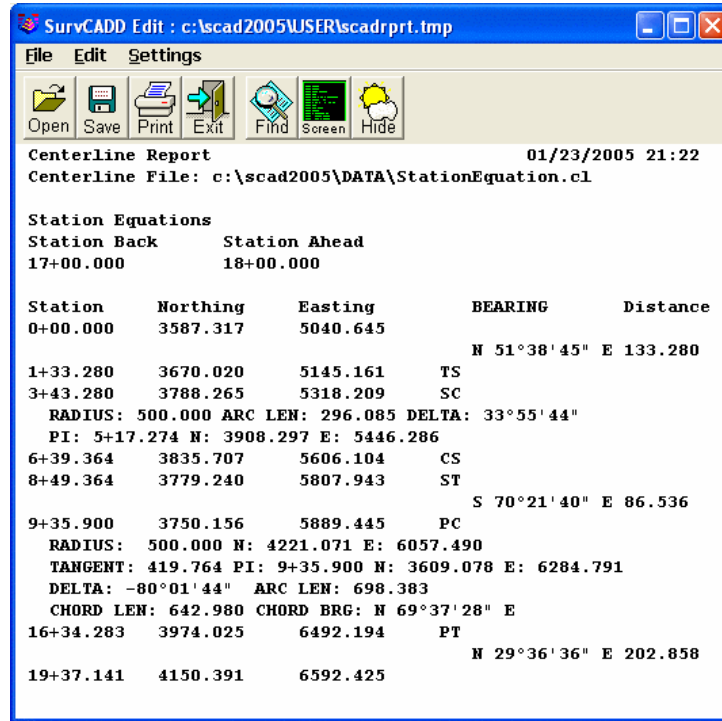
Keyboard Command: cl2pline

Prerequisite: a centerline file

Centerline Report

Function

This command reads a centerline file and creates a report in the standard report viewer which can be written to a file or printer. If the centerline file contains point numbers, then the report will include these point numbers. If station equations are found, they are noted at the top of the report. Here is an example report:



Pulldown Menu Location: Design
Keyboard Command: clreport
Prerequisite: A centerline (.CL) file

Centerline ID

Function

Centerline ID reports the centerline file name and location that is associated with an alignment polyline. The subject polyline must have been created with either Design Centerline, Input/Edit Centerline, or Centerline File to Polyline. When the routine is initiated and an alignment polyline is selected, the file associated with that polyline is reported at the command line. Additional alignment polylines may be selected without re-entering the command, or Enter may be pressed to exit the command.

Prompts

Select centerline polyline to identify: *pick the polyline*
Centerline Name: D:\SAMPLE.CL
Select centerline polyline to identify (Enter to end): *press Enter*

Pulldown Menu Location: Design > Centerline Utilities
Keyboard Command: CL_ID

Prerequisite: A polyline created from a Design Centerline, Input/Edit Centerline, or Centerline File to Polyline

Centerline Conversions

Function

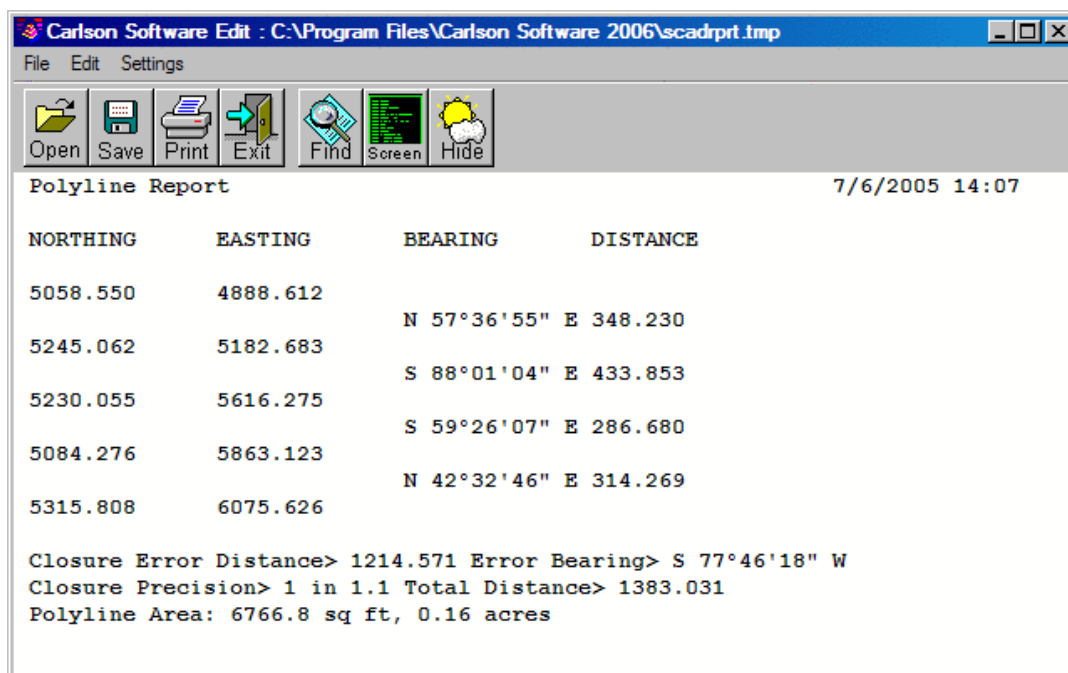
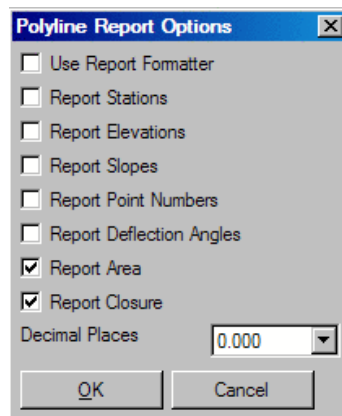
There are several centerline import and export commands. These import commands allow you to convert a single centerline file from their respective program to the Carlson centerline (.CL) format. For each, you are prompted to select the file to be imported, then provide a Carlson centerline file name.

The export commands allow you to convert a single Carlson centerline (.CL) file to formats for other programs. You are prompted to select the Carlson centerline file, then provide a name for the export file.

Polyline Report

Function

This command generates a report of bearing-distance and curve data for all the point along the selected polyline. The closure is reported between the starting and ending points of the polyline. The polyline area is also reported. After executing the command, press O for options. A small dialog box will appear providing you with various report options that can be selected. After making choices, click OK.



Prompts

Options/Select polyline to report: *O*

Make selections in Polyline Report Options dialog.

Options/Select polyline to report: *pick a polyline*

Standard Report Viewer Displays the report for the selected polyline.

Options/Select polyline to report (Enter to End): *press Enter*

Pulldown Menu Location: Tools > Polyline Tools

Keyboard Command: plreport

Prerequisite: A polyline

Polyline to RW5 File

Function

This command generates a raw data (.RW5) file for the selected polyline. This file can be opened using *Edit Process Raw Data File*, which allows you to process the raw data (.RW5) file to generate coordinate points, calculate closure and perform coordinate adjustments by the compass, crandall, transit and least squares adjustment routines.

Prompts

RW5 File to Write (Standard Windows File Selection Dialog): *choose file location and name*

Select Polyline To Process: *select polyline*

Done.

Pulldown Menu Location: Tools, Polyline Tools

Keyboard Command: pl2rw5

Prerequisite: A polyline

Station Polyline/Centerline

Function

This command stations a polyline or centerline file at a given interval distance. The options for this command are set in the dialog box shown below. After setting the options, click OK, and then pick the polyline or select the centerline file. The Polyline should have been drawn in direction of increasing stations.

1 In the Stationing Settings dialog box, you determine the stations and intervals to label.

- **Distance for Stations:** This is the primary interval for stationing.
- **Distance for Intermediate Stations:** This is the intermediate interval for stationing.
- **Beginning Station:** This is the beginning station of the centerline for stationing.
- **Locate Even Stations:** This labels the stations at the distance interval (for example, 2+00, 3+00 ...).
- **Locate Odd Stations:** This labels the non-interval stations at the polyline/centerline end points and PC and PT points.
- **Locate User-Entered:** This prompts you for individual stations to label.
- **Increment Station Labels from Beginning Station:** Without this option, the program increments the station labels from zero. For example, if the station interval is 100 and the polyline starting station is 145, then the program will label 2+00, 3+00, etc. With this option active, the station labels are incremented from the starting station. In this example, the program would then label 2+45, 3+45, etc.
- **Specify Start/End Stations:** Allows you to specify stations to begin and/or end the stationing text.
- **Locate Centerline Points:** When checked, the command will locate points and store them in the current coordinate file.
- **Locate Radius Points:** When checked, the command will locate the radius points of any arc segments. Only available when Locate Centerline Points is checked.
- **Use Profile:** Use this option to locate points on the centerline at each profile PVI. You will be prompted to select the profile (.PRO) file that corresponds to the centerline. Only available when Locate Centerline Points is checked.
- **Label Station Text:** When checked, this command places station text along the polyline at the angle of the corresponding segment. The text is plotted with the current style and on the current layer.
- **Plot PC Lines:** When checked, this option draws radial lines from the PC to the radius point and from the PT to the radius point on centerline arcs. The length of these lines is controlled by using the Max Length field described

below.

- **Max Length:** Specify the maximum length for the PC lines described above. Only available when Plot PC lines is selected.
- **Label Intermediate Stations:** Intermediate distance is drawn the same way as the station distance, with no intermediate station ticks or labels. For example, with the above entries and 0+00 for the first station, the stations will be labeled with descriptions as follows: 0+00 0+50 1+00 1+50, etc.
- **Station + at Tick Mark:** Labels the station text along the polyline with the "+" of the station text at the station's location on the polyline.
- **Text Layer:** Specify layer for text entities.
- **Mark Layer:** Specify layer for tick marks
- **Decimals:** This is the number of decimals used in the stationing.
- **Text Size Scaler:** Specify scaling factor for text size.
- **Mark Size Scaler:** Specify scaling factor for tick marks.

2 Under Centerline By, the item to station is selected.

- **Polyline:** You pick a polyline in the drawing to station.
- **CL File:** You pick the centerline file to station.

3 Under Label Stations, you choose the alignment.

- **Perpendicular:** Stationing is drawn perpendicular to the centerline.
- **Parallel:** Stationing is drawn parallel to the centerline.

4 Under Position, you determine if the position of the label is above or below the line.

5 Under Station Type, you choose the label option.

- **1+00:** Stationing is drawn in the format 1+00.
- **1+000:** Stationing is drawn in the format 1+000.
- **100:** Stationing is drawn in the format 100.
- **NO. 0:** Stationing is drawn in the format NO. 1, NO. 2, etc.

6 Under the Type of Curves option, you select the type of curve in the centerline.

- **Roadway:** Stationing uses the actual arc length of the curve.
- **Railroad:** Stationing applies a slight adjustment to the arc length based on 100 foot chord segments.

7 Other Options

- **Locate Offset Points:** When checked, you may specify left and right offset distances to locate additional points
- **Offsets:** Only available when Locate Offset Points is checked. Specify the left and right offsets.
- **Use Slopes:** When checked, you may specify percent slopes to be used when locating the offset points. Only available when Locate Offset Points is checked.
- **Percent Slopes:** Only available when Locate Offset Points and Use Slopes is checked. Specify left and right offset slopes.

Pulldown Menu Location: Tools

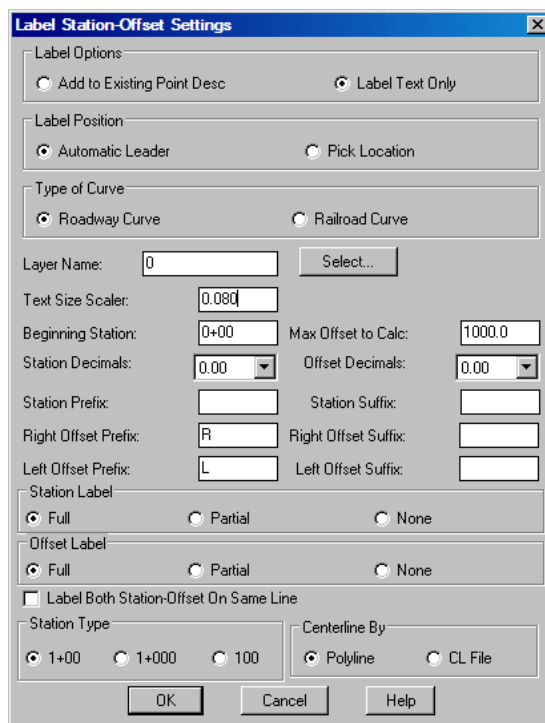
Keyboard Command: STAPL

Prerequisite: A polyline or CL file

Label Station-Offset

Function

This command labels the station and offset of a point relative to a centerline. A polyline that represents the centerline or a centerline (.CL) file is required before running this command. The points to label can either be picked on screen or specified by point number. As the crosshairs are moved, the station and offset of the current position are displayed in real time in the corner of the drawing window.



The options for this command are set in the dialog box shown.

1 Under the Label Options, there are two options for labeling. In addition to updating the point descriptions, these options control the label format.

- **Add to Existing Pnt Desc:** If you have Carlson Survey points and want to add the station-offset to the point descriptions, then use the Add to Existing Point Description option. The Point Description option puts the station and offset on.
- **Label Text Only:** Labels the offsets on screen as text only. The Label Text option draws a leader to the point with the station text above the line and the offset below.

2 Under the Label Position, the location is set. The polyline should be drawn in the order of increasing stations. If the polyline goes the wrong way, use the Reverse Polyline command in the Polyline Utilities in the Edit menu.

- **Automatic:** Labeling is automatic.
- **Pick Location:** You pick the location for each label.

3 Under the Type of Curve, you set the type of curve.

- **Roadway:** Stationing uses the actual arc length of the curve.
- **Railroad:** Stationing applies a slight adjustment to the arc length based on 100 foot chord segments.

4 Other settings in the Label Station-Offset Settings dialog box are used for precision and text additions.

- **Layer Name:** Enter in a layer name for the text. The Select button brings up a list of layers to choose from.
- **Beginning Station:** Enter in the beginning station to start the labeling for Automatic.
- **Max Offset to Calc:** Enter in the maximum offset distance to label. Points with offsets greater than the Maximum Offset to Calc are not labeled.
- **Station Decimals:** Determines the precision of the station for labels.
- **Offset Decimals:** Determines the precision of the offset labels.
- **Station Prefix:** Assigns a prefix to station labels.
- **Station Suffix:** Assigns a suffix to station labels.
- **Right Offset Prefix:** Assigns a prefix to right offset labels.
- **Right Offset Suffix:** Assigns a suffix to right offset labels.
- **Left Offset Prefix:** Assigns a prefix to left offset labels.
- **Left Offset Suffix:** Assigns a suffix to left offset labels.

5 Under the Station Label, the label can be abbreviated.

- **Full:** Labels the full station.
- **Partial:** Labels a partial station, for example at station 5+89, the label would be +89, the characters after the + sign.
- **None:** No station is labeled, only the offset.

6 Under the Offset Label, the label can be abbreviated.

- **Full:** Labels the full offset value.
- **Partial:** Labels a partial offset, for example at offset R 34.8, the label is 34.8. The Offset Label Partial will drop the L for left or R for right from the label.
- **None:** No offset is labeled, only the station.

7 Under the Station type, the label format is assigned.

- **1+00:** Stationing is drawn in the format 1+00.
- **1+000:** Stationing is drawn in the format 1+000.
- **100:** Stationing is drawn in the format 100.

8 Under the Centerline By, the entity is chosen. The centerline labeled is either from a polyline or a centerline (.CL) file.

Prompts

The Label Station-Offset dialog box is displayed.

The Polyline should have been drawn in direction of increasing stations.

1 Select Polyline Centerline: pick the polyline centerline

2 Pick point or point number (Enter to End): **pick a point**

Station > 2+10.91 Offset> 57.36 Right

3 Select point number to add station description to: **pick point number**

This prompt will not appear if the L option, Label Text Only, was selected.

4 Pick point or point number (Enter to End): **Press Enter**

Pulldown Menu Location: Tools

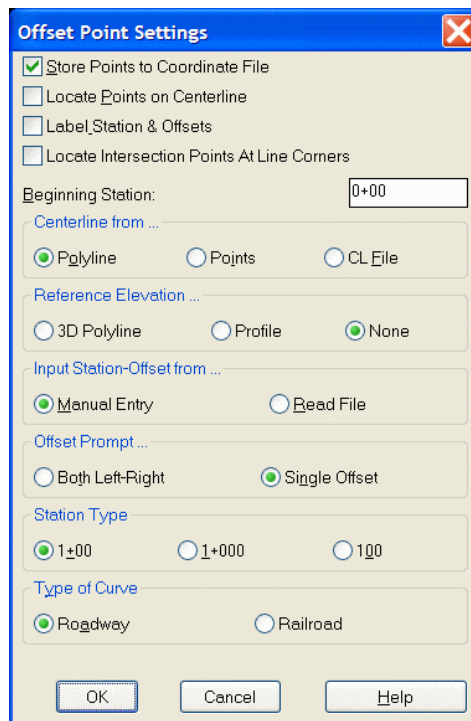
Keyboard Command: offsta

Prerequisite: A polyline centerline

Offset Point Entry

Function

This command creates points along a centerline at specified stations and left and right offsets. The centerline can be defined by a polyline, centerline (.CL) file or two points.

The image shows the 'Offset Point Settings' dialog box. It has a title bar with a close button. The settings are organized into several sections: 1. 'Store Points to Coordinate File' with a checked checkbox. 2. 'Locate Points on Centerline' with an unchecked checkbox. 3. 'Label Station & Offsets' with an unchecked checkbox. 4. 'Locate Intersection Points At Line Corners' with an unchecked checkbox. 5. 'Beginning Station:' with a text box containing '0+00'. 6. 'Centerline from ...' with three radio buttons: 'Polyline' (selected), 'Points', and 'CL File'. 7. 'Reference Elevation ...' with three radio buttons: '3D Polyline', 'Profile', and 'None' (selected). 8. 'Input Station-Offset from ...' with two radio buttons: 'Manual Entry' (selected) and 'Read File'. 9. 'Offset Prompt ...' with two radio buttons: 'Both Left-Right' and 'Single Offset' (selected). 10. 'Station Type' with three radio buttons: '1+00' (selected), '1+000', and '100'. 11. 'Type of Curve' with two radio buttons: 'Roadway' (selected) and 'Railroad'. At the bottom are 'OK', 'Cancel', and 'Help' buttons.

Store Points to Coordinate File: This option will store any points the the current coordinate (.CRD) file. This includes centerline points and offset points.

Locate Points on Centerline: When checked, the program will locate points along the centerline, otherwise just the offset points will be created.

Label Stations & Offsets: When checked, the program will label the station-offset as the point description attribute.

Locate Intersection Points At Line Corners: When checked, the program will locate points along the centerline at the intersection points of selected lines with that of the centerline. This routine is to be used along with Locate Points on Centerline. This is a good option to use when the exact station of where the offset points are to be created is not known but is referenced by an existing line on the drawing.

Centerline from: Use this feature to specify whether to define the centerline by picking a polyline in the drawing, selecting a centerline (.CL) file, or using 2 points.

Reference Elevation: Use this to assign elevations to the points created when locating points on the centerline of offset points. When using a 3D Polyline for the elevation reference, points will be created at the station entered and

the offsets specified with the elevation of the same station along the 3D polyline. The Profile option will do the same as the 3D Polyline option only it will use a profile file for the elevation reference. You will be prompted for the profile to use for the elevation reference. None simply creates 2d point data on elevation zero. The Reference Elevation option is good for creating points along the centerline for final grade elevation points. *Profile to 3D polyline* can be used to transfer the profile data to the polyline before calculating the final grade points.

Input Station-Offset from: The Manual Entry option will prompt for the station and offset distances. The Read File option will read the stations and offsets from a text file. The text file format is comma delimited with point number, station, offset and elevation. The station should be just the station number without the '+' (i.e. 250 instead of 2+50). The elevation is optional. The Read File option is a quick routine to convert a station-offset data file into coordinates.

Offset Prompt: When set to Both Left-Right, the program will prompt for left and right offsets. If you respond to an offset prompt with zero (0), no offset point is created. The Single Offset option will prompt for one offset per station. Enter a right offset with a positive value and a left offset as a negative value.

Station Type: Use to specify the stationing format to use.

Type of Curve: Use to specify whether the curves are for a roadway or railroad.

Prompts

Offset Point Settings Dialog

Polyline should have been drawn in direction of increasing stations.

Select Polyline near endpoint which defines first station.

[nea on] **Select Polyline to Station-Measure:** *select a polyline*

(5309.0 4845.0) **Station:** 0.00

(5526.0 4917.0) **Station:** 228.63

Distance from beginning station along centerline (Enter to end): 110

Starting Segment Station: 0.0 **Ending Segment Station:** 228.633

Working Line segment...(5413.4 4879.64 0.0)

Left offset distance <10.0>: 15

Right offset distance <15.0>: 20

Distance from beginning station along centerline (Enter to end): *press Enter*

Pulldown Menu Location: Tools

Keyboard Command: offpts

Prerequisite: A centerline (.CL) file, polyline, or two points

Calculate Offsets

Function

This command calculates the station and offsets of point coordinates relative to a centerline. The points to calculate can be stored in a coordinate (.CRD) file or picked on the screen. As the crosshairs are moved, the station and offset of the current position are displayed in real-time in a small window.

Beginning Station: Specify the beginning station of the centerline. The polyline should be drawn in the order of increasing stations. Not available when you use a centerline (.CL) file to define the centerline.

Maximum Offset to Calc: Enter your preferred value.

Report Offsets Ahead/Behind Centerline: When checked, this option shows offsets for points or picked points located before the beginning station and after the ending station of the centerline.

Label Station Offsets: When checked, the station offsets will be labeled in the drawing.

Sort Report by Stations: When checked, this option will report the station-offsets in station order no matter what order the points were calculated.

Report Point Coordinates: When checked, this option will include the point northing and easting in the report.

Report Point Notes: When checked point notes will be included on the calculate offset report.

Use Report Formatter: When checked, the output of this command is directed to the Report Formatter which allows you to customize the layout of the report fields and can be used to output the data to Microsoft® Excel or Microsoft® Access. You must check this option on in order to use the Report Grade Elevation From option.

Create Point Notes: When checked, the station and offset of the offset point will be created as notes and written to a note file (*.NOT). This note file will have the same name as the crd file.

Round Stations: When checked, this option will round the stations for the selected points on the report to the Rounding Interval specified. For example if an offset point is located at station 1+01, and the rounding interval is set to 10, then the report will show the offset point at station 1+00.

Report Grade Elevation From: When checked, this option will calculate an elevation for each point from a 3D polyline, grid file (.GRD) or triangulation (.FLT) file. To Use this option, the *Report Formatter* must be toggled on. The grade elevation is reported and compared with the point elevation to report the cut/fill. For the 3D polyline option, the grade elevation is calculated by finding the elevation at the point on the 3D polyline that is the nearest perpendicular position from the offset point. The 3D polyline that is used for elevations does not need to be the same polyline that is used as the centerline for the station-offset calculations.

Define Centerline by: Specify whether to define the centerline by picking a polyline in the drawing, selecting a centerline (.CL) file, or using 2 points.

Station Type: Specify the stationing format to use.

Decimals: Specify the display precision for the stations and offsets.

Type of Curve: Specify whether the curves are for a roadway or railroad.

Prompts

Calculate Offset Settings Dialog

Polyline should have been drawn in direction of increasing stations.

Select Polyline near endpoint which defines first station.

[nea on] **Select Polyline Centerline:** *select polyline centerline*

(5309.0 4845.0) **Station: 0.00**

(5526.0 4917.0) **Station: 228.63**

PtNo. North(y) East(x) Elev(z) Description

140 4889.13 5410.25 0.00 1+10.00L10.00

Station on Line> 1+10.00 Offset> 10.00 Left

PtNo. North(y) East(x) Elev(z) Description

141 4870.15 5416.55 0.00 1+10.00R10.00

Station on Line> 1+10.00 Offset> 10.00 Right

+ before station denotes point is ahead of line segment, - denotes beyond.

Pick point or point numbers (Enter to End): 22-28

Station	Offset	Description	Elev	Pt#	North	East
4+95.89L	15.48	Catch Basin	0.00	22	4811.00	4454.00
5+78.43L	58.18	Power Pole	0.00	23	4839.00	4548.00
6+77.26L	57.28	Power Pole	0.00	24	4868.00	4656.00
9+01.55R	16.81	Catch Basin	0.00	25	4745.00	4887.00
10+50.51L	25.39	Traffic Sign	0.00	27	4872.00	5043.00
4+03.48R	22.15	Light Pole	0.00	28	4657.00	4454.00

Pick point or point numbers (Enter to End): *press Enter*

Pulldown Menu Location: Tools

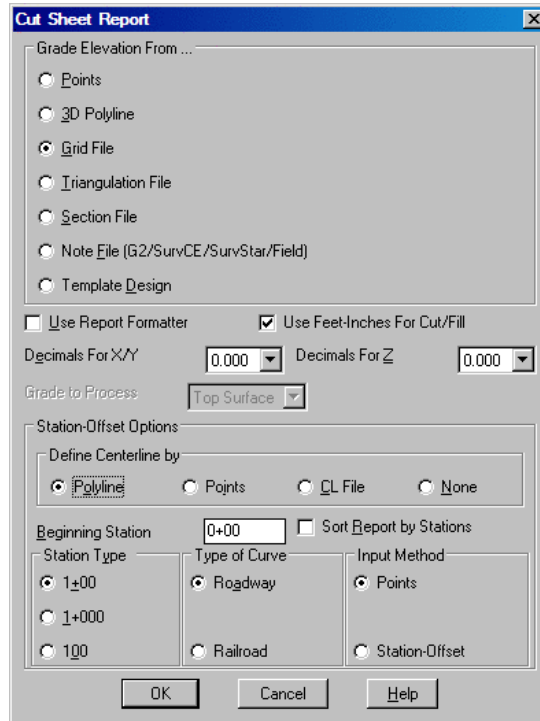
Keyboard Command: calcoff

Prerequisite: A centerline (.CL) file, polyline or two points

Cut Sheet

Function

This command creates a report of the elevation difference between points and a design elevation which can be defined by a grid file, triangulation file, 3D polyline, section file, note file, road template file or design points. The station and offset of the points can also be reported if a centerline is specified. The Report Formatter option can be used to customize the report layout and to output the report data to Microsoft® Excel or Microsoft® Access.



The Grade Elevation From option has seven choices for the surface.

Points: The Points option reports the horizontal distance and cut/fill between two points. The points to compare can be in the same coordinate file, or separate files. For the same coordinate file option, two ranges of point numbers are compared. For the separate file option, the point numbers are used to match points between the files.

3D Polyline: When using a 3D polyline for the grade elevation, the command calculates the elevation along the polyline at the position perpendicular from the point.

Grid File: For grid surface files, the design elevation is determined by the surface file at the point.

Triangulation File: For triangulation surface files, the design elevation is determined by the surface file at the point.

Section File: For section files, the grade elevation is interpolated from the offset-elevation data in the section file based on the station-offset of the point along the centerline.

Note File (G2/SurvCE/SurvStar/Field): The Note File option reads the grade elevation from the note file (.not) that is associated with the current coordinate file. For example, if the current coordinate file is job3.crd, then the note file name is job3.not.

Template Design: The Template Design option defines the grade elevation using road design files. For each point, the program finds the station-offset for the point along the centerline and then applies the road design at that station to determine the grade elevation. The required design files include a centerline (.cl), template (.tpl), and profile (.pro).

Use Report Formatter: This option can be used to customize the report layout and to output the report data to Excel or Access. The Report Formatter is explained in the List Points command in the Points menu. The Decimals option controls the decimal precision used. The Grade to Process option uses the top surface or various subgrades. The Define Centerline by options contain the station settings.

Polyline: Select this option to pick a polyline in the drawing.

Points: Select this option to use points representing the centerline.

CL File: Select this option to use a centerline file.

None: Centerline is not used.

The Beginning Station is used when defining a centerline by points or by selecting a polyline. Enter the beginning station. The Sort Report by Stations option allows you to sort the output report by station number. Under the Station type, the label format is assigned.

1+00: Stationing is drawn in the format 1+00.

1+000: Stationing is drawn in the format 1+000.

100: Stationing is drawn in the format 100.

Under the Type of Curve, you set the type of curve.

Roadway: Stationing uses the actual arc length of the curve.

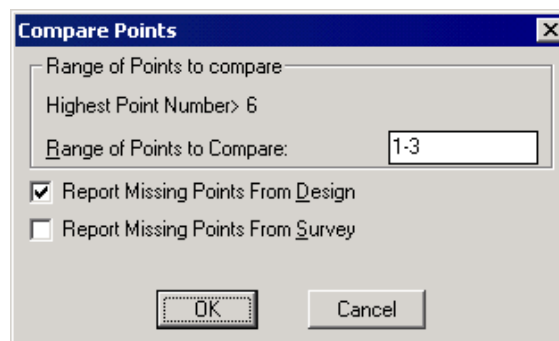
Railroad: Stationing applies a slight adjustment to the arc length based on 100 foot chord segments.

When using a 3D polyline for the grade elevation, the program calculates the elevation along the polyline at the position perpendicular from the point. For grid and triangulation surface files, the design elevation is determined by the surface file at the point. With section files, the grade elevation is interpolated from the offset-elevation data in the section file based on the station-offset of the point along the centerline.

The Note File option reads the grade elevation from the note (.NOT) file that is associated with the current coordinate file. For example, if the current coordinate (.CRD) file is job3.crd then the note file name is job3.not. In Carlson Software's data collection programs (SurvCE and Field), there is an option to store stakeout data to the note file under the Stakeout options. When storing a point in the stakeout routines (using SurvCE or Field), the target point number, coordinates and elevation can be stored to the note file. This results with the as-staked coordinate stored in the coordinate (.CRD) file and the target coordinate stored in the associated note file. The Cut Sheet report can display this stakeout data using the Stakeout Point Comparison report option. The horizontal difference between the staked point and the target point can be reported in Bearing-Distance, Delta X-Y or North-South-East-West format. Also, in SurvCE and Field, the elevation difference routines can record the design grade elevation and station-offset to the note file when a point is stored to the coordinate (.CRD) file. This grade data can be reported using the Grade Elevation Report option.

The Template Design option defines the grade elevation using road design files. For each point, the program finds the station-offset for the point along the centerline and then applies the road design at that station to determine the grade elevation. The required design files include a centerline (.CL) file, a template (.TPL) file, and a profile (.PRO) file. There are also several optional design files such as superelevation. The design files are created in the Section-Profile module. Using the design files in Cut Sheet is similar to the Process Road Design command.

The Points option reports the horizontal distance and cut/fill between two points. The points to compare can be in the same coordinate (.CRD) file or separate files. For the same coordinate (.CRD) file option, two ranges of point numbers are compared. For the separate file option, the point numbers are used to match points between the files. If point numbers are missing in the comparison (e.g. points 1 to 3 in the current coordinate (.CRD) file are being compared to points 1 and 3 in the design coordinate (.CRD) file), then there is an option for reporting the missing points, as seen in the Compare Points dialog.



This leads to the following report.

Cut Sheet 11/29/2004 02:25

Survey Coordinate File> c:\CarlsonOEM\data\spring.crd

Design Coordinate File> C:\CarlsonOEM\data\springf.crd

Survey Design

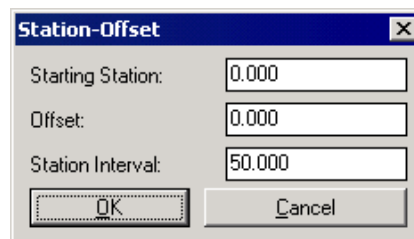
Pt# Elevation Elevation Delta-X Delta-Y Cut/Fill Description

1 3511.400 3519.340 0.000 0.000 F7.940 fill

2 Missing From CRD File 2

3 3499.000 3502.110 0.000 0.000 F3.110 fill

If the Station-Offset method is selected as an Input Method, then only the final grade elevations are produced in the report. This is useful for writing final grades on the stakes prior to taking field shots. You are first prompted for the desired offset and starting station, as shown in the Station Offset dialog. Then you obtain a report of final grades only.



Cut Sheet 11/29/2004 02:55

PT# Station Offset ElevationGrade Cut/Fill Desc

PP 0.000 R0.000 3663.288

PP 0+50.0 R0.000 3662.031

PP 1+00.0 R0.000 3660.800

PP 1+50.0 R0.000 3633.005

PP 2+00.00 R0.000 3652.743

When comparing points in the same file, the Points to Compare dialog appears, which includes an option allowing the assigning of multiple design points to the same survey point.

Points To Compare

Selected Points

Point#	Point#	Distance
3	6	84.785
2	5	88.859
1	4	96.900

Survey Points

Point#	North	East	Elevation	Desc
1	4156.537	8300.635	397.419	0+00
2	4110.658	8280.758	400.558	0+50
3	4071.817	8263.931	398.483	0+92.1

Design Points

Point#	North	East	Elevation	Desc
4	4070.320	8256.408	396.248	1+00
5	4060.557	8207.370	395.440	1+50
6	4055.263	8180.778	391.996	1+77.1

Range of Points to compare

Highest Point Number: 6

Survey Range of Points:

Design Range of Points:

The goal in this dialog is to establish in the upper window all the point pairings that you wish to compare for the cutsheet. This is done 3 ways:

1. By entering the survey point and design point in the lower dialog boxes (e.g. 3 and 13 as shown above) and clicking add.
2. By picking the points from Survey Points and Design Points sections and clicking add.
3. By matching points that are within a distance tolerance from each other, using Match by Tolerance.

This latter option can be a huge time-saver, particularly when office personnel are not familiar with the pairings to analyze. When comparing points, there is an option to flag points in the report that exceed the specified distance tolerance, as shown here.

Cutsheet Points Options

Source of Points for Comparison

☒ Current Coordinate File

☐ Another Coordinate File

Horizontal Tolerance:

Vertical Tolerance:

☒ Report Coordinates

Output Option

☐ Bearing-Distance

☒ DeltaX-DeltaY

☐ North-South-East-West

☐ None

Pulldown Menu Location: Tools

Keyboard Command: CUTRPRT

Prerequisite: A coordinate file (.CRD file) with points.



COGO Commands

12

This chapter provides information on using the commands from the COGO menu to perform coordinate geometry operations in your drawing.

Inverse

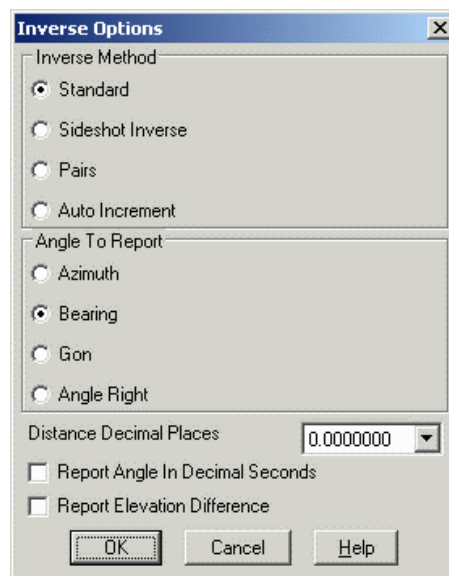
Function

This command reports the bearing/azimuth and horizontal distance between two points. The command prompts for a series of points. Use the appropriate object snap mode to select the points from the screen, or use the point numbers to reference coordinates stored in the current coordinate (.CRD) file. The results are then displayed. This command is also used in conjunction with the *Traverse* and *Sideshot* commands to occupy and backsight two points. The last two points you Inverse to are the Backsight and the Occupied point for the Traverse and Sideshot commands. An attractive feature of *Inverse* is that you can enter T or SS within the command and go directly to *Traverse* or *Sideshot*. Even a single S will transmit to *Sideshot*. Hotkeys are not case sensitive. Press [Enter] at the point prompt to end the command.

You can also inverse around an arc by inverting to the PC, and then entering an A for Arc option. The program will ask for the radius point, the curve direction left or right and the PT point. The curve data is then reported. There is an unequal PC-Radius and PT-Radius distance check. The tolerance for this is set in the *Area Label Defaults* command.

There are several input options for *Inverse* that are set by entering O for Options. Sideshot inverse holds the current occupied point and calculates the bearing/distance to each entered point. The Pairs option reports the bearing/distance between pairs of points and not for every entered point. For example, if points 1,2,11,12 were entered, the bearing/distance would be reported for 1,2 and 11,12 but not 2,11. The Auto Increment option uses the next point number by just pressing Enter. To exit the routine with Auto Increment active, End must be entered.

There are also several angle output options that are set at the second prompt in the Options. The angle can be reported as either Bearing, Azimuth, Gon or Angle Right. You can also specify to report with decimal seconds.



Inverse Options dialog

Prompts

Calculate Bearing & Distance from starting point?

Traverse/SideShot/End/Options(auto)/Arc/Pick point or point number: *pick a point*

Traverse/SideShot/End/Options(auto)/Arc/Pick point or point number: 9

PtNo.	Northing (Y)	Easting (X)	Elev (Z)	Description
9	4909.25	4648.37	0.00	

Bearing: N 81d8'54" E Azimuth: 81d8'54"

Horizontal Distance: 261.17407461

For instruction on how to insert either new or existing points into the drawing, see Draw-Locate Points in the Points Commands section of the General Commands chapter. This feature can be found in the Points pulldown of all menus.

Pulldown Menu Location: COGO

Keyboard Commands: inverse, i

Prerequisite: None

Occupy Point

Function

This command sets the occupied point and backsight angle for other COGO commands such as *Traverse*. For setting the occupied point, you have the option of picking a point on the screen, entering coordinates at the command line or typing in a point number that will be read from the current coordinate (.CRD) file. Four options are available for determining the backsight direction: Azimuth, Bearing, None and Point. For the default Point option, you may pick a point on the screen, input coordinates, or type a point number that will be read from the current coordinate file. For the Azimuth and Bearing option, you enter the backsight angle in the selected format. The None option sets the backsight to an azimuth of 0 (zero) or North. You can also set the occupied point by using the *Inverse* command. If you inverse from point 3 to point 1, you have set point 1 as the occupied point and point 3 as the backsight. For more information, see the *Inverse* command.

The current occupied point and backsight are shown in the lower right hand corner of the AutoCAD status bar just below the command line.

Prompts

Set Occupied Point

Pick point or point number: *pick a point (5000 5000 0.0)*

Set backsight method [Azimuth/Bearing/None/<Point>]? *press Enter*

Set Backsight Point

Pick point or point number: *pick a point (5184.76 5381.3 0.0)*

For instruction on how to insert either new or existing points into the drawing, see Draw-Locate Points in the Points Commands chapter. This feature can be found in the COGO and Points pulldown menu.

Pulldown Menu Location: COGO

Keyboard Commands: occpoint, op

Prerequisite: None

Traverse

Function

This command allows the user to input any combination of turned angles, azimuths or bearings to define a traverse or figure. The command prompts for an Angle-Bearing Code which defines the angle or bearing type. This command always occupies the last point it calculated and backsights the point before that.

Codes 1 through 4 define the bearing quadrants:

- 1 = Northeast
- 2 = Southeast
- 3 = Southwest
- 4 = Northwest

The remaining codes define as follows:

- 5 = a north based azimuth
- 6 = an angle turned to the left
- 7 = an angle turned to the right
- 8 = a deflection angle left
- 9 = a deflection angle right

For both the Angle-Bearing Code and the Distance prompt, the user can enter point-defined responses: two points separated by an asterisk, as in 2*3 for the bearing (or distance) defined by 2 to 3. You can also add math expressions. For angles, 2*3+90 would deflect 90 degrees right from 2 to 3. For distance, 2*3/2 would mean half the distance of 2 to 3. You do not need to enter N before entering a number-defined distance. Just bring up the number inverse prompt.

The command draws lines between located points (if the Line On/Off in the COGO menu is set to on) and plots the points calculated and stores them in the current coordinate (.CRD) file if point numbering is On. The point settings are defined in the *Point Defaults* command. If Point Protect is turned on, *Traverse* checks if the point numbers are already stored in the file. Point Protect is set in the *Coordinate File Utilities* command.

There are Angle-Bearing code input options for *Traverse* that are set by entering O for Options. The Angle Right option prompts for the angle right and skips the angle-bearing code prompt. The Azimuth option prompts for the azimuth and skips the angle-bearing code prompt.

Prompts

Occupied Point ?

Pick point or point number: *pick a point*

You will only be prompted for the occupied point the first time you use the command.

Use the *Inverse* command to set the occupied and backsight points.

Exit/Options/SideShot/Inverse/Enter Azimuth (ddd.mmss) <>: o

Angle prompt angle right or azimuth only [Right/Azimuth/Prompt]? p

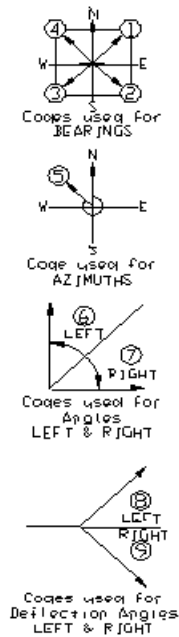
Exit/Options/Arc/Points/Line/SideShot/Inverse/Angle-Bearing Code <5>: *press Enter* Pressing Enter uses the default angle right code.

Enter Angle (dd.mmss) <90.0000>: 88.1324 You can also enter L or R to define an angle 90 degrees Left or Right.

Backsight Point ?

Pick point or point number: *pick a point*

Number inverse/<Distance>: 100



Select Coordinate (.CRD) File This dialog only appears if there is not a current coordinate coordinate (.CRD) file.
Exit/Options/Line/Side Shot/Inverse/ <Angle-Bearing Code <7>>: $14*9-45.2045$ Uses the bearing defined by point numbers 14 & 9 and subtracts the angle 45 degrees, 20 minutes, and 45 seconds. You can use a + or - in this type of entry.

Number inverse/ <Distance>: N (note: you can enter $14*9/2$ here, as well)

Point number inverse (i.e. $10*20$): $14*9/2$ This causes the command to recall the distance from point number 14 to 9 and divide it by 2.

Exit/Options/Line/Side Shot/Inverse/ <Angle-Bearing Code <7>>: L

Select Line or Polyline that defines Bearing: select line that defines bearing

Number inverse/ <Distance>: 100

Exit/Options/Line/Side Shot/Inverse/ <Angle-Bearing Code <7>>: E Enter E to end the command. Enter S or SS to execute the *Side Shots* command or I to execute the *Inverse* command.

For instruction on how to insert either new or existing points into the drawing, see Draw-Locate Points in the Points Commands chapter. This feature can be found in the Points and COGO pulldown menus.

Pulldown Menu Location: COGO

Keyboard Commands: T, Traverse

Prerequisite: None

Side Shots

Function

This command allows the user to input any combination of turned angles, azimuths or bearings while remaining on an occupied point. The command prompts for an Angle-Bearing Code which defines the angle or bearing type. Codes 1 through 4 define the bearing quadrants; 1 being North-East, 2 South-East, 3 South-West, and 4 North-West. Code 5 is a north-based azimuth, 6 an angle turned to the left, 7 an angled turned to the right, 8 a deflection angle left and 9 a deflection angle right. The command plots the points calculated and stores them in the current coordinate (.CRD) file if point numbering is On. If Point Protect is turned On, *Side Shots* checks if the point numbers are already stored in the file. All points calculated radiate from the occupied point. Use the *Traverse*, *Inverse*, or *Occupied Point*

commands explained previously to define the occupied and backsight points. Options allows you to select your angle entry method.

Prompts

Occupied Point ?

Pick point or point number: *screen pick a point or enter a point number*

Exit/Options/Traverse/Inverse/Enter Azimuth (ddd.mmss) <A>: *O for options*

Angle prompt angle right or azimuth only [Right/Azimuth/Prompt]?P *for prompt*

Exit/Options/Points/Line/Traverse/Inverse/<Angle-Bearing Code <7>: *6 Code 6 for angle turned to left.*

Pick point or point number: *pick a point*

Enter Angle (dd.mmss) <6>: *22.3524 Angle of 22 degrees, 35 minutes, 24 seconds.*

Points/<Distance>: *120.91*

Enter Vertical Angle (dd.mmss) <0.0000>: *88.2548*

These prompts only come up if you have Instrument and Rod height prompting turned on.

Instrument Height <5.000>: *5.12*

Rod-Target Height <5.120>: *press Enter*

Enter Point Description <>: *Topo Shot*

Exit/Options/Points/Line/Traverse/Inverse/<Angle-Bearing Code <6> *E*

For instruction on how to insert either new or existing points into the drawing, see Draw-Locate Points in the Points Commands chapter. This feature can be found in the Points and COGO pulldown menus.

Pulldown Menu Location: COGO

Keyboard Commands: sideshot, ss

Prerequisite: None

Enter-Assign Point

Function

This command creates a point at the user-entered coordinates. The point is both stored to the current coordinate (.CRD) file and drawn on the screen. The program will prompt for the northing and easting. This routine will prompt for point number, elevation and description, depending on the settings in the *Point Defaults* command. *Point Defaults* also allows you to set the point symbol and layer. *Point Defaults* is found under the Points pulldown.

Prompts

Enter North(y): *5000*

Enter East(x): *5000*

Select/<Enter Point Elevation <0.00>: *Enter 100 for elevation, or press S and enter to select text to set elevation.*

Enter Point Description <>: *START*

N: 5000.00 E: 5000.00 Z: 0.00

Enter North(y): *press Enter to end*

For instruction on how to insert either new or existing points into the drawing, see Draw-Locate Points in the Points Commands section of the General Commands chapter. This feature can be found in the Points pulldown of all menus.

Pulldown Menu Location: COGO
Keyboard Commands: eapoint, ea
Prerequisite: None

Raw File On/Off

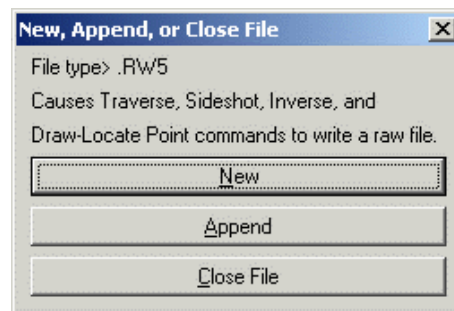
Function

This menu selection toggles raw file (.RW5) creation. When this option is active, commands such as *Traverse* create entries in the current raw data (.RW5) file. If Raw File is turned on, the pulldown menu option will have a check mark character in the menu. A dialog will appear, allowing you to create a New, Append an existing, or Close the .RW5 file.

Prompts

Select COGO pulldown. Observe Raw File (On or Off) toggle for check. Click and the dialog appears.

✓ Raw File On/Off



Pulldown Menu Location: COGO
Keyboard Command: openraw
Prerequisite: None

Line On/Off

Function

This menu selection toggles line plotting on and off for the commands such as *Traverse*, *Locate by Line Bearing*, etc. If line drawing is turned on, the pulldown menu option will have a check mark character to the left of the command.

Command: set_lonoff
Line ON
Command: set_lonoff
Line Off

✓ Line On/Off

Checked (on)

Pulldown Menu Location: COGO

Keyboard Command: set_lonoff

Prerequisite: None

Line by Angle-Distance

Function

This command draws a line from an occupied point at a given angle and distance, where the angle format supports the standard 1-9 angle-bearing codes. It holds the current occupied point and calculates a line by angle-distance to each entered point. As for the angle formats, the Options choice allows for angle right, azimuth only or prompt entry (Right/Azimuth/Prompt) methods. The Prompt method allows you to enter the 1-9 angle-bearing codes.

Prompts

Exit/Options/SideShot/Inverse/Enter Azimuth (ddd.mmss) <90.0000>: 112.3024

Points/<Distance>: 290

Exit/Options/SideShot/Inverse/Enter Azimuth (ddd.mmss)<112.3024>: O

Angle prompt angle right or azimuth only [Right/Azimuth/Prompt]? R

Exit/Options/SideShot/Inverse/Enter Angle (dd.mmss) <112.3024>: 88

Points/<Distance>: 300

Exit/Options/SideShot/Inverse/Enter Angle (dd.mmss) <88>: O

Angle prompt angle right or azimuth only [Right/Azimuth/Prompt]? P

Exit/Options/Points/Angle-Bearing Code <7>: Enter

Enter Angle (dd.mmss) <88>: 31.4340

Points/<Distance>: 419

Exit/Options/Points/Angle-Bearing Code <7>: E

Pulldown Menu Location: COGO

Keyboard Command: travline

Prerequisite: None

Locate by Line Bearing

Function

This command calculates and plots a line (if the Line On/Off is set to Line On) and point from an occupied point. The bearing can be defined by picking two points, selecting a line, inputting two point numbers, or typing in a bearing or azimuth. The command always occupies the last point calculated.

Prompts

Press [Enter] to use preview point/or select occupied point.

Pick point or point number: 14

PointNo.	North(Y)	East(X)	Elev(Z)	Description
14	4869.06	4390.31	0.00	

Pick points that define bearing.

Define Bearing by, Line/Bearing/Numbers/<pick 1st point>: B

At this prompt the default is to pick the first point that defines the bearing. If you pick a point, you are then prompted for a second point. You can input B to type in a bearing or azimuth or L to select a line or polyline that defines the bearing, or N to input two point numbers that define the bearing.

[A]zimuth/<Bearing (Qdd.mmss)>: A

Azimuth (ddd.mmss): 45.2349

Number inverse/<Distance>: 188.27

Enter Vertical Angle (dd.mmss) <0.0000>: press Enter

The horizontal distance is given.

Enter Point Description <stk>: press Enter

The coordinates are given.

Pulldown Menu Location: COGO > Locate by Bearing-Ang

Keyboard Command: locbrg, lb

Prerequisite: None

Locate by Turned Angle

Function

This command creates a point using turned angle and distance and plots a line if Line On/Off is set to on.

Prompts

Define occupied & backsight points by [L]ine or [P]oints <P>: L

Select Line or Polyline near end point that defines occupied point: select line

Occupied point: (4078.44 4610.89 0.0)

Backsight point: (4390.31 4869.06 0.0)

Enter Angle (ddd.mmss) <45.2349>: 22.5632

Pick or Type Distance <188.27>: 40.32

Enter Zenith Angle (dd.mmss) <90.0000>: 88.4515

Enter Point Description <>: ip

Pulldown Menu Location: COGO > Locate by Bearing-Ang

Keyboard Command: turnang2 or TA

Prerequisite: None

Locate by Azimuth

Function

This command locates points by azimuth and distance. The AutoCAD text screen provides the horizontal distance and coordinates.

Prompts

[Enter] to use preview point/ or Select occupied point ?

Pick point/<point Number>: *_endp of (pick a point)*

Enter Azimuth (ddd.mmss) <22.5632>: 277.1259

Enter or pick Distance <40.32>: 104.39

Enter Vertical Angle (dd.mmss) <0.0000>: *Enter*

Pulldown Menu Location: COGO > Locate by Bearing-Ang

Keyboard Commands: locazi2, az

Prerequisite: None

Locate by Bearing

Function

This command locates points by bearing and distance. Additionally, the AutoCAD text screen provides the horizontal distance and coordinates.

Prompts

[Enter] to use preview point or Select occupied point ?

Pick point/<point Number>: 24

PointNo.	Northing (Y)	Easting (X)	Elev (Z)	Description
24	4922.37	4544.81	0.00	

Enter Bearing (Qdd.mmss) <277.1259>: 435.2317

Enter or pick Distance <104.39>: 200

Enter Vertical Angle (dd.mmss) <0.0000>: *Enter*

Pulldown Menu Location: COGO > Locate by Bearing-Ang>

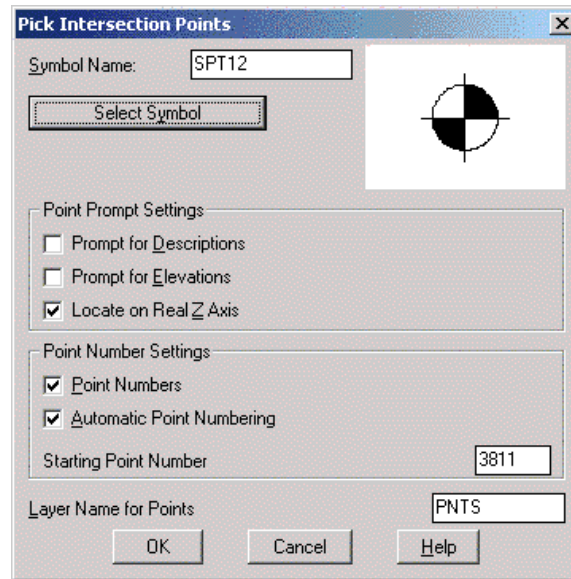
Keyboard Command: locbrg2, lg

Prerequisite: None

Pick Intersection Points

Function

This command locates points at screen picked intersections. The AutoCAD object snap mode is set to intersection. This routine is similar to the Locate Point command with an additional check that makes sure there is an intersection at the picked point. If there is not an intersection at the picked point, then no point is created.



Prompts

Pick Intersections Points dialog

APParent intersection on [<Yes>/No]: *Y*

This first prompt is very important. Apparent Intersection snaps to the apparent intersection of two objects (arc, circle, ellipse, elliptical arc, line, multiline, polyline, ray, spline, or xline) that do not intersect in 3D space, but may appear to intersect in the current view. This allows you to locate a point at the theoretical intersection of two 3D entities. You should answer No to this prompt if you want to ignore theoretical 3D intersections.

[app on] Pick intersection Point: *pick a point*

[app on] Pick intersection Point: *press Enter to end*

Pulldown Menu Location: COGO > Locate at Intersect

Keyboard Command: pickint

Prerequisite: Intersection of two entities

Bearing-Bearing Intersect

Function

This command locates a point at the intersection of two lines. The lines can be defined by picking two points, selecting a line or typing in a bearing. After the lines are defined a point symbol is located at the point of intersection.

Prompts

[Enter] to use preview point or select 1st Base point ?

Options/<Pick point or point number>: *press Enter*

Define 1st angle by (Line/Points?Right/Azimuth/Bearing) <Bearing>: L

Select Line or Polyline that Defines 1st Bearing: *select*

Enter 1st Offset Distance <0.0>: *press Enter*

2nd Base point?

Pick point or point number: *pick a point*

Define 2nd angle by (Line/Points/Right/Azimuth/Bearing) <Line>: P

[Enter] to use preview point/or pick 1st point that defines 2nd bearing.

Pick point or Point number: *pick point*

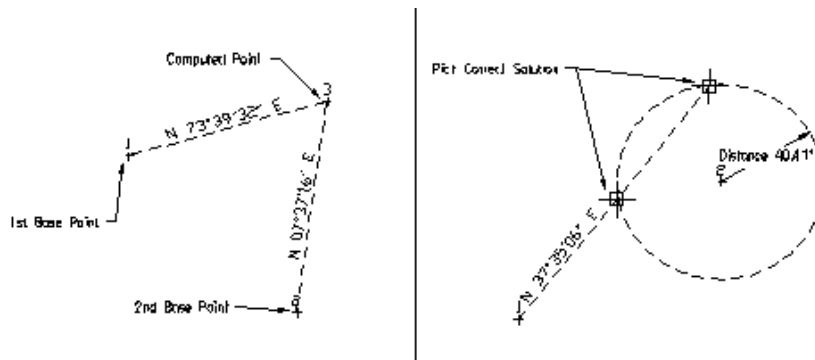
2nd point that defines 2nd bearing ?

Pick point or Point number: *pick a point*

Enter 2nd Offset Distance <0.0>: *press Enter*

Enter/<Select text of elevation>: *select*

The point is then located at the computed point of intersection.



Bearing-Bearing Intersect Bearing-Distance Intersect

Pulldown Menu Location: COGO > Locate at Intersect

Keyboard Command: bb

Prerequisite: None

Bearing-Distance Intersect

Function

The Bearing-Distance Intersection command prompts the user for a base point from which the known bearing intersects. It then defines the bearing by one of three methods. The bearing can be defined by picking two points, selecting a line with the same bearing or by typing in the bearing in the form of Qdd.mmss (similar to the *Locate by Bearing* command). Next the user is prompted for a base point from which the known distance radiates. After entering the known distance a circle is drawn radiating from the selected base point, and a line defined by the bearing is extended to intersect the circle. The user then picks the correct point for the solution desired and a point symbol is located at the selected intersection. The command then erases the temporary circle and line. The Options choice allows you to be prompted for angle method or for offsets, or both.

Prompts

[Enter] to use preview point or select known Bearing base point

Options/Pick point or point number: *pick point*

Define 1st bearing by (Line/Points/Azimuth/Bearing)<Bearing>: *l*

Select Line or Polyline that Defines Bearing: *pick entity*

Enter 1st Offset Distance <0.0>: *press Enter*

Known distance base point.

Pick point or point number: *pick point*

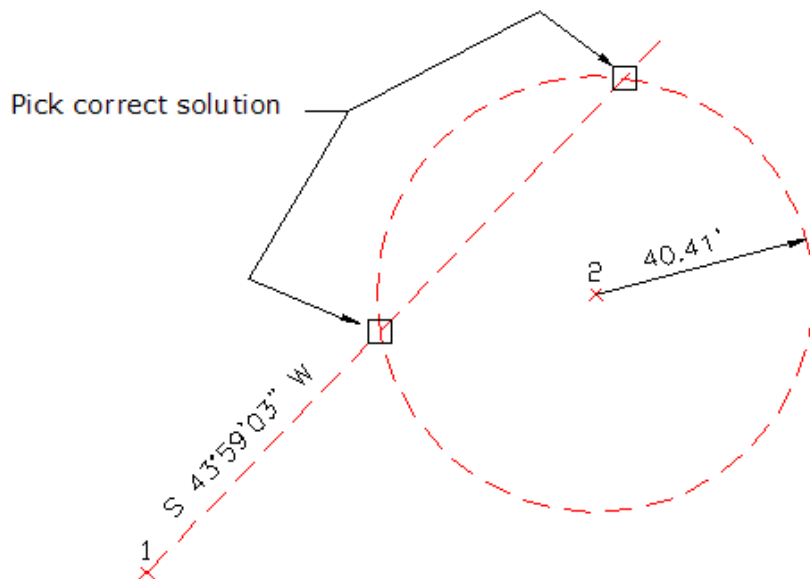
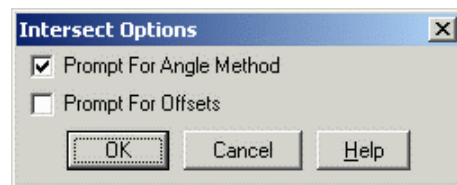
Points/<Enter Distance>: *40.41*

Enter 2nd Offset Distance <0.0>: *press Enter*

[int on] Pick Intersection point ([Enter] to cancel): *pick point*

Enter Point Number <55>: *press Enter* This prompt appears only if Automatic Point Numbering is turned off.
See Point Defaults

Enter Point Symbol Number <4>: *press Enter* This prompt appears only if point symbol prompting is turned on.
Symbol number 4 is located at the computed coordinate and labeled point number 55.



Example of this routine

Pulldown Menu Location: COGO > Locate at Intersect

Keyboard Command: bdint

Prerequisite: None

Distance-Distance Intersect

Function

This command creates a point at the distance-distance intersection from two base points. The program prompts for two distances and two base points. The two possible intersections (A,B) are shown on the screen. You can either pick near the desired intersection or type in the letter A or B. The A intersection is clockwise from the first point. The Options choice brings up a small dialog that allows you to be prompted for angle method or for offsets, or both.

Prompts

Select 1st base point

Options/<Pick point or point number>: 1

Points/<1st distance>: 46.72

Enter 1st Offset Distance <0.0>

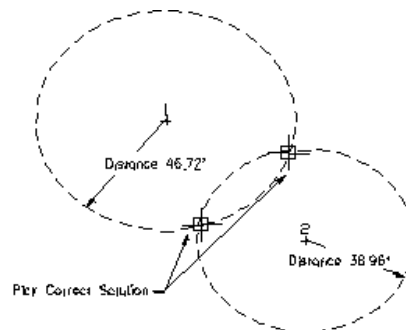
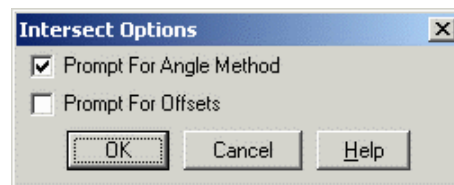
Select 2nd base point

Pick point or point number: 2

Points/<2nd distance>: 38.96

Enter 2nd Offset Distance <0.0>: *press Enter*

Pick near solution or Enter [A] or [B]: *pick a point*



Pulldown Menu Location: COGO > Locate at Intersect

Keyboard Command: DD

Prerequisite: None

Resection

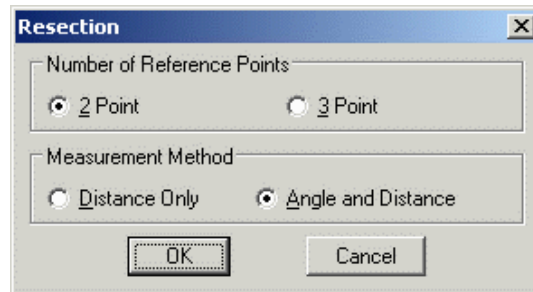
Function

This command calculates point coordinates given the angle and distance from two or three reference points. The Z coordinate can also be calculated in addition to the X,Y. If you only need the 2D solution, then enter the instrument and rod heights as 0.0, the zenith angle as 90 and the distance as the horizontal distance. The reference points are specified by point number. These reference points need to be stored in the current coordinate (.CRD) file before running this command. After entering the reference point, there is a dialog to enter the horizontal angle, zenith angle and slope distance. The horizontal angle is the horizontal azimuth or angle right from the unknown point to the reference point. In the example, the backsight azimuth is 0 (due north), but this is not a requirement since the

backsight can be any angle. The program calculates the coordinate by averaging the distance-distance and angle-angle solutions. Since there is redundant data, the final calculated coordinate will differ slightly from the individual measurements. For example in a 3-point resection, there are two different distance-distance solutions (between the first-second point and between the second-third points). The program reports the difference between the final coordinate and the individual solutions as the residuals which act as an indicator whether the data is good. High residuals suggest a problem with the input data. In the dialog that displays the final coordinates and residuals, there is a button to store the coordinates to the current coordinate (.CRD) file with a specified point number.

Prompts

In the first Resection dialog box, you can choose to use two or three reference points.



The first Resection dialog box has a title bar with a close button. It contains two sections: 'Number of Reference Points' with radio buttons for '2 Point' (selected) and '3 Point'; and 'Measurement Method' with radio buttons for 'Distance Only' and 'Angle and Distance' (selected). At the bottom are 'OK' and 'Cancel' buttons.

In the second Resection dialog box, you assign the reference point.



The second Resection dialog box has a title bar with a close button. It contains fields for 'First Point' (Point: 1, with 'List' and 'Pick' buttons), 'Northing:' (5191.892), 'Easting:' (5050.572), 'Elevation:' (100.000), 'Stk', 'Inst. Height:' (0.000), and 'Target Height:' (0.000). At the bottom are 'OK' and 'Cancel' buttons.

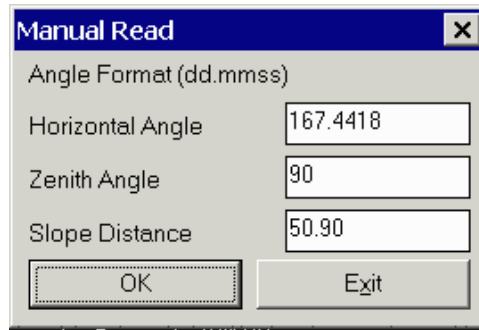
Point: You must enter the point number of your reference point. These reference points need to be stored in the current coordinate file before you run this command.

Inst. Height: You must enter the instrument height.

Target Height: You must enter the target height.

If you need only the 2D solution, then enter the instrument and target heights as 0.0.

In the Manual Read dialog box you must specify parameters for the calculation.



Manual Read

Angle Format (dd.mmss)

Horizontal Angle: 167.4418

Zenith Angle: 90

Slope Distance: 50.90

OK Exit

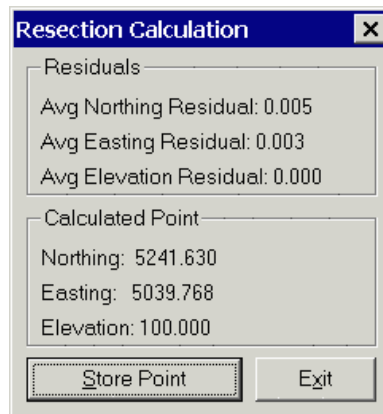
Horizontal Angle: You must enter a horizontal angle from the resection to the reference points. The horizontal angle is the horizontal azimuth, or angle right, from the unknown point to the reference point.

Zenith Angle: You must enter a zenith angle. For a 2D solution, set the zenith angle to 90 degrees.

Slope Distance: You must enter a slope distance from the reference points to the resection.

You are prompted for additional reference points and parameters.

The Resection Calculation dialog box that displays the final coordinates and residuals. You can select the option to store the coordinates in the current coordinate file with a specified point number.



Resection Calculation

Residuals

Avg Northing Residual: 0.005

Avg Easting Residual: 0.003

Avg Elevation Residual: 0.000

Calculated Point

Northing: 5241.630

Easting: 5039.768

Elevation: 100.000

Store Point Exit

Pulldown Menu Location: COGO > Locate at Intersect

Keyboard Command: cresection

Prerequisite: Two or three reference points

Benchmark

Function

This command is similar to the data collector routine, where a measurement with a total station is taken from an unknown elevation to a known elevation foresight. The unknown elevation of the occupied point is then calculated based on the measurement. Either the Occupied Elevation or the Instrument Height can be calculated. Note that a check box is located at the bottom of the dialog box to "Store Elev To Occupied Pt". This will automatically change the elevation of the occupied point.

Benchmark

Target Data

Target Rod Height: 0.000

Target Point #:

Target Elevation:

Occupy Data

Instrument Height: 0.000

Occupied Point #:

Occupied Elevation:

Measurement Data

Zenith Angle (dd.mmss):

Slope Distance:

Calculate...

☒ Elevation ☐ Instrument Height

☒ Store Elev To Occupied Pt

Calculate OK Cancel Help

Prompts

Coordinate File to Process dialog select file

Benchmark dialog Fill in the variables

Pulldown Menu Location: COGO

Keyboard Command: benchmark

Prerequisite: None

Point on Arc

Function

This command locates a point on an arc. You can select an arc entity, an arc polyline segment or enter three points to define an arc. After the arc is defined, the screen preview arrow shows the occupied point and the distance to solve for is entered. The command then displays the curve information and locates/inserts a point symbol at the computed point. When prompted for the distance, use a positive value if the distance is from the 1st endpoint (PC the one highlighted by the screen preview arrow) and a negative value if from the 2nd endpoint (PT).

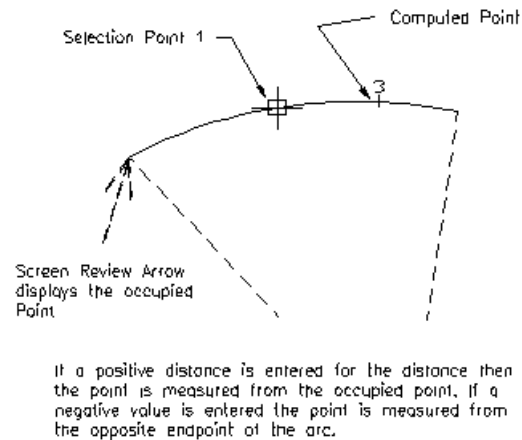
Prompts

Define arc by, Points/<select arc or polyline>: *pick arc or polyline arc segment* Pick a point on the arc somewhere near it's midpoint. The preview arrow points to the 1st endpoint.

Precede distance with minus sign if distance from 2nd endpoint.

Distance along arc from 1st point: 100

The command then plots a point at the computed distance.



Pulldown Menu Location: COGO > Interpolate Points

Keyboard Command: ptarc

Prerequisite: None

Divide Between Points

Function

This command divides the distance between two points and inserts one of the point symbols at the specified distances. It can also interpolate elevations (to interpolate the elevations, the points picked must be at their real Z axis elevation).

Prompts

Interpolate elevations [Yes/<No>]?

Point to divide-interpolate from?

Pick point or point number: 1

PointNo.	Northing(Y)	Easting(X)	Elev(Z)	Description
1	4252.76	4158.32	0.00	

Point to divide-interpolate to?

Pick point or point number: *pick a point*

Number of Segments-Divisions: 3

The command then locates two points.

Pulldown Menu Location: COGO > Interpolate Points

Keyboard Command: divlin

Prerequisite: 2 points

Divide Along Entity

Function

This command locates points along an entity such as a line, polyline, spline or arc. You must specify the number of divisions.

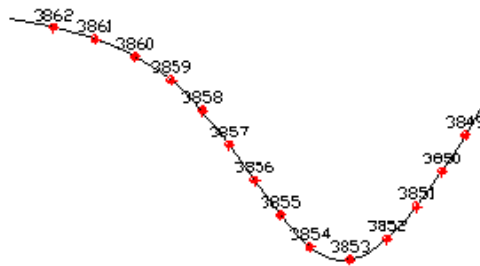
Prompts

Interpolate Elevations [Yes/<No>]: *press Enter*

Select Entity to Divide: *pick point on entity*

Number of Divisions/Segments: 15

The command then locates 14 points.



Pulldown Menu Location: COGO > Interpolate Points

Keyboard Command: *divent*

Prerequisite: 2 points if you want to interpolate elevations

Interval Along Entity

Function

This command creates points at a specified distance along an entity such as a line, arc, spline or polyline. The points are listed out on the text screen, stored in the current coordinate (.CRD) file and drawn on the screen. For example, you might use this command to locate lot corner points along a frontage line. When Break Entity at Points is checked the selected entity will be broken at every located point. When Create Point at Endpoint is checked, points will also be located at the endpoints of the selected entity. Horizontal Distance Between Points allow you to specify the distance between located points. There is also an option to create points on curved portions of the centerline at a different interval than on tangent portions (to reduce chord lengths, a shorter interval may be suitable for curves). For options related to points, see *Point Defaults* under the Points pulldown.

Interval Along Entity

Symbol Name: 

Point Prompt Settings

☐ Prompt for Descriptions

☐ Prompt for Elevations

☒ Locate on Real Z Axis

Point Number Settings

☒ Point Numbers

☒ Automatic Point Numbering

Starting Point Number

Layer Name for Points

☐ Break Entity At Points

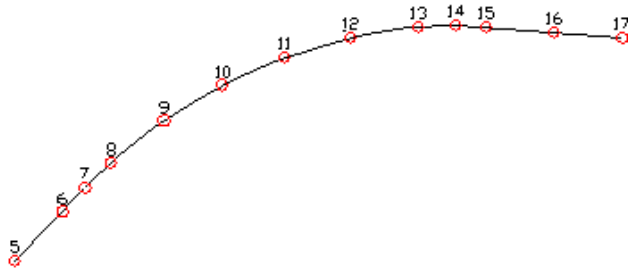
☒ Create Points At Endpoints

☐ Reset Interval At Endpoints

Horizontal Distance Between Points

Distance On Line Segments

Distance On Curve Segments



Create Points at Endpoints turned on

Prompts

[nea on] Select Entity to Interpolate Points:

Select entity near endpoint which defines first station. *select entity*

[nea on] Select Entity to Interpolate Points: Locating 13 Points

The command locates points along the selected entity.

Pulldown Menu Location: COGO > Interpolate Points

Keyboard Command: ptint

Prerequisite: An entity

Create Points from Entities

Function

This command will create Carlson Survey points on selected entities. The points are stored in the current coordinate (.CRD) file and drawn on the screen. For arcs and polylines with arc segments, points are created at the radius points of the arcs as well as the PC and PT.

In the first options dialog, there are settings for the point attributes. To have points obtain their elevation from the selected entities, unselect the **Prompt for Elevations** toggle and select the **Locate on Real Z Axis** toggle. After you have specified the point options, a secondary dialog appears which allows you to specify the entity types to process. Under the **Description Settings**, **Prompt for Description At Each Point** will prompt you at the command line for a description for each individual point. **Prompt Per Entity** will ask you for a description per each highlighted entity. **Use Entity Layer for Description** will assign the layer name to the description. **Same Description For All Points** will prompt you for a single description for all points.

The second options dialog has processing settings. When **Entity Layer for Description** is checked, the layer name of the entity will be used as the description for the created point. When **Avoid Duplicates with Existing Pts** is checked, this routine will not create a point if a point with the same coordinates already exists in the current coordinate (.CRD) file.

Convert Entities To Points

Symbol Name: SPT10

Select Symbol

Elevation Settings

☐ Prompt for Elevations ☒ Label Elevations

☐ Locate on Real Z Axis

Point Number Settings

☒ Point Numbers ☒ Automatic Point Numbering

Starting Point Number 25

Description Settings

☒ Prompt for Description At Each Point

☐ Prompt for Description Per Entity

☐ Use Entity Layer For Description

☐ Same Description For All Points

Description for Points

Separate Attribute Layers

☒ None ☐ Points ☐ Symbols ☐ Both

Layer Name for Points PNTS

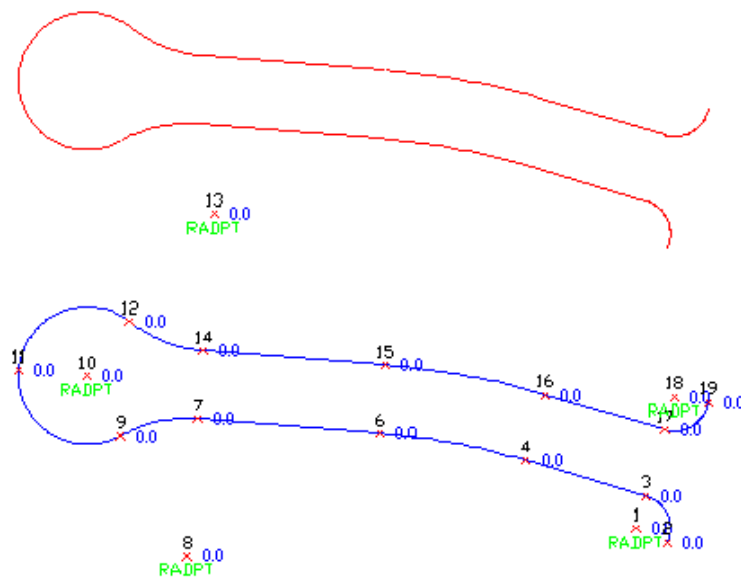
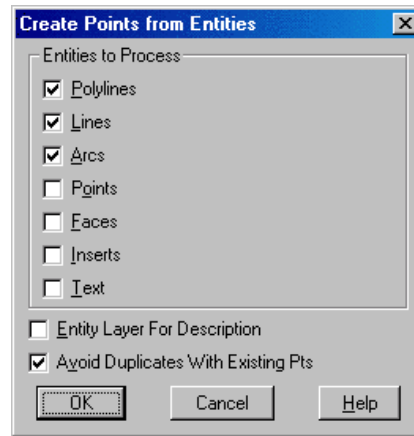
OK Cancel Help

Prompts

Create Points From Entities Dialogs Choose settings

Select arcs, faces, points, text, lines and polylines.

