

Simplicity **“Sight” Survey 2009**

by Carlson Software



**Authorized
IntelliCAD® Technology
Consortium Member**

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Section 1

Installation

"**Sight**" **Survey** is a Windows based coordinate geometry program designed to provide you with simplified methods for solving any commonly encountered coordinate geometry and construction surveying problem.

"Sight" Survey contains several menus and provides numerous monitor prompts and help screens to guide you. You will be capable of running the routines contained in this package without the aid of the manual in a very short time. As each routine runs, all data inputs will be requested by screen prompts. As you enter data, the computer checks the responses for obvious errors, refusing most improper entries. This results in a collection of routines which actually guide you from beginning to end.

Sight" Survey is capable of working with AutoCAD (release 2002 and newer), MicroStation (v8, XM and PowerDraft), and IntelliCAD. It is even capable of running without a CAD application, giving you the ultimate flexibility in a COGO program.



YOUR CAD MANUAL: *This manual is in no way, shape or form to be considered as a substitute for your CAD application documentation. In most cases the manual attempts to use generic terminology, but there are some instances where certain items are discussed in only AutoCAD/IntelliCAD terms. For example, the manual refers to "Layers," which MicroStation calls "Levels." The differences are few, but be aware of them.*

"Site" or "Sight"?

We've long been chided about misspelling "Site" as "Sight", but rest assured it's intentional. Why? Because "Sight" Survey is a visual feedback program. Not content to show you a "connect-the-dots" or "not-to-scale" view screen, "Sight" Survey incorporates a CAD application to present your work graphically while you calculate your data!

However "Sight" Survey's CAD features are much more than a simple routine to show your computations graphically. The entire package is more like a well-orchestrated harmony of two different programs: COGO and CAD.

Using "Sight" Survey's CAD routines, you may:

- Draw and annotate lines, points, and arcs;
- Set points;
- Select bearings and distances to be used as COGO data entries;
- Set line types, colors, and weights;
- Move, cut, copy and paste graphic elements;
- Place symbols and text;
- Select text fonts and colors;
- Import bitmaps or scanned images such as aerial photos or USGS quadrangles and overlay your computations on them;
- Import and export AutoCAD and MicroStation drawings;
- Scale your drawing;
- Plot or print your drawing on any Windows compatible device.

1.01 Minimum System Configuration

To run effectively with a CAD application, "Sight" Survey requires the same configuration as your CAD program. Typically, at a minimum, this includes:

- Intel® Pentium® 4 processor, 2.2 GHz Recommended
- Microsoft® Windows Vista™, Windows® XP Home and Professional (SP2), Windows® 2000 (SP4)
- 512 MB RAM, minimum 1 GB Recommended
- 2 GB free disk space for full installation with IntelliCAD
- 1024x768 VGA with True Color

"Sight" Survey may also be run on any dual-monitor system.

1.02 Your Software License

Your purchase of "Sight" Survey is nothing more than a license to run the "Sight" Survey program on a single computer. You can install "Sight" Survey on a second (home or laptop) computer as long as you are the only operator of that computer. The actual **End User License Agreement** (EULA) is located [here](#).

You may need an additional seat license if you plan to:

- Install "Sight" Survey on more than one computer at your place of business;
- Install "Sight" Survey on a home computer;
- Install "Sight" Survey on a field computer;
- Install "Sight" Survey on a network computer or server;
- Have "Sight" Survey available at temporary field office sites within your company.

The best rule to follow is this: ***If there is any probability that a single copy of "Sight" Survey will be running on more than one computer at a time, an additional license is required!***

The "Transportable" License

Realizing that you may not always perform your job entirely in the office, the "Sight" Survey license is a "Transportable" license which allows you to copy the "Sight" Survey program to your home computer or laptop and use it there for no additional fee, provided that "Sight" Survey is used in accordance with the copyright. In other words, you may use "Sight" Survey under the "Transportable" license only when you are certain that no other licensed copies of "Sight" Survey are running at the same time.

If the "Sight" Survey license was originally purchased by a Company, and the Company has multiple owners, the license extends to one owner only. The Company must purchase additional seats in order for additional owners and/or their employees to have a legal copy of "Sight" Survey on their home computers. The purchasing Company retains ownership of ALL licenses of the programs.

Multiple Office Installations

The "Sight" Survey license covers only a single seat at a building or address. ***If you have multiple locations, each location is expected to purchase a license.***

Network Installations

If "Sight" Survey is loaded on a network computer, either a server or a node, additional seat licenses may be needed. If the network administrator limits access to "Sight" Survey to a single user at any one time, additional licenses are not

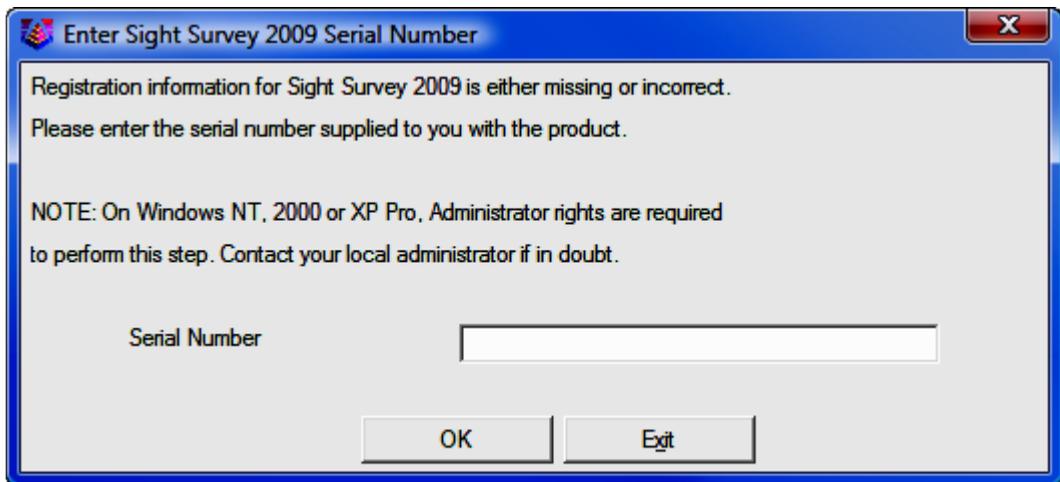
needed. However, if "Sight" Survey is available to more than one networked computer at a time, at least one additional site license is required. The number of site licenses required is based on the number of computers likely to be using "Sight" Survey *concurrently*, not necessarily the total number of computers on the network.

Site Licensing

"Sight" Survey is licensed by the seat. There are no site licenses available to cover any number of installations at a single location.

1.03 Installation

To install "Sight" Survey, simply insert the CD into your CD-Rom drive. The setup program will start by itself. If it does not, click **Windows Start**, select **Run**, and type **D:setup.msi [Enter]**, where **D:** is the drive letter for your CD-Rom.

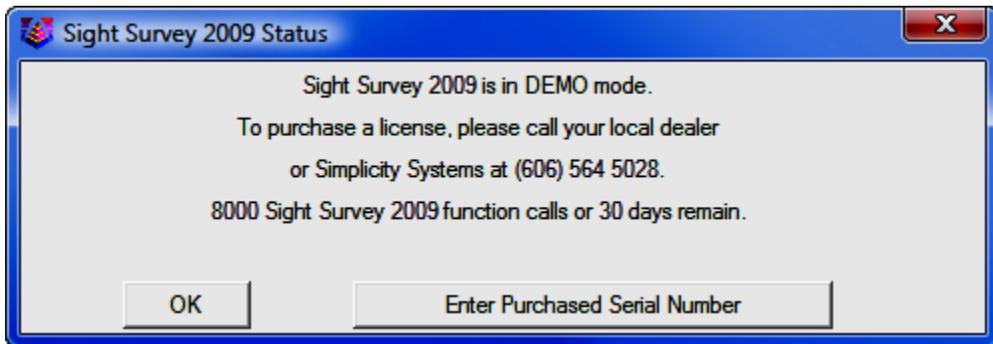


When you start "Sight" Survey for the first time, you will need to enter a serial number to continue.

If you have a **Demo Serial Number** or a **Registered (Purchased) Serial Number**, enter it into the **Serial Number** field and click [**OK**]. If you have a **Registered Serial Number**, please continue with information found in **Registration** (see [Section 1.04](#)).

Demo Users

After entering your Demo serial number you will see this dialog box:

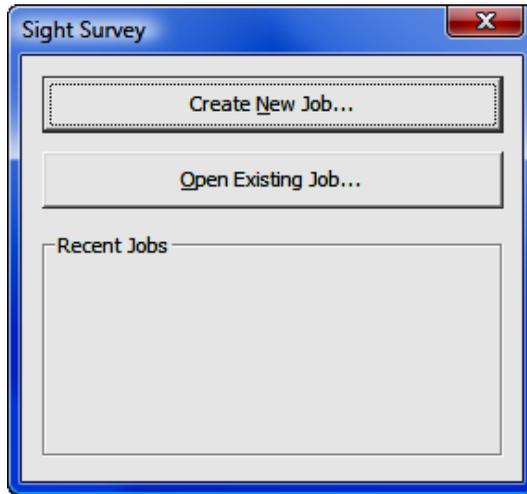


Click [**OK**] to run "Sight" Survey in a demo mode for the next 30 days. If you later decide to purchase the software, use **Help > Change Registration** (see [Section 1.04](#)) to upgrade your demo to a fully registered version.

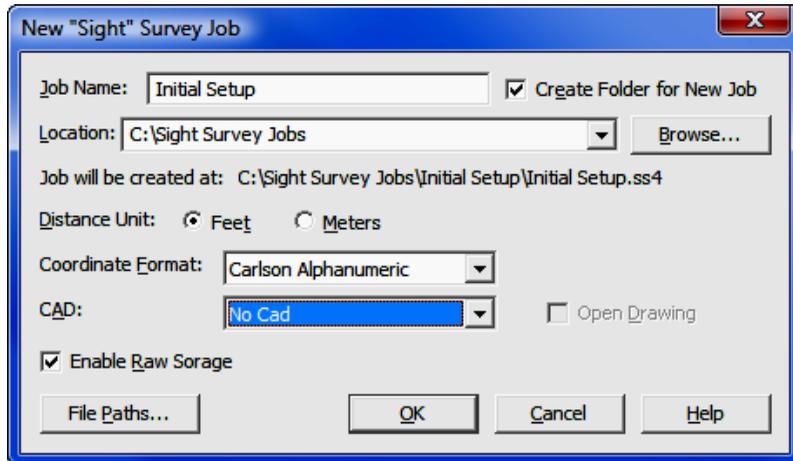
Initial Setup

"Sight" Survey is capable of running with IntelliCAD (included), or your own AutoCAD or MicroStation. The first time you run "Sight" Survey you should set up the program for the CAD you will be running.

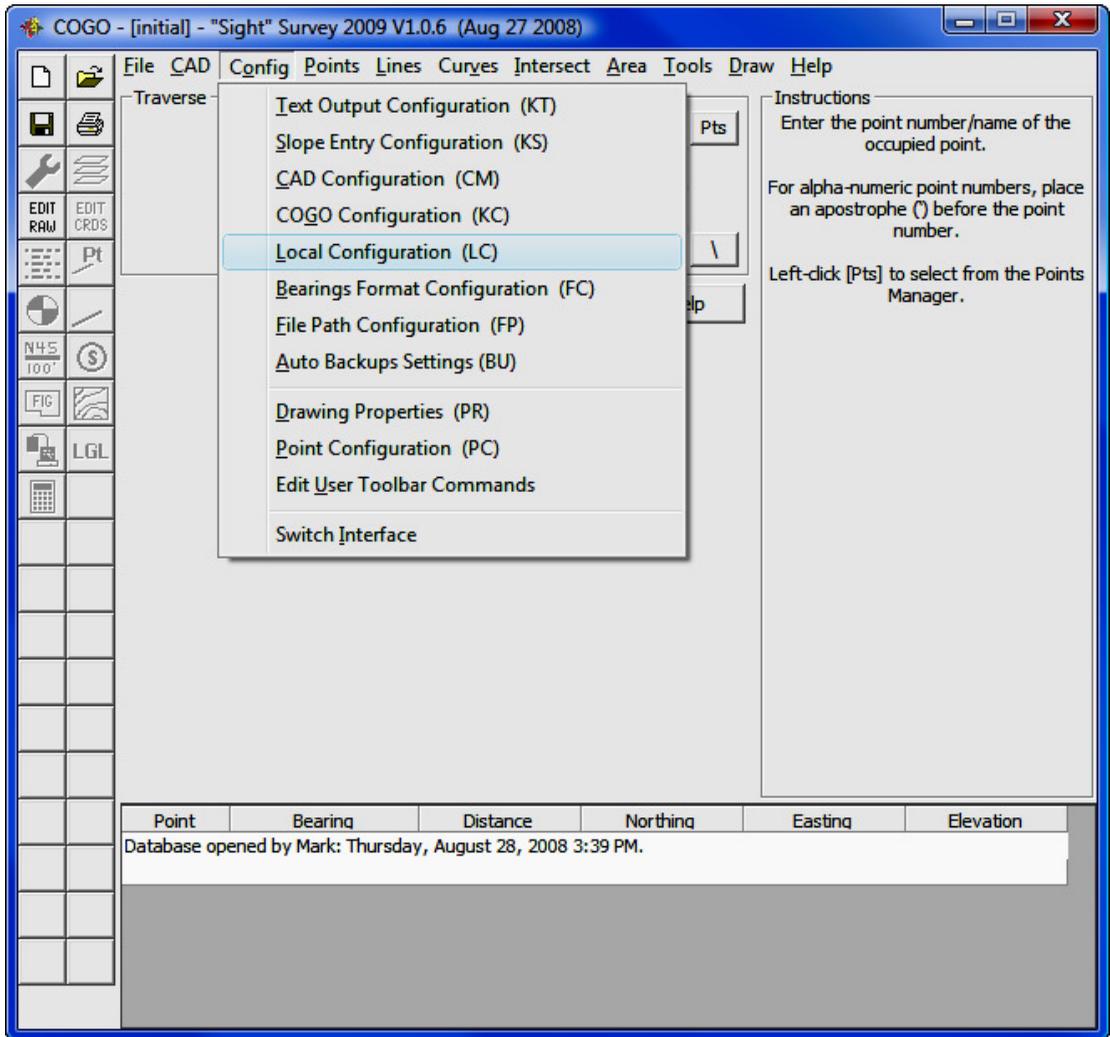
After you enter the serial number, the first screen will be the main interface overlaid by the startup screen.



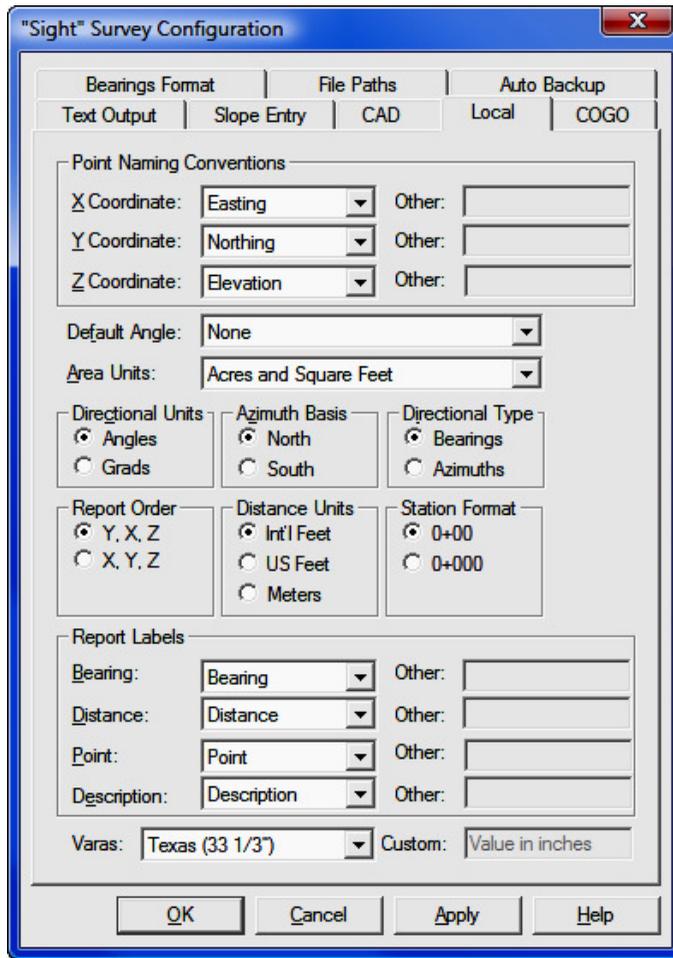
Click the [**Create New Job...**] button, or just press [**Enter**]. This action will launch the **New "Sight" Survey Job** dialog.



Enter a job name (such as **Initial Setup**) in the **Job Name** field. Under the **CAD** selection, click [**▼**] and select **No CAD**. Select your **Distance Unit**, and leave everything else unchanged. Click [**OK**] to continue. The program will change to the **No Cad** interface as shown below.



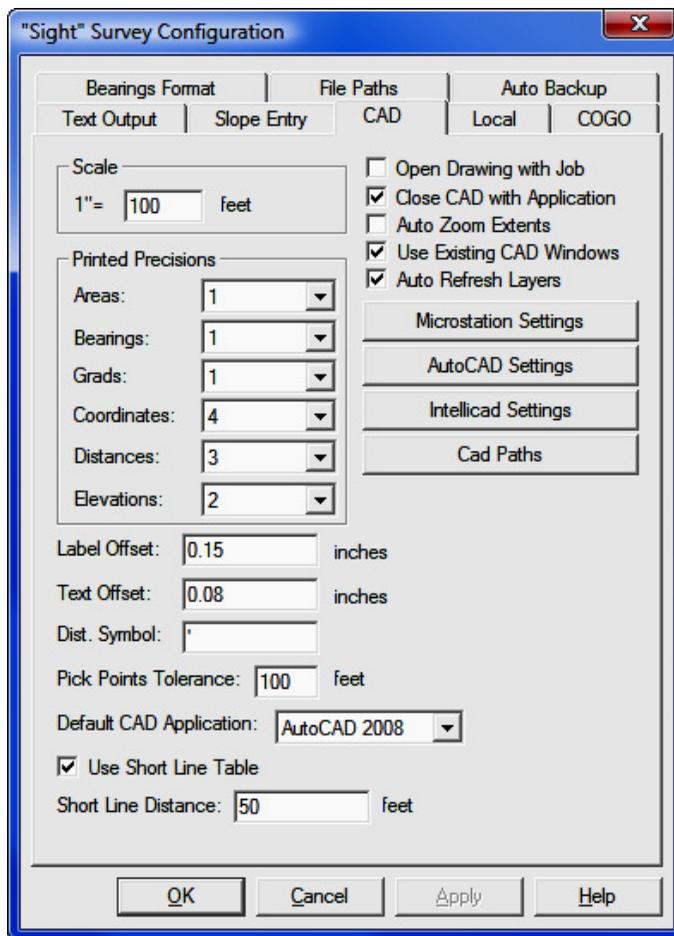
Select the **Config** menu, then select **Local Configuration**. Refer to [Section 5.05](#) for help with this dialog.



Adjust any settings as desired and click [**Apply**]. Now click the **Text Output** tab (described in [Section 5.01](#)) and make desired changes to those settings. Click [**Apply**] after making any changes. In a similar manner, click each of these tabs and make any desired changes:

- Slope Entry:** Described in [Section 5.02](#)
- COGO:** Described in [Section 5.04](#)
- Bearings Format:** Described in [Section 5.06](#)
- File Paths:** Described in [Section 5.07](#)
- Auto Backup:** Described in [Section 5.11](#)

Finally, click on the **CAD** tab near the top of the **Configuration** dialog.



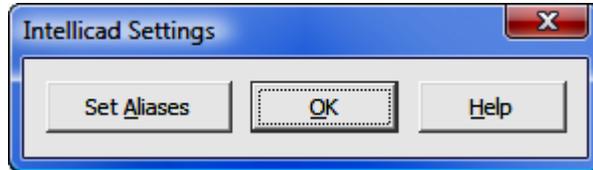
Refer to [Section 5.03](#) for information regarding the settings on this screen. For now, we are only interested the **Default CAD Application**, the applicable **CAD Settings**, and **CAD Paths**.

Under **Default CAD Application**, click [▼] and select your CAD program: **IntelliCAD** (included with "Sight" Survey); **MicroStation** (includes v8, XM, and PowerDraft); and **AutoCAD** (pick the correct year).

- If you have selected **IntelliCAD**, continue with [IntelliCAD below](#).
- If you have selected **MicroStation**, continue with [MicroStation below](#).
- If you have selected **AutoCAD**, continue with [AutoCAD below](#).

IntelliCAD

Click the [[IntelliCAD Settings](#)] button.

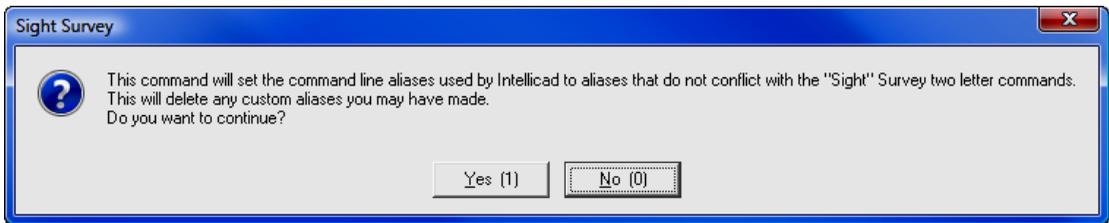


When using IntelliCAD, "Sight" Survey has been optimized to accept regular "Sight" Survey two-letter commands entered from the IntelliCAD command line. This serves to better integrate the COGO/CAD experience. However, there are a number of two-letter commands in "Sight" Survey that are also used in IntelliCAD, but for different functions. To coexist, "Sight" Survey can remap the IntelliCAD commands by simply adding a dash before the command. For example, the "Sight" Survey command **TR** is **Traverse**, and in IntelliCAD is **Trim**. After setting aliases, the IntelliCAD command is reset to **-TR**.

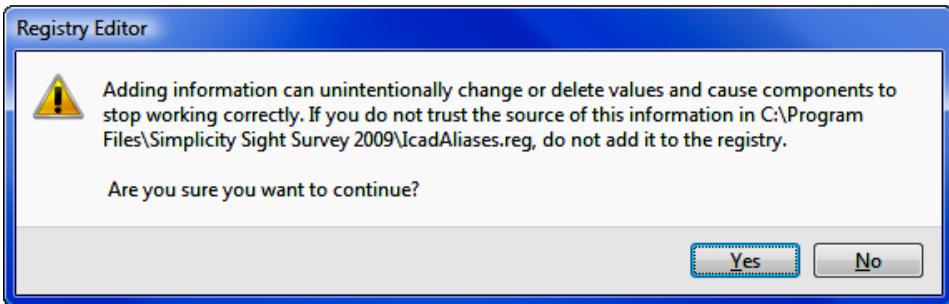
Shown below is a listing of the aliases changed by the procedure outlined above. The new alias for each of these commands was produced by adding a dash to the original alias command.

<u>ICAD Command</u>	<u>New Alias</u>	<u>ICAD Command</u>	<u>New Alias</u>	<u>ICAD Command</u>	<u>New Alias</u>
AREA	-AA	IDPOINT	-ID	CONFIG	-PR
ATTDISP	-AD	INTERSECT	-IN	PSPACE	-PS
APERTURE	-AP	ISOPLANE	-IS	REINIT	-RI
ARRAY	-AR	LIST	-LI	SCALE	-SC
BASE	-BA	LIST	-LS	FONT	-ST
COPY	-CO	MATCHPROP	-MA	TABLET	-TA
COPY	-CP	OPEN	-OP	TBCONFIG	-TO
DIST	-DI	SETESNAP	-ES	TRIM	-TR
DXFOUT	-DX	PASTESPEC	-PA	XREF	-XA
FILTER	-FI	POINT	-PO	INFLINE	-XL

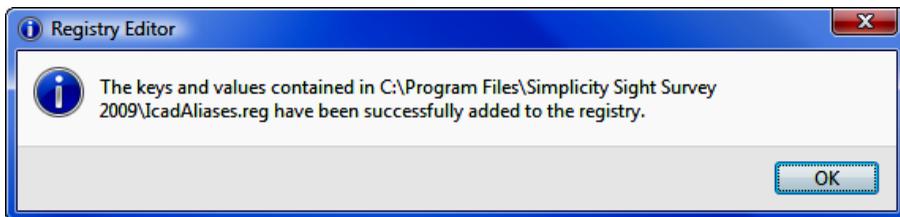
To enable "Sight" Survey to use commands entered from within IntelliCAD, click [**Set Aliases**].



Click [**Yes**] or press **1**.



This is a **Registry Editor** confirmation screen. If you wish to continue to reset the aliases, click [**Yes**], otherwise click [**No**].

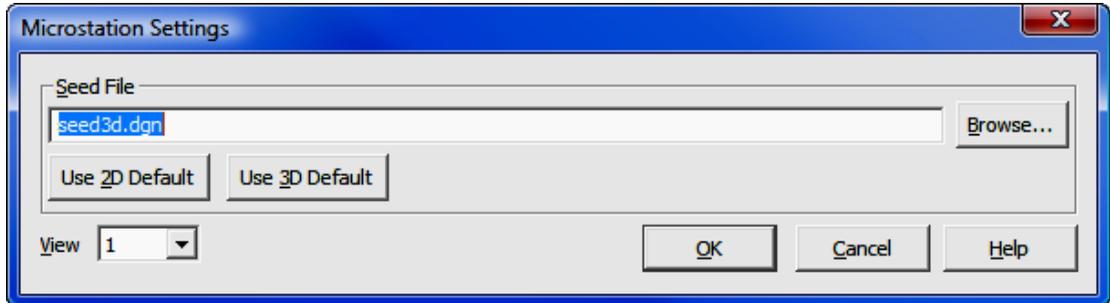


This screen confirms that changes have been made to the aliases. Click [**OK**] to return to the initial **IntelliCAD Settings** dialog, then click [**OK**] again. The **CAD Configuration** dialog remains; click [**OK**] to close it.

At this point you may exit the program by selecting **File>Exit**. The next time you enter the program using the **SS2009 External** icon, your CAD application will already be configured.

MicroStation

Click the [**MicroStation Settings**] button.



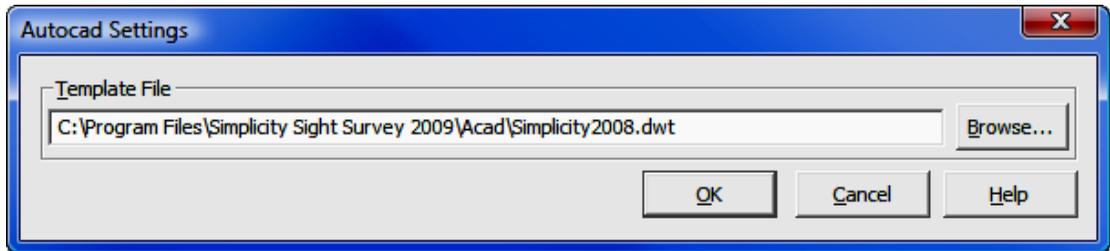
MicroStation uses seed files (basically a drawing template) as a startup file. Seed files may contain items such as symbols, linetypes, and levels, among other settings. If you have a particular seed file you use for your MicroStation projects, click [**Browse**] and navigate to the file. If you do not have a seed file, use either a 2D or 3D seed file by clicking the appropriate button on this dialog. Always use a 3D seed file if you are planning to include any 3D data (points, contours, surfaces) in your project.

Click [**OK**] to return to the **CAD Configuration**; then click [**OK**] to close it.

At this point you may exit the program by selecting **File>Exit**. The next time you enter the program using the **SS2009 External** icon, your CAD application will already be configured.

AutoCAD

Click the [**AutoCAD Settings**] button.



AutoCAD uses a template drawing file as a startup file. Template files may contain items such as linetypes, and layers, among other settings. If you have a particular template file you use for your AutoCAD projects, click [**Browse**] and navigate to the file. If you do not have a template file, you may leave this blank or click [**Browse**] and select one of the template files included in your "Sight" Survey installation. "Sight" Survey template files are located in the **C:/Program Files/Simplicity Sight Survey 2009/Acad** folder. Be sure to select the correct version to match your CAD version.

Click [**OK**] to return to the **CAD Configuration**; then click [**OK**] to close it.

At this point you may exit the program by selecting **File>Exit**. The next time you enter the program using the **SS2009 External** icon, your CAD application will already be configured.

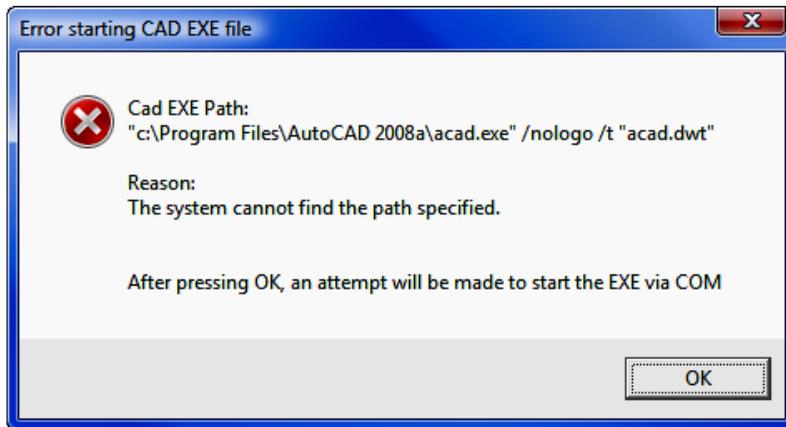
CAD Paths

If you have multiple versions of a CAD application installed on your computer (for example AutoCAD 2006, 2008, & 2009; or MicroStation v8 & PowerDraft) click the [**CAD Paths**] button to set up the program path to each CAD application. These settings allow you to use any of the installed CAD applications with "Sight" Survey.

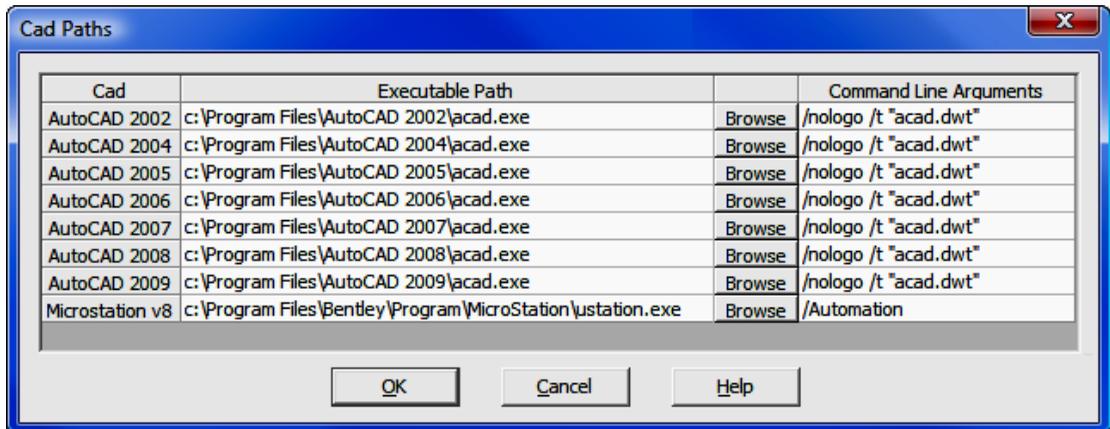


HINT: If you have only one version of a CAD application, you do not need to set the CAD path. **HOWEVER:** If you have LDD, AutoCAD Map, or some other flavor of AutoCAD that contains the actual CAD application, you must set the correct path. See **Using MAP, LDD, etc.** below.

If you start "Sight" Survey and get the following error screen, use [**CAD Paths**] to set the correct path.



When you click on [**CAD Paths**] you get this dialog screen:



The **Cad** column contains the versions supported by "Sight" Survey. The **Executable Path** column contains the actual path to the CAD application. Initially, default values are given. To change a path, click the [**Browse**] button and use the Windows File Selection dialog to find the correct path. The **Command Line Arguments** are used by the CAD application at startup. In AutoCAD, the argument **/nologo** suppresses the application start-up splash screen for faster loading; while the **/t "acad.dwt"** argument specifies the drawing template used to create

a startup drawing. The actual "Sight" Survey drawing uses the template set by the [**AutoCAD Settings**] button when creating a new drawing. In MicroStation, the **/Automation** argument suppresses the startup screen and prompt for a drawing name. The command line arguments should not be changed.

Using MAP, LDD, etc.

You can use enhanced AutoCAD products that contain versions of AutoCAD by setting the CAD path. For example, if you want to use AutoCAD Map 2006, you would select [**CAD Paths**] then in the AutoCAD 2006 line, click [**Browse**] and find the location of the **acad.exe** file under the program folder containing AutoCAD Map. Then in "Sight" Survey you would select AutoCAD 2006 as your CAD program. You must take care to use the same year. In other words, you cannot put information for AutoCAD Map 2006 under the AutoCAD 2004 line.



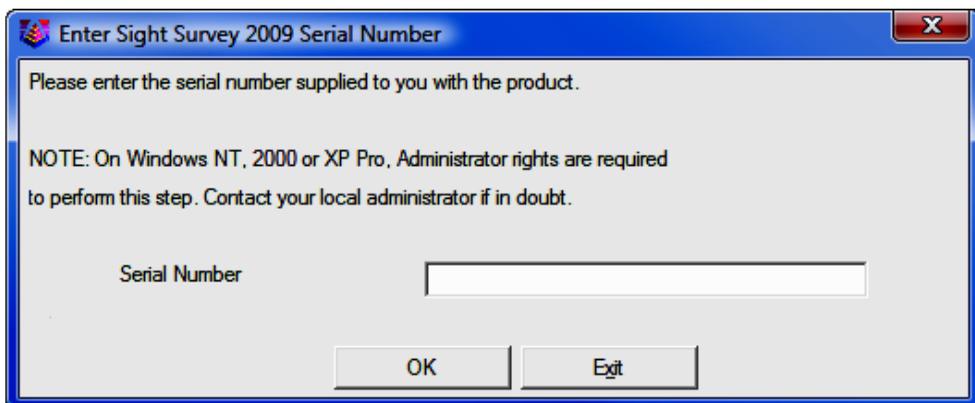
NOTE: "Sight" Survey will not work with any version of AutoCAD LT.

1.04 Registration

"Sight" Survey may be installed as a fully registered version, or you may convert from a demo to a registered version.

Upgrading from a Demo to a Registered Version

Select the **Change Registration** menu item under the **Help** menu.



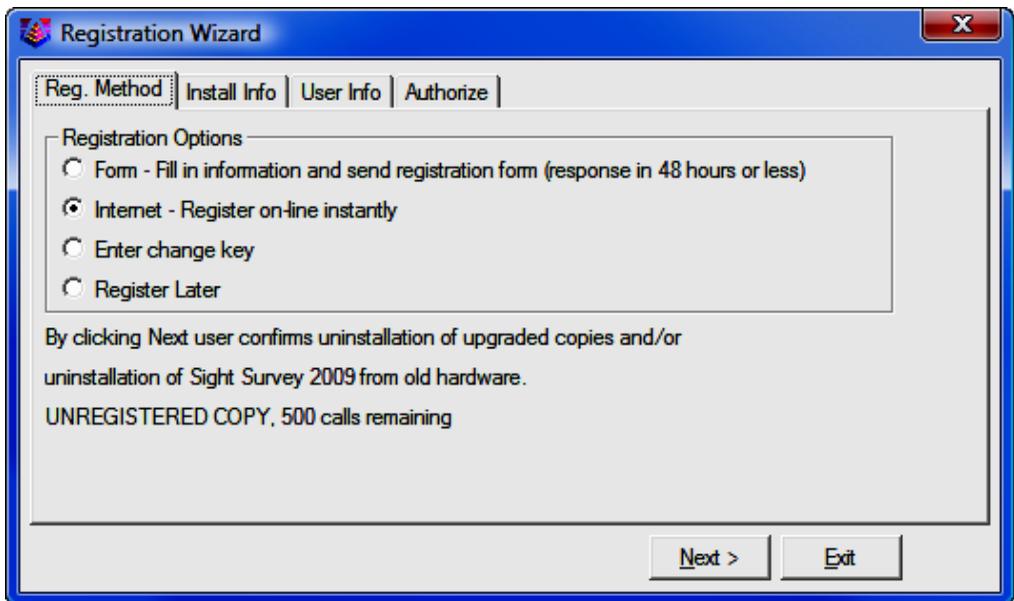
Enter your **Registered (Purchased) Serial Number** into the **Serial Number** field and click [**OK**]. Continue with the instructions below.

Initial Installation with a Registered (Purchased) Serial Number: To register your "Sight" Survey you will need to acquire a **Change Key**. After entering your serial number you will be given the opportunity to go on-line to activate your software. The activation process is necessary to convert your software from demo status to a full-working copy.

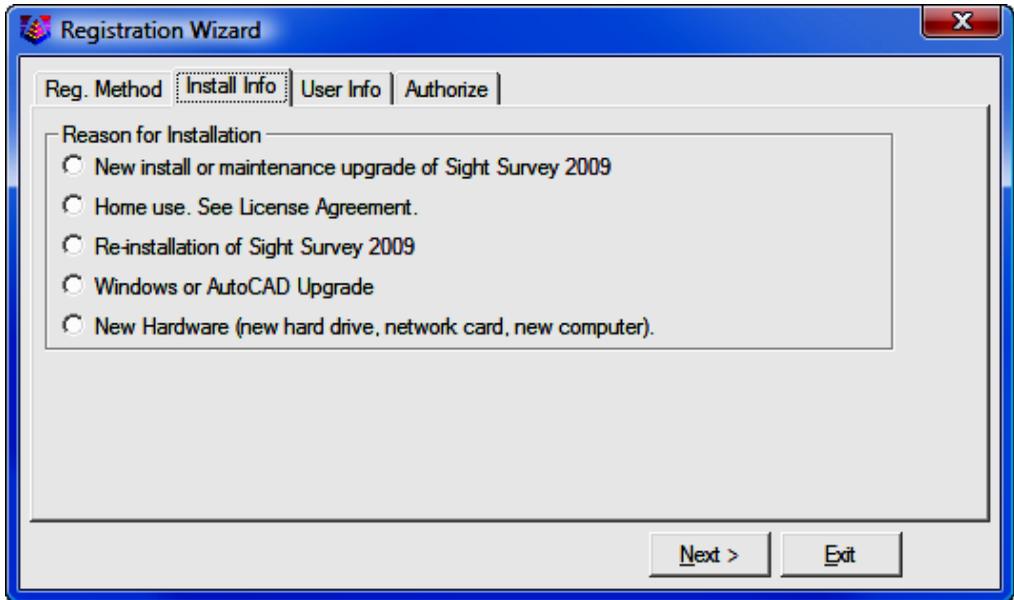
Change keys are available only on-line. They are not available to be given out over the telephone.

The registration process is covered by four dialog screens. Proceed from each screen to the next by clicking on the [**Next**] button.

Registration Method: Select your method of registration. You can register by **Form** (fax); by **Internet**; or by **Entering a Change Key**. The **Enter Change Key** option is one you would use after receiving a change key by fax, or if you need to reinstall/re-register the product *on the same computer*.

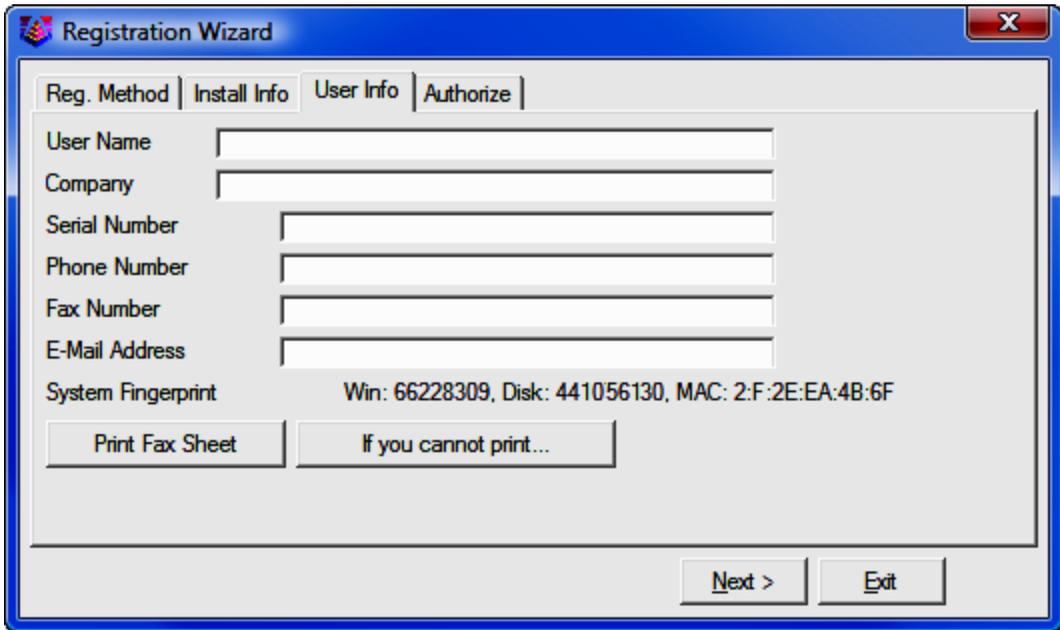


Install info: Select the reason for the **Change Key** request.



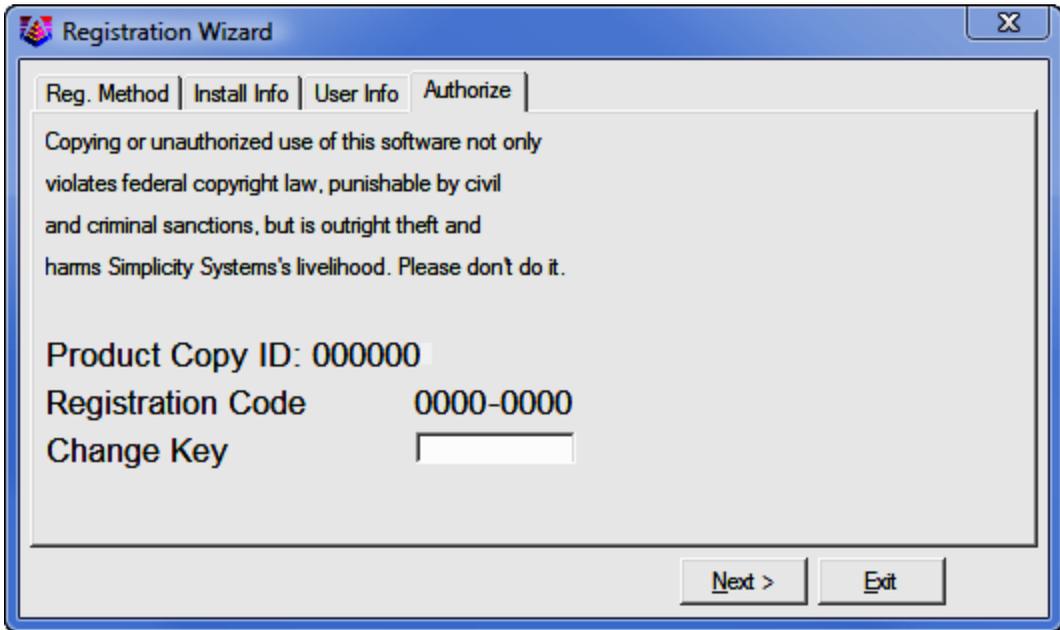
User info: Complete the User Info form, making sure to give valid contact information so you will receive your **Change Key**. The serial number field will contain your registered serial number. DO NOT change this field.

If you are submitting a **Change Key Request** form by fax, click [**Print Fax Sheet**]. If you cannot print a fax sheet, click the [**If you cannot print...**] button and you will given an information sheet that you can save/email.



Authorize: If you are requesting a **Change Key** via the internet, the final dialog screen will display your **Change Key**. If you provided a valid email during the registration process, you will also receive this information by email. You should record this information in a safe place in case you ever need to reinstall your software on the same computer.

If you requested a **Change Key** by fax, you will receive a return fax containing your **Change Key**. Enter it in the **Change Key** field and click [**Next**].



That's it! You've registered your software and now have a fully working copy of "Sight" Survey.

1.05 Help and Technical Support

Context-sensitive help is available throughout "Sight" Survey by clicking on any [**Help**] button. You may also access help by selecting the menu item **Help > Sight Survey Help**. While you are using the on-board help (or the online help manual at www.simsystems.com) please note that even the help screens are interactive. For help on a particular prompt, data entry field or button, hover your mouse over the item in question on the screen display images within the help manual. Help may be in the form of a tool-tip, or you may simply click on the item, field or button in question and you will be guided to the precise section in the help manual that addresses the field or function.

"Sight" Survey technical support is free, but not toll-free, and available from 8am to 5pm Eastern time Monday through Friday. Additional support may be found

on the internet by visiting www.simsystems.com or the Carlson Support Forum at <http://update.carlsonsw.com/phpBB2/>.

To contact Simplicity Systems directly, call 828-338-2516 or send an email to support@simsystems.com.

To contact Carlson Technical Support, call 606-564-5028 or send an email to support@carlsonsw.com.

1.06 Program Updates

Program updates for the current version are always free for download, and they are available by selecting **Help > Check for Updates**.

Section 2

Data Entry Basics

This section covers basic data entry procedures for "Sight" Survey, including: distance entry; angle entry, file imports; point selection; coordinate entry; and working with CAD. It also discusses "Sight" Survey's menus and routine selection by menu and two-letter code.



NEVER USED "SIGHT" SURVEY BEFORE? *If you are a new user of "Sight" Survey, be sure to read Section 2.08, **Getting Around "Sight" Survey**.*

Before getting into data entry detail, let's cover a few of the conventions used in this manual.

Colors: The on-line help that accompanies this program encompasses the entire printed manual (which is also available in a PDF file.) The differences between the on-line help and the printed manual are:

- The on-line help (and the PDF manual) contains hyperlinks you can use to jump to referenced sections.
- The on-line help (and the PDF manual) is in color, the printed manual is in grayscale.
- In the on-line help (and PDF file) user responses are usually **bold dark blue**. Headings, routine names, and software names are in **bold black**.

Bracketed Items: When you see an item in brackets, such as [**OK**] or [**Cancel**], this indicates a button in the software, or a button on your keyboard. Single letters such as [**A**], [**B**], [**1**], [**2**], etc. indicate single key presses. Words such as [**Alt**], [**Ctrl**], [**Tab**], and [**Enter**] indicate pressing those keys on the keyboard, as do depictions such as [**F8**], [**F9**], etc. When you see an item such as [**Ctrl**][**A**], [**C**] it means that you need to press and hold the first while typing the second key, then releasing those keys and typing the third key.

Menus: Menus are depicted in bold text and may contain greater than (>) signs. For example, when we ask you to select **File > Save As**, we are instructing you to select the **Save As** item under the **File** menu. You might also see multiple menu items like **Tools > Surface > Contour** which would indicate the **Contour** routine under the **Surface** menu under the Tools menu.

Most menus contain single routine items but some also contain additional fly-out menus such as in the **Tools > Surface > Contour** example given above. You can tell the difference between a routine and a fly-out menu by the arrow (▶) present on the right-side of the menu item indicating a fly-out menu. Activate a fly-out menu by hovering the mouse over the menu name.

Menu Location: Unlike most programs, when you are using a "CAD" version of "Sight" Survey, the menu bar runs down the left side of the program window, and not across the top of the window. Instead of dropping down, the menu "flies out" to the right. Move your mouse directly to the right and into the menu before moving down to select a routine. If you are using the non-CAD version of "Sight" Survey, the menu bar is in the traditional location.

Mouse Clicks: When we say "click your mouse" we mean that you should single-click the left mouse button. When we say double-click your mouse, we again are referring to the left mouse button. In some cases we may say left-click or right-click in reference to the required mouse button.



HINT: We are referring to a normal mouse with buttons configured for a right-handed user. If you are left-handed and have reversed the buttons on your mouse, you must of course reverse our instructions as well.

2.01 Using Files from Other Programs

"Sight" Survey is fully capable of using files from a variety of sources including older Simplicity Systems programs and Carlson Survey. Of course, "Sight" Survey is capable of importing ASCII point files, but there may be times when you want to use a job developed under different software. As long as you can produce at least an ASCII coordinate file and an AutoCAD DXF or DWG file, you can recreate the job in the "Sight" Survey environment.

- [Using Old "Sight" Survey Jobs](#)
- [Using Old Simplicity \(DOS\) Survey 3 & 4 Jobs](#)
- [Using Carlson Survey Jobs](#)
- [Using C&G Survey Jobs](#)
- [Using Old Files from Other Software](#)

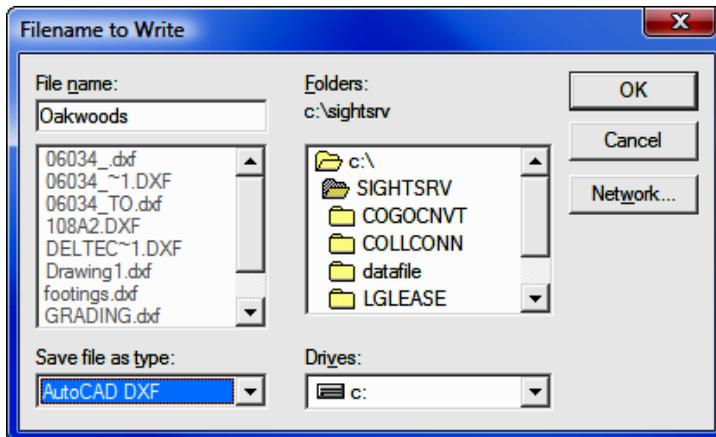
Using Old "Sight" Survey Jobs

Many users of previous versions of "Sight" Survey may have want or need to use old data and drawings they have accumulated over the years. This is entirely possible although the drawing file will need to be converted. The old "Sight" Survey coordinate file (.zak) does not need to be changed.

Drawing Files: Older "Sight" Survey drawings were stored in files having a **.DRG** filename extension. The .DRG file is a proprietary file type for TrueCAD (by Choice Computing), and this older format is not supported by your new "Sight" Survey. To use these older drawings you first need to convert them to an AutoCAD **.DWG** or **.DXF** format using your old "Sight" Survey program. **Note:** The conversion to an AutoCAD format is necessary even if you intend to import the drawing into MicroStation.

STEP 1: Export the DRG file to a DWG or DXF file: Open "Sight" Survey 3 (or 2) and load your job as you always have. Once it has loaded:

- "Sight" Survey 2 users select **File > Export > Drawing**.
- "Sight" Survey 3 users type **XF** to save the drawing as a DWG or DXF file.



Save File as Type: Click [▼] and set this to **AutoCAD DXF** or **AutoCAD DWG**.



WHAT TYPE SHOULD YOU USE? *It makes no difference to "Sight" Survey 2009 what format (type) you use to convert your drawing; the program will automatically convert DXF files into the correct DWG format. However, using **XF** to create a DWG file will yield better results in terms of color and font selections. Converting DXF files set properties for the various entities to **By Layer**, while converting to a DWG file will set the properties to the actual settings from "Sight" Survey 2/3. When possible you should convert to a DWG file inside "Sight" Survey 2/3.*

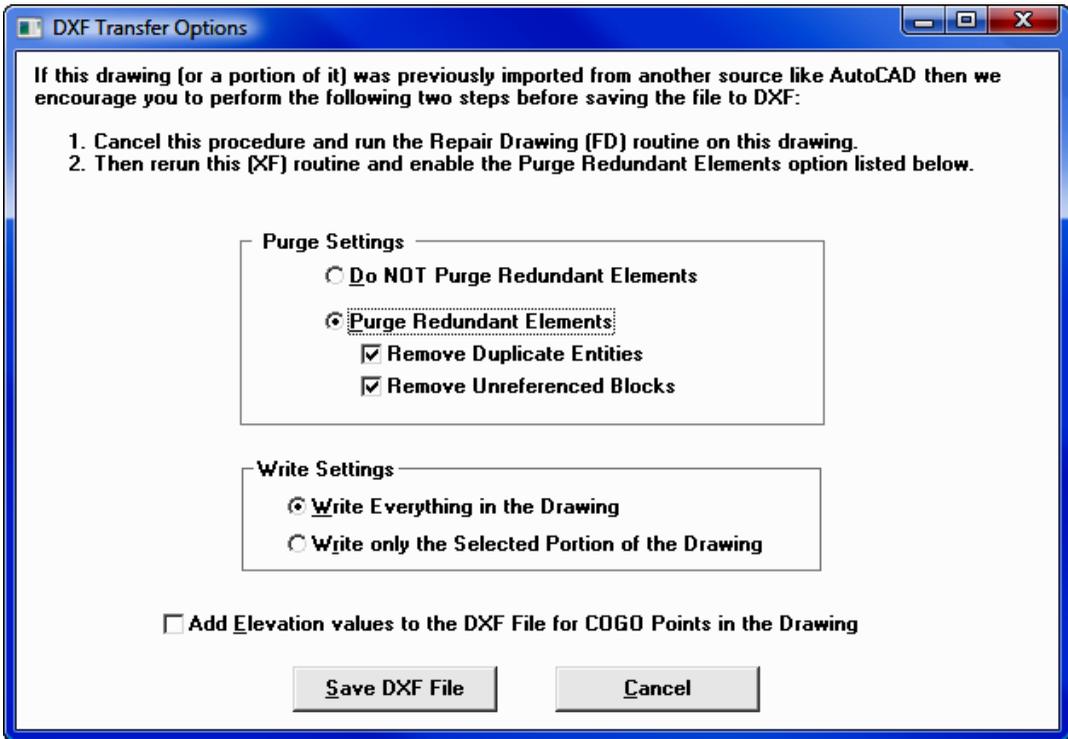
Filename: Enter the **File Name** as **filename.DWG** (or **filename.DXF**) and make sure the **Save file as type** setting is **AutoCAD DWG** (or **DXF**). Note that the filename must match the name of the .ZAK file you will be importing.

Folders & Drives: This is where your DXF or DWG file will be written and it must also match the drive and folder location of the .ZAK file you will be importing.

Click [**OK**] to continue the drawing export process.

"Sight" Survey 2 Users: You will be prompted at the top of the drawing screen: **Write everything? (else just selected)**. Click [**Yes**] and proceed to [Step 2](#).

"Sight" Survey 3 Users: You will be presented with a **DXF Transfer Options** dialog.