Select objects: *pick entities*



Before and after using Create Points from Entities. Points are created at each endpoint and radius point.

Pulldown Menu Location: COGO

Keyboard Command: autopnts

Prerequisite: drawing entities

Building Offset Extensions

Function

This command is used to calculate building corner offsets that are extensions of the building faces. The below example was for 10' offset points to be generated starting at point number 510. Starting point number: This is the point number that the offsets are supposed to start. Select the building object by screen picking, and then press enter. Enter offset amount: This is the distance that the offsets are extended past the end of the building face line.

Prompts

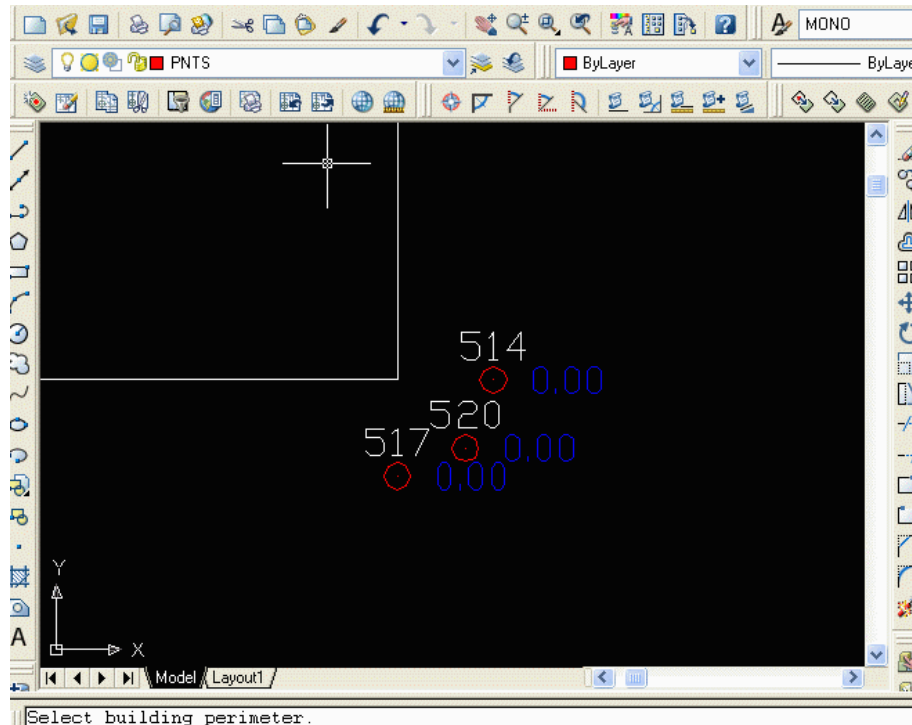
Starting point number <373>: 510

Select building perimeter.

Select objects: 1 found

Select objects:

Enter offset amount <10.00>:



Pulldown Menu Location: COGO

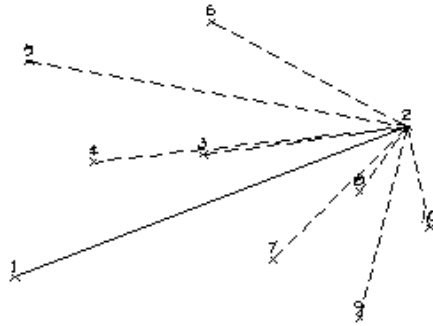
Keyboard Command: bldg_pnts

Prerequisite: An object that represents a building

Radial Stakeout

Function

This command creates a radial stakeout report using the current coordinate (.CRD) file. The program calculates the azimuth, angle right, horizontal distance and/or slope distance for a range of points relative to an occupied point and a backsight point.



Radial Stakeout

Occupied Point Number:

X: Y:

Backsight Point Number:

X: Y:

Maximum H_z Distance:

Range of points to Compute: ☐ Select Points from Screen

Number of Decimal Places for...

North/Easting Elevation

Report Options

☐ Bearing ☐ Azimuth ☒ Angle Right ☐ Azi & Ang Right

☒ Report Slope Distance

☐ Use Cut Sheet Format

Sample radial stakeout report:

```
Radial Stakeout
Occupied Point
2  7137.7248  9016.1417  500.000
Backsight Point
1  7075.7408  8875.7884  500.000
Backsight Azimuth= 246.1021
PtNo.  Azimuth  AngRight  HxDist  North(y)  East(x)  Elev(z)
3      261.0258  14.5237  74.061  7126.2022  8942.9830  500.000
4      262.4347  16.3327  113.032  7123.4208  8904.0181  500.000
5      281.1809  35.0748  137.858  7164.7435  8880.9572  500.000
6      301.4512  55.3452  82.296  7181.0342  8946.1639  500.000
```

Prompts

Radial Stakeout Dialog

Occupied Point Number: Specify the occupied point number X and Y values will fill in automatically.

Backsight Point Number: Specify the backsight point number X and Y values will fill in automatically.

Maximum H_z Distance: This is the maximum horizontal distance from the occupied point that the program will include in the report.

Range of points to Compute: Enter the range of points to be included in the stakeout report If you check Select

Points from Screen, this option is unavailable.

Select Points from Screen: This option allows you to select from the screen the points to be included in the stakeout report.

Number of Decimal Places: Specify the display precision for the report.

Report Options: Specify the direction format that the report should use.

Report Slope Distance: When checked, the slope distance is included in the report in addition to the horizontal distance.

Use Cut Sheet Format: When checked, adds columns to the report for Description, Hub Elev, and Elevation.

Pulldown Menu Location: COGO

Keyboard Commands: radstake, rs

Prerequisite: A coordinate file (.CRD file) with points

Edit-Process Level Data

Function

This command is for entering level data. It has a spreadsheet editor for entering this information, and the level calculations are updated as the data is entered. There is also a processing and reporting feature. This routine runs the *.LEV file editor and *.LEV file report functions. If you are creating a new .LEV file, you must choose either single-wire or three-wire for your level format data entry preference. The command starts by asking you, with a dialog box, to select an existing level file (.LEV) to process or to select a name for a new level file. The below example using an existing file. Once this choice is made the small, Level Format dialog appears.



Format choice box

Choose Single Wire. Once you do, the Level Editor appears in its own window. Below we see the editor displaying the contents of an existing file of level information.

Level Editor LEV> C:\...d settings\Scott langbein\Desktop\Data\Pg202.lev CRD> C:\Scad2005\Data\Mantopo.crd

File Edit Add Tools Help

	Type	Station	BS	HI	FS	Elevation	Code	AdjustElv	Description
1									
2	SR	BMX	5.300	105.300		100.000	EL	100.000	100.0
3	TP		0.700	100.000	6.000	99.300	EL	99.310	TP1
4	TP		15.000	114.000	1.000	99.000	EL	99.020	TP2
5	TP	A	6.800	111.900	8.900	105.100	EL	105.130	TBM1
6	TP		2.300	109.100	5.100	106.800	EL	106.840	TP3
7	TP		16.300	119.200	6.200	102.900	EL	102.950	TP4
8	ER	BMX	6.500		11.760	107.440	EL	107.500	
9	SR	BMX	6.500	114.000		107.500	EL	107.500	BM
10	TP		10.000	118.200	5.800	108.200	EL	108.213	TP4
11	TP	C	10.500	116.750	11.950	106.250	EL	106.275	TBM2
12	TP		4.800	116.250	5.300	111.450	EL	111.488	TP5
13	ER	BMX			16.300	99.950	EL	100.000	
14	SR	BMX	8.400	115.900		107.500	EL	107.500	BM
15	TP		1.500	113.600	3.800	112.100	EL	112.113	TP
16	TP	B	6.900	111.400	9.100	104.500	EL	104.525	TBM3
17	TP		5.000	111.190	5.210	106.190	EL	106.227	TP7
18	ER	C			4.990	106.200	EL	106.250	
19	SR	A	6.300	111.400		105.100	EL	105.100	TBM1
20	ER	B			6.980	104.420	EL	104.525	

Level File Editor dialog

Level Settings

3-Wire Tolerance:

3-Wire Distance:

OK Cancel

Settings, under File

File: Standard File routines - Open, Save, Save As, Settings, Print and Exit. Settings brings up a dialog where you can adjust the 3-wire tolerance and distance values.

Edit: Cut, Copy, Paste and Go To. Go To will take you to the row of your choosing.

Add: These options provide the standard level run routines. Details on each and a graphic of the pulldown follow.

Tools: This pulldown is for adjusting and storing elevations. More below.

Editor columns -

Type: These are small pulldown menus with two-letter level procedure choices. The two letters are abbreviations as indicated in the next dialog. These steps may be made with the Add pulldown or with this method. The options are SR, TP, ER, LV and DS. DS stands for description shot.

Code: Can be either EL or FE using the pulldown.

The Add and Tools pulldown at the top of the editor provide the following features:

Add Tools Help

- Level Start (SR)
- Level Turning Point (TP)
- Level SideShot (LV)
- Level End (ER)
- Note

Level Editor - Add pulldown menu

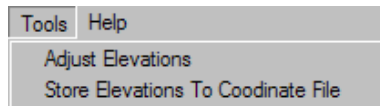
Level Start (SR): Starts the level run, usually with a know starting elevation or benchmark.

Level Turning Point (TP): Turning point procedure for leveling.

Level Side Shot (LV): For entering leveling side shots.

Level End (ER): Enter your value.

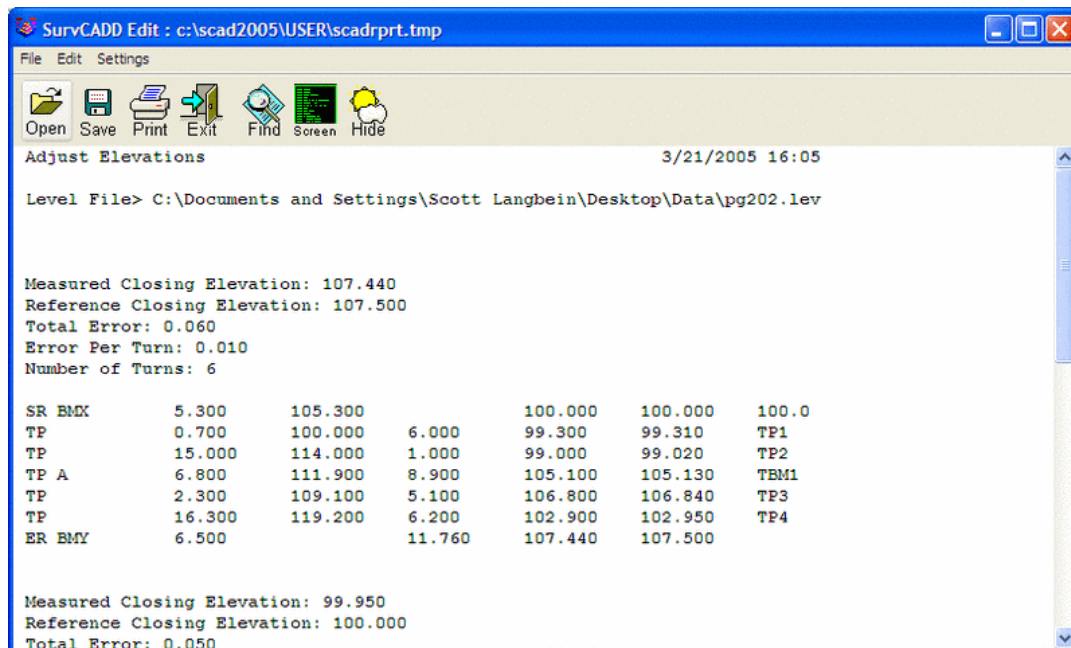
Note: You can add a note, or comments, into the editor as you move through the level run.



Level Editor - Tools pullown menu

Store Elevations to Coordinate File: Coordinates can be saved and used outside of this editor.

Adjust Elevations: Easy for tool for the adjustments needed.



Selecting Print, under File, provided this Level File Report example

Pulldown Menu Location: COGO

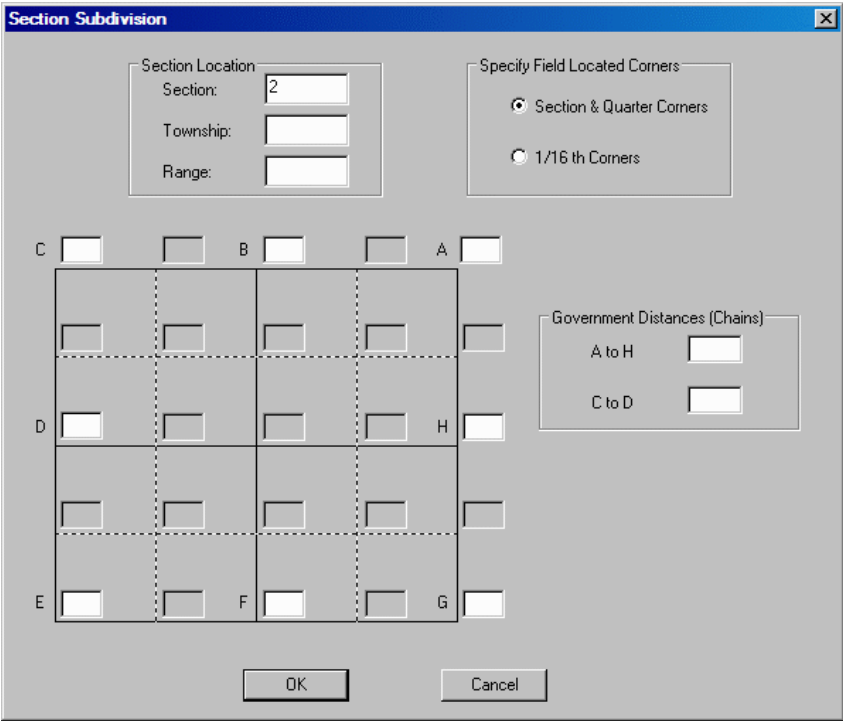
Keyboard Command: diglevel

Prerequisite: .LEV (level) file to process

Section Subdivision

Function

This command calculates and stores all 1/16th Section corners. The Section number, Township and Range must be entered first. Specify which Field Corners have been located either Section & Quarter or 1/16th Corners. Enter the appropriate point numbers for the field located corners. Then enter the government changes as prompted. The calculated points will be located on the screen as well as the coordinate file. For each calculated corner, a dialog box will be displayed. On this box, the default point number value can be accepted or changed. The description and elevation can also be changed or accepted.



The 'Section Subdivision' dialog box is used for calculating and storing 1/16th section corners. It features a 'Section Location' section with input fields for 'Section' (containing '2'), 'Township', and 'Range'. A 'Specify Field Located Corners' section contains two radio buttons: 'Section & Quarter Corners' (selected) and '1/16 th Corners'. Below these is a grid of 16 input fields arranged in a 4x4 pattern, labeled with letters A through H at the corners. To the right of the grid is a 'Government Distances (Chains)' section with two input fields: 'A to H' and 'C to D'. At the bottom are 'OK' and 'Cancel' buttons.

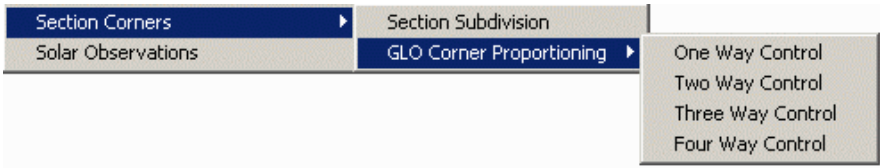
Pulldown Menu Location: COGO > Section Corners

Keyboard Command: sectionsub

Prerequisite: Coordinate File

GLO Corner Proportioning

The GLO Corner Proportioning commands calculate section and 1/4 section corners by one, two, three or four way control. GLO plats are the official plats of the U.S. Government Land Office (GLO) executed after July 1946. The Department of the Interior, Bureau of Land Management (BLM) is the successor agency to the GLO.



The 'GLO Corner Proportioning' menu is shown as a pulldown menu. It is located under the 'Section Corners' menu item. The menu options are: 'Section Subdivision', 'GLO Corner Proportioning', and 'Solar Observations'. The 'GLO Corner Proportioning' option is selected, and its sub-menu is displayed, showing four options: 'One Way Control', 'Two Way Control', 'Three Way Control', and 'Four Way Control'.

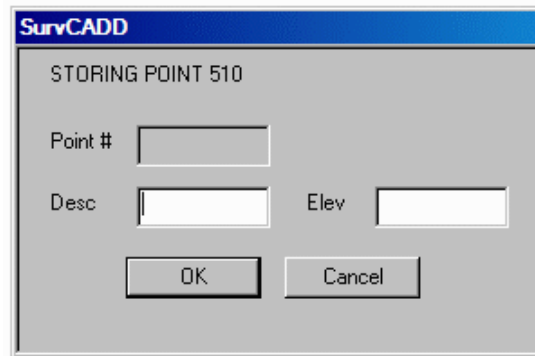
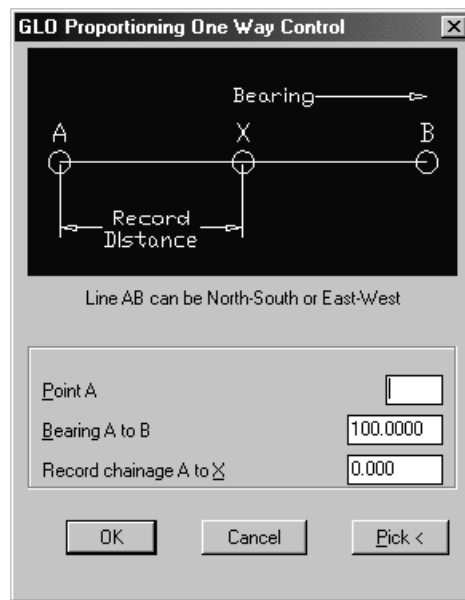
One Way Control

Function

This routine calculates section and 1/4 section corners by one way control. First, enter the point number for Point A. This number can be entered in manually or picked from the screen by selecting the Pick radial button at bottom right. In a like manner, the Bearing from A to B can be entered manually or by using the Pick radial button to pick from the screen. The distance from A to X can be specified in the same manner as above. After selecting OK, a dialog box will display where the Point number, description and elevation can be edited. The point default settings determine the available data for editing. For example, if the option for Automatic Point Numbering is turned off in the Point Defaults, then the field for the point number will be grayed out. If elevations are turned off in the point defaults, then the elevation field will be grayed out. This also applies to the description of the point as well.

Prompts

GLO Proportioning One Way Control dialog



Pulldown Menu Location: COGO > Section Corners > GLO Corner Proportioning

Prerequisite: A coordinate (CRD) file

Keyboard Command: glo_oneyway

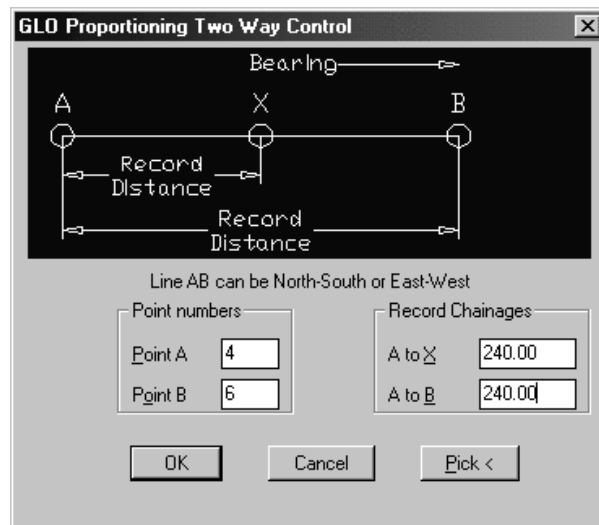
Two Way Control

Function

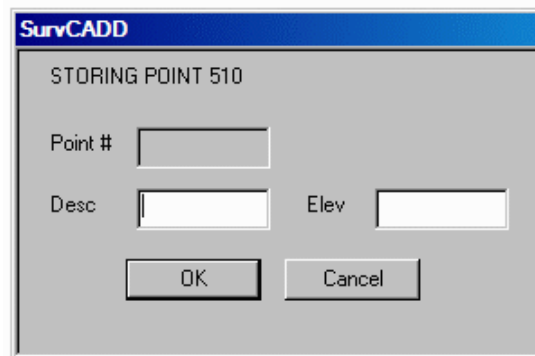
This routine calculates section and 1/4 section corners by two way control. Enter the point numbers for Point A and B. These numbers can be entered manually or picked from the screen by selecting the Pick radial button at bottom right. In a like manner, the Record Chainages from A to X and from A to B can be entered manually or by using the Pick radial button to pick from the screen. After selecting OK, a dialog box will display where the Point number, description and elevation can be edited. The point default settings determine the available data for editing. For example, if the option for Automatic Point Numbering is turned off in the Point Defaults, then the field for the point number will be grayed out. If elevations are turned off in the point defaults, then the elevation field will be grayed out. This also applies to the description of the point as well. GLO is an acronym for Government Land Office.

Prompts

GLO Proportioning Two Way Control dialog



The dialog box titled "GLO Proportioning Two Way Control" features a diagram at the top showing a horizontal line with points A, X, and B. Above the line is a "Bearing" label with a right-pointing arrow. Below the line are two "Record Distance" labels, each with a double-headed arrow indicating the distance from A to X and from A to B. Below the diagram, a text label states "Line AB can be North-South or East-West". There are two input sections: "Point numbers" with fields for "Point A" (containing the value 4) and "Point B" (containing the value 6); and "Record Chainages" with fields for "A to X" (containing 240.00) and "A to B" (containing 240.00). At the bottom are three buttons: "OK", "Cancel", and "Pick <".



The dialog box titled "STORING POINT 510" has a blue header bar with the "SurvCADD" logo. It contains three input fields: "Point #" (empty), "Desc" (empty), and "Elev" (empty). At the bottom are two buttons: "OK" and "Cancel".

Pulldown Menu Location: COGO > Section Corners > GLO Corner Proportioning

Prerequisite: A coordinate (CRD) file

Keyboard Command: glo.twoway

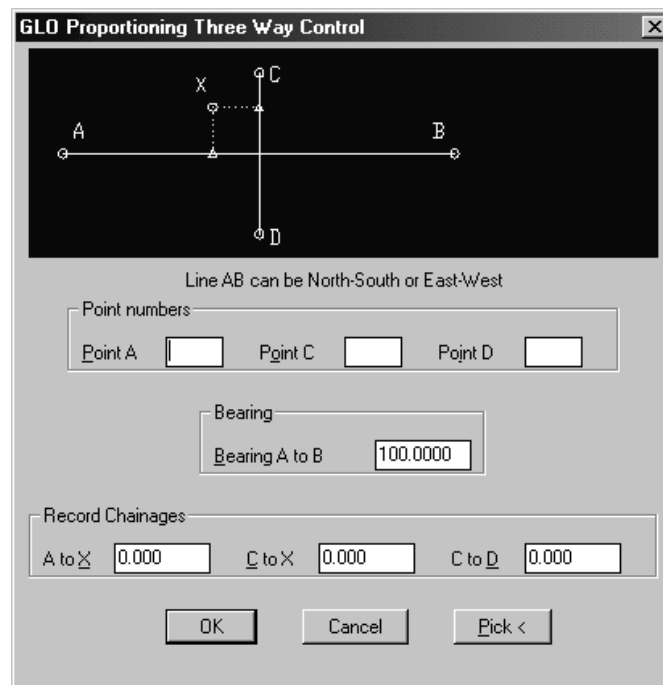
Three Way Control

Function

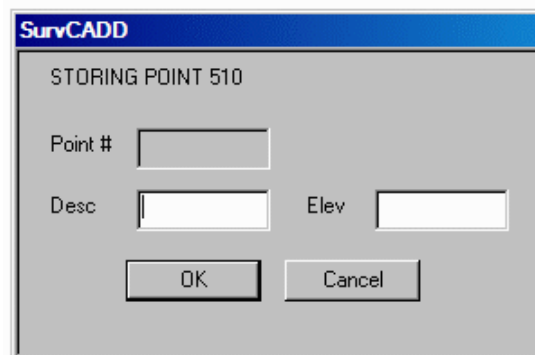
This routine works as the previous GLO Proportioning methods described. Fill out the required data fields on the dialog box and select OK. After selecting OK, a dialog box will display where the Point number, description and elevation can be edited. The point default settings determine the available data for editing. For example, if the option for Automatic Point Numbering is turned off in the Point Defaults, then the field for the point number will be grayed out. If elevations are turned off in the point defaults, then the elevation field will be grayed out. This also applies to the description of the point as well. GLO is an acronym for Government Land Office.

Prompts

GLO Proportioning Three Way Control dialog



The dialog box titled "GLO Proportioning Three Way Control" features a diagram at the top showing a horizontal line segment AB with a point X on it, and a vertical line segment CD intersecting AB at X. Below the diagram, the text "Line AB can be North-South or East-West" is displayed. The "Point numbers" section contains three input fields: "Point A", "Point C", and "Point D". The "Bearing" section has a label "Bearing A to B" and an input field containing "100.0000". The "Record Chainages" section includes three input fields: "A to X" (0.000), "C to X" (0.000), and "C to D" (0.000). At the bottom are three buttons: "OK", "Cancel", and "Pick <".



The dialog box titled "STORING POINT 510" has a blue header bar with the text "SurvCADD". It contains three input fields: "Point #", "Desc", and "Elev". At the bottom are two buttons: "OK" and "Cancel".

Pulldown Menu Location: COGO > Section Corners > GLO Corner Proportioning

Keyboard Command: glo_threeway

Prerequisite: A coordinate (CRD) file

File Name: \lsp\cgsc.arx

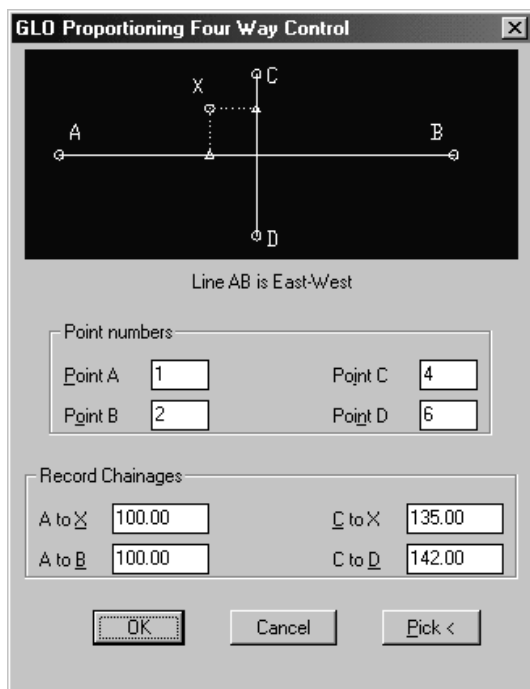
Four Way Control

Function

This routine works as the previous GLO Proportioning methods described. Fill out the required data fields on the dialog box and select OK. After selecting OK, a dialog box will display where the Point number, description and elevation can be edited. The point default settings determine the available data for editing. For example, if the option for Automatic Point Numbering is turned off in the Point Defaults, then the field for the point number will be grayed out. If elevations are turned off in the point defaults, then the elevation field will be grayed out. This also applies to the description of the point as well. GLO is an acronym for Government Land Office.

Prompts

GLO Proportioning Four Way Control dialog

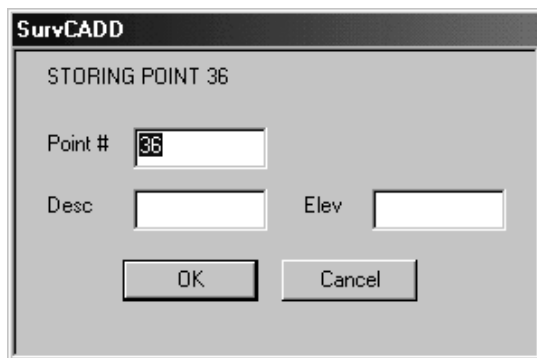


The dialog box titled "GLO Proportioning Four Way Control" features a diagram at the top showing a cross-shaped intersection of lines AB and CD. Point X is located at the intersection. Below the diagram, it states "Line AB is East-West". The dialog is divided into two main sections: "Point numbers" and "Record Chainages".

Point numbers			
Point A	1	Point C	4
Point B	2	Point D	6

Record Chainages			
A to X	100.00	C to X	135.00
A to B	100.00	C to D	142.00

At the bottom, there are three buttons: "OK", "Cancel", and "Pick <".



The dialog box titled "SurvCADD" is for "STORING POINT 36". It contains fields for "Point #", "Desc", and "Elev".

Point #	36
Desc	
Elev	

At the bottom, there are two buttons: "OK" and "Cancel".

Pulldown Menu Location: COGO > Section Corners > GLO Corner Proportioning

Prerequisite: A coordinate (CRD) file

Keyboard Command: glo_fourway

Solar Observations

Function

This routine calculates true north and/or grid north bearings by solar observation. It uses the Local Hour Angle method. The routine calculates Ephemeris data, thus alleviating the necessity of obtaining a Solar Ephemeris. The True-North option calculates the true north bearing to mark. This option requires no zone/ellipsoid information. The True-North & Grid-North option calculates both true north and grid north bearings to north. The convergency angle is also shown.

True North Prompts

Calculate true north, or true north and grid bearing (<True north>/Grid Bearing: *type T, press Enter*

Choose field method (Leading edge/Trailing edge/<center>): *choose method, press Enter* If a Roelofs prism is being used, the Center Method should be selected. If not, select one of the other options. The Trailing Edge Method is the more popular of the two remaining methods.

Date of observation as MM/DD/YY or MM-DD-YYYY: *For example 04/08/03.*

Enter latitude of instrument point as DD.MMSS: *For example 36.0545*

Enter longitude of instrument point as DD.MMSS:

The following input loop will begin:

Obs. #1 - Time of observation as HH.MMSS: *For example 15.3030*

Enter angle to mark as DD.MMSS: *Angle in the instrument when backsighting the mark.*

Enter angle to sun as DD.MMSS: *Clockwise angle from mark to sun.* The angle to the mark always has a default value of the last entered Angle to Mark. Each observation is numbered and the true bearing to the mark will be calculated. There is not limit as to the number of observations that can be made from a setup. After data entry is complete, press Enter.

The following options appear:

Edit/<OK>/Quit: If you choose Edit, you will have the following options:

ADD/Change/Delete/eXit:

Add: Allows for addition observation data entry.

Change: Allows editing of existing data. When selected a prompt for Enter observation to change will be displayed. Choose which observation number to edit. You will then be prompted with the initial input prompts for the observation again. The original input values will be the default values for each prompt. To change the value, simply enter new data.

Once Delete: This will delete the specified observation data. Choose the observation number to delete.

eXit: This exits the change routine.

OK: The bearings from all the observations will be averaged and shown as well as the True Bearing. For example:
No. Time Angle-@-Mark Angle-to-Sun True-Brg-to-Mark.

1 12.3030 0°00'00" 20°00'00" N 73°05'43"E

2 12.4456 0°00'00" 21°00'00" N 74°17'15"E

Average True Bearing: N 73°41'29"E

True-North & Grid North Prompts

Calculate true north, or true north and grid bearing (<True north>/Grid Bearing: G

The following dialog will be displayed. Select the state in which the observations were made. All fifty states are available, as well as PR for Puerto Rico and UM for Universal Transverse Mercator. If the state is divided into zones, you will be prompted for the zone you are working in.

Enter zone (N,S): Enter the zone. After entering the zone, if applicable, the input loop described for True North calculation as detailed above will begin. After data entry the same options, Edit/<OK>/Quit as detailed above will be displayed. Pressing OK averages and displays the bearings from all the observations taken along with the Average True Bearing, Average Grid Bearing and the Convergency Angle as follows:

No. Time Angle-@-Mark Angle-to-Sun True-Brg-to-Mark

1 12.2222 0°00'00" 20°00'00" N 72°57'31"E

2 12.4444 0°00'00" 22°00'00" N 74°20'51"E

Average True Bearing: N 73°39'11"E

Average Grid Bearing: N 72°15'12"E

Convergency Angle: 1°23'59"

Pulldown Menu Location: COGO

Keyboard Command: solarobs

Prerequisite: None



Design Commands

13

This chapter provides information on using the commands from the Design menu to create and organize lots, develop street intersections, and design various land features in your drawing.

Set Lot File

Function

This command sets the lot (.LOT) file name that other lot routines will automatically reference. The lot (.LOT) file stores a list of lots with each lot being a list of point numbers which reference coordinates stored in a coordinate (.CRD) file.

Pulldown Menu Location: Design

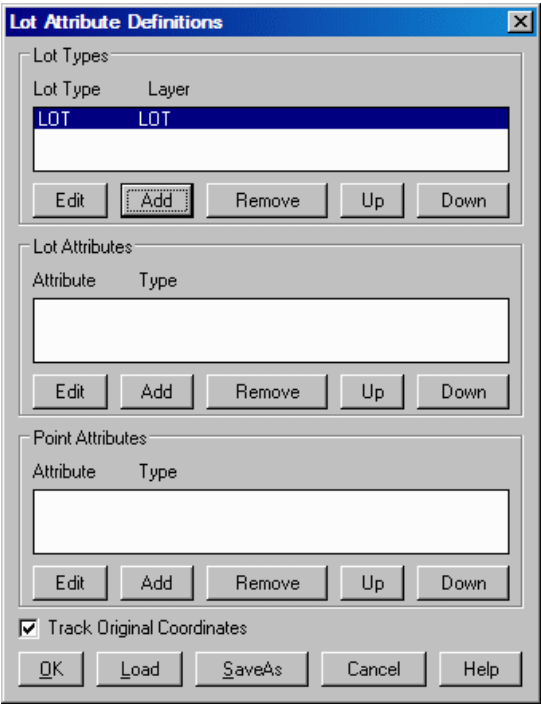
Keyboard Command: setlot

Prerequisite: None

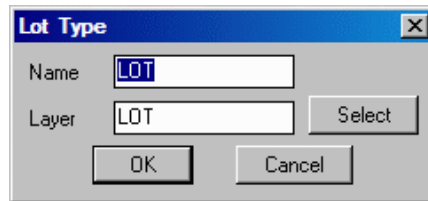
Define Lot Attributes

Function

This command allows the user to define the Lot Type, Lot Attributes and Point attributes. With the use of the opening Lot Attribute Definitions dialog box, shown below, this routine allows you to edit, add, remove or reposition all of these definition types. You can save the selected data to a new Lot Attribute Definition file (LTD). You are also able to load an existing LTD file to work with.

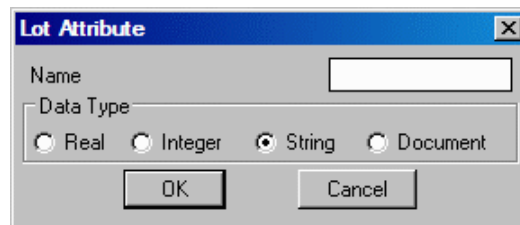


The Lot Types section of the dialog lists out the Lot Type and the layer associated with it. You can set up different lot types and a layer. When the lots are drawn, the layer name is used per lot type. Also, Lot Types are used in the lot report. There are also Lot Attributes, which are additional fields that you can define for the lots, such as deed number. And there is also Point Attributes.



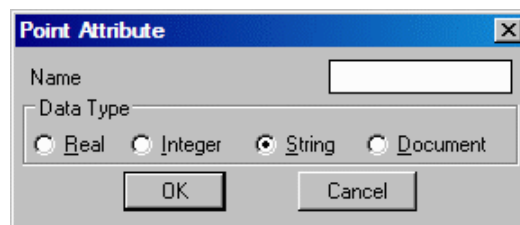
Edit/Add: Both the Edit and the Add buttons bring up the same Lot Type dialog, shown here. You can edit an existing lot or add a new one.

The **Lot Attributes** section asks for the Name and to enter the Data Type.



Edit/Add: Edit or add the name of the lot attribute. Choose from one of the four options for Data Type: Real, Integer, String or Document.

Similarly, the **Point Attributes** section also asks for the Name and to enter the Data Type.



Remove: Any of the Remove buttons will remove a lot type, lot attribute or point attribute from the list above it, depending upon which Remove button you use.

Up/Down (all three): Types and attributes can be repositioned.

Track Original Coordinates: This option will track the original coordinates of the lot so that this record may be kept for your future usage and needs.

Load: A Lot Attribute Definition file (LTD) can be loaded.

SaveAs: A new Lot Attribute Definition file (LTD) can be saved.

Pulldown Menu Location: Design

Keyboard Command: lotattr

Prerequisite: None

Design Lot

Function

This command creates lot definitions that are stored in a lot (.LOT) file. The lots are defined by entering a sequence of point numbers. The point numbers reference coordinates from the current coordinate (.CRD) file. Each lot has a lot name and block name. The lots are not required to be closed perimeters and can also be used to represent other

linework such as centerlines. Curves are entered by first specifying the PC point number, then type R for radius and enter the radius point number followed by the PT point number.

Prompts

Lot Name <1>: 105

Block Name <1>: *press Enter*

Lot Starting Station <0.0>: *press Enter* If the figure that you are entering is a centerline, then you could use this as the starting station of the centerline.

Starting point number: 17

Point number (R-RadiusPt,U-Undo,Enter to end): 18

Point number (R-RadiusPt,U-Undo,Enter to end): 19

Point number (R-RadiusPt,U-Undo,Enter to end): R

Radius point number: 20

Use large included angle for curve (Yes/<No>)? *press Enter*

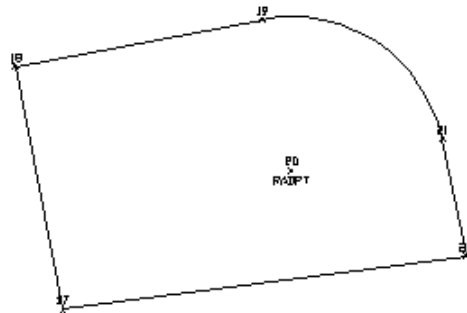
End of curve point number (R-RadiusPt,U-Undo,Enter to end): 21

Point number (R-RadiusPt,U-Undo,Enter to end): 22

Point number (R-RadiusPt,U-Undo,Enter to end): 17

Point number (R-RadiusPt,U-Undo,Enter to end): *press Enter*

Enter another lot (<Yes>/No)? N



Pulldown Menu Location: Design > Create Lots

Keyboard Command: mklot

Prerequisite: Points in a coordinate (.CRD) file

Polyline to Lot File

Function

This command will create lot (.LOT) files from selected polylines. The lots are defined by the series of point numbers. This command will create point numbers in the current coordinate (.CRD) file for each point in the polylines. Before creating a point number, the program will check to see if the point coordinates are already in the coordinate (.CRD) file and will use the existing point number if found. Each lot has a lot name and block name. Lots are not required to be closed perimeters and can also be used to represent other linework such as centerlines.

Prompts

Starting point number <8>: *press Enter* Points will be automatically numbered starting from this value.

Select lot polyline: *pick a polyline*

Lot Starting Station <0.0>: *press Enter*

Lot Name <106>: *press Enter* This defaults to the next available name.

Block Name <1>: *press Enter*

Lot Starting Station <0.0>: *press Enter*

Created 7 lot points.

Select lot polyline (Enter to end): *press Enter*

Pulldown Menu Location: Design > Create Lots

Keyboard Command: pl2lot

Prerequisite: A polyline

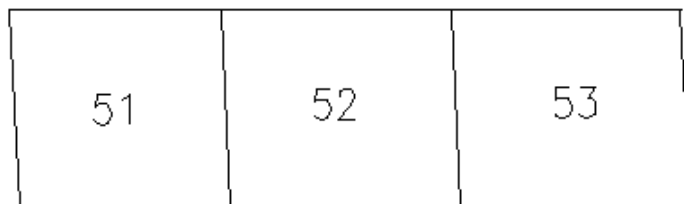
Lot File by Interior Text

Function

This command creates lot definitions from the selected polylines and text. For each text entity, the program finds the bounding polyline around the text. The text is used as the lot name. The polylines do not need to be closed themselves but selected together they should define closed areas. Multiple lots can be created at once with this command. All the lots will have the same block name as entered and all lots will be assigned a starting station of 0.0.

The lots are defined by the series of point numbers. This command will create point numbers in the current coordinate (.CRD) file for each point in the bounding polylines. Before creating a point number, the program will check to see if the point coordinates are already in the coordinate (.CRD) file and will use the existing point number if found.

This command works well in conjunction with *Draw Lot File*. Once a lot (.LOT) file containing 1 or more lots is created, all lots can be redrawn automatically, with annotation, using *Draw Lot File*. Furthermore, since the lots are drawn from point numbers, if the point numbers for the lot corners are moved, the lots can be redrawn to the new point positions using *Draw Lot File*. If a point number is at the corner of four lots, moving that one point number will cause *Draw Lot File* to draw differently all four lots.



Polylines and text to convert into 3 lots

Prompts

Starting point number <8>: *press Enter* Points will be automatically numbered starting from this value.

Select lot polyline: *pick a polyline*

Block Name <1>: *press Enter*

Select lot lines, polylines and text.

Select objects: *select the polylines and text*

Select objects: *press Enter*

Created 3 lots.

Pulldown Menu Location: Design

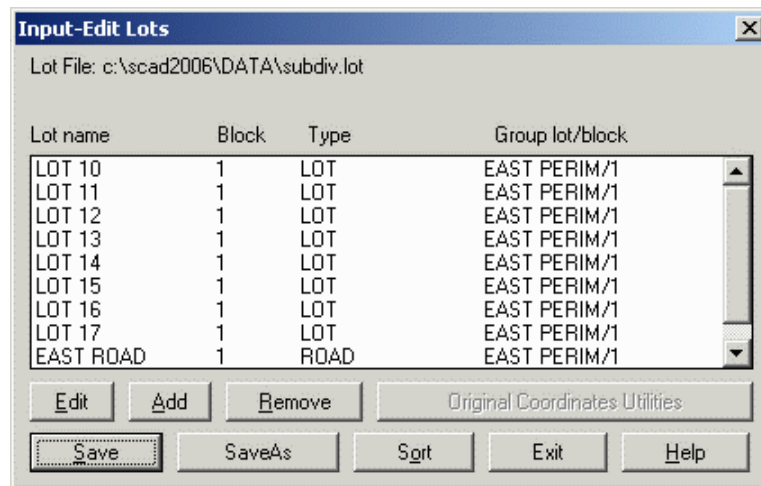
Keyboard Command: txt2lot

Prerequisite: Polylines and text

Input-Edit Lot File

Function

This command allows you to edit the lot definitions in a lot (.LOT) file. You can add lots with definitions, edit existing lot definitions and remove lot definitions. This routine starts with the Input-Edit Lots dialog.



Edit: This opens the Lot Definition dialog for the selected lot. This dialog allows you to edit the lot name, block name, coordinate (.CRD) file, starting station, ending station and the point numbers that define the lot. A curve is specified by the PC, radius point and PT point numbers. The Large Arc option indicates a curve with an included angle greater than 180 degrees.

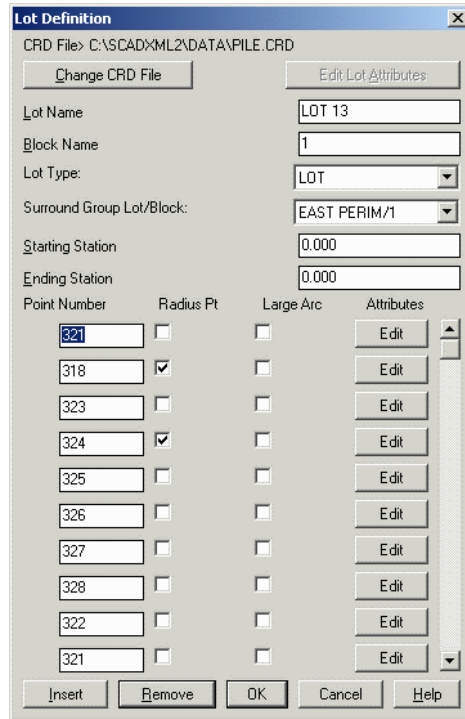
Add: This opens a blank Lot Definition dialog where you can enter information to create a new lot.

Remove: Removes the currently highlighted lots. Note that multiple lots can be selected.

Original Coordinates Utilities: Keeps track of the original and current coordinates so that the routine can report the transformation between these two coordinate groups. In order for this feature to be active and usable, you must first be sure that the Track Original Coordinates feature of the Lot Attribute Definitions dialog is clicked ON. This dialog is found under Design by selecting Define Lot Attributes.

Sort: This will sort the lots in alphanumerical order with numbers first. (Example: 1,1A,2,3,4A,4B).

This following dialog appears when Edit is chosen.



Lot Definition

CRD File> C:\SCAD\ML2\DATA\PILE.CRD

Lot Name: LOT 13

Block Name: 1

Lot Type: LOT

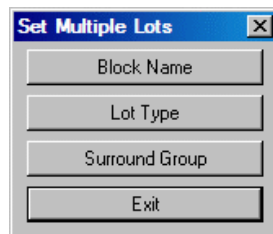
Surround Group Lot/Block: EAST PERIM/1

Starting Station: 0.000

Ending Station: 0.000

Point Number	Radius Pt	Large Arc	Attributes
321	☐	☐	Edit
318	☒	☐	Edit
323	☐	☐	Edit
324	☒	☐	Edit
325	☐	☐	Edit
326	☐	☐	Edit
327	☐	☐	Edit
328	☐	☐	Edit
322	☐	☐	Edit
321	☐	☐	Edit

Change CRD File: This button allows you to specify a new name or location for the coordinate (.CRD) file associated with the lot.



Set Multiple Lots

When multiple lots are selected in Input-Edit Lots dialog

Pulldown Menu Location: Design

Keyboard Command: editlot

Prerequisite: None

Lot Inspector

Function

This command activates a small pop-up window that when you place your pointer into a lot file area, the details of that lot file will be displayed in the Lot Inspector window.



Prompts

Move pointer inside lots (Pick to edit, Enter to End) *hover crosshairs above lot(s)*

Pulldown Menu Location: Design > Lot Inspector

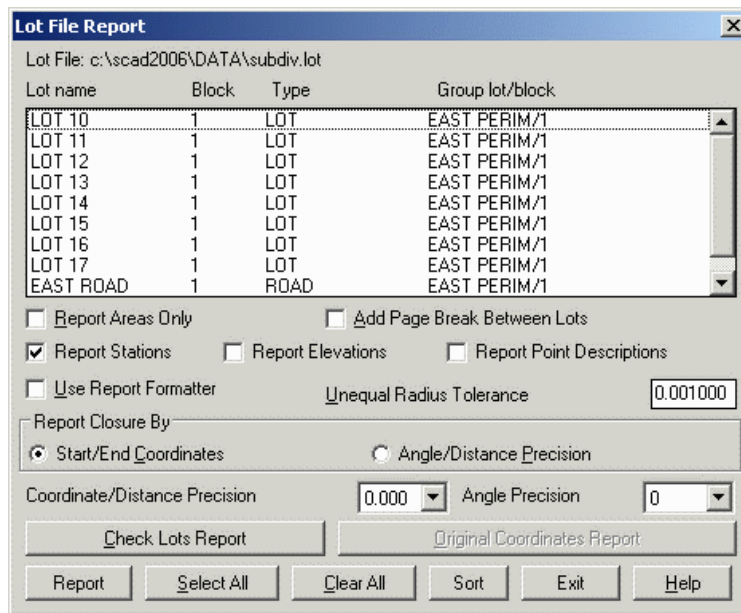
Keyboard Command: lotinspector

Prerequisite: None

Lot File Report

Function

This command generates a report for the selected lots that includes the point number, coordinates, station, bearing and distance, and curve data. At the end of each lot, the lot closure is reported. The area for each lot is reported as well as the total area for all the lots. This command begins with the Lot File Report dialog.



Lot Name: Select the lots to be included in the report. You may also use the Select All button at the bottom to select all the lots. The Clear All button will unselect all lots.

Report Areas Only: When checked only the lot name, block name, and area are included in the report.

Add Page Break between Lots: Formats the report so that each lot definition begins on a new page when printed.

Report Stations: If selected the report will include stations.

Report Elevations: If selected the report will include elevations.

Report Point Descriptions: If selected the report will include point descriptions.

Use Report Formatter: When checked, the report is output to the *Report Formatter* where it can be customized as well as exported to Microsoft® Excel or Microsoft® Access. See *Report Formatter* for more details.

Unequal Radius Tolerance: When reporting the curve data for a lot, the two radial lengths are compared. If the difference in their length is more than this value, it is noted on the report.

Report Closure By: If the Start/End Coordinates method is used, closure error distance is typically 0 (perfect closure-you end where you start). If the Angle/Distance Precision method is used, then the actual bearings and distances (computed from the coordinates) in the report are used, and due to the rounding used to present the bearings and distances, minute closure errors will occur which will be reported.

Check Lots Report: If selected, this will check the lot file for errors in area, unequal radius or missing points.

Original Coordinates Report: If selected, it will track the original lot coordinates and an Original Coordinates Report that reports the transformation from the current back to original coordinates.

Report Precision: Specify the decimal precision for reporting coordinates, distance, etc. on the report.

Sample Report:

```
Lot Report
CRD File> C:\scadxml\data\subdivision1.crd

LOT 3 OF BLOCK 1

PNT#  BEARING      DISTANCE  NORTHING  EASTING  STATION
18      N 03d19'13'' E   1541.33    13987.04   90980.96   0.00
19      S 86d29'57'' E   1095.64    15525.79   91070.24  1541.33
20      S 86d29'57'' E   1095.64    15458.88   92163.84  2636.98
RADIUS: 856.25 LENGTH: 1263.15 CHORD: 1151.69 DELTA: 84d31'22''
CHORD BRG:S 44d14'16'' E PC-R:S 03d30'03'' W PT-R:S 88d01'25'' W
RADIUS POINT: 21 14604.23,92111.55
22      S 03d38'04'' W    761.06    14633.76   92967.30  3900.12
23      N 86d40'08'' W   1941.37    13874.23   92919.05  4661.18
18      N 86d40'08'' W   1941.37    13987.04   90980.96  6602.55
Closure Error Distance> 0.00
Total Distance> 6602.55
LOT AREA: 2838274.2 SQ FT OR 65.16 ACRES
```

BLOCK 1 TOTAL AREA: 5072860.5 SQ FT OR 116.46 ACRES

Pulldown Menu Location: Design

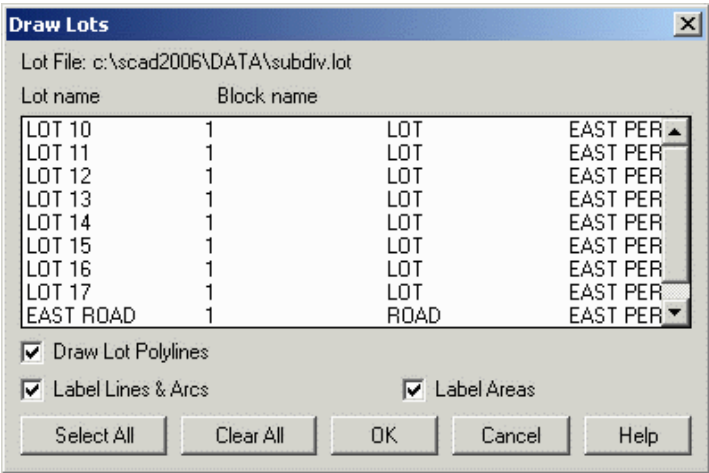
Keyboard Command: lotreport

Prerequisite: A lot (.LOT) file

Draw Lots from File

Function

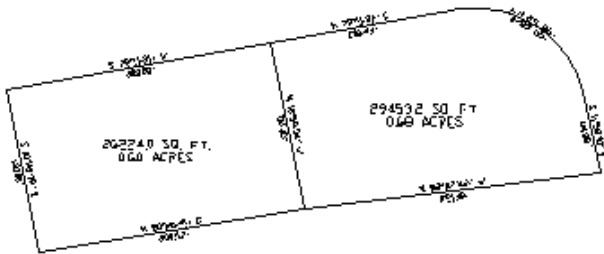
This command can draw and label lots stored in a lot (.LOT) file. The options for the Draw Lots dialog are described below.



Draw Lot Polyline: Draws the selected lots as polyline entities.

Label Lines & Arcs: Labels the bearing, distance, and curve data using the *Auto-Annotate* command. See *Auto-Annotate* for more details.

Label Areas: Labels the area and, optionally, the name of the selected lots using the Area Label Settings dialog. See *Area Label Defaults* for more details.



Prompts

Draw Lots dialog *select one or more lots*

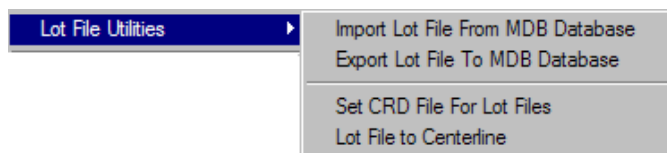
Pulldown Menu Location: Design

Keyboard Command: drawlot

Prerequisite: A lot (.LOT) file

Lot File Utilities

These four commands are used to import and export lot files (.LOT) to Microsoft Access databases (.MDB). These commands import lot files from MDB database files and export lot files to MDB database files. There is a command to set the coordinate CRD file for Lot file, and lot files. And there is a fourth routine that sends a lot file to to Centerline.



Import Lot File From MDB database

Function

This command will import a lot file from a Microsoft Access database file (.MDB) format.

Prompts

Database File to Import dialog *select existing .MDB file*

Lot File to Write dialog *select existing or create a new .LOT file*

Pulldown Menu Location: Design > Lot File Utilities

Keyboard Command: lotimport

Prerequisite: A lot (.LOT) file

Export Lot File to MDB database

Function

This Lot File Utilities command will export a lot file to a Microsoft Access database file format.

Prompts

Lot File to Export dialog *select existing .LOT file*

Database File to Write dialog *select existing or create a new .MDB file*

Pulldown Menu Location: Design > Lot File Utilities

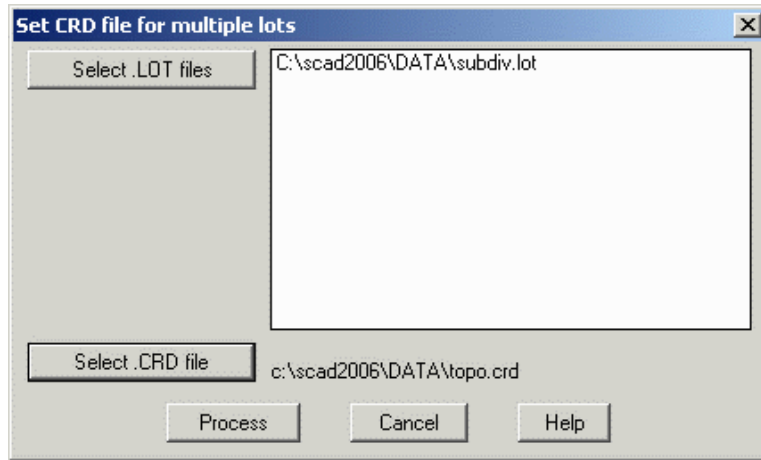
Keyboard Command: lotexport

Prerequisite: A lot (.LOT) file

Set CRD File for Lot Files

Function

This command allows you to set the coordinate (.CRD) file that is associated with any number of lot (.LOT) files. This can be useful if the name or location of the coordinate (.CRD) file is changed. In the Set CRD for Multiple Lots dialog, press the Select .LOT files button to select any number of lot (.LOT) files. They are added to the list. Next, press the Select .CRD file button. After you have selected the files, press the Process button.



Pulldown Menu Location: Design > Lot File Utilities

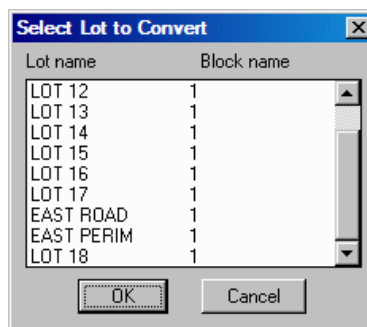
Keyboard Command: lotscrd

Prerequisite: Existing lot (.LOT) file(s)

Lot File to Centerline

Function

This command creates a centerline (.CL) file from a lot (.LOT) file. Since the lot definitions contain a series of points and a starting station, the lot (.LOT) file contains the necessary data to create a centerline. The Select Lot to Convert dialog lists the available lot names in the current lot (.LOT) file. Select a single lot to process, then specify the centerline (.CL) file name to create.



Prompts

Centerline File to Write dialog *enter new centerline (.CL) file name*

Select Lot to Convert dialog *select a lot from the list*

Pulldown Menu Location: Design > Lot File Utilities

Keyboard Command: lot2cl

Prerequisite: None

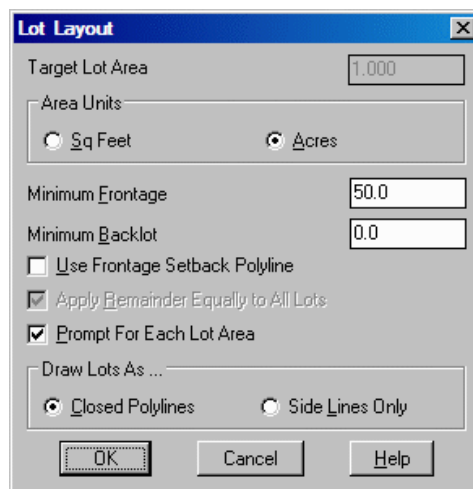
Lot Layout

Function

This command draws lots based on a front and back polyline. Starting from the front polyline, the program calculates two lot side lines perpendicular from the front polyline that intersect the back polyline and create the specified lot size. Lots are created along the front polyline in the order that the front polyline is drawn. If the front polyline needs to be reversed, use the *Reverse Polyline* command found on the Edit menu. The direction of the back polyline does not matter. The lots can be drawn as closed polylines or just the lot sides can be drawn. There is also an option to automatically create all the possible lots at the specified area between the front and back polylines or to prompt for each 0.4 acre lot.

In prompt mode, the program reports the remaining area between the front and back polylines and then asks for the lot size. The lot size can be specified either by area or frontage along the front polyline.

The lots are sized to meet the specified area and also meet the minimum frontage and backlot distances. The program starts by checking the lot area at the minimum distances. If this area is greater than the target, then the lot is drawn at the minimum distance and the resulting lot area will be greater than the target area. Otherwise the program will increase the frontage until the lot reaches the exact target area. The Use Frontage Setback Polyline option allows you to use another polyline besides the actual frontage polyline for the minimum frontage indicator. Typically, this Frontage Setback Polyline would be offset a set amount from the actual frontage polyline.



Prompts

Lot Layout dialog

Select front polyline: *pick a polyline*

Select back polyline: *pick a polyline*

With prompt for each lot active:

Area remaining: 160326.88 S.F, 3.6806 Acres

Quit/Frontage/Enter lot area (Acres) <1.2269>: 1

Area remaining: 116766.88 S.F, 2.6806 Acres

Quit/Frontage/Enter lot area (Acres) <1.0000>: F

Enter Frontage <50.00>: 75

Lot Area: 37807.50 S.F., 0.8679 Acres

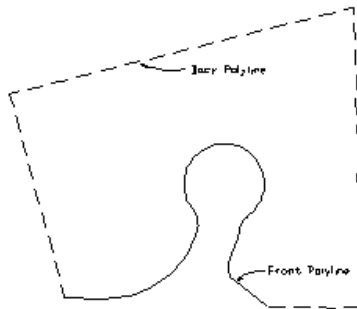
Area remaining: 78959.38 S.F, 1.8127 Acres

Quit/Area/Enter frontage <50.00>: A

Quit/Frontage/Enter lot area (Acres) <1.0000>: *press Enter*

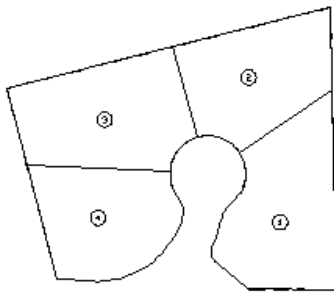
Area remaining: 35399.38 S.F, 0.8127 Acres

Quit/Frontage/Enter lot ara (Acres) <1.0000>: Q



Polylines for Lot Layout

The Front Polyline goes from right to left



Resulting lots numbered using Sequential Numbers

Pulldown Menu Location: Design

Keyboard Command: lotlay

Prerequisite: A frontage polyline and a backlot polyline.

Offsets & Intersections

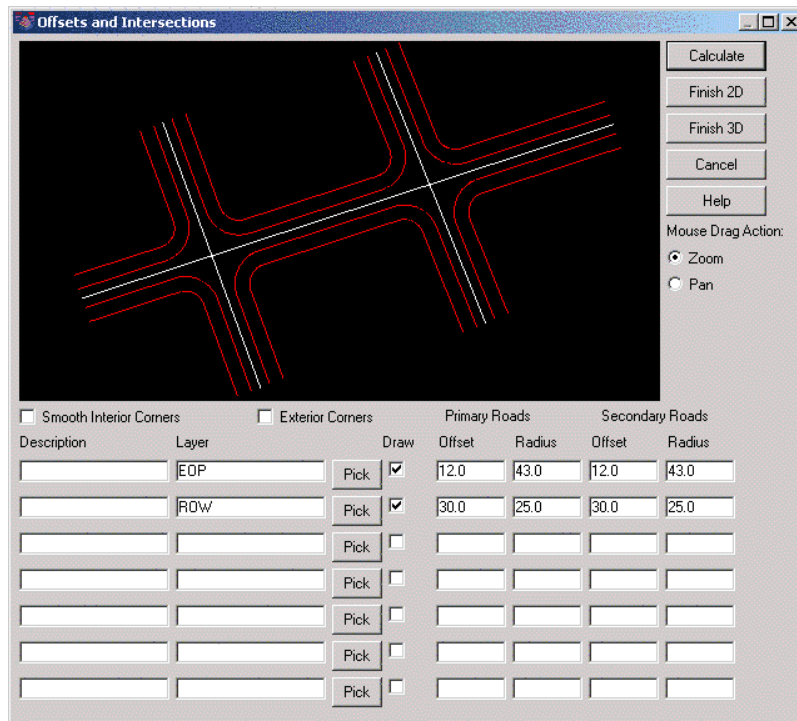
Function

This command takes a set of centerline polylines and calculates the series of offset polylines using the user defined offset and fillet radius values. The function recognizes primary and secondary roadways which allows for different offsets and fillet radii to be specified for each. Up to seven sets of offsets and radii can be defined for different features such as edge of pavement, right-of-way, sidewalk, etc. Each set also has a layer name and description. The Pick button lets you set the layer name by picking an entity with that layer in the drawing. The description is for your own information and is not used by the program.

Multiple centerline polylines can be processed together which allows for the creation of an entire set of roadway offset polylines in one step. Intersections are calculated based on the centerlines selected and the fillet radii are

applied at the intersections. The Smooth Interior and Exterior Corner options will fillet bends in the offset polylines. Otherwise turns without an arc in the original centerline will become straight corners in the offset polylines. The results of the calculations for the given parameters may be previewed in the dialog. Zoom and pan are available by clicking and dragging mouse on the preview image (zoom or pan mode is selected by a toggle). Once the satisfactory offsets are calculated, they are inserted into the drawing by clicking on Finish2D button. The Finish 3D button opens the *Elevate 2D Polylines* command, described in this chapter.

If it is preferable to handle intersections manually, you may run the command multiple times on non-intersecting centerlines. Another alternative is to use the *Offset* command in the Draw menu and the *Fillet* command in the Edit menu.



Prompts

Select all PRIMARY road polylines.

Select objects: *select polylines*

Select objects: *Enter*

Select all SECONDARY road polylines.

Select objects: *select polylines*

Select objects: *Enter*

Calculating offsets for layer EOP...

Calculating offsets for layer ROW...

Pulldown Menu Location: Design

Keyboard Command: wayint

Prerequisite: Centerline polylines

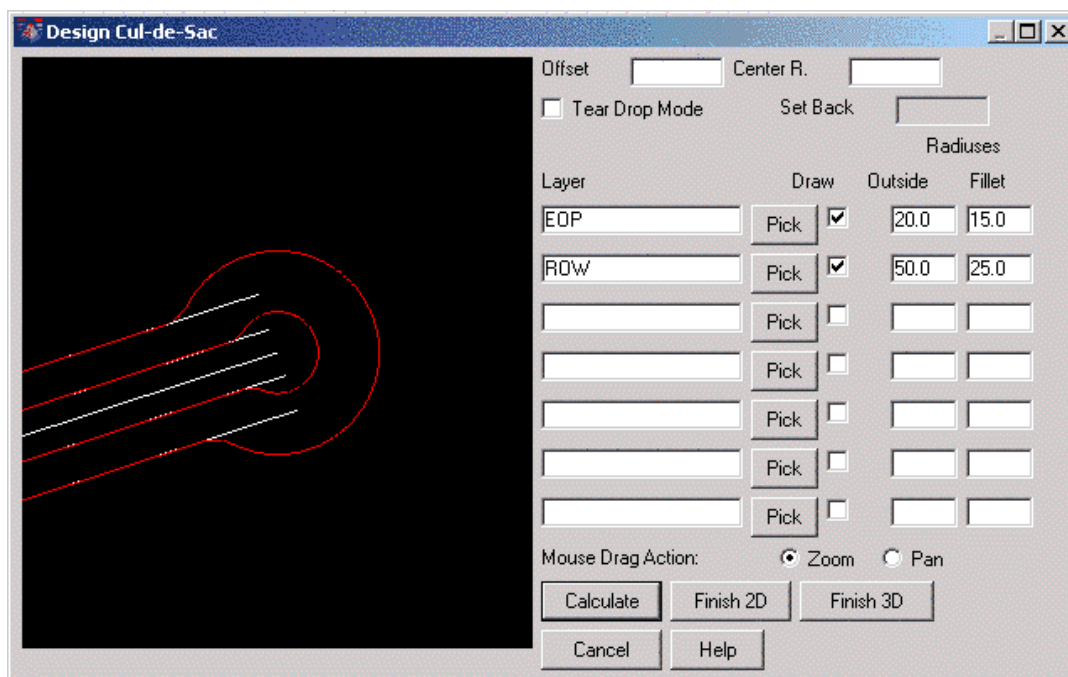
Cul-de-sacs

Function

This command uses a polyline centerline and the offset polylines to create a cul-de-sac. These offset polylines can be generated by the *Offsets & Intersections* command, or with the standard *Offset* command. The layer names of the offset polylines must match the layer names set in the dialog.

To run this command, pick a set of polylines and point on roadway centerline where the cul-de-sac center is. For cul-de-sacs with an offset center, pick a projection of that center onto the centerline and specify an offset distance (positive value is offset to the right, negative - to the left). Like the *Offsets and Intersections* command, a preview is shown of the cul-de-sac being designed. Any of the cul-de-sac parameters may be modified and reviewed before the cul-de-sac is applied and the drawing is modified with the Finish 2D button. The Finish 3D button opens the *Elevate 2D Polylines* command described in this chapter.

Bend cul-de-sacs are created by selecting offset entities on one side of the centerline.



Prompts

Select all offset polylines to end with cul-de-sac.

Select objects: *make selections*

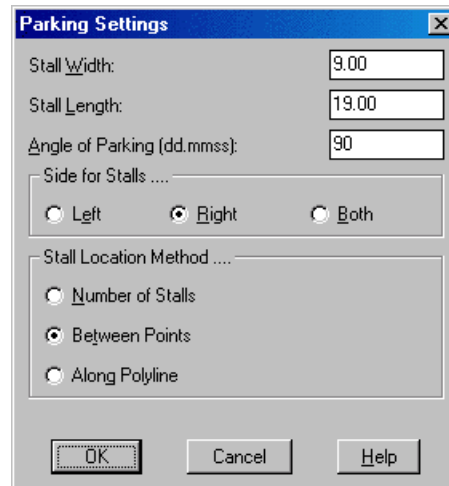
Pulldown Menu Location: Design

Parking

Function

This command draws a series of parking stalls or equilateral lot lines. The command prompts for stall width, stall parking angle, side for stalls and stall depth. Stalls can be located by the number of stalls in a direction, as many as

fit between two points, or along a polyline.



Prompts

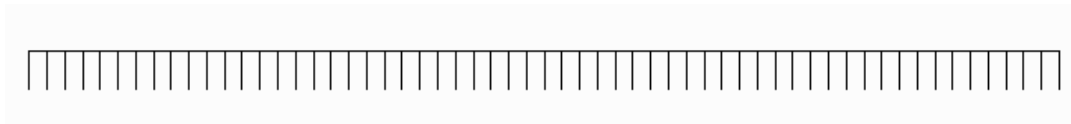
Parking Settings dialog *make selections*

Starting point? *pick a point*

Pick point or point number

Ending point? **Pick point or point number** *pick a point*

Created 58 stalls.



Pulldown Menu Location: Design

Keyboard Command: parking

Prerequisite: Locate a starting point and an ending or direction point

4 Sided Building

Function

Often only two sides of a building are surveyed in the field. This routine completes the building by drawing the other two sides. 4 Sided Building creates a parallelogram given two connecting lines or given a polyline with two segments. With two lines, there is an option to make the parallelogram as a polyline or as four lines.

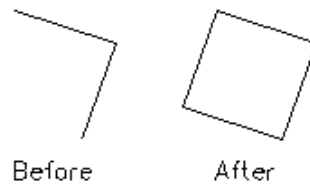
Prompts

Options/(<Pick a line or polyline>: *pick a line*

Pick another side (Enter for none): *pick a line*

Convert the lines into a polyline [<Yes>/No]? *press Enter*

Options/(<Pick a line or polyline>): *press Enter* Entering O for options lets you choose whether or not to be prompted to set the new polyline width.



Pulldown Menu Location: Design

Keyboard Command: 4sided

Prerequisite: A polyline with two segments or two adjoining lines

Best Fit Circle

Function

This command draws a least-squares best-fit circle based on points on the perimeter. The program handles four or more perimeter points. A design point for the circle center can optionally be specified. The report shows the residuals for each point, the residuals standard deviation, the difference between the design point and the circle center, and the circle parameters. The residuals are calculated as the perpendicular distance from the point to the circle. The program generates a report.

Prompts

Select points from screen or by point number [<Screen>/Number]? N

Point numbers: 2-6

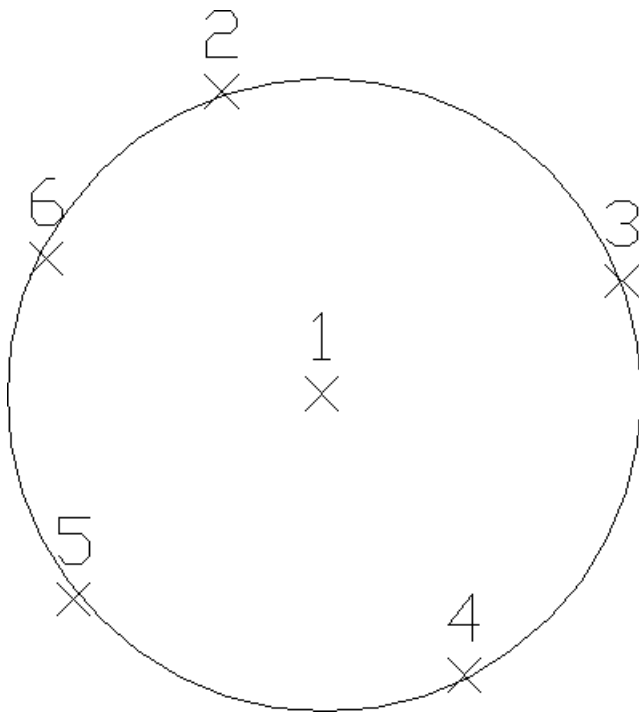
Point numbers (Enter to continue): *press Enter*

Enter design center point# (Enter for None):

Sample Report:

```
Source Coordinates
Point#    Northing Easting  Residual
2         5253.198 5070.233  0.126
3  5246.623  5084.077  0.045
4  5232.963  5078.608 -0.131
5         5235.610 5065.105  0.217
6  5247.392  5064.165 -0.264
Residuals Standard Deviation: 0.174

Circle Center: 5242.678,5073.785 Radius: 10.977
Design Center Point#: 1
Design Center: 5242.718,5073.688
Center Distance Difference: 0.105
```

Best Fit Circle

Pulldown Menu Location: Design

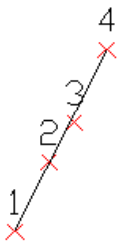
Keyboard Command: bfitcir

Prerequisite: Four or more points

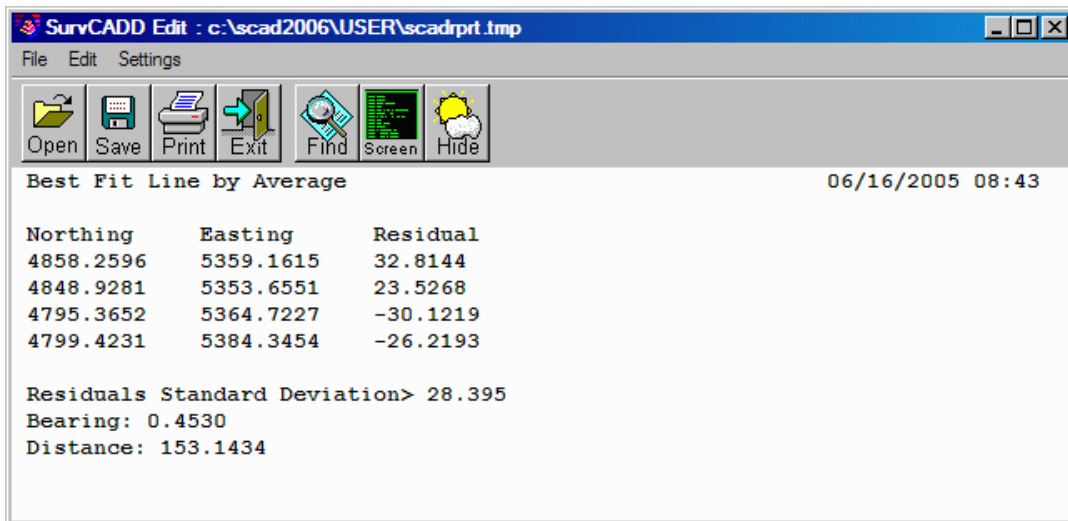
Best Fit Line by Average

Function

This command will fit a line from a starting point by sampling a group of points. The routine averages the coordinates of the sampling group then draws the best-fit line. The program generates a report of the residuals, standard deviation, line bearing and line distance. The perpendicular distance from each point to the line is reported as the residual.



Screen selection of lines almost in line with one another



Sample report of Best Fit Line by Average with a different group of points

Prompts

Starting point ?

Pick point or point number: *pick starting point*

Select points by screen or by point number (Screen/<Number>): *press Enter*

Select points.