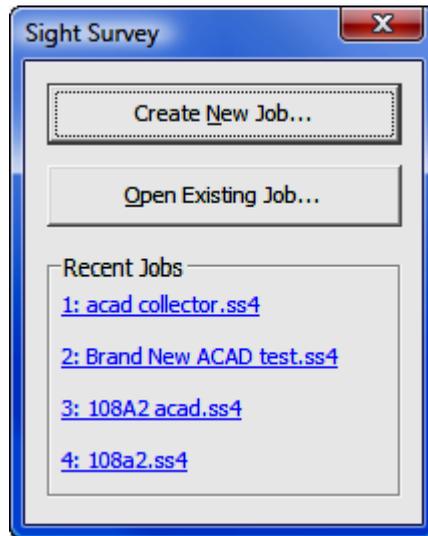
To keep the file as small as possible, you should select **Purge Redundant Elements** and leave the two associated removal options checked. Click [**Save DXF File**] to complete the drawing translation to DXF.

STEP 2: Once you have confirmation that the drawing file has been saved, click [**OK**] and then close your old "Sight" Survey.

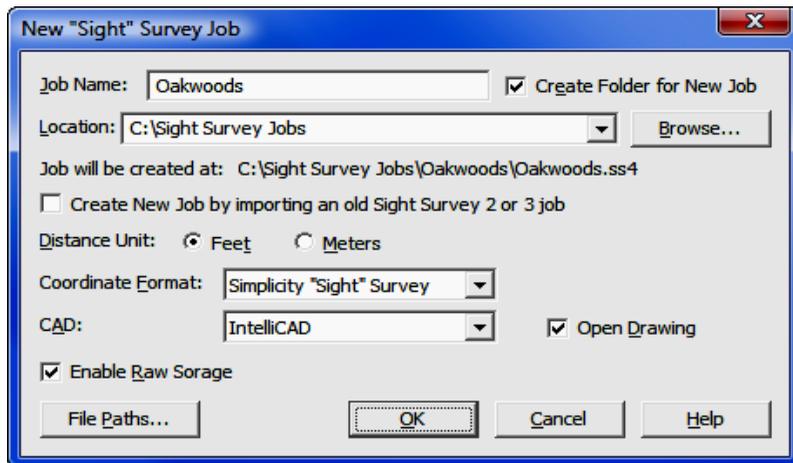


Creating Your New Job

Start "Sight" Survey 2009 by double-clicking the **SS2009 External** icon on your desktop.



Left-click on the [**Create New Job**] Button.

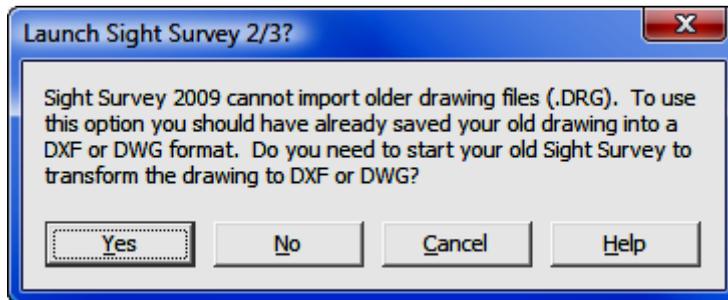


In the **New Job** window, set the **Job name** to the desired *filename*. Check the box: **Create new Job by importing an old Sight Survey 2 or 3 job**.

Set everything else as shown on the dialog above, with two exceptions:

- The **Location** (the path to the job) – leave it as it appears when the dialog opens. Do not change this setting.
- **CAD** – select **IntelliCAD**, **AutoCAD** or **MicroStation**.

Click [**OK**].

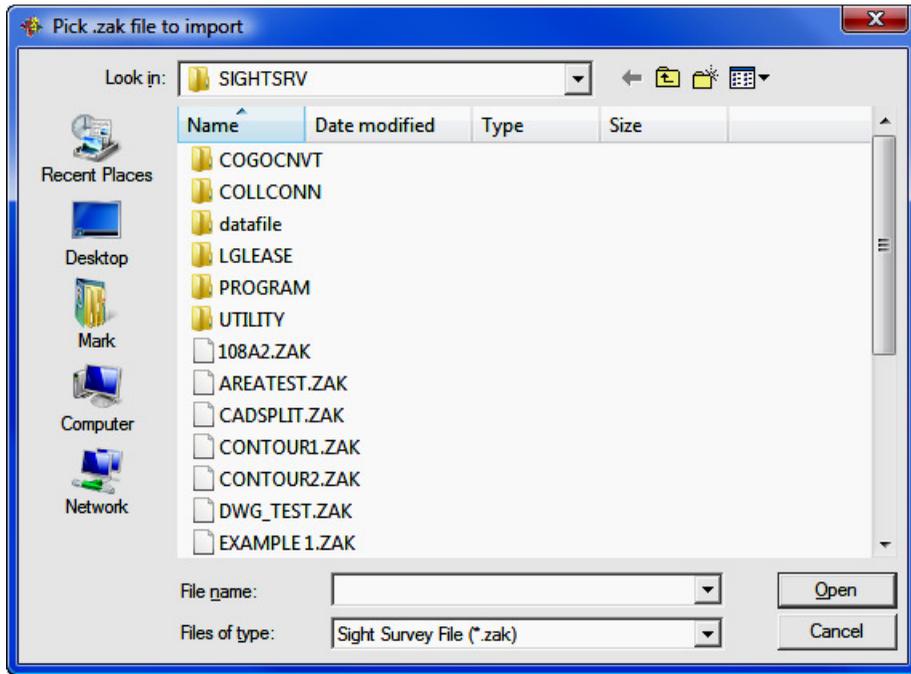


Just in case you have not yet converted your old drawing file, this dialog will allow you to launch your old "Sight" Survey and make the conversion.

[Yes]: Clicking [**Yes**] will launch "Sight" Survey 2/3 provided that your old "Sight" Survey is in the default location. If you installed it to another location, DO NOT click any buttons on this dialog, but use your normal "Sight" Survey 2/3 startup procedures to launch the old program. After you have converted the drawing and closed "Sight" Survey 2/3, click [**No**] on this dialog.

[Cancel]: Click [**Cancel**] to return to the **New Job** dialog to change your settings.

[No]: Click [**No**] to continue importing your job.



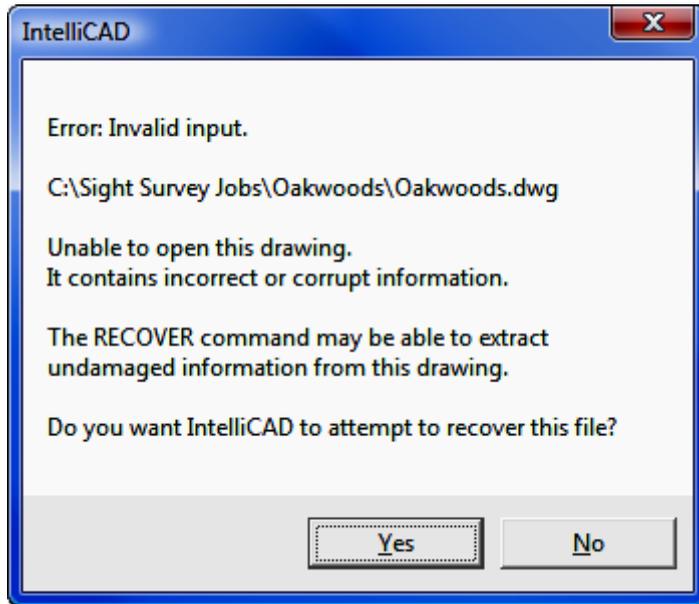
Pick .zak file to import: "Sight" Survey 2009 will display a **Windows File Selection** dialog box pointing to a folder location of **C:\SightSrv**. This is the default location for "Sight" Survey 2/3 files. If you are saving data files to a different location, you will need to navigate to your data folder.

Select the old **.ZAK** file you want to import and click [**Open**]. You do not need to import a drawing file, only the **.ZAK** file. The drawing file will be automatically included.

"Sight" Survey 2009 will open the imported job. If you do not see the drawing, issue a **Zoom All** command in "Sight" Survey by typing the two-letter command **ZA**. Before continuing, it is a good idea to save your job. Select **File > Save** or left-click the save icon in the "Sight" Survey toolbar.

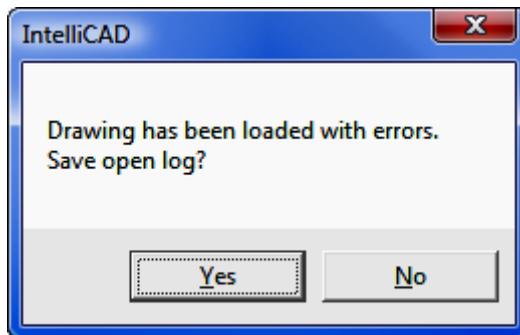
Note to IntelliCAD Users:

If you have imported a DWG file, when the drawing first opens you will likely see this error message.

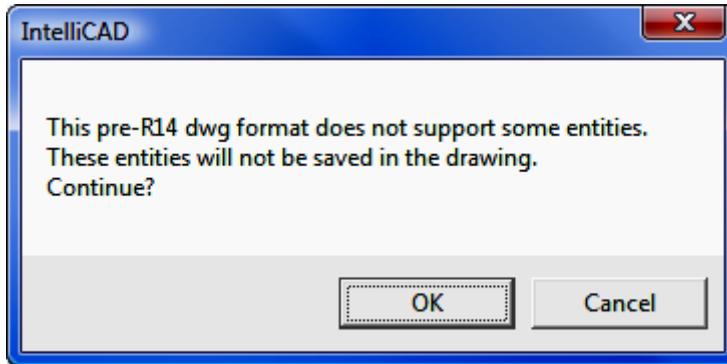


The error message is caused by settings in the release 12 formatted drawing file that are not recognized by IntelliCAD. These are general settings and there is nothing wrong with your drawing. Click [**Yes**] to continue loading the drawing.

A log file is created as the drawing is recovered, resulting in another message. You do not need to save the log file. Click [**No**].



When you attempt to save the imported drawing for the first time, you will also see this dialog:



Again, there is nothing wrong with the drawing, and nothing will be left out of the drawing when you save it. Click [**OK**] to complete the initial save process. Your drawing is saved in the most current IntelliCAD/AutoCAD drawing format and you will not see this message again.

Using Old Simplicity (DOS) Survey 3 & 4 Jobs

There may be times when you need to import an old DOS **Survey 3 (.DAT)** or **Survey 4 (.DAT)** file. "Sight" Survey is capable of directly reading these file types using **File > Import > Coordinates** ([Section 3.09](#)). In some cases you may also have a **Generic CADD** or **General CADD** drawing (**.GCD**) that you created with the old **Simplicity Draftsman** program. Unfortunately, "Sight" Survey is not capable of directly reading those drawings. But don't despair, you still have the tools to create a new "Sight" Survey job.

Converting the COGO files: You can use "**Sight**" **Survey 2009** to import any **Survey 3/4** data file and create a **.ZAK** file. Under **File > Import > Coordinates** simply select the file name and set the file type as Survey 3 or Survey 4.

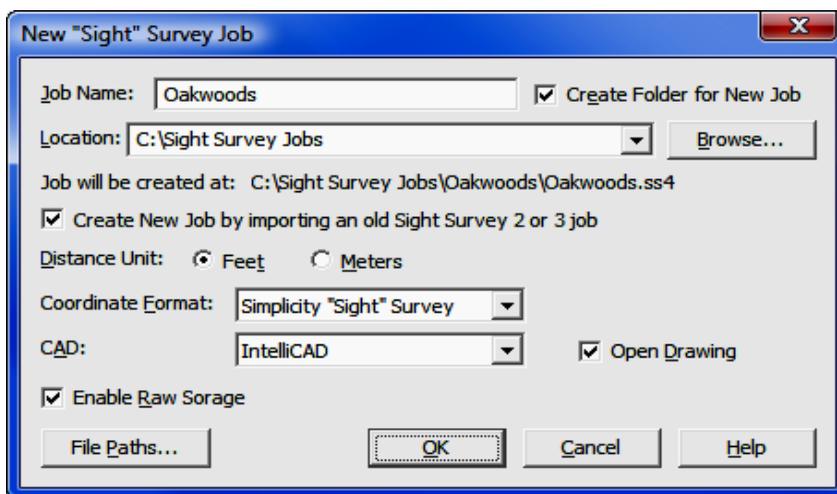
Converting Generic CADD drawings: If you have **GCD** drawing files, you can use **General CADD** or **Generic CADD** to save a copy of the GCD file as an **AutoCAD DXF** or **DWG** file.

Using your existing **.DAT** file and your new **DXF/DWG** file, simply follow the instructions for [Using Old Files from Other Software](#) located later in this section.

Using Carlson Survey Jobs

Using Carlson files is a relatively simple process since no file conversions need to be made.

Importing Your Job: Open your new "Sight" Survey and left-click on the [**Create New Job**] button.



Job Name: Give your job a name: the same name as the Carlson job you are importing.

Coordinate Format: Click [▼] and select a coordinate format from the list. It should be the same format as the Carlson file you are importing.

CAD: Select your AutoCAD version and click [**OK**]. "Sight" Survey will initialize a job file and open the CAD window.

Close "Sight" Survey: Select **File > Exit** or type the two-letter code **SY**. Save the data file and the drawing file.

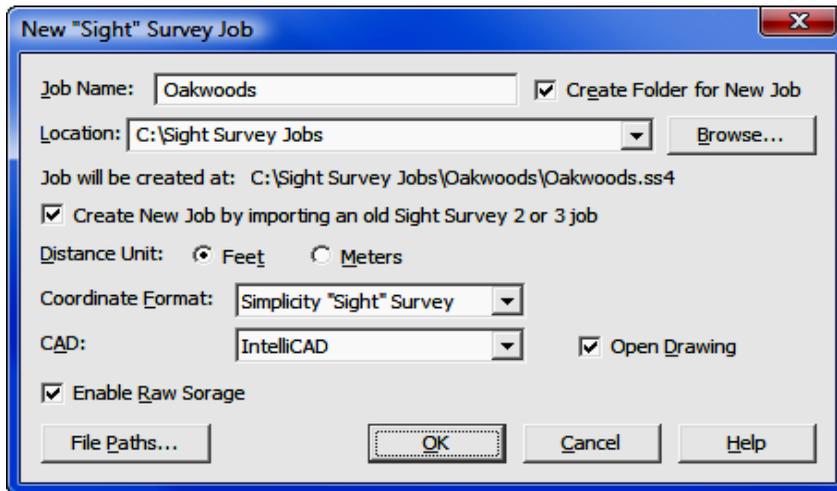
Import the Files: Use **Windows Explorer (My Computer)** to copy the existing .CRD and DWG file from the Carlson Jobs folder to the folder for the new job under **Documents\Sight Survey Jobs** folder. Overwrite the .CRD and .DWG files that are already there since they are empty anyway. Now restart "Sight"

Survey and reload the job. Your CRD file and DWG file will be loaded and ready to use.

Using C&G Survey Jobs

Using C&G files is a relatively simple process since no file conversions need to be made.

Importing Your Job: Open your new "Sight" Survey and left-click on the [**Create New Job**] button.



Job Name: Give your job a name: the same name as the C&G job you are importing.

Coordinate Format: Click [**▼**] and select a coordinate format from the list. It should be the same format as the C&G file you are importing, either numeric or alphanumeric.

CAD: Select your AutoCAD version and click [**OK**]. "Sight" Survey will initialize a job file and open the CAD window.

Close "Sight" Survey: Select **File > Exit** or type the two-letter code **SY**. Save the data file and the drawing file.

Import the Files: Use **Windows Explorer (My Computer)** to copy the existing C&G coordinate file (.CRD or .CGC), the index files (.IDX or .CGI) and the DWG file from the C&G Jobs folder to the folder for the new job under **Documents\Sight Survey Jobs** folder. Overwrite the coordinate, index and drawing files that are already there since they are empty anyway. Now restart "Sight" Survey and reload the job. Your coordinate and drawing files will be loaded and ready to use.

Using Old Files from Other Software

As long as you can create an ASCII coordinate file and (optionally) an AutoCAD DXF or DWG file, you can port a job to "Sight" Survey. Once you have these file, follow this general procedure:

1. **Start a New Job in "Sight" Survey:** Choose your **Job Name, Coordinate Format,** and **CAD** program.
2. **Import the Data:** Click **File > Import > ASCII** Files and import your coordinate file.
3. **Import the Drawing:** If you want to import a DXF/DWG file, follow the steps below appropriate to your CAD program.

AutoCAD/IntelliCAD - Import the Drawing File:

1. On the AutoCAD/IntelliCAD command line, type **Open [Enter]** and select the correct file type (**DXF** or **DWG**).
2. Using the Windows dialog box, find the drawing file and click [**Open**].
3. Type **Zoom [Enter] [E] [Enter]** to **Zoom Extents** and you should see your drawing.
4. Notice that the title of the drawing is set to the name of the drawing file you just imported.
5. Minimize the drawing. (Not the entire CAD screen, just the drawing.) You should now see the original drawing screen. It will be blank, but the title will reflect the name of the job you are creating.
6. Close this drawing so we can save our imported drawing file to the same name. Click the **X** in the upper right corner of the drawing (not the CAD window, but only the current drawing).
7. Restore the minimized drawing.

8. In the command line, type **SAVEAS** [Enter]. Using the navigation dialog box, go to the folder for the new job under **Documents\Sight Survey Jobs** folder. In the job folder you will find the name of the new job with a **.DWG** file name extension. Double-click the file and the drawing will be renamed and saved as the current drawing. You may now continue working in your new job file.

MicroStation - Import the Drawing File:

1. In MicroStation, click **File > Open** and select the correct file type (**DXF** or **DWG**).
2. Using the Windows dialog box, find the drawing file and click [**Open**].
3. Click the **Fit View** toolbar icon and you should see your drawing.
4. Notice that the title of the drawing is set to the name of the drawing file you just imported.
5. Click **File > Save As**. Using the navigation dialog box, set the **File Type** to **DGN** and go to the folder for the new job under **Documents\Sight Survey Jobs** folder. In the job folder you will find the name of the new job with a **.DGN** file name extension. Double-click the file and the drawing will be renamed and saved as the current drawing. You may now continue working in your new job file.
6. If your drawing has disappeared, you can either click the **Fit View** toolbar icon again, or click into "Sight" Survey and type **ZE** to **Zoom Extents**.

2.02 Point Identifiers

"Sight" Survey has several methods that can be used for identifying points. Among these are:

- [Point Numbers](#)
- [Alphanumeric Point Numbers](#)
- [Point Names \(Descriptions\)](#)
- [Stations](#)

Point Numbers

Entering point numbers into "Sight" Survey is as easy as typing them on your keyboard. Any number is a valid number, from **0** up to **99999999**, as is any alphanumeric combination up to eight characters long. This gives "Sight" Survey a point capacity of over 3.5 trillion points!

To make numeric point number assignment easy, "Sight" Survey includes (optional) **Automatic Point Numbering (AN)**. In most COGO routines that compute and set a data point, automatic point numbering may be used to seek out the next available point number. You can toggle automatic point numbering from the **COGO Configuration** menu (**KC** - [Section 5.04](#)) or by entering the two-letter command **AN** at any data entry prompt.

Alphanumeric Point Numbers

"Sight" Survey allows the use of numeric or alphanumeric point numbers up to 8 characters in length. To use an alphanumeric point number, press the apostrophe (') **before** typing any alphabetic characters. For example, to use point number 100A, type **100'A** or **'100A**, and to use point number NECORNER, type **'NECORNER**.

Because "Sight" Survey uses alphabetic characters for routine codes, you must press the apostrophe (') to notify the program that the characters you will type are not routine codes. If you have accidentally press the apostrophe key, simple press it again to disable alphabetic entries.



NOTE: *You will not see the single quote on the screen. It is simply a toggle code and is not part of the actual point number. Likewise, you cannot create a point name that contains an apostrophe.*



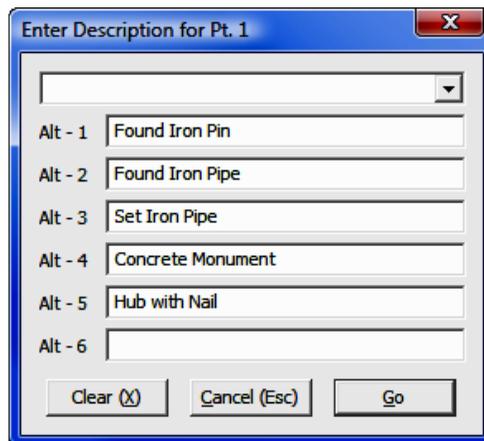
WARNING: DO NOT *use commas, dashes or apostrophes in alphanumeric point names. These are characters that are reserved for use as separators for bearing and distance recall operations.*

Point Names (Descriptions)

Naming a point may be done at any request for a point number, or by using the **Identify Point** routine (**ID** - [Section 6.03](#)). Point names may be up to 28 characters in length.

You may set "Sight" Survey to prompt for point names in either of two ways: Check the **Prompt for Point Names (PN)** box on the **COGO Configuration** menu (**KC** - [Section 5.04](#)); or toggle the prompting with the two-letter routine code **PN**.

When point name prompting is active, "Sight" Survey prompts you to enter a point description after creating any point.



Field	Description
Alt - 1	Found Iron Pin
Alt - 2	Found Iron Pipe
Alt - 3	Set Iron Pipe
Alt - 4	Concrete Monument
Alt - 5	Hub with Nail
Alt - 6	

From this dialog box, you have several options. You can:

- Enter a point description by typing the description into the top line and pressing [**Enter**].
- Enter point descriptions into any of the alternate description fields for later use. If you press [**Enter**] after typing the description into an alternate field, the description will also be used as the current description. You can fill all the alternate fields while the dialog box is open by using your mouse to move between fields. If you fill alternate fields but do not want to enter a point description for the current point, delete any text in the top description field and press [**Enter**]. The descriptions entered into the six alternate description fields are retained between "Sight" Survey sessions for the same job.

- Select an alternate descriptions by pressing [**Alt**] followed by the description number and [**Enter**], such as: [**Alt**][**1**] [**Enter**];
- Click the down arrow [**▼**] and select one of the previously entered descriptions. All descriptions entered during a "Sight" Survey session are accumulated in the drop-down menu for easy re-use, however the descriptions are not retained between sessions.

Stations

When "Sight" Survey computes stations, they are formatted in an **English** or **metric** format as specified in the **COGO Configuration** menu (**KC** - [Section 5.04](#)). Stationing precision matches the distance precision, from 0 to 6 decimal places, as specified in the **Text Output Configuration** menu (**KT** - [Section 5.01](#)).

Entering Station Values: When **Traversing with Stations** (**TS** - [Section 7.11](#)) and **Inversing with Stations** (**IS** - [Section 7.12](#)) you will be required to enter station data. Enter the station in a format as shown in the following examples:

ENGLISH UNITS

<u>Station Distance</u>	<u>Enter as Station</u>
25.0 feet	0.25 or 0+25
600.0 feet	6 or 6+00
1675.0 feet	16.75 or 16+75
1550.4 feet	15.504 or 15+50.4
12535.3 feet	125.353 or 125+35.3

Care must be taken to avoid entering an erroneous station. For example, entering 1+50 as **150** results in a station of 150+00. The station should be entered as **1+50** or **1.50**.

METRIC UNITS

<u>Station Distance</u>	<u>Enter as Station</u>
25.0 meters	0.025 or 0+025
600.0 meters	.6 or 0+600
1675.0 meters	1.675 or 1+675
1550.4 meters	1.5504 or 1+550.4
12535.3 meters	12.5353 or 12+535.3

Care must be taken to avoid entering an erroneous station. For example, entering a station at 150 meters as **150** results in a station of 150+000. The station should be entered as **0.150** or **0+150**.



CAUTION: You may enter stations directly into the **Point Manager** window (**PM** - [Section 6.09](#)) but you must use the correct entry format using a **+** sign in your entry.

Assigning Stations: You can assign a station to a point in one of two ways: by using the **Enter Station** routine (**ES** - [Section 6.04](#)) when the **Traversing with Stations** (**TS** - [Section 7.11](#)) or **Inversing with Stations** (**IS** - [Section 7.12](#)) is active; or by entering the station into the **Station** field in the **Point Manager** window (**PM** - [Section 6.09](#)).

2.03 Selecting Points

"Sight" Survey has several methods of point selection and generation. Among these are:

- [Manual Point Number Entry](#)
- [Semi-automatic Point Number Entry](#)
- [Automatic Point Numbering](#)
- [Point Strings and Ranges](#)
- [Defined Figures \(Point Groups\)](#)
- [Selecting Points using the Point Manager](#)
- [Select By Options](#)
- [Picking Points in CAD](#)

Manual Point Number Entry

Numeric Points: To enter a point number (numeric points only) into any point number field, simply type the number.

Alphanumeric Points: "Sight" Survey allows the use of numeric or alphanumeric point numbers up to 8 characters in length. To use an alphanumeric point number, press the apostrophe (') **before** typing any alphabetic characters. For example, to use point number 100A, type **100'A** or **'100A**, and to use point number NECORNER, type **'NECORNER**.

Because "Sight" Survey uses alphabetic characters for routine codes, you must press the apostrophe (') to notify the program that the characters you will type are not routine codes. If you have accidentally press the apostrophe key, simply press it again to disable alphabetic entries.



NOTE: *You will not see the single quote on the screen. It is simply a toggle code and is not part of the actual point number. Likewise, you cannot create a point name that contains an apostrophe.*

Semi-automatic Point Number Entry

Instead of entering an actual number into a point field, you may enter a plus (+) or minus (-) sign. If you enter a plus sign, the program will search for and use the next available point number in an ascending direction. If you enter a minus sign, the program will search for and use the next available point number in an descending direction. If "Sight" Survey reaches point 0 without finding an available point, the first available point number in an ascending direction will be assigned. If you are creating points, the first available point will be an unused point. If you are in a "measuring" routine (such as **Inverse**) and you are looking for the next or previous point, "Sight" Survey will find the first used point in whatever direction you have chosen. Measuring routines also allow you to use function keys [**F8**] and [**F9**] to go to the **Previous** and **Next** points respectively.

Semi-automatic point entry applies only to numeric point numbers, with one exception. In some routines (such as **Radial Stake Out**, **Radial Inverse**, **Coordinate Transformation**, etc) you may enter the letter **A** (for **All Points**) into the **To Point** field. When has been told to use **All** points, it does not matter if the points are numeric or alphanumeric. Numeric points are used first followed by alphanumeric points.

Automatic Point Numbering

To speed data entry, you may instruct "Sight" Survey to use **Automatic Point Numbering** by checking the box in the **COGO Configuration** menu (**KC** - [Section 5.04](#)). You may also toggle **Automatic Point Numbering** on or off by entering the two-letter command **AN** at any data entry prompt. **Automatic Point Numbering** works only with numeric point numbers.

Point Strings and Ranges

In "inverse" type coordinate geometry routines, (routines that *measure between* points, rather than routines that *compute* points), you may speed your data entry by entering a point range instead of a single point at a time. If care is taken when assigning point numbers, entering point ranges can save you a considerable amount of time. For example, say you have a meander line containing 200 points, consecutively numbered. Keying in each point number into the **Inverse** routine requires 696 key presses to inverse through 199 legs. Even streamlining point number entry by replacing each point number with a [**+**] key requires 404 key presses. However, by using a point range "Sight" Survey requires only 11 key presses: [**S**][**T**] [**1**][**Enter**] [**I**][**N**] [**-**][**2**][**0**][**0**][**Enter**] which is **S**Tart at **1** **I**Nverse to **-200**.

"Sight" Survey allows you to enter point strings and/or point ranges, using these rules:

1. Separate single points by a comma, for example: **1,3,5,7**
2. Separate a consecutive range of **numeric** point numbers by a dash, for example: **1-7**
3. Enter all **alphanumeric** point numbers individually and separate them by a comma, for example: **PT1,PT3,PC8,NCorL1**
4. Preface any radius points with an asterisk (*****) or less than sign (**<**) for acute curves or a greater than sign (**>**) for obtuse curves, and use only the *****, **<**, or **>** to separate the PC and the radius point of a curve; for example **5*10,8** sets the acute curve from 5 through center point 10 to end point 8; and **5>10,8** sets the obtuse curve from 5 through center point 10 to end point 8. Don't place a comma after the 5.
5. Curve points may be entered within point ranges, if desired. For example: **1-7*8,10*8,15*8-17,1** is the same as entering points **1-7*8-10*8,15*8,16*8,17,1**.
6. **DO NOT** start your point string with a radius point (*****, **>**, or **<**) designation.

7. Preface any referenced figures with an **F:** and do not add any points after the referenced figure.
8. Use care when entering your point string since the program will not attempt to screen your entry for illegal characters or unassigned points.
9. If you are want to a routine code at the end of the string, for example AR to calculate an area, you need to put a comma after the last point number, then press an apostrophe (') to signal alpha character mode, then type the routine code. For example if the **From Point** was 1 and you wanted to inverse through point 4, back to 1, then calculate an area, your key press sequence for the **To Point** field would be: **-4,1,'AR**. The apostrophe will not appear as part of the point string entry.

Defined Figures (Point Groups)

"Sight" Survey allows you to define figures or point groups using the **Define Figure** routine (**DF** or **PG** - [Section 6.20](#)). Figures (groups) may be created using the rules for point strings and ranges printed above. You can assign a name to each figure (group) and enter the figure by prefacing it with an **F:** such as **F:Lot 1**, when entering it into a **To Point** field. Figures may even call other figures. Please refer to the **Define Figure** routine instructions in [Section 6.20](#) for a more detailed discussion.

Selecting Points using the Point Manager

"Sight" Survey's **Point Manager** (**PM** - [Section 6.09](#)) provides a spreadsheet style interface for point selection. In the **Point Manager** you can sort your data by Point Number, Northing, Easting, Elevation, Symbol, Description, etc. You may pick points individually or by ranges, or even select by various options as described below.

Select By Options

"Sight" Survey's **Point Manager** contains several ways to select points. These are:

- **Bounded:** This option allows you to identify two points and have "Sight" Survey select all the points that lie in the region bounded by those points. Enter the point numbers as prompted and click [**Select**] or press [**Enter**] or [**Alt**][**S**].

- **Coordinates:** This option allows you to identify the selection region by coordinate values and "Sight" Survey select all the points that lie in the rectangular region bounded by those points. This option has the added advantage of allowing you to select points by using a single coordinate parameter. In other words, you can select points lying in a Northing range, irrespective of the Eastings and vice-versa. Or you can ignore the Northings and Eastings altogether and select points lying within a range of elevations. Enter the coordinate values as prompted and click [**Select**] or press [**Enter**] or [**Alt**][**S**]. To ignore a particular field, simply leave the field blank.
- **Radius:** This option allows you to select all points within a radius distance of a known point or coordinates. Enter the radius values and either a point number or coordinates as prompted and click [**Select**] or press [**Enter**] or [**Alt**][**S**]. Note: You cannot enter both a point number and coordinate values.
- **Description, Symbol, Layer, or Field Code:** Use this option to define a selection set by any single parameter, or any combination of parameters. When searching for a description, you can use a wildcard character (*) to indicate partial matches. For example, an entry of "***sidewalk**" would seek out all points where the description ended with the word "sidewalk." Similarly, "**sidewalk***" would find points that begin with "sidewalk," and "***sidewalk***" would find all points having a description containing the word "sidewalk." Descriptions may be case sensitive. When choosing a Symbol, Layer, or Field Code, you may pick from the drop down selection boxes or type in a value. After entering the values as prompted click [**Select**] or press [**Enter**] or [**Alt**][**S**].
- **Station:** Enter a minimum and maximum station value and "Sight" Survey will find all stationed points within the specified range. You do not need to enter the + key when entering stations. For example, enter station 12+25.3 simply as 1225.3. After entering the stations as prompted click [**Select**] or press [**Enter**] or [**Alt**][**S**].

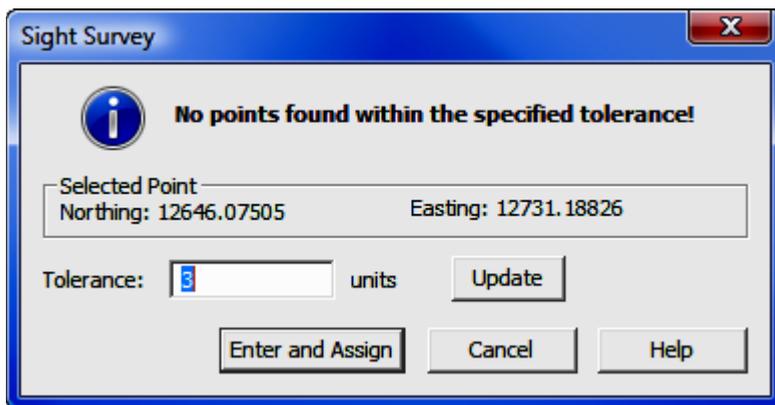
Picking Points in CAD

If you are using Sight Survey's internal CAD engine, AutoCAD, MicroStation, IntelliCAD, or any other CAD with a supported API (applications programming interface), you may pick a point from the CAD window by right-clicking the [**Pts**] button located just to the right of the point field.



NOTE: If you are using the non-CAD interface, this option is not available to you.

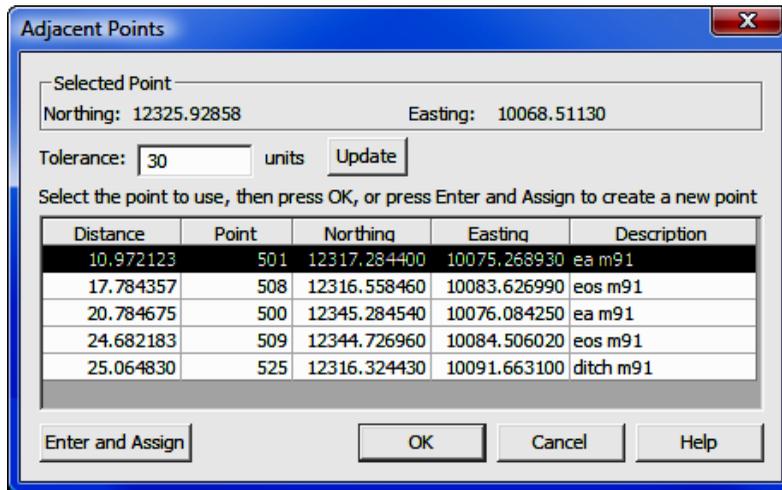
When picking points from the CAD window, "Sight" Survey will attempt to identify any existing points lying within the specified distance (the tolerance) from the mouse click. "Sight" Survey will find matches to the points in the coordinate file, even if those points are not plotted on the drawing. The tolerance distance units are the units you have selected under the **Local Configuration** menu ([LC - Section 5.05](#)) as either feet or meters. If no existing point is found within the specified tolerance, "Sight" Survey reports:



At this point you can: accept the point as picked; cancel this particular selection; or increase the **Tolerance** and click [**Update**] to expand the search for possible existing points.

If you want to accept the point as picked, click the [**Enter and Assign**] button. If you are using **Automatic Point Numbering** the point number will automatically be assigned. If not, an **Enter and Assign** dialog will appear (see below.) If you have selected **Prompt for Point Description** you will then be asked for a point description (see below). Finally, the point number will be drawn in CAD (if desired) and the point and coordinates will be entered into the coordinate file and reported in the **Text Output** window.

If "Sight" Survey finds any existing points the program reports:

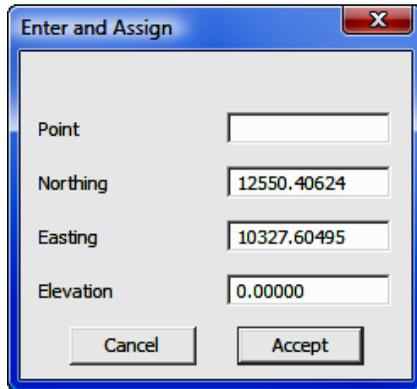


At this point you can: select one of the found points; accept the point location as picked; increase the **Tolerance** and click [**Update**] to expand the search for possible existing points; or cancel this particular selection by clicking [**OK**] or [**Cancel**].

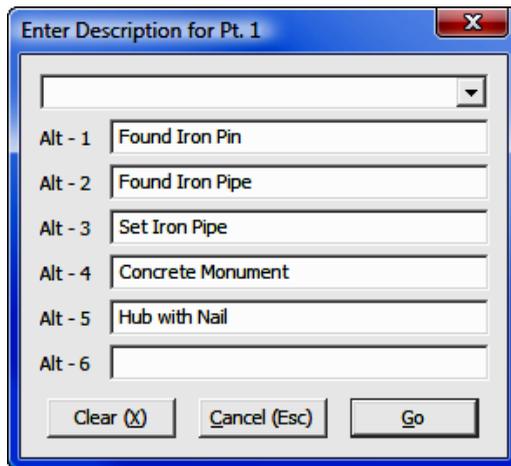
If the picked point matches one of the points returned, simply click on the found point in the table and click [**OK**] or [**Cancel**] to close this dialog, then pick another point in the drawing.

If you do not see a matching point and want to accept the point as picked, click the [**Enter and Assign**] button. If you are using **Automatic Point Numbering** the point number will automatically be assigned. If not, an **Enter and Assign** dialog will appear (see below.) If you have selected **Prompt for Point Description** you will then be asked for a point description (see below). Finally, the point number will be drawn in CAD (if desired) and the point and coordinates will be entered into the coordinate file and reported in the **Text Output** window.

If you are manually entering a point number for an accepted point, the **Enter and Assign** dialog appears. The **Northing** (Y) and **Easting** (X) coordinate fields will be populated with the values of the picked point. Enter a **Point** number and an **Elevation** (optional) and click [**Accept**].



If you have selected **Prompt for Point Names (PN)** you will then be asked for a point description. Click [▼] and select a description; type in a description and press [Enter]; or press [Alt][#] (where # is 1 - 6) to select a description offered.



2.04 Entering and Editing Coordinates

"Sight" Survey has four methods that can be used for entering and editing coordinate values. These are:

- [Null Values](#)
- [Using Enter and Assign](#)
- [Using the Point Manager](#)
- [Picking Points in CAD](#)

Null Values

"Sight" Survey uses 0 as a null value. Therefore, a point having X and Y coordinates of exactly 0,0 is not considered a valid point by the program. Likewise for an elevation of 0; "Sight" Survey considers this a null elevation. To assign a point to 0,0, you must give a minimal value to at least one of the coordinates. This value can be something like 0.0000000001. If you want to assign an elevation of zero to a point, use a value of 0.00001.

When performing COGO operations, "Sight" Survey will print elevation differences only between points that both have valid elevations. If one or both points have a zero elevation, the elevation difference will not be computed or printed.

Using Enter and Assign

You can manually enter point data into "Sight" Survey using the **Enter and Assign** routine (**EA**). Using this routine you enter a point number, followed by the point's coordinates and elevation. A point name or description may also be entered at this time. You may also use the **Enter and Assign** routine to edit the coordinates of an existing point. See [Section 6.01](#) for a complete discussion of this routine.

Using the Point Manager

"Sight" Survey's **Point Manager (PM)** offers a spreadsheet style presentation of the point data in the coordinate file. You may click the [**Enter & Assign**] button to add a point to the spreadsheet, entering data and pressing [**Tab**] to move from column to column. To edit any existing data, simply click in a data field and begin typing. See [Section 6.09](#) for a complete discussion of this routine.

Picking Points in CAD

There are two main instances when you may want to pick a point from the CAD window. The first and perhaps most common instance is when you are trying to use or assign a single point for a routine. This option is active whenever you see a [**Pts**] button to the right of a point entry field. In this case, you would right-click on the [**Pts**] to pick a point from the CAD window. Instructions for selecting a point in this manner are discussed in **Picking Points in CAD** in [Section 2.03](#).

The second reason for picking points from the CAD window would be to pick several points to add to a coordinate file. "Sight" Survey contains a Pick Points in CAD routine which may be found under the CAD menu. This routine is used to select multiple points in the CAD window, assign them point numbers, and add the new points to the coordinate file. This routine is similar to right-clicking the [**Pts**] button to select a single point, but it allows you to continue selecting points until you choose to exit the routine. See [Section 4.04](#) for a complete discussion of this routine.



If you are using a CAD supported only through the use of DXF files, or if you are using the non-CAD interface, **Picking Points in CAD** options are not available to you.

2.05 Distance Entries

"Sight" Survey has several methods that can be used for entering distances. Among these are:

- [Horizontal Distance Entry](#)
- [Slope Distance Entry](#)
- [Recalling a Distance](#)
- [Recalling the Last Used Distance](#)
- [Using the Function Keys](#)
- [Distance Entry using a Constant Factor](#)

Horizontal Distance Entry

In all "Sight" Survey routines, horizontal distances are entered just as if you were keying data into a calculator. Trailing zeros need not be entered. If you are in **Traverse with Station** mode (**TS** - [Section 7.11](#)) you may also enter a station (e.g. **1+35.25**) into the distance field and "Sight" Survey will use station data to compute the distance. Stations are indicated by the inclusion of the plus sign (**+**) in the entry field.

Slope Distance Entry

When entering a slope distance, type the distance and click the [\] button immediately to the right of the distance entry field. You will then be prompted for the slope angle and any other information needed to reduce the distance to horizontal. If you slope the **Slope Angle Prompting (SA)** "On," you do not need to click the [\] button as "Sight" Survey will prompt for slope information after each distance entry.

Recalling a Distance

"Sight" Survey allows you to recall a distance between any two points residing in the memory for use in the forthcoming calculation. To recall any distance simply enter the two defining point numbers separated by either a comma or a dash, such as **14,25** or **14-25**.



CAUTION: DO NOT separate two alphanumeric point numbers with a dash. You must use a comma in this case since a dash is a valid character in an alphanumeric point name and commas are not allowed in alphanumeric point names.

"Sight" Survey also allows the older style entries from previous versions, such as an asterisk ***** or the letter **R** followed by a beginning and ending point separated by a comma or hyphen. For example, these entries are still valid:

***15-21**, ***15,21**, **R15-21**, or **R15,21**

In any case, if you omit one or both of the point numbers the program will prompt you to return and enter all of the necessary data.



CAUTION: *If you are recalling a bearing and your first point is alphanumeric, **DO NOT** use the option of prefacing the entry with the letter **R**.*

Mathematical Functions: "Sight" Survey also allows you to enter a recalled distance with an addition, subtraction, multiplication or division operator (+, -, *, /). To make an in-line calculation, simply type the expression and press [**Enter**]. For example, to enter the distance from point 1 to point 5 less 150.25 feet, enter ***1,5-150.25** [**Enter**]. When you press [**Enter**] the value is computed and used, but not entered into the text entry box. It will however, be reported in the **Text Output** window if your **Print Input Data** setting is on (**PI** - [Section 5.01](#)).

Recalling the Last Used Distance

A second method of distance recall involves recalling the value last used. In "Sight" Survey this is an automatic function. For example, suppose you traverse from point 20 to point 21 at a bearing of 10NW and a distance of 75.5. After traversing to point 21, you want to continue on and set three more points along the same bearing and at the same distance. As you proceed to the next point, both the bearing and distance are retained from the last calculation. All you have to do is accept them by pressing [**Enter**] or [**Tab**], not re-enter them.

Using the Function Keys

Whenever you are prompted for a distance entry within COGO, the function keys [**F1**] through [**F8**] will be predefined to the following values (where **L** is the last used distance):

[F1] = L	[F5] = L/8
[F2] = L/2	[F6] = L*2
[F3] = L/3	[F7] = L*3
[F4] = L/4	[F8] = L*4

Distance Entry using a Constant Factor

"Sight" Survey allows you to apply a constant factor, or scale factor, to your entered distances. In addition to allowing you to define a custom constant factor, "Sight" Survey offers these factors:

K = Kilometer
M = Meter
F = Feet
I = inches
C = Chains (a chain is 66 feet)
L = Link (a link is 0.66 feet – there are 100 links in a chain)
P = Pole or Perch (a Pole is 16.5 feet)
R = Rod (same as a Pole = 16.5 feet)
U = User defined constant
V = Vara (user defined)



*User defined constants and Vara values are set on the **Local Configuration** menu (**LC** - [Section 5.05](#)).*

To apply a constant factor, simply follow the numeric value with the desired letter (either upper or lower case) and the constant will be applied to the value.

For example, an entry of **80c** is interpreted as 80 chains or 5,280 feet. An entry of **4R** is interpreted as 4 rods or 66 feet. Likewise, if you are working in feet and you enter **100m**, that entry is interpreted as 100 meters or 328.08 feet.

If you have a grid factor assigned as the constant factor, you might enter a value such as **1235.22u** to apply that factor to your distance.

Varas: The vara is a traditional unit of distance in Spanish and Portuguese speaking countries. The length of the vara varied (no pun intended), but in Spanish Latin America it was generally about 33 inches or a little longer. In Texas, where it was often used in land measurement, the vara was defined to equal exactly 33 1/3 inches, which is equivalent to 84.667 centimeters. In California, the vara was considered equal to 33 inches (83.82 centimeters) and in Mexico the former standard was 32.993 inches (83.802 centimeters). In southern South America the vara was usually about 34 inches (86.4 centimeters). The Spanish vara is shorter; it equals 32.908 inches or 83.587 centimeters. The Portuguese vara, on the other hand, is much longer; it equals 5 palmos or about 110 centimeters (43.3 inches). The word *vara* means a stick or pole. ¹

US Survey Feet vs. International Feet: In your **Local Configuration (LC - [Section 5.05](#))** you can specify your working units as Meters, US Survey Feet, or International Feet. When making conversions, "Sight" Survey will apply the correct conversion factors for your chosen units.

For example, if you are working in **Int'l Feet** (as set on the **Local Configuration** settings), and you enters a distance of **80C**, (80 chains = 80*66 US Survey

1. Russ Rowlett, University of North Carolina at Chapel Hill
 Ft = 5280 US Survey Ft) the program should convert that data to **Int'l Feet** and use it. $80*66*((1200/3937)/.3048) = 5280.01056$.

If used, constants such as **F** (foot) and **I** (inch) make the assumption that you are working in the unit as configured by Local Configuration and entering data in the other unit. For example, if you are working in **US Survey Feet** and enter **100F**, the program will assume you are entering a value of **100 Int'l Feet**, and vice-versa.

Units	US Survey Foot Formula	US Survey Feet	International Feet	International Foot Formula
Kilometers	$1000/(12/39.37)$	3280.833333	3280.839895	$1000/0.3048$
Meters	$1/(12/39.37)$	3.280833	3.280840	$1/.3048$
Foot - US Survey	1	1.000000	1.000002	$(12/39.37)/0.3048$
Foot - Int'l	$0.3048/(12/39.37)$	0.999998	1.000000	1
Inch	$(1/12)*(0.3048/(12/39.37))$	0.083333	0.083333	$1/12$
Chain	66	66.000000	66.000132	$66*((12/39.37)/0.3048)$
Line	0.66	0.660000	0.660001	$0.66*((12/39.37)/0.3048)$
Pole/Perch/Rod	16.5	16.500000	16.500033	$16.5*((12/39.37)/0.3048)$
Vara TX	$(33+1/3) /12*(0.3048/(12/39.37))$	2.777772	2.777778	$(33+1/3) /12$
Vara CO	$32.993/12*(0.3048/(12/39.37))$	2.749411	2.749417	$32.993/12$
Vara FL	$33.372/12*(0.3048/(12/39.37))$	2.780994	2.781000	$33.372/12$
Vara CA	$33/12*(0.3048/(12/39.37))$	2.749995	2.750000	$33/12$
Vara Spanish	$32.908/12*(0.3048/(12/39.37))$	2.742328	2.742333	$32.908/12$
Vara So. S.Am	$34/12*(0.3048/(12/39.37))$	2.833328	2.833333	$34/12$
Vara Portuguese	$43.3/12*(0.3048/(12/39.37))$	3.608326	3.608333	$43.3/12$
Vara Mexico	$32.993/12*(0.3048/(12/39.37))$	2.749411	2.749417	$32.993/12$

2.06 Directional Entries

Several factors and methods affect how "Sight" Survey interprets directional entries. Among these are:

- [Directional Units](#)
- [Azimuth Basis](#)
- [Directional Type](#)
- [Angle Entry Formats](#)
- [Angle Codes and Function Keys](#)
- [Combining Angle Entries and Codes](#)
- [Recalling Bearings](#)
- [Recall the Last Used Bearing](#)
- [The Reference Bearing](#)

Directional Units

"Sight" Survey can work in either **Angles** or **Grads** (gons). This setting is made on the **Local Configuration** menu (**LC** - [Section 5.05](#)).

Azimuth Basis

"Sight" Survey can work in either **North** (0° or 0 gr. = North) or **South** (0° or 0 gr. = South) based azimuths. This setting is made on the **Local Configuration** menu (**LC** - [Section 5.05](#)). Despite the azimuth basis, quadrant based entries such as **36.3527NE** are allowable angular entries.

Directional Type

"Sight" Survey can output data in either Bearings or Azimuths in both types of directional units (angles or grads). This setting is made on the **Local Configuration** menu (**LC** - [Section 5.05](#)).

Angle Entry Formats

The D.MMSS Format: Enter angular entries in the D.MMSS format by separating the degrees value from the remainder of the entry with a decimal. For example; enter 45° 30' 52" as **45.3052**. There is no need to enter any trailing values if the values are zero. For instance, 45° 30' 00" may be entered as **45.30** (or **45.3**). Likewise, an even 55° should be entered simply as **55**.

In the D.MMSS format, you do not need a decimal points on fractional seconds entries. Simply omit the decimal point. An angle entry of 45° 25' 35.65" should be entered as **45.253565** and not as **45.2535.65**.

The Grads Format: The grad (or gon) is a unit of measure equivalent to 1/400th of a circle. Grads are expressed as decimal values and may be formatted in "Sight" Survey with up to 6 decimal places.

Angle Codes and Function Keys

In both degrees and grads format, directional entries may be in the form of bearings, angles left or right, deflection angles left or right, or as North or South referenced azimuths.

The information that identifies the directional type is referred to as the **angle code**. Angle codes may be entered by number, by two letter alpha codes, or by pressing function keys.

Direction	Alpha Code	Numeric Code	Function Key
Northeast	NE	1	[F1]
Southeast	SE	2	[F2]
Southwest	SW	3	[F3]
Northwest	NW	4	[F4]
Azimuth	AZ	5	[F5]
Angle Left	AL	6	[F6]
Angle Right	AR	7	[F7]
Deflect Left	DL	8	none

Deflect Right	DR	9	none
90° (100g) Angle Left	Perp. Angle Left	none	[F8]
90° (100g) Angle Right	Perp. Angle Right	none	[F9]

Combining Angle Entries and Codes

In "Sight" Survey, all directional data may be incorporated into a single entry in a variety of ways, from alphanumeric, to pure numeric entries. Angular data may also be identified by typing the numeric data and pressing a **Function Key**. Consider these examples of acceptable combined angle entry formats:

Entry Type	Data	May be entered as	Notes
Bearing	N 72° 37' 42" E	72.3742 [F1] NE72.3742 N72.3742E 72.3742NE 172.3742	Note 1
Azimuth	72° 37' 42"	72.3742 [F5] A72.3742Z 72.3742AZ AZ72.3742 572.3742	Note 1
Angle Left	72° 37' 42"	72.3742 [F6] A72.3742L 72.3742AL AL72.3742 672.3742	Note 1
Angle Right	72° 37' 42"	72.3742 [F7] A72.3742R 72.3742AR AR72.3742 772.3742	Note 1
Deflection Left	72° 37' 42"	72.3742 [F8] D72.3742L 72.3742DL DL72.3742 872.3742	Note 1
Deflection	72° 37' 42"	72.3742 [F9]	

Right

D72.3742R
72.3742DR
DR72.3742
972.3742

Note 1

Note:

1. Carlson style entry. In the Carlson option, the first number represents the angle/quad code. This format allows you to complete your angle entry entirely from the numeric keypad. When using this option: = NE; 2 = SE; 3 = SW; 4 = NW; 5 = Azimuth; 6 = angle left; 7 = angle right; 8 = deflect left; and 9 = deflect right. Set on the **Local Configuration** menu (**LC** - [Section 5.05](#)).

Recalling a Bearing

"Sight" Survey allows you to recall a bearing between any two points residing in the memory for use in the forthcoming calculation. To recall any distance simply enter the two defining point numbers separated by either a comma or a dash, such as **14,25** or **14-25**.



CAUTION: *Do Not* separate two alphanumeric point numbers with a dash. You must use a comma in this case since a dash is a valid character in an alphanumeric point name and commas are not allowed in alphanumeric point names.

"Sight" Survey also allows the older style entries from previous versions, such as an asterisk * or the letter **R** followed by a beginning and ending point separated by a comma or hyphen. For example, these entries are still valid:

***15-21**, ***15,21**, **R15-21**, or **R15,21**

In any case, if you omit one or both of the point numbers the program will prompt you to return and enter all of the necessary data.



CAUTION: *If you are recalling a bearing and your first point is alphanumeric, DO NOT use the option of prefacing the entry with the letter R.*

Recalling the Last Used Bearing

A second method of bearing recall involves recalling the value last used. In "Sight" Survey this is an automatic function. For example, suppose you traverse from point 20 to point 21 at a bearing of 10NW and a distance of 75.5. After traversing to point 21, you want to continue on and set three more points along the same bearing and at the same distance. As you proceed to the next point, both the bearing and distance are retained from the last calculation. All you have to do is accept them by pressing [**Enter**] or [**Tab**], not re-enter them.

The Reference Bearing

After the first traverse or inverse procedure in the COGO program, a bearing will be retained in the memory as a **reference** (or backsight) **bearing**. The reference bearing is simply the reverse of the bearing which you traveled on to get to the point which is now occupied. The reference bearing is the bearing referenced every time you enter an angle or deflection to the right or left. You may change this bearing through the use of the **Enter Backsight Bearing** (**EB** - [Section 6.08](#)) or **Enter Backsight Point** (**EP** - [Section 6.07](#)) routine. Enter or recall a backsight bearing in the same manner as you would enter any other bearing.

2.07 Vertical and Zenith Angles

"Sight" Survey recognizes two types of slope angles. These are:

- [Zenith Angles](#)
- [Vertical Angles](#)

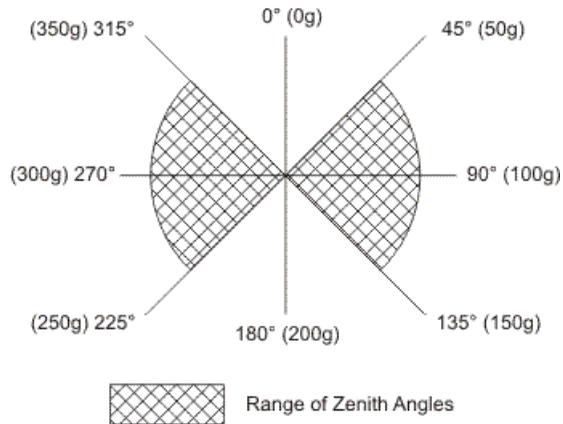
All **vertical angles** and **zenith angles** must be entered in the same format as horizontal angles. The routines contained in "Sight" Survey are set up to accept either vertical or zenith entries, with the program determining your intent by using break points set at every 45 degree (50 grad) point from the horizontal plane. The illustrations that follow indicate how the data entries will be treated.