Select objects: *select group of points* Select points using Window or Crossing. The line is then drawn to the computed point.

Pulldown Menu Location: Design

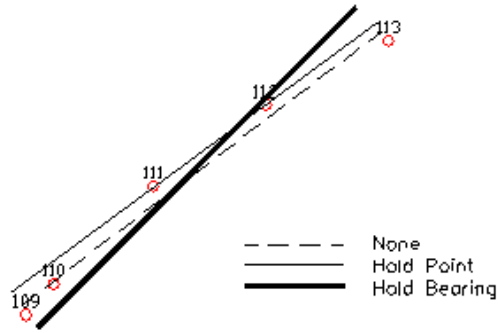
Keyboard Command: bfitlin

Prerequisite: points to sample

Best Fit Line by Least Squares

Function

This command will sample a group of points by screen selection or point number range, and then compute the best fitting line by least squares. There are options to best fit with nothing held (None), to best fit by holding a point, and to best fit by holding a bearing. All 3 options are shown below in the graphic. When holding a point, you are prompted to enter the weight for the point. In this example, a weight of 1000 caused the line to pass to within 0.025 of point 111. With a weight of 5000, the line passed to within 0.005 of point 111. Increase the weight accordingly to obtain the desired precision. When holding a bearing such as N45E, you are prompted to enter the bearing in the form QDD.MMSS (e.g. 145.0000 or just 145). The program generates a standard report.



Prompts

Select points from screen or by point number [<Screen>/Number]? S

Point numbers: *pick the five points*

Point numbers (Enter to continue): *press Enter*

Parameter to hold [<None>/Point/Bearing]: *P*

Enter point number to hold: *111*

Enter weight for point: *5000*

Sample Report:

Best Fit Line By Least Squares 05/14/2006 18:15
Holding point 111: (5227.721,5149.482)

Coordinate File> c:\scad2006\data\interval.crd

Source Coordinates

Point#	Northing	Easting	Residual
109	5103.542	5182.098	10.050
110	5114.634	5191.928	6.921
111	5149.482	5227.721	0.005
112	5178.703	5268.237	0.400
113	5201.666	5312.602	8.129

Residuals Standard Deviation: 6.559

Bearing: N 53°44'07'' E

Distance: 163.266

Pulldown Menu Location: Design

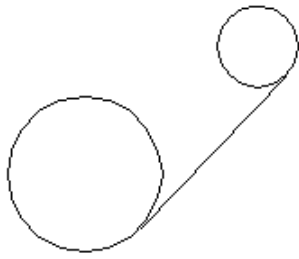
Keyboard Command: bfitline1q

Prerequisite: Group of points to sample

Tangent Line from Circles

Function

This command draws a line that is tangent to two circles. The circles are defined by picking the radius point and entering the radius. The tangent line can be drawn to either the left or right side. The line and the circles are drawn in the current layer.



Tangent line Between two circles

Prompts

Pick center point of first circle: *pick a point*

Pick first radius: 25

Pick center point of second circle: *pick a point*

Pick second radius: 35

Left or Right tangent [<Left>/Right]? L

Pulldown Menu Location: Design

Keyboard Command: linecircle

Prerequisite: None



Area Commands

14

This chapter provides information on using the commands from the Area menu to calculate and label areas in your drawing.

Area Defaults

Function

This command allows you to specify default settings for area labeling.

Sequence: The top portion of the dialog lists 10 area values. For each value, you can specify a value under the Order# column and a Suffix. The area label will include the values in the order specified. If an Order# is left blank, that value is not labeled.

Precision for Square Units Labels: Choose precision level for labeling Square Feet, Square Yards, Square Miles, Square Meters, and Square Kilometers.

Precision for Other Area Labels: Choose precision level for labeling Acres, Cuerdas, and Hectares.

Precision for Inverse with Area: Choose precision level when using Inverse with Area.

Label Both Feet & Meters for Inverse with Area: When this option is turned ON, both feet and meters will be shown in the *Inverse with Area* report.

Label Area with +/-: This allows you to display + or - in the area labels.

Use Commas in Labels: This allows you to use commas in the area labels.

Layer for area text: This allows you to assign a layer for the area text.

Style for area text: This allows you to set a text style for the area labels.

Area text size scaler: This value is multiplied by the horizontal scale to obtain the actual text size.

Max gap to join (Area by Lines and Arcs): You use this option during *Area by Lines & Arcs* command. When connecting lines and arcs that define the perimeter, the program will join endpoints if the distance between the two points is less than the specified gap. Otherwise the program will report an error and will not report an area.

Different Radius Tolerance: You use this option to check the difference between the PC-Radius and PT-Radius on curves. If the difference between these distances is greater than this tolerance, an accurate area calculation cannot occur and the command displays a warning.

Prefix/Suffix: Although most area labeling uses the suffix as in 1.25 Acres or 3.515 Hectares, those who prefer a prefix as in Ac: 1.25 can create that area labeling style automatically. This control is shown in the dialog below.

Keep in mind that changes in Area Defaults, if changed in the Area pulldown menu, only apply to that work session. If changed within the Configure command, the changes apply to all new work sessions as well.

Pulldown Menu Location: Area

Keyboard Command: defarea

Prerequisite: None

Inverse with Area

Function

This command generates a report of the bearing and horizontal distance between a series of points, and calculates the area of the closed figure defined by the points. Curve data can also be entered and reported. The points can be either picked on the screen, or entered by point number. You can also enter a range of point numbers (i.e. 1-9). The closure is reported using the total distance inversed, and the difference between the starting and ending points, as the closure error. There is an option in Area Label Defaults to report the distances in both feet and meters. The area can be labeled in the drawing using the settings from the *Area Label Defaults* command. If you don't want to label the area, press Enter at the pick label point prompt. This command creates a polyline of the figure which can be erased or kept in the drawing.

Prompts

Station/<Pick Starting point or point number>: *pick a point*

Pick point or point numbers (R-RadiusPt,U-Undo,Enter to end): *pick a point*

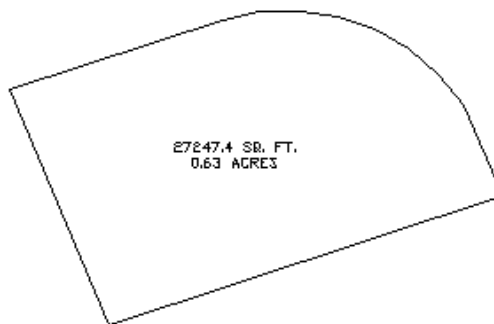
Pick point or point numbers (R-RadiusPt,U-Undo,Enter to end): *R for radius*

Radius point number or pick point: *pick a point*

Curve direction [Left/<Right>]?: *press Enter*

Pick End of Arc or point number (U-Undo,Enter to end): *pick a point*

Pick point or point numbers (R-RadiusPt,U-Undo,Enter to end): *pick a point*



Inverse with Area 05/19/2005 13:07

CRD File> c:\scad2006\data\newplat.crd

PNTNO	BEARING	DISTANCE	NORTHING	EASTING	STATION	DESC
903			4940.73	2490.40	0.00	StartPt
	S 48°43'58" W	136.21				
904			4850.89	2388.01	136.21	
	S 13°07'04" E	155.56				
905			4699.39	2423.32	291.77	

```

      S 73°55'04'' E 165.34
906      4653.59  2582.19  457.11
      RADIUS: 111.45  CHORD: 204.07  DEGREE: 05°08'28''  DIR: LEFT
      LENGTH: 257.86  DELTA: 132°33'53  TANGENT: 253.67
      CHORD BRG: N 39°47'59'' E  RAD-IN: N 16°04'56'' E  RAD-OUT: S 63°31'03'' W
      RADIUS PNTNO: 907 N: 4760.67  E: 2613.06
908      4810.37  2712.82  714.97  IP
      N 26°28'57'' W 125.87
909      4923.03  2656.69  840.84
      N 83°55'30'' W 167.23
903      4940.73  2490.40  1008.07  StartPt
Closure Error Distance> 0.0000
Total Distance Inversed> 1008.07
AREA: 74664.6 SQ METERS

```

Point number (R-RadiusPt,U-Undo,Enter to end): *pick a point*

Point number (R-RadiusPt,U-Undo,Enter to end): *pick a point*

Point number (R-RadiusPt,U-Undo,Enter to end): *press Enter*

SQ. FEET: 27247.4 SQ. YARDS: 3027.5 SQ. MILES: 0.0

ACRES: 0.63 PERIMETER: 668.35

Pick area label centering point: *pick a point*

Erase Polyline Yes/No <Yes>: *press Enter* The command plots a polyline that represents the figure you defined if you want to keep the polyline respond with No.

Pulldown Menu Location: Area

Keyboard Command: ia

Prerequisite: None

Map Check by Pnt#'s

Function

This command allows you to check the closure of a figure and produce a report. The points used for the map check should already be stored in a coordinate (.CRD) file, by using commands such as *Traverse*, *Locate by Bearing*, *Curves* menu, *Locate by Angle* – or perhaps a file from an electronic data collector.

Prompts

Table Description: *Description*

Beginning Point Number: 903

PointNo. Northing(Y) Easting(X) Elev(Z) Description

903 4940.73 2490.40 0.00

eXit/Curve/<point number>: 904

PointNo. Northing(Y) Easting(X) Elev(Z) Description

904 4850.89 2388.01 0.00

BEARING> S 48d43'58" W Hz DIST> 136.21

eXit/Curve/<point number>: 905

PointNo. Northing(Y) Easting(X) Elev(Z) Description

905 4699.39 2423.32 0.00

BEARING> S 13d07'04" E Hz DIST> 155.56

eXit/Curve/<point number>: 906

PointNo. Northing(Y) Easting(X) Elev(Z) Description

906 4653.59 2582.19 0.00

BEARING> S 73d55'04" E Hz DIST> 165.34

eXit/Curve/<point number>: 910

PointNo. Northing(Y) Easting(X) Elev(Z) Description

910 4941.88 2492.50 0.00

BEARING> N 17d16'54" W Hz DIST> 301.93

eXit/Curve/<point number>: X

Closure error distance> 2.39476609 Error Bearing> N 61°10'45" E

Closure Precision> 1 in 316.96 Total Distance Traversed> 759.04

SQ. METERS: 30403.0 SQ. KILOMETERS: 0.03

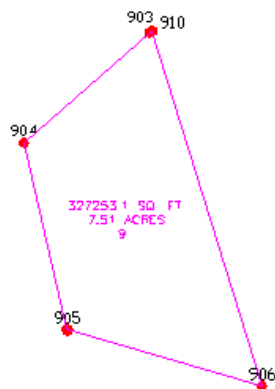
HECTARES: 3.04 CUERDAS: 7.74 PERIMETER: 759.04

Pick area label centering point: *pick point on screen for label text*

Erase Polyline Yes/No <Yes>: N

Typical Map Check Report:

Map Check	05/19/2005 13:14					
Description						
COURSE	BEARING	DISTANCE	PT#	NORTHING	EASTING	DESCRIPTION
			903	4940.73	2490.40	
903-904	S 48°43'58" W	136.21	904	4850.89	2388.01	
904-905	S 13°07'04" E	155.56	905	4699.39	2423.32	
905-906	S 73°55'04" E	165.34	906	4653.59	2582.19	
906-910	N 17°16'54" W	301.93	910	4941.88	2492.50	
Closure error distance> 2.39476609 Error Bearing> N 61°10'45" E						
Closure Precision> 1 in 316.96 Total Distance Traversed> 759.04						
327253.1 SQ. FT.						
7.51 ACRES						



Pulldown Menu Location: Area

Keyboard Command: mc

Prerequisite: Current coordinate (.CRD) file

Area by Lines & Arcs

Function

This command allows you to calculate the area of a perimeter or lot defined by lines, arcs, or polylines. The default settings for joining the perimeter and labeling the area are defined in Area Defaults. One of the settings is the maximum gap size to join. If a gap is greater than this gap tolerance, the area is not reported and the program displays a temporary X symbol at the gap.

Prompts

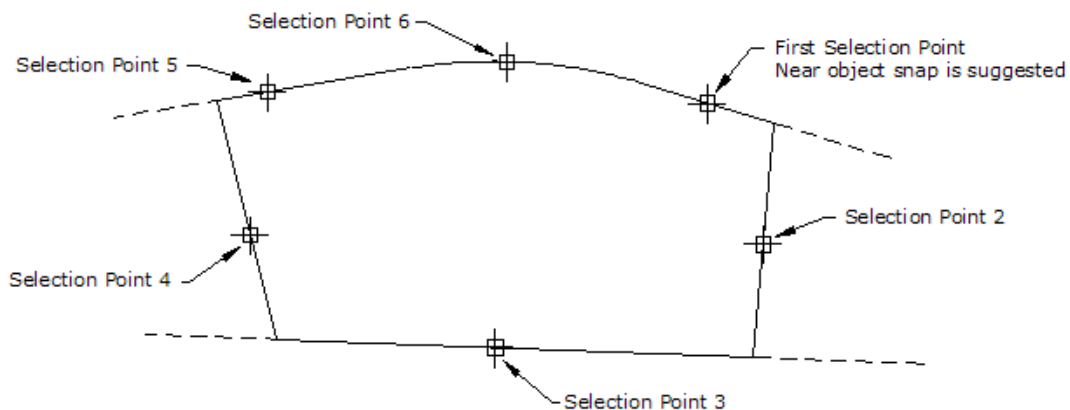
Select lines & arcs or polylines of perimeter for area calculation.

Select Objects: select lines and arcs or polylines

The lines and arcs are then joined together and the area is calculated.

Enter/pick Label center point: **pick point**

The area is then plotted at the point selected.



Menu Location: Area

Keyboard Command: JOINAREA

Prerequisite: Lines, arcs, or polylines on screen.

Area by Interior Point

Function

This command calculates and labels the area of the perimeter surrounding a picked interior point. The *Boundary Polyline* command is used to find the perimeter. Generally, this command will only work on closed or overlapping objects. Use *Area by Lines & Arcs* for other applications.

Prompts

Pick point inside area perimeter: *pick a point*

Pick area label centering point (Enter for none): *pick a point*

The area is then plotted at the point selected.

Pulldown Menu Location: Area

Keyboard Command: ptarea

Prerequisite: Set Area Label Defaults

Label Last Area

Function

This command will label the last area calculated with one of the Area commands in the manner defined in the *Area Defaults* dialog. The command prompts for a point where the label will be centered.

Prompts

Pick area label centering point (Enter for none): *pick a point*

Pulldown Menu Location: Area

Keyboard Command: lastarea

Prerequisite: Set *Area Defaults*, and use one of the Area commands to calculate an area.

Hinged Area

Function

This command can be used to determine the dimensions of a figure when the area is fixed and three or more sides are known. The figure can be defined by a closed polyline or by picking the known points and curves. The command then prompts for the area to be solved for (in square units and acres).

Prompts

Define area by points or closed polyline [Points/<Linework>]? press Enter

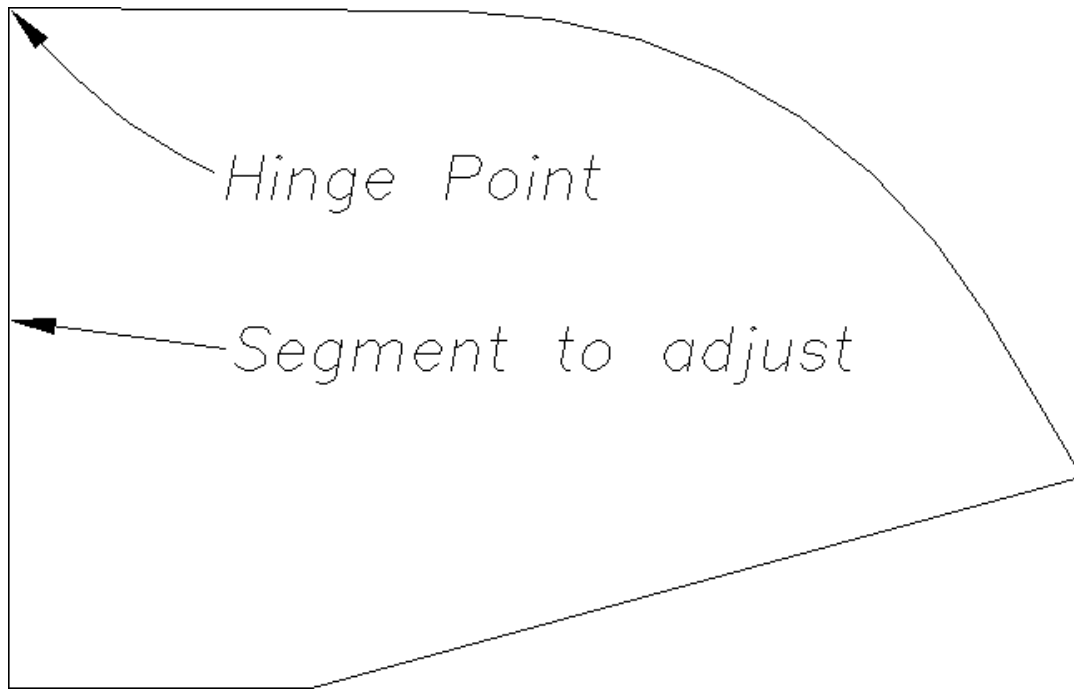
Select polyline segment to adjust: *select a polyline segment*

Select hinge point [endp]: Move the cursor around to find a hinge point.

Keep existing polyline [Yes/<No>]? N

Area: 47104.31 S.F, 1.0814 Acres

Remainder/Acres/<Enter target area (s.f.)>: 48000



Polyline method

Pulldown Menu Location: Area

Keyboard Command: harea

Prerequisite: A closed polyline or at least one known side. Two direction lines should be drawn.

Sliding Side Area

Function

This command adjusts one side of a polyline to meet a specified area. The existing area can be defined by a closed polyline or by picking each point in the perimeter. The desired area can be entered in either square feet or acres. The area to adjust must be represented by a closed polyline. The program moves the selected segment of the polyline in or out. The original direction of the segment is maintained.

Prompts

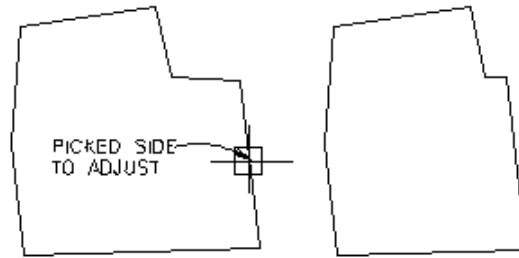
Define area by points or closed polyline [Points/<Linework>]? press Enter

Select polyline segment to adjust: *pick a point on a closed polyline*

Keep existing polyline [Yes/<No>]? press Enter

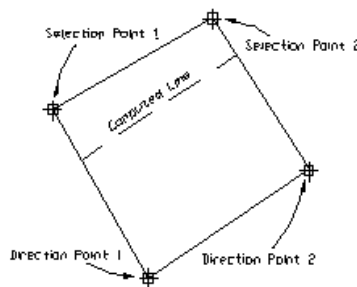
Area: 176044.14 S.F, 4.0414 Acres

Remainder/Acres/<Enter target area (s.f.)>: 17800



Polyline method:

Original perimeter polyline on left, adjusted perimeter on right



Point method

Pulldown Menu Location: Area

Keyboard Command: ssarea

Prerequisite: A closed perimeter polyline

Area Radial from Curve

Function

This command swings a line radial from a curve to reach a predetermined area. The existing area can be defined by polylines or by picking each point on the perimeter. For the point method, the curve to radiate from should be the last entity selected when defining the figure. For the polyline method, front and back polylines are used. The computed line goes perpendicular from the front polyline and intersects the back polyline. This line is moved to find the target area. Both ends of the front and back polylines are connected to close the area. The options for the polyline method are set in the dialog shown.

Prompts

Define area by points or closed polyline [Points/<Linework>]? press Enter

Area Radial from Curve dialog Make choices and click OK.

Select curve to radiate from: *pick the curve*

Select back polyline: *pick the back polyline*

Lot Area: 9000.00 S.F., 0.2066 Acres

Area Radial from Curve [X]

Target Area: 9000.000

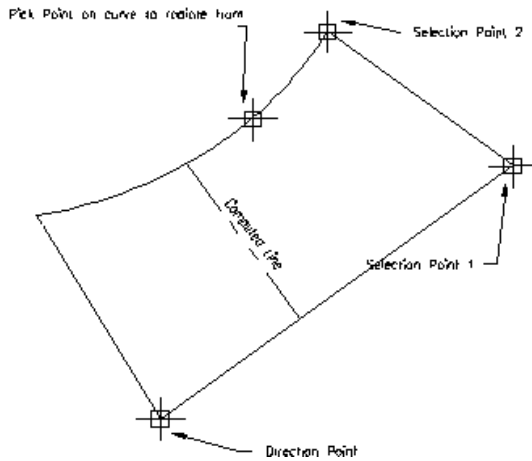
Area Units:

☒ Sq Feet ☐ Acres

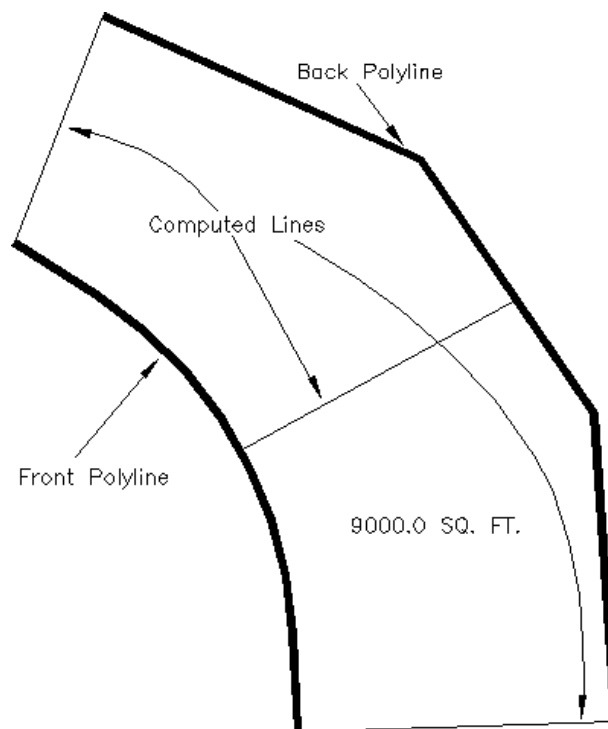
Draw Area As ...

☐ Closed Polyline ☒ Side Lines Only

OK Cancel



Point Method



Polyline Method

Pulldown Menu Location: Area

Keyboard Command: arearc

Prerequisite: An existing area defined by points or polylines

Bearing Area Cutoff

Function

This command is capable of working with a "U" shaped figure, from which you desire to cut out a predetermined area on a specific bearing. The lines where the cut-off bearing line intersects can be either straight lines or arcs.

Prompts

Units for area [<Acres>/Square-feet]: Type in *A* for acres or *S* for square feet.

Acres to cut off <0.000000>: This is asking you the number of acres necessary for the desired area to contain.

Enter cut-off bearing <100.0000>: Enter the bearing of the cutoff line through the property.

Area to right or left of bearing [<Right>/Left]: Select whether you want the area to be left or right of the cut-off bearing.

Enter points individually or pick a polyline. [Polyline/<Individual>]: *P*

Pick a polyline whose vertices correspond to desired property corners:

Select objects: *pick a polyline*

Pulldown Menu Location: Area

Keyboard Command: baco

Prerequisite: An area and bearing



Annotate Commands

15

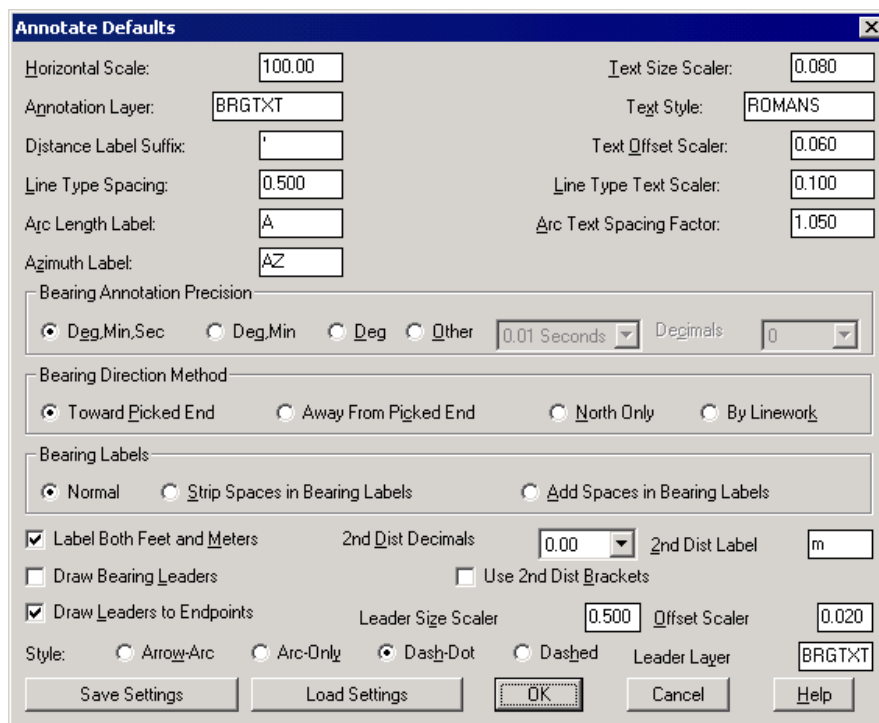
This chapter provides information on using the commands from the Annotate menu to annotate and label entities in your drawing.

Annotate Defaults

Function

This command sets the defaults for the annotation commands and controls the way various annotation commands work. Some of these defaults can be changed globally by running the Configure command in the Settings menu, which changes the file COGO.INI so that every time you start Carlson Survey the new defaults are set.

When you select Annotate Defaults under the Annotate menu, the following dialog box appears.

The image shows the 'Annotate Defaults' dialog box. It has a title bar with the text 'Annotate Defaults' and a close button. The dialog is organized into several sections. The top section contains input fields for 'Horizontal Scale' (100.00), 'Text Size Scaler' (0.080), 'Annotation Layer' (BRGTX), 'Text Style' (ROMANS), 'Distance Label Suffix' (empty), 'Text Offset Scaler' (0.060), 'Line Type Spacing' (0.500), 'Line Type Text Scaler' (0.100), 'Arc Length Label' (A), 'Arc Text Spacing Factor' (1.050), and 'Azimuth Label' (AZ). Below these is a 'Bearing Annotation Precision' section with radio buttons for 'Deg,Min,Sec' (selected), 'Deg,Min', 'Deg', and 'Other', followed by a dropdown for '0.01 Seconds' and a 'Decimals' dropdown set to '0'. The next section is 'Bearing Direction Method' with radio buttons for 'Toward Picked End' (selected), 'Away From Picked End', 'North Only', and 'By Linework'. This is followed by 'Bearing Labels' with radio buttons for 'Normal' (selected), 'Strip Spaces in Bearing Labels', and 'Add Spaces in Bearing Labels'. The bottom section contains checkboxes for 'Label Both Feet and Meters' (checked), 'Draw Bearing Leaders' (unchecked), and 'Draw Leaders to Endpoints' (checked). It also has a '2nd Dist Decimals' dropdown (0.00), a '2nd Dist Label' field (m), a 'Use 2nd Dist Brackets' checkbox (unchecked), a 'Leader Size Scaler' field (0.500), and an 'Offset Scaler' field (0.020). At the very bottom are radio buttons for 'Style' (Arrow-Arc, Arc-Only, Dash-Dot (selected), Dashed) and a 'Leader Layer' field (BRGTX). The dialog concludes with buttons for 'Save Settings', 'Load Settings', 'OK', 'Cancel', and 'Help'.

1 Determine scaling options for the annotation.

- **Horizontal Scale:** This is the horizontal scale for the current drawing. This value can also be set by using the Drawing Setup command on the Settings menu.
- **Text Size Scaler:** This value is multiplied by the horizontal scale value to set the text size units.
- **Annotation Layer:** This specifies the layer to be used for the bearing and distance text.
- **Text Style:** This specifies the text style to be used for the bearing and distance text.
- **Distance Label Suffix:** This specifies the suffix that is appended to distance Annotations.
- **Text Offset Scaler:** This value multiplied by the horizontal scale defines the distance that an annotation label is placed from its defining line.
- **Line Type Spacing:** Specifies the distance between the symbols on special line types.
- **Line Type Text Scaler:** Specifies the size of the symbols of special line types.
- **Arc Length Label:** Specifies the prefix label for arc length labels.
- **Arc Text Spacing Factor:** This variable controls how close letters will be spaced when labeling arcs. The lower the number, the closer the spacing. The higher, the farther apart. (The suggested range between 0.8 and 1.5)
- **Azimuth Label:** Specifies the prefix text for azimuth labels.

2 Under the Bearing Annotation Precision option, there are settings for the precision of bearing and azimuth labels.

- **Deg, Min, Sec:** This labels the degrees, minutes, and seconds.
- **Deg, Min:** This labels the degrees and minutes with the specified decimals.
- **Deg:** This labels the degrees with the specified decimals.
- **Other:** This option activates the Seconds option so you can select a precision from 0.01 seconds to 30 seconds.

3 Under the Bearing Direction Method, you choose the orientation of the bearing. This controls how lines selected for bearing or azimuth annotations will be referenced.

- **Toward Picked End:** If this option is chosen, the line will be labeled in the direction of the endpoint that is closest to the point where you selected the line.
- **Away from Picked End:** This labels the line in the direction away from the closest endpoint.
- **North Only:** This option controls whether bearing annotations will always be labeled in the north quadrants (NE or NW) and never in the south quadrants.
- **By Linework:** This option labels the line in the direction that the line was drawn.

4 Determine format options for leaders and labels.

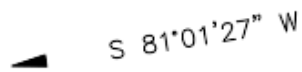
- **Strip Spaces in Bearing Labels:** This option causes the spaces in bearing labels to be removed.
- **Add Spaces in Bearing Labels:** This option puts spaces between the degree, minutes, and seconds numbers.
- **Label Both Feet and Meters:** This option causes the program to label distances in both feet and meters.

67.56' 20.59m

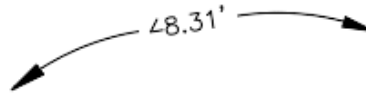
- **2nd Dist Decimals:** This option applies to the second distance label. The number of decimal places for the first distance label is set by the Units Control command in the Settings menu. For example, distances in feet could have 2 decimals and distances in meters could have 3 decimals.
- **2nd Dist Label:** This option applies to the second distance label. This variable will be assigned as a suffix to the label.
- **Use 2nd Dist Brackets:** This option applies to the second distance label. If turned on, the second distance labels will be enclosed in brackets, for example [34.5m].

67.56' [20.59m]

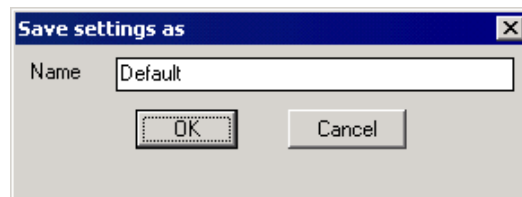
- **Draw Bearing Leaders:** This option creates a direction arrow with the bearing annotation as shown below.



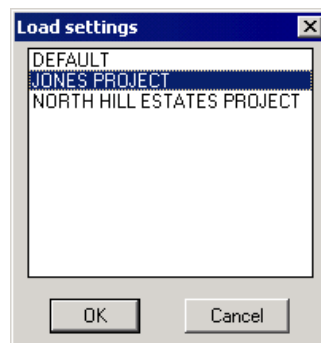
- **Draw Leaders to Endpoints:** This option creates leader lines (Crow's Feet) between the distance annotation and the line segment endpoints as shown below. These leaders are used to help identify the endpoints that were used to create the distance label.



- **Leader Size Scaler:** This option determines the maximum length for leaders. The size in drawing units will be the Leader Size Scaler multiplied by the Horizontal Scale (for example, 0.5x50=25). If the line segment is too short, the leader is shortened to fit.
- **Offset Scaler:** This option controls the distance between the line endpoints and the leader endpoints.
- **Style:** This option determines which of the four styles of endpoint leaders to use. The four styles are: Arc with arrow, Arc only, Dash-dot-dash, and Dashed.
- **Leader Layer:** This option determines the layer for drawing the leader.
- **Save Settings:** Allows you to save the current annotation settings.



- **Load Settings:** Allows you to load previously saved annotation settings



Pulldown Menu Location: Annotate
Keyboard Command: LDEF
Prerequisite: None

Auto Annotate

Function

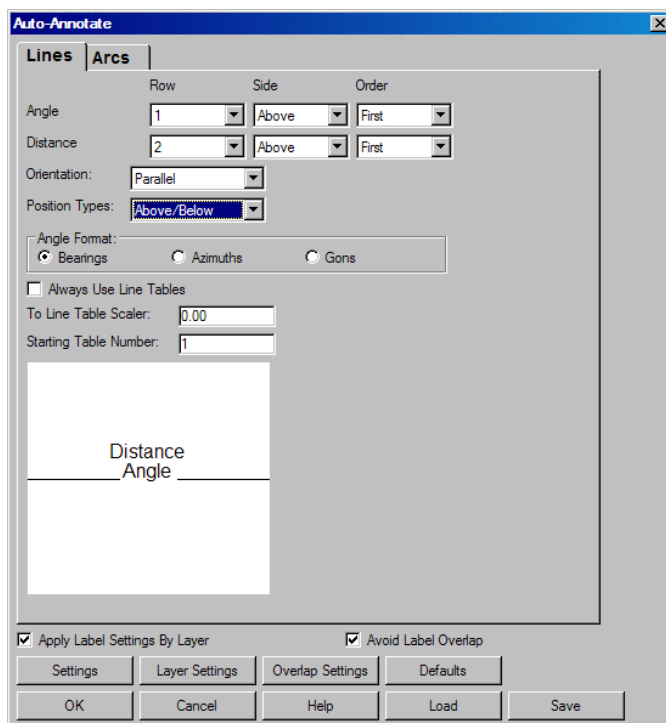
This command allows you to select a group of lines, arcs and/or polylines to be labeled. It allows for any combination of line and distance labeling, and also any combination of arc labeling.

You can position the features of the labels, once in the Auto-Annotate dialog, by using the Row, Side, Order, Orientation and Position Types options, all found under Lines tab. For Arcs, you can select the Arcs tab and determine the type of auto-annotating you would prefer for arc entities. As you select different options, you can see the changes in the preview display of the entry dialog. You will select the Angle Format in terms of Bearing, Azimuths and Gons and there is an important feature that allows you to avoid label overlaps. This is done by applying specific, user-defined settings. When labeling arcs, there are options to set the label prefixes for curve annotation. The Settings button will bring you to the Annotation Defaults dialog, as explained in a previous section. Defaults will restore the prior settings.

Apply Label Settings by Layer brings up another dialog box which allows you to import from file, or load, predetermined configurations. There is an option to have different label settings applied by layer. Apply Label Settings By Layer allows you to set, load, and save your preferred variables.

The Avoid Label Overlap option can bring up a special dialog called the Overlap Manager. This screen, which contains extra tools for, as an example, sliding or stacking the labels that are overlapping and conflicting with drawing entities, gives you the real-time ability to move along the plan and make your corrections. This also will help you to avoid overlapping with other labels, text, symbols and linework – including fence and utility lines. In this Overlap Manager, docked on the left side of the screen. it is recommended that you use the Back and Next button frequently in order to review, adjust and correct your drawing.

Auto-Annotate dialog starts with the **Lines (tab)**.



Angle/Distance: Allows you to enter the what row the Angle label is on, what side and the order of the label on the linework. The same applies for Distance labels. Notice the preview display changing.

Row: Using numbers (1 or 2), or choosing None, you can determine the order and appearance of the descriptions. Note the change in the preview display.

Side: Choose inside or outside of the line.

Order: If you determine that the annotations are to be on the same row and same side of the line, then you must pick the order in which they will appear, from left to right.

Orientation: This offers this choice between parallel or perpendicular with regards to the labels' orientation to the line being labeled.

Position Types: Determined how each label is placed in relationship to the line and the other label.

Angle Format: Bearing, azimuths or gons are the choices.

Always Use Line Tables: Line tables are sometimes preferred as they keep the drawing linework clean and free of labeling.

To Line Table Scaler: The To Line Table Scaler applies when the Type of Line Label option is not set to Line Table. If the length of the line is less than this minimum, the line is labeled as a line table entry. The To Line Table Scaler is relative to the current horizontal scale and represents the length of the line in plotted inches.

Starting Table Number: User choice. You might change this because perhaps you have another group of line labels, in table form, in the drawing. Line table entries are numbered sequentially beginning at the line Starting Table Number. The location for the line table can be picked if there is no current table. Otherwise, Auto Annotate will add to the end of the current line table. To set the location for the current line table, run the Table Header command in the Annotate > Line/Curve Table menu.

Auto-Annotate dialog box, by selecting the **Arcs tab**, displays the options for auto-annotating arcs. The columns are described, followed by therest of the options.

The screenshot shows the 'Auto-Annotate' dialog box with the 'Arcs' tab selected. The dialog is divided into two main sections: 'Lines' and 'Arcs'. The 'Arcs' section contains a table with columns for 'Label', 'Row', 'Side', and 'Order'. Below the table are various settings for arc labeling, including 'Label Chord Angles in...' (Bearings, Azimuths, Gons), 'Type of Curve' (Road, Rail), and checkboxes for 'Flip Text on Arcs that Open to the North', 'Use Symbol for Delta Angle Label', and 'Always Use Arc Tables'. There are also input fields for 'To Curve Table Scaler' and 'Starting Table Number'. At the bottom, there are checkboxes for 'Apply Label Settings By Layer' and 'Avoid Label Overlap', and a row of buttons: 'Settings', 'Layer Settings', 'Overlap Settings', 'Defaults', 'OK', 'Cancel', 'Help', 'Load', and 'Save'.

	Label	Row	Side	Order
Arc Length:	A	1	Inside	First
Radius:	R	2	Inside	First
Delta Angle:	D	3	Inside	First
Chord Angle:	B	None	Inside	First
Chord Length:	C	None	Inside	Second
Tangent:	T	None	Inside	Third
Degree Of Curve:	DOC	None	Inside	Fourth

Label Chord Angles in...
☒ Bearings ☐ Azimuths ☐ Gons

Type of Curve
☒ Road ☐ Rail

☐ Flip Text on Arcs that Open to the North
☐ Use Symbol for Delta Angle Label
☐ Always Use Arc Tables

To Curve Table Scaler: 0.00
Starting Table Number: 1

☒ Apply Label Settings By Layer ☒ Avoid Label Overlap

Settings Layer Settings Overlap Settings Defaults
OK Cancel Help Load Save

Label: Here you might alter slightly the defaults by entering a letter or acronym that will represent to type of calculation. Or you could leave it alone.

Row: Using numbers, or choosing None, you can determine the order of the descriptions, and determine whether or not some might be left off altogether.

Side: Choose inside or outside of the arc.

Order: If you determine that the annotations are to be on the same row and same side of the curve, then you must

pick the order in which they will appear, from left to right.

Label Chord Angles in: Bearing, azimuths or gons are the choices.

Type of Curve: Choose between Road and Rail.

Flip Text on Arcs that Open to the North: Clicking here might make for a easier to read finished plan. User preference.

Use Symbol for Delta Angle Label: The popular and traditional triangle-shaped symbol can be used, instead of the letter D, or any other letter(s).

Always Use Arc Tables: Curve tables are sometimes preferred as they keep the drawing linework clean and free of labeling.

To Curve Table Scaler: The To Curve Table Scaler applies when the Type of Arc label options is not set to Curve Table. If the length of the arc is less than this minimum, the arc is labeled as a curve table entry. The To Curve Table Scaler is relative to the current horizontal scale and represents the length of the arc in plotted inches.

Starting Table Number: The Starting Table Number is the starting number for the first line entered in the Curve Table. Curve Table entries are numbered sequentially from the curve Starting Table Number. The location for Curve Tables can be picked if there is no current table. Otherwise, Auto Annotate will add to the end of the current Curve Table. To set the location for the current Curve Table, run the Table Header command in the Annotate > Line/Curve Table menu.

Auto-Annotate dialog commands, common to both Lines and Arcs.

Apply Label Settings By Layer: See the Label By Layer Settings dialog and details below.

Avoid Label Overlap: See dialog and details below.

Settings: Brings you to the Auto Defaults dialog.

Layer Settings: Apply Label Settings By Layer option must be clicked in order to activate. You will then see the Label By Layer Settings dialog.

Overlap Settings: Avoid Label Overlap option must be clicked in order to activate. Brings up the Avoid Label Overlap dialog.

Defaults: This returns you to the default label values.

Load: You can load an existing .AAN file.

We will now say, for example, that with linework only to label in the drawing we run this routine. We first decide to go without the Avoid Label Overlap feature. This can be done by unclicking this option in the Auto-Annotate dialog. We will say that there is a fence line cutting through our property line, the property lines being the lines that we want to auto-annotate. In going without Auto Annotate's overlap protection, we perform Auto Annotate and we see that there is an overlap, with the labels running into the property lines and the fence line.

Panning and zooming the screen shows the problems we confront. Now, run Auto annotate again, but this time click ON the Avoid Label Overlap feature. Then click Overlap Settings button which brings up a dialog as shown below. This program and this specific dialog box has many different methods for fixing the overlaps. We will choose the different methods to apply.

First, we will choose Slide. This slides the labels along the linework. We can even choose a maximum amount of slide and other related parameters. We will also turn on the Stack method. The Avoid Linework Conflicts feature pertains to that fence line we have. Finally, click OK. Now can pick the linework. Note that you do not need to erase the existing auto annotate labels ahead of time. This command will remember that those labels were created with this command. It will simply replace the entire group of labels with the new auto annotate labels.

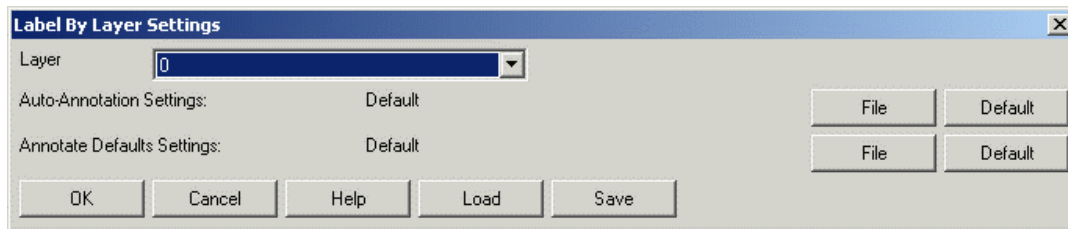
The result, with overlap detection on, is that this routine fixed 7 out of 7 of the conflicts. It slid some of the labels over and stacked others. You can also run Auto Annotate Overlap with manual mode. To do this, remove the automatic options (such as Stack, Slide, etc.) and click View Remaining Overlaps After Applying Rules ON. Say OK. It docks the Overlap Manager on the left side of the screen.

You can then fix the conflicts with this Overlap Manager by using the different methods presented in this new

window. This manager will highlights the conflicts, it will, for example, slide to the next conflict and allow you to pick a new position. Hit the Next several times. Again, stack one, slide another over, and perform other changes. Then choose Close.

Also, remember that depending on the linework layer, you can even have different annotation styles. There is also an option to have different label settings "by layer". These decisions are made by using the Label By Layer Settings dialog options. To get to this dialog, click on the Layer Settings button at the bottom of the Auto-Annotate dialog.

Label By Layer Settings option and dialog.



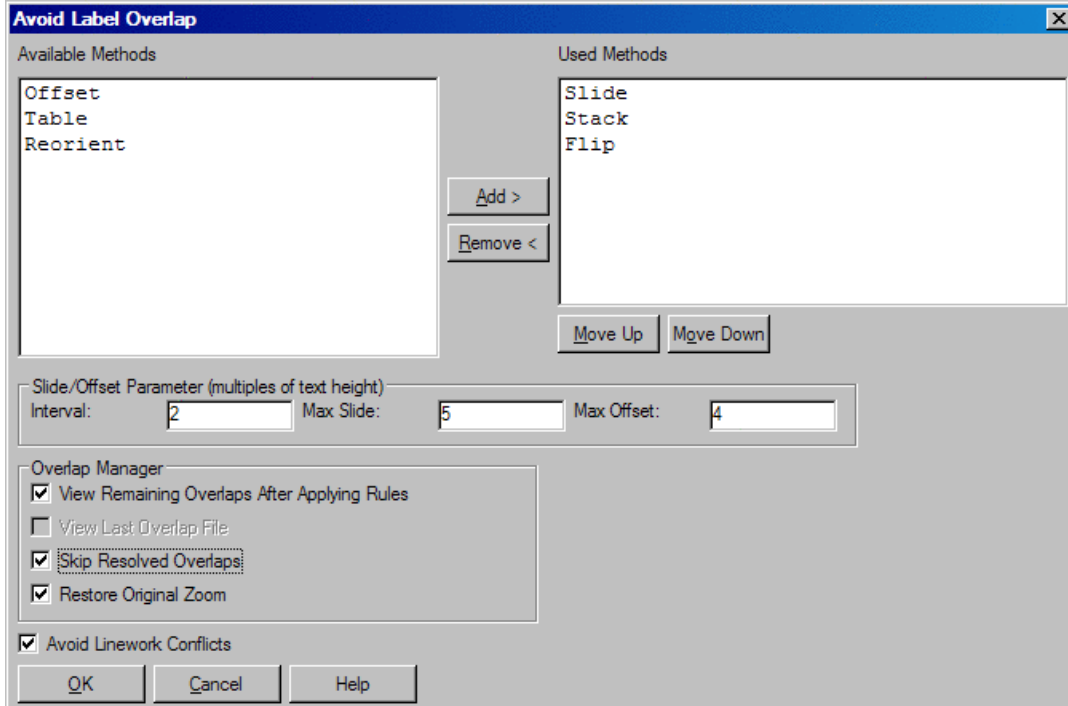
Layer: Select a layer from the existing list of layers. If the linework you select and to be labeled is on this layer, the parameters that you set in this dialog will be reflected in all labels.

Auto-Annotation Settings: Select an existing Annotation Settings file (AAN) by clicking the **File** button on the right. Or stick with the defaults.

Auto-Defaults Settings: Select an existing Default Settings File (ADF) by clicking the **File** button on the right. Or stick with the defaults.

Load: Select this option in order to load an existing layer file (LAY) to load.

Avoid Label Overlap option and dialog.



Overlap Settings dialog

Available Methods: Your choices. Pick from these.

Used Methods: Different ways in which this routine keeps the label from overlapping.

Slide: If this is selected then the labels will be moved parallel to your linework until they do not overlap. The labels will not move past the end of the linework or the Max Slide which you determine.

Offset: will move your labels perpendicular to your linework as far as you set the Max Offset.

Table: Replaces your labels with a numbers and create a table of the numbers with the corresponding labels.

Reorient: If chosen, the labels will change orientation in the plain view to avoid overlapping.

Flip: It will flip your label onto the other side of the linework.

Stack: It will stack or unstack the text of your labels to avoid overlapping.

You can use any combination of these commands by using the add/remove button. You can also determine the order in which the command tries a method by using the **Move Up** and **Move Down** buttons. If a solution is not found by using the first method then the next method is used in descending order.

Add/Remove: Some methods you might prefer not to use.

Slide/Offset Parameter (multiples of text height): These are variable that help you to slide or offset the label(s) in question.

View Remaining Overlaps After Applying Rules: This option will help you to see what still needs treatment.

View Last Overlap File: When it is checked, the Overlap Manager will return to the previous labels that were under review.

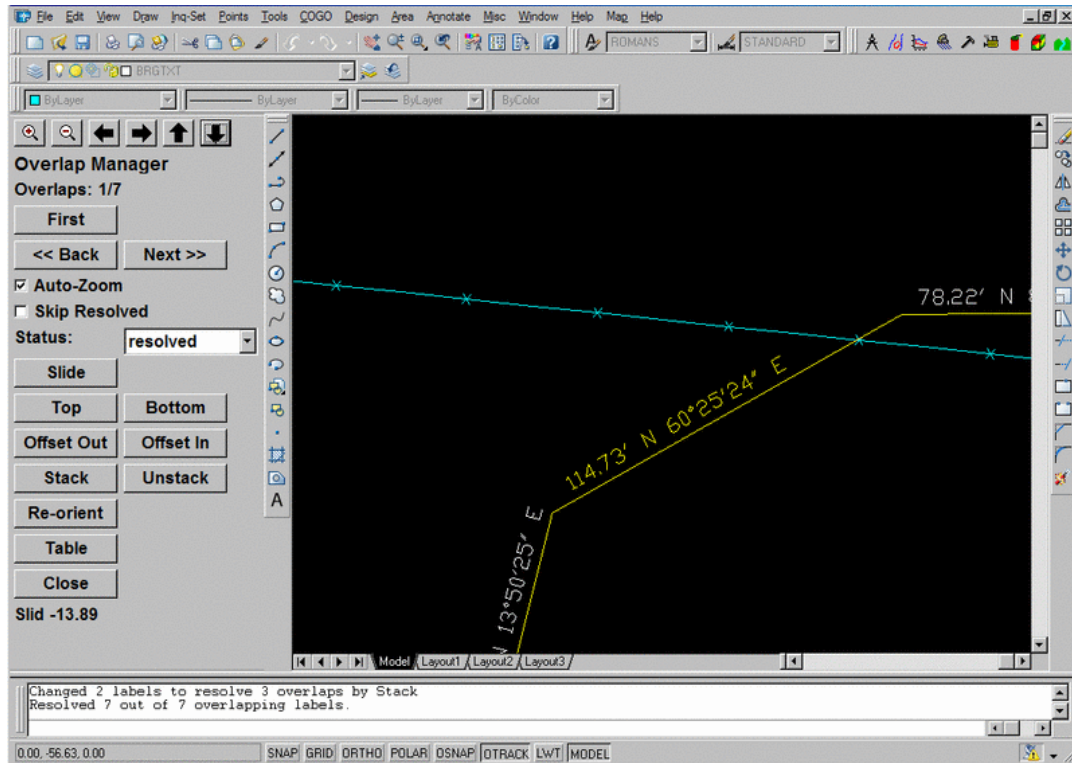
Skip Resolved Overlaps: When it is unchecked, the Overlap Manager will display all the labels that were moved by the command as a final check to you.

Restore Original Zoom: This will restore the zoom you were previously at before running the command.

Avoid Linework Conflicts: This is an extra precaution for when linework conflicts exist.

If there is a conflict, the following Overlap Manager dialog appears on the screen. It zooms to the conflict and provides you with the necessary tools to resolve the issues that need to be addressed. Many of the choices selected in the earlier dialog boxes can be modified yet again in the Overlap Manager, in your quest for a clean looking drawing. Within this special window you can zoom, pan, move to the next conflict, and perform many other tasks.

The Overlap Manager screen appears as a new window.



The Overlap Manager can be used to manually check and change label overlaps. If you check on "View Remaining Overlaps After Applying Rules" then any remaining overlaps will be zoomed in on and you will have the ability with the Overlap Manager to flip through and fix or ignore the unresolved labels.

Prompts

Auto Annotate Dialog Choose settings and click OK.

Select Lines, Arcs, and/or Polylines to Annotate.

Select Objects: *pick entities*. Select the group of lines, arcs and/or polylines you want to annotate.

Pulldown Menu Location: Annotate

Keyboard Command: autoann

Prerequisite: Lines, arcs or polylines to annotate

Angle/Distance

Function

Under the Annotate menu, the Angle/Distance submenu contains several commands for labeling the angle and/or distance of line segments. The line segments can be defined by picking a line, picking a polyline segment, entering two point numbers or picking two points. The angles can be labeled in bearing, azimuth or gon format. In the command names, the "_" indicates which side of the line the label will appear. For example, "Bearing_" will label the bearing above the line and "_Bearing" will label below the line. There is also a Custom Label Formatter option. When this command is used and Option is chosen, there will appear a Custom Line Label dialog with various settings.

Prompts

Define bearing by, Points/type in Bearing/<select line or polyline>: P

1st Point ?

Pick point or point number: 11

PtNo. North(y) East(x) Elev(z) Description

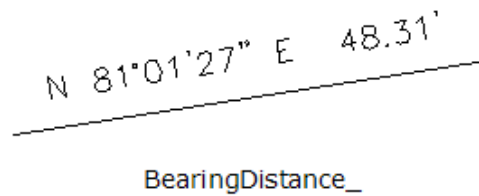
11 4869.06 4390.31 0.00

2nd Point ?

Pick point or point number: 2

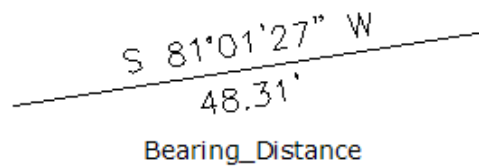
PtNo. North(y) East(x) Elev(z) Description

2 4610.89 4078.44 0.00



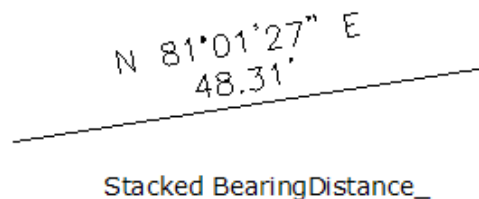
N 81°01'27" E 48.31'

BearingDistance_



S 81°01'27" W 48.31'

Bearing_Distance



N 81°01'27" E 48.31'

Stacked BearingDistance_

Pulldown Menu Location: Annotate > Angle/Distance

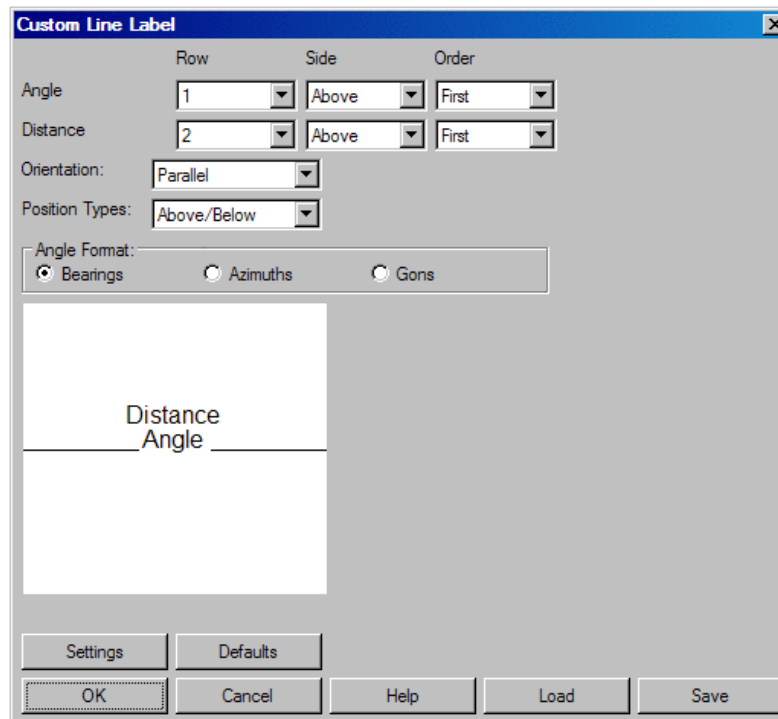
Keyboard Command: BRG_, BBRG, BRG_DIS, DIS_BRG, BRGDIS_, DIS_, BDIS, STACKBD, STACKBD2, STACKBD3, STACKBD4, AZI_, BAZI, AZI2_, AZI3_, GONLAB, GONLAB2, GONLAB3, GONLAB4

Prerequisite: Object to label

Custom Linework Label Formatter

Function

This command allows you to customize the labeling for lines and polylines. You are first prompted to select a line or polyline to label, given the existing defaults currently set. The command line, shown below, also offers you an important choice called Options. When you type 'O' for options the below dialog box appears. There are three columns at the top of the dialog along by other features.



Row: This column allows you to stack the data in different ways. You can place more than one item in the same row. If *None* is selected then that item will not be displayed.

Side: This column allows you to place each item either inside or outside of the line or polyline.

Order: This column determines the order of items when they are placed in the same row.

Settings: This button brings you to the Annotate Defaults dialog, see 'Annotate Defaults' for more.

Defaults: This button restores the default settings shown above.

Load/Save: You may also Load and Save different label configurations with the corresponding buttons.

Prompts

Options/Points/(<Select line or polyline>): *select entity*

Options/Points/(<Select line or polyline>): *O*

Custom Line Label dialog *choose your preferences and click OK*

You can decide to go into the Option dialog at the start of the command and after your initial labeling.

Pulldown Menu Location: Annotate > Angle/Distance

Keyboard Command: annline

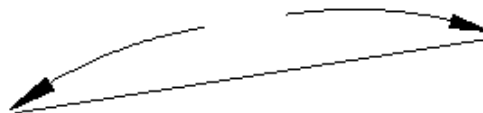
Prerequisite: An arc to label

Draw Endpoint Leaders

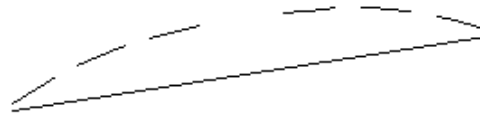
Function

This command draws a pair of leaders (crow's feet) at the ends of the line or polyline segment. The segment can be selected from a line, polyline or pair of points. The leaders are drawn above or below the segment, depending on which Endpoint Leader command is run. Controls to customize the look of the endpoint leaders are accessed through the *Annotate Defaults* command in the Annotate menu. The Leader Size Scaler determines the maximum length of the leader. If the line segment is too short, the leader is shortened to fit. The actual length of the leader in drawing units is calculated by multiplying the leader scaler by the drawing horizontal scale (i.e.. $0.5 \times 40 = 20$). The Offset Scaler sets the distance that the leader head is off the line endpoint. There are four leader styles to choose from: Arc with Arrow, Arc Only, Dash-Dot-Dash and Dashed. Endpoint leaders can be drawn together with bearing/distance annotation by having the Draw Leaders to Endpoints option clicked. This option is also in *Annotate Defaults*. This Draw Endpoint Leaders command allows you to add the leaders as another step after initially labeling lines or polylines without them.

At the command prompt below, if you wish to define by points, enter "P" at this prompt and pick points on the screen, or type in point numbers. If a coordinate (.CRD) file has not been previously loaded, a dialog will open to allow you to select a coordinate (.CRD) file to process. While using the Point selection method, the last point picked in the selection is stored in default brackets. So if you are working around a boundary, simply press enter to accept the defaults for the first point and move ahead to the next point.



Arc with Arrow Endpoint Leader



Dashed Endpoint Leader

Prompts

Define line by, Points/<select line or polyline>: *Select a line or polyline*

Pulldown Menu Location: Annotate

Keyboard Command: crowft, crowft2

Prerequisite: None

Switch Bearing/Azimuth Quadrant

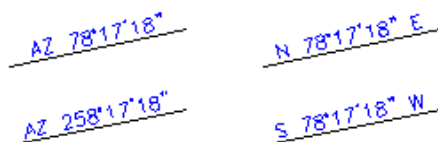
Function

This command switches the Bearing quadrant label or adds 180° to an Azimuth label. For example, N90°32'16"E would be replaced with S90°32'16"W or AZ 78°17'18" would be replaced with AZ 258°17'18". This routine changes bearing text to read as if the bearing were in the opposite direction.

Prompts

Pick Bearing or AzimuthText: *pick text*

Pick Bearing or Azimuth Text: *press Enter to end*



Examples of switch bearing/azimuth quadrant

Pulldown Menu Location: Annotate > Flip Labels

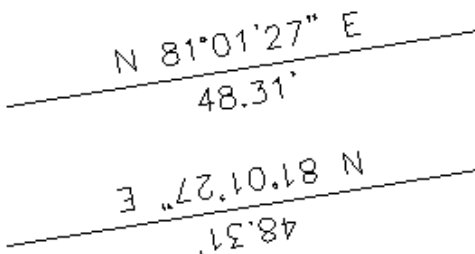
Keyboard Command: brgquad

Prerequisite: bearing or azimuth label

Mirror Selected Labels

Function

This command rotates text 180 degrees and maintains the same text position. Use this command to rotate any type of text. The command ignores all entities in the selection set except text.



Before and After Mirror Labels

Menu Location: Annotate
Keyboard Command: FLIPSET
Prerequisite: Text to rotate

Flip Last Label

Function

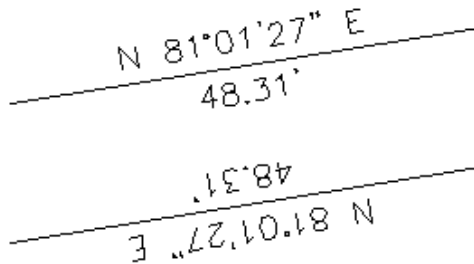
This command flips the last text drawn 180 degrees. Use this command to rotate your last annotation.

Pulldown Menu Location: Annotate > Flip Labels
Keyboard Command: flip
Prerequisite: Text to flip

Flip Selected Labels

Function

This command rotates a group of text 180 degrees. Use this command to rotate any text. The command ignores all entities in the selection set except text.



Before and After Flip Labels

Pulldown Menu Location: Annotate > Flip Labels
Keyboard Command: flip_labels
Prerequisite: Text to rotate

Flip ON/OFF

Function

When activated, the bearing and distance text will be rotated 180 degrees when drawn.

Pulldown Menu Location: Annotate > Flip Labels

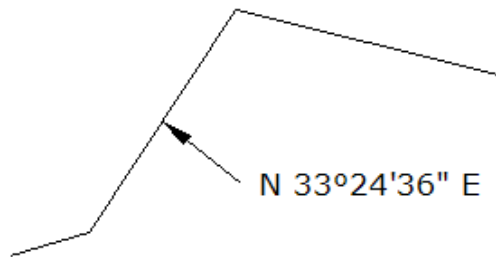
Keyboard Command: flp

Prerequisite: None

Bearing with Leader

Function

This command places the bearing of a line or polyline segment at a point, then plots a leader line pointing to the line. The appearance of the leader line is controlled in the Annotate Defaults command in the Annotation menu. There is the ability for multi-segment leaders and the option to align the label horizontal to the current view or parallel to the linework.



Prompts

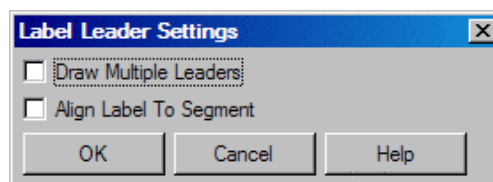
Define bearing by, Points/<select line or polyline>: *select a line*

Pick point to start leader: *pick a point near the line*

Label Position: *pick a point*

Select the point where to place the label.

Define bearing by, Points/<select line or polyline>: *press Enter to end*



This dialog appears after choosing Options (O)

Pulldown Menu Location: Annotate > Annotate w/Leader

Keyboard Command: brglead

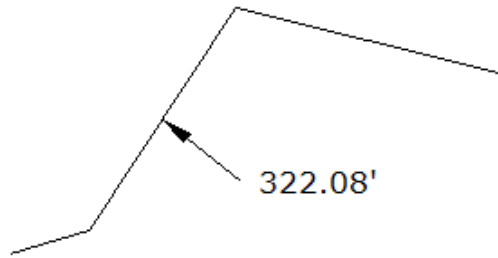
Prerequisite: None

Distance with Leader

Function

This command labels the length of a line or polyline segment at a point, then draws a leader line pointing to the line.

Using Options on the command line, there is the ability a feature for using multi-segment leaders and also the option to align the label horizontal to the current view or parallel to the linework.



Prompts

Options/Points/<Select line or polyline>: *select a line*

Pick point to start leader: *pick a point near the line*

Label Position: *pick a point*

Options/Points/<Select line or polyline>: *press Enter to end*

Pulldown Menu Location: Annotate > Annotate w/Leader

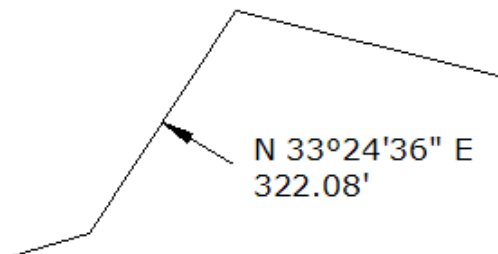
Keyboard Command: distlead

Prerequisite: None

Bearing-Distance with Leader

Function

This command places the bearing and distance of a line at a point and then plots a user specified leader line which points to the defining line. There is the ability for multi-segment leaders and the option to align the label horizontal to the current view or parallel to the linework.



Pulldown Menu Location: Annotate > Annotate w/Leader

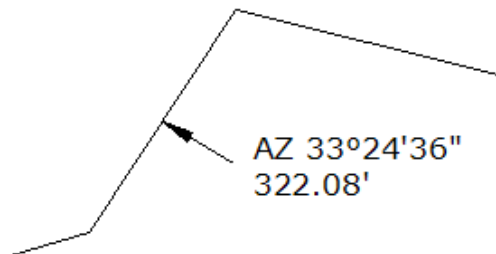
Keyboard Command: BDLEAD

Prerequisite: None

Azimuth-Distance with Leader

Function

This command places the azimuth and distance of a line at a point, and then plots a user specified leader line which points to the defining line. There is the ability for multi-segment leaders and the option to align the label horizontal to the current view or parallel to the linework.



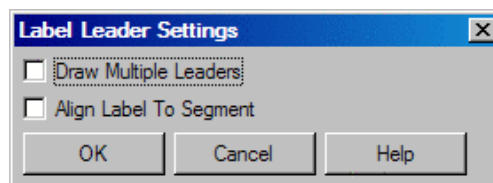
Prompts

Options/Points/<Select line or polyline>: select line

Pick point to start leader: pick point near the line

Label Position: pick point

Options/Points/<Select line or polyline>: Press Enter



This dialog appears after choosing Options (O)

Pulldown Menu Location: Annotate > Annotate w/Leader

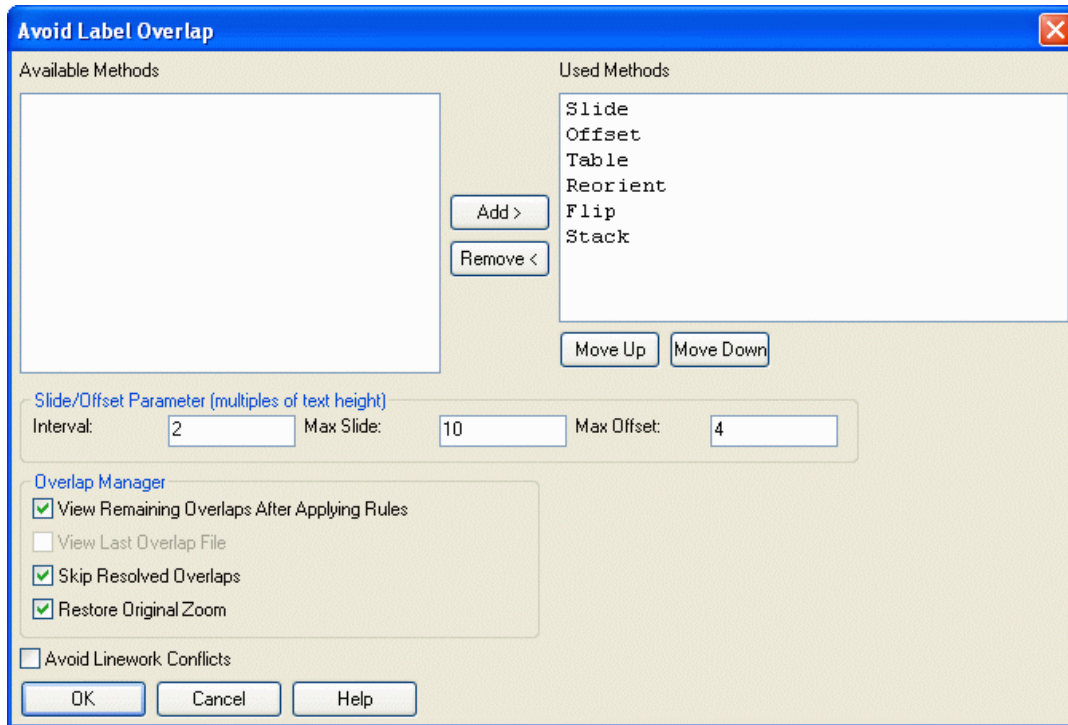
Keyboard Command: azil

Prerequisite: None

Check Label Overlaps

Function

This command will realign your labels so they do not overlap one another by using a variety of optional methods.



If **Slide** is selected then the labels will be moved parallel to your linework until they do not overlap. The labels will not move past the end of the linework or the Max Slide which you determine.

Offset will move your labels perpendicular to your linework as far as you set the Max Offset.

Table will replace your labels with a numbers and create a table of the numbers with the corresponding labels.

If **Reorient** is selected then the labels will change orientation in the plain view to avoid overlapping.

Flip will flip your label onto the other side of the linework.

Stack will stack or unstack the text of your labels to avoid overlapping.

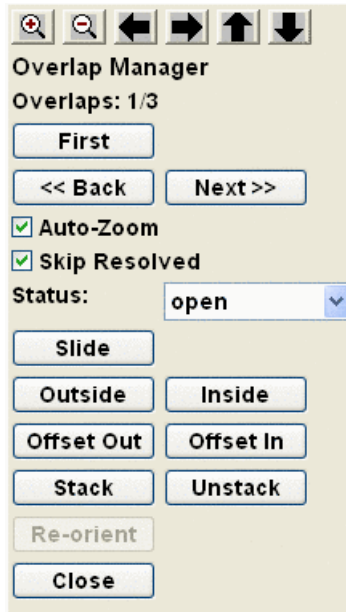
You can use any combination of these commands by using the add/remove button. You can also determine the order in which the command tries a method by using the **Move Up** and **Move Down** buttons. If a solution is not found by using the first method then the next method is used in descending order.

The **Overlap Manager** can be used to manually check and change label overlaps. If you check on "View Remaining Overlaps After Applying Rules" then any remaining overlaps will be zoomed in on and you will have the ability with the Overlap Manager to flip through and fix or ignore the unresolved labels.

When **View Last Overlap File** is checked, the Overlap Manager will return to the previous labels that were under review.

When **Skip Resolved Overlaps** is unchecked, the Overlap Manager will display all the labels that were moved by the command as a final check to you.

Restore Original Zoom will restore the zoom you were previously at before running the command.



Pulldown Menu Location: Annotate

Keyboard Command: annconf

Prerequisite: overlapping labels

Global Reannotate

Function

This command updates bearing and/or azimuth labels for when the lines and polylines associated with the labels have been rotated after the bearings and/or azimuths were labeled.

Prompts

Select One Bearing/Azimuth Text Before Rotation: *pick a bearing or azimuth label*

Pick line associated with old bearing/azimuth: *pick the line or polyline for the selected label*

Select All or specific objects to reannotate (<All/Objects)? *press Enter to update all text*

Pulldown Menu Location: Annotate

Keyboard Command: globalre

Prerequisite: Bearing or azimuth labels and lines or polylines

Survey Text Defaults

Function

This command sets the defaults for the Offset Dimensions, Building Dimensions and Adjoiner Text commands.

The image shows a 'Survey Text Defaults' dialog box with three main sections: Building Dimensions, Offset Dimension Text, and Adjoiner Text. Each section has various input fields and checkboxes for configuring text and dimension settings. The Building Dimensions section includes fields for Layer (BTXT), Text Style (ROMANS), Text Size Scaler (0.100), Decimal Places (0.0), and checkboxes for Drop Trailing Zeros and Label As Feet and Inches. It also has a Characters To Append field (empty) and an Offset From Line field (0.040). The Offset Dimension Text section includes fields for Layer (DTXT), Text Style (ROMAND), Text Size Scaler (0.080), Arrow Size Scaler (0.080), Decimal Places (0.0), and checkboxes for Use EndPoint Snap For 1st Point, Drop Trailing Zeros, and Characters To Append (ft). It also has an Offset From Line field (0.040). The Adjoiner Text section includes fields for Layer (ATXT), Text Style (ROMANS), Text Size Scaler (0.100), and a Justification dropdown (L). The dialog box also features a Dimension Line Type section with radio buttons for Single Arrow Line, Dual Arrows Line, Standard Line, Curved Leaders, and Dimension Only. At the bottom, there are OK, Cancel, and Help buttons.

Building Dimensions allows you to set text specifications for building dimensions.

Layer: Allows you to set the layer for the building text.

Text Style: Allows you to set the text style for the building text.

Text Size Scaler: This value multiplied by the horizontal scale determines the actual text size.

Decimal Places: Allows you to set the display precision for the building dimensions.

Drop Trailing Zeros: Allows you to truncate trailing zeros from dimensions.

Characters To Append: Allows you to set characters to add to reported dimensions.

Offset From Line: Allows you to set the offset distance from the line to the dimension text.

Auto Label Closed Pline allows you to choose between automatically labeling the Interior or Exterior or closed polylines. You may also choose none.

Offset Dimension Text allows you to set text specifications for offset dimensions.

Layer: This option allows you to set the layer for the offset text.

Text Style: This option allows you to set the text style for the offset text.

Text Size Scaler: This value multiplied by the horizontal scale determines the actual text size.

Arrow Size Scaler: This option allows you to set the arrow scaler to determine arrowhead size.

Decimal Places: This option allows you to set the precision for the offset dimensions.

Drop Trailing Zeros: This option allows you to truncate trailing zeros from dimensions.

Label as Feet and Inches: This option allows you to use feet and inches.

Characters To Append: This options allows you to set characters to add to reported dimensions.

Offset From Line: This option allows you to set the offset distance from the line to the dimension text.

Text Alignment allows you to align text either parallel to the line or horizontally in the drawing.

Position allows you to determine if you are to pick the location of the text, or if the text is automatically positioned in the drawing.

Adjoiner Text allows you to set text specifications for adjoiner text.

Layer: Allows you to set the layer for the adjoiner text.

Text Style: Allows you to set the text style for the adjoiner text.

Text Size Scaler: Allows you to set the text scaler to determine text size.

Justification: Allows you to set the text justification. See the AutoCAD Reference Manual for details on each justification choice.

Dimension Line Type allows you to determine the line style to use for dimensions.

Single Arrow Line: Draws a line with an arrowhead from the dimension text to the figure.

Dual Arrows Line: Draws dual arrowhead.

Standard Line: Draws a line with no arrowhead from the dimension text to the figure.

Curved Leaders: Draws a curved line with an arrowhead from the dimension text to the figure.

Dimension Only: Draws the dimension text with no line.

Pulldown Menu Location: Annotate > Survey Text

Keyboard Command: svtextdf

Prerequisite: None

Offset Dimensions

Function

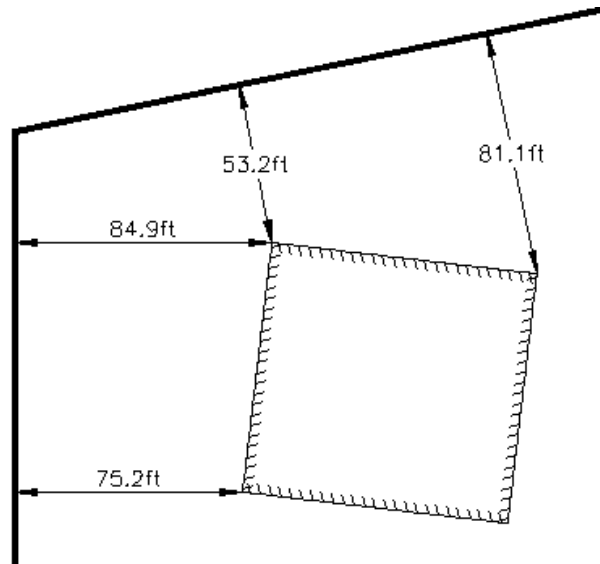
This command labels the perpendicular distance between a point and a line or polyline. The point can be a building corner or other object. The line or polyline can represent the property line. The text layer, size, and style and the dimensioning method is set in the Survey Text Defaults command. The endpoint snap is turned on by default when you pick the point although you may choose another snap mode manually.

There is also an option for arrow only on end of line.

Prompts

[end on] Pick Bldg/Object Corner: *pick a point*

Pick Line To Offset From: *pick a line or polyline*



Offset Dimensions showing perpendicular distance from points to property line

Pulldown Menu Location: Annotate > Survey Text

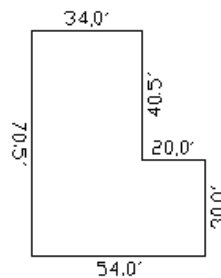
Keyboard Command: dimentxt

Prerequisite: Line or polyline

Building Dimensions

Function

This command labels the length of line and polyline segments. The label is located in the middle of the line or polyline segment. The options for Building Dimensions are set in the *Survey Text Defaults* command. One option labels all the segments of a closed polyline with one pick of the polyline. Otherwise the procedure is to pick a line or polyline segment and then choose an alignment. Depending where the alignment point is picked, the label is drawn either perpendicular or parallel, above or below the line.



Prompts

Pick Line or Polyline: *pick line or polyline segment to label*

Pick alignment: *pick point as shown*

Pulldown Menu Location: Annotate, Survey Text

Keyboard Command: bldgtext

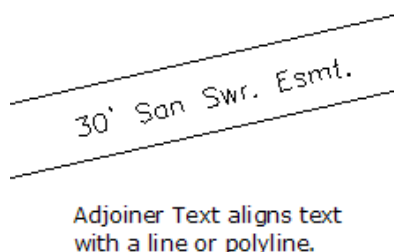
Prerequisite: Line or polyline

File Name: \lsp\bldgtext.lsp

Adjoiner Text

Function

This command draws text that is aligned with the selected line or polyline segment. The layer, style, size and justification for the text is set in the Survey Text Defaults command. To align text that is already drawn, use the Rotate Text command under Edit.



Prompts

Pick Line or Polyline: pick a line or polyline for alignment

Starting point: pick a point to start the text

Text: 30' San Swr. Esmt.

Pulldown Menu Location: Annotate > Survey Text

Keyboard Command: adjntext

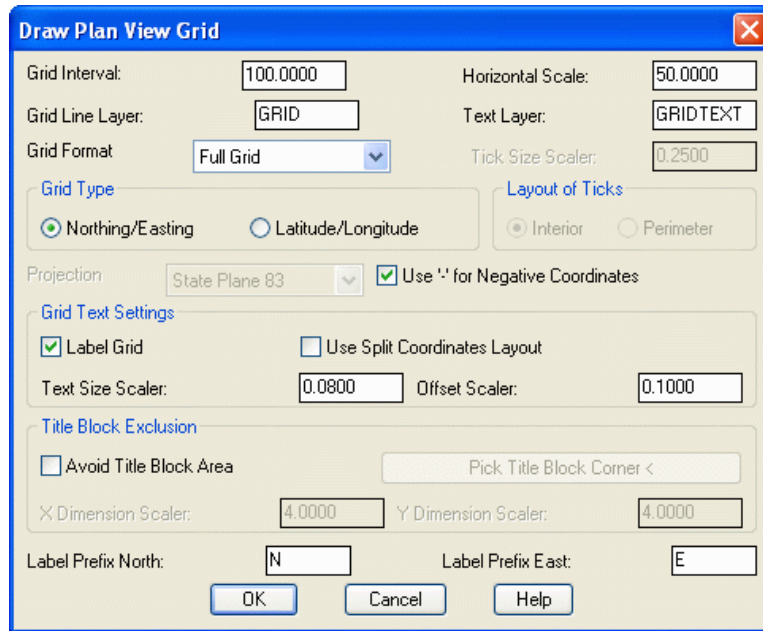
Prerequisite: Line or polyline

File Name:

Draw Grid

Function

This command will plot a plan view grid at a user specified distance and optionally label the northing and easting coordinates of the grid. This command takes in consideration the current screen twist angle in which case it prompts for three corner points. After selecting the corner points the dialog below will appear. The title block is assumed right justified to the lower right corner of the grid definition points. After changing any of the settings select the *OK* button to plot the grid.



Grid Interval: The distance between each gridline.

Horizontal Scale: Reports the scale of the current drawing. This can also be set using the DrawingSetup command in the Settings menu.

Grid Format: The Ticks Only option will draw tick marks instead of grid lines. Selecting the Ticks Only option activates the Tick Size option for sizing the tick marks. There is also a Full Grid and Perimeter option.

Layout of Ticks: This option places the ticks throughout the interior of the grid work or just on the perimeter of the grid boundary.

Use '-' for Negative Coordinates: This option labels the negative grid coordinates with a '-'.

Label Grid: Selecting this Grid Text Setting option labels the grid coordinates.

Use Split Coordinates Layout: Select

Text Size Scaler: This scaler, multiplied by the Horizontal Scale, determines text size.

Offset Scaler: This scaler, multiplied by the Horizontal Scale, determines the offset for text.

Avoid Title Block Area: This Title Block Exclusion option will allow you to not draw grid lines or tick marks in the title block area. It is for making sure that the grid does not overwrite the title block.

Pick Title Block Corner: This option prompts you to pick the corner of the title block to determine where the grid lines and ticks will be omitted.

X Dimension Scaler: This is the horizontal dimension of the title block. This option is automatically filled in when the Pick Title Block Corner option is selected.

Y Dimension Scaler: This is the vertical dimension of the title block. This option is automatically filled in when the Pick Title Block Corner option is selected.

Label Prefix North: This option is for assigning a prefix to the northing grid line and tick mark coordinates.

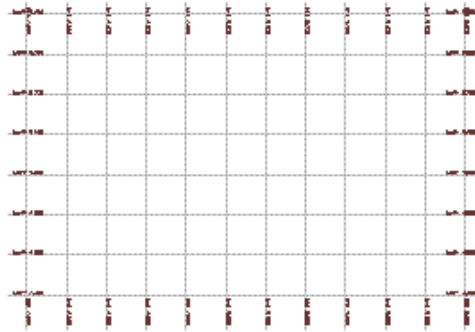
Label Prefix East: This option is for assigning a prefix to the easting grid line and tick mark coordinates.

Prompts

Pick or Type Lower Left Corner Point: *endp of (pick point)*

Pick or Type Upper Right Corner Point: *endp of (pick point)* Select the corners of your border in which you want the grid plotted.

Draw Plan View Grid Dialog See image above



Pulldown Menu Location: Annotate

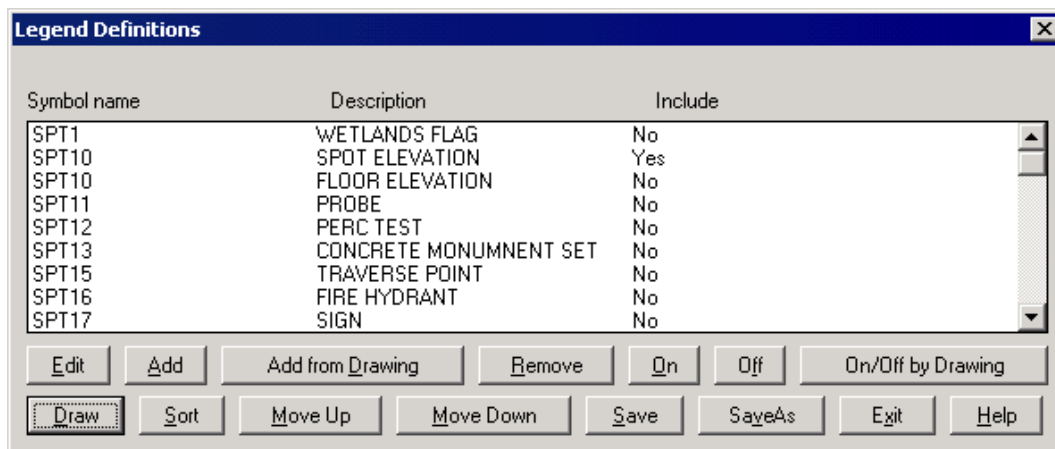
Keyboard Command: dgrid

Prerequisite: None

Draw Legend

Function

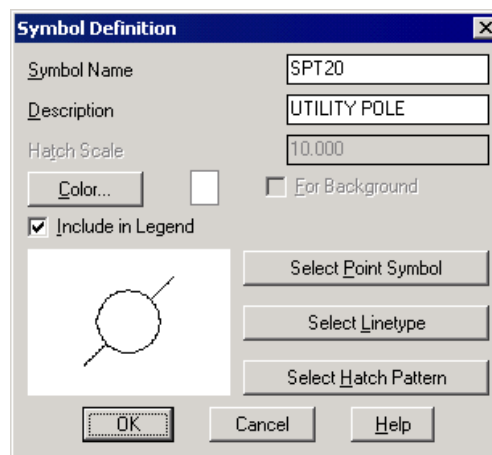
This command draws a legend based on a legend definition file. After you choose the legend definition file to use, a dialog box displays the current definitions. A definition consists of a description assigned to a symbol, linetype, or hatch pattern. If Include is set to Yes, this symbol will be included in the legend when it is plotted on the screen.



- **Edit:** This options edits a definition, select it and then click on the Edit button. This brings up the Symbol Definition dialog box described below.
- **Add:** This option inserts a new definition to the definitions. To insert a new definition, pick an existing definition and click on the Add button. The new definition is added immediately following the existing definition.
- **Add from Drawing:** This option adds entries to the legend table for each different symbol that is selected from the drawing.
- **Remove:** This option removes the selected definition.
- **On:** This option switches the Include field in the selected definition to Yes.
- **Off:** This option switches the Include field in the selected definition to No.

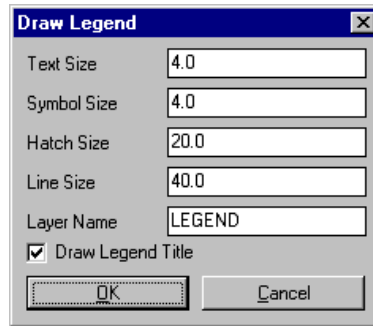
- **On/Off by Drawing:** Prompts you to select symbols from the drawing. Symbols found will be turned on, all others will be turned off. This helps you create a legend that includes only symbols found in the drawing.
- **Draw:** This option draws the included definitions as a legend.
- **Sort:** This option sorts the definitions alphabetically and numerically.
- **Move Up:** This option moves the selected definition up one row. Legend entries are drawn in the order that they are defined.
- **Move Down:** This option moves the selected definition down one row. Use the Move Up and Move Down buttons to change the order that the symbols will be drawn.
- **Save:** This option saves the legend file as its original file name. The definitions are stored in a file with the .LGD extension in the data directory. The default legend that comes with Carlson Survey is called legend.lgd. You can have multiple legend definitions by creating multiple definition files.
- **Save As:** This option saves the legend file to a new file name
- **Quit:** This option exits the command back to the drawing window.

Selecting the Edit option or the Add option brings up the Symbol Definition dialog box.



- **Symbol Name:** This designates the symbol to draw in the legend. You can either type in the symbol name or choose it from a slide library by picking the appropriate Select button.
- **Description:** This is the name of the symbol.
- **Hatch Scale and Color:** These options are used if the symbol uses a hatch pattern.
- **Include in Legend:** This option corresponds to the Include column on the Legend Definitions dialog box. Not all the defined entries need to be drawn. An entry will be drawn (shown as Yes) if the Include in Legend box in the Symbol Definition dialog box is checked.
- **Select Point Symbol:** This option displays a slide library of point symbols to choose from.
- **Select Linetype:** This option displays a slide library of linetypes to choose from.
- **Select Hatch Pattern:** This option displays a slide library of hatch patterns to choose from.

Selecting the Draw button causes the Draw Legend dialog box to appear



- **Text Size:** Specify text size. The default is the value from Drawing Setup in the Setting menu.
- **Symbol Size:** Specify symbol size. The default is the value from Drawing Setup in the Settings menu.
- **Hatch Size:** Specify the hatch pattern scaling factor.
- **Line Size:** Specify size for lines in the legend.
- **Layer Name:** Specify the layer for the legend.
- **Draw Legend Title:** If checked, draws the following text "Legend: These standard symbols will be found in the drawing."



Prompts

- 1 Specify the Legend Definition File, choose the .LGD file to process.
- 2 On the Draw Legend Dialog box, enter the sizes.
- 3 Enter or pick upper left point for legend: **pick a point**

Pulldown Menu Location: Annotate

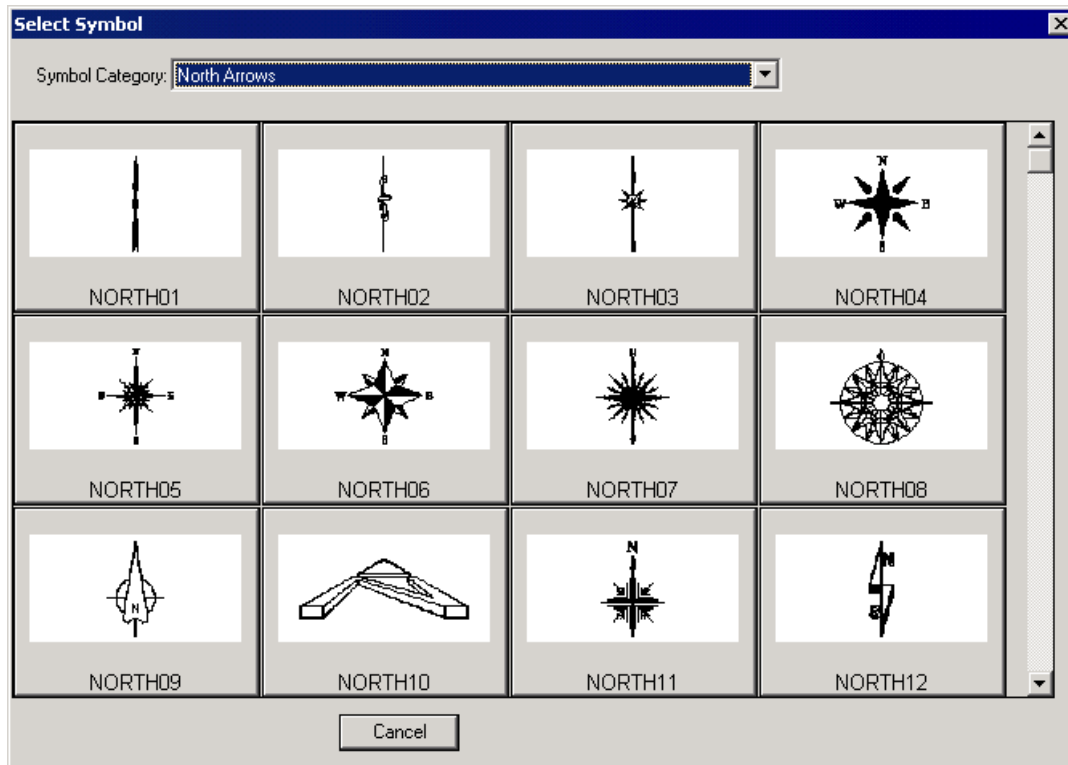
Keyboard Command: LEGEND

Prerequisite: None

Draw North Arrow

Function

This command draws a north arrow symbol. The following dialog allows you to choose from any of the predefined north arrows. You may add your own north arrows to the list. See Edit Symbol Library in the Tools menu.



Prompts

North Arrow Dialog *choose a north arrow*

Insertion point: *pick a point*

X scale factor <1> / **Corner** / **XYZ**: *press Enter*

Y scale factor (default=X): *press Enter*

Rotation angle <0d0'0">: *press Enter*

Specify insertion point or [Scale/X/Y/Z/Rotate/PScale/PX/PY/PZ/PRotate]: *pick a point*

You can choose to specify the scale and rotation angle prior to insertion by selecting one of the listed options. You may also preview your scale or rotation by choosing a P option.

Specify insertion point or [Scale/X/Y/Z/Rotate/PScale/PX/PY/PZ/PRotate]:

Enter X scale factor, specify opposite corner, or [Corner/XYZ] <1>: 50

Enter Y scale factor <use X scale factor>:

Specify rotation angle <E>:

Pulldown Menu Location: Annotate

Keyboard Command: narrow

Prerequisite: None

Draw Barscale

Function

This command draws a barscale. You will be prompted for the horizontal scale. The default scale value is set in the

Drawing Setup command in the Settings menu. It may also be changed to a user-specified scale.



Prompts

Horizontal scale <50.0>: *press Enter to accept default*

Specify a horizontal scale, if not 50.

Layer name <BARSCALE>: *press Enter to accept default*

Specify a layer name if not default.

Decimal places <0>: *press Enter to accept default*

Specify display precision.

Pulldown Menu Location: Annotate

Keyboard Command: barscale

Prerequisite: None

Create Point Table

Function

This command draws a table of the coordinate data of the points from the current coordinate (.CRD) file or from the screen. The command displays the dialog shown below for setting the point table options. At the top of the dialog, enter the range of point numbers to label. You can also specify the order and format of the table columns. To not include a data type, set the Sequence number to blank. Under Field Control, you specify the order and format of the table columns containing Point Number, Northing, Easting, Elevation, and Description. Under the General Specs, the size of the table is defined.

Point Table Generator [C:\Program Files\Carlson Software 2006\DATA\mantopo.crd] X

Point Range: 1-356 Screen Pick Point Group

Field Control

	Seq#	Heading	Width	Align	Prec
Point Num:	1	POINT	8	R	
Northing:	2	NORTHING	12	R	3
Easting:	3	EASTING	12	R	3
Elevation:	4	ELEVATION	8	R	2
Description:	5	DESCRIPTION	30	L	

General Settings

Table Layer: PNT_TABLE Grid Layer: PNT_TBL_G

Text Height: 5.00 Space Between Columns: 2

Interline Scale: 1.71 Column Scale Factor: 1.0

OK Cancel Help

Seq#: Place a number 1 to 5 in the order you want the data type to appear. To exclude a data type, set the Sequence number to blank.

Heading: This is the actual text to appear in the column heading.

Width: This is column width in characters.

Align: This is the alignment of the column. It can be set to right, left, or center.

Prec: This is the decimal precision to be shown in the table.

Table Layer: This option lets you choose the layer for the table.

Text Height: This is height of the text in the table.

Interline Scale: This option spaces the row height.

Grid Layer: This option lets you choose the layer for the grid.

Space Between Columns: This option places space between the columns.

Column Scale Factor: This scales the columns by this factor.

Prompts

Point Table Generator dialog

Building Data List ... Done.

Table Upper Left Corner: *pick a point*

Generating Table... Done.

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
903	4940.730	2490.400	0.00	
904	4850.890	2388.010	0.00	
905	4699.390	2423.320	0.00	
906	4653.590	2582.190	0.00	
910	4941.880	2492.500	0.00	

Typical Point Table

Pulldown Menu Location: Annotate > Point Table >

Keyboard Command: pointtbl
Prerequisite: A coordinate (.CRD) file

Update Point Table

Function

This command prompts you to select an existing point table. The program then reads the settings from the table and displays these settings in the same dialog box used in Create Point Table. You can change any of the table format options. The program also updates coordinates that changed in the coordinate file after the point table was created.

Prompts

Select existing point table: pick anywhere on the point table
Point Table dialog box is displayed.

Pulldown Menu Location: Annotate > Point Table

Keyboard Command: POINTTBLUPD

Prerequisite: A point table and coordinate file

Table Defaults

Function

This command sets the format for line and curve tables. Text Layer and Text Style determine the layer and style of the line/curve table text. The distance for line tables can be labeled in horizontal or slope distance. The Automatic Table Update option will automatically insert the entry into the line or curve table. The auto update will renumber the other table entries and the associated labels in the drawing. For example, if a line table had lines #1-5 and a line #4 was added, then the new line #4 would be inserted into the table and the previous lines #4 and #5 would be updated to #5 and #6. The L4 and L5 labels on the lines would also be updated to L5 and L6. Without the automatic update option, the entry location must be picked and the labels updated manually. The Label Alignment determines the orientation of the L# or C# that is labeled on the line or curve. Horizontal will make the label horizontal to the current twist screen and Parallel will draw the label parallel with the line or curve chord. The Line and Curve Label Prefix sets the text before the number that is drawn in the table and on the line or curve (i.e. "L3" or "Line3"). The Curve Options specifies which curve data to include in the table and the order. You specify the label and table attributes in the Line/Curve Table Defaults dialog.

The dialog box is titled "Line/Curve Table Defaults" and contains various settings for line and curve tables. It is organized into several sections:

- Text Settings:**
 - Label Text Layer: LAB_TEXT
 - Label Text Style: ROMANS
 - Label Text Size: 0.08
 - Line Label Prefix: L
 - Table Text Layer: TBL_TEXT
 - Table Text Style: ROMANS
 - Table Text Size: 0.08
 - Curve Label Prefix: C
- Action Buttons:**
 - Set Line Table Labels (highlighted with a dashed border)
 - Set Curve Table Labels
- Prompt for Label Location:**
 - ☐ Prompt for Label Location
- Line Table Distance:**
 - ☒ Horizontal
 - ☐ Slope
- Label Angles in:**
 - ☐ Azimuths
 - ☒ Bearings
 - ☐ Gons
- Automatic Table Update:**
 - ☐ On
 - ☒ Off
- Label Alignment:**
 - ☐ Horizontal
 - ☒ Parallel
- Curve Options:**
 - Label Symbol: None (dropdown menu)
 - Sequence# (list of checkboxes):
 - Radius: ☐ 1
 - Arc Length: ☐ 2
 - Chord Length: ☐ 3
 - Chord Angle: ☐ 4
 - Delta Angle: ☐ 5
 - Tangent: ☐
 - Degree of Curve: ☐

At the bottom are three buttons: OK, Cancel, and Help.

Label Text Layer: This field determines the layer of the line/curve text.

Label Text Style: This field determines the style of the line/curve text.

Label Text Size: This field determines the size of the line/curve text.

Line Label Prefix: This field determines the prefix for each line.

Table Text Layer: This field determines the layer of the line/curve table text.

Table Text Style: This field determines the style of the line/curve table text.

Table Text Size: This field determines the size of the line/curve table text.

Curve Label Prefix: This field determines the prefix for each curve.

Prompt for Label Location: This option prompts you to pick the location to label each line or curve. If this is not selected, the location is chosen automatically.

Under Line Table Distance, the method for measuring distance is specified.

Horizontal: The distance measured is only horizontal, even if the line is a 3D polyline.

Slope: The distance measured is the slope distance, used mostly for 3D polylines to get their true length.

Under Label Angles in, the type of angle is selected.

Azimuth: The angles are reported as azimuth.

Bearings: The angles are reported as bearings.

Gons: The angles are reported as gons.

Under Automatic Table Update, the option automatically inserts the entry into the line or curve table. The auto update rennumbers the other table entries and the associated labels in the drawing. For example, if a line table contained lines #1-5 and a line #4 was added, then the new line #4 would be inserted into the table, and the previous lines #4 and #5 would be updated to #5 and #6. The L4 and L5 labels on the lines would also be updated to L5 and L6. If you set the Automatic Table Update to Off, you must manually pick the entry location and update the labels. If Automatic Table Update is set to On, the table is updated automatically whenever the line is modified.

Label Alignment determines the orientation of the L# or C# that is labeled on the line or curve. Horizontal will make the label horizontal to the current screen alignment, Parallel will draw the label parallel to the line or curve chord. Under Curve Options, you specify which curve data to include in the table and the order.

Selecting "Set Line Table Labels" will lead you to the Line Table controls, as "Set Curve Table Labels" leads to the

Curve Table controls. The options in "Set Line Table Labels" are shown below:

Field	Label	Width	Justification
Line Number	LINE	6.250	LEFT
Bearing	BEARING	14.000	LEFT
Azimuth	AZIMUTH	14.000	LEFT
GON	GONS	14.000	LEFT
Horiz Distance	DISTANCE	11.500	RIGHT
Slope Distance	SLOPE DIST	11.500	RIGHT

Buttons: OK, Cancel, Help

With the above settings, for example, the Line Table appears as shown below. For improved "aesthetics", you might prefer to change the Bearing justification to "Center", for example.

LINE	BEARING	DISTANCE
L1	S 58°18'48" W	87.33'
L2	S 75°06'27" E	148.57'
L3	N 88°27'07" E	63.44'
L4	N 58°40'01" W	63.44'

To save space, you can reduce the size of the "Distance" column from 11.5 to 10. Note that using the Line Label Prefix option, L1 and L2, for example, can read Line1 and Line2, and for that, you may want to expand the "Width" setting for the Line column. The prefix flexibility, and the fact that the text used for the column header can be changed, means that line tables and curve tables can be plotted in any language. In Puerto Rico, for example, surveys are typically conducted in bearings, in meters and in Spanish. For that location, the table could be reconfigured as shown here:

Field	Label	Width	Justification
Line Number	LINEA	6.250	LEFT
Bearing	RUMBO	14.000	CENTER
Azimuth	AZIMUTH	14.000	LEFT
GON	GONS	14.000	LEFT
Horiz Distance	DISTANCIA	11.500	RIGHT
Slope Distance	SLOPE DIST	11.500	RIGHT

Buttons: OK, Cancel, Help

This would lead to the following line table:

LINEA	RUMBO	DISTANCIA
L1	S 58°18'48" W	87.33m
L2	N 88°27'07" E	63.44m
L3	N 58°40'01" W	63.44m

Note that changing the distance suffix to "m" (or omitting any suffix by making it blank) is accomplished in the more general command Annotation Defaults.

Pulldown Menu Location: Annotate > Line/Curve Table

Keyboard Command: TDEF

Prerequisite: None

Table Header

Function

This command draws the column header labels for the Curve Table and Line Table commands. When you are prompted for the starting point, you can enter a coordinate or pick a point on the screen. The starting point location is one row below the start of the header labels.

Pulldown Menu Location: Annotate > Line/Curve Table

Keyboard Command: TABHEAD

Prerequisite: None

Set Table Position

Function

This command sets the position for adding line table entries. The next line table rows will start from this point. To add to an existing table, pick a point at the lower left of the existing table.

Pulldown Menu Location: Annotate > Line/Curve Table

Keyboard Command: set_tbl

Prerequisite: None

Curve Table

Function

This command will compute curve data and draw it in tabular form using the settings specified in Table Defaults. The program computes the curve data from an arc entity, an arc segment of a polyline or from specified points on an arc. The curve data includes radius, length of curve, chord length, chord bearing, tangent and delta or included angle. The user is prompted for curve number (default is sequential starting with 1) and the starting point of the table. The curve is labeled with a C#, where # is the sequential curve number. After picking the starting point of the table, the placement point for the other table entries will default to the next position and you can just press Enter unless you want to relocate the table.

The current curve table numbers are remembered between drawings. The Auto Annotate command can also create curve tables. Use the Table Header command to draw the column header of the curve data names.

Prompts

Define arc by, Points/<Select arc or polyline>: *pick an arc*

Enter curve number <1>: *press Enter*

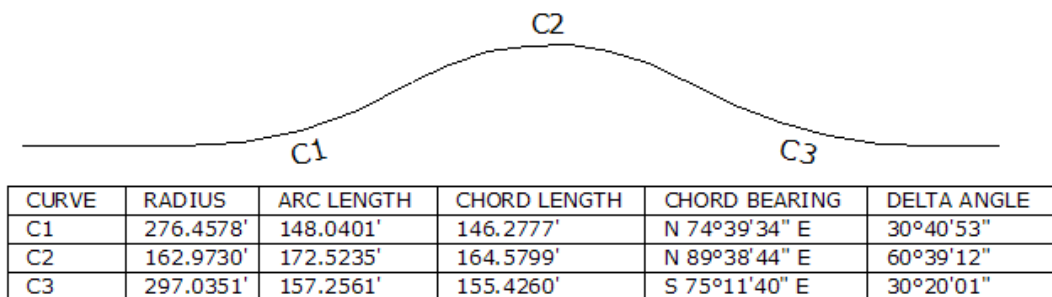
Starting point of curve table text <(5000,5000)>: *pick a point in a clear area of the drawing*

Define arc by, Points/<Select arc or polyline>: *pick another arc*

Enter curve number <2>: *press Enter*

Starting point of curve table text <(4030,4490)>: *press Enter to use next position*

Define arc by, Points/<Select arc or polyline>: *press Enter to end*



Pulldown Menu Location: Annotate > Line/Curve Table >

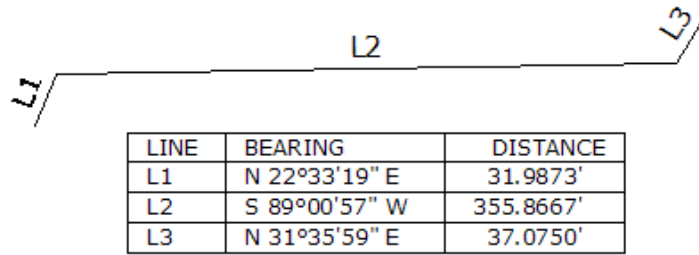
Keyboard Command: CURVETBL

Prerequisite: None

Line Table

Function

This command will compute line data and draw it in tabular form. The program computes the bearing and distance from a line, polyline segment, or between points. The line is labeled with a L#, where # is the sequential number of the line picked. The bearing and distance is then drawn in tabular form similar to the Curve Table command. You can also use the Auto Annotate command to create line tables. Use the Table Header command to draw the column header containing the line data names.



Menu Location: Annotate > Line/Curve Table

Keyboard Command: LINETAB

Prerequisite: None

Delete Table Elements

Function

This command erases rows from line or curve tables. The table entries following the removed rows are automatically repositioned and renumbered. The line or curve labels on the linework in the drawing are also updated.

Pulldown Menu Location: Annotate > Line/Curve Table

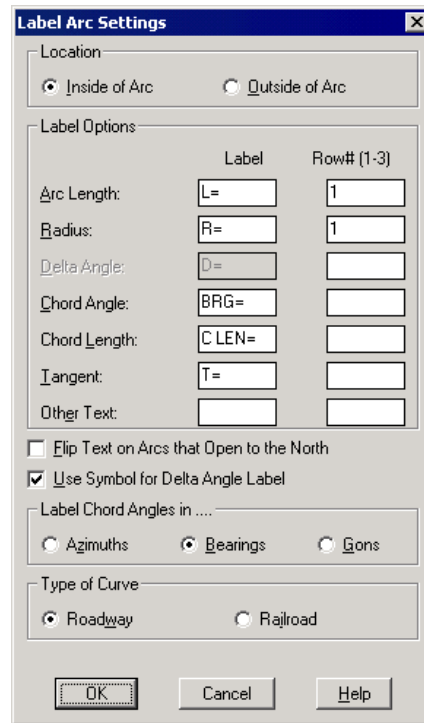
Keyboard Command: del_tbl

Prerequisite: Line or curve tables

Label Arc

Function

This command labels the arc data along the arc and between the endpoints of the arc. The curve information is also displayed. Carlson Survey plots the annotation as a block. The advantage of this is that the characters, rather than being individual entities, are plotted as a single entity that can be moved and edited as a unit. The format for the label is set in the following dialog box.



The dialog box is titled "Label Arc Settings" and contains the following sections:

- Location:** Radio buttons for "Inside of Arc" (selected) and "Outside of Arc".
- Label Options:** A table with two columns: "Label" and "Row# (1-3)".

	Label	Row# (1-3)
Arc Length:	L=	1
Radius:	R=	1
Delta Angle:	D=	
Chord Angle:	BRG=	
Chord Length:	C LEN=	
Tangent:	T=	
Other Text:		
- Flip Text on Arcs that Open to the North:** A checkbox that is currently unchecked.
- Use Symbol for Delta Angle Label:** A checkbox that is currently checked.
- Label Chord Angles in:** Radio buttons for "Azimuths", "Bearings" (selected), and "Gons".
- Type of Curve:** Radio buttons for "Roadway" (selected) and "Railroad".

At the bottom are three buttons: "OK", "Cancel", and "Help".

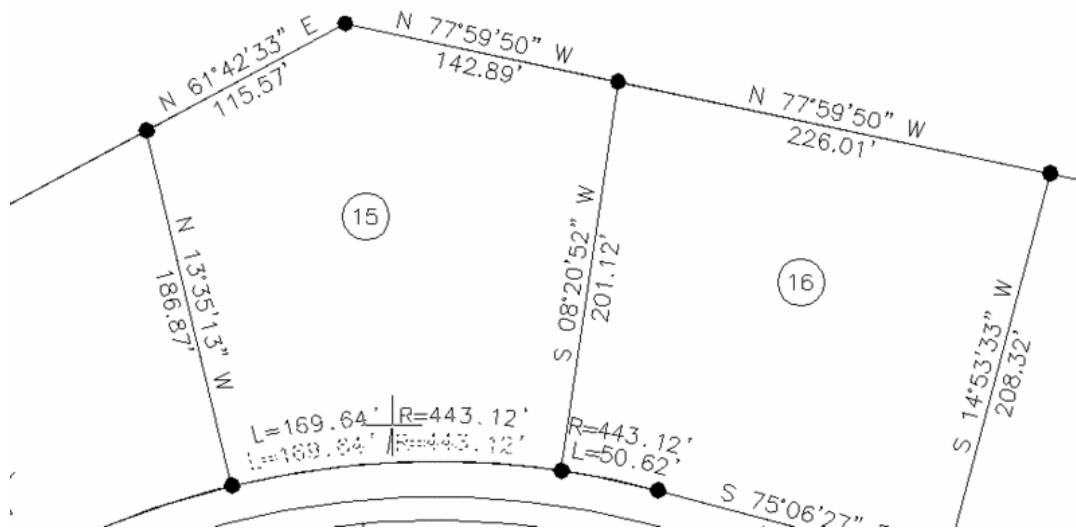
Under Location, the placement of the text is determined.

- **Inside of Arc:** The arc is labeled on the inside.
- **Outside of Arc:** The arc is labeled on the outside

Under Label Options, the text and row locations are set. If a row number is left blank, then that value is not labeled.

- **Arc Length:** Select a label prefix and a row number.
- **Radius:** Select a label prefix and a row number.
- **Delta Angle:** Select a label prefix and a row number.
- **Chord Angle:** Select a label prefix and a row number.
- **Chord Length:** Select a label prefix and a row number.
- **Tangent:** Select a label prefix and a row number.
- **Other Text:** Enter any other item you want labeled.

The Flip Text on Arcs that Open to the North determines whether to flip the text on arcs that open to the top of the drawing. An example is seen below.



4 The Use symbol for Delta Angle option uses a delta triangle symbol for the prefix.

5 Label Chord Angles In allows you to set how the angle is labeled.

- **Azimuth:** The angles are reported as azimuths.
- **Bearings:** The angles are reported as bearings.
- **Gons:** The angles are reported as gons.

6 The Type of Curve option determines the type of curve.

- **Roadway:** The length is determined as the true length of the curve.
- **Railroad:** The length is adjusted based on 100-foot chord segments.

Prompts

1 Define arc by, Points/<select arc or polyline>: **select arc**

After you select the arc or polyline arc segment, the command displays the dialog box. Select the OK button and the arc is labeled with the current settings of the dialog box.

Menu Location: Annotate > Annotate Arc

Keyboard Command: LABARC

Prerequisite: An arc or polyline should be drawn before execution.

Stack Label Arc

Function

This command draws a small table of curve data. Unlike the command *Label Arc*, instead of fitting the text on the arc this command lines the data up in rows. After selecting the command the dialog below appears. For each type of arc value, you can specify the label and the sequence number. Under Label Options, the Stack Label Arc data table

will display the values in the order by sequence number. If the sequence number is left blank, then that data value is not labeled. The text and sequence is set. If a row number is left blank, then that value is not labeled.

Label Options		
	Label	Sequence#
Arc Length:	L=	1
Radius:	R=	2
Delta Angle:	D=	3
Chord Angle:	BRG=	5
Chord Length:	C LEN=	4
Tangent:	T=	
Degree of Curve:	DC=	
External:	E=	

☒ Use Symbol for Delta Angle Label
☐ Draw Leader Horizontal Tick
☐ Align Text With Chord

Label Chord Angle in

☐ Azimuths ☒ Bearings ☐ Gons

Type of Curve

☒ Roadway ☐ Railroad

OK Cancel Help

Under Label Options, the data table will display the values in order based upon sequence number.

Arc Length: Select a label prefix and a sequence number.

Radius: Select a label prefix and a sequence number.

Delta Angle: Select a label prefix and a sequence number.

Chord Angle: Select a label prefix and a sequence number.

Chord Length: Select a label prefix and a sequence number.

Tangent: Select a label prefix and a sequence number.

Degree of Curve: Select a label prefix and a sequence number.

External: Select a label prefix and a sequence number.

The **Use symbol for Delta Angle** option uses a delta triangle symbol for the prefix.

Label Chord Angles in allows you to set how the angle is labeled.

Azimuth: The angles are reported as azimuths.

Bearings: The angles are reported as bearings.

Gons: The angles are reported as gons.

The Type of Curve option determines the type of curve.

Roadway: The length is determined as the true length of the curve.

Railroad: The length is adjusted based on 100-foot chord segments.

Prompts

Define arc by, Points/<select arc or polyline>: *P* The *P* option causes the command to prompt for points on the arc. This can be useful for labeling sub-arcs such as lot corners of a cul-de-sac.

Pick Points in a Clockwise direction.

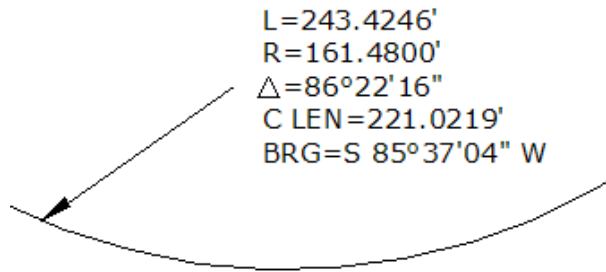
Pick Endpoint of arc: *pick a point*

[nea on] Pick point between endpoints on arc: *pick a point*

Pick Other Endpoint arc: *pick a point*

Starting point of label: *pick a point* The labels are then drawn left justified from the point picked.

Define arc by, Points/<select arc or polyline>: *press Enter* Pressing Enter causes the program to end.



Pulldown Menu Location: Annotate > Annotate Arc

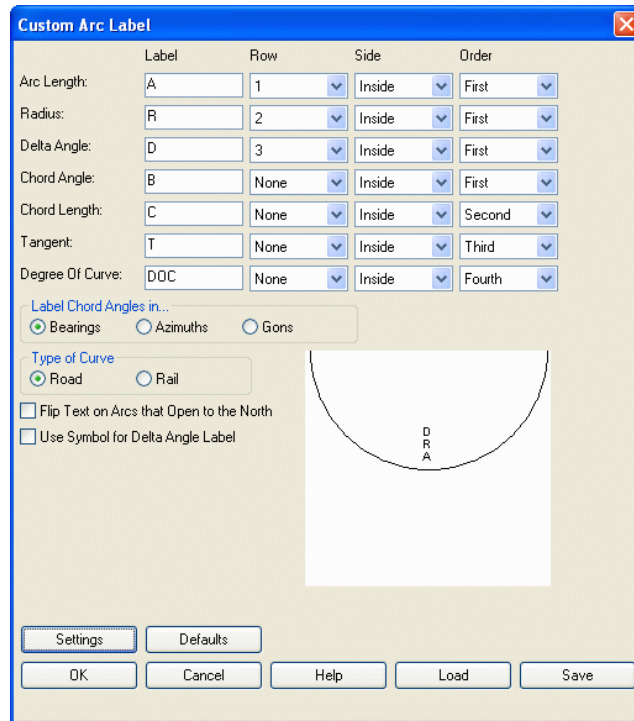
Keyboard Command: slabarc

Prerequisite: an arc entity or arc points

Custom Arc Label Formatter

Function

This command allows you to customize the labeling for arcs. You are first prompted to select an arc to label, given the existing defaults currently set. The command line, shown below, also offers you an important choice called Options. When you type 'O' for options the below dialog box appears. There are four columns at the top of the dialog along by other features.



Label: This first column allows you to set the prefix that will go before your arc data.

Row: This column allows you to stack the data in different ways. You can place more than one item in the same row. If *None* is selected then that item will not be displayed.

Side: This column allows you to place each item either inside or outside of the arc.

Order: This column determines the order of items when they are placed in the same row.

Flip Text on Arcs that Open to the North: When this is checked text will be orientated according to the open side of your arcs instead of being orientated according to the plain view.

Use Symbol for Delta Angle Label: Allows you to use the triangle symbol for delta as the label instead of plain alphabetic or numeric representation.

Settings: This button brings you to the Annotate Defaults dialog, see 'Annotate Defaults' for more.

Defaults: This button restores the default settings shown above.

Load/Save: You may also Load and Save different label configurations with the corresponding buttons.

Prompts

Options/⟨Select arc⟩: *select entity*

Options/⟨Select arc⟩: *O*

Custom Arc Label dialog *choose your preferences and click OK*

You can decide to go into the Option dialog at the start of the command and after your initial labeling.

Pulldown Menu Location: Annotate > Annotate Arc

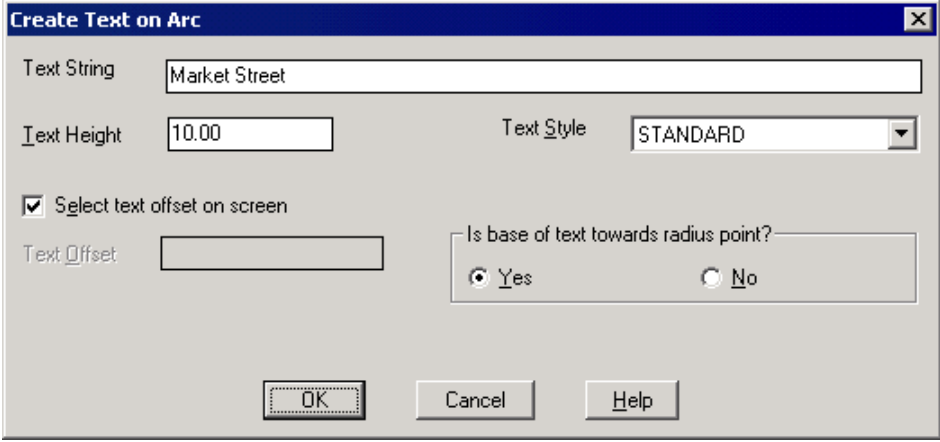
Keyboard Command: annarc

Prerequisite: An arc to label

Draw Text On Arc

Function

This command draws text that aligns with an arc, beginning at a picked point. Each letter of the text is drawn as a separate text entity that is rotated to align with the arc. These text letters are automatically grouped together as a block. The text string, text height, and text style are set in the Create Text on Arc dialog box.

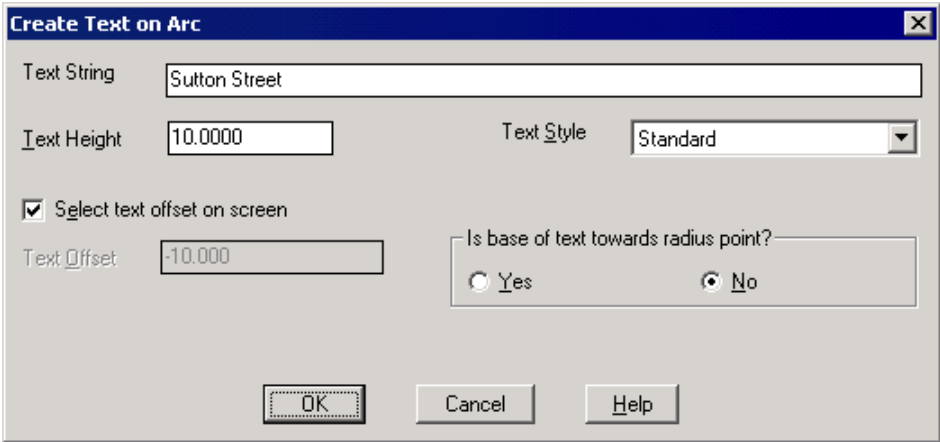


The 'Create Text on Arc' dialog box is shown. It has a title bar with a close button. The 'Text String' field contains 'Market Street'. The 'Text Height' field contains '10.00'. The 'Text Style' dropdown menu is set to 'STANDARD'. The 'Select text offset on screen' checkbox is checked. The 'Text Offset' field is empty. The 'Is base of text towards radius point?' section has two radio buttons: 'Yes' (selected) and 'No'. At the bottom are 'OK', 'Cancel', and 'Help' buttons.

- **Text String:** Specify the text to label on the arc.
- **Text Height:** Specify the text height.
- **Text Style:** Choose an existing text style.
- **Select text offset on screen:** When checked, the program will prompt you for offset. You can set the text offset from the arc by graphically picking the offset point on the screen
- **Text Offset:** If the above setting is not selected, specify the Text Offset here. Placing a minus sign "-", in front of the text offset in the dialog box places the text above the arc. A positive text offset places the text below the arc.
- **Is base of text towards radius point?:** This option orients the text to the curve. Examples of different settings follow.

Prompts

Example 1 - Offset distance specified on screen and base of text away from radius point.



The 'Create Text on Arc' dialog box is shown. It has a title bar with a close button. The 'Text String' field contains 'Sutton Street'. The 'Text Height' field contains '10.0000'. The 'Text Style' dropdown menu is set to 'Standard'. The 'Select text offset on screen' checkbox is checked. The 'Text Offset' field contains '-10.000'. The 'Is base of text towards radius point?' section has two radio buttons: 'Yes' and 'No' (selected). At the bottom are 'OK', 'Cancel', and 'Help' buttons.

1 Select Arc or Polyline segment: **pick Arc or Polyline segment** to place text on.

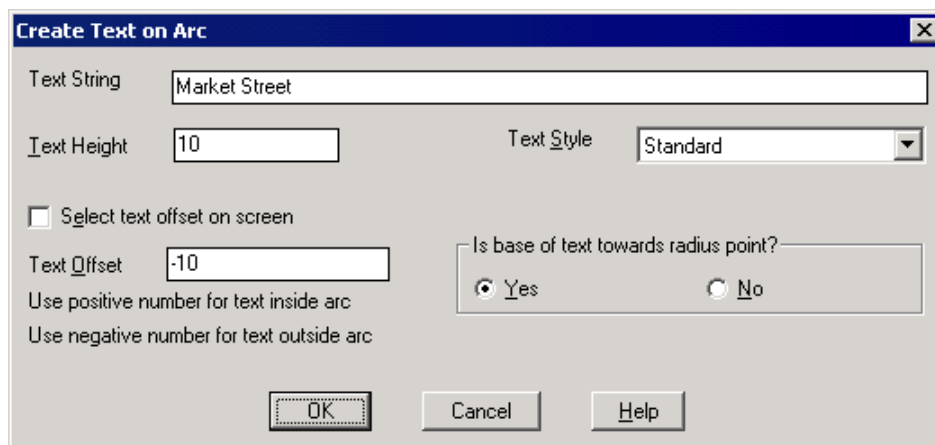
2 Select Text Offset: **pick the desired offset distance from arc**

Note that the ghosted text is located along the mid point of the arc. If no offset distance is specified or picked from the screen, the text will be placed at this point. An offset of zero puts the text directly on the arc.

3 Select Text Placement: **pick a point**, select the desired position to draw the text. Note that the text remains visible on the screen and attached to the "rubber banding cursor" so that various positions can be inspected before specifying the placement point. The graphic below shows this aspect of the command.



Example 2 - Offset distance specified in dialog and base of text towards radius point



1 Select Arc or Polyline Arc Segment: **pick Arc**

2 Select Text Placement: **pick point**

Note that the prompt for offset distance was skipped because the offset distance was input on the dialog box. Simply select the text placement point resulting in the graphic below.



Pulldown Menu Location: Annotate > Annotate Arc

Keyboard Command: TEXTARC

Prerequisite: An arc entity

Draw Text on Tangent

Function

This command is identical to *Draw Text on Arc* except that the text is not curved to fit the arc.

Pulldown Menu Location: Annotate, Annotate Arc

Keyboard Command: textarctan

Prerequisite: Arc or polyline arc segment

Edit Text on Arc or Tangent

Function

This command edits text created by the *Draw Text on Arc* command. You can change the text string, text height, and text style. The command prompts you to select a previously drawn 'text on arc' entity, and then displays the same dialog as *Draw Text on Arc*. Adjust any settings and press OK. The text is redrawn.

Pulldown Menu Location: Annotate > Annotate Arc

Keyboard Command: editarctext

Prerequisite: text entity as described above

Fit Text Inside Arc

Function

This command fits text between two points picked along an arc. Text is curved to fit the arc using individual text entities which can only be edited one at a time. The *Draw Text on Arc* command creates a text entity that can be edited using *Edit Text on Arc/Tangent*. It will optionally display information about the selected arc. If you choose to display the curve data, you will be prompted to pick the endpoints of the arc in a clockwise manner. When prompted, enter the text you want drawn inside the arc.

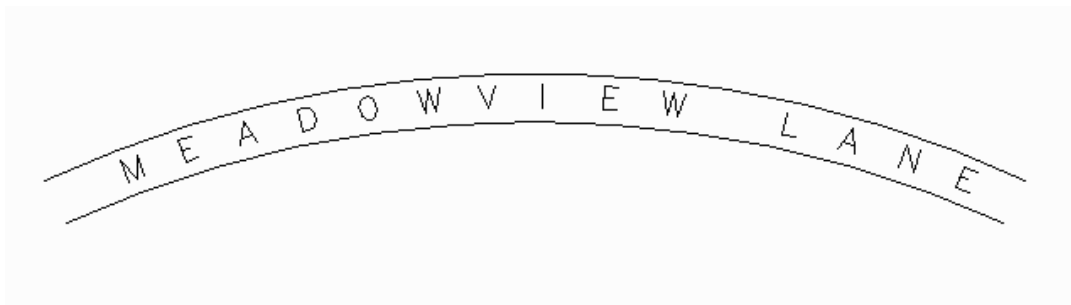
Prompts

Pick points in a clockwise direction.

[nea on] Start Point on arc for text: *pick point on arc to start text* Notice that the AutoCAD Near snap is turned on by default.

[nea on] End Point on arc for text: *pick point on arc to end text* Notice that the AutoCAD Near snap is turned on by default.

Enter text for inside of arc: MEADOWVIEW LANE



Pulldown Menu Location: Annotate > Annotate Arc

Keyboard Command: inarc

Prerequisite: An arc entity

Fit Text Outside Arc

Function

This command fits text between two points picked along an arc. It will optionally display information about the selected arc. If you choose to display the curve data, you will be prompted to pick the endpoints of the arc in a clockwise manner. When prompted, enter the text you want drawn outside the arc.

Prompts

Pick points in a clockwise direction.

[nea on] Start Point on arc for text: pick starting point on arc *pick point*

[nea on] End Point on arc for text: pick ending point on arc *pick point*

Enter text for outside of arc: enter text to label *Type in text*

Pulldown Menu Location: Annotate > Annotate Arc

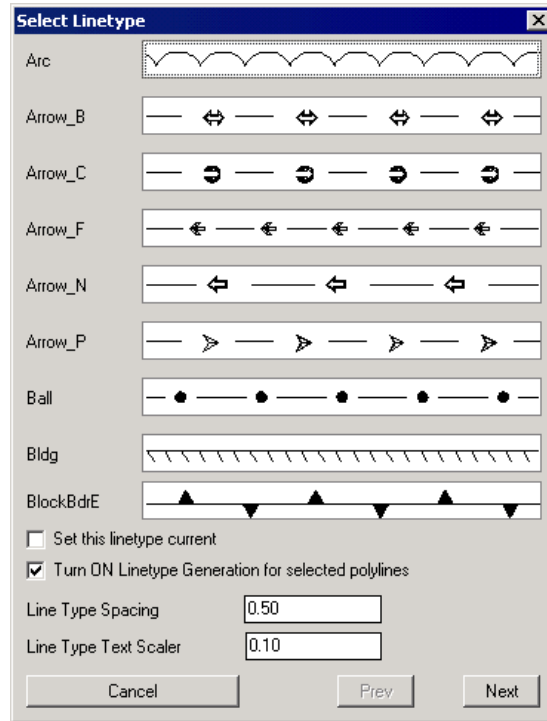
Keyboard Command: OARCT

Prerequisite: An arc entity

Change Polyline Linetype

Function

This command changes the linetype of polylines to the specified linetype. The polyline remains all one entity, which is the advantage of this command over the other linetype commands, such as Polyline to Special Line, which break the polyline between the linetype symbols. The spacing between linetype symbols and the symbol size is controlled by the Line Type Spacing and Line Type Text Scaler settings in the Annotate Defaults command. In the Select Linetype dialog, you must choose a linetype to apply. To select a linetype from the dialog box, pick on the linetype image. At the end of the list of linetypes, there are two special choices. The UserDef choice lets you enter your own text string into a linetype, and the Wingdings choice lets you insert any Wingdings font character into a linetype. Consult Windows® documentation for a listing of Wingdings characters.



Set this linetype current: When checked, the linetype you select will be set as the current linetype after this command is finished.

Turn ON Linetype Generation for selected polylines: Generates the linetype in a continuous pattern through the vertices of the polyline. When turned off, this option generates the linetype starting and ending with a dash at each vertex.

Line Type Spacing: Specifies the distance between the symbols for special line types. Can also be set in Annotation Defaults.

Line Type Text Scaler: Specifies the size of the text or symbols of special line types. Can also be set in Annotation Defaults.

Next: Displays next page of linetypes.

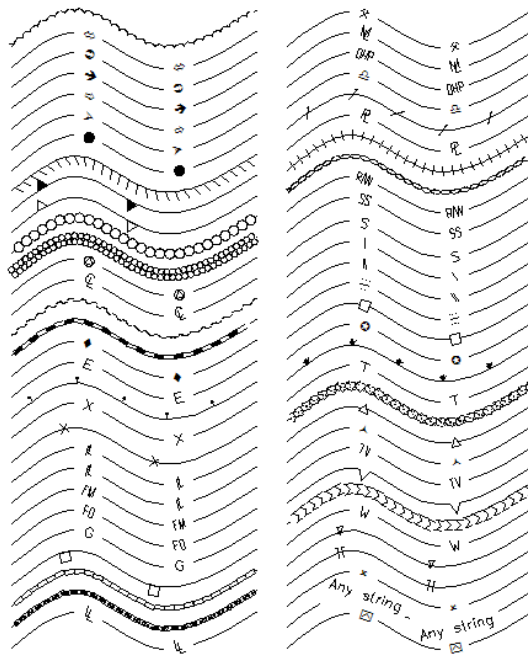
Prev: Displays previous page of linetypes.

Prompts

Select Linetype dialog

Select items to change.

Select objects: *pick the polylines*



Pulldown Menu Location: Annotate > Line Types

Keyboard Command: pltype2

Prerequisite: Polylines

Polyline to Special Line

Function

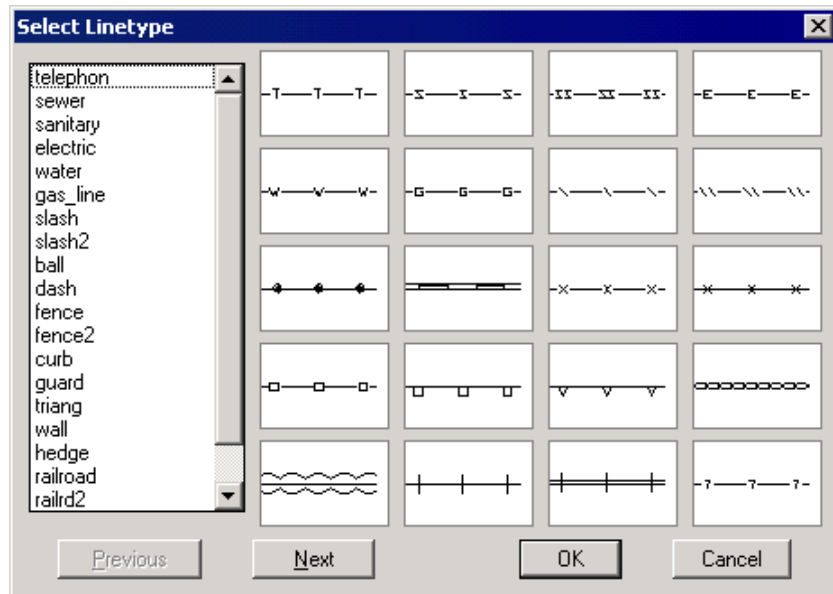
This command converts polylines into special lines by adding the appropriate symbol onto the polyline, such as railroad, hedge, stonewall or telephone lines. Carlson Survey has several predefined line types shown below. You can create your own custom linetype by selecting the icon of the linetype containing the question mark, or by selecting "other" from the list on the left. This command will then prompt you for a text string to use. The size and spacing of the text string can be set in the Annotate Defaults command. Most of these line types break the polyline in order to fit in the symbol. Broken polylines cannot be used by the Area command and are harder to edit, so you may want to delay using this command until your drawing is complete or use the *Change Polyline Linetype* command. *Change Polyline Linetype* creates actual AutoCAD linetypes that are applied to the selected entities.

Prompts

Select Linetype dialog

Select the polyline(s) to convert.

Select objects: *pick the polylines*



Pulldown Menu Location: Annotate > Line Types

Keyboard Command: pltype

Prerequisite: Polylines

Add Zig to Polyline

Function

This command draws a [not-to-scale] style zig to a polyline. First pick the polyline and then pick a position on the polyline to draw the zig.

Prompts

Zig size <4.0>: *press Enter*

Select polyline to add zig: *pick a polyline*

Pick or enter point to add zig: *pick a point along the polyline*

Select polyline to add zig: *press Enter to end*



A zig in a polyline

Pulldown Menu Location: Annotate, Line Types >

Keyboard Command: addzig

Prerequisite: Polyline

Polyline to Tree Line

Function

This command changes a polyline into a series of semicircles for representing a tree line.

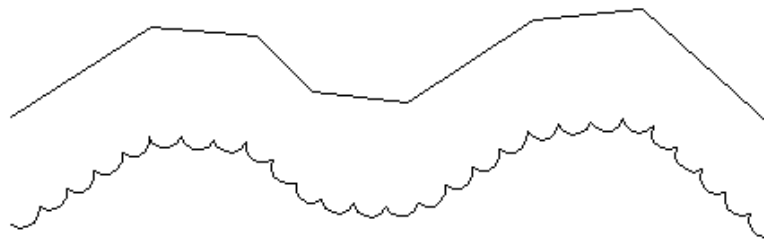
Prompts

Side for arcs on polyline direction? (<Left>/Right) *press Enter*

Enter the segment distance <10.0>: *press Enter*

Select the polylines to convert.

Select objects: *pick one or more polylines*



Before and After Polyline to Tree Line Command

Pulldown Menu Location: Annotate > Line Types

Keyboard Command: maketree

Prerequisite: Polyline

Label Coordinates

Function

This command labels the northing and easting of a selected point. You can pick the point on the screen or specify a point number from the current coordinate file.

In the Symbol option, select the type of symbol to use.

- **Select Symbol:** Allows you to choose from any symbol in your symbol library.
- **Draw with Leader:** This option adds a leader to the label instead of using a symbol.

2 Under the Options, select the items to display.

- **Layer Name:** This specifies the layer to draw the label in.
- **Box Coordinate Labels:** This option draws a box around the coordinate.
- **Prompt for Label Angle:** Allows you to specify a rotation angle for the label.
- **Prompt for Elevation:** Allows you to enter an elevation rather than use the selected elevation.
- **Use Commas in Labels:** Causes coordinate values to include commas. Example - 4,162,325.18
- **Label Both Feet and Meters:** This labels both feet and meters at the coordinate.

3 Under Fields to Label, choose coordinate values to label

- **North and East Only:** Labels only Northing and Easting
- **Elevation Only:** Labels only elevations
- **North, East and Elevation:** Labels Northing, Easting, and Elevations

4 Under Coordinate Order, choose the order for the coordinates.

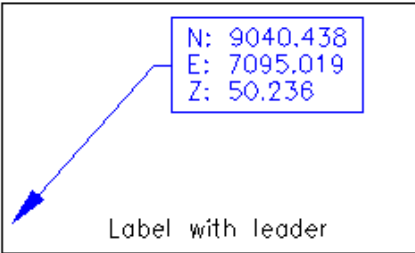
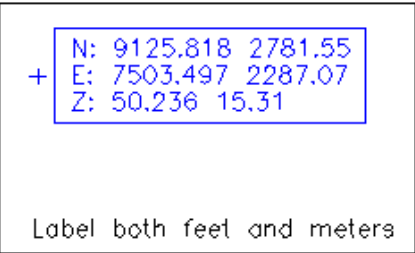
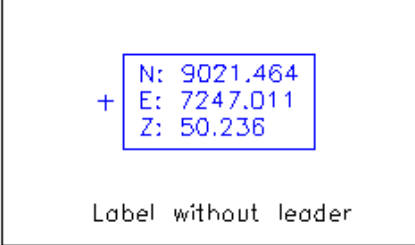
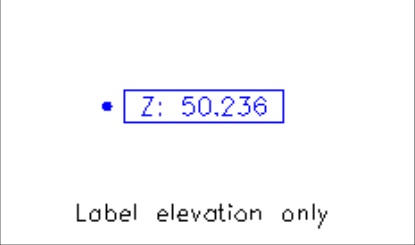
- **North and East:** Northing is on the top and Easting on the bottom
- **East and North:** Easting is on the top and Northing on the bottom

5 The North Label Prefix and Suffix are specified.

6 The East Label Prefix and Suffix are specified.

7 The Elev Label Prefix and Suffix are specified.

8 Under the Number of Decimal Places option, the precision for the North/East and Elevation are set for the number of decimal places. If the Label Both Feet and Meters option is selected, the 2nd North/East and 2nd Elevation can have different decimal precision.

 Label with leader	 Label both feet and meters
 Label without leader	 Label elevation only

Prompts

1 On the Label Coordinate Dialog box, choose settings

2 Point to Label ?

Pick point or point number: **pick a point**

3 Point to Label (ENTER to End)?

Pick point or point number: **Press Enter**

Pulldown Menu Location: Annotate

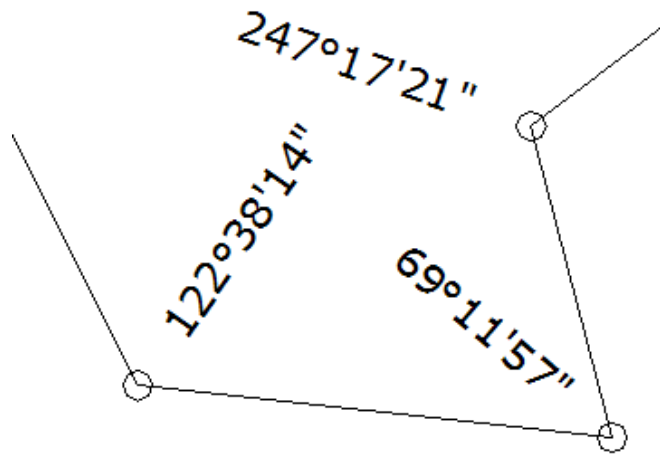
Keyboard Command: LABCOOR

Prerequisite: None

Label Angles

Function

This command labels and reports the interior and exterior angles between two directions. The angles can be defined by three points, or by two line or polyline segments that have a common endpoint. An example of labeling interior and exterior angles is shown below.



Prompts

- 1 Define angle by, Points/<select line or polyline>: **pick a polyline segment**
- 2 Select adjoining line or polyline: **pick another polyline segment**
- Interior: 72d39'46" Exterior: 287d20'14"
- 3 Angle to label (<Interior>/Exterior/None)? **Press Enter**
- 4 Define angle by, Points/<select line or polyline>: **Press Enter to end**

Menu Location: Annotate

Keyboard Command: LABANG

Prerequisite: None

Label Lat/Long

Function

This command will label the latitude and longitude of a selected point. The input point should be a state plane coordinate (either 27 or 83) which the program will convert to latitude and longitude. First the program displays a dialog box with options to set the label prefixes, to set the display precision, to draw a box around the label and to change the symbol used to mark the point. Next there is a second dialog for setting the state plane zone. Then the program prompts for the points to label.

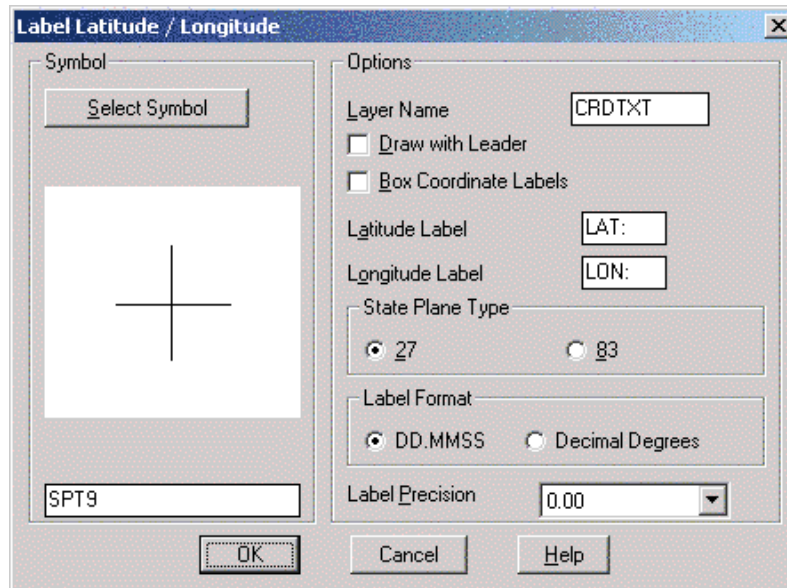
Prompts

Label Options Dialog

State Plane Zone Dialog

Enter/Pick Point to Label: *pick a point*

Enter/Pick Point to Label: *press Enter to end*



Pulldown Menu Location: Annotate

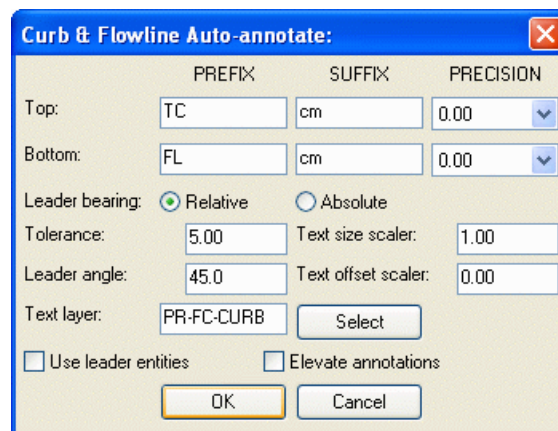
Keyboard Command: lablat

Prerequisite: None

Label Curb/Flow Elevations

Function

This command will automatically label curb and flowlines. Label the prefix and suffix as desired. Set the the precision up to seven decimal places. Leader bearing sets the leader 'relative' to the angle of the polyline or 'absolute,' meaning to the orientation of the screen. You can also set the Tolerance, Leader angle, Text size scaler, Text offset scaler, and layer as you desire.



The next dialog asks you to specify which descriptions to use when assigning the curb and flowline.

Pulldown Menu Location: Annotate

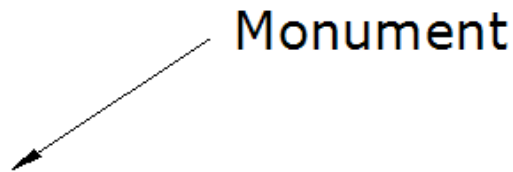
Keyboard Command: cflev

Prerequisite: curb and flowline data

Leader With Text

Function

This command draws a straight leader between two points with an arrow at one end and optional text at the other. The arrow size is determined by the Symbol Size setting in the Drawing Setup command.



Prompts

Arrow location: **pick a point**

Text location: **pick a point**

Text: CENTERLINE

Text: Press Enter

Menu Location: Annotate

Keyboard Command: LDR

Prerequisite: None

Special Leader

Function

This command draws a curved leader line like the one shown. You can draw multiple lines of text.

Prompts

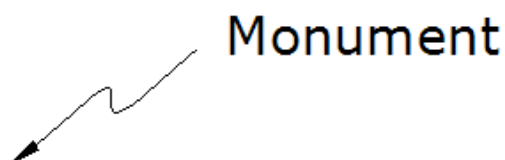
Arrow location: *pick a point* Pick point where leader arrow will start.

Text location: *pick a point*

Text: *SPECIAL*

Text: *LEADER*

Text: *press Enter*



Pulldown Menu Location: Annotate

Keyboard Command: sleader

Prerequisite: None

File Name: \lsp\al.lsp

Label Elevations Along Pline

Function

This command labels point elevations and aligns with a polyline. The point elevations are read from Carlson points drawn on the screen. The options for the labels are set in the first dialog. The Text Size Scale and Offset Distance Scaler are relative to the current horizontal scale which is set in *Drawing Setup*. These scalers are multiplied by the horizontal scale to obtain the actual AutoCAD units. The Side for Labels is relative to the direction the polyline is drawn.

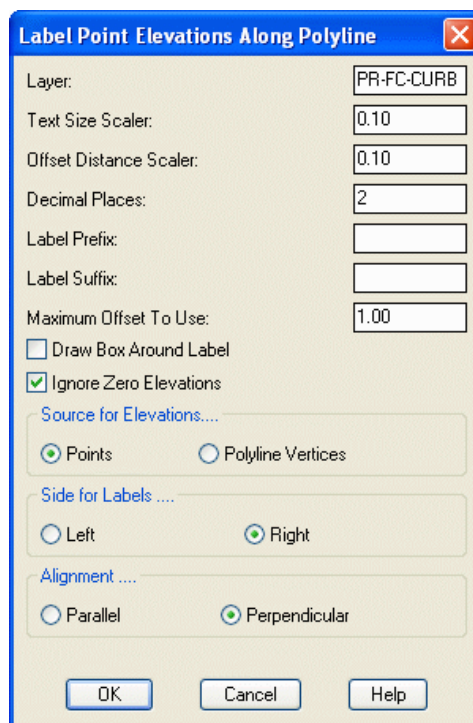
Prompts

Label Point Elevations dialog

Select alignment polyline: *pick a polyline*

Select points to label.

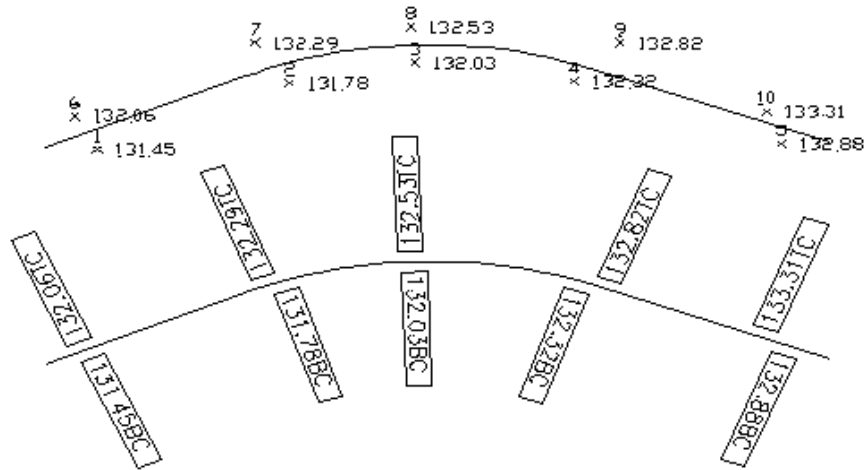
Select objects: *pick the points*



The dialog box is titled "Label Point Elevations Along Polyline" and contains the following fields and options:

- Layer: PR-FC-CURB
- Text Size Scaler: 0.10
- Offset Distance Scaler: 0.10
- Decimal Places: 2
- Label Prefix: (empty)
- Label Suffix: (empty)
- Maximum Offset To Use: 1.00
- ☐ Draw Box Around Label
- ☒ Ignore Zero Elevations
- Source for Elevations....
 - ☒ Points
 - ☐ Polyline Vertices
- Side for Labels
 - ☐ Left
 - ☒ Right
- Alignment
 - ☐ Parallel
 - ☒ Perpendicular

Buttons: OK, Cancel, Help



The alignment polyline with points to label is shown

Pulldown Menu Location: Annotate

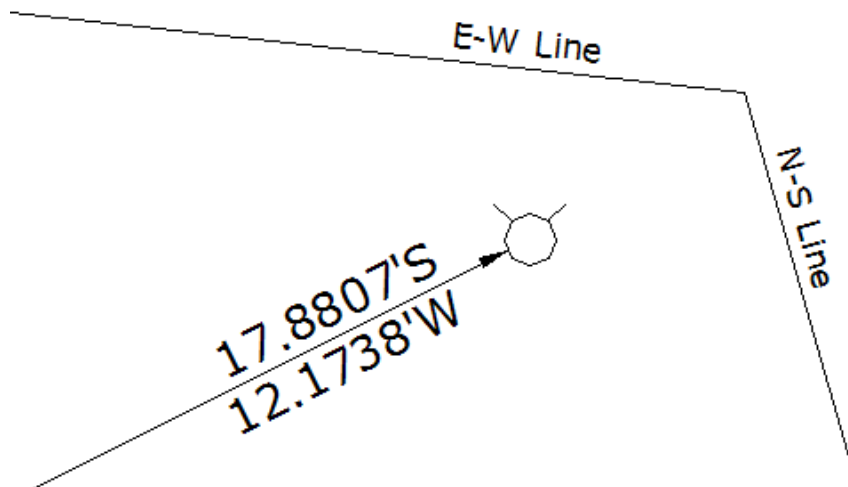
Keyboard Command: elevlab

Prerequisite: Polyline and points

Label Offset Distances

Function

This command labels the distances between a point and one or two lines. The first distance is between the point and an east-west line. This distance is labeled either north or south of the line. The second distance is between the point and a north-south line. This distance is labeled either east or west of the line. The distances are labeled with a leader and a description of the point.