*To enter a zenith angle in the range of -45° to 45° , 135° to 225° , or 315° to 360° , preface your angle entry with the letter **Z**, for example **Z44.2835**.*

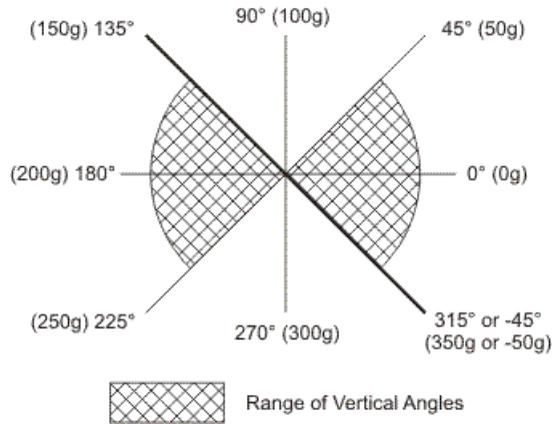
Zenith Angles

Zenith angles are referenced to a 0° (0g) value straight up. All values between 45 and 135 degrees (50 and 150 grads), and all values between 225 and 315 degrees (250 and 350 grads), are automatically considered zenith angles.



Vertical Angles

Vertical angles are referenced to a 0° (0g) value on the horizontal plain. All values lying between 0 and 45 degrees (0 and 50 grads), between -45 and 0 degrees (-50 and 0 grads), between 315 and 360 degrees (350 and 400 grads), and between 135 and 225 degrees (150 and 250 grads) are automatically considered vertical angles.



2.08 Getting Around "Sight" Survey

This section discusses some "look and feel" issues of "Sight" Survey's user interface, including:

- [Layouts](#)
- [Activating Routines](#)
- [Primary Dialogs vs. Secondary Dialogs](#)
- [Tabbed Dialogs](#)
- [The \[Pts\] Button](#)

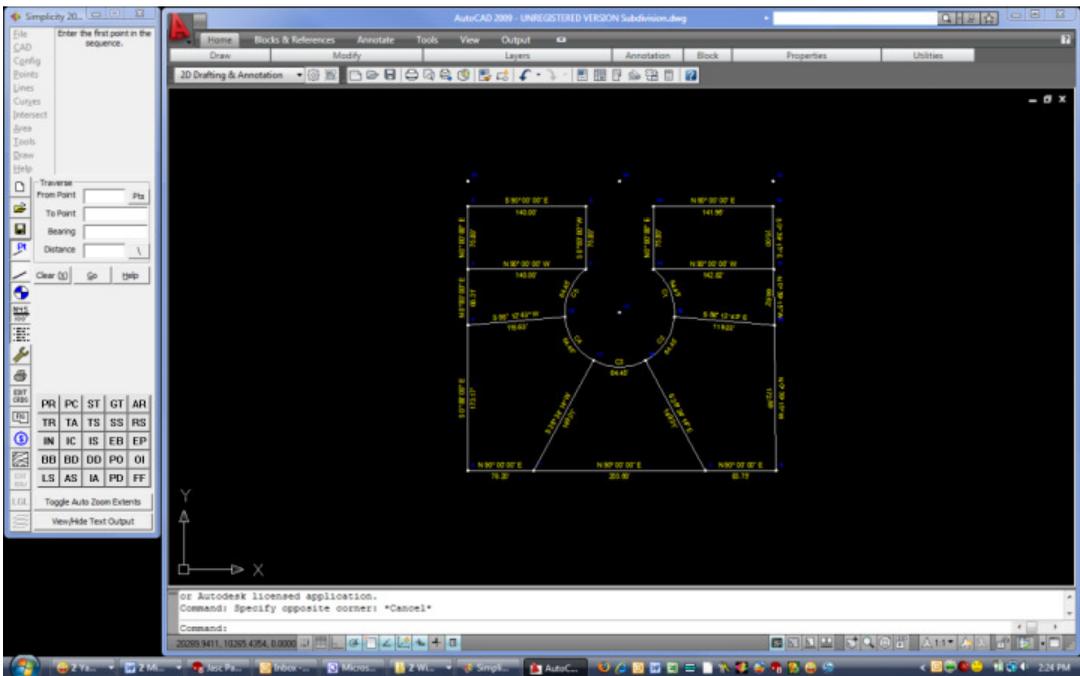
Layouts

"Sight" Survey has two main layouts: a CAD layout; and a Non-CAD layout. During installation "Sight" Survey will install four icons on your desktop: **Sight Survey Help**; **SS2009 External**; **SS2009 No-CAD**; and **Sight Survey Jobs**.

Sight Survey Help: The **Sight Survey Help** icon opens the help file. This is the same help file that is used when you click on any [**Help**] button from within "Sight" Survey.

SS2009 External: Double-click this icon to open "Sight" Survey in a version that interfaces with your existing AutoCAD, IntelliCAD, or MicroStation running as a stand-alone program. In this configuration "Sight" Survey occupies 10-20% of your screen width depending upon your display resolution.

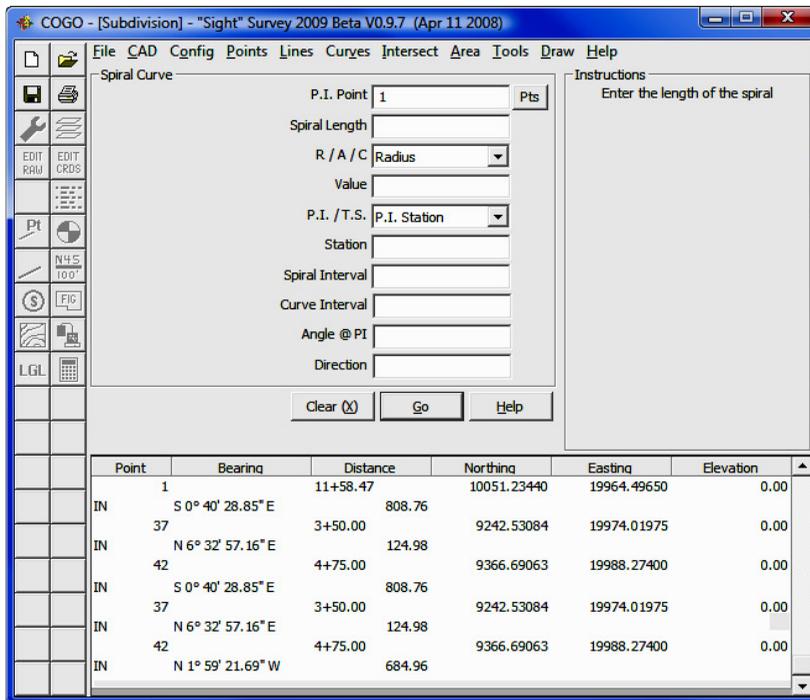
The first time you run "Sight" Survey, your CAD program will most likely be set to use the entire display and it will be covering up the "Sight" Survey interface. Use standard Windows procedures to resize the CAD program and position it so you can see the "Sight" Survey interface. If you are running a dual monitor system, you may choose to run either "Sight" Survey or CAD on the second display, using the entire display for your CAD window.



Typical screen layout for "Sight" Survey running with an external CAD

SS2009 No-CAD: While you can use "Sight" Survey's **External CAD** interface without actually opening a CAD program, the **No-CAD** interface may be preferable to those users who are coming from the DOS Survey 3 or DOS Survey 4 en-

vironment. Note that several of the toolbar icons relate specifically to CAD and will be inactive when using this interface.



Typical screen layout for "Sight" Survey running with the No-CAD option

Sight Survey Jobs: The **Sight Survey Jobs** folder is a convenient link to the main jobs folder. In this folder you will find subfolders, one for each job. If you double-click on one of these subfolders, you will see the files that make up the job. You may actually load a job by double-clicking on the **.ss4** file in the folder. The job will open using the interface that it was last saved in. If that interface was a CAD interface, you may also open the drawing from within the job startup process.

Activating Routines

Command Codes: "Sight" Survey routines may be activated by menu selection; by entering two-letter (sometimes three-letter) command codes; or by toolbar buttons. "Sight" Survey also contains a user-defined toolbar so you can assign commonly used routines to toolbar buttons for fast access (see [Section 5.12](#)). For

reference purposes, the menus also list the two-letter command assigned to each routine. Some additional routines are not shown on the menus. These routines are activated only by configuration settings or by two-letter commands, and they are discussed in [Section 2.10 - Miscellaneous Two-Letter Commands](#). Generally, you may change routines from anywhere within "Sight" Survey by entering a two-(or three) letter command code into virtually any data entry field. In most cases you will not see the letters as you enter them, but if "Sight" Survey cannot decipher your entry and the code does not exist, the program will warn you. There are certain routines where entering command codes will not work. These are the routines that are actually sub-programs within "Sight" Survey, such as: raw data editing; data collector communications; and network least squares. In these routines you must exit the routine before you can start another "Sight" Survey routine.



WORKING WITH INTELLICAD: *In IntelliCAD (and only in IntelliCAD) you may enter two-letter "Sight" Survey commands into the IntelliCAD command line. Press [Enter] after typing the command. Focus will switch to "Sight" Survey and the command will be executed. Note that certain drawing commands may shift focus immediately back to IntelliCAD, where you will be prompted for actions to complete the command. Also note that 30 IntelliCAD aliases that shared the same two-letters as "Sight" Survey commands have been remapped to include a dash before the command (e.g. **AA** has become **-AA**). If you issue an alias command in IntelliCAD and it activates a "Sight" Survey routine, try inserting a dash before the command and enter it again.*

Menus: In the CAD interfaces, the menus are arranged in a column down the left side of the screen. These are "fly-out" menus that will open to the side. To open a menu using your mouse, click on the menu then move horizontally into the menu before you begin to navigate vertically. If you move vertically before you are actually positioned in the menu, the next menu will open.

You may also activate menus and select menu items using your keyboard. To launch a menu press **[Alt][X]** where **X** is the hotkey which is the underlined letter on the menu name. To select a routine from an open menu, simply press the hotkey for the routine. Hotkeys are indicated as the underlined character. For example, to select the **Start At** routine from the **Points** menu you would press **[Alt][P] [S]**.



MISSING HOTKEYS? *If you open a menu with your mouse, hotkeys may not be visible unless you have set Windows to always show them. In this case, open the menu with your keyboard and you will see the hotkeys.*

To set Windows to always show hotkeys:

In Vista: *Select **Start>Control Panel>Ease of Access Center>Make the Keyboard Easier to Use>** Under "**Make it easier to use keyboard shortcuts,**" check the box **Underline keyboard shortcuts and access keys** and click **[Apply]** or **[Save]**.*

In Windows XP: *Select **Start>Control Panel>Display.** Click the **Appearance** tab, click **[Effects]**, uncheck the box "**Hide underlined letters for keyboard navigation until I press the Alt key.** Click **[OK]** to close the dialog, and then click **[Apply]** and **[OK]** on the **Display Properties** dialog.*

Primary Dialogs vs. Secondary Dialogs

"Sight" Survey works from one main interface. Various routines create additional dialog boxes, some of which are primary dialogs (or windows), while others are secondary dialogs (or windows). Sometimes you may want to click on a dialog box but find that you cannot activate it. In the general hierarchy of the programs, the dialog box (or window) that looks to be on top of the pile is a primary dialog. You cannot activate or access dialog boxes lying below a primary box without first completing or closing the primary dialog. If you are trying to access a dialog box and your computer is beeping, chances are that another dialog box has "focus" and is preventing you from your objective.

Tabbed Windows

Some of the menus, particularly the configuration menus, use a tabbed interface. The use of tabs allows you to quickly set other options that might be related or have certain interrelated data dependencies. For example, certain settings on the **Local Configuration** menu affect **Text Output** and **Bearing Formats**. When you see a tabbed dialog and you make changes on a particular form, be sure to click **[Apply]** (and not **[OK]**) before proceeding to the next

form. Clicking [**Apply**] will keep the form open, while clicking [**OK**] will apply the change and close the dialog.

The [Pts] Button

On several routines you will see a [**Pts**] button just to the right of a point data entry field. This is a dual purpose button for point selection. If you left-click the button, you will activate the **Point Manager (PM** - [Section 6.09](#)) from which you may select points. If you right-click the button, you may select a point from the CAD screen. For a complete discussion on selecting points in CAD, refer to **Picking Points in CAD** in [Section 2.03](#).



NOTE: *If you are using the non-CAD interface, the right-click option is not available to you.*

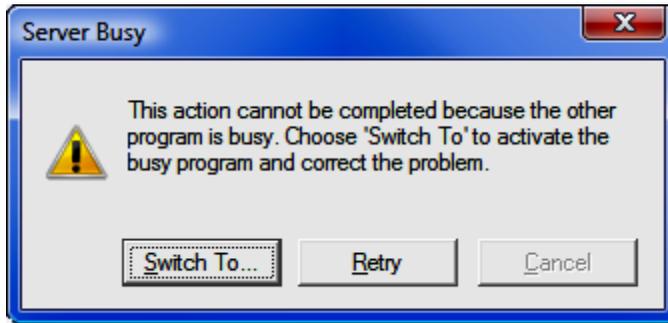
2.09 Working with CAD

"Sight" Survey has several areas of interaction with your CAD program that depend on CAD settings for proper operations. Among these are:

- [Survey Busy Error](#)
- [Color Choices](#)
- [Line Types \(or Linestyles\)](#)
- [Layers \(or Levels\)](#)
- [Setting up Layers for BYLAYER Use](#)
- [Using MicroStation Cell Files](#)
- [MicroStation Drawing units](#)

Server Busy Error

Before discussing the areas listed above, one important aspect regarding "Sight" Survey's interaction with your CAD application must be covered. There are times when "Sight" Survey issues a command and turns over control (or focus) to CAD. Attempting to have "Sight" Survey issue an additional command before CAD has finished processing a previous command may result in an error message similar to this:



This error message may also be caused when you are working directly in CAD and, in the middle of a CAD function you attempt to access a "Sight" Survey routine that calls a CAD function.

A third cause of this error is potentially the most damaging. It is caused when "Sight" Survey has issued a CAD command and you shut your CAD application off before it returns control to "Sight" Survey. In this case, try reopening the CAD drawing you were just working on. If that does not work to get rid of the error, you will have little choice but to manually shut down "Sight" Survey using Window's Task Manager.



TO AVOID DATA LOSS: Always let "Sight" Survey close your CAD application. **NEVER** close your CAD application while it is actively working with "Sight" Survey.

Lockups: Finally, if "Sight" Survey ever appears to be locked up, check to make sure that your CAD application is not prompting you for input. If you cannot tell, AutoCAD/IntelliCAD users should press [**Esc**] a few times, then try "Sight" Survey. MicroStation users should right-click the mouse a few times, then try "Sight" Survey.

Color Choices

Whenever "Sight" Survey offers a drop-down listing of color choices, you are given about 17 choices, plus a **By Layer** setting. These choices represent a variety of colors, but pale in comparison to the thousands of hues available in CAD. To use a color from the CAD palette that is on the color list, use your CAD layer setup. In CAD assign the color to a layer. In "Sight" Survey select the color

option as **By Layer**. Anything drawn on that layer will use the color assigned to the layer.

Line Types (or Linestyles)

Whenever "Sight" Survey offers a drop-down listing of line type choices, you are given only those line types that are currently in the drawing, plus a **By Layer** setting. As with colors, you may also assign line type properties to layers in CAD, and in "Sight" Survey select the line type option as **By Layer**. Anything drawn on that layer will use the line type properties assigned to the layer.



TEMPLATE FILES: When you start a new job you can open a new drawing using a template file that contains a set of default lines types and layers. See **New Job (NJ - [Section 3.01](#))**

Layers (or Levels)

Whenever "Sight" Survey offers a drop-down listing of layer choices, you are given only those layers that are currently in the drawing. You may create layers in CAD, or by typing a layer name into the **Properties Menu (PR - [Section 5.10](#))** or into the **Layer** column in the **Point Manager (PM - [Section 6.09](#))**

Setting up Layers or Levels for BY LAYER Use

By Layer settings are a powerful, yet fast and easy way to control the properties of elements that go into your drawing. When you set **Drawing Properties** to **By Layer** settings, "Sight" Survey takes the pre-defined layer settings for color, line style, and text style and applies them to the elements inserted into the layer. This prevents you from constantly having to change other drawing properties as you move through your project. To set up your layers, use the **Edit Layers** command (**LA - [Section 4.05](#)**). To obtain maximum uniformity across projects and establish certain CAD standards within your organization, you may consider creating a template drawing containing commonly used linetypes, layer names, and layer properties. For more on creating a template, see the **New Job** routine (**NJ - [Section 3.01](#)**).

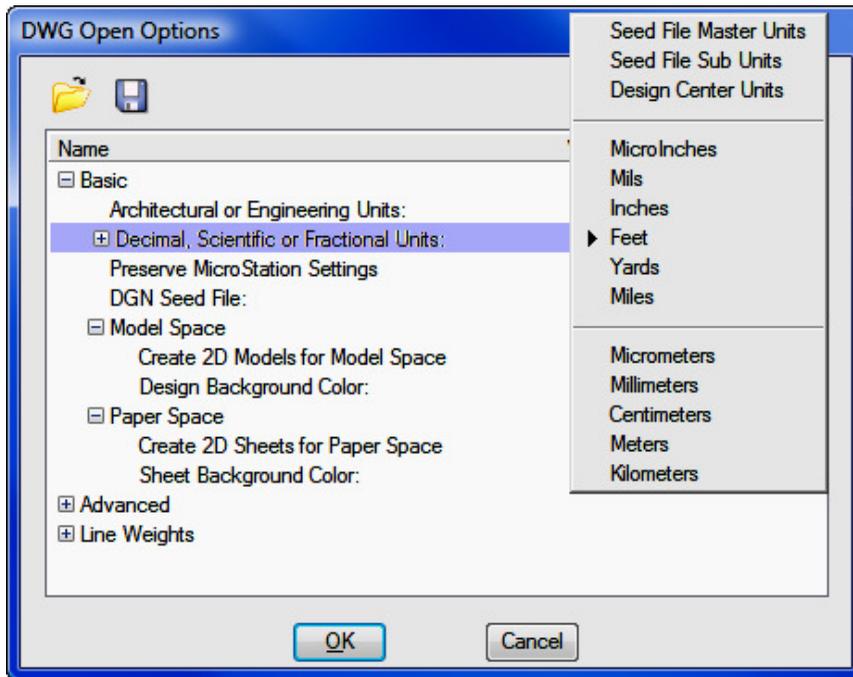
Using a MicroStation Cell Library

"Sight" Survey can make use of MicroStation cell libraries when processing **Field to Finish (FF - [Section 6.33](#))**. To utilize a cell library you must first load it into MicroStation in one of two ways:

1. In MicroStation, select **Element > Cells**, then click **File > Attach** and use the dialog box to **Browse** to the desired library and attach the file.
2. Set up a **User Configuration** file in MicroStation that will attach the cell library on startup. Set MS_CELL and MS_CELLLIST system variables to establish search paths for cells so you don't have to manually attach the cell library each time.

MicroStation Drawing Units

Unlike AutoCAD which is not unit specific, MicroStation may be set to operate under a variety of metric and imperial units. Normally this does not present any issues. However, because all of the symbol libraries, title blocks, and page borders in "Sight" Survey are essentially AutoCAD drawings, scaling issues may arise when these elements are inserted into a MicroStation drawing. All of these symbols were created as unitless AutoCAD drawings so to insure correct scaling; MicroStation must know that the AutoCAD drawings used by "Sight" Survey are to be interpreted in imperial units. In MicroStation, key in the command: **DWGOPEN DIALOG OPEN [Enter]**.



Look at the line **Decimal, Scientific or Fractional Units**. On the right side of the line the current units are listed. If they are anything other than "**Feet**," double-click on the unit designation and a menu will appear. Select **Feet** and click [OK].

2.10 Miscellaneous Two-Letter Commands

Most "Sight" commands may be activated by selecting them from a menu. However there are some routine that are not covered by menu commands. Several, but not all of these routines act as toggle switches. Others are simply routines that need little or no documentation. In either case, these routines can be activated by using two-letter commands which may be entered virtually anytime the program is expecting you to enter data. You may even enter these commands while in the middle of another routine without any major disruption to what you're doing. Among these are:

Routine	Command	Comment
Automatic Point Numbering	AN	This toggle switch activates and deactivates automatic point numbering. You may also set Automatic Point Numbering on the COGO Configuration menu (KC - Section 5.04).
Clear Workspace	CW	This command clears the contents of the Text Output window. Use it with caution as it clears the entire window. You will be asked to confirm your intentions. You can select and delete individual pieces of text in the Text Output window manually.
Edit Coordinates	EC	This routine code is a legacy command for the old Edit Coordinates routine from previous versions. Now this command activates the Point Manager (PM - Section 6.09).
Job Heading	JH	This command inserts a Job Heading into the Text Output window. The heading typically consists of the Windows log-in Name of the user running the program; the date and time the file was opened; the default distance unit used; the Vara value (if set); and a standard Page Heading (see below).
Names Output	NO	This toggle switch activates and deactivates the printing of point descriptions as well as prompting for those descriptions. You may also set Print Point Descriptions on the Text Output Configuration menu (KT - Section 5.01).
Overwrite Protection	OP	This is a toggle switch that activates and deactivates point overwrite protection. When "On," you will be prompted whenever you attempt to assign new coordinates to an existing point. You may also set Point Overwrite Protection on the COGO Configuration menu (KC - Section 5.04).
Page Break	BK	This command inserts a printer Page Break into the Text Output window.

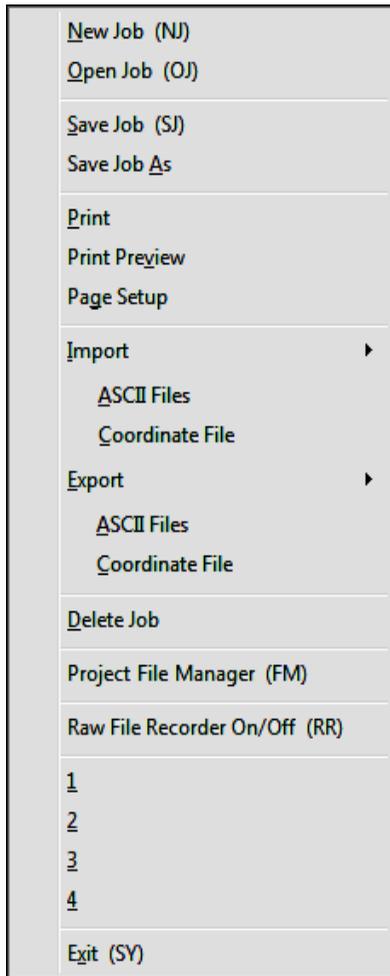
Page Heading	PH	<p>This command inserts a Page Heading into the Text Output window. The heading typically consists of:</p> <p style="text-align: center;">Point Bearing Distance Nor- thing Easting Elevation</p> <p>Titles may vary depending upon the Report Order settings and Naming Conventions set under the Local Configuration menu (LC - Section 5.05).</p>
Print Input Data	PI	<p>This toggle switch activates and deactivates the printing of your input data. You may also set Print Input Data on the Text Output Configuration menu (KT - Section 5.01).</p>
Prompt for Point Names	PN	<p>This toggle switch activates and deactivates prompting for point names. You may also set Prompt for Point Names on the COGO Configuration menu (KC - Section 5.04).</p>
Print Elevations	PZ	<p>This toggle switch activates and deactivates the printing of point elevations. You may also set Print Elevations on the Text Output Configuration menu (KT - Section 5.01).</p>
Slope Angle Prompting	SA	<p>This toggle switch activates and deactivates prompting for slope angles. When "On," every distance entered is assumed to be a slope distance and you will be prompted for whatever data is needed to reduce the distance to its horizontal and vertical components. The information needed will depend upon the Default Slope Type you have selected on the Slope Entry Configuration menu (KS - Section 5.02). When this toggle is "Off," you will only be prompted for slope data on manually entered slope distances (see Distance Entries - Section 2.05).</p>

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Section 3

The File Menu (& Starting "Sight" Survey)



The **F**ile menu contains commands related to transferring information. Here you will find commands to do things like create a new job, open an existing job, import and export coordinates, print text, and set up your job files.

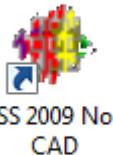
All commands are discussed in the order in which they appear on the menu. You can access menu routines by using your mouse on the menu or by using the keyboard shortcuts to each routine.

Starting "Sight" Survey

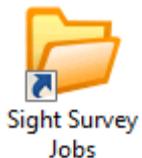
When you first installed "Sight" Survey, three start-up shortcuts and icons were placed on your computer desktop.



Double-clicking this icon will start "Sight" Survey with an External CAD program (such as AutoCAD, MicroStation, or IntelliCAD).



Double-clicking this icon will start "Sight" Survey with no CAD program.



Double-clicking this icon will open the "Sight" Survey Jobs Folder. This folder will contain several sub-folders, one for each of your jobs. Double-clicking on any sub-folder will open the sub-folder and show you the files it contains. Double-clicking on any file with

an extension of .ss4 will open that particular job and also the CAD program associated with the job.

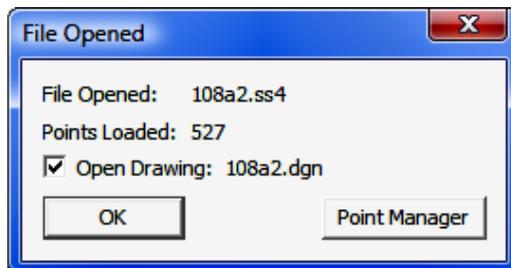
When you open the program using one of the first two icons, you must specify the job to use, or create a **New Job**.



If you are creating a new job, click the [**Create New Job**] button and refer to the instructions contained in **New Job** section (**NJ** - [Section 3.01](#)).

If you want to open an existing job (one not shown on the **Recent Jobs** list), click the [**Open Existing Job**] button and refer to the instructions contained in **Open Job** section (**LO** - [Section 3.02](#)).

If you want to open a job from the **Recent Jobs** list, simply left-click on the desired job.

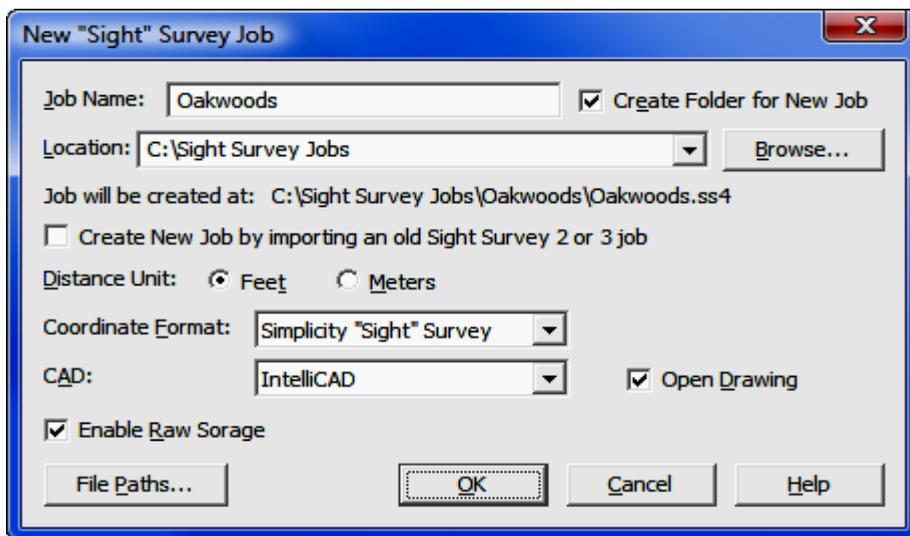


From the **File Opened** dialog, you can see how many points have been loaded. Check the **Open Drawing** box to open the associated CAD drawing and click either **[OK]** or **[Point Manager]** to complete the operation. If you click on **[Point Manager]**, "Sight" Survey will load the drawing (if selected) and display your points in the **Point Manager** window (**PM** - [Section 6.09](#)).