Prompts

Pick 'E-W', Left to Right Property Line (if any)

Pick Line or Polyline (Enter for None): **pick the polyline**

2 Pick 'N-S', Top to Bottom Property Line (if any)

Pick Line or Polyline (Enter for None): **pick the polyline**
 Pick Offset Point, (N) for Number, <E> to Exit: **pick a point**
 Pick point to start leader at: pick a point at or near the offset point
 To point: pick an alignment point for the label
 To point: Press Enter
 Pick Offset Point, (N) for Number, <E> to Exit: **Press Enter to end**

Pulldown Menu Location: Annotate
Keyboard Command: OFFLAB
Prerequisite: Polyline or line

Rescale Drawing

Function

This command globally resizes selected text, symbol and block entities within the drawing by comparing the existing drawing scale factor to a new scale factor. Entities are scaled from their individual insertion points. Lines and polylines are not scaled.

Prompts

Old Horizontal Scale: 20

New Horizontal Scale: 30

Select text, symbols and blocks to scale.

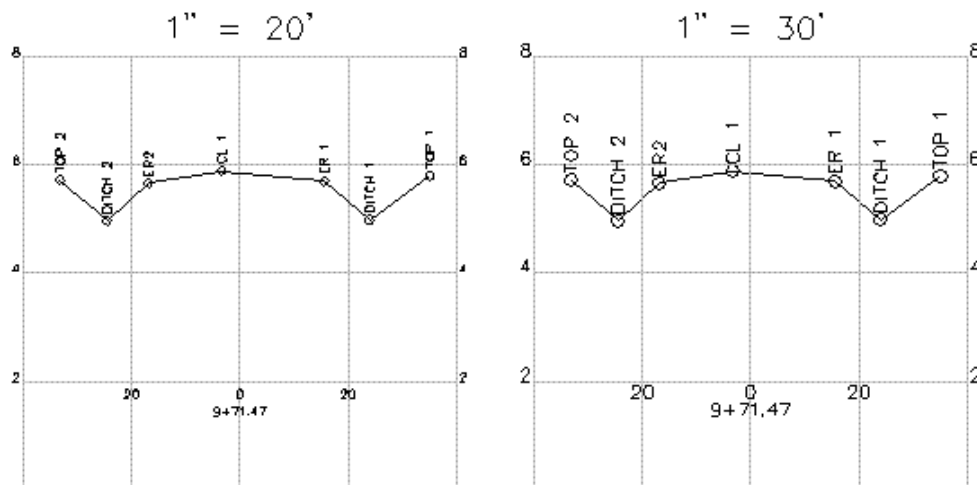
Select objects: *select objects by window, crossing or by typing "all" at the command prompt, and press Enter*
 41 found

Select objects: *press Enter*

Number of symbols and blocks changed> 7

Testing Entity> 41

Number of text entities changed> 20



Pulldown Menu Location: Annotate

Keyboard Command: scaledwg

Prerequisite: Drawing entities to be scaled



Surface Commands

16

This chapter provides information on using the commands from the Surface menu to produce contours, profiles, and earthwork volumes.

Triangulate & Contour

Function

This command provides a complete set of functionality for contouring, labeling, and creating tin surface models. Given data entities that represent the surface, this command creates a final contour map with labeled, smoothed, and highlighted contours and/or a surface model that can be saved to a file (to be used in other areas of the program) or drawn on the screen as triangles or faces. Eligible data entities include points, inserts, lines, 2d polylines, 3d polylines, elevation text, 3d faces, and points from ASCII or coordinate (.CRD) files.

Triangulate & Contour has many options which are defined in the exhibits shown in the following pages. With this command, you can do any combination of drawing the triangulation network lines, drawing the contours, drawing triangulation network 3D Faces or lines, writing a triangulation file and storing a surface file.

In order to force *Triangulate & Contour* to correctly interpolate elevations between two points that define a grade break in the surface (such as points on a ridge, wall, or road), a breakline must exist between the points. A breakline line can be specified as a 3D polyline or line. In fact, all 3d polylines and lines with elevation are treated as breaklines.

If *Triangulate & Contour* reports zero points found and fails to do anything when you're using Carlson points, then those points are probably located at zero elevation. To fix this problem, make sure that Carlson Point Inserts is toggled on in the Selection tab. This will enable *Triangulate & Contour* to read the elevation from the elevation attribute of the point.

Triangulate Tab

The screenshot shows the 'Triangulate and Contour' dialog box with the 'Triangulate' tab selected. The dialog has four tabs: 'Triangulate', 'Contour', 'Labels', and 'Selection'. The 'Triangulate' tab contains the following options:

- ☒ Draw Triangulation Lines (Layer: TRI_LINES)
- ☒ Draw Triangulation Faces (Layer: TRI_FACE)
- ☒ Store Surface Data (Surface Name: pit2)
- ☒ Write Triangulation File (Browse... button)
- ☐ Use Inclusion/Exclusion Areas
- ☐ Pick Reference Plane
- ☒ Ignore Zero Elevations
- ☐ Highlight Breaklines
- ☒ Erase Previous Contour Entities
- ☒ Interpolate Ridges and Valleys
- ☐ Specify Elevation Range
- ☒ Interpolate Summits and Pits

Maximum triangle mesh line length:

Interior	Exterior
5000	10000

Buttons: OK, Cancel, Help

When **Draw Triangulation Lines** is turned on, the program will draw the triangulation as simple AutoCAD lines with elevation. Specify the layer for these lines in the box to the right.

When **Draw Triangulation Faces** is turned on, the program will draw each triangle in the triangulation network as a 3D Face. These 3D Faces can then be used in AutoCAD's modeling routines such as *HIDE* and *SHADE* or in routines such as *3D Viewer Window*. Specify the layer for these 3DFaces in the box to the right.

Store Surface Data names and creates a surface or surfaces that are stored in the drawing. The creation of a surface is a prerequisite for the use of *Surface Tools* and *Edit Pad Template*. A Triangulation file must also be specified in order to use the Store Surface option.

Write Triangulation File stores the triangulation surface model as an .flt or a .tin file. The .flt file format is a text file depicting the edges in the triangulation network. The .tin file is a new binary file format depicting the triangulation network. The .tin file is much faster and more efficient than the previous .flt file format. The triangulation file/s can be used by several commands such as *Volumes By Triangulation*, *Spot Elevations*, and *Profile from FLT File*. Either type in the file name to create or press the Browse button to select a file name.

When **Use Inclusion/Exclusion Areas** is activated, the program will prompt you for inclusion and exclusion polylines. These are used to define the area of activity for triangulation and contouring. The inclusion and exclusion polylines must be closed polylines and must be drawn before using *Triangulate & Contour*. The command line display must be set to show at least two lines to see the prompting for the selection of the Inclusion/Exclusion perimeters.

Only the parts of the contour lines and triangles that are within the inclusion polylines will be drawn. For example, an inclusion could be the perimeter of the site. The parts of contour lines that are inside the exclusion polylines are not drawn. Exclusion polylines can be used for areas where you don't want contours such as within buildings. When **Ignore Zero Elevations** is activated, this setting will filter out all data points at an elevation of zero from the data set.

When **Erase Previous Contour Entities** is activated, this setting will erase previously drawn contour entities.

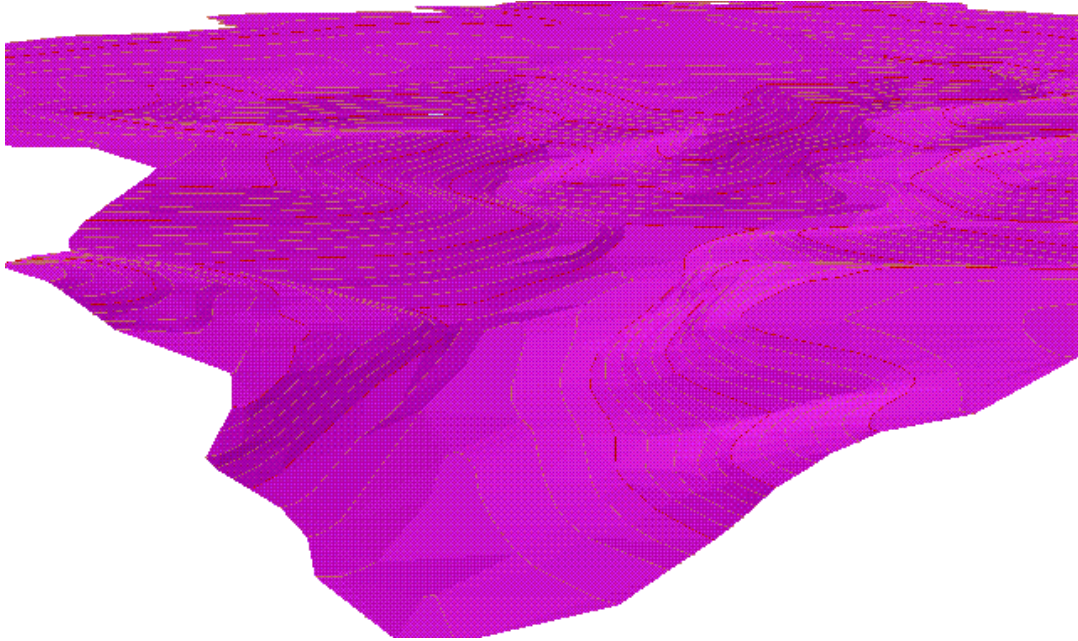
If you would like to manually set the range over which to contour, select the **Specify Elevation Range** option. The program will automatically contour from the lowest elevation in the data set up to the highest at the increment specified in Contour Interval.

The triangulation network is based on the x,y position of the points. **Pick Reference Plane** allows you to contour an overhang or cliff by changing the reference plane to a side view. The reference plane can be specified by first using the *Viewpoint 3D* command and then using the View option, or you can specify three data points on the cliff (two along the bottom and one at the top).

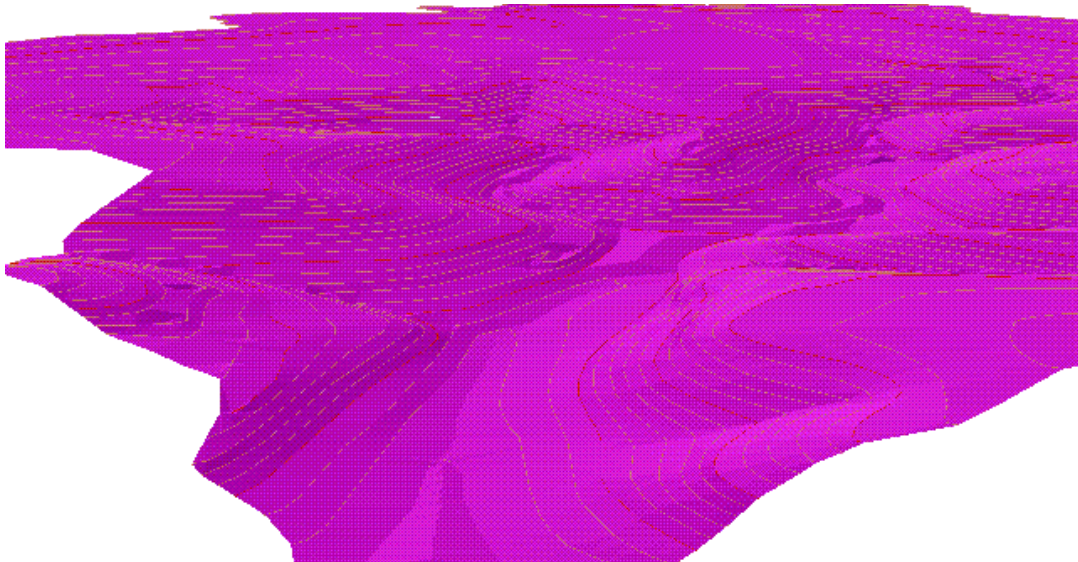
Highlight Breaklines highlights breaklines in the triangulation network by drawing the triangulation lines along breaklines in yellow.

Interpolate Ridges and Valleys creates additional triangulation in a ridge or valley situation to more accurately define the feature during surface modeling operations. This option would commonly be used when creating a surface model from existing contours, since it replaces the need to manually draw 3d polylines along ridges and valleys.

Interpolate Summits and Pits creates additional triangulation in a summit or pit situation to more accurately define the feature during surface modeling operations. This option would commonly be used when creating a surface model from existing contours.



Before: Surface made from an existing contour map. Note the flat spots in the bottom of the valley (bottom center of the image) when Interpolate Ridges and Valleys is disabled.



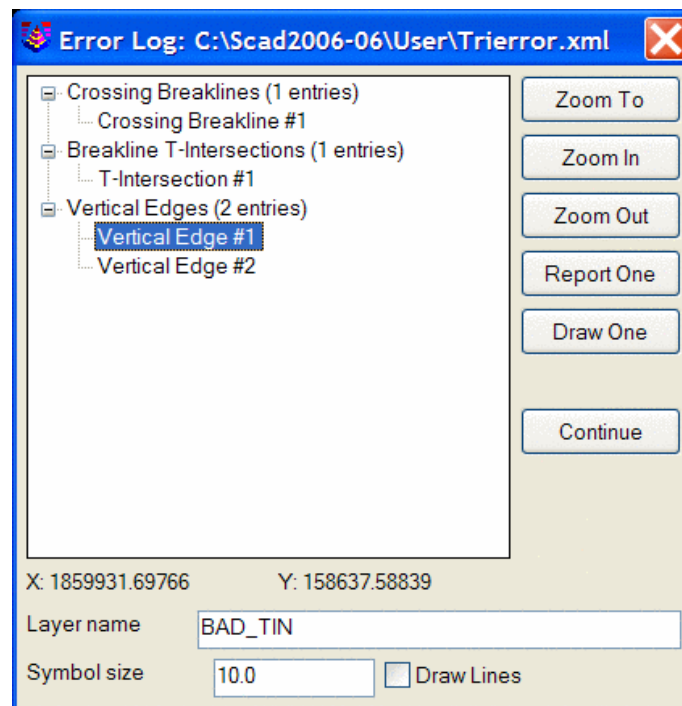
After: The same surface with Interpolate Ridges and Valleys enabled.
Note the smooth flowline at the bottom center of the image.

The **Max Triangle Mesh Line Length** value limits the length of the triangulation network lines. Any triangulation line that exceeds this limit will not be drawn or included in contouring. This allows you to avoid abnormally long triangulation lines where you have relatively too few data points and on the outskirts of your data points. The **Exterior** value applies to triangulation lines around the perimeter of the triangulation area and the **Interior** value

applies all the other triangulation lines. Generally you would have the exterior value larger than the interior.

An **Error Log** is generated if the *Triangulate and Contour* routine finds a vertical conflict between breaklines or other surface entities, opening the following dialog box. Three types of conflicts are reported; Crossing Breaklines, Vertical Edges, and Breakline T-Intersections. Crossing Breaklines indicates that the intersection of two entities does not have a common elevation. Vertical Edges indicates that two entities or vertexes of differing elevations have the same x-y location, thus forming a vertical plane. Breakline T-Intersections indicates that a 3d entity is abutting another entity, but the second entity doesn't have a vertex at the point of intersection. Each type of conflict is listed in its own category.

Clicking to the "plus" sign beside a category will display the individual conflicts within that category. When a line item error is selected, a highlighted arrow is temporarily placed in the drawing to indicate the exact location of the specific conflict. Zoom functionality allows the user to more closely inspect the specific problem area, and if needed a marker can be drawn or a report generated for an individual conflict or conflicts.

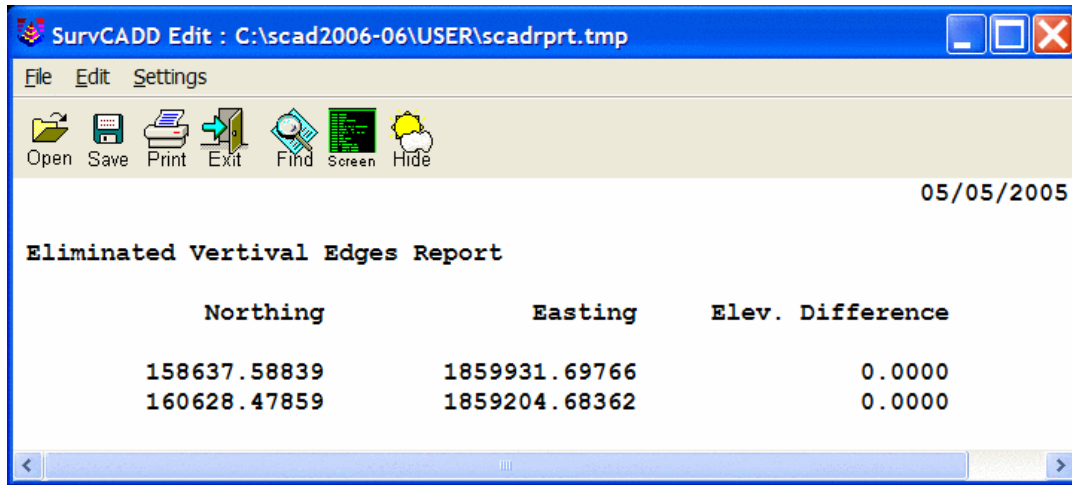


Zoom pans the drawing to move the selected conflict to the center of the screen. The zoom functions are only active when a single line item is selected.

Zoom In zooms in on the highlighted area for closer inspection. Multiple picks on the zoom button will increase the magnification.

Zoom Out zooms out away from the highlighted area.

Report All/One toggles between One and All depending whether a single line item conflict or a category is selected from the error log. An error report is generated listing the x-y position and the elevation difference of the entities in conflict.



Draw All/One toggles between One and All depending whether a single conflict or a category is selected from the list. This option draws an "X" symbol at each selected conflict. The layer and size of the symbol is controlled in the fields below.

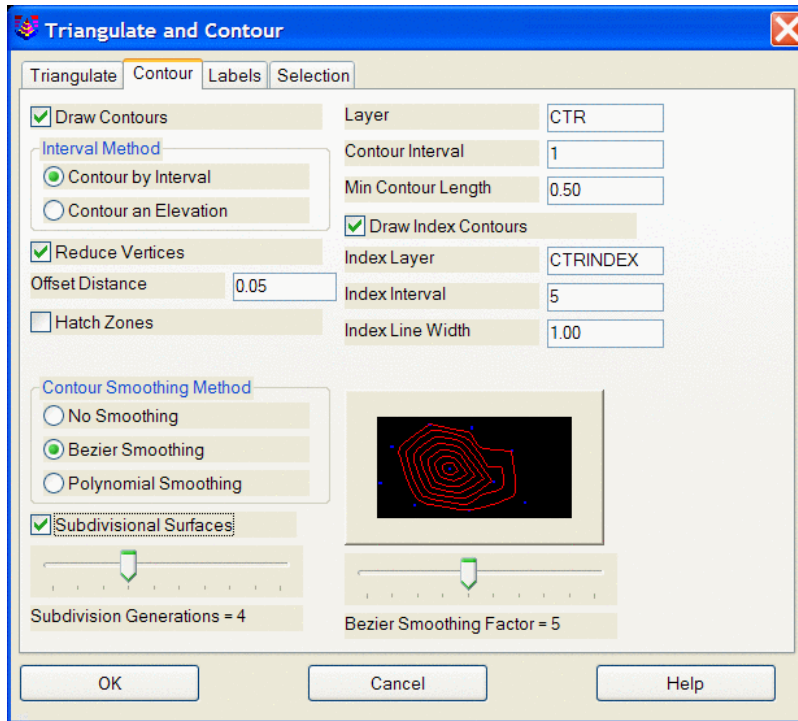
Continue closes the Error Log and proceeds with the contouring operation.

Layer Name specifies the layer name for the "X" entities drawn with Draw One/All. This also sets the layer name for the "Draw Lines" option.

Symbol Size specifies the size of the "X" symbol that is drawn to delineate the selected errors. This will determine the actual size of the symbol in the drawing. This value is not multiplied by the horizontal drawing scale.

In the case of crossing polylines, **Draw Lines** will trace over the polylines responsible for the conflict. The polylines will be created in the layer specified in the layer field.

Contour Tab



When the **Draw Contours** box is checked, the program will draw contour lines after triangulating. Otherwise, only the designated triangulation operations are performed. Specify the layer for contours in the edit box to the right.

Contour by Interval or **Contour an Elevation** determines whether to contour by interval (ie: every 10 feet) or to contour a certain elevation. The elevation option allows you to contour specific values. For example, if you want just the 100ft contour, then select elevation and enter 100. The default mode is by interval.

Use **Contour Interval** to specify the interval to contour. **Note:** If the previous option is set to Contour an Elevation, then this field is used to specify the elevation to contour.

Contour lines whose total length is less than the **Min Contour Length** value will not be drawn.

Reduce Vertices attempts to remove extra vertices from the contour polylines which has the advantages of a faster drawing and smaller drawing size. Default is ON

When the Reduce Vertices option is enabled, the **Offset Distance** value is the maximum tolerance for shifting the original contour line in order to reduce vertices. The reduced contour polyline will shift no more than this value, at any point, away from the original contour line. A lower value will decrease the number of vertices removed and keep the contour line closer to the original. A higher value will remove more vertices and allows the contour line to shift more from the original.

When activated, the **Hatch Zones** option will create hatching between the contours based on elevation zones. The following dialog will open allowing the user to specify the hatch type and color for each elevation zone. The entire elevation range of selected data is displayed under Current Values.

Define Ranges (Lowest to Highest)

Current Values: 1924.000 to 2044.000

Elevation	Range	Color	Pattern	Scale	Layer	Page: 1
1924.000	<= 1924.000			SOLID	1.000	zone1
1928.000	1924.000 to 1928.000			SOLID	1.000	zone2
1932.000	1928.000 to 1932.000			SOLID	1.000	zone3
1936.000	1932.000 to 1936.000			SOLID	1.000	zone4
1940.000	1936.000 to 1940.000			SOLID	1.000	zone5
1944.000	1940.000 to 1944.000			SOLID	1.000	zone6
1948.000	1944.000 to 1948.000			SOLID	1.000	zone7
1952.000	1948.000 to 1952.000			SOLID	1.000	zone8
1956.000	1952.000 to 1956.000			SOLID	1.000	zone9
1960.000	1956.000 to 1960.000			SOLID	1.000	zone10
1964.000	1960.000 to 1964.000			SOLID	1.000	zone11
1968.000	1964.000 to 1968.000			SOLID	1.000	zone12
1972.000	1968.000 to 1972.000			SOLID	1.000	zone13
1976.000	1972.000 to 1976.000			SOLID	1.000	zone14

Auto Clear Load Save OK Cancel Help

Clear clears the all of the Elevation fields in the dialog.

Load loads previous settings from a saved .pat file.

Save saves the current setting configuration to a .pat file.

Auto opens the following dialog, allowing for automatic configuration of the range of elevations in each zone, assigning of colors and hatch patterns, and the scale.

Set Pattern Values

Starting Zone# ☒ Set Colors ☒ Set Pattern

☒ Set Values Starting Value Starting Color# Pattern

Value Interval Color Increment ☒ Set Scale Scale

OK Cancel Help

Starting Zone sets the zone with which to begin the application of the setting defined in this dialog. For Instance, if the Starting Zone was set to 10, the settings definitions applied here wouldn't affect Zones 1-9, but would start at Zone 10.

Set Values enables the Starting Value and Value Interval fields, which allow the user to specify the starting elevation for the given zone and set the zone increment.

Starting Value sets the elevation of the beginning zone to define.

Value Interval sets the elevation increment for subsequent zones.

Set Colors enables the Starting Color and Color Increment fields.

Starting Color sets the starting color number, based on the AutoCAD standard color chart.

Color Increment sets the color number to increase for subsequent zones. So if the increment was set to 5, and the starting color was 60, the next color would be 65, 70, and so on.

Set Pattern sets the hatch pattern for the defined zones.

Set Scale enables the Scale option.

Scale sets the scale for the selected hatch pattern.

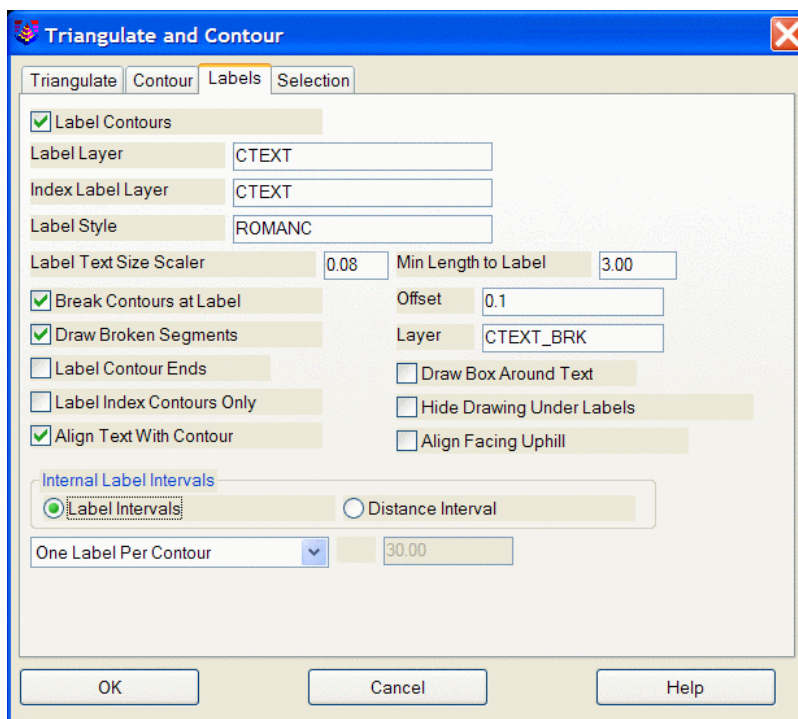
Draw Index Contours creates highlighted contours at a specified interval. When enabled, the fields for Index Layer, Index Interval and Index Line Width are activated.

Use **Contour Smoothing Method** to select the type of contour smoothing to be performed. Bezier smoothing holds all the contour points calculated from the triangulation and only smooths between the calculated points. Polynomial smoothing applies a fifth degree polynomial for smooth transition between the triangulation faces. The smoothing factor described below affects the smoothing bulge.

Bezier Smoothing Factor The contour preview window shows you an example of how much smoothing can be expected at each setting. Sliding the bar to the left results in a lower setting which have less looping or less freedom to curve between contour line points. Likewise, moving the slider to the right results in a setting that increases the looping effect. Note that too much smoothing applied in some situations can result in crossing contours.

Subdivisional Surfaces / Subdivisions Generation causes each triangle in the triangulation surface model to be subdivided into an average of three smaller triangles per subdivision generation, with the new temporary vertices raised or lowered to provide smoother contours. More generations increases the smoothness of the algorithm at a cost of increased processing time. If Straight Lines are chosen as the contouring drawing method, then the contours are guaranteed never to cross. The original points of the surface model are always preserved. These modifications to the surface model are only for contouring purposes and are not written to the triangulation (.FLT) file or inserted into the drawing. If some contour movement is too small for appearance's sake, consider enabling Reduce Vertices.

Labels Tab



When **Label Contours** is activated, contours will be labeled based on the settings below.

Label Layer specifies layer name for intermediate contour labels.

Index Label Layer specifies layer name for index contour labels.

Label Style specifies the text style that will be used for the contour label text.

Label Text Size Scaler specifies the size of the contour labels based on a multiplier of the horizontal scale.

Contours whose length is less than the **Min Length to Label** value will not be labeled.

When **Break Contours at Label** is checked, contour lines will be broken and trimmed at the label location for label visibility. When enabled, the Offset box to the right activates. The Offset determines the gap between the end of the trimmed contour line and the beginning or ending of the text.

When **Draw Broken Segments** is checked, segments of contours that are broken out for label visibility will be redrawn as independent segments. Specify the layer for these broken segments in the box to the right of this toggle.

When **Label Contour Ends** is checked, contour ends will be labeled.

When **Draw Box Around Text** is checked, a rectangle will be drawn around contour elevation labels.

When **Label Index Contours Only** is checked, only the index contours will be labeled. This option is active only when "Draw Index Contours" has been selected in the Contour tab of the main dialog.

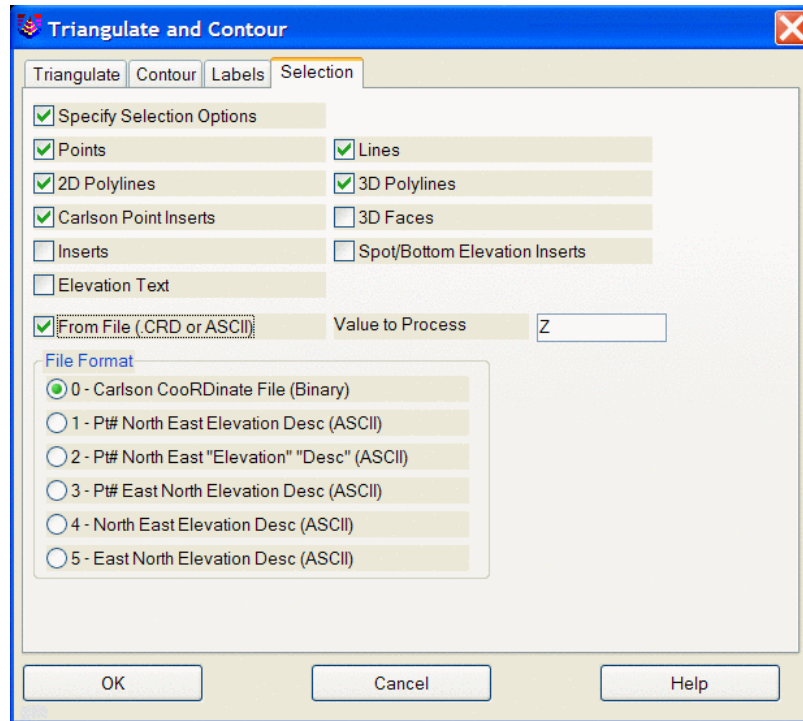
Hide Drawing Under Labels activates a text wipeout feature that will create the appearance of trimmed segments at the contour label, even though the contour line is still fully intact. This feature provides the user with the best of both worlds; you have clean looking contour labels, yet the contour lines themselves remain contiguous. This feature will also hide other entities that are in the immediate vicinity of the contour label.

When **Align Text with Contour** is checked, contour elevation labels will be rotated to align with their respective contour lines. This option also activates the Align Facing Uphill feature explained below.

When **Align Facing Uphill** is checked, contour elevation labels will still be rotated to align with their respective contour lines, but the labels will be flipped in such a manner that the top of the text label will always be toward the uphill side of the contours. So as the labels are read right side up, the contours will be progressing uphill.

Use **Internal Label Intervals** to choose between Label Intervals or Distance Interval. Label Intervals will label each contour with a set number of labels. Distance Interval lets you specify a distance between labels.

Selection Tab



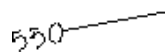
When **Specify Selection Options** is checked, you can control what type of entities *Triangulate & Contour* uses. This is an excellent method of "filtering out" unwanted entity types.

Points, 3D Polylines, 2D Polylines, Lines, Inserts are standard AutoCAD entities types.

Carlson Point Inserts refer to Carlson points which include the block SRVPNO* with the point number, elevation, and description attributes.

Spot/Bottom Elevation Inserts include text entities that start with 'X'.

From File allows you to triangulate from the points in a coordinate (.CRD) or ASCII file.



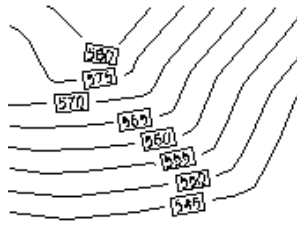
Label Contour Ends



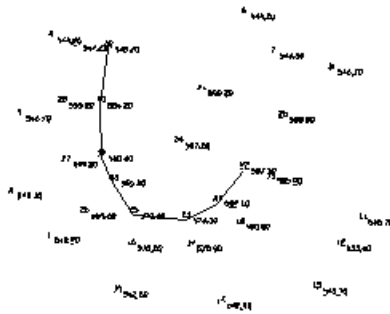
Align Text With Contour ON



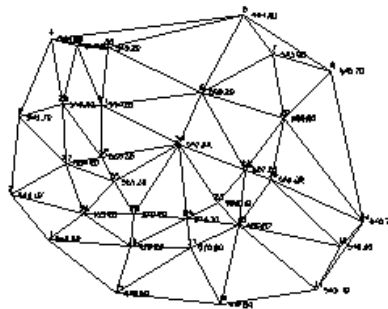
Align Text With Contour OFF



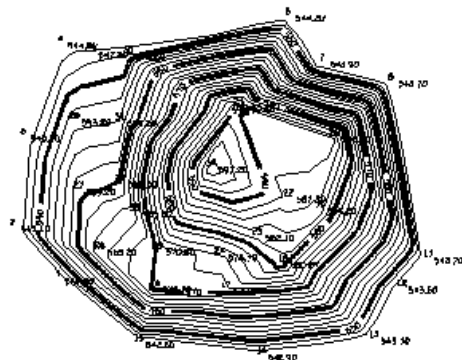
Draw Box Around Text



Original data points with one 3D polyline



Triangulation network without contouring



Contours without triangulation network. The contours are smoothed, reduced, drawn at an interval of 2, and highlighted at an interval of 10 with labeling on the index contours.

Pulldown Menu Location: Surface

Keyboard Command: tri

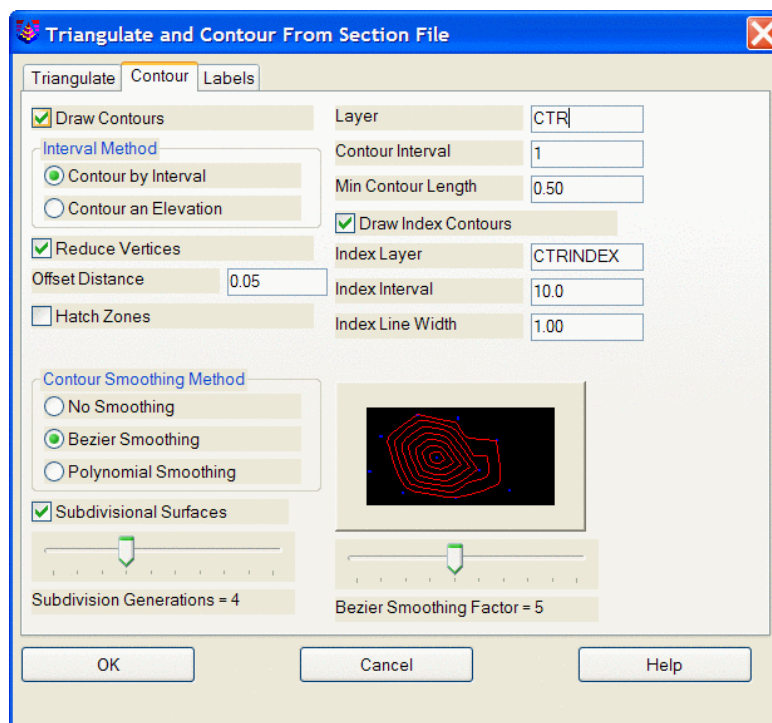
Prerequisite: Data entities in the drawing, including points, inserts, lines, 2d polylines, 3d polylines, elevation text, 3d faces, and points from ASCII or coordinate (.CRD) files.

Contour from TIN File

Function

This command creates contours directly from a TIN file (.flt or .tin) without the need to have the TIN drawn on the screen. The routine starts by opening the dialog for *Triangulate and Contour*, allowing the user to specify TIN, contour and label settings. After pressing OK on the initial dialog, a second dialog opens, allowing for the selection of the TIN file from which to create the contours.

See the *Triangulate and Contour* section in the manual for a detailed description of each of the settings.



Prompts

Fill out the Triangulate and Contour Dialog information with the desired options. Select the desired TIN file and choose Open.

Loading edges...

Loaded 1994 points and 5944 edges

Created 3936 triangles

Removed 9 disconnected edges.

Reading points... 0

Contouring elevation 497

Inserted 1926 contour vertices.

The user may be prompted for additional information depending on settings used in the Triangulate and Contour dialog box.

Pulldown Menu Location: Surface

Keyboard Command: cntrTIN

Prerequisite: A TIN file created with Triangulate and Contour. (.flt or .tin)

Draw Triangular Mesh

Function

This command draws a triangulation (.flt or .tin) file as either 3D LINES or 3DFACEs. Since 3DFACE entities can be shaded within the *3D Viewer Window*, this is an excellent tool for visual surface inspection. 3D Lines cannot be shaded.

Triangulation (.flt or .tin) files can be created by *Triangulate & Contour*.

Prompts

Select TMESH File to Draw

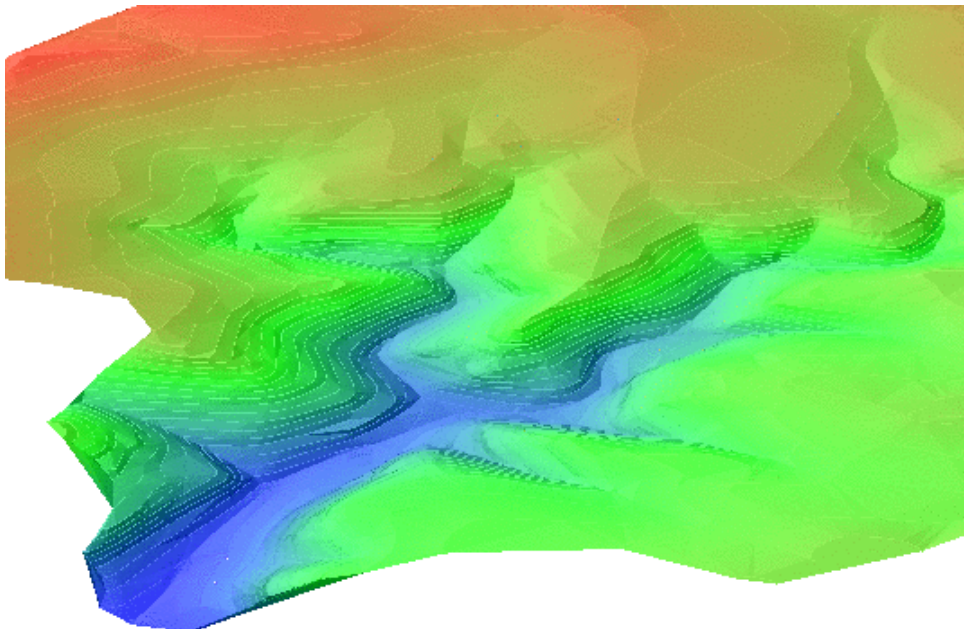
Choose a triangulation (.flt or .tin) file from the file selection dialog

Layer name <TMESH>: *press Enter*

Draw TIN as 3D Lines or 3DFaces [Lines/<3DFaces>]: *press Enter*

Loading edges...

Loaded 198 points and 234 edges



Triangulation mesh drawn as 3DFaces and shaded within 3D Viewer Window

Pulldown Menu Location: Surface

Keyboard Command: drawtri

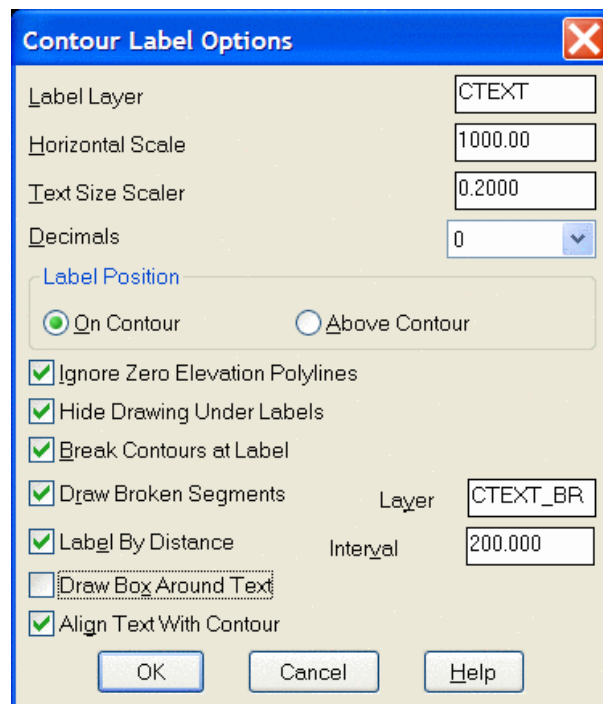
Prerequisite: A triangulation (.flt or .tin) file

Contour Elevation Label

Function

This command can be used to simultaneously create elevation labels on a group or groups of contour polylines at elevation. To place the labels, pick two points crossing the contour polylines at the desired label location. The program will find all the contour polylines that intersect the picked line (defined by the two picked points) and will place labels at the intersection point of each contour. A second crossing line can be initiated immediately, so multiple areas can be quickly labeled while remaining in the command. The actual "z" elevation of the contour line determines the label value.

Contour Label Options Dialog



Label Layer specifies layer name for the contour labels that will be created.

Horizontal Scale is used in conjunction with the Text Size Scaler to determine unit height of the contour labels.

Text Size Scaler is a scaler that will be multiplied by the horizontal scale to set the actual text height of the labels in AutoCAD units.

Decimals sets the decimal precision for the labels to be created.

Label Position determines the label position in relation to the contour polyline.

- **On Contour** centers the label on the contour line.
- **Above Contour** places the label above the contour line. If this option is used, the options for Break Contours at Label and Draw Broken Segments become inactive.

Ignore Zero Elevation Polylines enables the routine to filter out all entities with an elevation of zero.

Hide Drawing Under Labels activates a text wipeout feature that will create the appearance of trimmed segments at the contour label, even though the contour line is still fully intact. This feature provides the user with the best of both worlds; you have clean looking contour labels, yet the contour lines themselves remain contiguous. This feature will also hide other entities that are in the immediate vicinity of the contour label.

When **Break Contours at Label** is checked, the contour lines will be broken and trimmed at the label location for label visibility.

When **Draw Broken Segments** is checked, segments of contours that are broken out for label visibility will be redrawn as independent segments. Specify the layer for these broken segments in the box to the right of this toggle.

Label By Distance places the labels by distance along the contour. The user is not prompted for screen picks of contour crossing when this option is used.

- **Interval** sets the distance interval to be used between labels on each contour.

When **Draw Box Around Text** is checked, a rectangle will be drawn around the elevation labels.

When **Align Text with Contour** is checked, contour elevation labels will be rotated to align with their respective contour lines.

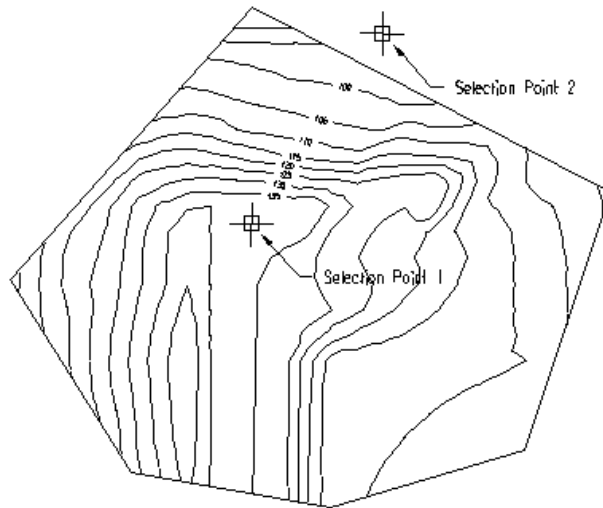
Prompts

Contour Label Options Dialog Opens Select the desired options and press OK.

Define a line which slices the contours at the desired label locations.

Pick 1st point: *pick a point*

Pick 2nd point: *pick a point*



By selecting two points the contour lines that cross the line defined by the two points are labeled.

Keyboard Command: gclabel

Pulldown Menu Location: Surface

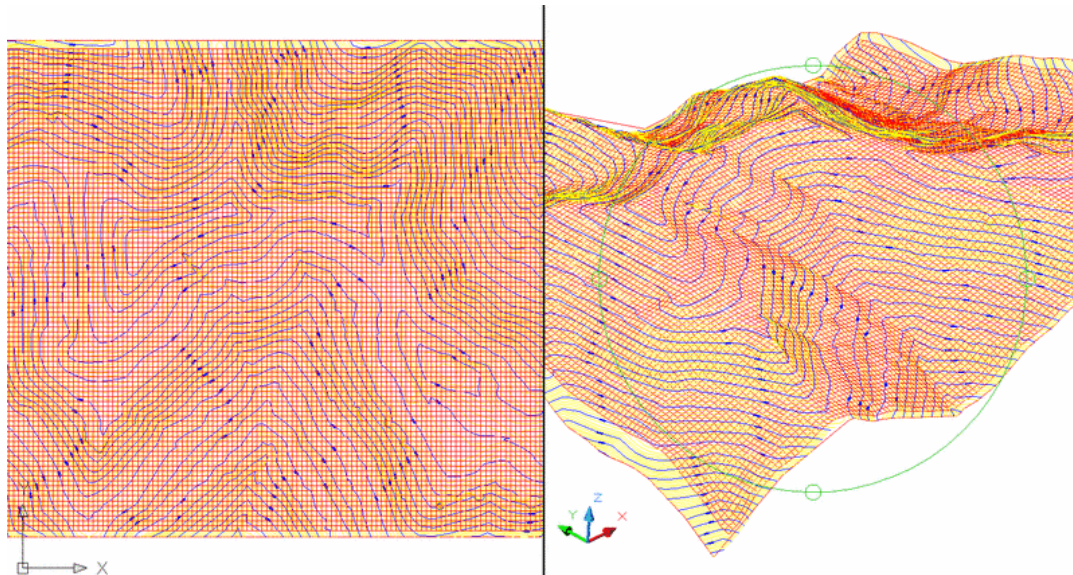
Prerequisite: polylines with elevation (contour polylines)

Make 3D Grid File

Function

This command creates a grid (.GRD) file which serves as a surface model and is a prerequisite to many of the other DTM routines. The program internally makes a triangular network of the data points and then interpolates the elevation values of a rectangular grid at the specified grid resolution. Data points can be either points, inserts, lines, or polylines. Lines and polylines are treated as breaklines in the triangulation.

The grid location is specified by first picking a lower left corner and then an upper right corner. The screen cannot be twisted when this is done because grids always run north-south and east-west.



Make 3D Grid File

Range of Elevations/Values to Process

Low: 0.01 High: 20000.00

Modeling Method

☒ Triangulation

☐ Inverse Distance

☐ Kriging

☐ Polynomial

☐ Linear Least Squares

Triangulation Mode

☒ Auto Detect

☐ Triangulation Only

☐ Triangulation with Subdivision

☐ Intersection Only

of cells in X: 133, in Y: 97 Total cells: 12901

Grid Resolution

Specify Grid Resolution As....

☐ Number of Cells in X and Y

☒ Dimensions of a Cell

X: 25 Y: 25

OK Cancel Help

The dialog box sets the range of elevations to process, modeling method and grid resolution. Each of these items is described below.

- **Range of Elevations/Values to Process:** Entities with elevations or values outside the range to process are ignored and will not be used for the gridding.
- **Modeling Method:** The modeling method almost always should be triangulation for surface topographic grid files. Polynomial, inverse distance, Kriging and linear least squares apply to random data points for surfaces like underground features.
- **Triangulation Mode:** When using Triangulation and Polynomial methods, There are four triangulation modes: AutoDetect, Triangulation Only, Intersection with Triangulation and Intersection Only.
 - **Auto Detect** method automatically chooses between the Triangulation Only and Intersection with Triangulation methods. If the selected surface entities are primarily made of polylines, then the Intersection

with Triangulation method is used. Otherwise the Triangulation Only method is used.

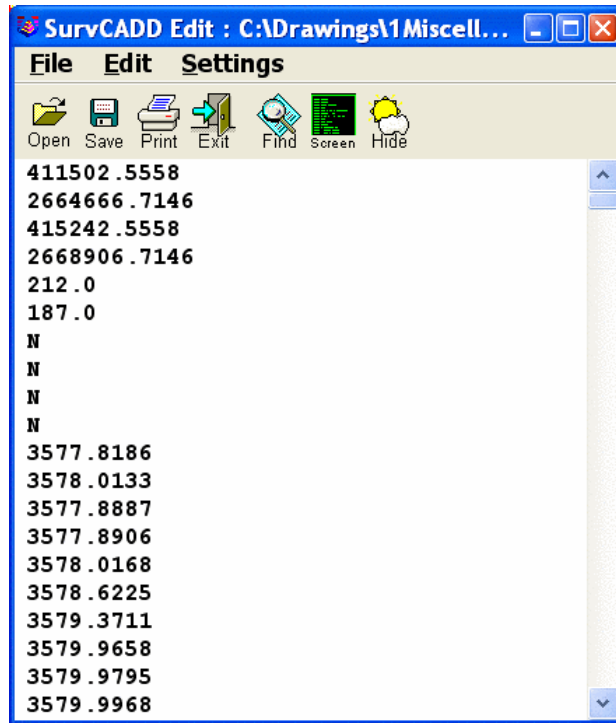
- **Triangulation Only** method builds a triangulation surface out of all the selected points, lines and polylines. All lines and polylines are treated as breaklines. Grid node elevations are calculated based on the triangulation.
- **Triangulation with Subdivision** method uses the subdivisional surfaces modeling method. This option causes each triangle in the triangulation surface model to be subdivided into an average of three smaller triangles per subdivision generation. This gives a much smoother surface model, where instead of one triangle, there are now three or more.
- **Intersection Only** method goes directly to the Steepest Intersection method using the selected lines and polylines. The Steepest Intersection method is used to assign the grid node elevations from the linework of the triangulation lines and the selected lines and polylines. The triangulation step is skipped and any selected point data is not used. This method can be used for making grids out of polylines such as a contour map as long as the surface is defined just by contour polylines without needing spot elevation points. Skipping the triangulation step makes this method a lot faster especially for large files.
- **Grid Resolution:** The grid resolution is specified by either the number of grid cells or by the size for each grid cell. It is usually best to set the Dimensions of a Cell to a known size, and the program will calculate the "number of cells in X and Y". While the program can handle really large grids with no limit, a general rule of thumb is to keep the total number of grids cells under 500,000 (about 700 by 700 cells) to limit the processing time. The grid location and resolution can also be specified by using the position/resolution from an existing grid file. In this case, the location and resolution of the new grid will match those of the selected grid file which is useful for routines that require two grid files with identical locations and resolutions.

No elevations are calculated on grid cells that extend beyond the extent of the data. The figure shows an example of how the grid is calculated to the limits of the data points. Extrapolation can be used to calculate elevations for the grid cells that are beyond the data limits. When there are grid cells with no elevation in a grid (.GRD) file, many routines will prompt *Extrapolate grid to full grid size?* Extrapolation fills in all the grid cells. The method to extrapolate uses a safe calculation that tends average out or level the extrapolated values. So extrapolated grid areas are not as accurate as grid areas within the limits of the data. *Grid File Utilities* can be used to apply and save extrapolation to a grid file. The *Plot 3D Grid* command can then draw the grid file so that you can see the extrapolation.

A Carlson Survey grid (.GRD) file has the following format:

Line 1 is the lower left Y coordinate
Line 2 is the lower left X coordinate
Line 3 is the upper right Y coordinate
Line 4 is the upper right X coordinate
Line 5 is the X direction grid resolution
Line 6 is the Y direction grid resolution

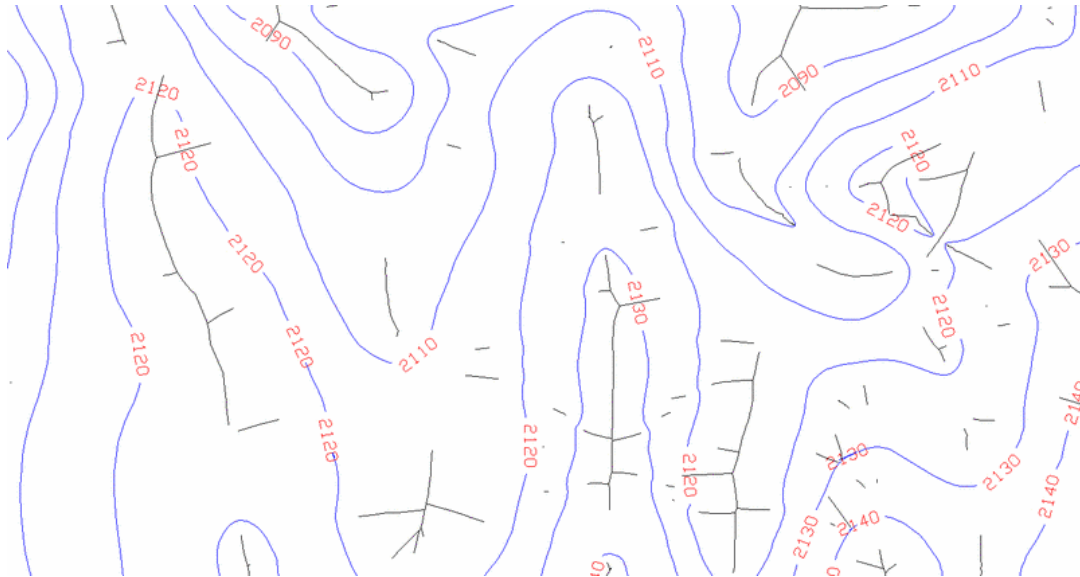
The rest of the lines are the Z values of the grid intersects starting from the lower left moving in the left to right direction and ending at the upper right. If the intersect has no value, the letter 'N' is saved instead of the Z value for Null values. An example is shown in the Display-Edit Report dialog.



Gridding from Contour Maps

A grid file can be created from contours represented as polylines with elevation. The program calculates the elevation of each grid corner by looking for contour intersections in eight directions (N, S, E, W, NE, SE, SW, NW) and then interpolating the elevation between the two steepest intersections.

To accurately model the surface, it might be necessary to add entities in addition to the contour polylines. For one, spot elevation points can be added for the high and low points. Otherwise the grid model might plateau at the last contour. Also 3D breaklines need to be added on long narrow ridge and valley contours because in these areas the program will find the same contour when it looks for intersections in the eight directions. When all eight intersections are the same contour, the interpolated grid elevation equals the contour elevation instead of rising up the ridge or dipping in the valley. The 3D breaklines force interpolation along the ridge or valley. To draw these polylines, set the OSNAP to Nearest and run the *3D Polyline* command. Then draw the polyline by picking the contour polylines where the breakline crosses them. Another way to quickly create breaklines is to first draw 2D polylines. Then convert these polylines into 3D polylines with the *Screen* option in the *2D to 3D Polyline by Surface Model* command found on the 3Dpoly menu. There is an automatic way to draw these breaklines. Under 3Dpoly, use the command: Create Ridge polylines from Contours.



Prompts

Grid File to Create File Selection Dialog

Enter a name for the grid file. The default directory is the Carlson Survey data directory.

Use position from another file or pick grid position [<Pick>/File]?

Pick Lower Left grid corner <8111.88,3985.08>: *pick a point for the lower left limit of the grid*

Pick Upper Right grid corner <8366.88,4195.08>: *pick a point*

Make Grid File dialog box

In this dialog, you specify the grid resolution and whether or not to include data points with zero elevations. You can specify the resolution by entering the number of grid cells in the X and Y directions. By the Dimensions option, you to set the X and Y size for each grid cell.

Reading points ...

Select points, lines, polylines and faces to grid from.

Select objects: Specify opposite corner: 1075 found

Select objects:

Reading points ... 980

Finding points on breaklines ...

Ignored 2729 duplicate points.

Inserting breaklines 3480 ...

Triangulating points ... 980

Assigning grid values> 1800

Writing grid file: C:\Scad\WORK\example1.grd

Pick the Lower Left grid corner: *pick a point for the lower left limit of the grid*

Pick the Upper Right grid corner: *pick a point*

Pulldown Menu Location: Surface

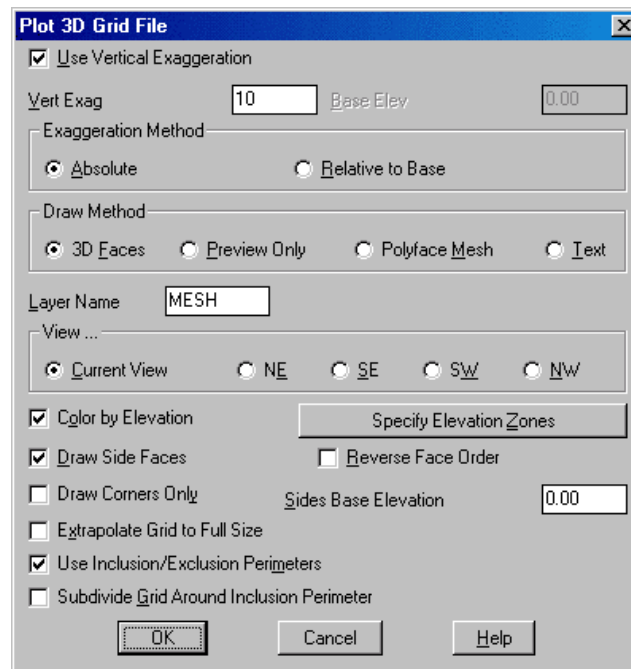
Keyboard Command: mkgrid

Prerequisite: Entities that define the surface

Draw 3D Grid File

Function

This command draws the 3D grid mesh of the chosen grid (.GRD) file. Each grid cell can be drawn as a 3D Face entity, Polymesh, Text or temporary lines. 3D Faces and Polymesh can be viewed/used in commands like *3D Viewer Window*.



If **Use Vertical Exaggeration** is checked, grid elevations are multiplied by the value specified.

Exaggeration Method specifies whether to use an absolute exaggeration method or relative to a base elevation

Specify the type of entities to draw in **Draw Method**. 3D Faces are described above. The Preview Only option draws the grid using temporary vectors. This method provides a much faster way to view the grid. However these temporary vectors are erased when the viewport is modified. This means as soon as you execute zoom, redraw, regen or plot, this grid will disappear. You can quickly redraw the grid by typing in VG for View Grid at the command prompt. Polyface Mesh is similar to 3D Faces except it is a single entity. The Text option will label the grid elevation at the grid corner. The text is placed center justified over the grid corner. To reduce clutter, there is an option to skip rows and columns.

Specify the layer for the grid entities in **Layer Name**.

Specify the initial viewing direction in **View**.

When **Color by Elevation** is checked, the grid will be colored based on a table of user-defined elevation ranges and the assigned colors. There is also an option to subdivide the grid cells at the color zone transitions. This is similar to the Elevation Zone Analysis command. Use the Specify Elevation Zones command to define ranges and colors.

When **Draw Side Faces** is checked, the program will draw vertical faces around the perimeter of the grid. The side faces will be drawn vertically from the grid perimeter to the Sides Base Elevation. You may optionally specify the Sides Base Elevation, it defaults to 0.00.

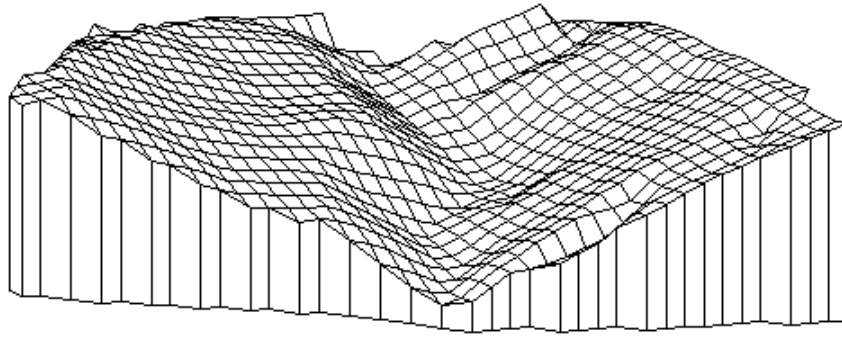
When checked, **Reverse Face Order** changes the direction of the points for a grid cell from clockwise to counter-clockwise. The order applies to shading the grid cell in 3D render viewers such as the *3D Viewer Window* command. The grid cell will only appear shaded when viewing the grid cell from the clockwise side. Viewing from the other side will show a wire frame. The default is to show the shaded side from the top-down view. This option allows you to draw the grid so that the underside of the grid is shaded.

When checked, **Draw Corners Only** will draw the side lines only at the grid corners. Otherwise side lines are drawn down each perimeter grid cell.

When checked, **Extrapolate Grid to Full Size** draws the entire rectangular surface of the grid.

When **Use Inclusion/Exclusion Perimeters** is checked, it allows you to select inclusion and exclusion areas. Only grid cells inside the inclusion polylines will be drawn. Grid cells inside the exclusion polylines will not be drawn.

When checked, **Subdivide Grid Around Inclusion Perimeter** subdivides grid cells that are partially inside and outside the perimeter into smaller resolution grid cells.



Drawn grid file using inclusion perimeter and side faces option
viewed with Viewpoint 3D

Pulldown Menu Location: Surface

Keyboard Command: plotgrid

Prerequisite: a grid (.GRD) File

Two Surface Volumes

Function

Two Surface Volumes calculates the cut and fill volumes between two surfaces modeled by grid (.GRD) files. These two grid files must have the same location and resolution. To create the grid files, use the *Make 3D Grid File* routine. When creating the second grid file, choose Use position of another file and select the first grid file. Using the position of the first grid file sets the location and resolution of second grid to match the first.

There are several other routines that calculate volumes based on grid files. Grid based volumes can be calculated by *One Surface Volumes*, *Volumes by Layer*, *Stockpile Volumes*, and *Pond/Pit Volumes*. These routines have special prompting and calculate the grid surfaces and volume in one step.

Volumes by Two Surface Volumes has three steps:

1. Creating the first grid file with *Make 3D Grid File*
2. Creating the second grid file with *Make 3D Grid File*
3. Running Two Surface Volumes

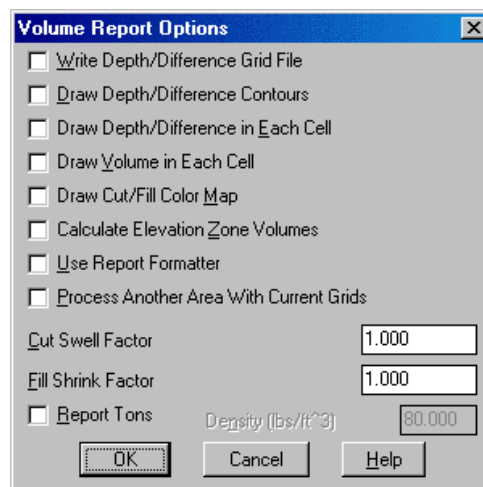
One advantage to this command is that you have more control in the creation of the grid files. Also you can draw the grid files with the *Plot 3D Grid File* routine so that you can view exactly what is being compared. Another

way to verify that the grid files model the surfaces correctly is to run the *Contour From Grid* routine and review the contours. *Two Surface Volumes* also has more output options to check volumes.

Besides grid based volumes, volumes can also be calculated between triangulation surfaces using the *Volumes by Triangulation* command. Cross section end area is another volume method that is used by the *Calculate Sections Volume* command in the Section-Profile module.

There are also options to specify inclusion and exclusion areas. When inclusion areas are specified, only the volume within this inclusion area is calculated. **Important:** Whenever possible you should use a polyline that represents the limits of disturbed area as the inclusion perimeter. Volumes within an exclusion area are not included in the calculations. Inclusion and exclusion areas are represented by closed polylines and must be drawn prior to calling this routine.

If the grid contains grid cells that have no elevations, you have the option to extrapolate elevations from the grid cells with elevations. When you choose not to extrapolate, no volume is calculated for the grid cells left without elevations. In general, extrapolation is not very accurate and should be avoided whenever possible. Sometimes you may get small amounts of cut in stockpiles that should only be fill, or small amounts of fill in pits that should only be cut. These extraneous quantities are due to extrapolation at the border and should be small enough to be ignored. When inclusion or exclusion polylines are used, the program will automatically extrapolate the grids. In addition to writing a volume report to the file, printer or screen, there are several volume report options.



Write Difference Grid File creates a grid (.GRD) file of the elevation difference of the two grid files.

Draw Difference Contours creates a contour map of the difference or depth between the two grid files.

Draw Elevation Difference in Each Cell plots the elevation difference at the grid corners which is the same as the Elevation Difference routine.

Draw Volume in Each Cell plots the calculated volume for each grid cell and is an excellent way to verify the volume calculation. If a cell contains both cut and fill, both values will be plotted.

Calculate Elevation Zone Volumes calculates the cut and fill between different elevation ranges.

Draw Cut/Fill Color Map fills each grid cell with different shades based on the average cut or fill in the cell. Red shades are used for cut and blue for fill. There is an option to draw a color legend. You can subdivide the grid cells at zone transitions. Also, there is an option to control the zone intervals and range.

Use Report Formatter allows you to customize the report by choosing the fields to report and their order. Also the report formatter can be used to output the report data to Microsoft® Excel or Microsoft® Access.

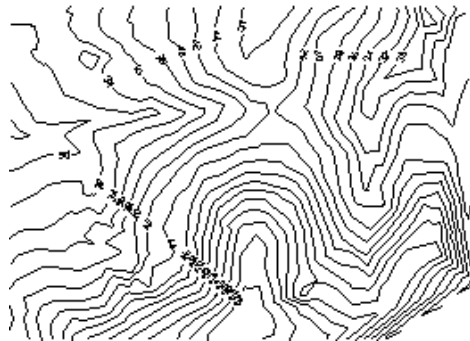
Process Another Area with Current Grids runs Two Surface Volumes again using the same grid files but different inclusion/exclusion polylines. This option saves the step of reloading the grid files to calculate volumes from the same grids for multiple areas.

The **Cut Swell Factor** value is multiplied by the cut volume in the report.

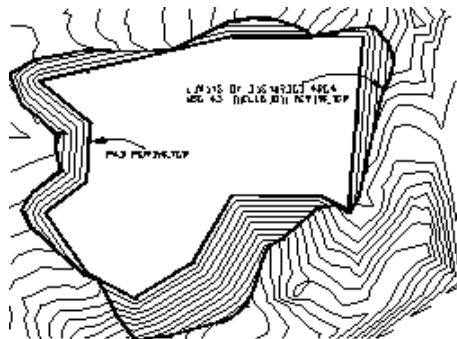
The **Fill Swell Factor** value is multiplied by the fill volume in the report.

Report Tons allows you to enter the material density and the program will report the cut and fill tons in addition to volume.

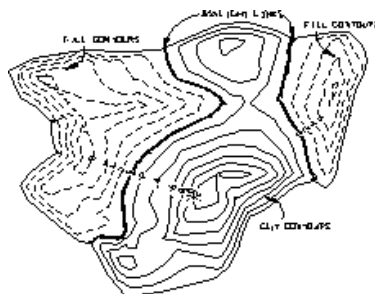
Given two accurate grid (.GRD) files, this routine will calculate accurate volumes. To verify the volume calculation, it is a good idea to check the grid (.GRD) files either by drawing them with *Plot 3D Grid File* and viewing them with *Viewpoint 3D* or by contouring the grids with the *Contour Grid File* command.



Existing surface



Final surface contours with a closed polyline to



Contours from the Draw Depth/Difference Contours option
Cut contours are red, fill contours are blue, daylight contours are green.
This is a good way to check that both surfaces are modeled correctly and to verify the volumes.

Sample Two Surface Volumes report:

Volume Report

```
Comparing Grid: C:\scad2006\data\simo.grd
and Grid: C:\scad2006\data\final.grd
Lower left grid corner : 186551.67,57624.98
Upper right grid corner: 186828.81,57897.09
X grid resolution: 75, Y grid resolution: 75
X grid cell size: 3.70, Y grid cell size: 3.63
Total inclusion area: 37016.71 sq ft, 0.850 acres
Cut to Fill ratio: 1.14
Cut (C.Y) / Area (acres): 3642.35
Fill (C.Y) / Area (acres): 3182.70
Cut vol: 83570.89 cubic ft, 3095.22 cubic yards
Fill vol: 73024.56 cubic ft, 2704.61 cubic yards
```

Prompts

Select the Inclusion perimeter polylines or ENTER for none:

Select objects: *pick a closed polyline for the limits of disturbed area*

Select objects: *press Enter*

Select the Exclusion perimeter polylines or ENTER for none:

Select objects: *press Enter*

Specify Base Grid File Selection Dialog

Choose a grid (.GRD) file to process.

Extrapolate grid to full grid size (Yes/<No>)? *press Enter* If you enter *Yes* to this prompt, surface elevations will be computed for any grid cells that have nullelevations.

Sample report from the Calculate Elevation Zone Volumes option:

(Calculates the cut and fill in different elevation ranges at a user-specified interval and beginning at a user-specified starting elevation.)

Volumes by elevation zone

```
Zone 20.00 to 30.00
Cut volume : 0.30 cubic ft, 0.01 cubic yards
Fill volume: 107.90 cubic ft, 4.00 cubic yards
Zone 30.00 to 40.00
Cut volume : 4.88 cubic ft, 0.18 cubic yards
Fill volume: 73021.14 cubic ft, 2704.49 cubic yards
Running total:
Cut volume : 5.18 cubic ft, 0.19 cubic yards
Fill volume: 73129.05 cubic ft, 2708.48 cubic yards
Zone 40.00 to 50.00
Cut volume : 65044.26 cubic ft, 2409.05 cubic yards
Fill volume: 0.25 cubic ft, 0.01 cubic yards
Running total:
Cut volume : 65049.44 cubic ft, 2409.24 cubic yards
Fill volume: 73129.29 cubic ft, 2708.49 cubic yards
Zone 50.00 to 60.00
Cut volume : 17786.85 cubic ft, 658.77 cubic yards
Fill volume: 0.00 cubic ft, 0.00 cubic yards
```

Running total:
Cut volume : 82836.29 cubic ft, 3068.01 cubic yards

Specify Final Grid File Selection Dialog

Choose a grid (.GRD) file to process.

Extrapolate grid to full grid size (Yes/<No>)? press Enter

Volume Report Options dialog

-83.8	-82.1	-63.2	-31.8	-7.5 +0.4	+15.1	+37.2	+59.4
-81.2	-78.8	-61.2	-33.8	-11.6	-0.1 +10.6	+32.7	+54.9
-77.2	-73.9	-60.4	-38.3	-16.1	-0.6 +6.7	+28.2	+50.4
-71.7	-65.6	-53.3	-36.9	-18.7	-2.1 +3.6	+23.7	+45.8
-64.1	-53.8	-40.3	-28.7	-12.7	-1.1 +4.7	+21.8	+41.6
-53.2	-40.3	-26.8	-13.3	-2.1 +2.5	+14.3	+28.5	+44.4

This shows a grid drawn by *Plot 3D Grid File* and volume values drawn by the Draw Volume in Each Cell option of the Two Surface Volumes routine. Cut appears as negative and fill as positive. Notice that cells bordering cut and fill regions contain a little of both.

Pulldown Menu Location: Surface

Keyboard Command: volcalc2

Prerequisite: Two grid files

Volumes By Layers

Function

This is the easiest yet still equally accurate method for calculating volumes. For this command, volumes are calculated in one step by a simple window of the area, selecting the items, and calculate.

First you must specify the grid location and resolution. The grid location should enclose the area for volume calculations. Next the program asks for the layer names of the entities for the base and final surfaces. These entities, for use in modeling the surfaces, can be points, lines (such as triangulation lines), 2D polylines (such as contours), and 3D polylines (such as breaklines). Inclusion and exclusion perimeters may optionally be specified to limit the

volume calculation area on the grid. An inclusion perimeter should be used if there is a closed polyline for the limit of the disturbed area. Then the program internally generates grids of the surfaces from the entities on the corresponding layers and then calculates and reports the volume. The main disadvantage to this routine is that it doesn't have the special output options of *Two Surface Volumes* such as Depth Contours.

Prompts

Pick Lower Left limit of surface area: *pick a point*

Pick Upper Right limit of surface area: *pick a point to window the entire area*

Make Grid File Dialog Choose a grid resolution.

Volumes by Layer Dialog Specify layer names. Click Select Layers to get layers of picked entities on screen.

Select surface entities on corresponding layers.

Select objects: *select all the objects on both the EXISTING and FINAL layer sets for the site.* In this example, select all entities on the perimeter, ctr, and pnt layers.

Choose Predefined Boundary Dialog Choose none.

Select the Inclusion perimeter polylines or ENTER for none:

Select objects: *press Enter*

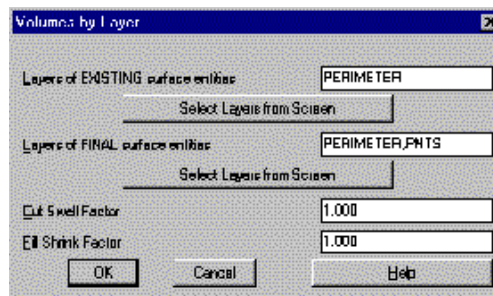
Select the Exclusion perimeter polylines or ENTER for none:

Select objects: *press Enter*

Reading cell 2500

Extrapolate grid to full grid size [Yes/<No>]? *press Enter twice*

Volume Report Choose viewing option.



Pulldown Menu Location: Surface

Keyboard Command: layervol

Prerequisite: Entities that define both the base and final surfaces.

Volumes By Triangulation

Function

Volumes By Triangulation is an alternative volume method that compares two triangulation networks. This method is different from the grid based volume routines (*Volumes By Layer*, *Two Surface Volumes*, etc.). Volumes by Triangulation calculates faster in most cases than the other methods, and it is the most accurate because it uses true TIN to TIN primordial volumes. This added accuracy in general is very small. The grid resolution is usually sufficient to model the surface for the grid based volumes. The Volume By Triangulation accuracy applies well when there is a feature like a 5 foot wide ditch. Then the grid resolution would need to be less than 5 foot to model the ditch which might be difficult on a large site.

The disadvantage to this routine is that it lacks the output options that help the analysis of the volume such as

Difference Contours. Also Volumes by Triangulation does no extrapolation and stops calculating volume at the perimeter of the smaller of the two triangulation networks. Volumes By Triangulation is better when used with point data instead of contour data because contour data requires triangulating all the contour polylines as breaklines which creates a large triangulation network and is slower.

The triangulation networks to compare are defined in .tin or .flt files that are created by *Triangulate & Contour*. *Triangulate & Contour* twice to create a triangulation (.TIN or .FLT) file for each surface. The volume calculation is limited by either the extent of the triangulation networks or by an inclusion/exclusion perimeter(s). These perimeters must be closed polylines.

with the Write Triangulation File option. Note that while both file formats are supported, the newer binary triangulation file format (.tin) is twice as fast to load and save, and half the size, of the .flt triangulation file format. For this reason, the .tin file format is recommended. Before using this command, run

Output data includes area, tons by density, average thickness, shrink and swell, ratio, and total volume.

Prompts

Select EXISTING surface Tmesh File

Choose an .flt or .tin file

Select final elevation or surface TIN [Elevation/<TIN>]? *press Enter*

Select FINAL surface Tmesh File Dialog

Choose another .flt or .tin file.

Choose Predefined Boundary Dialog Choose none.

Select Inclusion polylines *select objects*

Select Exclusion polylines *select objects*

Volume Report Choose viewing option

Comparing Triangulation files: C:\SCAD2006\DATA\TRI1.FLT
and C:\SCAD2006\DATA\TRI2.FLT

Cut volume: 66891.35 C.F., 2477.46 C.Y.

Fill volume: 43458.01 C.F., 1609.56 C.Y.

Pulldown Menu Location: Surface

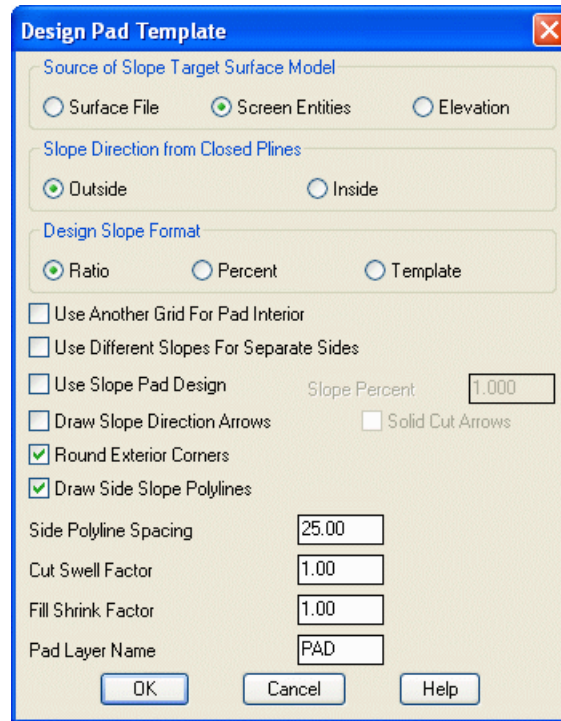
Keyboard Command: trivol

Prerequisite: Two .flt or .tin files

Design Pad Template

Function

This command creates design slopes from a perimeter polyline at specified cut/fill slopes to reach existing ground. This routine can be used to design building pads, pits, roads, ditches, stockpiles, etc. The design is drawn as 3D polylines for the cut/fill slopes and for the daylight perimeter where the design meets existing ground. Before beginning this routine, you must have drawn the polyline perimeter. The polyline perimeter can be either a 2D or 3D closed or open polyline. For a 2D polyline, the program will prompt for an elevation for the pad perimeter. With a 3D polyline, the pad perimeter is set to the elevations of the 3D polyline. For an open polyline, the program will prompt for the side for the design. With a closed polyline, the program designs the slopes either outward or inward depending on the setting in the dialog.



Under **Source of Surface Model**, choose between a grid (.GRD) file, screen entities, or a flat elevation.

For closed pad perimeters, there is a **Slope Direction from Closed Plines** option to draw the slopes inward or outward from the perimeter. The outward method starts the slopes at the design elevation of the perimeter and projects out to intersect the existing surface. The inward method projects the slopes inside to reach the grid surface or a set elevation.

Under **Design Slope Formula**, choose between Slope, Ratio, or Template. The template (.TPL) file is created in the *Design Template* routine in the Section Profile module. When using a template, the pad perimeter represents the centerline. One way to create the pad perimeter for the template is to use the *Profile to 3D Polyline* command which converts a 2D centerline to a 3D polyline using a design profile. With a template, the program uses not only the cut and fill slopes from the template file but also draws all the template grade points such as edge of road, curb and ditch. The subgrade, superelevation and template transition options of the template file are not used in this command. These options are only applied in the *Process Road Design* command. The grade points are drawn as 3D polylines parallel with the centerline. Cross section 3D polylines that include the grade points are also drawn at the specified interval.

Use Another Grid for Pad Interior will bring up a prompt for another grid (.GRD) file to use for the design surface within the starting pad perimeter. Otherwise the program will model the pad interior by straight interpolation from the starting pad perimeter elevations. For example, if a building pad has a starting pad perimeter at a set elevation and the pad is supposed to be flat, then this option is not needed. This option is needed in a case where you are designing a pit and the starting pad perimeter is a 3D polyline that follows an undulating pit bottom surface. The pad design will model the pit side slopes. In order to model the undulating bottom of the pit, you need the Use Another Grid for Pad Interior option to select a grid that models the pit bottom.

Use Different Slopes for Separate Sides allows you to specify different slopes for different sides of your pad polyline. If this is toggled ON, you will be prompted to specify two of more slope groups, then you will be prompted to select the polyline segments that belong to each group.

Use Slope Pad Design allows you to set a cross slope amount for the top of the pad. You will be prompted to screen pick two points that designate the slope direction. For automatic balancing of cut/fill quantities, you will be

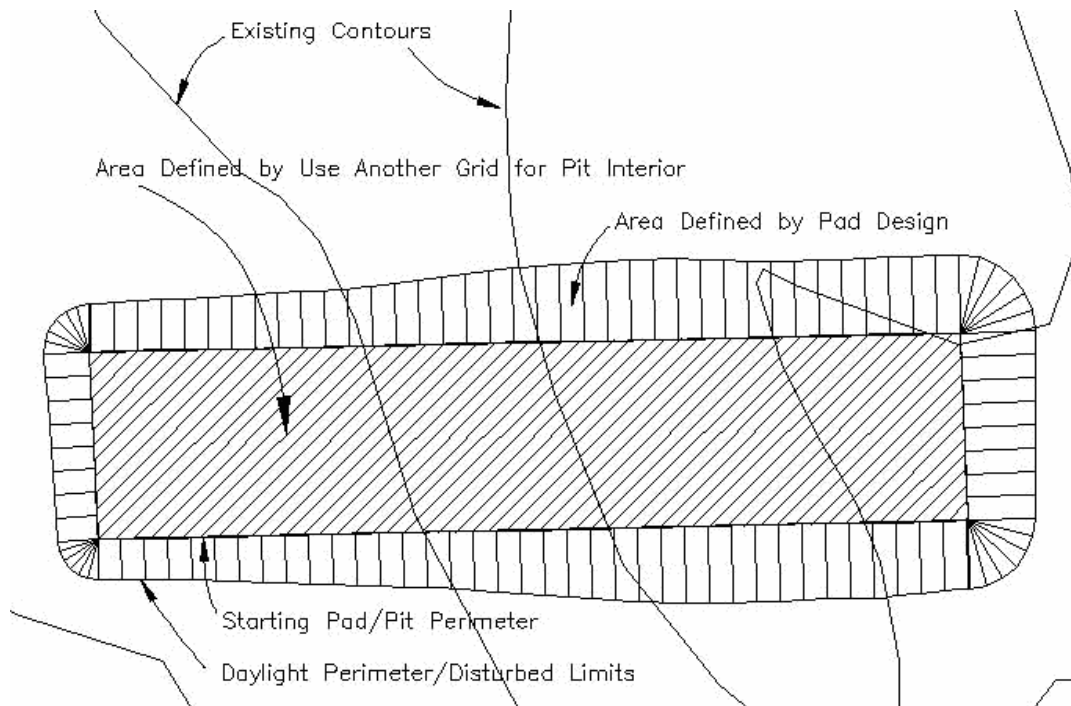
prompted to find the optimal slope and slope direction.

Draw Slope Direction Arrows draws an arrow on the outslopes that points in the downhill direction. Arrows on fill slopes are drawn as solid filled.

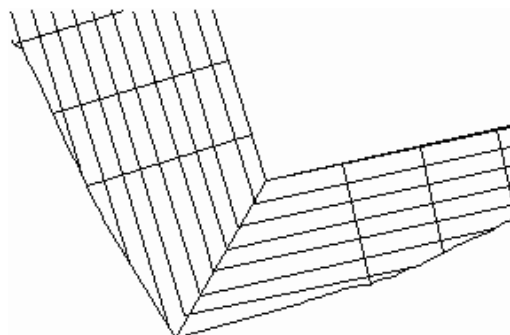
Solid Cut Arrows allows you to choose between drawing the cut arrows as solid filled or as wire frame.

Round Exterior Corners holds the outslopes around the corners. Otherwise the side outslopes stay straight until they meet at the corners as shown in the figure.

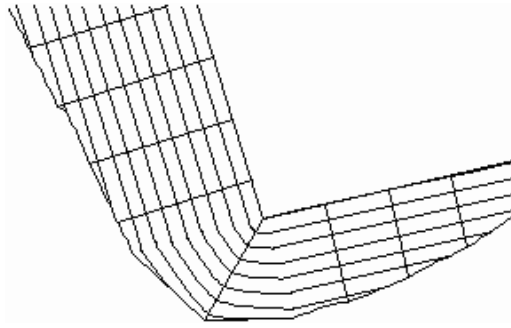
When **Draw Side Slope Polylines** is ON, Design Pad Template will draw 3D polylines perpendicular to the pad perimeter from the pad to the catch point.



Example of pit design for option of Use Another Grid for Pad Interior



Pad corner without round corners option



Pad corner with round corners option

Side Polyline Spacing specifies the interval at which to draw the Side Slope Polyline. Besides at the interval, side slope polylines are also drawn at grid corners.

Cut volume is multiplied by the **Cut Swell Factor** in the final volume report.

Fill volume is multiplied by the **Fill Shrink Factor** in the final volume report.

You must specify the **Pad Layer Name** that the pad 3D polylines will be drawn on.

There is an option to calculate volumes for the pad design. The volumes are calculated by comparing the existing surface with the pad design. The inclusion perimeter for the volume calculation is the daylight perimeter polyline which represents the limits of disturbed area. The existing surface model is defined by the existing grid (.GRD) file or screen entities selected at the beginning of the command. The pad design surface is calculated by making a grid from the pad 3D polylines including the starting pad perimeter, the side polylines and the daylight perimeter.

Besides calculating the volumes in the *Design Pad Template* routine, you can also calculate the volumes with the *Two Surface Volumes* command. The design surface for *Two Surface Volumes* can be the final output grid from Design Pad or you can create a design grid with *Make 3D Grid File* using the 3D polylines created in Design Pad. The reasons to use *Two Surface Volumes* are that this volume routine has more output options (cut/fill color maps, etc.) and you can check the volumes by plotting or contouring the grid files. Also you can combine several pads and other final surfaces by running *Make 3D Grid File* and then calculate the overall site volumes with *Two Surface Volumes*.

The surface is defined by a 3D rectangular grid mesh. The grid can be selected from a grid (.GRD) file or calculated by the routine. When calculated, *Design Pad Template* internally creates a grid mesh from the surface entities found by doing a crossing selection of the grid limit. Make sure that the grid area covers the entire area for the pad including room for the cut/fill slopes.

The design is drawn as 3D polylines and the earthwork volumes are calculated. Before ending, the program allows you to adjust the design by changing the pad elevation, slopes and offset. The program can find the cut/fill balance by automatically adjusting the pad elevation. If adjustments are specified, the pad polylines are redrawn and the volumes recalculated. At the end, there is an

option to trim existing contours inside the disturbed limits of the pad. Then there is an option to draw contours on the pad. If contouring is selected, a dialog lets you set the contouring options. Usually you should specify a new contour layer and turn off smoothing.

The cut and fill slopes can be defined by ratio, percent slope or template file. Using a template file lets you do road design without cross sections. Instead the existing surface is modeled by the grid. To do road design by cross section, use the *Process Road Design* command in the Section Profile module.

Prompts

Pick Lower Left limit of pad disturbed area: *pick lower left* These prompts appear for the Screen Entities surface model method.

Pick Upper Right limit of pad disturbed area: *pick upper right* Be sure to pick these limits well beyond the area of the top of pad polyline in order to make room for the outslopes.

Make Grid File Dialog After selecting the limits of the disturbed area the program will generate a 3D grid that represents the surface. Specify the grid resolution desired and select OK.

Pick the top of pad polyline: *select perimeter polyline*

Enter the fill outslope ratio <2.0>: 2.5

Enter the cut outslope ratio <2.0>: 2.5 After entering outslopes slope ratios, a range of elevations along the pad top will be noted.

Enter the pad perimeter elevation <29.54>: 39

Calculate earthwork volumes (<Yes>/No)? *press Enter*

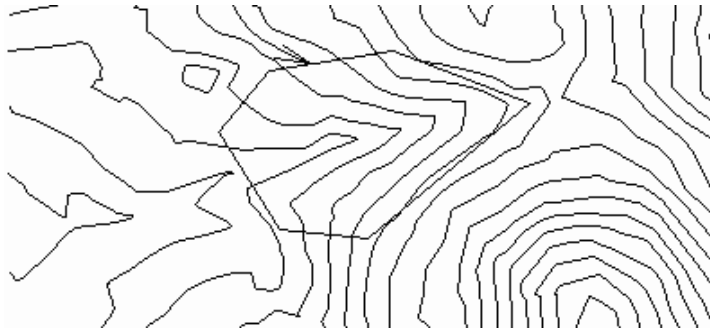
Report Viewer Reports cut/fill volume.

Write final surface to grid file (Yes/<No>)? *press Enter* This option will output a grid file using the elevations of the pad within the disturbed area polyline and using the original ground surface everywhere else.

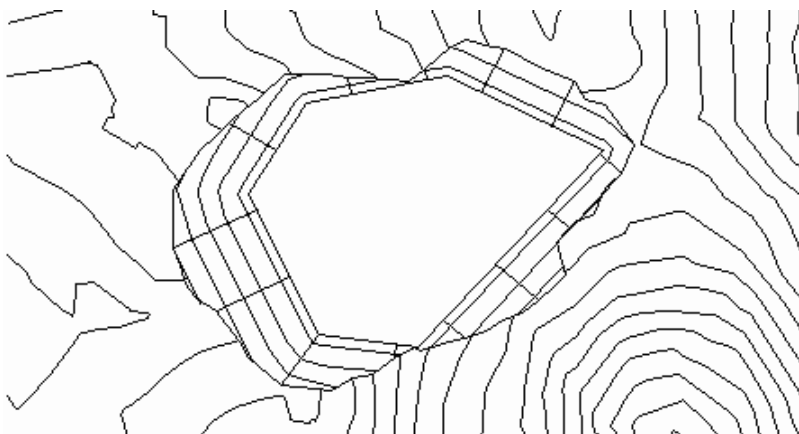
Adjust parameters and redesign pond (Yes/<No>)? *press Enter*

Trim existing contours inside pad perimeter (Yes/<No>)? *press Enter*

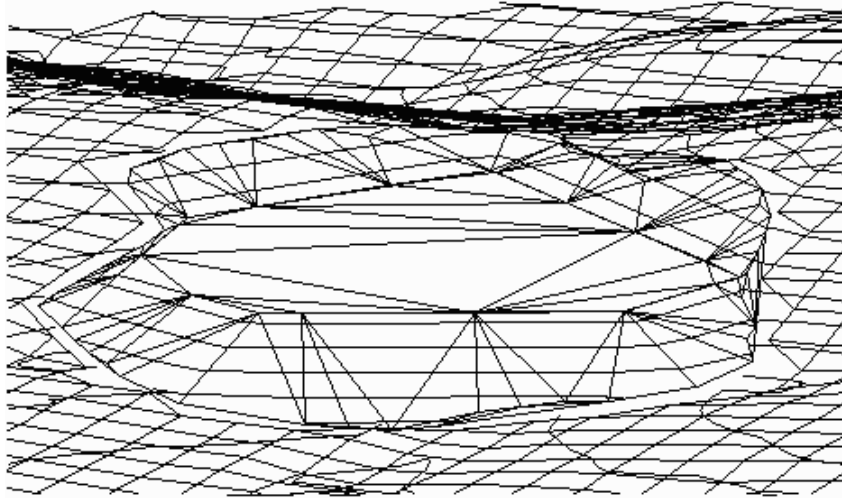
Contour the pad (<Yes>/No)? *press Enter*



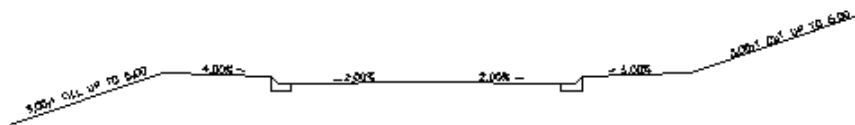
Existing contours with top of pad perimeter polyline



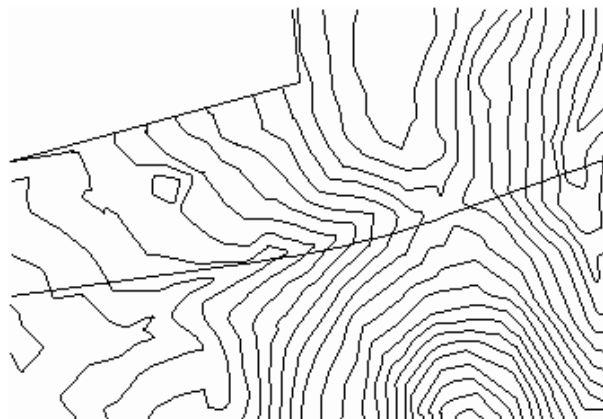
Pad template with contours



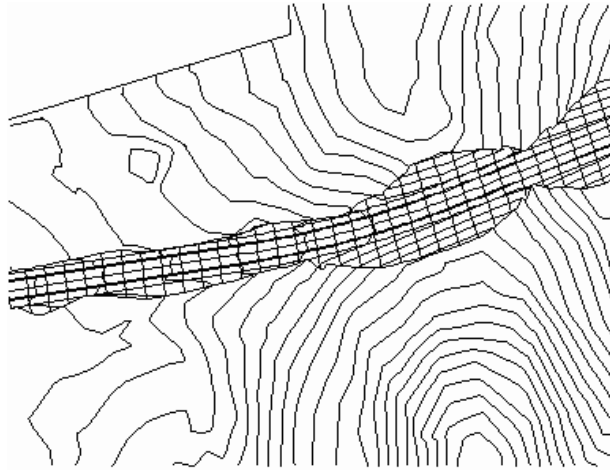
3D view of pad with DTM of surface and triangulation faces of pad



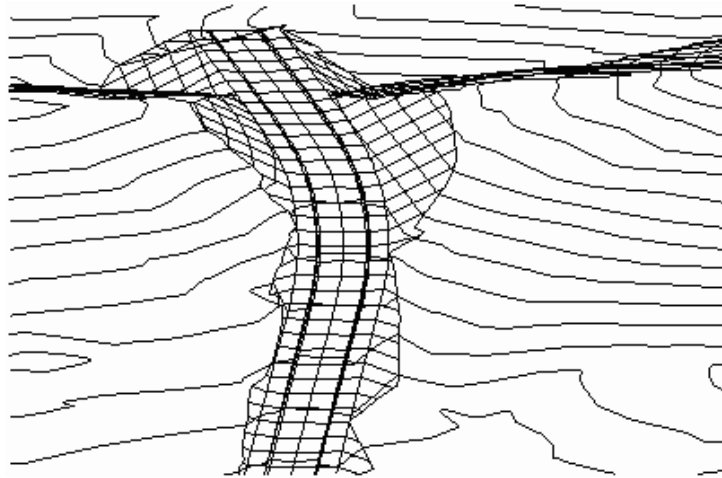
Template to apply in Design Pad Template



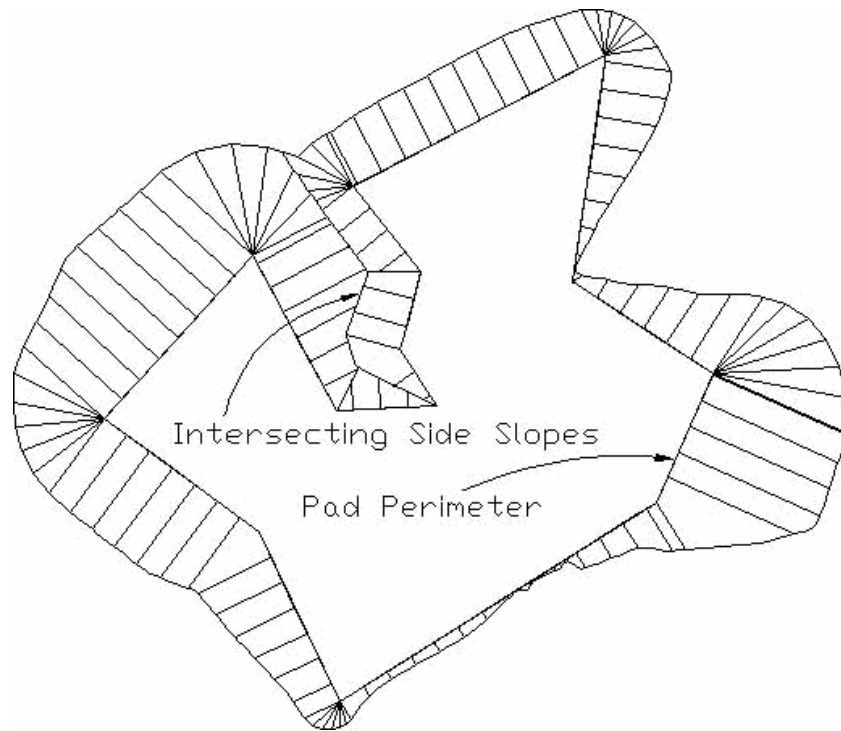
Existing surface with 3D polyline centerline



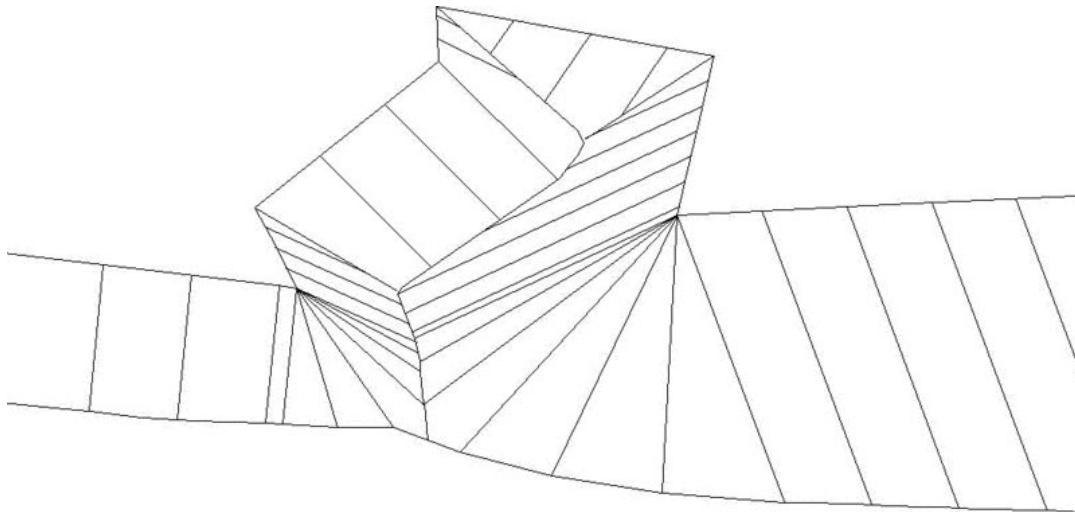
Result of Design Pad Template showing template grade polylines, cross section polylines, cut/fill slopes, and final contours



Viewpoint 3D view of Design Pad Template



Design Pad Template can also handle self-intersecting side slopes



Viewpoint 3D view of intersecting side slopes

Pulldown Menu Location: Surface

Keyboard Command: pad

Prerequisite: A pad perimeter polyline and surface entities or a grid (.GRD) file

Spot Elevations By Surface Model

Function

This command will calculate the Z coordinate of any point that falls within the surface model. Use this command to calculate the elevations for points of a design for slope staking or for putting spot elevations on a topography map. The calculated points are stored in the current coordinate (.CRD) file. A surface model is either selected from a grid (.GRD) or triangulation (.FLT) file or internally calculated from the existing entities on the drawing.

Spot elevations can be calculated at various user-specified points or at a specific interval. For random spot elevations, the user picks or enters the X,Y coordinates for each spot elevations. The elevation at the current position of the crosshairs is displayed in real-time in a small window. For interval spot elevations, the alignment for the intervals is defined by a polyline that must be created before starting this routine.

Prompts

Source of surface model (File/<Screen>)? *press Enter* Use the File option to select a grid (.GRD) or a triangulation (.FLT) file.

Layer for points <POINTS>: *press Enter*

Add spot points to Coordinate File (Yes/<No>)? *Yes* This option stores any points created in this routine to a .crd file and draws Carlson point entities.

Draw nodes only (Yes/<No>)? *press Enter* This prompt only appears if Add points to Coordinate File is off. This option either draws only AutoCAD POINT entities or an X mark and elevation text.

Pick Lower Left limit of surface area: *pick a point at the lower left corner of your area of interest*

Pick Upper Right limit of surface area: *pick a point to window around your area of interest*

Make Grid File Dialog Choose a grid resolution for modeling the surface.

For picked point spot elevations:

Random spot elevations or interval along pline (<Random>/Interval)? *press Enter*

Enter or pick point (Enter to end): *pick a point*

Enter or pick point (Enter to end): *press Enter*

For spot elevations along a polyline:

Random spot elevations or interval along pline (<Random>/Interval)? *Interval*

Pick the centerline polyline: *pick a polyline*

Interval along polyline <50.0>: *25*

Number of left offsets <0>: *1*

Enter left offset interval <25.0>: *10*

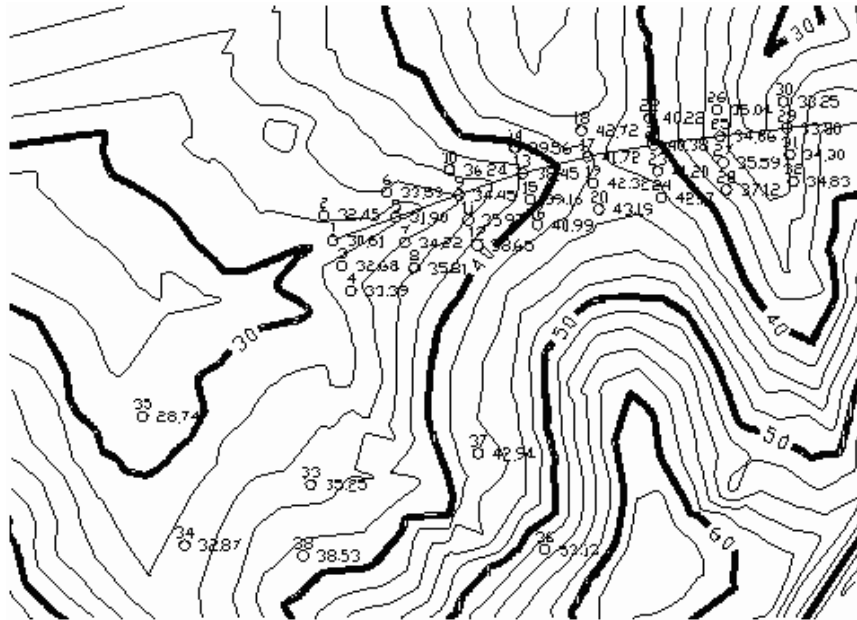
Number of right offsets <0>: *2*

Enter right offset interval <10.0>: *press Enter*

x 41.48
x 39.71
x 45.33

x 41.75 x 50.44

Spot Elevations with Add to Coordinate File off
and Draw Nodes Only off



Interval spot elevations for points 1-32. "Random" spot elevations for points 33-37.

Pulldown Menu Location: Site

Keyboard Command: spotelv

Prerequisite: Surface entities or a grid (.GRD) file

Tag Hard Breaklines

Function

This command tags polylines with a description so that the Triangulate & Contour command can identify these polylines as hard breaklines. The tag is invisible and doesn't change the polyline. Triangulate & Contour will not smooth contours as they cross these hard breaklines. For example, you can tag 3D polylines that represent a wall so that contours go straight across the wall without smoothing curves.

Prompts

Select hard breaklines.

Select objects: *select polylines*

Pulldown Menu Location: Surface

Keyboard Command: hardbrk

Prerequisite: Polylines

Untag Hard Breaklines

Function

This command removes description tags from polylines. These tags are used by the Triangulate & Contour command to identify polylines as hard breaklines. Contours are not smoothed as they cross hard breaklines. This command untags polylines so that contours are smoothed across them.

Prompts

Select polylines to remove hard breakline tag from.

Select objects: *select polylines*

Pulldown Menu Location: Surface

Keyboard Command: softbrk

Prerequisite: Polylines with hard breakline tag

Convert LDD-AEC Contours

Function

This command allows you to convert Autodesk Land Desktop contours (known as AECC.CONTOUR objects) into polylines. You must have the AEC Object Enabler installed before using this command. If you do not have the object enabler installed, download the latest version from www.autodesk.com.

You can use the *List* command to determine if contours are polylines or AECC.Contour objects. Here is an example listing:

AECC.CONTOUR Layer: "CONT-MJR"

Space: Model space

Handle = 429

Major Contour Interval

Elevation: 1005.00

Smoothing: None

Number of Vertices: 48

Open

Length: 560.25

Constant width: 0.00

Style Name: Standard

Prompts

Select AEC Contours to convert

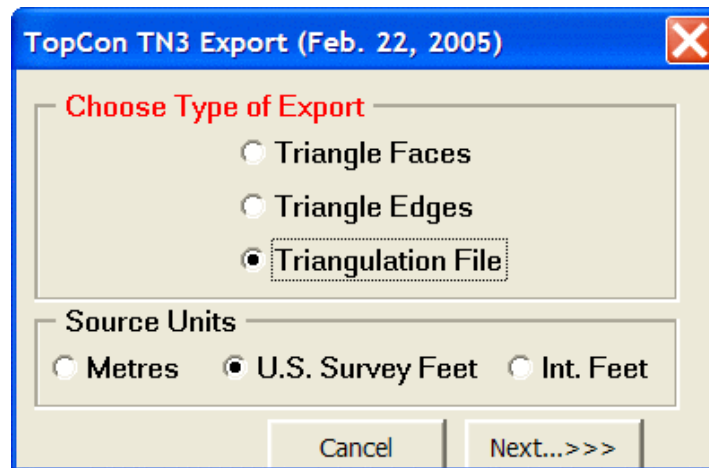
Select objects: *pick the AEC contour entities*

Pulldown Menu Location: Surface
Keyboard Command: aec_cntr
Prerequisite: AEC Contours to convert

Export Topcon TIN File

Function

This command writes a Topcon TIN file (.TN3) from 3d Faces, TIN lines, or triangulation files (.flt).



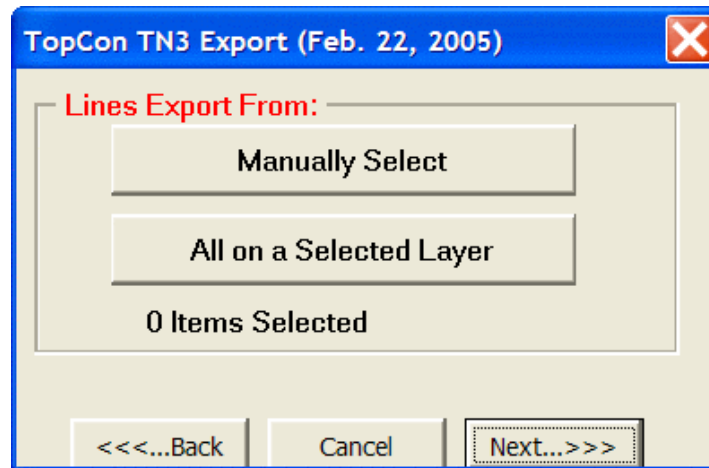
Choose Type of Export

- **Triangle Faces:** Triangulation networks that consist of edge matched 3DFaces defined by three points.
- **Triangle Edges:** Triangulation Networks that consist of edges drawn with Lines defined by two points.
- **Triangulation File:** A Carlson triangulation file (with a DOS extension of .flt).

Source Units: Select the appropriate unit type of the entities to be exported, then press NEXT.

If the Triangulation File option is chosen, a standard windows file selection dialog will open to allow for the selection of the .flt file.

If Triangulation Edges or Faces are used for the export, you must select the entities to be exported from the screen. The following dialog opens:



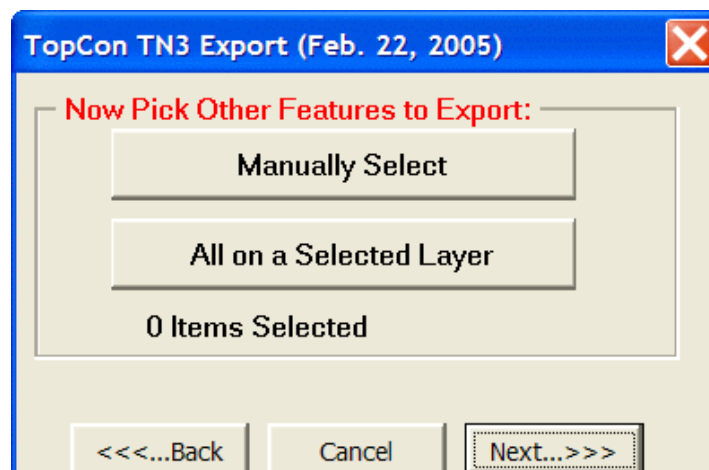
Manually Select allows on-screen selection with any of the various methods (Window, Crossing, Crossing Polygon, etc.)

All on a Selected Layer allows selection of a single entity. The command then selects all Lines or 3DFaces on the layer of the selected entity for export, filtering entities not on selected layer.

Generally, you can select any entities drawn on the screen without special care. The command filters out all types except Lines or 3DFaces depending on the type selected.

When Processing Lines: Crossings, crossing polygon, and fence selection sets can often result in "spikes" around the edges. The command generally discards these spikes, or reconnects them. In any case, better results are developed with clean selections of drawing entities.

Pressing NEXT will open the following dialog:

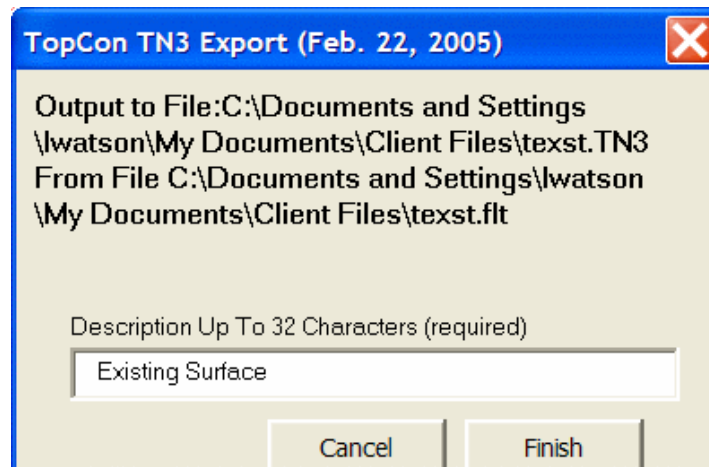


Other Features to Export: Often times, landmark lines, or other features will assist in orientation to the user when using the TN3 file in the field. For example: Property lines, project centerlines, or other well established reference lines. These features may be added and displayed on the TN3 by choosing them at this prompting. The Other Features dialog opens with all three Source Formats.

Selections are made as described above.

Once the selections are made and the dialog reappears, press NEXT.

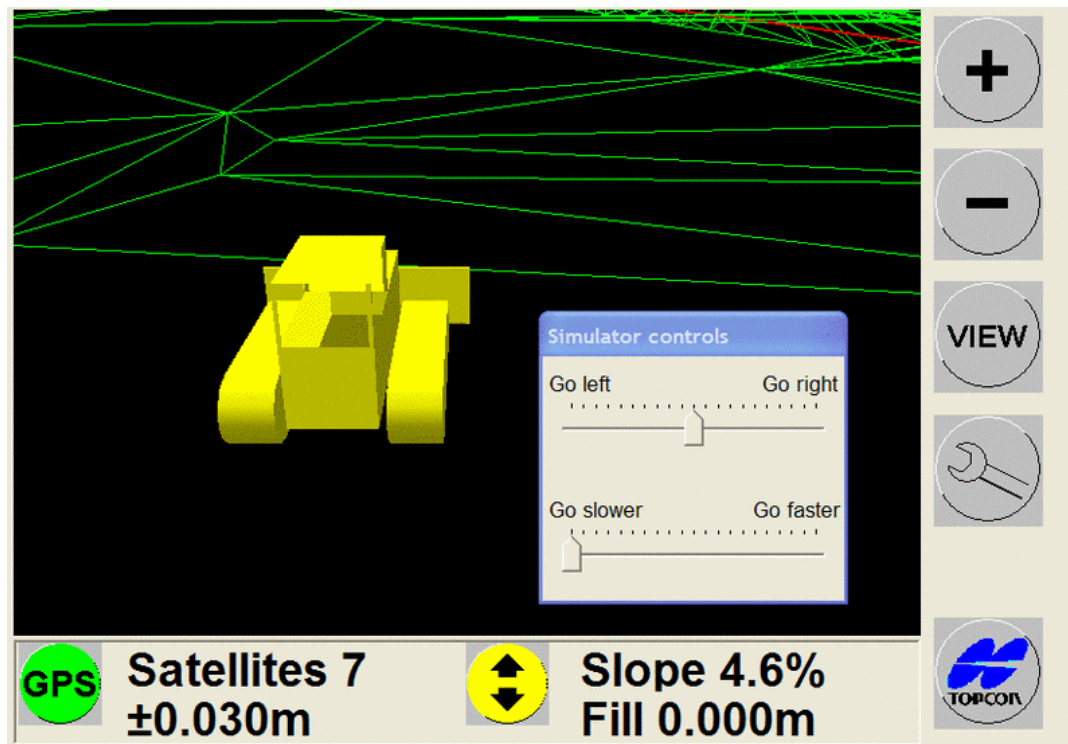
Naming the TN3 File: After all the triangulation and feature items are selected from the graphics screen, the command requests a name for the output file. Once a name is given, the following dialog reviews all the selections made. A description for the job can be added at this time. Press Finish when ready to proceed.



The program will process the selected entities and/or files and report as shown here:



To view the final output, press the Run Simulation button, or press Exit to return to the Carlson program.

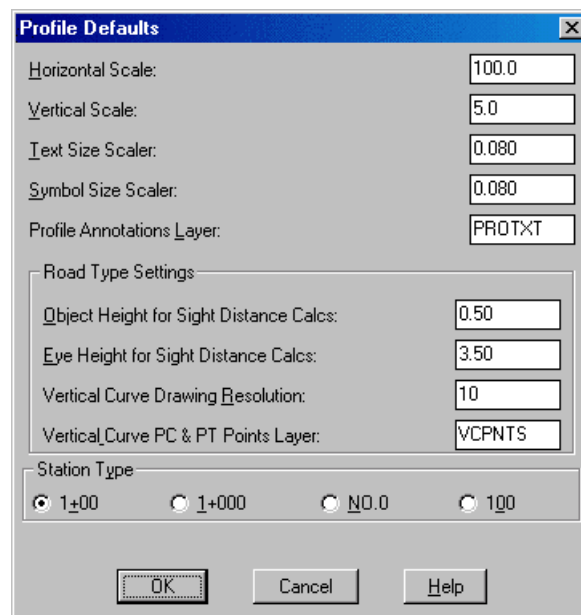


Run Simulation Dialog

Profile Defaults

Function

This command allows you to specify the default parameters for working with profiles.



Horizontal Scale: Specify the horizontal scale.

Vertical Scale: Specify the vertical scale.

Text Size Scaler: Specify the text size scaler. This value is multiplied by the horizontal scale to obtain the final text height.

Symbols Size Scaler: Specify the symbol size scaler. This value is multiplied by the horizontal scale to obtain the final symbol size.

Profile Annotations Layer: Specify the layer that the profile text will be plotted on.

Object Height for Sight Distance Calcs: Specify the object height value used when a sight distance is calculated.

Eye Height for Sight Distance Calcs: Specify the eye height value used when a sight distance is calculated. The sight distance defaults are set to the AASHTO standards but can be changed as conditions dictate such as for an accident study or for metric values.

Vertical Curve Drawing Resolution: Specify the length for line segments that are generated to represent vertical curves. Default value is 10.0

Vertical Curve PC & PT Points Layer: Specify the layer that the endpoint nodes of the vertical curve will be plotted on.

Station Type: Specify the format for the station labels: 1+00 is the default, 1+000 is for metric, NO.0 is the Korean format.

Pulldown Menu Location: Surface

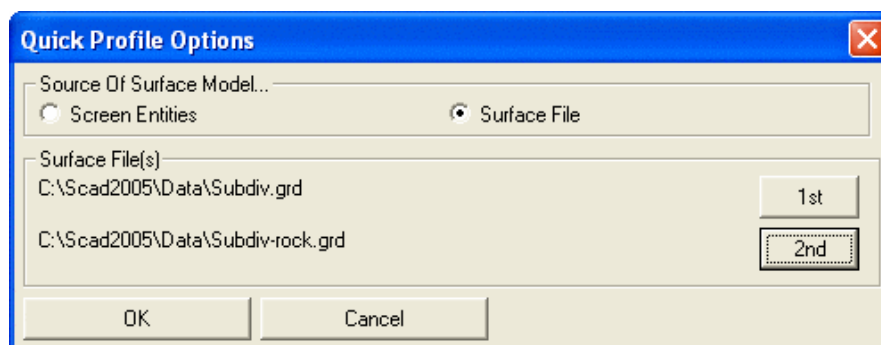
Keyboard Command: PRD

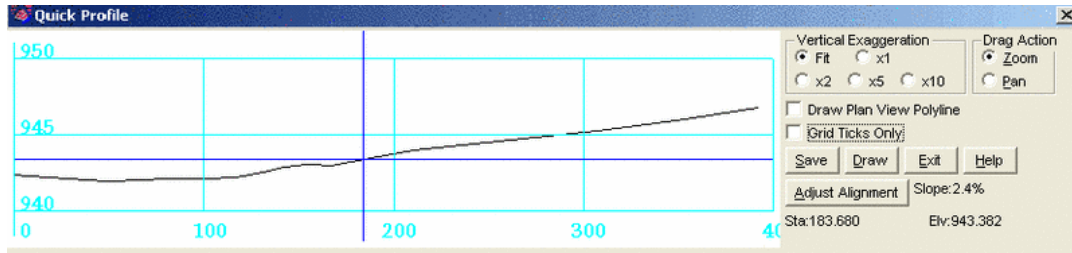
Prerequisite: None

Quick Profile

Function

This command allows you to create a profile in one step using picked points, a centerline file or a polyline to define the horizontal alignment and 3D screen entities or surface files (.GRD or .FLT) to define the vertical alignment. Since picked points are the default for the horizontal alignment, the command is as quick as select surface type (screen or file), then *Pick, Pick, Enter* and view. The resultant profile is displayed in a graphic dialog box with real time data reporting. As the crosshairs are moved across the profile in the window, the station, elevation and slope data corresponding to the current crosshair location appear in the lower right of the window. A second crosshair on the plan view corresponds to crosshair movement along the profile so the user knows exactly where the current profile point is on the plan view.





Vertical Exaggeration: Determines the amount of vertical exaggeration for the profile in the window.

Drag Action: Determines whether the right mouse button functions as "Zoom" or "Pan" in the profile window.

Grid Ticks Only: Instead of the full graph as shown above, Grid Ticks only plots only ticks along the horizontal and vertical axis near the station and elevation text.

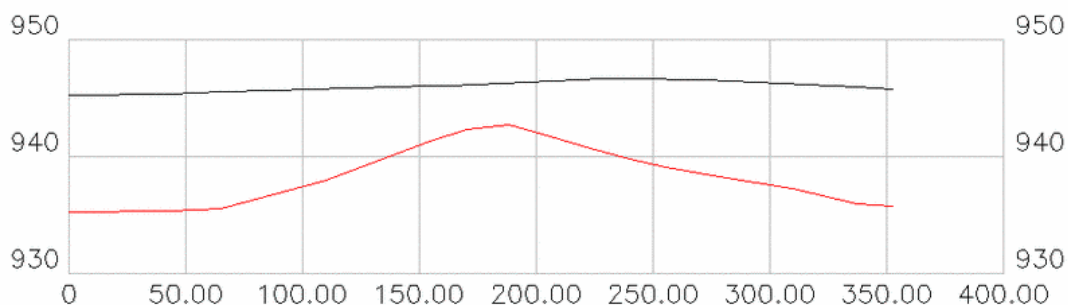
Save: Writes the current profile data to a .PRO file.

Draw: This draws the profile with grid in the drawing. The user has options for horizontal and vertical scales and the layer of the profile. The Draw Profile command includes more options for drawing the profile. In order to use this command, you must first create a .PRO file using the Save command described above.

Exit: Exits this command.

Help: Opens on-line help.

Note that the Draw option will exit the Quick Profile command after the drawing is complete. A typical completed drawing, in this case with two surfaces, is shown below. Note also that the horizontal stationing text offset follows the setting in the Draw Profile command itself.



Prompts

Pick starting point (CL-Centerline, P-Polyline): *screen pick alignment points for profile*

Pick second point: *pick next point*

Pick next point (Enter to end): *press enter to end*

Tested 58 of 58 Entities Intersects found > 33

Dialog Box

Opening file c:/scad2005/data/quickpro.pro for write. Note that the 2nd surface profile, if used, is named QUICK-

PRO2.PRO.

Pulldown Menu Location: Surface

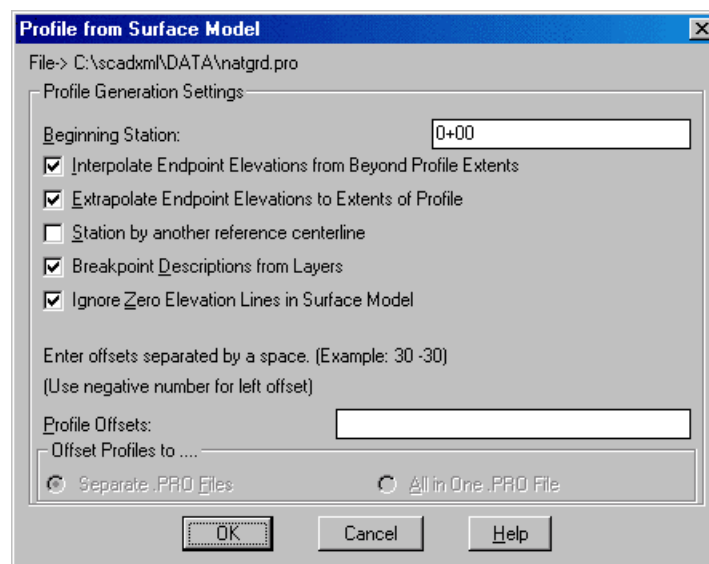
Keyboard Command: quickpro

Prerequisite: 3D screen entities and a grid (.GRD) or triangulation (.FLT) file

Profile from Surface Entities

Function

Profile from Surface Entities creates a profile from contours, triangular mesh, and other 3D drawing entities. The method is to draw a polyline as the profile centerline. Then the profile is derived from the intersections of this polyline with the 3D entities. For added accuracy in pulling the profile, include the triangular mesh as well as the contours.



File: Displays the name of profile to be created.

Beginning Station: Specify the beginning station for the profile.

Interpolate Endpoint Elevations from Beyond Profile Extents: When checked, the program will look past the ends of the centerline for additional intersections with 3D entities. These additional intersections will then be used to interpolate the elevation at the starting and ending station of the centerline.

Extrapolate Endpoint Elevations to Extents of Profile: This option uses the slope of the last two elevation points of the profile and calculates the elevation of the endpoint from this slope.

Station by another reference centerline: When checked, the program will prompt you to pick another centerline polyline. The intersection points along the first centerline are then projected onto the second centerline. The profile then stores the elevation of the intersection with the station along the second centerline.

Breakpoint Descriptions from Layers: When checked, breakpoint descriptions are assigned based on layer name of surface entities. These descriptions are used in routines such as *Input-Edit Profile* and *Profile Report*.

Ignore Zero Elevation Lines in Surface Model: When checked, any zero elevations selected in the surface model are ignored.

Profile Offsets: Specify optional offset profiles. Enter offsets separated by a space. Example: 30 -30 (to create 30' left and 30' right offset profiles). After entering the offset values, press TAB to select file options described below.

Offset Profiles to: Specify whether offsets profiles should be created as separate profile (.PRO) files, or included in a single profile (.PRO) file. Only available if you specify Profile Offsets above. Offset profiles are automatically named by combining the profile name and the offset. For example, if the profile is named NATGRD.PRO and you create a 30' right offset profile, it will be named NATGRD30.PRO.

Prompts

Profile File to Write dialog Specify a new profile file (.PRO) name to create.

Profile from Surface Model dialog Make choices, click OK.

Polyline should be drawn in direction of increasing stations.

CL File/<select polyline which represents the profile centerline>: *pick the centerline* (Do not press Enter.)

Select Lines, PLines, and/or 3DFaces that define the surface for profiling.

Select objects: *C* (for crossing and window everything the centerline crosses) or *All* (to select all objects on the drawing)

Pulldown Menu Location: Surface

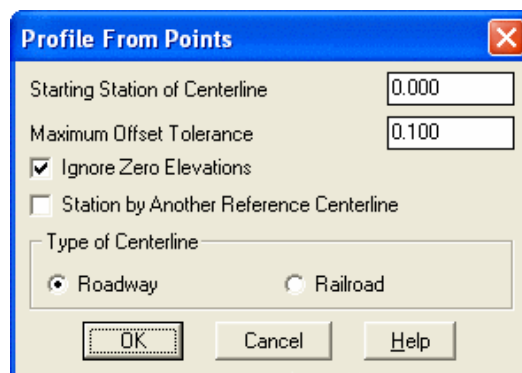
Keyboard Command: prosm

Prerequisite: A polyline centerline and surface lines and polylines.

Profile from Pts on Centerline

Function

This command creates a .PRO file from Carlson points and a centerline that is represented by a polyline or centerline file. The elevations of the profile are derived from the elevation of the points and the stationing for these profile points is calculated from the distance along the centerline. The points must be within the offset distance from the polyline in order to be included in the profile. The polyline or centerline should be drawn (or defined) in the direction of increasing stations.



Prompts

PROfile file to Write dialog box: Enter a new profile file name to write.

CL File/<Select polyline that represents centerline>: *pick a polyline or choose C for Centerline*

Select Centerline file if Centerline option is used. If the desired points are further from the centerline, enter a larger maximum offset tolerance.

Note: for all selected points, the points should be located on the real Z axis.

Select the Carlson Software points along the centerline.

Select objects: Select the point entities.

Pulldown Menu Location: Surface

Keyboard Command: profpts

Prerequisite: A polyline centerline and Carlson point inserts

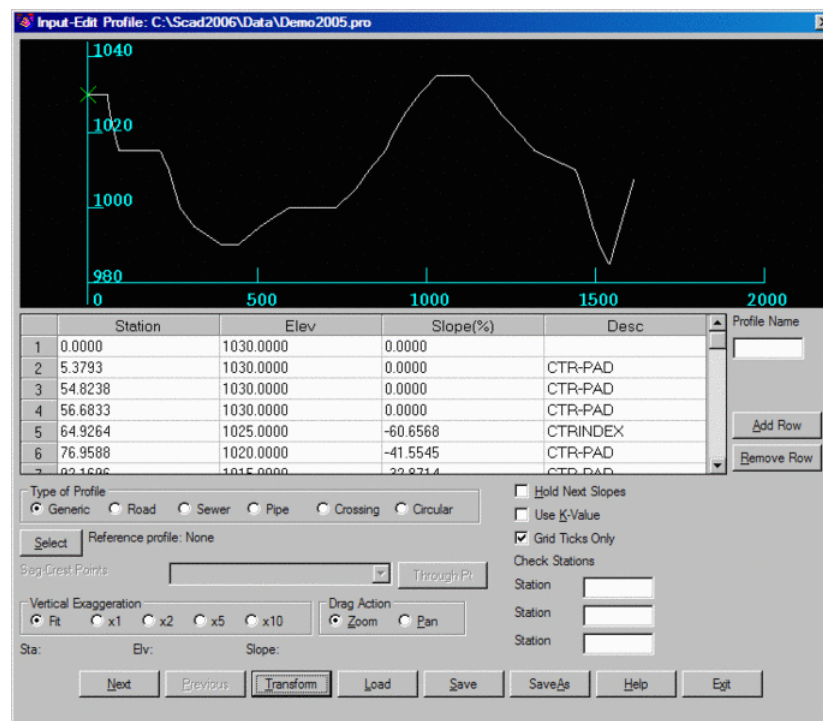
Input-Edit Profile

Function

This command is a spreadsheet type editor for profile (.PRO) files. Besides editing a profile, this routine can be used to just view the contents of a profile. Also, a new profile can be entered by editing a previously empty or non existing file.

The opening dialog below shows the layout of this editor. At the top of the dialog, you can dynamically see the profile and vary its appearance by using zoom and pan. You can change the look of the profile more by using the vertical exaggeration multipliers. The station, elevation and slopes are also shown at the lower left of the dialog, fluctuating with the movement of the cursor. Then there are between five and nine columns for the possible fields in a profile. Which columns are active depends on the type of profile: generic, road, sewer, pipe, crossing or circular. Six rows are visible at a time. To view different rows, use the scroll bar on the right. When a greater amount of columns are in use, use the scroll bar at the bottom. The Profile Name edit box is an optional identification name used by multiple profiles in Draw Profile. The Add Row and Remove Row buttons, when used, will dynamically and immediately make changes to the profile image at the top.

On the right is a column for Check Stations which report the elevation at the specified stations. The Check Stations are not stored in the profile. This is a design tool for viewing the elevations at certain stations while adjusting the profile data. The last line has eight action buttons.



Add Row: Adds a new row into the profile after the current row.

Remove Row: Removes the current row.

Type of Profile: Choose. Column titles and the amount of columns will change accordingly.

Hold Next Slopes: A toggle that may applied or left blank.

Use K-Value: Toggles between displaying K-Value and Sight Distance in the fifth column for road profiles.

Select Reference profile: An option to show a second profile as reference.

Next: Used for navigation when editing a .PRO file containing multiple profiles, loads the next profile.

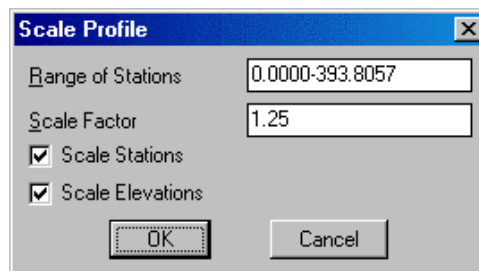
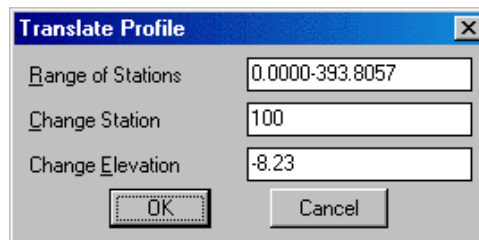
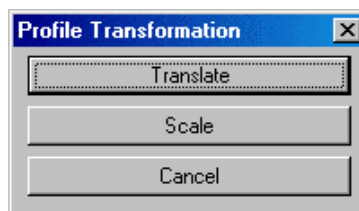
Previous: Used for navigation when editing a .PRO file containing multiple profiles, loads the previous profile.

Transform: Allows you to either Translate or Scale the profile. Translate globally adds or subtracts value to stations and/or elevations within the specified range of stations, while Scale will apply the specified scale factor to stations and/or elevations within the specified range of stations.

Load: Used for loading another, existing .PRO file for editing.

Save: Saves the profile using the current profile file name. The current profile file name is displayed in the top title bar of the dialog box.

SaveAs: Allows you to save the profile under a different profile file name.



Pulldown Menu Location: Surface

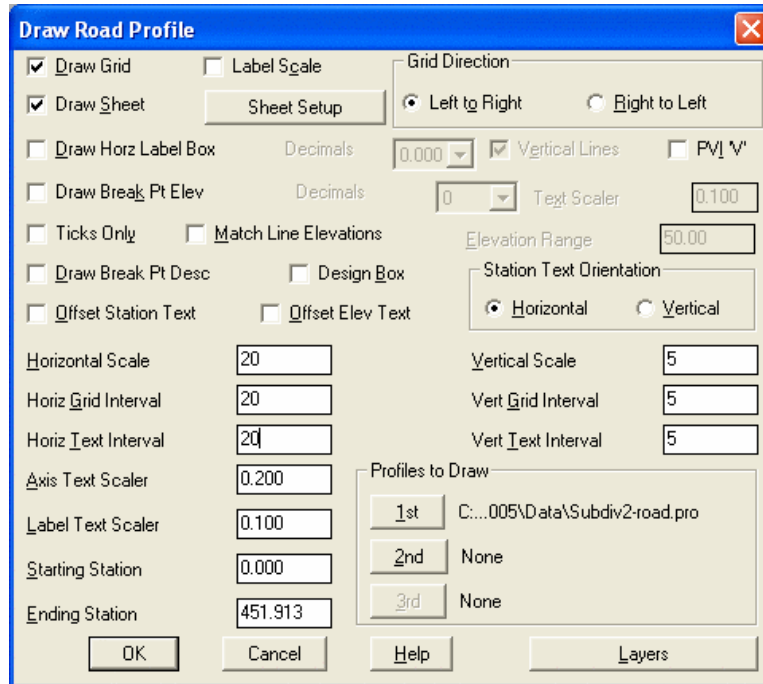
Keyboard Command: profedit

Prerequisite: None

Draw Profile

Function

Draw Profile is a flexible routine for drawing a profile anywhere in the drawing. The profile may be drawn with or without a grid or with just tick marks. The vertical curve annotations, for a road profile, and manhole annotations, for a sewer profile, may also be drawn. Draw Profile uses the profile information that is stored in .PRO files. Once the profile is drawn using Draw Profile, the design and labeling routines of the Profiles dropdown are applicable to the profile. The first step in Draw Profile is to choose a profile (.PRO) file. After selecting a file, the Draw Road Profile dialog box appears which defines how to draw the profile.

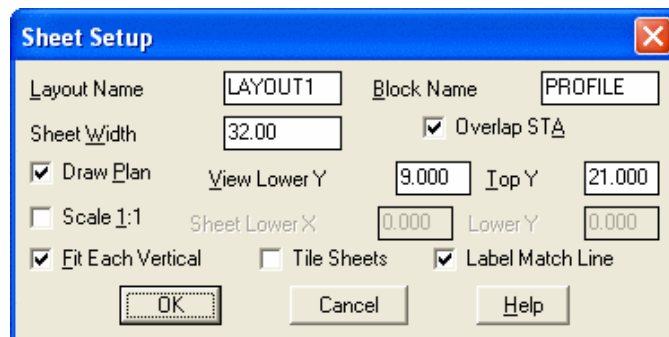


Draw Grid: This option will draw a grid and axis elevations for the profile.

Label Scale: Click on this option and you obtain a scale drawn at the lower left corner of the profile.

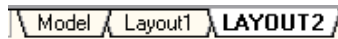
Grid Direction: Profiles can be drawn Left to Right (the default) or Right to Left. Although most profiles are drawn left to right, if you have a road that runs east to west and you wish to draw the profile stationing beneath the actual road stationing, then choosing a Right to Left profile may be appropriate. Unavailable when Draw Sheet is checked.

Draw Sheet: When checked, the profiles will be drawn in paper space. When used along with the Draw Plan options within Sheet Setup, plan and profile sheets can be created. In AutoCAD 2000 and later, each plan and profile sheet is created in its own layout tab. When the plan and profile is drawn, you are placed in tilemode=0 and paper space. Click the "model" space tab (shown below) to return to model space to edit the plan view features, for example. The options within Sheet Setup become available when this toggle is checked on. Here is the Sheet Setup dialog:



Layout Name: Enter a name for the paper space "tabs" to be assigned to each layout for each sheet. The program

will automatically divide the plan view (if "draw plan" is clicked) and the profile view into sheet layouts, and if the length of the profile extends beyond a single sheet, then multiple layouts are created, with the layout name ID incremented by 1. If you enter "ms" to go to model space within a layout tab, you can pan to alter the plan view position. Its best to zoom in/out and edit within the Model tab. The Layout tabs appear at the bottom of the screen, along with the "Model space" tab to go back to standard plan view:



Block Name: This is the drawing name for the plan and profile sheet to be inserted. Carlson Survey provides a standard plan and profile drawing in the form of Profile.dwg located in the Support subdirectory. You may wish to revise Profile.dwg, add your company logo, and re-save it as Profile1.dwg or you could add your own complete version of a Plan and Profile sheet. If you choose the latter, you should examine the scale, dimensions and the lower left corner of Profile.dwg, and try to duplicate those dimensions and corner coordinates in your own drawing. It is also important to store all your standard profile sheets in the Support subdirectory. You cannot draw Right to Left in Sheet mode. Note that the Sheet mode will re-orient the centerline left to right, which may cause text (such as the stationing) to plot upside down, until you use the *Flip Text* command under the Edit menu.

Sheet Width: This is the profile width, in inches, on the sheet. Even though the sheet is a fixed size, you can limit the length of the plot to 32 inches or less with this entry. If we used an entry of 16 for the example profile above, two plan and profile sheets would be created, because the first sheet would go from station 0+00 to 3+20 (16 inches at a 20 scale) and the second sheet would finish from 3+20 to 4+51.91. In English units, a typical entry here would be 30 for 30 inches.

Overlap Station: In multiple plan and profile sheet plotting, after the first sheet, all subsequent sheets will have the first 2 stations in common with the last 2 stations on the previous sheet, if the Overlap Station option is turned on. For example, if the last 2 stations are 3+10 and 3+20 on sheet 1, then sheet 2 will start with 3+10, then 3+20, with this option turned on. With this option turned off, if the first sheet ends with 3+20, then the second sheet would begin with 3+20.

Draw Plan: With this clicked on, you are asked to select the polyline that represents the centerline, and the program best fits the centerline in the plan view portion of the plan and profile sheet, then captures all of the associated drawing that will fit in that paper space window. If the length of the polyline divided by the scale exceeds the Sheet Width entry (for example, 5000 feet of road divided by 50 Horiz. Scale is 100, which exceeds the sheet width), then multiple plan and profile sheets will be automatically created. A 5000 foot road at 50 scale with a 30-inch sheet width, would lead to 3 full sheets of 1500 feet each and a "leftover" fourth sheet showing the last 500 feet.

View Lower Y: This sets the lower position of the paper space window for the plan view. With Lower Y set to 9 (inches above the base of the sheet) and Top Y set to 21, there is a 12 inch vertical window, running the full Sheet Width (typically 30 to 32). This window for the plan view can be expanded or reduced with these settings.

Top Y: This sets the top vertical limit for the plan view window, measured in inches from the bottom of the plan and profile sheet.

Scale 1:1: With this clicked off (the default), the profile will draw in scaled units (e.g. 1"=50'), with a 1500-foot profile measuring 1500 feet. With this clicked on, the units will be 1:1. A 30-inch profile sheet will measure 30 units, even though the centerline and profile may be 1500 feet in length. If the Scale 1:1 option is turned on, then you cannot check the distances of features using commands such as Bearing and Distance on the Inquiry menu, because the distances will be scaled down by a factor equal to the drawing scale (for example, at 1"=50', the reduction in scale factor is 1/50 or 0.02). You can set the absolute starting coordinate for the 1:1 scaled plot by setting the Sheet Lower X and Sheet Lower Y.

Fit Each Vertical: With this option turned on, the command will recognize the lower and upper vertical elevations of the profile and set the vertical axis elevation range to enclose the actual elevation limits of the profile. With this option turned off, you can enter the lower vertical elevation range, dropping it down further to increase the lower

margin. Whether or not the Fit Each Vertical option is turned on or off, you are always prompted for the top elevation range.

Tile Sheets: If clicked on, only one Layout is created in paper space, and all sheets appear in this single Layout as tiles of individual sheets, much like the tiles mode of viewing files within Windows Explorer.

Label Match Line: When clicked on and multiple sheets are plotted with plan view option on, a match line will plot in the plan view.



Prompts (Draw Sheet option)

Bottom Vertical Spacing <0.0>? *press Enter*

The program places the profile plot flush against the bottom of the vertical grid, by default. This prompt allows for an offset, moving the profile plot up off the bottom of the grid. If the lowest elevation of the profile is 940 by default, entering 10 would start vertical axis labeling at 930, and if the vertical scale was 5 units, this would push the vertical plot up 10 units or 2 standard grid intervals.

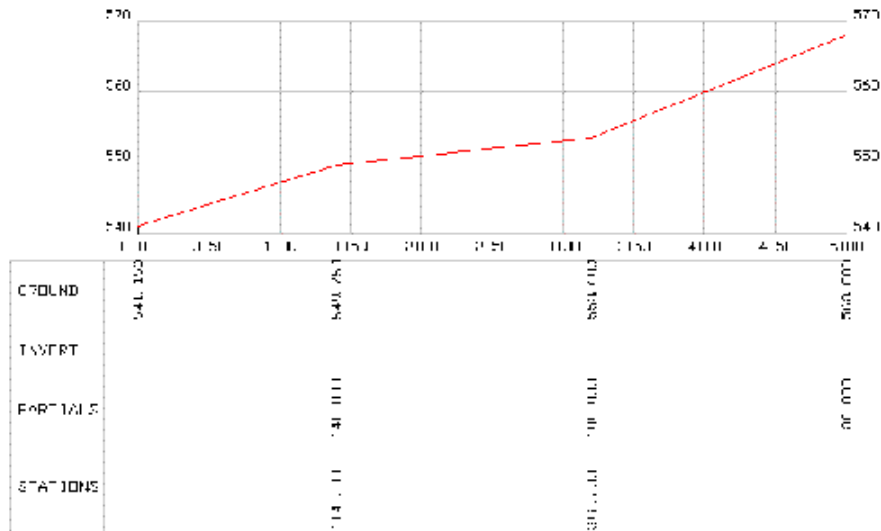
Top Elevation of Profile Grid <945.0>: *press Enter*

Cl File/Select polyline that represents centerline: Select the centerline polyline (if Draw Plan has been clicked on).

Beginning Station <0.0>: *press Enter*

The items below refer again to the profile options that are independent of the Draw Sheet option:

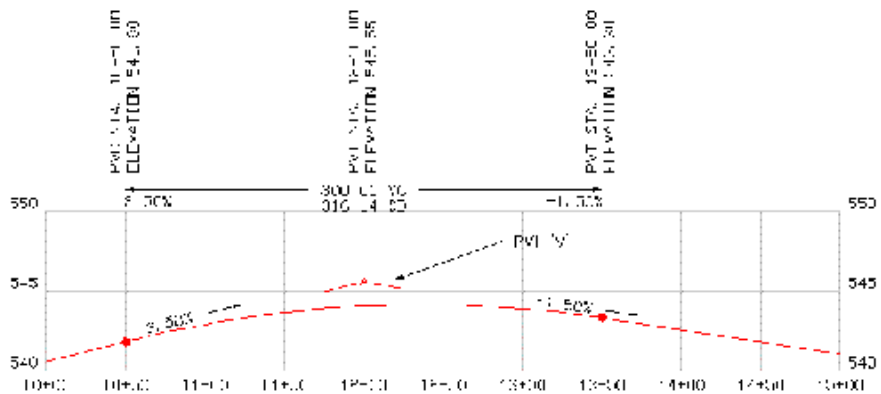
Draw Horz Label Box: This option draws a boxed area underneath the profile. It is best used in standard Draw Grid mode, with Draw Sheets clicked off. An example of the resulting plot is shown here:



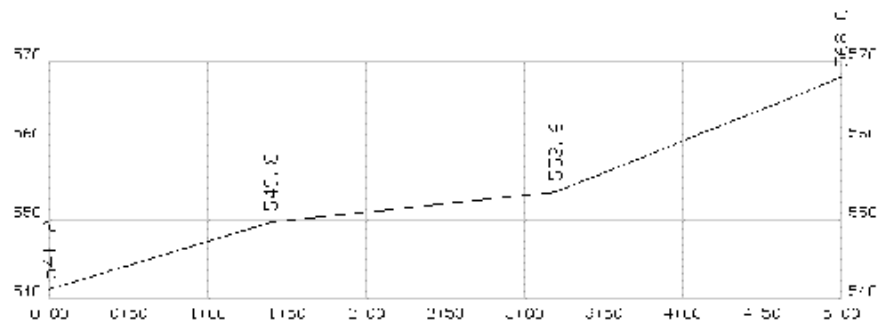
Decimals: The default is 3 decimal places, typical of metric accuracy (1 mm). This is applied to the stations, partial distances, and elevations of the break points on the profile. This decimal setting is in association with the Horizontal Label Box option.

Vertical Lines: This option enables or disables the drawing of the vertical lines that appear in the graphic above, also in association with the Horizontal Label Box option.

PVI 'V': This option plots a special "V" look above all vertical curve PVIs (points of vertical intersection), as shown:



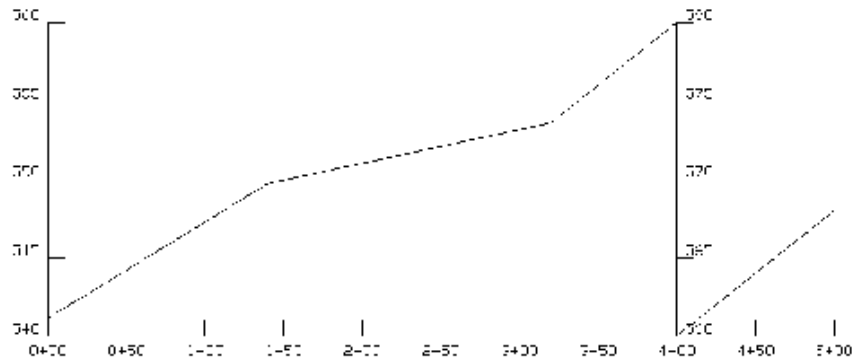
Draw Break Pt Elev: This option draws elevations vertically above all break points on a profile. It is typically applied to generic ground profiles and not to road profiles. See example:



Decimals (for Break Points): Typically a setting of 1 or 2 decimals is applied to break points for existing ground.

Text Scaler (for Break Points): This text scaler is multiplied by the Drawing Scale set in the Drawing Setup command under the Settings menu, to determine the actual text height. For example, if the horizontal scale is set to 50, a text scaler setting of 0.1 will produce a text height of 5.

Ticks Only: If this option is selected, full grid lines are not drawn. Instead, a fringe of ticks are drawn along the two vertical axes and the horizontal axis, as seen below:



Match Line Elevations: For high relief profiles that might otherwise extend up and into the plan view portion of the drawing, the Match Line Elevations option can be used to break the profile and redraw the remaining portion with its own vertical scale, as seen above.

Elevation Range: This is the range of elevations that is used in conjunction with the Match Line Elevation option. If the range is exceeded (that is, if the range above is 20), the program will break the profile and draw the remainder with a separate vertical axis range.

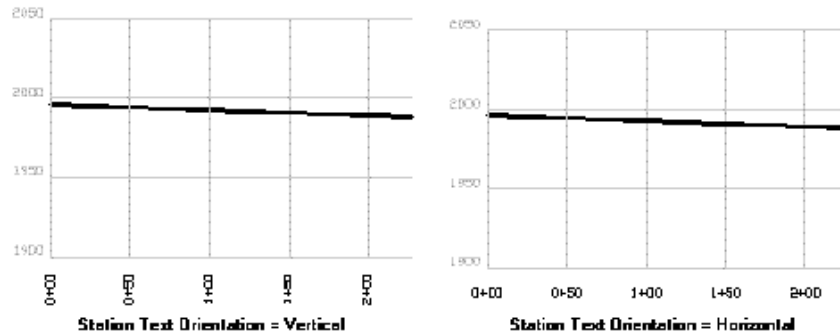
Draw Break Pt Desc: Similar to the Draw Break Pt Elev option, this option draws vertically, at each break point, the description associated with the profile points. If a profile is made by the Profile from Surface Entities command, there is an option to store the layer of any polyline used for interpolation in the description for the profile break point. In addition, within the Input-Edit Profile command, you can enter a description. The descriptions are plotted with this option turned on.

Design Box: This is very similar to the Draw Horizontal Label Box option discussed above. This draws three rows of information beneath the profile, with text plotted vertically. The first row shows the elevation of each vertex or break point in the profile. The second row shows the "partial" or incremental distance between break points, and the third row shows the station of each break point. This command does not draw any line work associated with these rows of text.

Offset Station Text: When clicked on, this option offsets the horizontal axis text by an amount equal to about 6 standard text characters, allowing the insertion of elevation or other information above the stationing. It is often used in conjunction with the Label Horizontal Axis options.

Offset Elev Text: This option offsets the left-side vertical axis text a distance equal to the horizontal scale.

Station Text Orientation: This option allows you to specify the orientation of the station text shown along the bottom of the profile. The example below shows both options:



Horizontal Scale: This scale applies primarily to text size. If the text scaler is 0.1 and the horizontal scale is 50, then text size will be $0.1 * 50 = 5$.

Horizontal Grid Interval: This sets the spacing of the grids that run vertically from the horizontal scale.

Horizontal Text Interval: This sets the spacing of the stationing text that appears along the horizontal axis. When using a large "Axis Text Scaler", the horizontal axis text can become too large, and it often necessary to space the horizontal text interval at twice the horizontal scale.

Vertical Scale: This scale sets the vertical exaggeration of the profile. If the horizontal scale and vertical scale are the same, then the vertical is not exaggerated. Profiles are often plotted with a 5 or 10 vertical exaggeration. For example, the horizontal scale may be 50, but the vertical scale may be 5.

Vertical Grid Interval: This sets the spacing of the grids that run horizontally between the vertical axes on the left and right side of the profile.

Vertical Text Interval: This sets the spacing of the elevation text that appears along the vertical axes.

Axis Text Scaler: This sets the size of the horizontal and vertical axis text to the horizontal scale times the scaler, when you are working in English units. In metric units, the text height would be $0.01 * \text{horizontal scale} * \text{scaler}$. In English units, a scale of 0.2 or more will usually require that the Horizontal Text Interval be set to twice the horizontal scale (every other inch).

Label Text Scaler: This sets the size of text used for vertical curve annotation to the horizontal scale times the scaler, when you are working in English units. In metric units the text height would be $0.01 * \text{horizontal scale} * \text{scaler}$.

Starting Station: This field defaults to the starting station in the selected profile(s). If changed, the starting station can move forward, clipping out the first part of the profile. When you are not plotting sheets, you must set the starting station to the end of the previous sheet's ending station to force a multiple sheet layout.

Ending Station: This field defaults to the ending station in the selected profile(s). A profile that is 3000 feet in length could be plotted in 2 parts, first station 0 to 1500, then station 1500 to 3000, using the Starting Station and Ending Station options.

Profiles to Draw: This portion of the Draw Profile dialog box allows up to 3 profiles to be selected and plotted simultaneously. These profiles can be distinctly layered using the Layers button at the base of the dialog box. If the goal is to plot more than 4 profiles on the same drawing, run the Draw Profile command a second time, and specify up to 3 more profiles, choosing the same scaling and lower left corner for placement. Be sure to turn off Draw Grid when placing additional profiles on a pre-drawn profile. Otherwise the grid and axis text may be drawn more than once.

When OK is clicked at the base of the dialog box, the prompting at the command line continues. In this example, assume that a road profile has been selected, since more prompts will occur with road profiles than with generic profiles.