3.01 **New Job (NJ)**

FUNCTION: The **New Job** routine is used to close the current "Sight" Survey job and create a new job. Do not use this routine to open an existing job.

Activate the **New Job** routine by picking from the **File** menu; by pressing **[Alt][F]**, **[N]**, or by typing the two-letter command **NJ** at any data entry prompt.

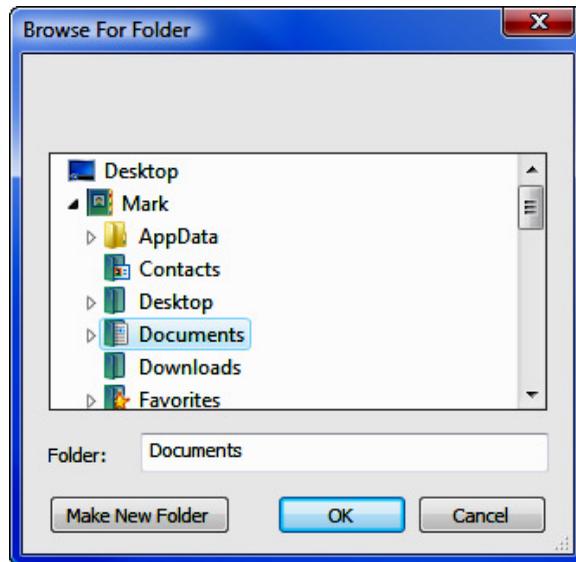


Job Name: Enter the name of the new job. You do not need to add a filename extension, only the name.

Create Folder for New Job: Checking this box will create a folder of the same name as the Job. While this might sound redundant, keep in mind that "Sight" Survey creates many different files associated with your new job, and by establishing a folder for these files, you are assured that all relevant files are kept in a

single location. It is strongly advised that you create a folder for each job by selecting this option.

Location: This setting displays the location of the root folder, the folder in which the new job folder will be created. If you are not creating a new job folder, this is the location where all files associated with the new job will be stored. To change this location, click the [**Browse**] button.



From this menu you can select the desired *root* folder or [**Make a New Folder**]. Normally, "Sight" Survey jobs are kept in a **Sight Survey Jobs** folder under your **Documents** folder.

Distance Unit: Specify the distance unit for this job, either feet or meters.



NOTE: *US Survey Feet or International Feet? If you have selected Feet as your **Distance Unit**, you can specify **US Survey Feet** or **International Feet** from the **Local Configuration** menu (**LC** - [Section 5.05](#)).*

Coordinate Format: Select the format for your new coordinate file. You have several choices available: Carlson Numeric; Carlson Alphanumeric; C&G Numeric; C&G Alphanumeric; Sight Survey 3; or LDD (Autodesk Land Desktop). If you are

using other software in your office, you might want to select a compatible file format although you will be able to export and import coordinates from any format.

CAD: Select the CAD application you want to use for this job, or select **No CAD** if you do not want to create a drawing. Choose from **AutoCAD** (2002-2008); **MicroStation v8** (includes v8 XM Edition); **Simplicity CAD** (IntelliCAD running internally in "Sight" Survey); or **AutoCAD Map**.



TIPS:

1. *Even if you have opened "Sight" Survey using the **No CAD** option, at a later time you can still choose a CAD, select the **Open Drawing** checkbox, and "Sight" Survey will open in the appropriate format.*
2. *If you have multiple versions of AutoCAD on your computer, "Sight" Survey will want to open the latest version. To use an older version, manually open the CAD program before instructing "Sight" Survey to create a new drawing.*

Open Drawing: Check this setting to open a drawing under the job name.

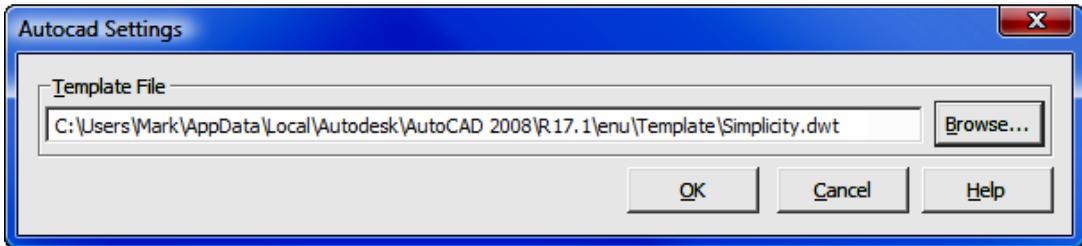
Enable Raw Storage: Select this option to create a **Raw Data** file. "Sight" Survey can create an **.RW5** raw data file that you can use in the **Edit Process Raw** routine ([ER - Section 11.11](#)) for traverse adjustment.

[File Paths]: This button opens the **Project File Manager (FM - Section 3.13)** where you can see and/or change the various paths to the **Coordinate, Drawing, Raw,** and **Text Output** files.

[OK]: When all your parameters are set to your satisfaction, click the **[OK]** button to continue.

AutoCAD Settings

Template Files: If your CAD application of choice is AutoCAD you are given the option to base your new drawing off an existing **Template File**. A template file may be customized to contain linetypes and layers of which "Sight" Survey can utilize. If you do not want to use a template file, just click **[OK]** without entering anything in the dialog box.



[Browse]: Click the **[Browse]** button to find a template file. The path shown in the dialog box above is a typical location for AutoCAD drawing files. If you create your own file, you may want to save the template file in a location that is easier to remember.

[OK]: Accepts the settings and continues to load AutoCAD.

[Cancel]: Cancels the template file selection, but continues to open AutoCAD using default settings.

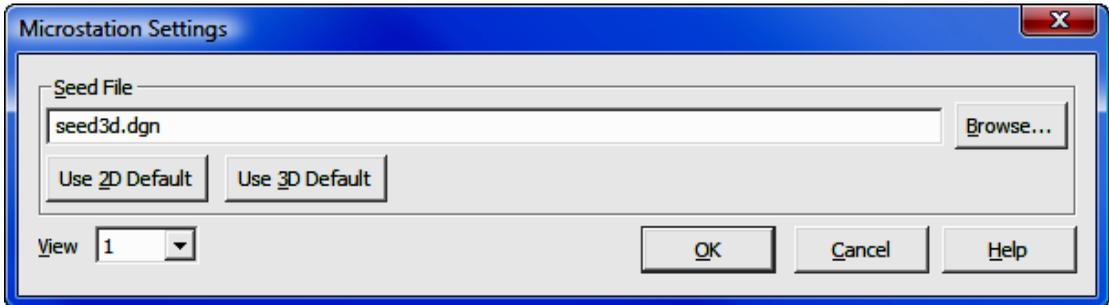


CREATE A TEMPLATE FILE: Since "Sight" Survey will only use linetypes that already exist in a drawing, you may want to create a template file containing commonly used linetypes. (Layers are not an issue since "Sight" Survey can create them as they are needed.) To create a template file:

1. Open AutoCAD.
2. At the command line, enter **LINETYPE** to see the linetypes currently contained in the drawing. You may only see a few.
3. To add linetypes, click **[Load]** or **[Add]** and select a line definition file such as **ACAD.LIN**.
4. Select the linetypes you wish to add. Hold the **[Ctrl]** key while you click on linetypes to make multiple selections. When you are done selecting, click **[OK]**.
5. Enter **SAVEAS** on the command line.
6. Set the **Files of Type** to **Drawing Template File (.dwt)**.
7. Select the folder location. You may want to pick something easy to remember.
8. Enter a **File Name** and click **[SAVE]**.

MicroStation Settings

Seed Files: If your CAD application of choice is MicroStation you are given the option to base your new drawing off an existing **Seed File**. A seed file may be customized to contain linetypes, layers, symbols, etc.



Seed File: Enter a seed file name or click [**Browse**] to locate one. You may select a default seed file by clicking [**Use 2D Default**] or [**Use 3D Default**]. If you are planning to have any 3D data in your drawing such as contours, select a 3D seed file.

View: This setting defines which view window will be the active view window when MicroStation initializes. Click [**▼**] to select view window **1** through **8**.

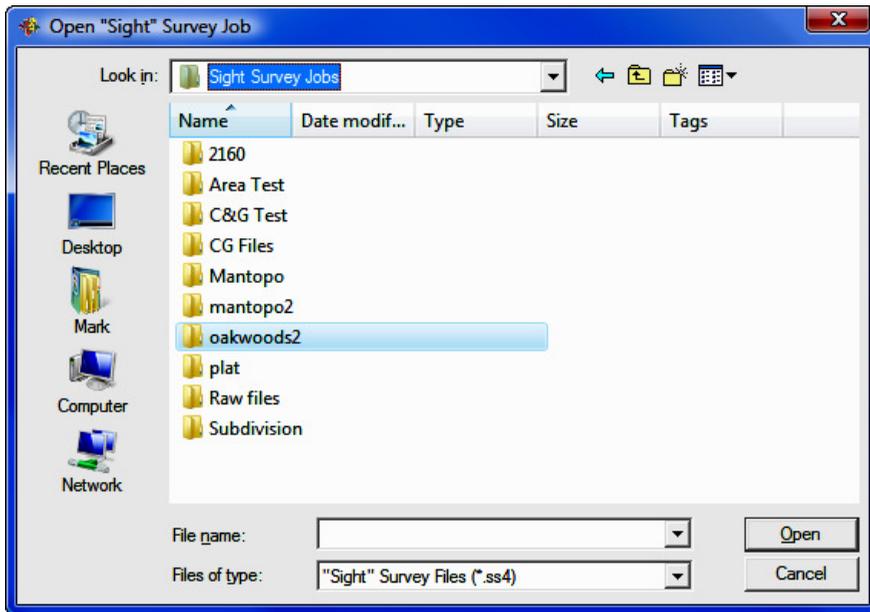
[**OK**]: Accepts the settings and continues to load MicroStation.

[**Cancel**]: Cancels the seed file selection, but continues to open MicroStation using default settings.

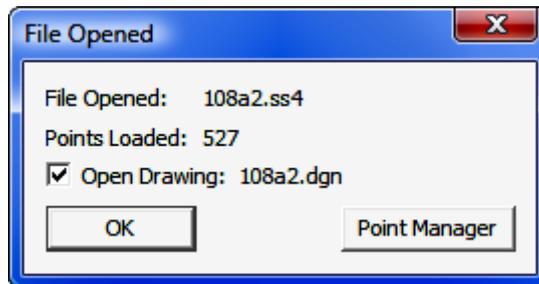
3.02 Open Job (OJ)

FUNCTION: The **O**pen Job routine is used to close the current "Sight" Survey job and open a new, existing job.

Activate the **O**pen Job routine by picking from the **F**ile menu; by pressing [**Alt**][**F**], [**O**], or by typing the two-letter command **OJ** at any data entry prompt.



Look in: Click the down arrow to select the drive and folder or root folder location containing the job files. Typically, the default location will be the **Sight Survey Jobs** folder under your **Documents** folder. Use the lower window to further refine your search and select the desired job folder. Once the Job folder is open, click on the **.ss4** file for your job and then click [**Open**].



From the **File Opened** dialog, you can see how many points have been loaded. Check the **Open Drawing** box to open the associated CAD drawing and click either [**OK**] or [**Point Manager**] to complete the operation. If you click on [**Point Manager**], "Sight" Survey will load the drawing (if selected) and display your points in the **Point Manager** window (**PM** - [Section 6.09](#)).

3.03 Save Job (SJ)

FUNCTION: The **Save Job** routine is used to save all of the open files associated with the current "Sight" Survey job. Files are not closed, just saved, and you may continue working in the same job.

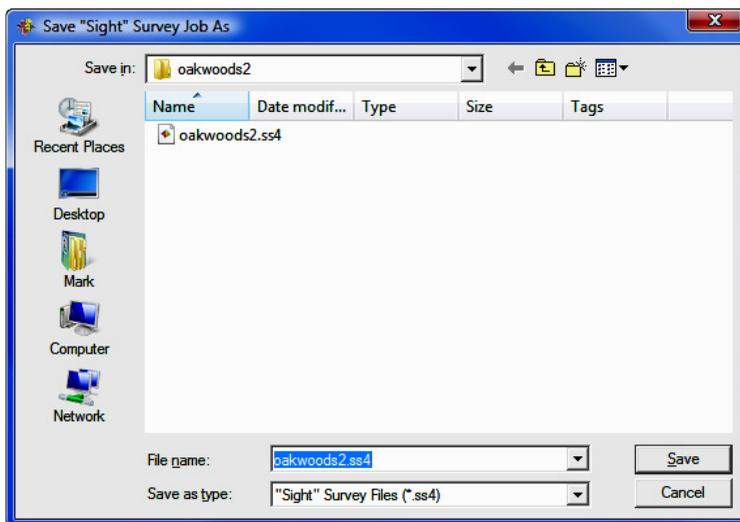
Activate the **Save Job** routine by picking from the **File** menu; by pressing [Alt][F], [S], or by typing the two-letter command **SJ** at any data entry prompt.

Upon activation, your current job files are saved. There are no prompts or other dialog boxes for this routine. Your action is confirmed by a note placed into the **Text Output** window: "**Database saved on (day & date) at (time)**"

3.04 Save Job As

FUNCTION: The **Save Job As** routine is used to save the current "Sight" Survey job under a new name, effectively creating a copy of the current job.

Activate the **Save Job As** routine by picking from the **File** menu, or by pressing [Alt][F], [A].



Save in: This dialog opens to the current job folder in the **Save In** field, and showing the current job name in the **File Name** field. Click the down arrow to select the drive and folder or root folder location containing the job files. Typically, the default location will be the **C:\Sight Survey Jobs**. Use the lower window to further refine your search and select the desired job folder.

File Name: Enter the new name under which you want to save this job. You do not need to add the filename extension, only the name. Once the desired job folder is open, click on the **.ss4** file for your job and then click [**Save**].

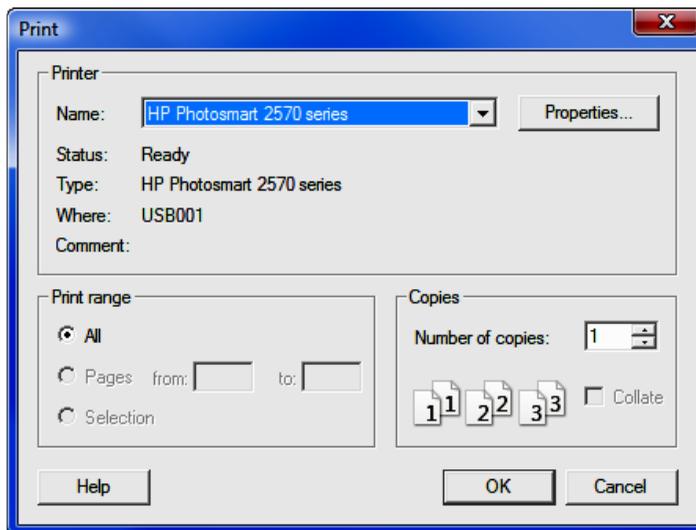


CAUTION: After saving the job under a new name, you are still working in the old job file. If you want to perform work in the new job file, you must use the **Open Job** routine (**OJ** - [Section 3.02](#)) to open the new job.

3.05 Print

FUNCTION: The **Print** routine is used to send the contents of the **Text Output** window to a printer.

Activate the **Print** routine by picking from the **File** menu, or by pressing [**Alt**][**F**], [**P**].





HINTS:

1. *This is a Windows dialog box. The appearance of this dialog box may vary depending on your Windows version.*
2. *It is a good idea to use **Page Setup** ([Section 3.07](#)) to set your margins prior to printing.*
3. *You may print to a PDF file using third-party shareware applications such as CutePDF (www.cutepdf.com) or PDF995 (www.pdf995.com). Simply select the PDF program as your printer.*

Name: Left-click the down arrow to select the printer from the printer list.

Properties: Left-click the [**Properties**] button to specify your printer's properties such as paper size, color options, etc. Every printer model is different and has unique setup pages, therefore it is beyond the scope of this manual to attempt to cover printer setup. Refer to the documentation that came with your printer.

Print Range: Left-click to select what pages are to be printed. You may choose to print all pages, a range of pages, or the any text specifically selected in the **Text Output** window. To preview pages prior to printing a range of pages, use the **Print Preview** routine ([Section 3.06](#)).



WHERE DID MY SELECTION GO? *You may select an area in the **Text Output** window to print with your mouse. The **Text Output** window is actually like a spreadsheet, with data contained in cells. To select data to print left-click and hold your mouse button on the top-left cell of the desired area, then drag the mouse down and to the right to select the cells. When you have selected everything you want, release the mouse button and select **File > Print**. At this point, the highlighting in the **Text Output** window will disappear, but when you choose to Print Selected, it will only print what you previously selected.*

Copies & Collate: Enter the number of copies desired. If you choose to print more than one copy, you can select to collate by page or by copy set.

When you have established your printing parameters, left-click [**OK**] to begin printing.



WIDER COLUMNS: You may find that you need to expand the width of columns in order to see the entire contents of a cell. This may be particularly true for extremely large coordinate values. The **Text Output** window is actually like a spreadsheet, with data contained in cells. To change the width of a column, you simply drag the column border. Move your mouse to the header line in the **Text Output** window and position it over one of the borders in the line. The mouse cursor will change to indicate that you are on the border. Left-click and hold the mouse button while moving the border left or right, then release the mouse button.

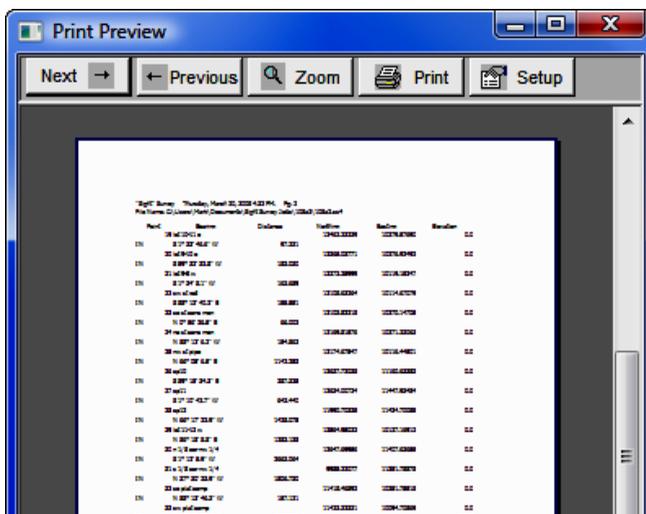


PRINTING TO PDF FILES: "Sight" Survey does not directly support the creation of PDF files, but it is very easy to do this on your own. Simply download and install one of the many shareware PDF file creators such as **CutePDF** (www.cutepdf.com) or **PDF995** (www.pdf995.com). Once a PDF creator is installed it shows up on your available printers list and functions just like any other printer attached to your system. When you want to create a PDF file (either a text document or a drawing) you simply select the PDF creator as your printer, give it a file name, and select [**Print**].

3.06 Print Preview

FUNCTION: The **Print Preview** routine is used to preview the printed output from the **Text Output** window.

Activate the **Print Preview** routine by picking from the **File** menu, or by pressing [**Alt**][**F**], [**V**].



[**Next**] & [**Previous**]: Left-click these buttons to navigate the preview window through your document.

[**Zoom**]: Left-click the [**Zoom**] button for a closer look at the page. Left-click again to return to a full-page view.



WIDER COLUMNS: You may find that you need to expand the width of columns in order to see the entire contents of a cell. This may be particularly true for extremely large coordinate values. The **Text Output** window is actually like a spreadsheet, with data contained in cells. To change the width of a column, you simply drag the column border. Move your mouse to the header line in the **Text Output** window and position it over one of the borders in the line. The mouse cursor will change to indicate that you are on the border. Left-click and hold the mouse button while moving the border left or right, then release the mouse button.

[**Print**]: Left-click the [**Print**] button to send the document to the printer.

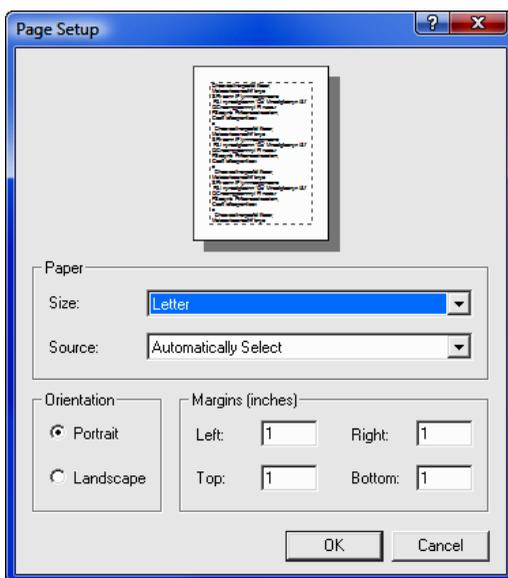
[**Setup**]: Left-click the [**Setup**] button to call the **Page Setup** routine (see [Section 3.07](#)).

To exit this window, left-click the **X** in the upper right corner.

3.07 Page Setup

FUNCTION: The **Page Setup** routine is used to set printer parameters such as margins and paper size.

Activate the **Page Setup** routine by picking from the **File** menu, or by pressing [**Alt**][**F**], [**G**].



Using this dialog you can set your paper size and source, orientation, and margins. The settings you choose (with the exception of Source) will be reflected in the image depicting a printed page.

Size: To set your paper size, click [▼] and make your selection from the options presented.

Source: To set the source of your paper, click [▼] and make your selection from the options presented. Unless you are printing on specialty paper, leaving the source set to Automatically Select is the best choice.

Orientation: To set either **Landscape** or **Portrait** paper orientation, left-click on the desired setting.

Margins: To set margins, left-click in each field and type in a value.

When you have set your options as desired, click [**OK**] to exit the **Page Setup** dialog.

To more closely examine the effect of your margin and page size settings as they are applied to actual text output, use the **Print Preview** routine (see [Section 3.06](#)).

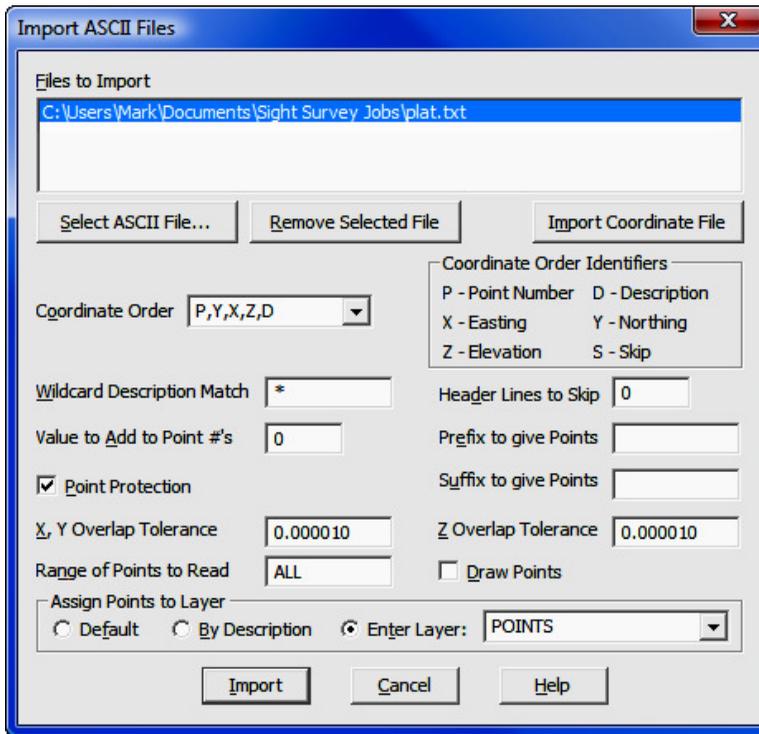
3.08 Import ASCII File

FUNCTION: The **I**mport > **A**SCII File routine is used to incorporate an ASCII (text) formatted coordinate file into the current job file. This is a common file format that may be used to read a file that has been created by another program or perhaps a data collector.

Activate the **I**mport > **A**SCII File routine by picking from the **File: I**mport menu; or by pressing [**Alt**][**F**], [**I**], [**A**].



CAUTION: *When importing into an existing job, it is strongly recommended that you save your existing data before importing new data. Then, if something should go wrong during the import (e.g. wrong file, points accidentally overwritten, etc.) you should exit "Sight" Survey WITHOUT saving the job and drawing files.*

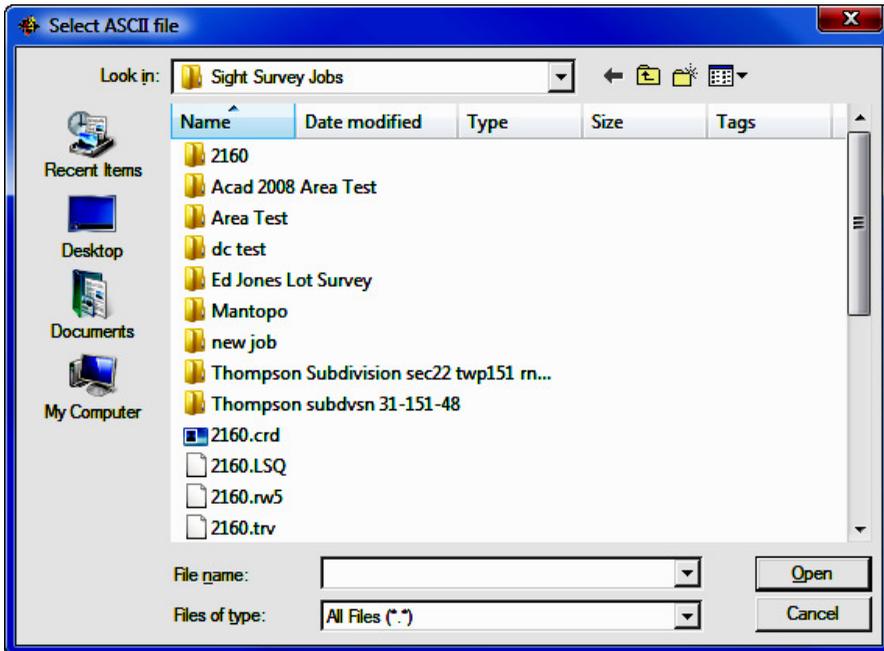


Files to Import: This is a listing of the ASCII files you have chosen to import. You may specify multiple files for importing and they will be imported in the order selected. To set or change the values in these fields, press [Alt][S] or click the [Select ASCII File] button.



HINT: If you select multiple files to be imported, each file must have the same format.

[Select ASCII File]: This button displays a dialog box allowing you to select an existing file for import.



Remove Selected File: To remove a file from the **Files to Import** list, click on the file and then press [Alt][M] or click the **[Remove Selected File]** button.

Import Non-ASCII File: Non-ASCII files are coordinate files such as: Simplicity (.zak); Carlson (.crd); and C&G (.cgc & .crd). If you realize that you actually need to import a Non-ASCII (text) file, click this button to cancel the routine and begin the **Import Coordinate File** routine (see [Section 3.09](#)).