Prompts (Road profile example)

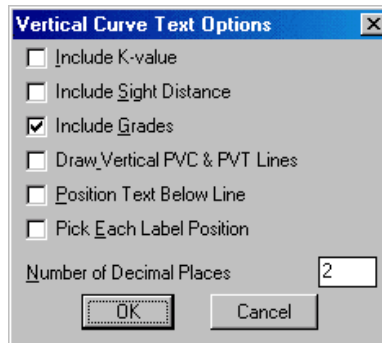
Erase existing profile [<Yes>/No]? *N* This prompt appears only if you have previously drawn the profile.

Bottom Elevation of Profile Grid <540.0>: *press Enter*

Top Elevation of Profile Grid <550.0>: *press Enter*

Pick Starting Point for Grid <8779.55 , 5716.36>: *pick a point for the lower left corner of the grid*

Assuming a road profile has been selected, the following dialog box appears:



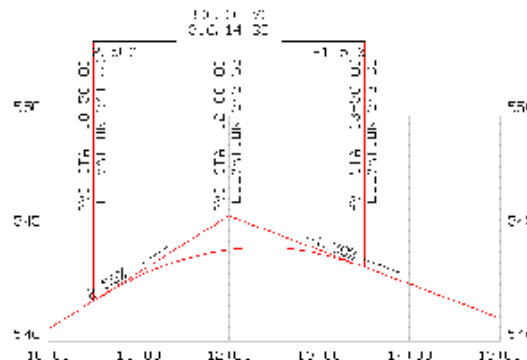
K-value: This option is a function of the change in slopes on either side of the point of vertical intersection.

Sight Distance: This option is computed by the delta slope and is a function of whether the vertical curve is a sag or a crest.

Include Grades: This option draws slopes along the tangent portion of the vertical curves, with slope direction arrows.

Draw Vertical PVC and PVT Lines: This option draws vertical lines emanating from the PVC and PVT of all vertical curves.

Position Text Below Line: This option draws the PVC, PVI, and PVT information under the picked location for the vertical curve labeling, as shown below.



Pick Each Label Position: If there were more than one vertical curve in the profile, this option allows you to pick a vertical position for each of the vertical curve's annotation.

Number of Decimal Places: The number entered here controls the decimal places in the elevation and stationing annotation for vertical curves.

Next, select a point vertically that corresponds to the position of the left-right lines under which is written percent grade and above which is written the vertical curve length, sight distance, and K-factor, if requested. The PVC, PVI, and PVT stations and elevations are written above or below this picked point depending on dialog box settings.

Additional Prompting for Multiple Profiles

Detected multiple profiles within C:\DATA\EXAMPLE.PRO Note that the Profile from Surface Entities command can store additional profiles into the same profile file.

Draw profiles on same or different grids (Same/<Different>)?*press Enter* This determines whether the multiple profiles will be drawn together on the same grid or drawn on separate grids.

Uniform or variable grid size (Uniform/<Variable>)?*press Enter* This selects between one-size-fits all grids or individually sized grids for each profile.

Pulldown Menu Location: Surface

Keyboard Command: drawprof

Prerequisite: A .PRO file

Profile To Points

Function

This command creates Carlson points along a horizontal alignment polyline using a profile file to compute the point elevations. The created points are stored in a coordinate (.CRD) file and can also be drawn on screen in the layer specified by the user. Station text, profile name, and special points (vertical and horizontal PC's and PT's) can be stored in the point description depending on user settings.

The screenshot shows the 'Profile to Points Settings' dialog box with the following options and values:

- ☒ Create Points At Profile Special Points
- ☒ Create Points At Centerline Special Points
- ☒ Create Points At Station Intervals
- Interval On Line Segments: 100.000
- Interval On Curve Segments: 25.000
- Station To Begin Intervals: 0.000
- ☐ Prompt For Additional Odd Stations
- ☒ Create Points On Centerline
- ☐ Create Left Offset Points Offset: 10.000
- ☐ Create Right Offset Points Offset: 10.000
- Vertical Offset Of Profile: 0.000
- ☒ Plot Points Layer: PNTS
- ☐ Include Profile Name In Point Descriptions
- Decimal Places: 0.00
- Centerline By: ☒ Polyline ☐ CL File
- Type of Centerline: ☒ Roadway ☐ Railroad

Buttons at the bottom: OK, Cancel, Help.

Create points at Profile special points: Includes vertical PC and PT points.

Create points at Centerline special points: Includes horizontal PC and PT points.

Create points at Station Intervals: Allows you to specify intervals for point creation.

Interval On Line Segments: Specify station interval for line segments.

Interval On Curve Segments: Specify station interval for curve segments.

Station to Begin Intervals: Specify station to start intervals.

Prompt For Additional Odd Stations: Any station can be entered to create additional points with elevations de-

rived from the profile.

Create Points on Centerline: When checked, points will be created on the centerline.

Create Left Offset Points: When checked, left offset points will be created. Specify the offset in the edit box.

Create Right Offset Points: When checked, right offset points will be created. Specify the offset in the edit box.

Vertical Offset of Profile: Specify the vertical offset. Enter zero for no vertical offset.

Plot Points: When checked, points will be plotted in the drawing, otherwise points are only added to the current coordinate (.CRD) file.

Include profile name in point descriptions: When checked, the profile name will be used as the prefix on the the point description. For example, if the profile name is DESIGN.PRO, then the point description might be DESIGN 0+63.37.

Decimal Places: Specify the display precision for points that are plotted in the drawing. This setting does not affect the coordinates stored in the CRD file.

Centerline by: Click either Polyline or CL File.

Type of Centerline: Click either Roadway or Railroad.

OK: Specify files.

Prompts

Select Coordinate File to Process

If the current coordinate is set, it is used automatically without this prompt.

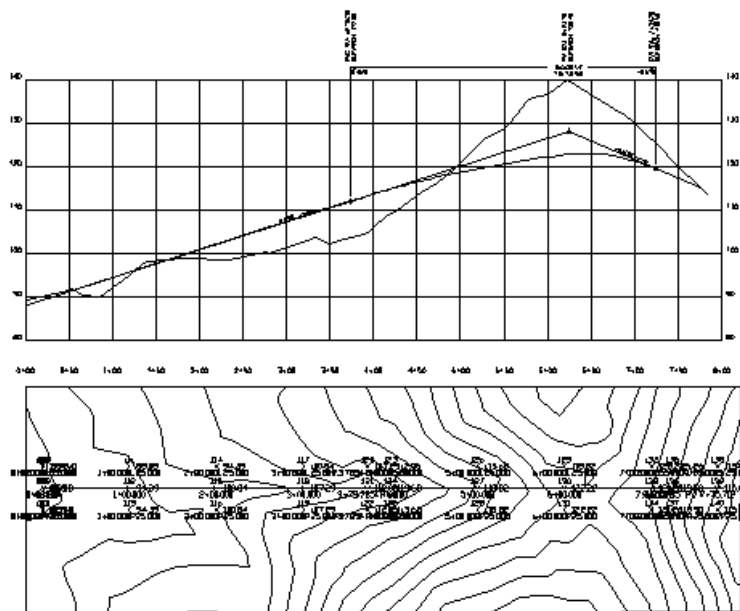
Select profile centerline polyline: *pick a polyline*

Starting station of centerline <0.0>: *press Enter*

Choose Profile to Process dialog Specify a profile name.

Starting point number <1>: *press Enter* This defaults to the point number after the highest one currently in the CRD file.

Station for additional point (ENTER to end): *press Enter* This option will create a point at the specified station. Prompt occurs only if option is specified in dialog.



Points created along profile centerline using elevations from the above road profile

Pulldown Menu Location: Surface

Keyboard Command: pro2pts

Prerequisite: A .PRO file and a centerline polyline

Profile Conversions

Function

There are ten Profile Conversion commands, all of which are listed below. The first eight in the list are Import Profile commands. These commands allow you to convert a single profile file from their respective program to the Carlson profile (.PRO) format. For each, you are prompted to select the file to be imported, then provide a Carlson profile file name. Underneath each of the eight brief descriptions shown are, in bold, the prompts that you see in dialog box form and/or on the command line.

The last two commands listed below are Export Profile commands. They allow you to convert a single Carlson profile (.PRO) file to Softdesk (.TXT) format, or a single Carlson profile (.PRO) file to Leica (.GSI) format. You are prompted to select the Carlson profile file, then provide a name for the Softdesk or Leica file.

Import CAiCE Profile

Allows you to convert a single CAiCE (.KCP) profile file to the Carlson profile (.PRO) format. You are prompted to select the CAiCE file, then provide a Carlson profile file name.

Pulldown Menu Location: Surface > Profile Conversions

Keyboard Command: caice2pro

Import Leica Profile

Allows you to convert a single Leica profile (.GSI) file to the Carlson profile (.PRO) format. You are prompted to select the Leica file then provide a Carlson profile file name.

Choose Leica/Wild File to Readdialog Select existing file.

Choose Profile to Writedialog Select file name.

Pulldown Menu Location: Surface > Profile Conversions

Keyboard Command: wildpro2

Import MOSS Profile

Allows you to convert a single MOSS profile (.INP) file to the Carlson profile (.PRO) format. You are prompted to select the MOSS file then provide a Carlson profile file name.

Choose MOSS Profile File to Readdialog Select existing file.

Choose Profile to Writedialog Select file name.

Pulldown Menu Location: Surface > Profile Conversions

Keyboard Command: moss2pro

Import Softdesk Profile

Allows you to convert a single Softdesk profile (.TXT) file to the Carlson profile (.PRO) format. You are prompted to select the Softdesk file then provide a Carlson profile file name.

Pulldown Menu Location: Surface > Profile Conversions

Keyboard Command: dcapro2

Import Sokkia/SDR Profile

Allows you to convert a single Sokkia/SDR (.SDR or .RAW) profile file to the Carlson profile (.PRO) format. You are prompted to select the Sokkia/SDR file, then provide a Carlson profile file name.

Pulldown Menu Location: Surface > Profile Conversions

Keyboard Command: sdr2pro

Import Spanish ALZ Profile

Allows you to convert a single Spanish ALZ profile (.INP) file to the Carlson profile (.PRO) format. You are prompted to select the Spanish ALZ file and then provide a Carlson profile file name.

Choose CLIP File to Readdialog Select existing .ALZ file.

Choose Profile to Writedialog Select file name.

Pulldown Menu Location: Surface > Profile Conversions

Keyboard Command: alz_to_pro

Import Spanish RAS Profile

Allows you to convert a single Spanish RAS profile (.RAS) file to the Carlson profile (.PRO) format. You are prompted to select the Spanish RAS file and then provide a Carlson profile file name.

ISPOL File to Readdialog Select existing .RAS file.

Choose Profile to Writedialog Select file name.

Pulldown Menu Location: Surface > Profile Conversions

Keyboard Command: ras_to_pro

Import Terramodel Profile

Allows you to convert a single Terramodel (.RLN) profile file to the Carlson profile (.PRO) format. You are prompted to select the Terramodel file, then provide a Carlson profile file name.

Pulldown Menu Location: Surface > Profile Conversions

Keyboard Command: tm2pro

Export Softdesk Profile

Choose Profile File to Read dialog Select existing .PRO file.

Choose Softdesk File to Write dialog Enter new Softdesk file name.

Pulldown Menu Location: Surface > Profile Conversions

Keyboard Command: dcapro1

Export Leica Profile

Choose Profile File to Read dialog Select existing .PRO file.

Choose Wild File to Write dialog Enter new .GSI file name.

GSI file format [<8>/16]? *press Enter*

Pulldown Menu Location: Surface > Profile Conversions

Keyboard Commands: wildpro1



GIS Commands

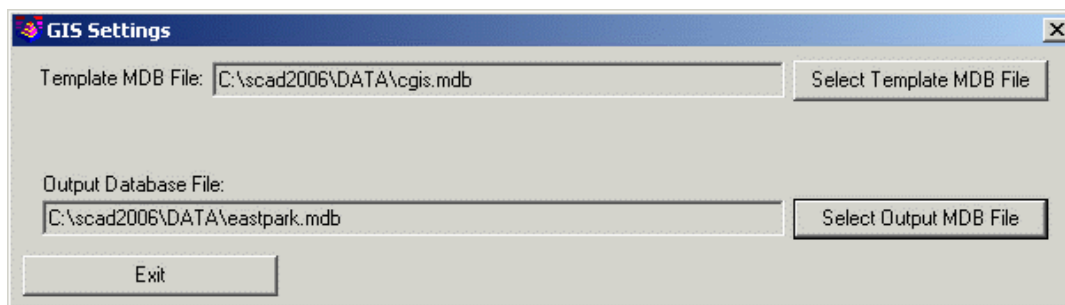
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The Carlson Survey GIS commands includes routines for processing data attached to drawing entities and commands for drawing cleanup and conversion. Carlson Survey supports these methods for attaching additional data to entities: Carlson GIS links and Carlson note files. Links can be converted between these formats.

GIS Database Settings

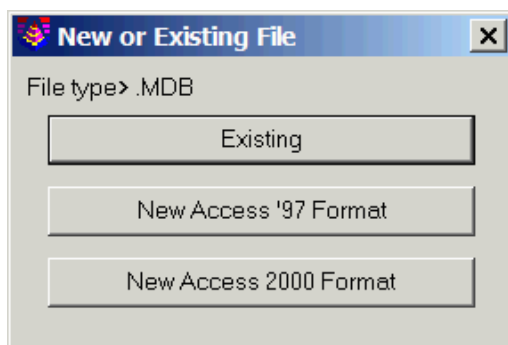
Function

This command sets the current Template and Output MDB files. The Template MDB file defines the GIS codes and the field names for each code. The Output MDB file is the database file where any new data will be stored. The MDB files for the Template and Output MDB files can be set up as either new MicroSoft® Access '97 or new Microsoft® Access 2000 database format files, or part of an existing MDB file. Either existing or new MDB files may be chosen or created for this GIS Database Setting routine.



Prompts

GIS Setting dialog Click both file buttons and select new or existing files.



Pulldown Menu Location: GIS

Keyboard Command: gis_config

Prerequisite: None

Define Template Database

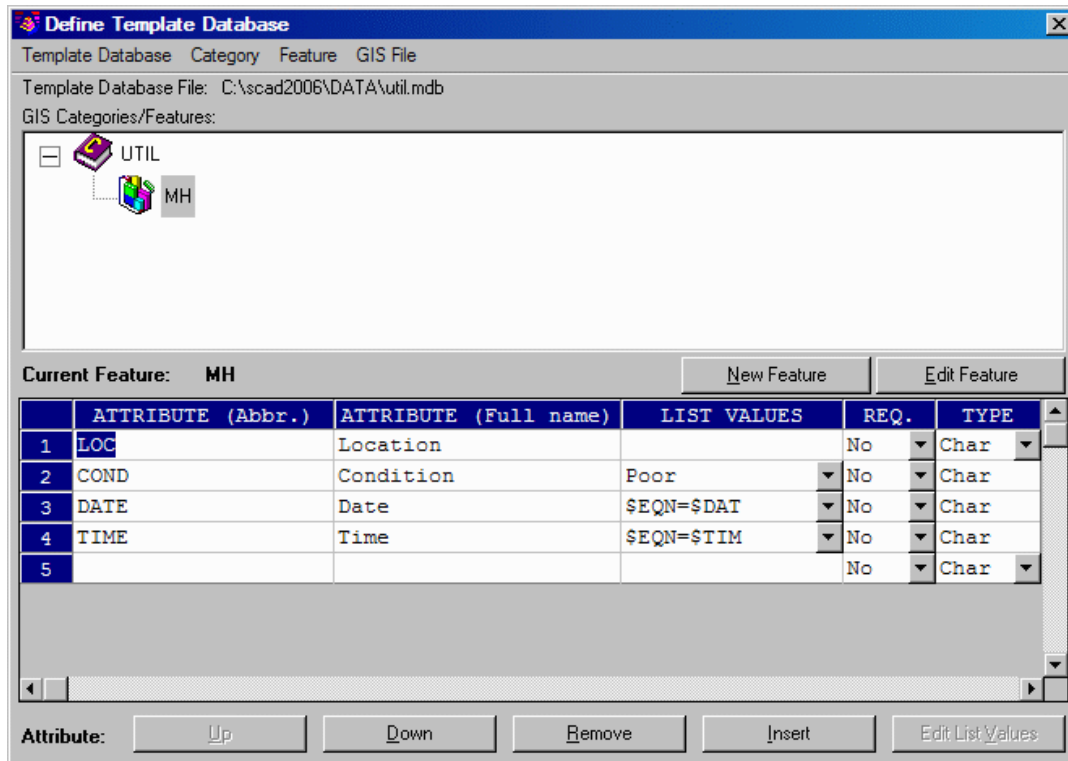
Function

This command prepares the fields for prompting to attach data to objects. The prompts are stored in the form of an .MDB file. A feature, such as a manhole, can have several prompts, such as Number of rungs, Type of material, Number of inlets, etc. Features can be organized into Categories: Utilities, Roads, Properties. The Category designation is an arbitrary way of organizing the features. Features and the prompts can be imported from Object Data found within the drawing in AutoCAD Map, or from tables within standard MDB database files, or from the Carlson .GIS files that are used by SurvStar, Carlson Field and other Carlson products to generate prompts. A Carlson GIS

file works by triggering prompts when a description such as "mh", for manhole, finds a corresponding MH.GIS file with pre-defined prompts and default responses. But the most common way to develop features, and the associated prompting, is to enter them directly here in Define Template Database, rather than using the three import options. From a database standpoint, features are the same as tables.

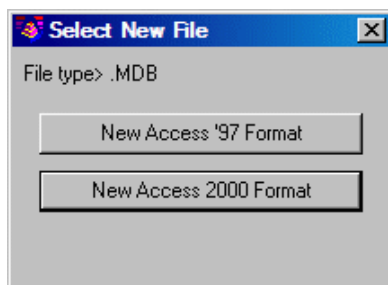
To create GIS prompting for ASCII and MDB GIS features, you need to input the following fields in the dialog box:

- 1) The first field to set is the Template Database, or MDB file. All MDB GIS prompting is stored in one template Microsoft® Access MDB file named here. To create a new MDB, choose the Template Database pulldown from the top of the Define Template Database dialog, then New, and then select which type of new MDB file you would like to create. Your choices are New Access '97 format or New Access 2000 format. You can also load an existing MDB Template file by choosing Open under the same pulldown.
- 2) The next field is the Category Name, found within a pulldown called Category. GIS feature codes can be categorized (e.g. STRUCTURES, UTILITIES, ROAD FEATURES, etc.). At least one category must be created. This is because in order to Export a GIS File to the Template MDB file, this routine requires a category to export the GIS code under. After selecting New and inputting a category name, click OK to create this category in the template MDB file.
- 3) The next field is Feature, which has a pulldown as well. A category such as UTILITIES might have features such as manholes, light poles, fire hydrants, water valves, etc. The GIS feature name needs to be input by selecting New. This GIS feature name is very important because it identifies the group of data fields.
- 4) You can upload features to SurvCE, GISCE or FAST Survey using a GIS File pulldown option. Using this option you will be able to choose a .FLD file.
- 5) The GIS prompting is input under ATTRIBUTE (abbr), ATTRIBUTE (full name), LIST VALUES, REQUIRED and TYPE. Once values are specified, only these values can be used. Values are entered by typing them under the List column and hitting Enter, then typing another, hitting Enter and continuing until complete. The default value is the one displayed when the GIS Code is stored to the MDB template file using Save As in the Feature pulldown. Fields, when created, can be designated Char, Int or Real. Fields with pre-set responses will default to Char type. To add a new attribute, click on the first available blank cell in the first Attribute row of the list, shown in the Define Template Database dialog, and click Insert.
- 6) To store the new prompts and field names, click Save As under Feature.
- 7) To use this dialog to "back-door" create a GIS File for the ASCII method of prompting (the .GIS file method), click Export under the GIS File pulldown at the top of dialog. This ASCII .GIS file will then be available to SurvStar for field prompting.
- 8) To import the attributes and jump start the completion of attribute full names, attribute prompts and other table elements, you can use Import under the GIS File pulldown. This will read a Carlson .GIS file.

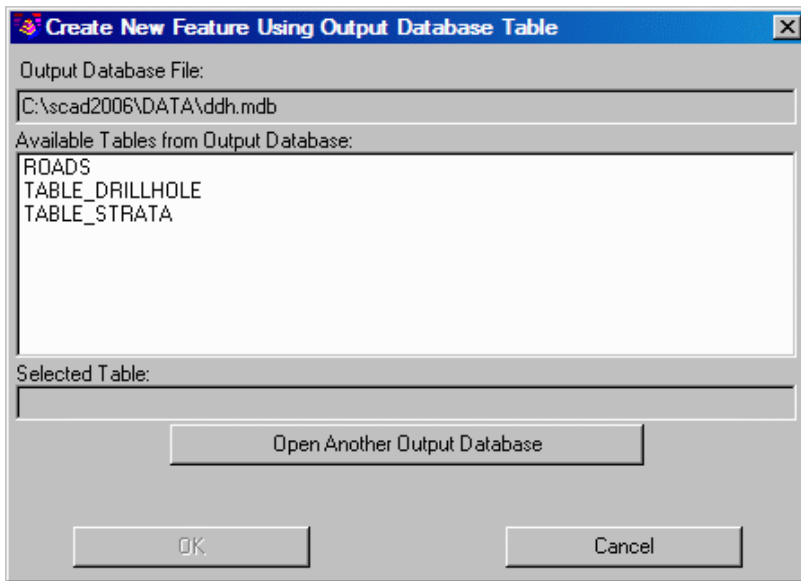


Automatic versus Prompted Values

It is possible to assign data to objects automatically, without any prompting. The automatic items are pre-set responses the program knows, such as date, time, currently configured instrument, etc. When the cursor is located in the List Values column, press the down arrow on the right side of one of the cells. You will see the available known data fields. Here you can select variable. The list may expand with new builds of Carlson Survey.



Template Database pulldown option



Feature pulldown: Import option dialog box

Pulldown Menu Location: GIS

Keyboard Command: def_template

Prerequisite: None

Input-Edit GIS Data

Function

This routine creates, reviews and appends GIS data linked to entities stored in the Carlson Survey drawing.

The GIS Smart Prompting dialog has a spreadsheet format for editing the data fields. The GIS table to process is selected in the pulldown field in the upper right of the dialog. The GIS tables that are available depend on the tables that are defined in the current template database. Use the *GIS Database Settings* and *Define Template Database* commands to setup the tables. Once you select a table to process, the fields for that table are displayed in a spreadsheet format.

The bottom portion of the dialog has features for attaching images to the entity. Existing image files (BMP, JPG or GIF) can be linked by choosing the New option. The Update option will replace the current image with a newly selected image. The Delete option will remove the current, attached image. The Capture button will take a shot in the field using a configured camera and then attach the image to the entity. Different digital cameras can be used by picking Pick or Set Camera.

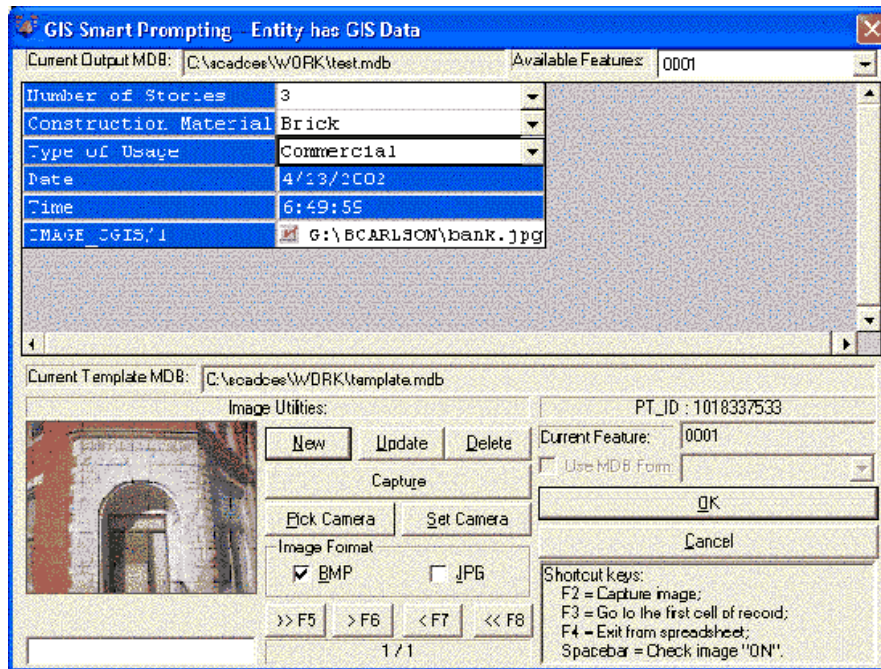
The *Input-Edit GIS Data* command is an excellent way to simply review the data associated with an entity. If the entity has GIS data, the banner line at the top of the dialog will display "Entity has GIS Data". If not, the banner line will display "Entity has no GIS Data". Even when the entity has no data, the default values for the prompts will appear. Pressing OK will assign this data to the entity. To avoid assigning data to the entity (if it has none), press Cancel. Alternately, you can use the commands *GIS Inspector Settings*, followed by *GIS Data Inspector*, to review the data with no possibility of editing or inputting data in the process.

There are three methods for selecting the drawing entities to process: S for Select, P for Pick and N for Number:

Select Object method: With this method, you pick the drawing entity to process the data attached to that entity. When selecting a Carlson Survey point, the point number is used to link to the database.

Pick method: For this method, you pick inside a closed polyline to process the data attached to that polyline.

Number method: Here you simply input the point number from the current CRD file to process.



Prompts

Select object (Number/Pick/<Select>): P

Pick a point inside polygon (Select/Number/<Pick>): pick a point

GIS Smart Prompting dialog make selections

Pulldown Menu Location: GIS

Keyboard Command: gisdata

Prerequisite: MDB GIS prompting must be created in *Define Template Database* and points or entities must exist to link GIS information to.

GIS Inspector

Function

This command displays all or portions of the data attached to drawing entities in real-time. How much of the attached data is displayed is set by the command GIS Inspector Settings. When you move the cursor over an entity with GIS data, selected fields are displayed in a tooltip box next to the cursor. For data attached to closed polylines, you can move the cursor anywhere inside the polyline to show the data. Polygons that are closed will highlight with a solid fill as you inspect each one. Open polylines, such as road centerlines, will highlight with a solid fill generated along the length of the polyline. The solid fill color for all highlighting is set in GIS Inspector Settings.

The routine starts by prompting you to select entities. The entities that you select will be used by GIS Inspector.

In the case of a large drawing, this selection allows you to limit the entities for inspector to a local area instead of having to process the whole drawing. Then after reading the entities, you can move the cursor around the drawing to inspect the GIS data. You can also use the arrow, page up and page down keys to pan and zoom the display. Pressing enter ends the routine.

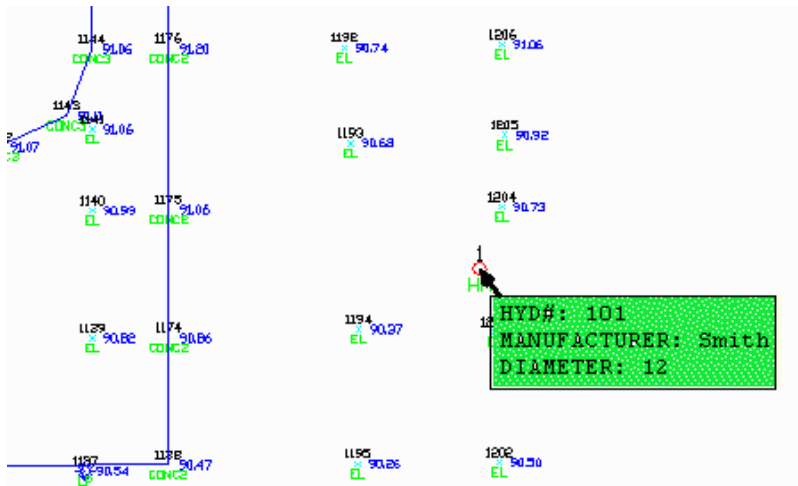
Prompts

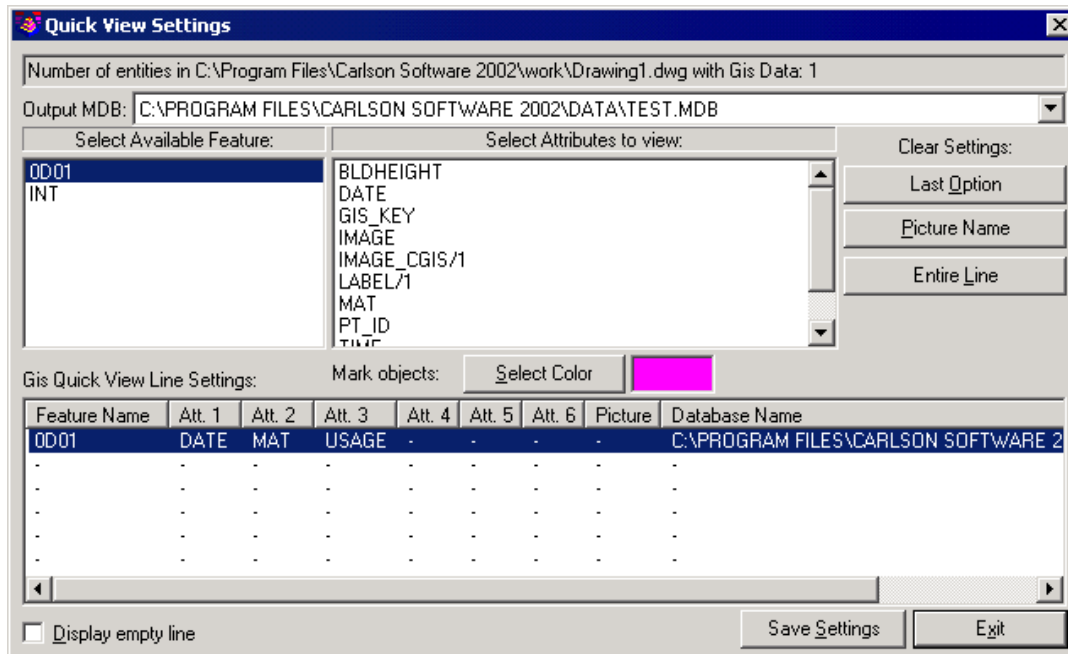
Select objects: *select entities with attached data*

Arrow keys=Pan; PageUp/Down=ZoomOut/In;

Zoom=Pick left-lower and right-upper corner;

Move pointer over entity with Gis Data (Enter to End): *move cursor over entities with data; press Enter to end*





Pulldown Menu Location: GIS

Keyboard Command: set_inspector

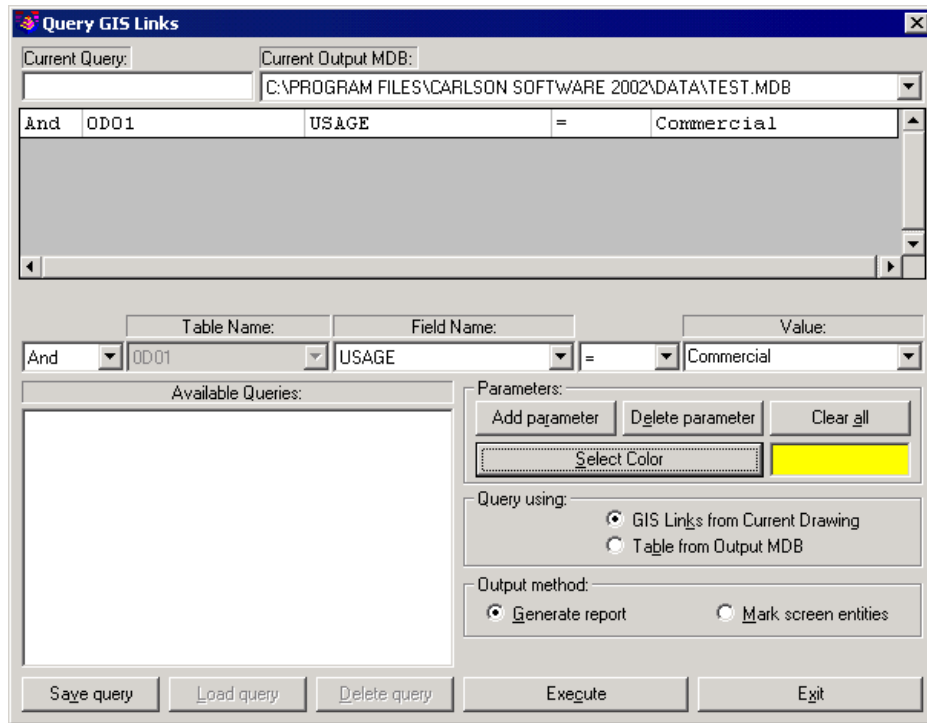
Prerequisite: MDB GIS Prompting must be created in *Define Template Database* and points or entities must have linked GIS information.

GIS Query/Report

Function

This command applies a user-defined query on a data table. Records in the table that pass the query can be reported or the associated entities can be highlighted in the drawing. The Query Using option sets the source of the data table to process as either GIS data attached to selected drawing entities or from the current Output MDB file.

The query is defined in the dialog shown here. To add a query, enter a new query name in the space underneath "Current Query:" If there is already a name there, just highlight and type over it with a new name, then hit "Clear all" to clear out existing query lines and get full access to all Table Names. (The Table Names will become unavailable while query lines appear-because conditional queries only apply to the current table.) The top portion of the dialog contains a list of the query parameters. To add a parameter, select a table name from the Table pop-up list. The available tables will either be all the tables found in the GIS links of the drawing or all the tables from the Output MDB file depending on the Query Using option. Once a parameter has been added for a table, all the other query parameters must come from the same table. Once the table is specified, the Field Name pop-up list contains all the available fields in the table. Choose a field from this list. Next choose the operator ("=", ">", etc) from the operator list. The Value pop-up list contains all the different values for that field that are found in the current data set. You can either select one of these values or type in another value into this field. When all the parameter values are set, pick the Add Parameter button.



When all the parameters are defined for the query, you can save these settings by filling out a name Current Query field and then picking the Save Query button. This query can be recalled later by highlighting the query name and clicking the Load Query button.

Pick the Execute button to process the query. With the Generate Report option, the program will bring up the Report Formatter which allows you to choose the fields to include in the report and the report format. If the Highlight Screen Entities option is on, then the program will highlight the entities with GIS data that pass the query. Point entities are highlighted by drawing a box around the point and polylines are highlighted by solid fill.

Pulldown Menu Location: GIS

Keyboard Command: GIS_QUERY

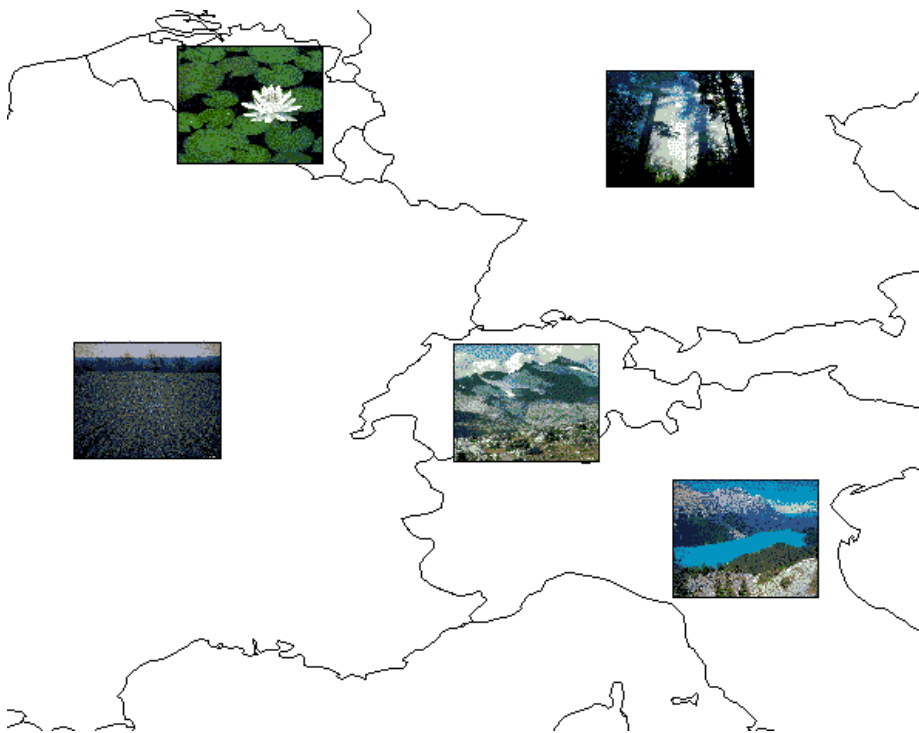
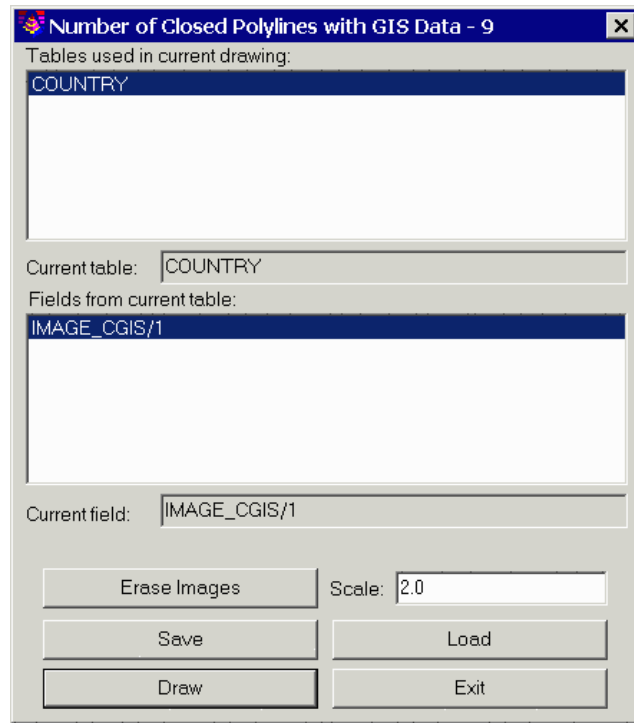
Prerequisite: MDB file with data or entities with linked GIS information.

Label GIS Polyline: Closed Polyline Image

Function

This command draws images inside the selected closed polylines with attached GIS image files. Images can be assigned to polylines by the Input-Edit GIS Data command.

The program starts by selecting closed polylines in the drawing with GIS data. Then a dialog appears for specifying the image to draw. This dialog displays a list of all the GIS table names found in the selected polylines. First choose a table to process. Then the image fields defined for this table are displayed in the lower list. Only one image can be drawn inside the polyline. The Erase Images button will erase any existing images inside the selected polylines. The settings can be saved to and recalled from a GIS settings file (.gsf) using the Save and Load buttons. Once all the settings are ready, pick the Draw button to draw the images. The images are drawn in the centroid of the polylines.



Example of images drawn inside closed polylines

Pulldown Menu Location: GIS >Label GIS Polyline

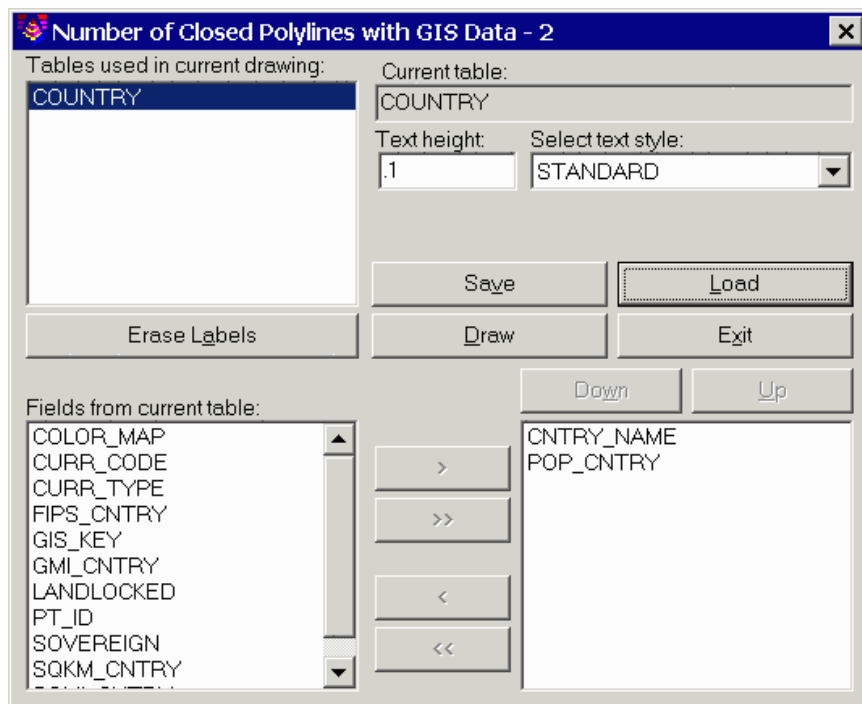
Keyboard Command: display_polygon_image

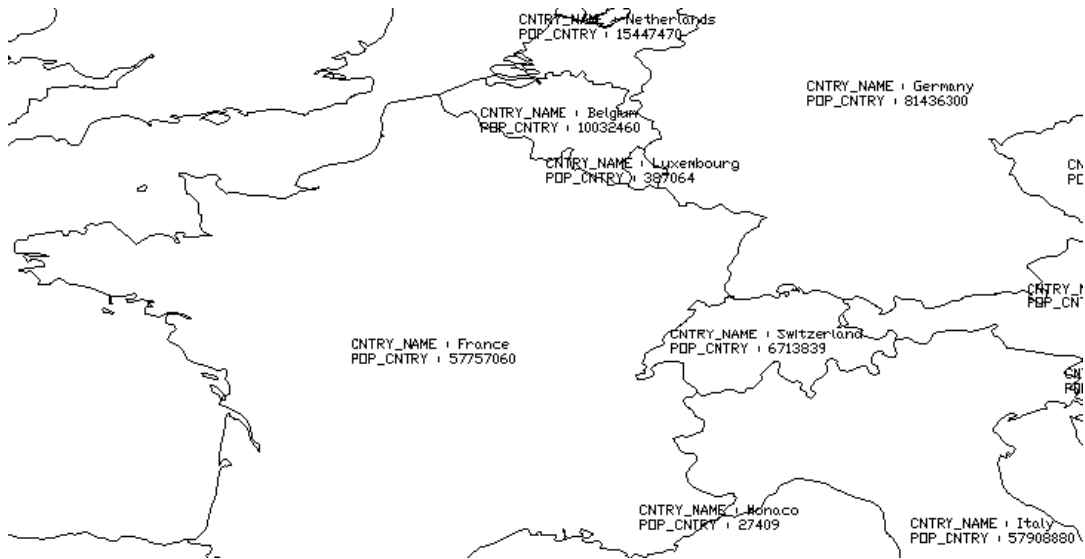
Prerequisite: Closed polylines with linked GIS images

Label GIS Polyline: Closed Polyline Data

Function

This command draws text labels for the specified fields inside the selected closed polylines with attached GIS data. The program starts by selecting closed polylines in the drawing with GIS data. Then a dialog appears for specifying the fields to label. This dialog displays a list in the upper left of all the table names found in the selected polylines. First choose a table to process. Then the fields defined for this table are displayed in the lower left list. To add a field to the label, highlight the field name and pick the > button. The fields names in the lower right list are the fields to be labeled in order. Use the Up and Down buttons to change the field order. The Erase Labels option will erase any existing field labels inside the selected polylines. The settings can be saved to and recalled from a GIS settings file (.GSF) using the Save and Load buttons. Once all the settings are ready, pick the Draw button to create the labels. The labels are drawn center justified in the centroid of the polylines.





Label Closed Polyline Data result of country name and population fields

Pulldown Menu Location: GIS > Label GIS Polyline

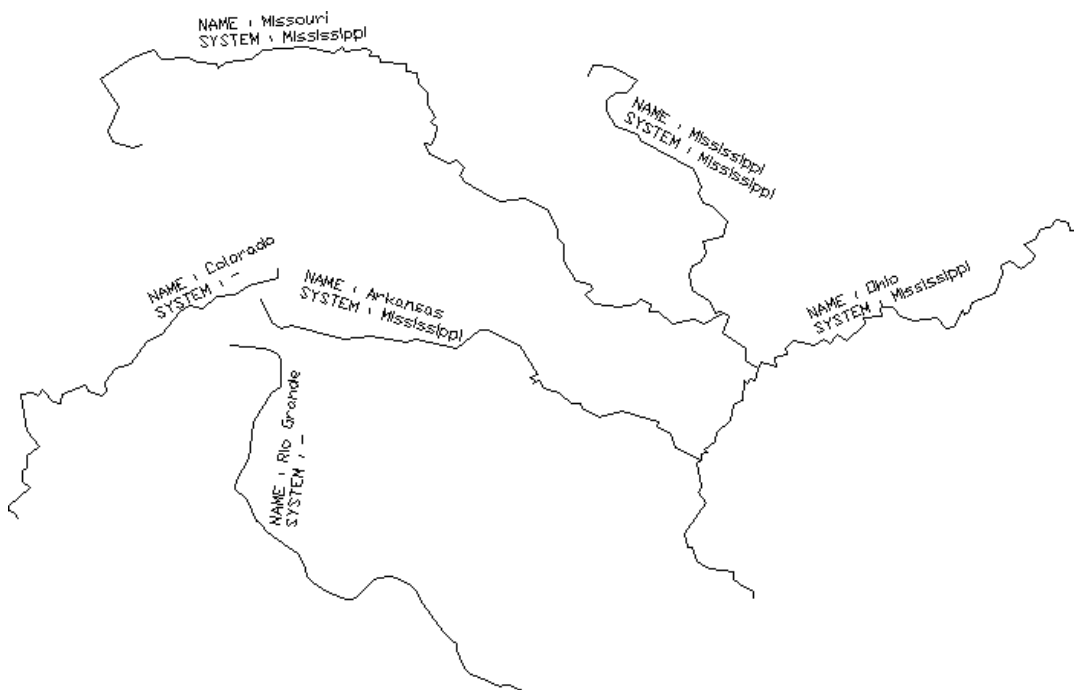
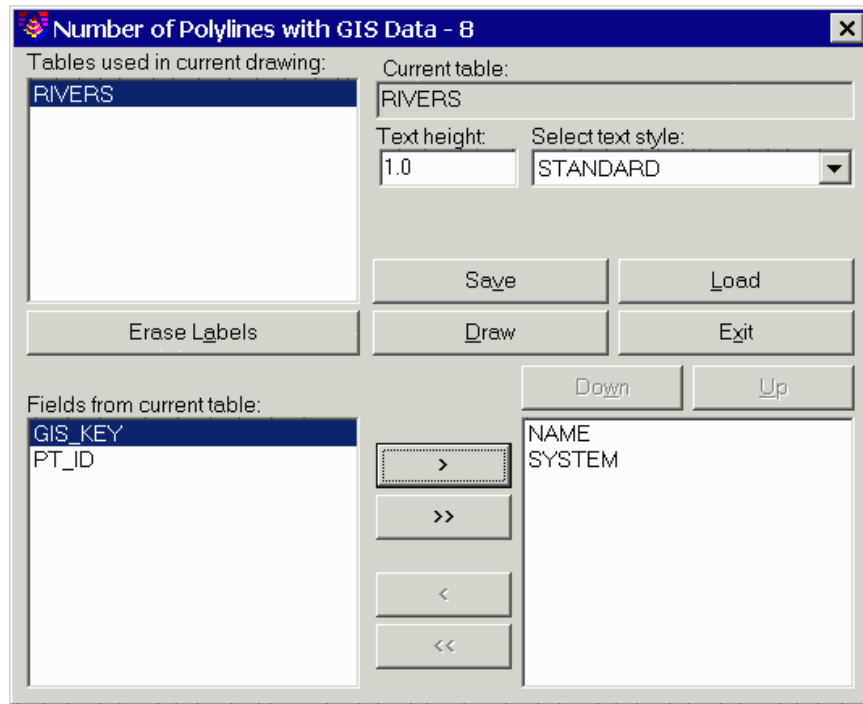
Keyboard Command: display_polygon_image

Prerequisite: Closed polylines with linked GIS information

Label GIS Polyline: Open Polyline Data

Function

This command draws text labels for the specified fields along the selected polylines with attached GIS data. The program starts by selecting polylines in the drawing with GIS data. Then a dialog appears for specifying the fields to label. This dialog displays a list in the upper left of all the table names found in the selected polylines. First choose a table to process. Then the fields defined for this table are displayed in the lower left list. To add a field to the label, highlight the field name and pick the > button. The fields names in the lower right list are the fields to be labeled in order. Use the Up and Down buttons to change the field order. The Erase Labels option will erase any existing field labels for the selected polylines. The settings can be saved to and recalled from a GIS settings file (.GSF) using the Save and Load buttons. Once all the settings are ready, pick the Draw button to create the labels. The labels are drawn along the polylines.



Example of text labels along polylines with GIS data

Pulldown Menu Location: GIS > Label GIS Polyline

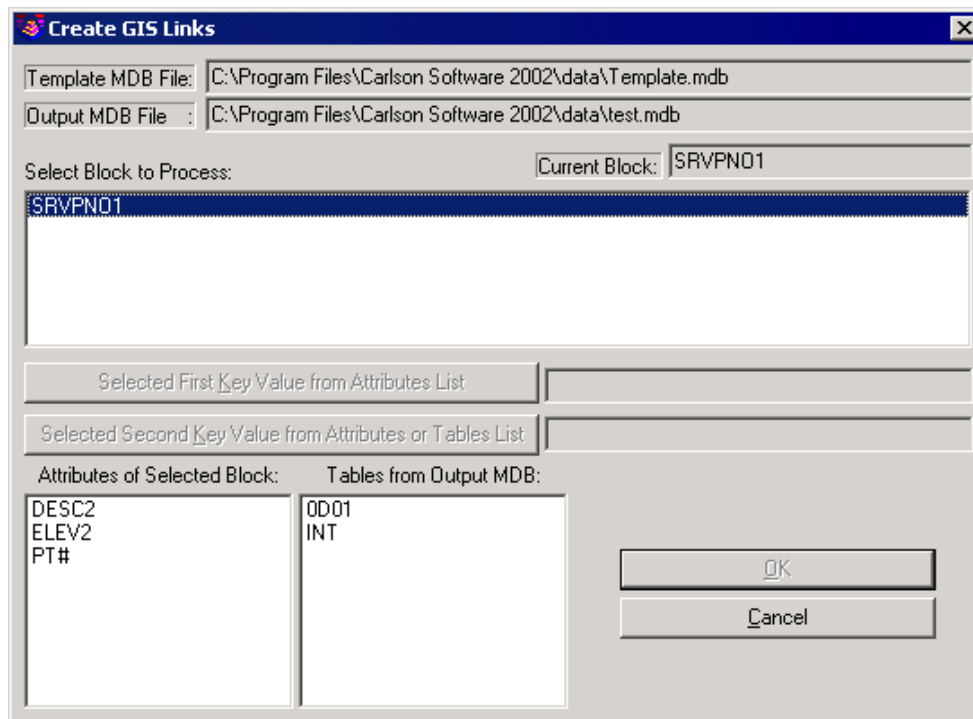
Keyboard Command: label_arc_text

Prerequisite: Polylines with linked GIS information

Create Links

Function

This command makes GIS links between blocks in the drawing and a database table using a key field that is in both the block attributes and the database table. Both the block entities and database records must exist before running this routine.



The routine starts by prompting you to select the block entities to process. Then a dialog appears for choosing the block attribute and table to link. The current template and output database file names are shown at the top of the dialog. Use the GIS Database Settings command to set these file names before running Create GIS Links. The dialog lists all the block names that were found in the entity selection. Choose a block name to process. Then in the lower left of the dialog, there is a list of the attributes for the selected block. Highlight the attribute name that contains the point ID key field for the blocks and then pick the Select First Key Value button. For each block entity, the program will use the value of this attribute to link to the record in database table. This value is matched to the database record using the PT_ID database table field. For example, a block with an attribute value of 402 for the specified attribute name will be linked to the database record with a value of 402 in the PT_ID field.

Next the database table needs to be specified to either one fixed table name or to table names defined by a block attribute. A list of the available tables in the current output database is displayed. To link all the blocks to one table, highlight the table name from the list and pick the Select Second Key button. Or to link the blocks to various table names based on a block attribute, highlight the attribute name and pick the Select Second Key button. This attribute value for the blocks will then need to contain the database table name. For example, consider a block for electric utility data with two attributes: ID and TABLE. The ID is a number to use as the first key and the TABLE is the table name (ie POLE, BOX). Once the key fields are set, pick the OK button to create the links.

Pulldown Menu Location: GIS

Keyboard Command: CREATE.LINKS

Prerequisite: Block entities with attribute IDs and a database table with matching IDs.

Erase Links

Function

This command removes all the GIS links from the selected entities (polylines, blocks, etc).

Pulldown Menu Location: GIS

Keyboard Command: erase_links

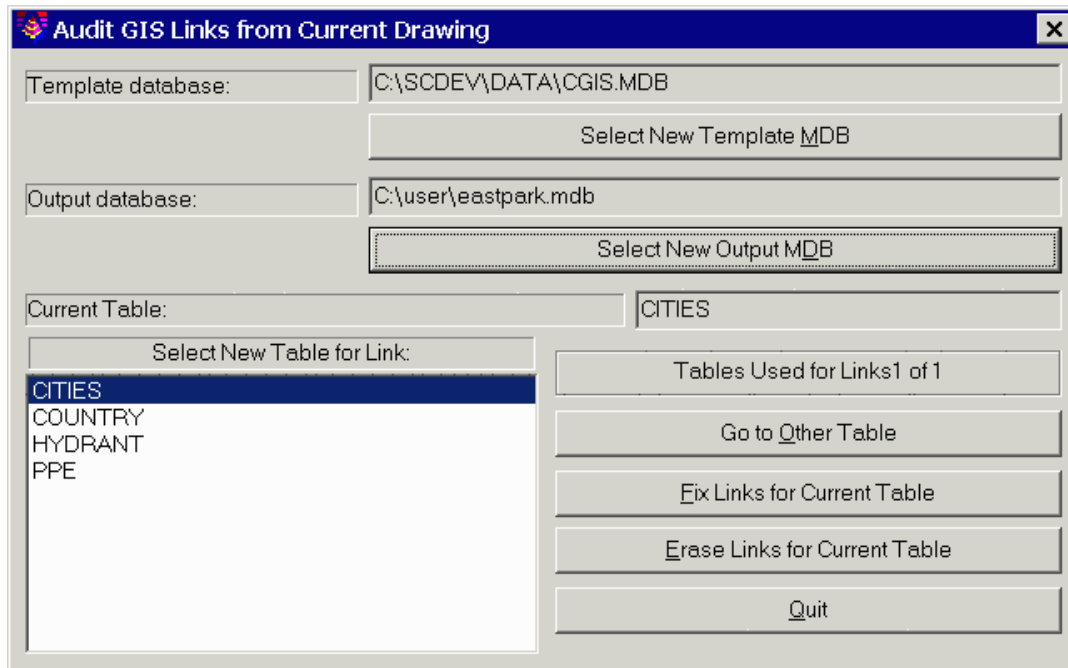
Prerequisite: Entities with GIS links

Audit Links

Function

This command checks the GIS links for the selected entities in the drawing to make sure that the template database, output database and table exist. Any invalid links can be erased from the entities or be fixed by selecting another database or table. For example if a database file (.MDB) has moved to another directory, then you can use this command to specify the new location.

The routine starts by prompting you to select the entities to check. If no errors are found, then the routine is done. When there are errors, a dialog box appears. Each GIS link is defined by a template database, output database and table. For each combination of these three settings that have an error, this dialog displays the template database, output database and table name from the entities. The number of GIS link combinations with errors is shown in Table Used for Links field (i.e. 1 of 2). The template database is shown at the top. If the template database link is broken, then use the Select New Template MDB button to assign another template database file. The output database also has a Select New Output MDB to set the output database file. In the lower left of the dialog is a list of the table names from the output database. You can choose the table to use for the link from this list. The Fix Links for Current Table button will assign the template database, output database and table name from the dialog to all the selected entities. The Erase Links from Table button will remove these broken links from the entities. The Go to Other Table button will process the next GIS link combination with errors.



Pulldown Menu Location: GIS

Keyboard Command: audit_links

Prerequisite: Entities with GIS links

Import SHP File

Function

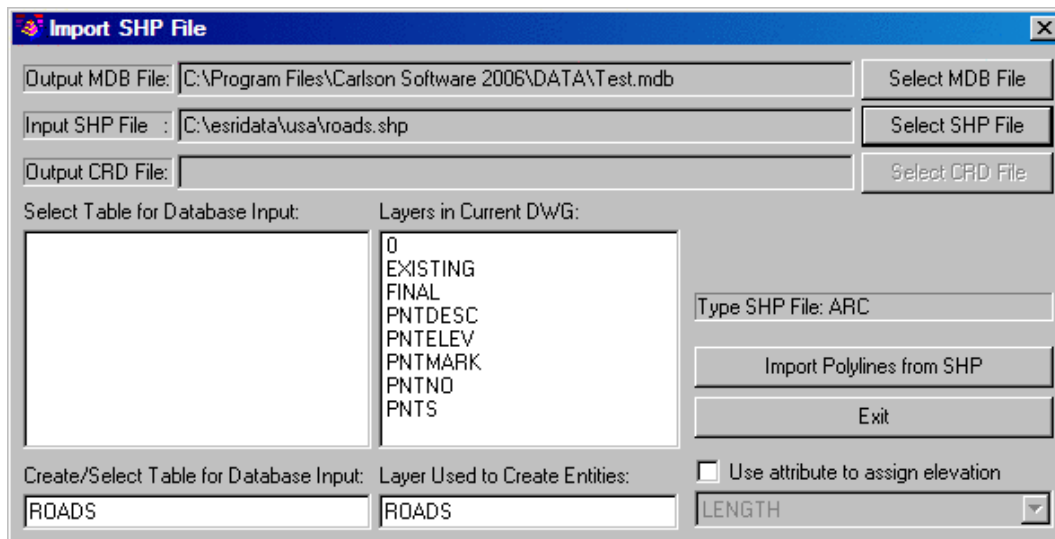
The Import/Export SHP file routines convert ESRI SHP files into Carlson GIS links and back. The Import SHP command reads database information from ESRI ArcView SHP files, and loads these SHP files into Carlson Survey with the database information intact. You can read SHP files into Carlson Survey and after completing all mapping convert these GIS features back into ESRI SHP files. The SHP Export command converts drawing entities and GIS links in Carlson Survey into SHP files for input into ESRI's ArcView product.

These routines are useful GIS data collection tools since the majority of surveying and civil engineering maps are created in the AutoCAD drawing (.DWG) format and the majority of GIS produced maps are made in the ESRI shape (SHP) format. Carlson Survey combines these two formats effortlessly and seamlessly. The GIS professional can stay with ESRI's ArcView SHP format while all field and GIS mapping can still be done in the AutoCAD drawing environment.

The Import SHP File dialog displays the Output MDB file to add data to and the source SHP file to be imported. SHP files are similar to entities in one layer in AutoCAD. You must specify the table name to store the data in the MDB database and the layer name for the entities to be created. Typically these names are the same or near equivalent as the SHP file name. Once these names are entered, the Import Polylines from SHP button becomes available. Pick this button to import the SHP files entities and database. You can also assign elevations by a specified data attribute.

ESRI ArcView creates primarily three types of SHP files: Points, Arcs and Polygons. Both Arc and Polygon SHP files are brought into Carlson Survey as polylines in the drawing and data stored in a table in an MDB database file. Point SHP files are imported in a three step process. The first step uses the Import SHP File command to create a

coordinate file (.CRD) for the points in the SHP file and a corresponding table in the output MDB file for the points database. The second is to use Draw Locate Points to draw the points from the CRD file into the drawing. The third step uses Create Links to select the points in the drawing and link the database to these plotted points. Once the SHP file is selected, Carlson Survey detects the data contents of the file and sets the dialog options for importing either polygons, arcs or points.



Pulldown Menu Location: GIS

Keyboard Command: import_shp

Prerequisite:

Export SHP File

This command creates a SHP file from the selected entities in the drawing. After selecting entities to be converted, a dialog shows the number of Points, Polylines (Arcs) and Closed Polylines (Polygons) found in the drawing selection set. Those Points, Arcs and Polygons with database information linked are displayed with their database table names. Any Points, Arcs and Polygons without linked database information display as unknown.

Highlight the Point, Arc and Polygon tables to output or selects Export All to select all entities including the UNKNOWN entities to export into SHP files. The Export SHP File commands outputs all entities selected into SHP files with the same name as their table name into a subdirectory selected. Also Points can be stored in the ESRI Arcview database as 3D X, Y and Z coordinates when Include Z Coordinates is toggled on. SHP files do not have arc entities. So the export routine will convert arcs and polyline arcs into a series of small chords segments. The Offset Cutoff field sets the maximum horizontal shift allowed between the original arc and the chord segments.

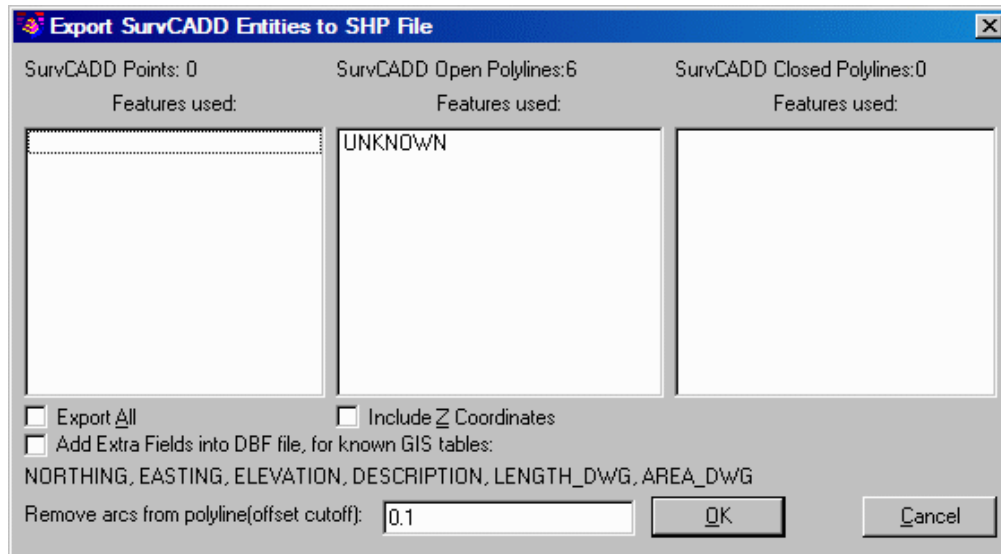
These SHP files can be imported into ESRI's Arcview product. Database GIS links in Carlson Survey are converted to SHP files by storing the GIS database information into DBF files for ESRI's Arcview product to read and link to.

Prompts

Specify Name for SHP File dialog *select .SHP file name*

Select objects *select entities*

Export Carlson Survey Entities to SHP File dialog *choose settings, click OK*



Pulldown Menu Location: GIS

Keyboard Command: export_shp

Prerequisite: None

Image Inspector

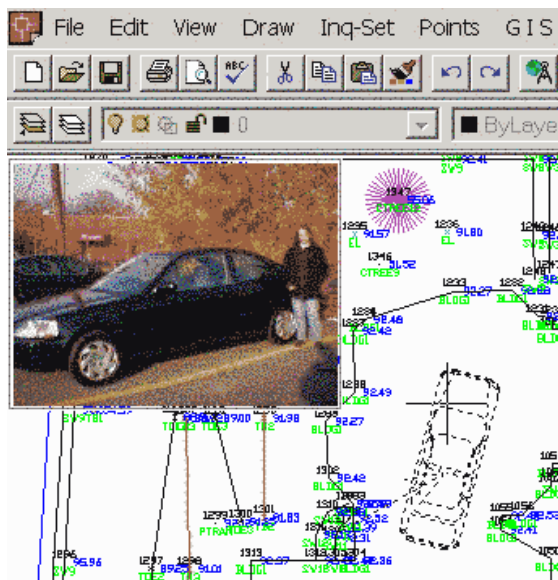
Function

This command views images attached to entities. At the start, the program highlights all entities that have attached images. When you move the cursor over these entities, the attached image is displayed in a window. If you click within the image window, the program will start the image application editor that is setup for your system. This application, such as Microsoft Internet Explorer, depends on your Windows system setup. Also while moving the cursor over drawing entities, you can use the arrow, page up and page down keys to pan and zoom the display.

Prompts

Arrow keys=Pan; PageUp/Down=ZoomOut/In; Pick Image Box = Open Image!

Move pointer over entity with image (Enter to End): *press Enter*



Car image displays in upper-left of drawing when cursor is over car symbol

Pulldown Menu Location: GIS

Keyboard Command: view_image

Prerequisite: drawing entity with attached image

Attach Image to Entity

Function

This command attaches an image file to a drawing entity. The possible image file formats are .BMP, .JPG and .GIF. Any type of drawing entity can be used such as polyline, points or symbols. To run the command, first pick an entity on the screen. Then a dialog appears for selecting the image. First set the image directory and then highlight the image file name. A graphic of the image should appear in the preview window. Then click OK.

The Capture Image button can be used to trigger an attached digital camera to take an image. The Pick Camera and Set Camera buttons can be used to configure the camera to use.

The View Image button will display in the preview window any image already attached to the entity. Also any image already attached to the selected entity is displayed in the Current Image field at the top of the dialog.

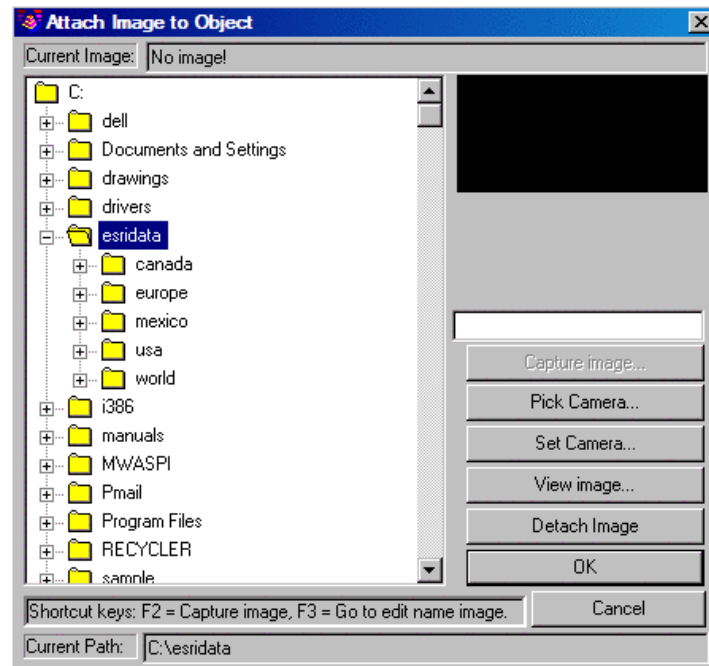
Prompts

Select object to attach symbol to: *pick an entity*

Attach Image to Object Dialog

Done.

Select object to attach symbol to: *press Enter*



Pulldown Menu Location: GIS

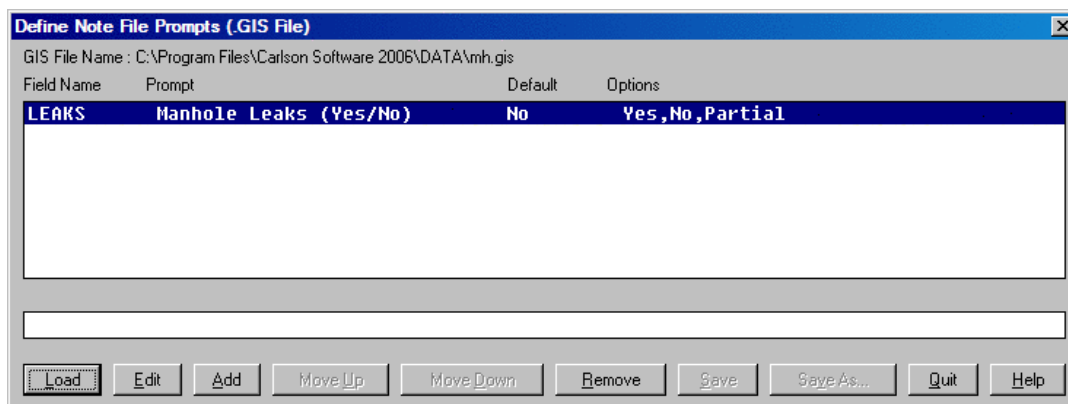
Keyboard Command: set_image

Prerequisite: A drawing entity and an image file

Define Note File Prompts

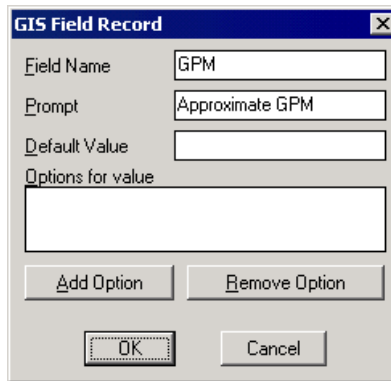
Function

This command allows the user to create a .GIS file for use in several other routines in Carlson Survey and other Carlson Software products such as SurvCE or SurvStar.



The program starts with the main Edit-GIS dialog as shown below. The Load button allows the user to load an existing GIS file for editing or review. The list box shows the various data capture items in the GIS file, showing the field name, the prompt, the default value and the various options for that field. The Edit button allows the user to edit the highlighted field. The Add button allows the user to add new fields after the highlighted field. The Move Up and Move Down allow the user to change the order in which fields appear in the GIS file, while the Remove button completely removes the highlighted field. The Save button saves the GIS file that is currently being edited, while

the SaveAs allows the user to save the current GIS file under a different name. The Quit button checks to see if the current GIS file is saved and quits the routine.



When the Edit or Add button is clicked, the dialog box shown here appears, allowing the user to enter and edit data with respect to a particular field in the GIS file. The Field Name is a unique identifier of the field in the GIS file and hence a GIS file cannot have repeated field names. The Prompt is what appears at the command prompt while waits for user input. The Default Value is the value that would be used among various options, if the user presses Enter at the command prompt without typing anything in response to the prompt. The list box Options for value contains a list of options that can be selected for the particular field. A new option can be added to the list or removed from the list by clicking the appropriate button. The Add Option button brings up a small dialog and accepts the option to be included in the list. Press OK to accept the values set here. At the minimum, the Field Name and Prompt must be specified.

Pulldown Menu Location: GIS

Keyboard Command: DEFNOTE

Prerequisite: None

Database File Utilities

Function

This command is designed to import GIS data from SurvCE, GISCE and FAST Survey files, as well as from user-defined text/ASCII file fields. It also exports data from Carlson Note files (.NOT or .VTT) to Microsoft® Access (.MDB) database tables. The .NOT extension is used when data transfers from desktop. The .VTT extension files are data transfers from data collector.

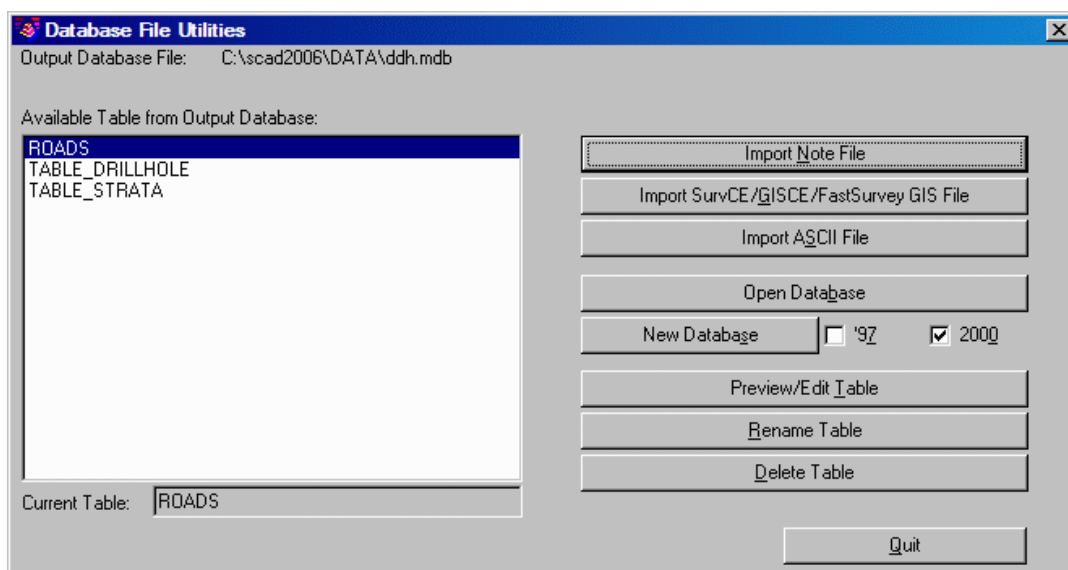
Note files are associated with Coordinate files (.CRD) and contain additional data for point numbers. For example, the Coordinate file for a manhole point could contain the point number, northing, easting, elevation and 32 character description, while the corresponding note file for that point contains additional data on the manhole such as diameter, depth, condition, etc. A Carlson Note file for a Coordinate file will have the same name as the Coordinate file, except with a .NOT or .VTT extension instead of the .CRD extension (e.g. PARK.NOT goes with PARK.CRD). The Carlson Note file is a text file which consists of a point number (PT_ID) followed by field names with values. This group of point number and fields can also have a GIS_FILE name, which is used to identify this group of fields. This GIS_FILE name comes from the Note file prompting definition file (.GIS), which defines the field names for the group and is created in the Define Note File Prompts command.

You can select the Note file to process by using the Import Note File button. The program will then list all the

GIS_FILE names that were found in the Note file. If a set of data for point number does not have a GIS_FILE name, then this group will appear in the list as UNKNOWN.

The name of the Microsoft® Access database to add the data to is the output database file, listed at the top-left of the Database File Utilities dialog. You can change the output database by using the Open Database button and selecting an existing database, or by clicking New Database to create a new database. The database tables will automatically have the same name as the GIS_FILE. This dialog also allows you to preview and edit a spreadsheet editor, which in turn allows you to modify values in the table. Each set of note file data for a point is displayed on one row with the corresponding record from the database shown on the next row. You can export the Note file data and create a new Access database .MDB file, in Access '97 format or in Access 2000 format, by doing a SAVEAS into .MDB format. You can rename and delete a table as well.

Database File Utilities can be combined with the Create Links command to make GIS links between the point entities in the drawing and the Microsoft® Access database records. The point entities can be drawn with the Draw/Locate Points or Field to Finish commands.



Available Table from Output Database: Selection list. Pick a table from the Output Database.

Import Note File: Imports a Carlson Note File (.NOT).

Import SurvCE/GISCE/FastSurvey GIS File: Imports a SurvCE/GISCE/FastSurvey Note File.

Import ASCII File: Imports ASCII file.

Open Database: Opens Access database .MDB file.

New Database: Creates a new Access database .MDB file in Access '97 format or in Access 2000 format.