Coordinate Order: Click [▼] to use this drop-down option box to select one of the pre-programmed formats, or type the correct coordinate order into the field using the **Coordinate Order Identifiers**. If you enter your own format, you can separate the fields by any character or number of spaces that you desire. You may also use quote marks if necessary. Simply use the proper **Coordinate Order Identifiers** for the values. For example, an entry of **P Y X "D"** would give you **point Northing Easting "Description"**. The most common format is **P,Y,X,Z,D** which is a common delimited file containing the **point, Northing, Easting, elevation, description**.

Wildcard Description Match: If you select **Wildcard Description Match**, you may enter a descriptive filter that, if matched, will cause the matching points to

be imported. If set to anything other than an asterisk (*), you will only import points with that match the filter. You can use * to mean any number of characters, and just entering * (the default setting) is a universal match. For example entering ***corner** would match *building corner, driveway corner, property corner*, etc. Likewise enter **Property*** would match *Property Corner, Property Line*, etc. Entering a question mark (?) means any single character (e.g. **Hub?** would match *Hub1, Hub2, Hub3*, etc., but not *Hub10, Hub11* and so on where *Hub* is followed by more than one character.) Wildcard filters are not case sensitive (e.g. HUB = Hub = hub).

Value to Add to Point Numbers: There may be times when you wish to renumber the imported points so they will not conflict with points which may be contained in the current file. If that is the case, enter a value to add to the imported point numbers. For example, suppose you have a file containing points 1-88 and you want to import a file containing points 1-45 but you don't want to overwrite any existing points. Entering 100 into the **Value to Add to Point Numbers** field will cause the imported points to be numbered 101-145, thus preserving your original data.



HINT: *Prior to importing points, you should run the **Blank Point Scan (BP - [Section 6.13](#))** to assist you in determining a safe starting point for renumbering.*

Header Lines to Skip: Some files may contain header lines that are not actually coordinate data, but rather they are informational items such as date, time, file name, user name, number of points in the file, etc. "Sight" Survey cannot correctly parse this data, nor does it require it for any other purpose. In fact, "Sight" Survey would return a file import error when trying to decipher such data. To avoid such errors, "Sight" Survey lets you specify the number of header lines that it will skip when importing the data.

Prefix to Give Points and **Suffix to Give Points.** Two additional fields are available when importing ASCII files. Use these fields to essentially turn numeric points into alpha-numeric points by prepending and/or appending text to the point numbers. (DO NOT use these fields if you are not working in an alpha-numeric format.) You may use any characters as a prefix or suffix. Note that you may also prepend or append numerals to the point numbers, similar to renumbering. If you have chosen to renumber the points, all renumbering will be done prior to attaching a prefix or suffix.



HINT: Do not use the **Prefix** and **Suffix** fields if you are not working in an alpha-numeric format.

Draw Points: Select the **Draw Points** option to immediately draw the imported points after the file is loaded. Points are drawn using the configuration settings under **Point Configuration (PC - [Section 5.08](#))**.

Assign Points to Layer: When importing a file, you can assign a layer or level for the imported points. Your choices are: **Default** (does not assign points to a layer); **By Description** (creates layers/levels from point descriptions and assigns the point to that layer/level); or **Enter Layer**. If you select **Enter Layer**, press [▼] to select a layer/level from the list provided or type in the name of a layer/level to be created.



NOTE: If you assign layers during file import then later run **Field-to-Finish**, your point layers will be reset according to the field definition file used by **Field-to-Finish**.

Point Protection: Check this option to use **Point Overwrite Protection** during import to protect against the overwriting of existing data. See **Point Overwrite Protection** below for instructions on handling duplicate points.



HOW "SIGHT" SURVEY SCREENS FOR DUPLICATE POINTS

1. Checks to see if the point number exists in memory. If not, the point is imported.
2. If the point exists, checks the coordinates and elevations of the imported point. If they are within the tolerances (see below) and the point descriptions are identical, the point being imported is the same as one in memory so it is ignored and not imported.
3. If the coordinates and/or elevation and/or descriptions do not match, the point is identified as a duplicate and either: renumbered and added to the end of the points in memory; or you are prompted for instructions of how to handle the point.

X, Y Overlap Tolerance and **Z Overlap Tolerance:** Enter values for **Positional** (X & Y) tolerance and **Elevation** (Z) tolerance. These values are used to determine duplicate points. For example, if the difference between the imported Northing and the existing Northing are less than the tolerance value, the values

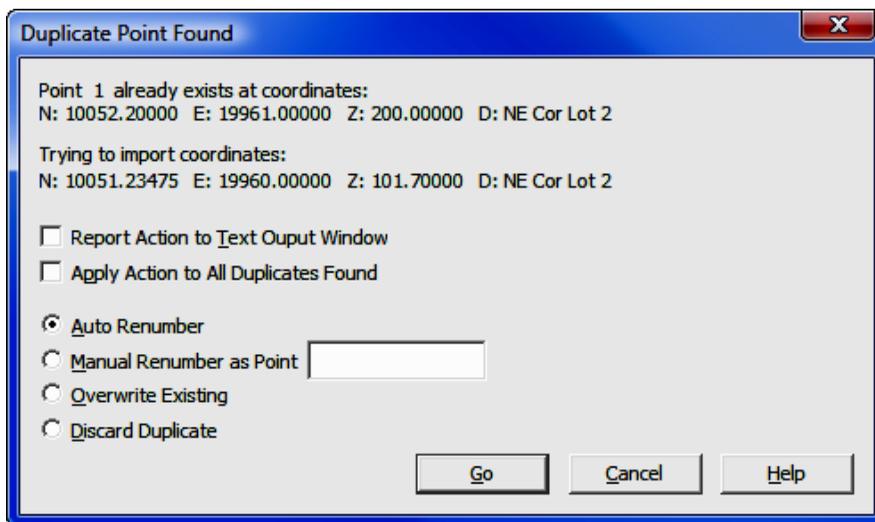
of the Northings are considered to be the same. If that same condition exists with the Eastings and elevations, the points would be duplicates. As you bring data out to the field and back into the office via a data collector, you may end up with points where the Northings and Eastings match but the elevations are different as in the case of a ground shot vs. an as-built shot. However, these points might also inadvertently share the same point number and you may want to keep them both. The fact that the elevations do not match within the specified tolerance will insure that this point (when imported) is flagged as a duplicate and you will be able to assign a new number to it, thus preserving data for both points.

Range of Points to Read: You may import any or all of the points in the ASCII file. Type **ALL** to import the entire file. To import a partial file enter the subject point numbers using the **Rules for Defined Figures and Point Strings** as found in [Section 6.20](#).

[**Import**]: Click this button to import the specified data file(s).

Point Overwrite Protection

If you are using **Point Protection** and "Sight" Survey finds a duplicate point, you are presented with an option dialog screen.



You will be shown the old and new point data, and given options to:

- ⦿ **Auto Renumber:** Automatically assigns a new number to the imported point.
- ⦿ **Manual Renumber:** You must supply a new number to assign to the imported point. You may enter a plus (+) to assign the point to the next available number.
- ⦿ **Overwrite:** Replace the old point with the imported point.
- ⦿ **Discard Duplicate:** Do not import the duplicate point.

Two additional checkbox options are shown on this screen:

Apply Action to All Duplicates Found: If you check this box prior to selecting **Discard**, **Overwrite**, or **Auto Renumber**, your choice will be applied to all the remaining points as they import.

Report Action to Text Output Window: All actions for renumbered, overwritten and skipped points are written into the **Text Output** window. This is particularly useful if you are renumbering imported points.

You may also **Cancel** the import. Any points imported up to the time of cancellation are retained in memory.

3.09 Import Coordinate File

FUNCTION: The **Import > Coordinate File** routine is used to incorporate a non-ASCII formatted coordinate file into the current job file. Available formats include: Carlson Numeric (the default format); Carlson Alpha-numeric; C&G Numeric; C&G Alpha-numeric; Simplicity "Sight" Survey 3 files; and Land Desktop Development files.

Activate the **Import > Coordinate File** routine by picking from the **File: Import** menu; or by pressing [**Alt**][**F**], [**I**], [**C**].



CAUTION: *When importing into an existing job, it is strongly recommended that you save your existing data before importing new data. Then, if something should go wrong during the import (e.g. wrong file, points accidentally overwritten, etc.) you should exit "Sight" Survey WITHOUT saving the job and drawing files.*

Point Overwrite Protection: Click the radio button (☉) on any one of the three options. Select **No Point Overwrite Protection** to import the point file and overwrite any point in memory that has the same point number as an imported point. Select **Renumber Duplicates & Place at the End of the File** to automatically renumber any duplicate point and place it at the end of the file. Select **Prompt for Instruction at each Duplicate Point** to stop at each duplicate and let you decide what to do with the point.



HOW "SIGHT" SURVEY SCREENS FOR DUPLICATE POINTS

1. Checks to see if the point number exists in memory. If not, the point is imported.
2. If the point exists, checks the coordinates and elevations of the imported point. If they are within the tolerances (see below) and the point descriptions are identical, the point being imported is the same as one in memory so it is ignored and not imported.

3. *If the coordinates and/or elevation and/or descriptions do not match, the point is identified as a duplicate and either: renumbered and added to the end of the points in memory; or you are prompted for instructions of how to handle the point.*

Tolerances: Enter values for **Positional** (X & Y) tolerance and **Elevation** (Z) tolerance. These values are used to determine duplicate points. For example, if the difference between the imported Northing and the existing Northing are less than the tolerance value, the Northings are considered to be the same. If that same condition exists with Eastings and elevations, the points are duplicates.

As you bring data out to the field and back into the office via a data collector, you may end up with points where the Northings and Eastings match but the elevations are different as in the case of a ground shot vs. an as-built shot. However, these points might also inadvertently share the same point number and you may want to keep them both. The fact that the elevations do not match within the specified tolerance will insure that this point (when imported) is flagged as a duplicate and you will be able to assign a new number to it, thus preserving the data for both points.

Import Points: Click the radio button () on any of three options. You may import **All Points in the File**; import **All Points Except** (specified) **Numbers**; or import **Only Point Numbers** specified. If you select either options two or three, in the corresponding field you must enter the subject point numbers using the **Rules for Defined Figures and Point Strings** as found in [Section 6.20](#).

Renumber Imported Points: There may be times when you wish to renumber the imported points so they will not conflict with points which may be contained in the current file. If that is the case, select the option to **Renumber Imported Points starting at Point Number** and enter the new starting point number into the adjacent text entry field.



HINT: *Prior to importing points, you should run the **Blank Point Scan (BP - [Section 6.13](#))** to assist you in determining a safe starting point for renumbering.*

Prefix to Give Points and **Suffix to Give Points.** Two additional fields are available when importing files. Use these fields to essentially turn numeric points into alpha-numeric points by prepending and/or appending text to the point numbers. (DO NOT use these fields if you are not working in an alpha-numeric

format.) You may use any characters as a prefix or suffix. Note that you may also prepend or append numerals to the point numbers, similar to renumbering. If you have chosen to renumber the points, all renumbering will be done prior to attaching a prefix or suffix.



HINT: Do not use the **Prefix** and **Suffix** fields if you are not working in an alpha-numeric format.

Draw Points: Select the **Draw Points** option to immediately draw the imported points after the file is loaded. Points are drawn using the configuration settings under **Point Configuration (PC - [Section 5.08](#))**.

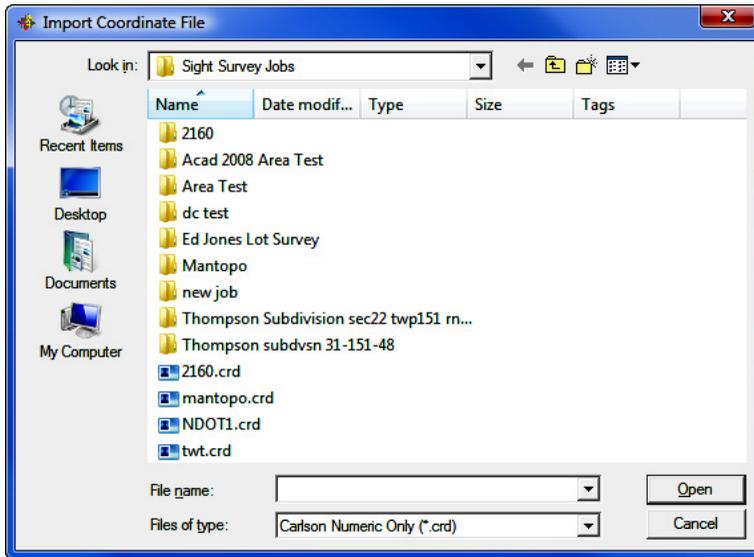
Assign Points to Layer: When importing a file, you can assign a layer or level for the imported points. Your choices are: **Default** (does not assign points to a layer); **By Description** (creates layers/levels from point descriptions and assigns the point to that layer/level); or **Enter Layer**. If you select **Enter Layer**, press [▼] to select a layer/level from the list provided or type in the name of a layer/level to be created.



NOTE: If you assign layers during file import then later run **Field-to-Finish**, your point layers will be reset according to the field definition file used by **Field-to-Finish**.

[**Import**]: Click this button to select data file to import.

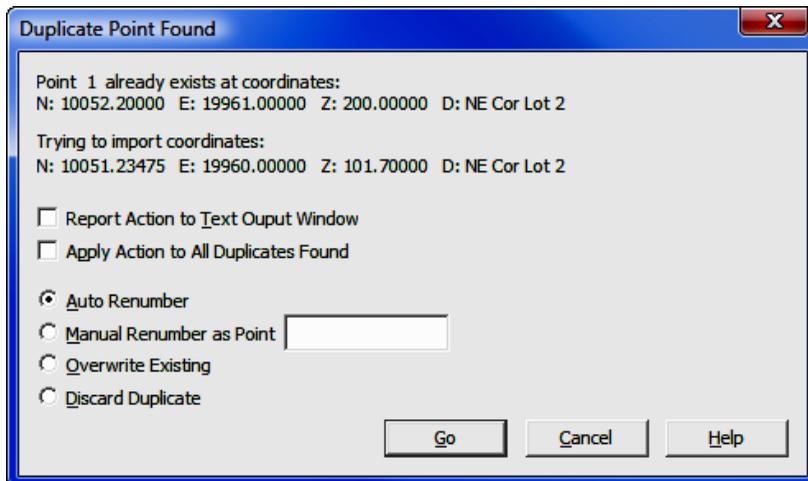
[**Select File & Type**]: This button displays a dialog box allowing you to select an existing file for import.



Use the standard Windows dialog box to select a folder location. Left-click on an existing file to import the file. Also choose a file type using the **Files of type** field. When you have completed your selections, click [**Open**] to import the file.

Point Overwrite Protection

If you are using **Point Protection** and "Sight" Survey finds a duplicate point, you are presented with an option dialog screen.



You will be shown the old and new point data, and given options to:

- Auto Renumber:** Automatically assigns a new number to the imported point.
- Manual Renumber:** You must supply a new number to assign to the imported point. You may enter a plus (+) to assign the point to the next available number.
- Overwrite:** Replace the old point with the imported point.
- Discard Duplicate:** Do not import the duplicate point.

Two additional checkbox options are shown on this screen:

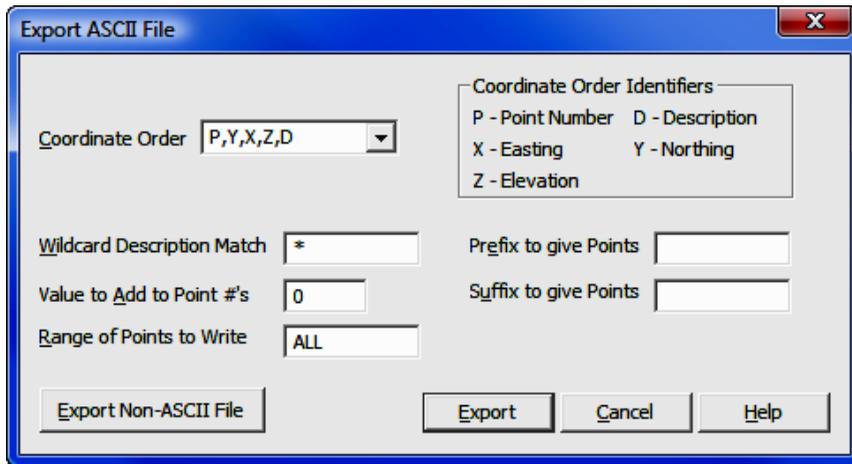
- Apply Action to All Duplicates Found:** If you check this box prior to selecting **Discard**, **Overwrite**, or **Auto Renumber**, your choice will be applied to all the remaining points as they import.
- Report Action to Text Output Window:** All actions for renumbered, overwritten and skipped points are written into the Text Output window. This is particularly useful if you are renumbering imported points.

You may also **Cancel** the import. Any points imported up to the time of cancellation are retained in memory.

3.10 Export ASCII File

FUNCTION: The **Export > ASCII File** routine is used to create and save a file of coordinate points in an ASCII (text) format. This is a common file format that may be used to create a file that may be imported into another program or perhaps a data collector.

Activate the **Export > ASCII File** routine by picking from the **File: Export** menu; or by pressing [**Alt**][**F**], [**E**], [**A**].



Coordinate Order: Use this drop-down option box to select one of the pre-programmed formats, or type the correct coordinate order into the field using the **Coordinate Order Identifiers**. If you enter your own format, separate the fields by any character or number of spaces that you desire. You may also use quote marks if necessary. Simply use the proper **Coordinate Order Identifiers** for the values. For example, an entry of **P Y X "D"** would give you **point Northing Easting "Description"**. The most common format is **P,Y,X,Z,D** which is a common delimited file of **point, Northing, Easting, elevation, description**.

Wildcard Description Match: If you select **Wildcard Description Match**, you may enter a descriptive filter that, if matched, will cause the matching points to be exported. If set to anything other than an asterisk (*), you will only export points with that match the filter. You can use * to mean any number of characters, and just entering * (the default setting) is a universal match. For example entering ***corner** would match *building corner, driveway corner, property corner*, etc. Likewise enter **Property*** would match *Property Corner, Property Line*, etc. Entering a question mark (?) means any single character (e.g. **Hub?** would match *Hub1, Hub2, Hub3*, etc., but not *Hub10, Hub11* and so on where *Hub* is followed by more than one character.) Wildcard filters are not case sensitive (e.g. HUB = Hub = hub).

Value to Add to Point Numbers: There may be times when you wish to re-number the exported points. If that is the case, enter a value to add to the exported point numbers. For example, suppose you have a file containing 1-45. Entering 100 into the **Value to Add to Point Numbers** field will cause the exported points to be numbered 101-145.

Prefix to Give Points and **Suffix to Give Points**. Two additional fields are available when exporting ASCII files. Use these fields to essentially turn numeric points into alpha-numeric points by prepending and/or appending text to the point numbers. (DO NOT use these fields if you are not working in an alpha-numeric format.) You may use any characters as a prefix or suffix. Note that you may also prepend or append numerals to the point numbers, similar to re-numbering. If you have chosen to renumber the points, all renumbering will be done prior to attaching a prefix or suffix.

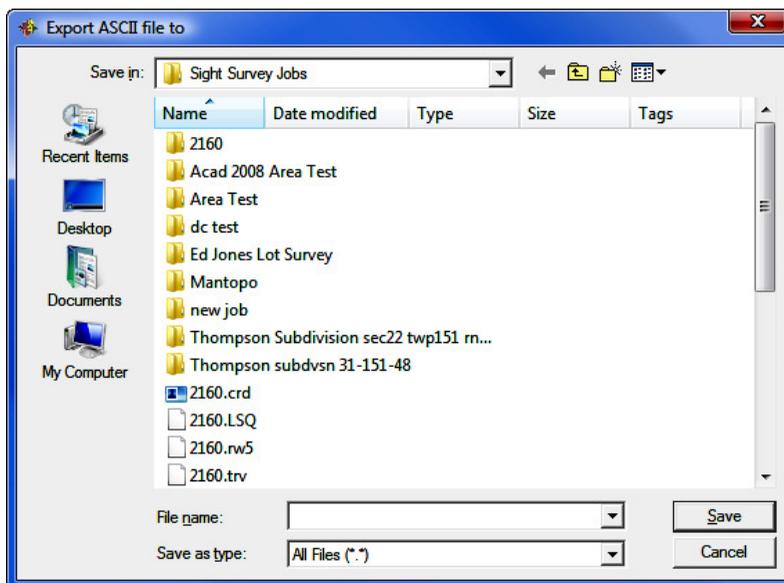


HINT: Do not use the **Prefix** and **Suffix** fields if you are not exporting to an alpha-numeric format.

Range of Points to Write: You may export any or all of the points to the ASCII file. Type **ALL** to export the entire file. To export a partial file enter the subject point numbers using the **Rules for Defined Figures and Point Strings** as found in [Section 6.20](#).

[Export Non-ASCII File]: If you realize that you actually need to export a non-ASCII file, click this button to cancel the routine and begin the **Export Coordinate File** routine (see [Section 3.11](#)).

[Export]: Click this button to select or specify the file to write.



Use the standard Windows dialog box to select a folder location, or to create a new folder. Left-click on an existing file to select that file to be overwritten, or type in a new name into the **File name** field. Also choose a file type using the **Save as type** field. When you have completed your selections, click [**Save**] and return to the previous dialog box to set your export parameters.



CAUTION: Always remember - if you specify an existing file name, that file WILL be overwritten with new data.

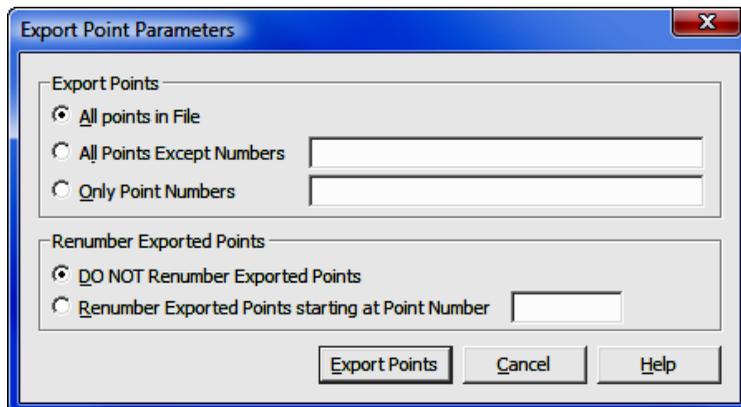
File Name: Enter a filename into this field or select an existing file name. Click [**Save**] to export the ASCII file.

Save as Type: Click [**▼**] to select the coordinate file type (format) to write. Generally, you can specify **All Files (*.*)** then just give the filename an extension like **.txt** or **.asc**.

3.11 Export Coordinate File

FUNCTION: The **Export > Coordinate File** routine is used to create and save a file of coordinate points in a non-ASCII format. Available formats include: Carlson Numeric (the default format); Carlson Alpha-numeric; C&G Numeric; C&G Alpha-numeric; Simplicity "Sight" Survey 3 files; and Land Desktop Development files.

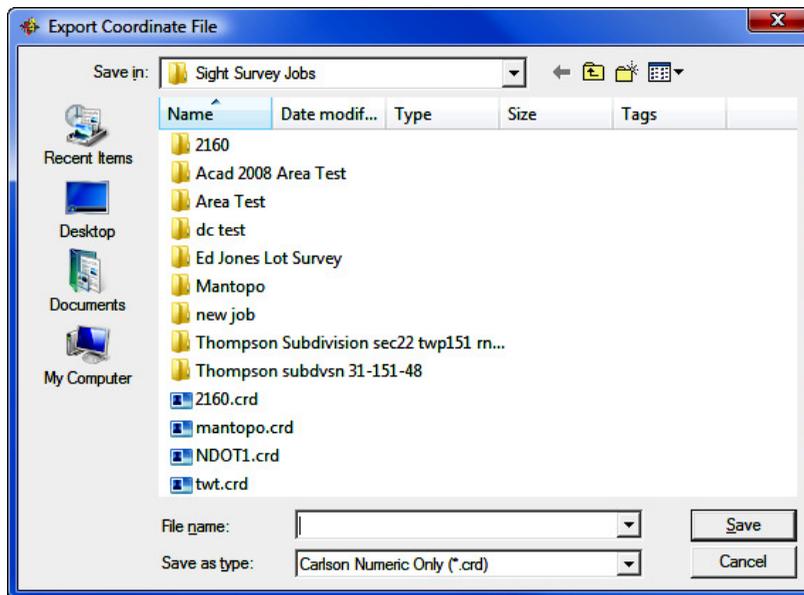
Activate the **Export > Coordinate File** routine by picking from the **File: Export** menu; or by pressing [**Alt**][**F**], [**E**], [**C**].



Export Points: Click the radio button (☉) on any of three options. You may export **All Points in the File**; export **All Points Except (specified) Numbers**; or export **Only Point Numbers** specified. If you select either options two or three, in the corresponding field you must enter the subject point numbers using the **Rules for Defined Figures and Point Strings** found in [Section 6.20](#).

Renumber Exported Points: There may be times when you wish to renumber the exported points so they will not conflict with points in another file should they be later imported into that file. In those cases, select the option to **Renumber Exported Points starting at Point Number** and enter the new starting point number into the adjacent text entry field.

[**Export Points**]: Click this button to select or specify the export data file name.



Use the standard Windows dialog box to select a folder location, or to create a new folder. Left-click on an existing file to select that file to be overwritten, or type in a new name into the **File name** field. Also choose a file type using the **Save as type** field. When you have completed your selections, click [**Save**] and return to the previous dialog box to set your export parameters.



CAUTION: Always remember - if you specify an existing file name, that file WILL be overwritten with new data.

File Name: Enter a filename into this field or select an existing file name. Click [**Save**] to export the coordinate file.

Save as Type: Click [**▼**] to select the coordinate file type (format) to write.

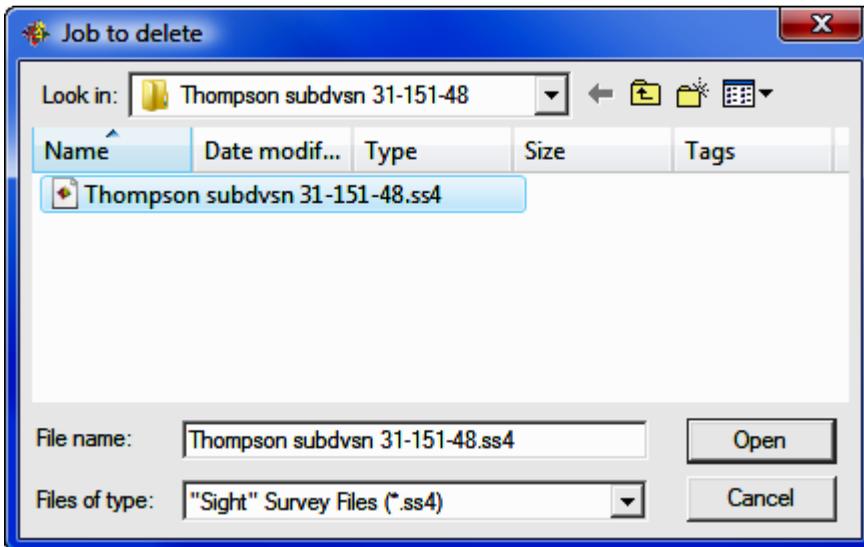
3.12 Delete Job

FUNCTION: The **Delete Job** routine is used to completely delete a "Sight" Survey job and all associated files.