Preview/Edit Table: Displays a spreadsheet editor, allowing you to preview/edit values from table.

Rename Table: For renaming a table as needed.

Delete Table: For deleting a table as needed.

Current Table: Displays the selected table from above list.

Import ASCII Data

Output Database File: C:\scad2006\DATA\test_djr2.mdb
 Current ASCII File: C:\scad2006\DATA\plat.txt

Available Table from Output Database:

- CGIS_CAT
- CGIS_LINKS
- CGIS_SMART_PROMPTING

Table Name Used to Import ASCII Data:
 PLAT

Fields from Table:

No	Name	Type	Is Key

Field Definition:

Name: Type: Char

Key Field: NONE

Data Preview:

1	4922.72961	5570.69498	502.51000	FL CM/(4" DIAM)
10	4571.00295	5617.44673	499.13000	IP
11	4889.99021	5551.49093	503.01000	18D/DAK
12	4811.61538	5579.17105	504.12000	24D/DAK

Delimiter: Comma ☐ Embedded Field Name (delimiter): Comma

Pulldown Menu Location: GIS

Keyboard Command: noteutil

Prerequisite: A note file (.NOT from desktop or .VTT from data collector)



Help Commands

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This chapter provides information on using the commands from the Help menu to assist you in using Carlson Survey.

On-Line Help

Function

This command opens the Carlson Survey on-line Help File.

Pulldown Menu Location: Help

Keyboard Command: [F1] or HELP

Prerequisite: None

Training Movies

Function

This command opens an application that lets you choose from several training movies. The movies provide instruction on all aspects of Carlson Survey.

Pulldown Menu Location: Help

Keyboard Command: RUN_MOVIES

Prerequisite: None

About Carlson Survey

Function

Displays the Carlson Survey version number, serial number, license information and copyright information. You can run the registration wizard by clicking the Change Registration button on this dialog.

Pulldown Menu Location: Help

Keyboard Command: ABOUT_SCAD

Prerequisite: None



Command Line

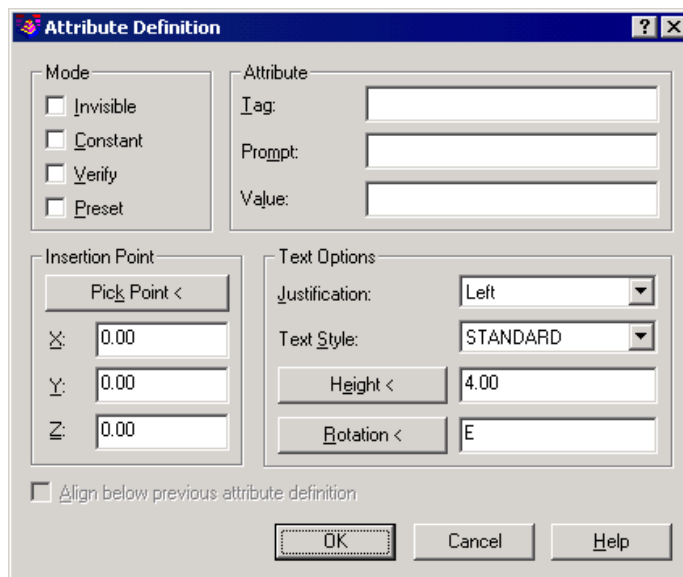
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This chapter provides information on using other commands available only at the command line. Since all of these commands are native to the AutoCAD engine, you may wish to consult an AutoCAD reference book for more details.

Attdef

Function

Defines the mode, as well as the attribute tag, prompt, and value. I also defines the insertion point and the text options for an attribute.



Under Mode, you may sets options for attribute values associated with a block when you insert the block in a drawing.

Invisible: Specifies that attribute values are not displayed or printed when you insert the block.

Constant: Gives attributes a fixed value for block insertions.

Verify: Prompts you to verify that the attribute value is correct when you insert the block.

Preset: Sets the attribute to its default value when you insert a block containing a preset attribute.

Under Attribute, you must set attribute data. You can enter up to 256 characters. If you need leading blanks in the prompt or the default value, start the string with a backslash (\). To make the first character a backslash, start the string with two backslashes.

Tag: Identifies each occurrence of an attribute in the drawing. Enter the attribute tag using any combination of characters except spaces. AutoCAD changes lowercase letters to uppercase.

Prompt: Specifies the prompt that is displayed when you insert a block containing this attribute definition. If you do not enter a prompt, the attribute tag is used as a prompt. If you select Constant in the Mode area, the Prompt option is not available.

Value: Specifies the default attribute value.

Under Insertion Point, you must specify the location for the attribute. Enter coordinate values or choose Pick Point and use the pointing device to specify the placement of the attribute in relation to the objects that it will be associated with. Under Text Options, you must set the justification, style, height, and rotation of the attribute text.

Justification: Specifies the justification of the attribute text. See TEXT for a description of the justification options.

Text Style: Specifies a predefined text style for the attribute text. Currently loaded text styles are displayed. To load or create a text style, see STYLE.

Height: Specifies the height of the attribute text. Enter a value, or choose Height to specify a height with your pointing device. The height is measured from the origin to the location you specify. If you select a text style that

has fixed height (anything other than 0.0), or if you select Align in the Justification list, the Height option is not available.

Rotation: Specifies the rotation angle of the attribute text. Enter a value, or choose Rotation to specify a rotation angle with your pointing device. The rotation angle is measured from the origin to the location you specify. If you select Align or Fit in the Justification list, the Rotation option is not available.

Align Below Previous Attribute Definition: This places the attribute tag directly below the previously defined attribute. If you have not previously created an attribute definition, this option is not available.

Pulldown Menu Location: None

Keyboard Command: Attdef

Prerequisite: None

Audit

Function

Evaluates the integrity of a drawing. AUDIT is a diagnostic tool for examining the current drawing and correcting errors. For every error detected, Carlson Survey provides a description of the error and recommends corrective action.

Pulldown Menu Location: None

Keyboard Command: Audit

Prerequisite: None

Draworder

Function

DRAWORDER changes the drawing and plotting order of any object in the drawing database. In addition to moving objects to the "front" or "back" of the sort order, you can order objects relative to another object (that is, above or below a selected object).

Prompts

Select objects: select objects from screen

Enter object ordering option [Above object/Under object/Front/Back] <Back>: select a method

Regenerating model.

Draworder always requires a regen.

Pulldown Menu Location: None

Keyboard Command: Draworder

Prerequisite: None

Layout

Function

A layout is used to compose or lay out your drawing for plotting. A layout may consist of a title block, one or more viewports, and annotations. Note that many of these options are available by right-clicking a layout tab name.

Copy: Copies a layout. If you do not provide a name, the new layout assumes the name of the copied layout with an incremental number in parentheses. The new tab is inserted before the copied layout tab.

Delete: Deletes a layout. The most current layout is the default.

New: Creates a new layout tab. Up to 255 layouts can be created in a single drawing.

Template: Creates a new layout tab based on an existing layout in a template (DWT), drawing (DWG), or drawing interchange (DXF) file. After you select a file, Carlson Survey displays the Insert Layouts dialog box, which displays the layouts saved in the selected file. After you select a layout, the layout and all objects from the specified template or drawing file are inserted into the current drawing.

Rename: Renames a layout. The last current layout is used as the default for the layout to rename.

Saveas: Saves a layout as a drawing template(DWT) file without saving any unreferenced symbol table and block definition information. You can then use the template to create new layouts in your drawings without having to eliminate unnecessary information. The default layout template directory is specified in the Options command.

Set: Makes a layout current.

?: Lists all the layouts defined in the drawing.

Prompts

Enter layout option [**Copy/Delete/New/Template/Rename/SAveas/Set/?**] <set>: Enter

Enter layout to make current <Layout1>: Enter

Regenerating layout.

Regenerating model.

Pulldown Menu Location: None

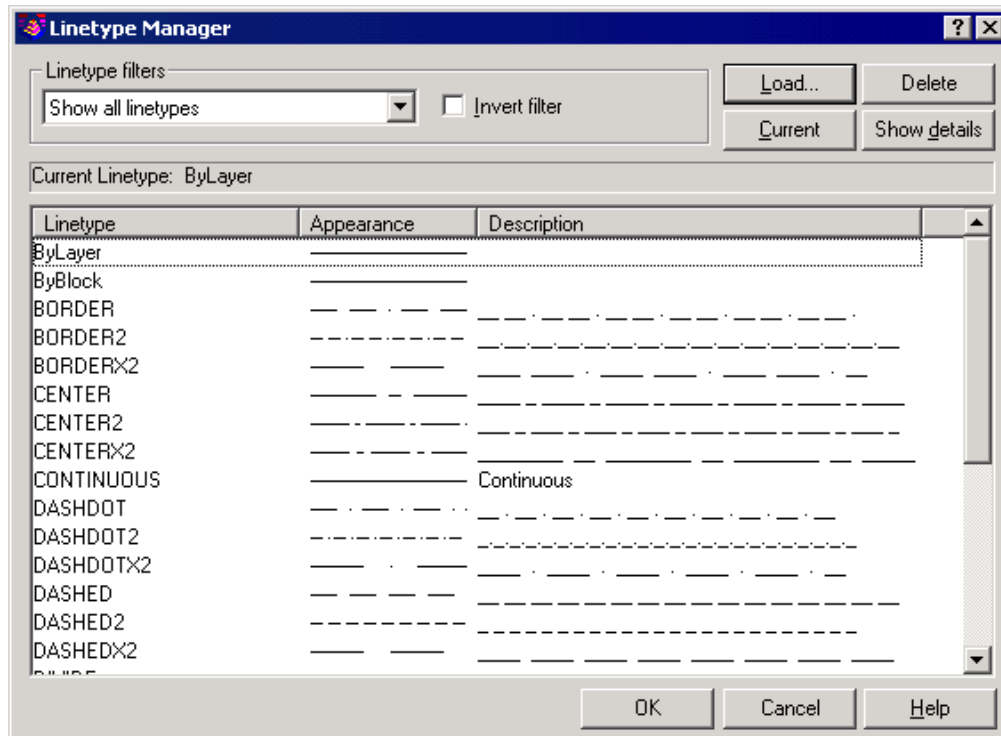
Keyboard Command: Layout

Prerequisite: None

Linetype

Function

Line characteristics consist of combinations of dashes, dots, and spaces. You can use LINETYPE to load linetype definitions from a linetype library (LIN) file, make a linetype current or modify linetype scales.



Under linetype filters, you may determine which linetypes to display in the linetype list. You can filter linetypes based on whether they are xref-dependent, or whether they are referenced by objects.

Invert Filter: Displays linetypes based on the opposites of the criteria you select. Lintypes that fit the inverse filter criteria are displayed in the linetype list.

Load: Displays the Load or Reload Linetypes dialog box, in which you can load into the drawing selected linetypes from the acad.lin file and add them to the linetype list.

Current: Sets the selected linetype to be the current linetype. Setting the current linetype to BYLAYER means that an object assumes the linetype that is assigned to a particular layer. Setting the linetype to BYBLOCK means that an object assumes the CONTINUOUS linetype until it is grouped into a block. Whenever the block is inserted, all objects inherit the block's linetype.

Delete: Deletes selected linetypes from the list. You can only delete unreferenced linetypes. Default referenced linetypes include BYLAYER, BYBLOCK, and CONTINUOUS.

Show details: Enlarges the dialog box by lowering the bottom portion of the dialog in order to show more detailed information about the currently selected linetype.

Pulldown Menu Location: None

Keyboard Command: Linetype

Prerequisite: None

Oops

Function

OOPS restores objects erased by the last ERASE command. You cannot use OOPS to restore objects on a layer that has been removed with the PURGE command.

Pulldown Menu Location: None

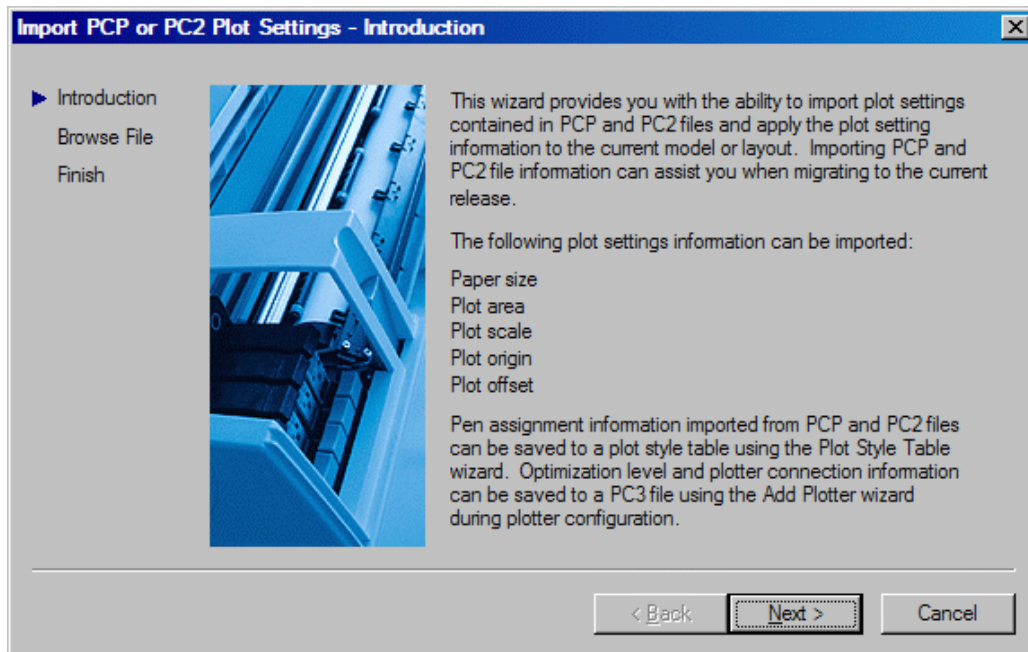
Keyboard Command: Oops

Prerequisite: None

Pcinwizard

Function

PCINWIZARD displays the Import PCP or PC2 Plot Settings wizard. Information that can be imported from PCP or PC2 files includes plot area, rotation, plot offset, plot optimization, plot to file, paper size, plot scale, and pen mapping. The wizard prompts you for the name of the PCP or PC2 configuration file from which you want to import settings. You can view and modify the plot settings prior to importing them. The imported settings can be applied to the current Model tab or layout tab.



Pulldown Menu Location: None

Keyboard Command: Pcinwizard

Prerequisite: None

Psetupin

Function

Provides the ability to import a saved, named page setup from one drawing into a new drawing. The settings that are saved in the named page setup can be applied to layouts in the new drawing. The command begins with a dialog box requesting a file to be selected.

Pulldown Menu Location: None

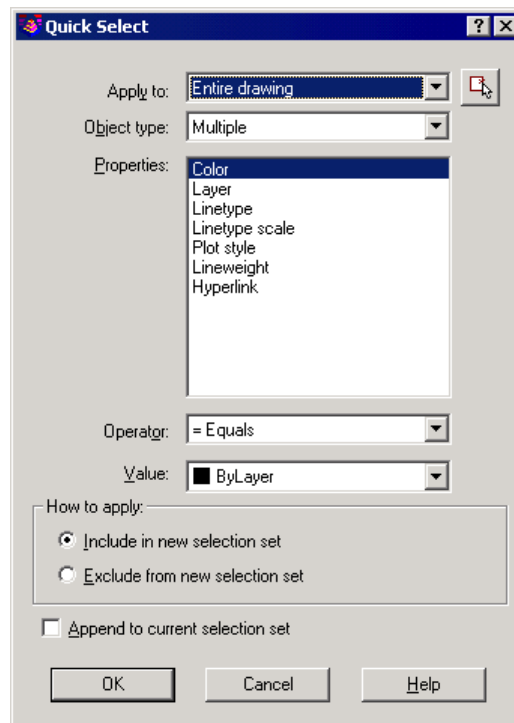
Keyboard Command: Psetupin

Prerequisite: None

Qselect

Function

QSELECT, which stands for Quick Select, creates a selection set that either includes or excludes all objects matching the filtering criteria you specify. QSELECT can apply to the entire drawing or to an existing selection set. The selection set created by QSELECT replaces or is appended to the current selection set. If you have partially opened the current drawing, QSELECT does not consider objects that you have not loaded.



Apply To: Applies the filtering criteria to the entire drawing or to the current selection set (if one exists). To select a group of objects to which you want to apply the filtering criteria, use the Select Objects button. When you have finished selecting objects, press ENTER to redisplay the dialog box. Carlson Survey sets Apply To to Current Selection. If Append to Current Selection Set is selected, Carlson Survey applies the filtering criteria to the entire drawing.

Select Objects: Temporarily closes the Quick Select dialog box so that you can select the objects to which you want to apply the filter criteria. Press ENTER to return to the Quick Select dialog box. Carlson Survey changes the Apply To box to show Current Selection. The Select Objects button is available only when you select Include In New Selection Set and clear Append to Current Selection Set.

Object Type: Specifies the type of objects to include in the filtering criteria. If the filtering criteria are being applied to the entire drawing, the Object Type list includes all object types, including custom. Otherwise, the list includes only the object types of the selected objects.

Properties: Specifies the object property for the filter. This list includes all searchable properties for the selected object type. Carlson Survey determines the sort order for the properties (alphabetical or categorized) based on the current sort order in the Properties window (see PROPERTIES). The property you select determines the options available in Operator and Value.

Operator: Controls the range of the filter. Depending on the selected property, options may include Equals, Not Equal To, Greater Than, Less Than, and *Wildcard Match. Greater Than and Less Than are not available for some

properties. *Wildcard Match is available only for text fields that can be edited.

Value: Specifies the property value for the filter. If known values for the selected property are available, Value becomes a list in which you can choose a value. Otherwise, enter a value.

How to Apply: Specifies whether you want the new selection set to include or exclude objects that match the specified filtering criteria. Choose Include in New Selection Set to create a new selection set composed only of objects that match the filtering criteria. Choose Exclude from New Selection Set to create a new selection set composed only of objects that do not match the filtering criteria.

Append to Current Selection Set: Specifies whether the selection set created by QSELECT replaces or is appended to the current selection set.

Pulldown Menu Location: None

Keyboard Command: Qselect

Prerequisite: None

Rectang

Function

The command draws a rectangular polyline. Below are the command line options, followed by the details on each, for the Rectang command.

Prompts

Specify first corner point or [Chamfer/Elevation/Fillet/Thickness/Width]: *pick point*

Specify other corner point or [Dimensions]: *pick another point*

Chamfer: Sets the chamfer distances for the rectangle. The values become the current chamfer distances for subsequent RECTANG commands.

Elevation: Specifies the elevation of the rectangle. The value becomes the current elevation for subsequent RECTANG commands.

Fillet: Specifies the fillet radius of the rectangle. The value becomes the current fillet radius for subsequent RECTANG commands.

Thickness: Specifies the thickness of the rectangle. The value becomes the current thickness for subsequent RECTANG commands.

Width: Specifies the polyline width of the rectangle to be drawn. The value becomes the current polyline width for subsequent RECTANG commands.

Pulldown Menu Location: None

Keyboard Command: Rectang

Prerequisite: None

Textscr

Function

TEXTSCR displays the Carlson Survey command line in a separate window. You can press F2 to toggle between the drawing area and the text window.

Pulldown Menu Location: None

Keyboard Command: Textscr

Prerequisite: None

Vplayer

Function

VPLAYER makes a layer visible in one or more viewports and invisible in all other viewports. The VPLAYER command can be used only while you are working in a layout tab.

Prompts

Enter an option [?/Freeze/Thaw/Reset/Newfrz/Vpvisdflt]: *make selection*

?: Displays the names of frozen layers in a selected viewport.

Freeze: Freezes a layer or set of layers in one or more viewports. Carlson Survey does not display, regenerate, or plot objects on frozen layers.

Thaw: Thaws layers in specific viewports.

Reset: Sets the visibility of layers in specified viewports to their current default setting.

Newfrz: Creates new layers that are frozen in all viewports.

Vpvisdflt: Thaws or freezes the specified layers in subsequently created viewports.

Pulldown Menu Location: None

Keyboard Command: Vplayer

Prerequisite: None



Command List

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Here are lists of all the Carlson Survey command names created by Carlson Software and the AutoCAD OEM

engine by Autodesk. These commands can be run by entering the command name at the Command: prompt, as well as selecting them from the menu or toolbars.

Carlson Commands

KEYBOARD NAME

2ASHTECH

2DLINE

2DP

2EDS

2SOFT

2SURV

2SURV2

2SURV3

2SURV4

2TANLAL

2TANLCL

2TANLDO

2TANLEX

2TANLIN

2TANLMO

2TANLTL

3CURVES

3DIST

3DP

3DTO2D

3P

3PA

4SIDED

A

ABOUT_SCAD

ADDINT

ADDPL

COMMAND NAME

Convert Points To Ashtech GIS

Line

2D Polyline

Convert Points to EaglePt

Convert Points to Softdesk

Convert Softdesk to Points

Convert EaglePt to Points

Convert Wild/Leica to Points

Convert Geodimeter to Points

2 Tangents, Arc Length

2 Tangents, Chord Length

2 Tangents, Degree of Curve

2 Tangents, External

2 Tangents, Radius

2 Tangents, Mid-Ordinate

2 Tangents, Tangent Length

3-Radius Curve Series

Bearing Distance

3D Polyline

3D Entity to 2D

3D Polyline

3 Point

4 Sided Building

Arc

About Carlson Software

Add Intersection Points

Add Polyline Vertex

ADDZIG	Add Zig to Polyline
ADJNTEXT	Adjoiner Text
AEC_CNTR	Convert LDT-AEC Contours
AEC_PT	
AL	Convert Land Desktop to Points
ALI_TO_CL	Align
ALIGNPT	Import Spanish ISPOL
ANNARC	Align Points
ANNCONF	Custom Label Formatter
ANNLIN	Check Label Overlaps
AREARC	Custom Label Formatter
ARROWHD	Area Radial from Curve
AUDIT_LINKS	Arrowhead
AUTOANN	Audit Links
AUTOPNTS	Auto Annotate
AZ	Create Points from Entities
AZI_	Loate By Azimuth
AZI2_	Azimuth_
AZI3_	AzimuthDistance_
AZILEAD	Azimuth_Distance
B	Azi-Dist w/Leader
BACKOBJ	Block
BACO	Send to Back
BARSCALE	Bearing Area Cutoff
BAZI	Draw Bar Scale
BB	_Azimuth
BBRG	Bearing-Bearing Intersect
BBRGDIS	_Bearing
BD	_BearingDistance
BDIS	Bearing-Distance Intersect
BDLEAD	_Distance
BENCHMARK	Brg-Dist w/Leader
BFITCIR	Benchmark
BFITCRV	Best Fit Circle
BFITLINE	Best Fit Curve
BFITLINELQ	Best Fit Line by Average
BH	Best Fit Line by Least Sq
BLDG_PNTS	Boundary Hatch
BLDGTEXT	Building Offset Extensions
BOFFSET	Building Dimensions
BOUNDPL	Buffer Offset
	Boundary Polyline

BREAK3D	Break 3D Polyline
BREAKAT	At Intersection
BRG_	Bearing_
BRG_DIS	Bearing_Distance
BRGDIS_	BearingDistance_
BRGLEAD	Bearing w/Leader
BRGQUAD	Switch Bearing Quadrant
BROT	by Bearing
C	
CAICE2PRO	Circle
CALCOFF	Import Caice
CARROW	Calculate Offsets
CENTERLN	Curve - Arrow
CFU	Design Centerline
CG2CRD	CooRDinate File Utilities
CH	Convert CG to Points
CHECKPL	Change Properties
CHGATTR	Check Elevation Range
CHGBLK	Attribute Style
CHGELEV	Substitute
CHGSTYLE	Elevations
CHGTEXT	Style
CHGTXTOBLIQUE	Replace Text
CHGTXTSIZE	Change Text Oblique Angle
CHGTXTSTYLE	Change Text Size
CHGTXTWIDTH	Change Text Font
CINFO	Change Text Width
CL_ID	Curve Info
CL2PLINE	Centerline ID
CL2SDR	Draw Centerline File
CLEDIT	Export Sokkia/Leitz
CLIPLINE	Input-Edit Centerline File
CLOSEPL	By Crossing Polyline
CLPLINE	Close Polylines
CLREPORT	Polyline to Centerline File
CNTRTIN	Centerline Report
CO	Contour from TIN File
CONFIG_SCAD	Copy
CR5_CRD	Configure
CRD_CR5	Convert TDS CR5 to CRD
CRD_LDD	Convert CRD to TDS CR5
	Convert CRD to LDD MDB

CRD2CG	Convert Points to CG
CREATE_LINKS	Create Links
CRESECTION	Resection
CROWFT	Endpoint Leaders_
CROWFT2	_Endpoint Leaders
CUBE	3D Viewer Window
CURVECALC	Curve Calc
CURVETBL	Curve Table
CUTRPRT	Cut Sheet
CWIDTH	Change Polyline Width
DATACOLT	Data Collectors
DCACL1	Export Softdesk
DCACL2	Import Softdesk
DCAPRO1	Export Softdesk
DCAPRO2	Import Softdesk
DD	Distance-Distance Intersect Properties
DDCHPROP	Process Deed File
DEED	Deed Correlation
DEED_ALIGN	Define Template Database
DEF_TEMPLATE	Area Defaults
DEFAREA	Define Note File Prompts
DEFNOTE	Delete Table Elements
DEL_TBL	Erase Points
DELPT	Draw Grid
DGRID	Distance
DI	Edit-Process Level Data
DIGLEVEL	Offset Dimensions
DIMENTXT	Distance_
DIS_	Distance_Bearing
DIS_BRG	Closed Polyline Image
DISPLAY_POLYGON_IMAGE	Distance w/Leader
DISTLEAD	Divide Along Entity
DIVENT	Divide Between Points
DIVLIN	Draw By Example
DRAWBYEX	Draw Lots from File
DRAWLOT	Draw Profile
DRAWPROF	Draw Triangular Mesh
DRAWTRI	Draw Text
DT	Export Drawing to Acad 14
DWG2R14	

DWGXEXPLORE
E
EA
EDITARCTXT
EDITLOT
EDITPL
EDITPL2
EDITPNT
EDITPT
EDITPTSYP
EDITXT
ELEVLAB
ERASE_LINKS
ERASEOUT
ERASEPLINE
ERASEPNT
EX
EXPLODE_SCAD
EXPLODE2
EXPORT_SHP
EXTARC
EXTEND3D
EXTENDER
EXTINT
F
FILLET3D
FLD2FIN
FLIP
FLIP_LABELS
FLIPSET
FLIPTEXT
FLP
FPNT
FRONTOBJ
GCLABEL
GEOCAD1
GEOCAD2
GEOCAD3
GEOCAD4
GEOD2CL

Drawing Explorer
Erase
Enter-Assign Point
Edit Text on Arc or Tangent
Input-Edit Lot File
Edit Polyline Vertex
Edit Polyline Section
Edit Point Attributes
Edit Points
Edit Symbol Library
Edit Title Text
Label Elev Along Pline

Erase Links
Erase Outside
Erase By Closed Polyline

Erase Point Attributes
Extend

Explode Points
Block Explode
Export SHP File
Extend Arc
Extend 3D Polyline
Extend By Distance
To Intersection

Fillet
Fillet 3D Polyline

Field to Finish
Flip Last Label
Flip Selected Labels
Mirror Selected Labels
Flip Text
Flip On/Off

Find Point(s)
Bring to Front

Contour Elevation Label
Graphical Interface
Viewport Set Scale
Viewport Grid Marks
GeoCadastral Help
Import GeodiMeter

GEOPAK2CL	Import GeoPak Centerline
GEOPAK2RD	Import GeoPak Road File
GEOTIFF	
GIS_CONFIG	Place Image by World File
GIS_INSPECTOR	GIS Settings
GIS_QUERY	GIS Data Inspector
GISDATA	GIS Query/Report
GLO_FOURWAY	Input-Edit GIS Data
GLO_ONEWAY	Four Way Control
GLO_THREEWAY	One Way Control
GLO_TWOWAY	Three Way Control
GLOBALRE	Two Way Control
GONLAB	Global Reannotate
GONLAB2	Gon_
GONLAB3	_Gon
GONLAB4	GonDistance_
H	Gon_Distance
HARDBRK	Hatch
HAREA	Tag Hard Breakline Polylines
I	Hinged Area
IA	Inverse
IMP_EXP	Inverse with Area
IMPORT_SHP	Import/Export LandXML Files
IMPORTRD5	Import SHP File
INARC	Import TDS RD5 File
INSPECTOR	Fit Text Inside Arc
ISOLATE	Drawing Inspector
JOIN3D	Isolate Layers
JOINAREA	Join 3D Polyline
L	Area by Lines Arcs
LABANG	Line
LABARC	Label Angles
LABCOOR	Label Arc
LABEL_ARC_TEXT	Label Coordinates
LABEL_POLYGON_TEXT	Open Polyline Data
LABLAT	Closed Polyline Data
LASTAREA	Label Lat/Long
LAYERID	Label Last Area
LAYERVOL	Layer ID
	Volumes by Layers

LB	Locate By Line-Bearing
LCHG	Change Layer
LDD_CRD	Convert LDD MDB to CRD
LDEF	Annotate Defaults
LDEL	Erase By Layer
LDR	Leader with Text
LEGAL	Legal Description
LEGEND	Draw Legend
LG	Locate By Bearing
LI	List
LINECIRCLE	Tangent Line from Circles
LINEONOFF	Line On/Off
LINETBL	Line Table
LISTPT	List Points
LOCAZI2	by Azimuth
LOCBRG	by Line-Bearing
LOCBRG2	by Bearing
LOFF	Freeze Layer
LON	Thaw Layer
LOTATTR	Define Lot Attributes
LOTEXPORT	Export Lot File To MDB Database
LOTIMPORT	Import Lot File From MDB Database
LOTINSPECTOR	Lot Inspector
LOTLAY	Lot Layout
LOTREPORT	Lot File Report
LP	Draw-Locate Points
LP	Draw-Locate Points
LS	List
LSET	Set Layer
LSTELEV	List Elevation
M	Move
MAKETREE	Polyline to Tree Line
MC	Map Check by Pnt#'s
MI	Mirror
MKGRID	Make 3D Grid File
MKLOT	Design Lot
MODPNTS	Edit Multiple Pt Attributes
MORTGAGE	Mortgage Block
MOSS2CL	Import Moss

MOVEPNT	Move Point Attributes
MPNT	Move Points
MULTSYM	Insert Multi-Point Symbols
NARROW	Draw North Arrow
NEARJOIN	Join Nearest
NOTEUTIL	Database File Utilities
NUMBERS	Sequential Numbers
O	Offset
OFFLAB	Label Offset Distances
OFFPTS	Offset Point Entry
OFFSET3D	Offset 3D Polyline
OFFSTA	Label Station-Offset
OP	Occupy Point
OPENPL	Open Polyline
OPENRAW	Raw File On/Off
OUTARC	Fit Text Outside Arc
P	Pan
PACSOFT2CRD	Convert PacSoft CRD to Carlson CRD
PAD	Design Pad Template
PARKING	Parking
PCA	PC, PT, Radius Point
PDD	Enter Deed Description
PGM	Point Group Manager
PICK_TEXT_ROTATE	Rotate Text By Pick
PICKINT	Pick Intersection Points
PL	Draw 2D Polyline
PL2LOT	Polyline to Lot File
PL2RW5	Polyline to RW5 File
PLA_TO_CL	Import Spanish CLIP
PLCHGORG	Set Polyline Origin
PLNEAR	Polyline by Nearest Found
PLOTGRID	Draw 3D Grid File
PLREPORT	Polyline Report
PLTYPE	Polyline to Special Line
PLTYPE2	Change Polyline Linetype
PNTCHG	Change Point Layer/Color
PNTENL	Scale Point Attributes

POINTSNAp	Point Object Snap On/Off
POINTTBL	Create Point Table
POINTTBLUPD	Update Point Table
POLYDRAW	Draw Polyline File
POLYLEN	Polyline Info
POLYWRITE	Write Polyline File
PR	Preferences
PRD	Profile Defaults
PRJXPLORE	Project Explorer
PRO2PTS	Profile to Points
PROFEDIT	Input-Edit Profile File
PROFPTS	Profile from Pts on Centerline
PROSM	Profile from Surface Entities
PT_AEC	Convert Points to Land Desktop
PT_ID	Point ID
PTARC	Point on Arc
PTAREA	Area by Interior Point
PTINT	Interval Along Entity
PTSETUP	Point Defaults
PTSYM	Insert Symbols
QUICKPRO	Quick Profile
R	Redraw
RADSTAKE	Radial Stakeout
RAWEDIT	Edit-Process Raw Data File
RE	Regen
READPT	Import Text/ASCII File
REDUCE	Reduce Polyline Vertices
REMOVEPL	Remove Polyline Segment
RENUMPNT	Renumber Points
REPORTLAYER	Layer Report
RESETXHAIRS	Reset X-Hairs
RESTORE	Restore Layers
REVPLINE	Reverse Polyline
RMARC	Remove Polyline Arcs
RMDUPLWORK	Remove Duplicate Polyline
RMVERTEX	Remove Polyline Vertex

RO	Rotate
ROADS	Carlson Roads Menu
ROTATEPT	Rotate Points
RUN_MOVIES	Training Movies
RUN_SCHELP	On-Line Help
SAREA	Sliding Side Area
SC	Scale
SCALEDWG	Rescale Drawing
SCALEPT	Scale Points
SCALIGN	2D Align
SCEDIT	Display-Edit Text/ASCII File
SCIRCLE	Circle
SDMS2CL	Import SDMS
SDR2CL	Import Sokkia/Leitz
SDR2PRO	Import Sokkia/SDR
SECTIONSUB	Section Subdivision
SET	Set Environment Variables
SET_IMAGE	Attach Image to Entity
SET_INSPECTOR	GIS Inspector Settings
SET_TBL	Set Table Position
SETCELEV	Change Polyline Elevation
SETCRD	Set CoorDinate File
SETLOT	Set Lot File
SETTMPDIR	Set Data Directory
SETUP	Drawing Setup
SETXHAIRS	Set X-Hairs
SITEMGR	Site Manager Menu
SIZEBLK	Resize
SIZEPNT	Resize Point Attributes
SLABARC	Stack Label Arc
SLEADER	Special Leader
SMICL1	Export SMI Chain
SMOOTHPL	Smooth Polyline
SOFTBRK	Untag Hard Breakline Polylines
SOLAROB	Solar Observations
SPIRAL	Spiral Curve
SRAL	Tang, PC, Radius, Arc Length
SRCB	PC, Radius, Chord
SRCL	Tang, PC, Radius, Chord Length

SRCR	Compound or Reverse
SRDA	Tang, PC, Radius, Delta Angle
SRTL	Tang, PC, Radius, Tang Length
SS	Side Shots
SSAREA	Sliding Side Area
ST	Style
STACKBD	Stacked DistanceBearing_
STACKBD2	Stacked _BearingDistance
STACKBD3	Stacked BearingDistance_
STACKBD4	Stacked _DistanceBearing
STAPL	
STDCUL	Station Polyline/Centerline
SVTEXTDF	Cul-de-Sacs
SWPLINES	Survey Text Defaults
T	Shrink-Wrap Entities
TA	Traverse
TABHEAD	Locate By Turned Angle
TABLET1	Table Header
TABLET2	Save Tablet Calibration
TBARCFG	Load Tablet Calibration
TBLOCK	Toolbars
TDEF	Title Block
TDSCL1	Table Defaults
TEXTARC	Export TDS
TEXTARCTAN	Draw Text on Arc
TEXTDEED	Draw Text on Tangent
TEXTEXP	Deed By Screen Entities
TEXTIN	Text Explode to Polylines
TEXTOUT	Text Import
TM2CL	Text Export
TM2PRO	Import Terramodel
TOPCON_TIN	Import Terramodel
TOPLINE	Export Topcon TIN File
TR	Entities to Polylines
TRANSPT	Trim
TRAVLINE	Translate Points
TRI	Line By Angle-Distance
TRIM3D	Triangulate Contour
TRIMPTS	Trim 3D Polyline
TRIVOL	Trim by Point Symbol
	Volumes by Triangulation

TURNANG2	Turned Angle
TWIST1	Twist Standard
TWIST2	Twist Line Polyline or Text
TWIST3	Twist Surveyor
TWIST4	Twist Restore Due North
TWISTPTS	Twist Point Attributes
TWISTTXT	Rotate Text
TXT2LOT	Lot File by Interior Text
TXTENL	Text Enlarge/Reduce
UCS.WORLD	Set UCS to World
UN	Units
UNZIP_PROJECT	Extract Project Archive
VAREdit	Set Environment Variables
VIEW_IMAGE	Image Inspector
VOLCALC2	Two Surface Volumes
VP	Viewport
VPLAYOFF	Viewport Layer Freeze
W	Write Block
WAYINT	Offsets Intersections
WILDCL1	Export Leica
WILDCL2	Import Leica
WILDPRO1	Export Leica
WILDPRO2	Import Leica
WRITEPT	Export Text/ASCII File
X	Explode
XD	Extend By Distance
Z	Zoom
ZC	Zoom Center
ZD	Zoom Dynamic
ZE	Zoom Extents
ZIN	Zoom In
ZIP_PROJECT	Store Project Archive
ZOOMPNT	Zoom Point(s)
ZOUT	Zoom Out
ZP	Zoom Previous
ZW	Zoom Window

AutoCAD Commands

KEYBOARD NAME

COMMAND DESCRIPTION

ALIGN	Moves and rotates objects to align with other objects
APBOX	Turns the AutoSnap aperture box on or off. The aperture box is displayed in the center of the crosshairs when you snap to an object.
APERTURE	Controls the size of the object target box
ATTACHURL	Attaches a URL to an object or an area
ATTDEF	Creates an attribute definition
ATTDIA	Controls whether the -INSERT command uses a dialog box for attribute value entry
ATTMODE	Controls display of attributes
ATTREQ	Determines whether the INSERT command uses default attribute settings during insertion of blocks
AUDIT	Evaluates the integrity of a drawing
AUTOSNAP	Controls AutoSnap marker, tooltip, and magnet.
BHATCH	Fills an enclosed area with a hatch pattern
BLIPMODE	Controls display of marker blips for point selection
BLOCK	Creates a block definition from selected objects
BREAK	Erases parts of objects or splits an object in two
BROWSER	Launches the default Web browser defined in your system's registry
CECOLOR	Sets the color of new objects.
CHAMFER	Bevels the edges of objects
CHPROP	Changes the color, layer, linetype scale factor and thickness of an object
CLAYER	Sets the current layer.
CLOSE	Closes the active drawing
CMDDIA	Controls whether dialogs are displayed for certain commands
CMDECHO	Controls whether AutoCAD echoes prompts and input during the AutoLISP command function.
COLOR	Sets the color for new objects
COORDS	Controls when coordinates are updated on the status line.
COPY	Duplicates objects
COPYCLIP	Copies objects to the Clipboard
CURSORSIZE	Determines the size of the crosshairs as a percentage of the screen size.
CUTCLIP	Copies objects to the Clipboard and erases the objects from the drawing
DDATTE	Attribute edit
DDEDIT	Edits text and attribute definitions
DDINSERT	Inserts a block or another drawing
DDPLOTSTAMP	Places a plot stamp on a specified corner of each drawing and/or logs it to a file
DDSTYLE	Displays dialog box for the STYLE command
DDUNITS	Displays dialog box for the UNITS command
DDVPOINT	Sets the three-dimensional viewing direction
DETACHURL	Detaches a URL from an object or area
DIM	Accesses Dimensioning mode
DIM1	Makes dim sub-prompt active

DIMADEC	Controls the number of precision places displayed in angular dimensions.
DIMALIGNED	Creates an aligned linear dimension
DIMALT	Controls the display of alternate units in dimensions.
DIMALTD	Controls the number of decimal places in alternate units.
DIMALTF	Controls the multiplier for alternate units.
DIMALTRND	Rounds off the alternate dimension units.
DIMALTTD	Sets the number of decimal places for the tolerance values in the alternate units of a dimension.
DIMALTTZ	Toggles suppression of zeros in tolerance values.
DIMALTU	Sets the units format for alternate units of all dimension style family members except angular.
DIMALTZ	Controls the suppression of zeros for alternate unit dimension values
DIMANGULAR	Creates an angular dimension
DIMAPOST	Specifies a text prefix or suffix (or both) to the alternate dimension measurement for all types of dimensions except angular.
DIMASO	Controls the associativity of dimension objects.
DIMASSOC	Controls creation of associative dimensions
DIMASZ	Controls the size of dimension line and leader line arrowheads.
DIMATFIT	Determines how dimension text and arrows are arranged when space is not sufficient to place both within the extension lines.
DIMAUNIT	Sets the units format for angular dimensions.
DIMAZIN	Suppresses zeros for angular dimensions.
DIMBASELINE	Continues a linear angular or ordinate dimension from the baseline of the previous or selected dimension
DIMBLK	Sets the arrowhead block displayed at the ends of dim
DIMBLK1	Sets the arrowhead for the first end of the dimension line when DIMSAH is on.
DIMBLK2	Sets the arrowhead for the second end of the dimension line when DIMSAH is on.
DIMCEN	Controls drawing of circle or arc center marks and centerlines.
DIMCENTER	Creates the center mark or the center lines of circles and arcs
DIMCLRD	Assigns colors to dimension lines, arrowheads, and dimension leader lines.
DIMCLRE	Assigns colors to dimension extension lines.
DIMCLRT	Assigns colors to dimension text.
DIMCONTINUE	Continues a linear angular or ordinate dimension from the second extension line of the previous or a selected dimension
DIMDEC	Sets the number of decimal places displayed for the primary units of a dimension.
DIMDIAMETER	Creates diameter dimensions for circles and arcs
DIMDISASSOCIATE	Allows users to disassociate associative dimensions
DIMDLE	Sets the distance the dimension line extends beyond the extension line when oblique strokes are drawn instead of arrowheads.

DIMDLI	Controls the spacing of the dimension lines in baseline dimensions.
DIMDSEP	Specifies a single-character decimal separator to use when creating dimensions whose unit format is decimal.
DIMEDIT	Edits dimensions
DIMEXE	Specifies how far to extend the extension line beyond the dimension line.
DIMEXO	Specifies how far extension lines are offset from origin points.
DIMFIT	Obsolete. Has no effect in AutoCAD 2000 except to preserve the integrity of pre-AutoCAD 2000 scripts and AutoLISP routines.
DIMFRAC	Sets the fraction format when DIMLUNIT
DIMGAP	Sets the distance around the dimension text when the dimension line breaks to accommodate dimension text.
DIMHORIZONTAL	Horizontal dimension
DIMJUST	Controls the horizontal positioning of dimension text.
DIMLDRBLK	Specifies the arrow type for leaders.
DIMLFAC	Sets a scale factor for linear dimension measurements.
DIMLIM	Generates dimension limits as the default text.
DIMLINEAR	Creates linear dimensions
DIMLUNIT	Sets units for all dimension types except Angular.
DIMLWD	Assigns lineweight to dimension lines.
DIMLWE	Assigns lineweight to extension lines.
DIMORDINATE	Creates ordinate point dimensions
DIMOVERRIDE	Overrides dimension system variables
DIMPOST	Specifies a text prefix or suffix (or both) to the dimension measurement.
DIMRADIUS	Creates radial dimensions for circles and arcs
DIMREASSOCIATE	Allows users to associate non-associative dimensions
DIMREGEN	Forces a regeneration of all associative dimensions
DIMRND	Rounds all dimensioning distances to the specified value.
DIMROTATED	Rotated dimension
DIMSAH	Controls the display of dimension line arrowhead blocks.
DIMSCALE	Sets the overall scale factor applied to dimensioning variables that specify sizes, distances, or offsets.
DIMSD1	Controls suppression of the first dimension line.
DIMSD2	Controls suppression of the second dimension line.
DIMSE1	Suppresses display of the first extension line.
DIMSE2	Suppresses display of the second extension line.
DIMSHO	Controls redefinition of dimension objects while dragging.
DIMSOXD	Suppresses drawing of dimension lines outside the extension lines.
DIMSTYLE	Creates and modifies dimension styles
DIMTAD	Controls the vertical position of text in relation to the dimension
DIMTDEC	Sets the number of decimal places to display in tolerance values for the primary units in a dimension.
DIMTEDIT	Moves and rotates dimension text
DIMTFAC	Sets a scale factor used to calculate the height of text for dimension fractions and tolerances.

DIMTIH	Controls the position of dimension text inside the extension lines for all dimension types except ordinate.
DIMTIX	Draws text between extension lines.
DIMTM	Sets the minimum (or lower) tolerance limit for dimension text when DIMTOL or DIMLIM is on.
DIMTMOVE	Sets dimension text movement rules.
DIMTOFL	Controls whether a dimension line is drawn between the extension lines even when the text is placed outside.
DIMTOH	Controls the position of dimension text outside the extension lines.
DIMTOL	Appends tolerances to dimension text.
DIMTOLJ	Sets the vertical justification for tolerance values relative to the nominal dimension text.
DIMTP	Sets the maximum (or upper) tolerance limit for dimension text when DIMTOL or DIMLIM is on.
DIMTSZ	Specifies the size of oblique strokes drawn instead of arrowheads for linear, radius, and diameter dimensioning.
DIMTVP	Controls the vertical position of dimension text above or below the dimension line.
DIMTXSTY	Specifies the text style of the dimension.
DIMTXT	Specifies the height of dimension text, unless the current text style has a fixed height.
DIMTZIN	Controls the suppression of zeros in tolerance values.
DIMUPT	Controls options for user-positioned text.
DIMVERTICAL	Vertical dimension
DIMZIN	Controls the suppression of zeros in the primary unit value.
DRAGMODE	Toggles display of objects while being dragged
DRAWORDER	Changes the display order of images and other objects
DSETTINGS	Specifies settings for Snap mode, grid, and polar and object snap tracking
DTEXT	Displays text on screen as it is entered
DXFIN	Imports a drawing interchange file
DXFOUT	Creates a drawing interchange file of the current drawing
ELEVATION	Sets elevation and extrusion thickness
EPLTEXT	Eplot extensions
ERASE	Removes objects from a drawing
EXPLODE	Breaks a compound object into its component objects
EXTEND	Extends an object to meet another object
FILEDIA	Suppresses display of the file dialog boxes.
FILEOPEN	Opens a new file
FILLET	Rounds and fillets the edges of objects
GRID	Displays a dot grid
GRIDMODE	Sets and stores value for grid display on/off
GRIDUNIT	Sets grid spacing
GRIPBLOCK	Specifies the grid spacing (X and Y) for the current viewport.
GRIPCOLOR	Controls the assignment of grips in blocks.
GRIPHOT	Controls the color of selected grips (drawn as filled boxes).

GRIPS	Controls the use of selection set grips for the Stretch, Move, Rotate, Scale, and Mirror Grip modes.
GRIPSIZE	Sets the size of the grip box in pixels.
HATCHEDIT	Modifies an existing hatch object
HIGHLIGHT	Controls object highlighting
IMAGE	Inserts images in many formats into a drawing file
IMAGEADJUST	Controls the brightness contrast and fade values of the selected image
IMAGEATTACH	Attaches a new image object and definition
IMAGECLIP	Creates new clipping boundaries for single image objects
IMAGEFRAME	Controls whether the image frame is displayed on the screen or hidden from view
INSERT	Places a named block or drawing into the current drawing
ISOPLANE	Specifies the current isometric plane
LAYER	Layer Properties Manager
LAYOUT	Creates a new layout and renames copies saves or deletes an existing layout
LAYOUTREGENCTL	Specifies how the display list is updated in the Model tab and layout tabs
LAYOUTUIXQT	Internal use Layout command
LAYOUTWIZARD	Enables the Layout wizard from which to designate page and print settings for a new layout
LEADER	Creates a line that connects annotation to a feature
LIMCHECK	Controls the creation of objects outside the drawing limits
LIMITS	Sets and controls the drawing boundaries
LINE	Creates straight line segments
LINETYPE	Creates loads and sets linetypes
LIST	Displays database information for selected objects
LTSCALE	Sets the linetype scale factor
LWDEFAULT	Sets linear units.
LWDISPLAY	Controls whether the lineweight is displayed on the Model tab or on a layout tab.
LWEIGHT	Sets the current lineweight
LWUNITS	Sets the value for the default lineweight.
MATCHPROP	Copies the properties from one object to one or more objects
MAXSORT	Sets the maximum number of symbol names or block names sorted by listing commands.
MBUTTONPAN	Controls the behavior of the third button or wheel on the pointing device.
MIRROR	Creates a mirror image copy of objects
MODEL	Switches from the Layout tab to the Model tab and makes it current
MOVE	Displaces objects a specified distance in a specified direction
MREDO	Multi-redo command
MSPACE	Switches from paper space to a model space viewport
MTEXT	Creates multiline text
MVIEW	Creates floating viewports and turns on existing floating viewports
NEW	Creates a new drawing file

OFFSET	Creates concentric circles parallel lines and parallel curves
OOPS	Restores erased objects
OPEN	Opens an existing drawing file
OPTIONS	Customizes the CAD settings
ORTHO	Constrains cursor movement
ORTHOMODE	Constrains cursor movement to the perpendicular.
OSMODE	Sets running Object Snap modes using the following bit-codes.
OSNAP	Sets running object snap modes and changes the target box size
PAGESETUP	Specifies the layout page, plotting device, paper size, and settings for each new layout
PAN	Moves the drawing display in the current viewport
PASTECLIP	Inserts data from the Clipboard
PASTEORIG	Inserts data from the Clipboard, positioned at the same coordinates as the original objects
PCINWIZARD	Displays a wizard to import PCP and PC2 configuration file plot settings into the Model tab or current layout
PDMODE	Controls how point objects are displayed.
PDSIZE	Sets the display size for point objects.
PEDIT	Edits polylines and three-dimensional polygon meshes
PICKADD	Controls whether subsequent selections replace the current selection set or add to it.
PICKAUTO	Controls automatic windowing at the Select Objects prompt.
PICKBOX	Sets the object selection target height, in pixels.
PICKDRAG	Controls the method of drawing a selection window.
PICKFIRST	Controls whether you select objects before (noun-verb selection) or after you issue a command.
PICKSTYLE	Controls the use of group selection and associative hatch selection.
PLINEGEN	Sets how linetype patterns generate around the vertices of a 2D polyline.
PLINETYPE	Specifies whether uses optimized 2D polylines.
PLINEWID	Stores the default polyline width.
PLOT	Plots a drawing to a plotter printer or file
PLOTSTAMP	Places a plot stamp on a specified corner of each drawing and/or logs it to a file
PLOTROTMODE	Controls the orientation of plots.
PLOTSTYLE	Sets the current plot style for new objects
PLQUIET	Controls the display of optional dialog boxes and nonfatal errors for batch plotting and scripts.
PREFERENCES	Preference settings
PREVIEW	Shows how the drawing will look when it is printed or plotted
PROPERTIES	Controls properties of existing objects
PSETUPIN	Imports a user-defined page setup into a new drawing layout
PSLTSCALE	Controls paper space linetype scaling.

PSPACE	Switches from a model space viewport to paper space
PSTYLEMODE	Indicates whether the current drawing is in a Color-Dependent or Named Plot Style mode.
PSTYLEPOLICY	Controls whether an object's color property is associated with its plot style.
PSVPSCALE	Sets the view scale factor for all newly created viewports.
PURGE	Removes unused named objects such as blocks or layers from the database
QSAVE	Saves the current drawing
QSELECT	Quickly creates selection sets based on filtering criteria
QUIT	Exits the program
R14PENWIZARD	Creates a color-dependent plot style table
RASTERPREVIEW	Controls whether BMP preview images are saved with the drawing.
RECOVER	Repairs a damaged drawing
RECTANG	Draws a rectangular polyline
RECTANGLE	Draws a rectangular polyline
REDO	Reverses the effects of the previous UNDO or U command
REDRAW	Refreshes the display of the current viewport
REGEN	Regens current viewport (recalculates all entities)
REGENAUTO	Controls automatic regeneration of a drawing
REGENMODE	Controls automatic regeneration of the drawing.
ROTATE	
RTPAN	Moves objects about a base point
RTZOOM	Real time pan
SAVE	Real time zoom
SAVEAS	Saves the drawing under the current file name or a specified name
SAVETIME	Saves an unnamed drawing with a file name or renames the current drawing
SCALE	Sets the automatic save interval, in minutes.
SETVAR	Enlarges or reduces selected objects equally in the X Y and Z directions
SHORTCUTMENU	Lists or changes the values of system variables
SNAP	Controls whether Default, Edit, and Command mode shortcut menus are available in the drawing area.
SNAPANG	Restricts cursor movement to specified intervals
SNAPBASE	Sets the snap and grid rotation angle for the current viewport.
SNAPISOPAIR	Sets the snap and grid origin point for the current viewport relative to the current UCS.
SNAPMODE	Controls the isometric plane for the current viewport.
SNAPSTYL	Turns the Snap mode on and off.
SNAPTYPE	Sets the snap style for the current viewport.
SNAPUNIT	Sets the snap style for the current viewport.
SOLID	Sets the snap spacing for the current viewport.
SPELL	Creates solid-filled polygons
	Checks spelling in a drawing

SPLINE	Creates a quadratic or cubic spline (NURBS) curve
STYLE	Creates named styles
TABLET	Calibrates configures and turns on and off an attached digitizing tablet
TABMODE	Controls the use of the tablet.
TEXT	Displays text on screen as it is entered
TEXTSCR	Opens the text window
TEXTSIZE	Sets the default height for new text objects drawn with the current text style (has no effect if the style has a fixed height).
THICKNESS	Sets the current 3D solid thickness.
TILEMODE	Makes the Model tab or the last layout tab current.
TRIM	Trims objects at a cutting edge defined by other objects
U	Reverses the most recent operation
UCSICON	Controls the visibility and placement of the UCS icon
UNDO	Reverses the effect of commands
UNITS	Controls coordinate and angle display formats and determines precision
USERI1	Used for storage and retrieval of integer values.
USERI2	Used for storage and retrieval of integer values.
USERI3	Used for storage and retrieval of integer values.
USERI4	Used for storage and retrieval of integer values.
USERI5	Used for storage and retrieval of integer values.
USERR1	Used for storage and retrieval of real numbers..
USERR2	Used for storage and retrieval of real numbers..
USERR3	Used for storage and retrieval of real numbers..
USERR4	Used for storage and retrieval of real numbers..
USERR5	Used for storage and retrieval of real numbers..
USERS1	Used for storage and retrieval of string values.
USERS2	Used for storage and retrieval of string values.
USERS3	Used for storage and retrieval of string values.
USERS4	Used for storage and retrieval of string values.
USERS5	Used for storage and retrieval of string values.
VPLAYER	Sets layer visibility within viewports
VPORTS	Divides the graphics area into multiple tiled viewports
WBLOCK	Writes objects to a new drawing file
XREF	Controls external references to drawing files
XREFNOTIFY	Controls the notification for updated or missing xrefs.
ZOOM	Increases or decreases the apparent size of objects in the current viewport
ZOOMFACTOR	Accepts an integer between 3 and 100 as valid values.



System Variables

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Carlson Survey stores the values for its operating environment and some of its commands in system variables. Each system variable has an associated type: integer, real, point, switch, or text string. You can examine any system variable and change any writable system variable directly on the command line by using the SETVAR command. Many system variables are also accessible through dialog box options.

APERTURE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 10

Sets the display size for the aperture, in pixels. The aperture is the selection tool used in drawing commands.

ATTDIA

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 0

Controls whether the INSERT command uses a dialog box for attribute value entry.

0 Issues prompts on the command line

1 Uses a dialog box

ATTMODE

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 1

Controls display of attributes.

0 Off: Makes all attributes invisible

1 Normal: Retains current visibility of each attribute: visible attributes are displayed; invisible attributes are not

2 On: Makes all attributes visible

ATTREQ

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Determines whether the INSERT command uses default attribute settings during insertion of blocks.

0 Assumes the defaults for the values of all attributes

1 Turns on prompts or dialog box for attribute values, as specified by ATTDIA

AUTOSNAP

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 63

Controls AutoSnap marker, tooltip, and magnet. Also turns on polar and object snap tracking, and controls the display of polar and object snap tracking tooltips. The system variable value is the sum of the following bit values:

0 Turns off the AutoSnap marker, tooltips, and magnet. Also turns off polar tracking, object snap tracking, and tooltips for polar and object snap tracking

1 Turns on the AutoSnap marker

2 Turns on the AutoSnap tooltips

4 Turns on the AutoSnap magnet

8 Turns on polar tracking

16 Turns on object snap tracking

32 Turns on tooltips for polar tracking and object snap tracking

BLIPMODE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 0

Controls whether marker blips are visible. If you type blipmode at the command line, you will be prompted for a setting of on or off rather than 0 or 1.

0 or Off Turns off marker blips

1 or On Turns on marker blips

CECOLOR

- **Type:** String
- **Saved in:** Drawing
- **Initial value:** "BYLAYER"

Sets the color of new objects.

CLAYER

- **Type:** String
- **Saved in:** Drawing
- **Initial value:** "0"

Sets the current layer

CMDECHO

- **Type:** Integer
- **Saved in:** Not saved
- **Initial value:** 1

Controls whether Autodesk Carlson Survey echoes prompts and input.

0 Turns off echoing

1 Turns on echoing

COORDS

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls when coordinates are updated on the status line.

0 Coordinate display is updated as you specify points with the pointing device

1 Display of absolute coordinates is updated continuously

2 Display of absolute coordinates is updated continuously, and distance and angle from last point are displayed when a distance or angle is requested

CURSORSIZE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 5

Determines the size of the crosshairs as a percentage of the screen size. Valid settings range from 1 to 100 percent. When set to 100, the crosshairs are full-screen and the ends of the crosshairs are never visible. When less than 100, the ends of the crosshairs may be visible when the cursor is moved to one edge of the screen.

DIMSTYLE

(Read-only)

- **Type:** String
- **Saved in:** Drawing
- **Initial Value:** Standard

DIMSTYLE is both a command and a system variable. The DIMSTYLE system variable shows the current dimension style. To display the DIMSTYLE system variable, use the SETVAR command. The DIMSTYLE system variable is read-only; you cannot change its value on the command line. To change the current dimension style, use the DIMSTYLE command.

DIMZIN

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Controls the suppression of zeros in the primary unit value. DIMZIN stores this value when you enter it on the command line or set it under Primary Units in the Annotation dialog box. DIMZIN values 0-3 affect feet-and-inch dimensions only.

0 Suppresses zero feet and precisely zero inches

- 1 Includes zero feet and precisely zero inches
- 2 Includes zero feet and suppresses zero inches
- 3 Includes zero inches and suppresses zero feet
- 4 Suppresses leading zeros in decimal dimensions (for example, 0.5000 becomes .5000)
- 8 Suppresses trailing zeros in decimal dimensions (for example, 12.5000 becomes 12.5)
- 12 Suppresses both leading and trailing zeros (for example, 0.5000 becomes .5)

DRAGMODE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 2

Controls the display of objects being dragged. If you type dragmode at the command line, you will be prompted for off, on, or auto rather than 0, 1, or 2.

0 or Off Does not display an outline of the object as you drag it.

1 or On Displays the outline of the object as you drag it only if you enter drag on the command line after selecting the object to drag

2 or Auto Always displays an outline of the object as you drag it

ELEVATION

- **Type:** Real
- **Saved in:** Drawing (viewport specific)
- **Initial value:** 0.0000

Stores the current elevation relative to the current UCS for the current viewport in the current space.

FILEDIA

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Suppresses display of the file dialog boxes.

0 Does not display dialog boxes. You can still request a file dialog box to appear by entering a tilde () in response to the command's prompt.

1 Displays file dialog boxes.

GRIDMODE

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Specifies whether the grid is turned on or off.

0 Turns the grid off

1 Turns the grid on

GRIDUNIT

- **Type:** 2D point
- **Saved in:** Drawing
- **Initial value:** 0.5000,0.5000

Specifies the grid spacing (X and Y) for the current viewport.

GRIPBLOCK

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 0

Controls the assignment of grips in blocks.

0 Assigns a grip only to the insertion point of the block

1 Assigns grips to objects within the block

GRIPCOLOR

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 5

Controls the color of nonselected grips (drawn as box outlines). The valid range is 1 to 255.

GRIPHOT

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls the color of selected grips (drawn as filled boxes). The valid range is 1 to 255.

GRIPS

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls the use of selection set grips for the Stretch, Move, Rotate, Scale, and Mirror Grip modes.

0 Turns off grips

1 Turns on grips

To adjust the size of the grips and the effective selection area used by the cursor when you snap to a grip, use GRIPSIZE.

GRIPSIZE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 3

Sets the size of the grip box in pixels. The valid range is 1 to 255.

HIGHLIGHT

- **Type:** Integer
- **Saved in:** Not saved
- **Initial value:** 1

Controls object highlighting; does not affect objects selected with grips.

0 Turns off object selection highlighting

1 Turns on object selection highlighting

LAYOUTREGENCTL

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 0

Specifies how the display list is updated in the Model tab and layout tabs. For each tab, the display list is updated either by regenerating the drawing when you switch to that tab or by saving the display list to memory and regenerating only the modified objects when you switch to that tab. Changing the LAYOUTREGENCTL setting can improve performance.

0 The drawing is regenerated each time you switch tabs.

1 For the Model tab and the last layout made current, the display list is saved to memory and regenerations are suppressed when you switch between the two tabs. For all other layouts, regenerations still occur when you switch to those tabs.

2 The drawing is regenerated the first time you switch to each tab. For the remainder of the drawing session, the display list is saved to memory and regenerations are suppressed when you switch to those tabs.

The performance gain achieved by changing the LAYOUTREGENCTL setting is dependent on several factors, including the drawing size and type, the objects contained in the drawing, the amount of available memory, and the effect of other open drawings or applications. When LAYOUTREGENCTL is set to 1 or 2, the amount of additional memory used is the size of the Model tab's display list multiplied by the number of viewports in each layout for which the display list is saved.

If LAYOUTREGENCTL is set to 1 or 2 and performance seems slow in general or when you switch between tabs for which the display list is saved, consider changing to a setting of 0 or 1 to find the optimal balance for your work environment.

NOTE: Regardless of the LAYOUTREGENCTL setting, if you redefine a block or undo a tab switch, the drawing is regenerated the first time you switch to any tab that contains saved viewports.

LIMCHECK

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Controls the creation of objects outside the drawing limits.

0 Objects can be created outside the limits

1 Objects cannot be created outside the limits

LISPINIT

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

When single-document interface is enabled, specifies whether AutoLISP-defined functions and variables are preserved when you open a new drawing or whether they are valid in the current drawing session only.

0 AutoLISP functions and variables are preserved from drawing to drawing

1 AutoLISP functions and variables are valid in the current drawing only

LTSCALE

- **Type:** Real
- **Saved in:** Drawing
- **Initial value:** 1.0000

Sets the global linetype scale factor. The linetype scale factor cannot equal zero.

MAXSORT

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 200

Sets the maximum number of symbol names or block names sorted by listing commands. If the total number of items exceeds this value, no items are sorted.

MBUTTONPAN

- **Type:** Integer
- **Saved in:** Registry
- **Initial Value:** 1

Controls the behavior of the third button or wheel on the pointing device.

0 Supports the action defined in the Carlson Survey menu file.

1 Supports panning by holding and dragging the button or wheel.

ORTHOMODE

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Constrains cursor movement to the perpendicular. When ORTHOMODE is turned on, the cursor can move only horizontally or vertically relative to the UCS and the current grid rotation angle.

0 Turns off Ortho mode

1 Turns on Ortho mode

OSMODE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 4133

Sets running Object Snap modes using the following bitcodes.

0 NONE

1 ENDpoint

2 MIDpoint

4 CENter

8 NODe

16 QUAdrant

32 INTersection

64 INSertion

128 PERpendicular

256 TANgent

512 NEArest

1024 QUIck

2048 APParent Intersection

4096 EXTension

8192 PARallel

To specify more than one object snap, enter the sum of their values. For example, entering 3 specifies the Endpoint (bitcode 1) and Midpoint (bitcode 2) object snaps. Entering 16383 specifies all object snaps.

When object snaps are switched off using the Osnap button on the status bar, a bitcode of 16384 (0x4000) is returned, in addition to the normal value of OSMODE. With this additional value, you can distinguish this mode from Object

Snap modes that have been turned off from within the Drafting Settings dialog box. Setting this bit toggles running object snaps off. Setting OSMODE to a value with this bit off toggles running object snaps on.

PDMODE

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Controls how point objects are displayed. Autodesk Carlson Survey uses a setting of 0 (zero).

PDSIZE

- **Type:** Real
- **Saved in:** Drawing
- **Initial value:** 0.0000

Sets the display size for point objects. This variable has no effect when PDMODE is set to the Autodesk Carlson Survey default of 0 (zero).

0 Creates a point at 5 percent of the drawing area height

>0 Specifies an absolute size

<0 Specifies a percentage of the viewport size

PICKADD

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls whether subsequent selections replace the current selection set or add to it.

0 Turns off PICKADD. The objects most recently selected become the selection set. Previously selected objects are removed from the selection set. Add more objects to the selection set by pressing SHIFT while selecting.

1 Turns on PICKADD. Each object selected, either individually or by windowing, is added to the current selection set. To remove objects from the set, press SHIFT while selecting.

PICKAUTO

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls automatic windowing at the Select Objects prompt.

0 Turns off PICKAUTO

1 Draws a selection window (for either a window or a crossing selection) automatically at the Select Objects prompt

PICKBOX

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 3

Sets the object selection target height, in pixels.

PICKDRAG

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 0

Controls the method of drawing a selection window.

0 Draws the selection window using two points. Click the pointing device at one corner then click to select another corner.

1 Draws the selection window using dragging. Click one corner and drag the pointing device; release the button at the other corner.

PICKFIRST

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls whether you select objects before (noun-verb selection) or after you issue a command.

0 Turns off PICKFIRST; you select objects after you issue a command

1 Turns on PICKFIRST; you select objects before you issue a command

PICKSTYLE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls the use of group selection and associative hatch selection.

0 No group selection or associative hatch selection

1 Group selection

2 Associative hatch selection

3 Group selection and associative hatch selection

PLINEGEN

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Sets how linetype patterns generate around the vertices of a 2D polyline. Does not apply to polylines with tapered segments.

0 Generates polylines to start and end with a dash at each vertex

1 Generates the linetype in a continuous pattern around the vertices of the polyline

PLINETYPE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 2

Specifies whether Carlson Survey uses optimized 2D polylines. PLINETYPE controls both the creation of new polylines with the PLINE command and the conversion of existing polylines in drawings from previous releases.

0 Polylines in older drawings are not converted when opened; PLINE creates old-format polylines

1 Polylines in older drawings are not converted when opened; PLINE creates optimized polylines

2 Polylines in older drawings are converted when opened; PLINE creates optimized polylines

PLOTROTMODE

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 2

Controls the orientation of plots.

0 Rotates the effective plotting area so the corner with the Rotation icon aligns with the paper at the lower left for 0, top left for 90, top right for 180, and lower right for 270.

X and Y origin offsets are calculated relative to the lower-left corner.

1 Aligns the lower-left corner of the effective plotting area with the lower-left corner of the paper.

2 Works the same as 0 value except that the X and Y origin offsets are calculated relative to the rotated origin position.

PLQUIET

- **Type:** Integer
- **Saved in:** Registry
- **Initial Value:** 0

Controls the display of optional dialog boxes and nonfatal errors for batch plotting and scripts.

0 Displays plot dialog boxes and nonfatal errors

1 Logs nonfatal errors and doesn't display plot-related dialog boxes

PSLTSCALE

- **Type:** Integer
- **Saved in:** Drawing

- **Initial value:** 1

Controls paper space linetype scaling.

0 No special linetype scaling. Linetype dash lengths are based on the drawing units of the space (model or paper) in which the objects were created. Scaled by the global LTSCALE factor.

1 Viewport scaling governs linetype scaling. If TILEMODE is set to 0, dash lengths are based on paper space drawing units, even for objects in model space. In this mode, viewports can have varying magnifications, yet display linetypes identically. For a specific linetype, the dash lengths of a line in a viewport are the same as the dash lengths of a line in paper space. You can still control the dash lengths with LTSCALE.

When you change PSLTSCALE or use a command such as ZOOM with PSLTSCALE set to 1, objects in viewports are not automatically regenerated with the new linetype scale. Use the REGEN command to update the linetype scales in each viewport.

PSTYLEMODE

(Read Only)

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 1

Indicates whether the current drawing is in a Color-Dependent or Named Plot Style mode.

0 Uses named plot style tables in the current drawing

1 Uses color-dependent plot style tables in the current drawing

PSTYLEPOLICY

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls whether an object's color property is associated with its plot style. The new value you assign affects only newly created drawings.

0 No association is made between color and plot style. The plot style for new objects is set to the default defined in DEFPLSTYLE. The plot style for new layers is set to the default defined in DEFLPLSTYLE.

1 An object's plot style is associated with its color.

PSVPSCALE

- **Type:** Real
- **Saved in:** Drawing
- **Initial Value:** 0

Sets the view scale factor for all newly created viewports. The view scale factor is defined by comparing the ratio of units in paper space to the units in newly created model space viewports. The view scale factor you set is used with the VPORTS command. A value of 0 means the scale factor is Scaled to Fit. A scale must be a positive real value.

RASTERPREVIEW

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 1

Controls whether BMP preview images are saved with the drawing.

0 No preview image is created

1 Preview image created

REGENMODE

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 1

Controls automatic regeneration of the drawing.

0 Turns off the REGENAUTO command

1 Turns on the REGENAUTO command

SAVETIME

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 120

Sets the automatic save interval, in minutes.

0 Turns off automatic saving

>0 Saves the drawing at intervals specified by the nonzero integer automatically.

The SAVETIME timer starts as soon as you make a change to a drawing. It is reset and restarted by a manual QSAVE, SAVE, or SAVEAS. The current drawing is saved to the path specified in the Options Dialog by the SAVEFILEPATH system variable.

SHORTCUTMENU

- **Type:** Integer
- **Saved in:** Registry
- **Initial value:** 11

Controls whether Default, Edit, and Command mode shortcut menus are available in the drawing area. SHORTCUTMENU uses the following bitcodes:

0 Disables all Default, Edit, and Command mode shortcut menus, restoring R14 legacy behavior.

1 Enables Default mode shortcut menus.

2 Enables Edit mode shortcut menus.

4 Enables Command mode shortcut menus. In this case, the Command mode shortcut menu is available whenever a command is active.

8 Enables Command mode shortcut menus only when command options are currently available from the command line.

To enable more than one type of shortcut menu at once, enter the sum of their values. For example, entering 3 enables both Default (1) and Edit (2) mode shortcut menus.

SNAPANG

- **Type:** Real
- **Saved in:** Drawing
- **Initial value:** 0

Sets the snap and grid rotation angle for the current viewport. The angle you specify is relative to the current UCS.

Changes to this variable are not reflected in the grid until the display is refreshed. Autodesk Carlson Survey does not redraw automatically when system variable settings are changed.

SNAPBASE

- **Type:** 2D point
- **Saved in:** Drawing
- **Initial value:** 0.0000,0.0000

Sets the snap and grid origin point for the current viewport relative to the current UCS.

Changes to this variable are not reflected in the grid until the display is refreshed. Carlson Survey does not redraw automatically when system variable settings are changed.

SNAPISOPAIR

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Controls the isometric plane for the current viewport.

0 Left

1 Top

2 Right

SNAPMODE

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Turns the Snap mode on and off.

0 Snap off

1 Snap on for the current viewport

SNAPSTYL

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 0

Sets the snap style for the current viewport.

0 Standard (rectangular snap)

1 Isometric snap

SNAPTYPE

- **Type:** Integer
- **Saved in:** Registry
- **Initial Value:** 0

Sets the snap style for the current viewport.

0 Grid, or standard snap.

1 Polar snap. Snaps along polar angle increments. Use polar snap with polar and object snap tracking.

SNAPUNIT

- **Type:** 2D point
- **Saved in:** Drawing
- **Initial value:** 0.5000,0.5000

Sets the snap spacing for the current viewport. If SNAPSTYL is set to 1, Carlson Survey adjusts the X value of SNAPUNIT automatically to accommodate the isometric snap.

Changes to this system variable are not reflected in the grid until the display is refreshed. Carlson Survey does not redraw automatically when system variable settings are changed.

TABMODE

- **Type:** Integer
- **Saved in:** Not saved
- **Initial value:** 0

Controls the use of the tablet. For more information on using and configuring a tablet, see the Settings chapter.

0 Turns off Tablet mode

1 Turns on Tablet mode

TEXTSIZE

- **Type:** Real
- **Saved in:** Drawing
- **Initial value:** 0.2000

Sets the default height for new text objects drawn with the current text style (has no effect if the style has a fixed height).

THICKNESS

- **Type:** Real
- **Saved in:** Drawing
- **Initial value:** 0.0000

Sets the current 3D solid thickness

TILEMODE

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 1

Makes the Model tab or the last layout tab current.

0 Makes the last active layout tab (paper space) active

1 Makes the Model tab active

UCSICON

- **Type:** Integer
- **Saved in:** Drawing (viewport specific)
- **Initial value:** 3

Displays the UCS icon for the current viewport using bitcode. UCSICON is both a command and a system variable. It is the sum of the following:

0 No icon displayed

1 On; icon is displayed

2 Origin; if icon is displayed, the icon floats to the UCS origin if possible

3 On and displayed at origin

WORLDVIEW

- **Type:** Integer
- **Saved in:** Drawing
- **Initial value:** 1

Determines whether input to the Viewpoint 3D command is relative to the WCS (default) or the current UCS.

0 UCS remains unchanged

1 UCS changes to the WCS for the duration of the Viewpoint 3D command.



Quick Keys

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"Quick Keys" allows you to enter in the coding shown here on the left and by doing so run the commands shown on the right.

2DP = 2D Polyline

3DP = 3D Polyline

A = Arc

AL = Align

B = Block

BB = Bearing-Bearing Intersect

BD = Bearing-Distance Intersect

BH = Boundary Hatch

C = Circle

CH = Change Properties

CO = Copy

DD = Distance-Distance Intersect

DI = Distance

DT = Draw Text

E = Erase

EA = Enter-Assign Point

EX = Extend

F = Fillet

H = Hatch

I = Inverse

L = Line

LI = List

LP = Draw-Locate Point

LS = List

M = Move

MI = Mirror

O = Offset

OP = Occupy Point

P = Pan

PL = Polyline

PR = Preferences

R = Redraw

RE = Regen

RO = Rotate

SC = Scale

SET = Set Environment Variable

SS = SideShot

ST = Style

T = Traverse
TR = Trim
UN = Units
VP = Viewpoint
W = Write Block
X = Explode
Z = Zoom
ZC = Zoom Center
ZD = Zoom Dynamic
ZE = Zoom Extents
ZIN = Zoom In
ZOUT = Zoom Out
ZP = Zoom Previous
ZW = Zoom Window

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