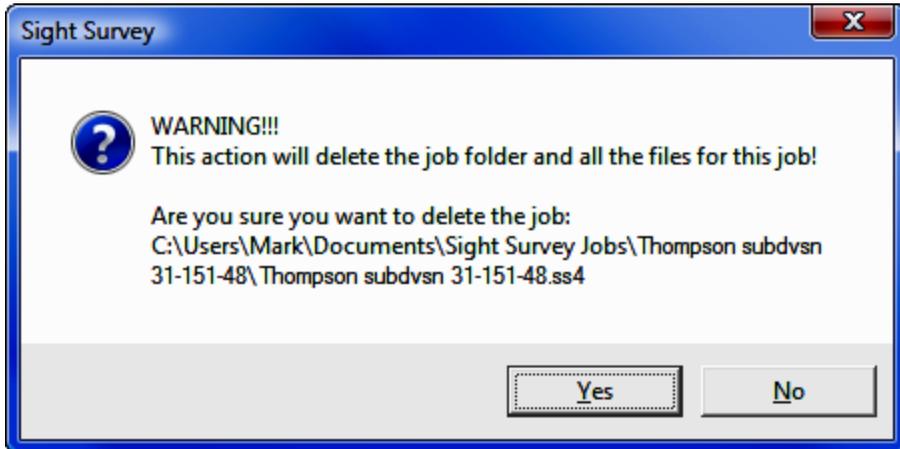
Activate the **Delete Job** routine by picking from the **File** menu, or by pressing [**Alt**][**F**], [**D**].



TIP: You can not delete the job you are currently working in. You must close the job first.



Look in: Click the down arrow to select the drive and folder (or root folder) location containing the job files. Typically, the default location will be the **Sight Survey Jobs** folder under your **Documents** folder. Use the lower window to further refine your search and select the desired job folder. Once the job folder is open, click on the **.ss4** file for your job and then click [**Open**].



Even though you have only selected the **.ss4** file, as the warning indicates, "Sight" Survey will delete not only that file but all associated job files and that particular job folder if you elect to proceed. If for some reason you only want to delete certain files such as a drawing file, raw file, or report file, use the **Windows Explorer (My Computer)** to manually delete selected files.

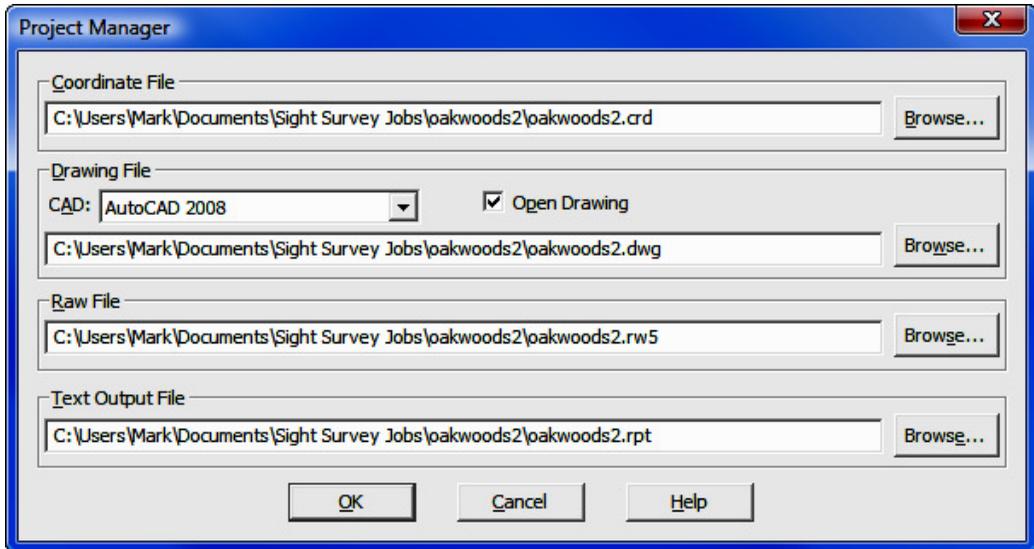


HINT: *If you find that you have deleted a job in error, check your Windows Recycle bin for the job folder. You might be able to restore them from there.*

3.13 Project File Manager (FM)

FUNCTION: The **Project File Manager** routine is used to change the current "Sight" Survey file set.

Activate the **Project File Manager** routine by picking from the **File** menu; by pressing [**Alt**][**F**], [**M**]; or by typing FM at any data entry prompt.



At first glance, this routine might be confusing. Why would you want to change the drawing file or the coordinate file while you are in the middle of a job? Why would you want to change a raw data file or a text output file? The **Project File Manager** allows you to combine elements from various files into one body of work without actually combining the data files.

Consider for example, a scenario in which you have a job containing all of the elements of a topographic site survey of an existing tract of land. You have loaded this as your current job. Your company's engineering design team has produced another file of proposed improvements; perhaps parking lot and building layouts. Now you must combine the data into a single drawing but you really don't want to merge the data files into a single job. Perhaps all they need to show is an outer boundary and contours. How can you do this?

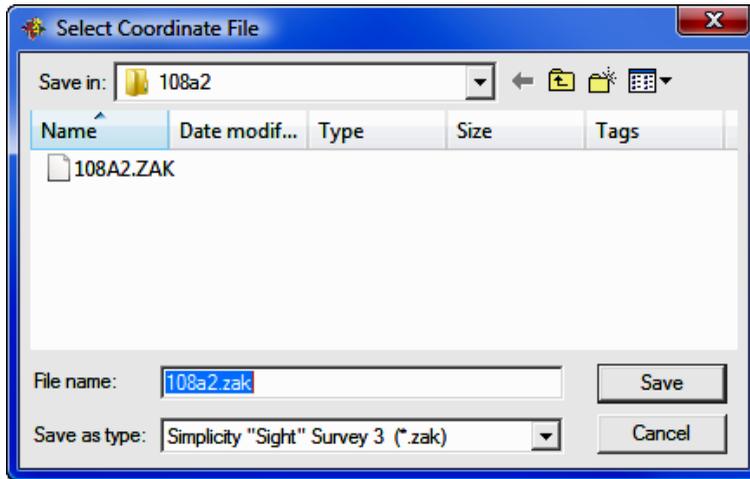
You start by opening the topographic job, then launch the **Project File Manager** from the file menu. Under the **Drawing File** section, select the proposed site improvements drawing as the new drawing file and check the **Open Drawing** box. When you click [**OK**] you will be able to insert drawing elements into the new drawing from the old drawing file. You inverse around the property boundary and run contours and you're done.

Similarly there may be times when you need to change a coordinate file to use points from another file to insert drawing elements into your current project, but you don't want to actually import the points into the project. Accomplish this by temporarily changing the **Coordinate File**.

The **Raw File** referenced by the **Project Manager** is not the same as the raw data file you may have from your data collector. This raw file is actually created by "Sight" Survey as you enter in data, and is used in traverse adjustment using the **Tools > Edit Process Raw Files > Carlson Editor** routine (**ER** - [Section 11.11](#)). If you are checking several traverses or deeds, you might want to create a separate raw file for each tract.

The **Text Output File** contains everything that goes into the **Text Output** window. there may be times when you want to create a report file that contains only certain information but not the entire output. If you set up a new **Text Output File** you can create a specific report that does not include previous calculations and data.

[**Browse**]: The [**Browse**] button is also an element common to all the options. Clicking on [**Browse**] will open a file selection dialog. The **Save as type** automatically reflects only the file types that are available for each particular option. Other than the **Save as type** setting, the window function is identical for all options and therefore will only be discussed once.



Save in: Click [▼] to select the drive and folder or root folder location containing the job files. Typically, the default location will be the **Sight Survey Jobs** folder under your **Documents** folder. Use the lower window to further refine your search and select the desired job folder. Once the Job folder is open, click on the desired file and then click [**Save**] (or double-click the desired file).

File name: If you are creating a new file (coordinate, drawing, raw, or text output) type in the new filename here and select the file type in the Save as type field. Only valid file types will be presented for your selection and the chosen type will automatically determine the filename extension to add to the file name.



HINT: If you create a new coordinate file, be aware that the original file is closed when the new one opens which results in an empty coordinate file. To populate an empty coordinate file you may use: the **Enter and Assign** routine ([EA - Section 6.01](#)); the **Import ASCII Files** routine (see [Section 3.08](#)); or the **Import Coordinate File** routine (see [Section 3.09](#)).

Save as type: Use this field to select the proper type for the file. Only valid file types will be presented for your selection and the chosen type will automatically determine the filename extension to add to the file name.

Coordinate File: Click [**Browse**] to select a new coordinate file. It may be a file of any supported type: Carlson Numeric; Carlson Alphanumeric; C&G Numeric; C&G Alphanumeric; Sight Survey 3; or LDD (Autodesk Land Desktop).

Drawing File: Click [**Browse**] to select a new drawing file.

CAD: Select the CAD version for the new drawing file. (If you are referencing an existing drawing, the drawing will automatically open in the CAD format under which it was last saved.)

Open Drawing: Check this box to open the new drawing when you leave this routine.

Raw File: Click [**Browse**] to select a new raw file.

Text Output File: Click [**Browse**] to select a new coordinate file.

Once you have completed your file specifications, click [**OK**] to activate the changes.

3.14 Raw File Recorder On/Off (RR)

FUNCTION: The **Raw File Recorder** routine is used to toggle raw data file recording in "Sight" Survey. Raw data files are used in traverse adjustment using the **Tools > Edit Process Raw Files > Carlson Editor** routine (**ER** - [Section 11.11](#)).

Activate or deactivate the **Raw File Recorder** routine by picking from the **File** menu; by pressing [**Alt**][**F**], [**R**], or by typing the two-letter command **RR** at any data entry prompt.

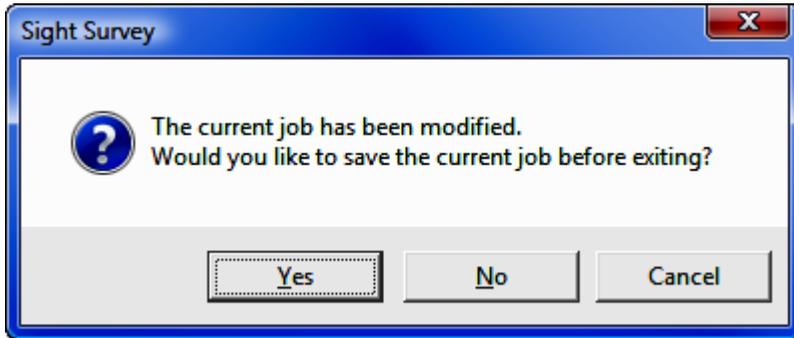
Change the name of the raw data file being written by using the **Project File Manager** (**FM** - [Section 3.13](#)).

3.15 Exit (SY)

FUNCTION: The **Exit** routine is used to close the current "Sight" Survey job and exit to Windows. (The two-letter **SY** command is a holdover from older Simplicity DOS applications where exited to the DOS **SY**stem.)

Activate the **Exit** routine by picking from the **File** menu; by pressing [**Alt**][**F**], [**X**], or by typing the two-letter command **SY** at any data entry prompt.

If you have done any work in the file, you will be asked if you would like to save your work before "Sight" Survey exits.



After saving the data and drawing files, "Sight" Survey will close and CAD may close assuming you have elected to automatically close CAD when you exit "Sight" Survey. This option is available under the **CAD Configuration** screen (**CM** - [Section 5.03](#)).

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Section 4

The CAD Menu



The **CAD** menu contains commands related to the use of a CAD drawing within "Sight" Survey.

"Sight" Survey runs with, but not inside a CAD program. When using "Sight" Survey, you simply cannot use your CAD's normal commands to open, close, or start and close drawings. These operations need to be completed through the use of "Sight" Survey commands that signal the program of the availability (or lack thereof) of various drawing commands. Performing these operations solely within the CAD program will result in "Sight" Survey errors as it at-

tempts to execute drawing commands.

On this menu, you will find commands to open and close CAD, to open a drawing in CAD (associated with the current job), and to pick points in CAD. Picking points allow you to incorporate drawing points into the coordinate file.

In order to simplify some CAD operations for users with limited CAD experience, this menu also includes an **Edit Layers** item to help you set up and manipulate CAD layers.

Finally, there are three additional "measuring" items to help you bring data from CAD into "Sight" Survey. **Select Bearing** and **Select Distance** will grab bearing and distance data from selected CAD points and insert it into the appropriate data entry fields in "Sight" Survey, while **Measure Between CAD Points** is a reporting only routine that returns the bearing and distance between selected CAD points.

4.01 Open Drawing in CAD

FUNCTION: The **Open Drawing in CAD** routine will open the CAD drawing associated with the current job. Either this routine or the **Project File Manager** (**FM** - [Section 3.13](#)) must be used to open your drawing if you do not open your drawing when starting your job.

Activate the **Open Drawing in CAD** routine by picking from the **CAD** menu, or by pressing [**Alt**][**C**], [**O**].



WARNING: *If you have closed the CAD program using the **Close CAD** routine (see [Section 4.03](#)), you cannot simply reopen the CAD program and load the drawing. You must use this routine so "Sight" Survey knows the CAD program has been opened. If not, "Sight" Survey will not attempt to write to the drawing.*

Selecting this routine will not produce any additional dialog boxes. This routine simply re-opens your CAD program and loads in the drawing associated with the current job.



NOTE: *If you have multiple CAD versions installed on your computer and you wish to open a drawing in a version other than the latest version installed, open your CAD application manually before issuing this command. This command will likely open the latest installed version.*

4.02 Open CAD

FUNCTION: The **Open CAD** routine opens the **Default CAD Application** as specified in the **CAD Configuration** menu (**CM** - [Section 5.03](#)).

Activate the **Open CAD** routine by picking from the **CAD** menu, or by pressing [**Alt**][**C**], [**D**].

The **Default CAD Application** is opened but no drawing file is loaded at this time. Use either the **Project Manager** (see [Section 3.13](#)) or the **Open Draw-**

ing in **CAD** routine (see [Section 4.01](#)) to open and/or associate a drawing with the current job.



NOTE: *If you have multiple CAD versions installed on your computer and you wish to open a version other than the latest version installed, open your CAD application manually. This command will likely open the latest installed version.*

4.03 Close CAD

FUNCTION: The **C**lose CAD routine is used to close your drawing by closing the CAD program connected to your "Sight" Survey job.

Activate the **C**lose CAD routine by picking from the **CAD** menu, or by pressing [**Alt**][**C**], [**C**].

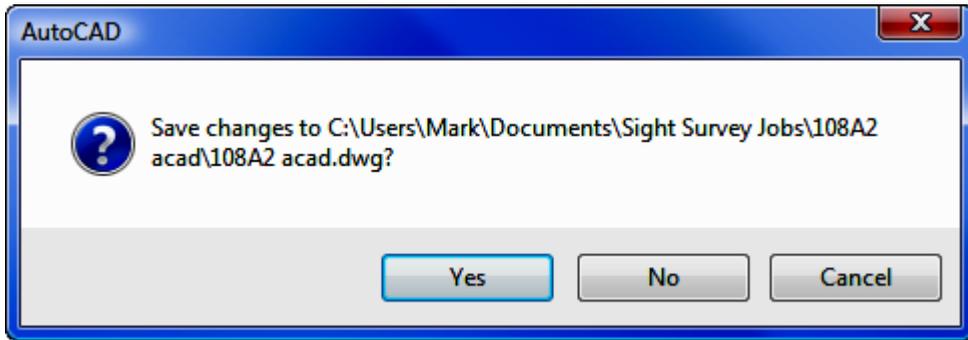


WARNING: *If you intend to close the CAD program and continue working, you cannot simply close the CAD program on its own. You must use this routine so "Sight" Survey knows the CAD program has been closed. If not, errors will result when "Sight" Survey attempts to write to the drawing. Other methods of turning off the drawing commands from within "Sight" Survey are described below.*

If you have made any changes to the drawing you will be asked if you would like to save your drawing before exiting.



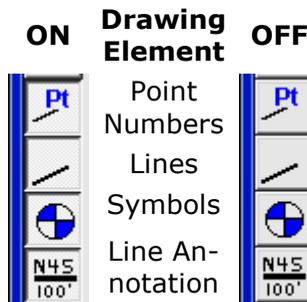
NOTE: *Your CAD configuration may simply close the drawing and save the changes without prompting you to save the drawing.*



Once closed, you can reopen and reattached the drawing using the **Open Drawing in CAD** routine (see [Section 4.01](#)).

Other Ways to Stop Drawing Commands in "Sight" Survey

You can temporarily turn off individual elements of the drawing commands using icons on the "Sight" Survey toolbar. There are icons to control four drawing elements. These are shown below in both their **ON** and **OFF** states:



When buttons are depressed, the drawing elements are active. When they are in the "up" position, the drawing elements are inactive. Double-clicking on any of the four icons will set all the icons to an **ON** or **OFF** state, so to turn off the drawing completely, simply double-click on any of the four icons. Double-click again to turn them all back on again.

4.04 Pick (Get) Points in CAD (GP)

FUNCTION: The **Pick (Get) Points in CAD** routine is used to select multiple points in the CAD window, assign them point numbers, and add the new points to the coordinate file. This routine is similar to right-clicking the [Pts] button to select a single point, but it allows you to continue selecting points until you choose to exit the routine. This routine may also be used to create a defined figure (or point group) by selecting points from the drawing.

Activate the **Pick Points in CAD** routine by picking from the **CAD** menu; or by pressing [Alt][C], [P]; or by typing the two-letter command **GP** (Get Point) at any data entry prompt.



NOTE: *If you are using the non-CAD interface, this option is not available to you.*

A screenshot of a software dialog box titled "Pick Points in CAD". The dialog has a blue title bar with a close button (X) in the top right corner. The main area contains several options with checkboxes and text boxes:

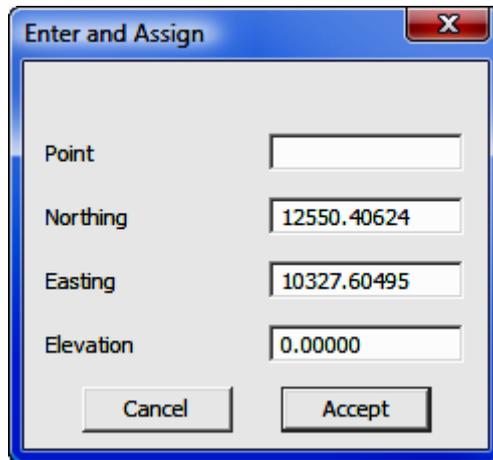
- Automatic Point Numbering starting at
- Prompt for Point Description
or Use Point Description
- Use Duplicate Point Tolerance feet
- Draw Points
- Draw Lines
- Draw Line Annotation
- List Picked Points in Text Output Window
- Create Figure

At the bottom, there are two buttons: "Edit Point Configuration" and "Drawing Properties". Below these are three smaller buttons: "Go", "Exit", and "Help".

MicroStation Users: *When you first enter **Pick Points** (only for the first time in a particular session) and pick the first point, you may see a small delay as MicroStation initializes Carlson symbol.dwg files. Wait a few seconds and the point number will appear on the drawing, then continue picking points.*

Automatic Point Numbering: This check box will enable or disable automatic point numbering. When on, each picked point will be assigned the next available point number. Specify the starting point number in the field.

If you are manually entering a point number for an accepted point, the **Enter and Assign** dialog appears. The Northing (Y) and Easting (X) coordinate fields will be populated with the values of the picked point. Enter a point number and an elevation (optional) and click [**Accept**].



Field	Value
Point	
Northing	12550.40624
Easting	10327.60495
Elevation	0.00000

Prompt for Point Description: When this option is checked, you will be asked to supply a point name or description of up to 28 characters in length for each picked point. If you leave this option disabled, you can manually enter a point name later using the **Identify Point** function (**ID** - [Section 6.03](#)).

Or Use Point Description: You may specify a point description to be automatically assigned to your picked points. Note that if **Prompt for Point Description** is selected, that setting will override any data entered into this field.

Use Duplicate Point Tolerance: When picking points while using a tolerance setting, "Sight" Survey will attempt to identify any existing points lying within the specified distance (the tolerance) from the mouse click. If the clicked point falls within the positional X, Y tolerance of an existing point, "Sight" Survey will not create a new point thus avoiding the creation of duplicate points. The tolerance distance units are the units you have selected under the **Local Configuration** menu (**LC** - [Section 5.05](#)) as either feet or meters.



HINT: *When picking points, you should consider turning on object snaps in CAD to accurately snap to the desired point or drawing element.*

Draw Points: Select this option if you want "Sight" Survey to draw the points in your drawing using the parameters outlined in **Point Configuration** menu (**PC** - [Section 5.08](#)).

Draw Lines: Select this option if you want "Sight" Survey to draw lines between the picked points as they are created, using the parameters outlined in the **Drawing Properties** (**PR** - [Section 5.10](#)).

Draw Line Annotation: Select this option if you want "Sight" Survey to annotate the lines between the picked points as they are created, using the parameters outlined in the **Drawing Properties** menu (**PR** - [Section 5.10](#)). Note that you do not actually have to draw the lines before placing the annotation.

List Picked Points in Text Output Window: Select this option to list into the **Text Output** window any points created by this routine. These points will appear under a heading of **Assigned Points**.

Create Figure: "Sight" Survey can create a defined figure (or point group) from the selected points. To create a figure, enter a figure name into this field.

[**Edit Point Configuration**]: Click this button to activate the **Point Configuration** menu (**PC** - [Section 5.08](#)) to edit the appearance of plotted points.

[**Drawing Properties**]: Click this button to activate the **Drawing Properties** menu (**PR** - [Section 5.10](#)) to edit the appearance of lines and line annotation.

[**Go**]: Click [**Go**] to accept the settings and begin picking points in CAD.

AutoCAD / IntelliCAD Users: Use a single-left click of the mouse to select points. When you have completed picking points, press [**Esc**] while the mouse is still in the CAD window to instruct the CAD program to release the point selection command.

MicroStation Users: Use a single-left click of the mouse to select points. When you have completed picking points, press [**Esc**] or right-click your mouse while

the mouse is still in the CAD window to instruct the CAD program to release the point selection command.

[**Exit**]: Click [**Exit**] to close the **Pick (Get) Points in CAD** routine.

4.05 **E**dit Layers/Levels (**LA**)

FUNCTION: The **Edit Layers/Levels** routine is used to create drawing layers and set the layer properties.

Activate the **Edit Layers/Levels** routine by picking from the **CAD** menu; by pressing [**Alt**][**C**], [**E**]; or by typing the two-letter command **LA** at any data entry prompt.



NOTES:

1. *If you are using the non-CAD interface, this option is not available to you.*
2. *"Sight" Survey uses the AutoCAD/IntelliCAD term "Layers" which corresponds to the MicroStation term "Levels."*

Edit Layers/Levels is not an actual "Sight" Survey routine, but when activated, "Sight" Survey starts the **Layer Manager** (in AutoCAD/IntelliCAD) or the **Level Manager** (in MicroStation). Using the **Layer** (or **Level**) **Manager** you can:

- add layers;
- delete layers;
- assign linetypes, weights, and colors;
- freeze and thaw layers;
- set the current or active layer;
- hide or show layers.

Follow the instructions for your particular CAD application.

4.06 Refresh Layer List

FUNCTION: The **Refresh Layer List** routine is used to scan the drawing and compile a list of layers contained therein. The resulting layer list is used a variety of routines where layer selection is required.

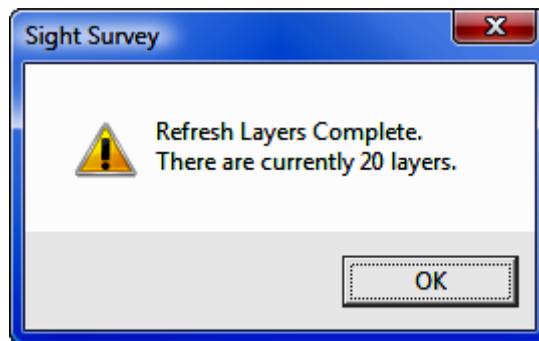
Activate the **Refresh Layer List** routine by picking from the **CAD** menu, or by pressing [**Alt**][**C**], [**R**].



NOTE: *If you are using the non-CAD interface, this option is not available to you.*

After you have manually added layers to your drawing using only CAD commands (commands not initiated from within "Sight" Survey), you should issue the **Refresh Layer List** command to incorporate those layers into "Sight" Survey. Also, if you change the drawing file attached to the job using the **Project Manager (PM - [Section 3.13](#))**, you should issue this command to update the layer list from the current drawing.

There are several "Sight" Survey routines that require the selection of a layer, and refreshing the list is the only way to make sure all drawing layers are available for selection within "Sight" Survey. After issuing the command you will receive a confirmation screen. Click [**OK**] to continue. No further user action is necessary.



The **Refresh Layer List** routine is a manual procedure, but it also has an automatic counterpart. Whenever you issue a **Draw Field-to-Finish (FF - [Section 6.33](#))** command, "Sight" Survey will automatically refresh the layer list to incorporate any layers introduced by field-to-finish.

4.07 Select Bearing (SB)

FUNCTION: When called from a **Bearing** prompt, the **Select Bearing** routine is used to compute the bearing between two CAD points and then insert that bearing into the **Bearing** field.

Activate the **Select Bearing** routine by picking from the **CAD** menu; by pressing [**Alt**][**C**], [**B**]; or by typing the two-letter command **SB** at any data entry prompt.



NOTE: If you are using the non-CAD interface, CAD point selection is not available to you and this routine functions like **Recall Bearing** (see [Section 2.06](#)).

The **Select Bearing** routine is meant to be called from within any **Bearing** prompt, although you can run this routine anytime. Only when called from within a **Bearing** prompt will it utilize the computed data in the bearing field of the calling routine.

A screenshot of a software dialog box titled "Select Bearing or Distance". The dialog box has a blue title bar with a close button (X) in the top right corner. Below the title bar, there is a text label "Right-click [Pts] to select from CAD". There are two input fields: "From Point" with the value "15" and "To Point" with the value "7". Each input field has a "Pts" button to its right. Below the input fields, the text "Bearing: 48.4210SW" and "Distance: 222.86" is displayed. At the bottom of the dialog box, there are three buttons: "Go", "Cancel", and "Help".

When the dialog box first appears, the **From Point** and **To Point** fields are blank. Into each field you may:

- Right-click [**Pts**] and select a point from the drawing.
- Left-click [**Pts**] and select a point from the **Point Manager** (**PM** - [Section 6.09](#)).
- Enter a point number.

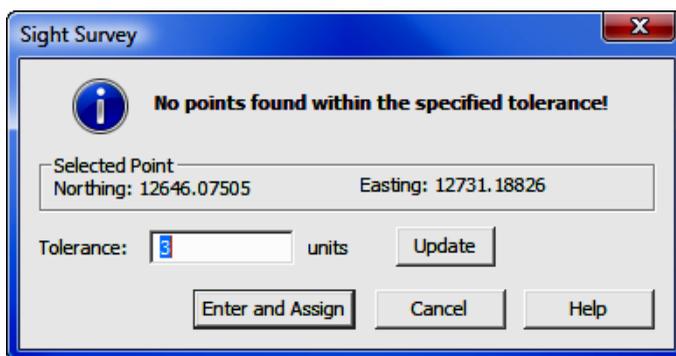
When you have completed the point fields, a bearing and distance is computed between the points and displayed in the dialog box. Click [**Go**] to close the dialog box and have the computed bearing inserted back into the bearing field from

which the **Select Bearing** routine was called. Click [**Cancel**] to close the dialog box without returning a value to the bearing field.

Selecting Points from CAD

If you are using Sight Survey's internal CAD engine, AutoCAD, MicroStation, IntelliCAD, or any other CAD with a supported API (applications programming interface), you may pick a point from the CAD window by right-clicking the [**Pts**] button located just to the right of the point field.

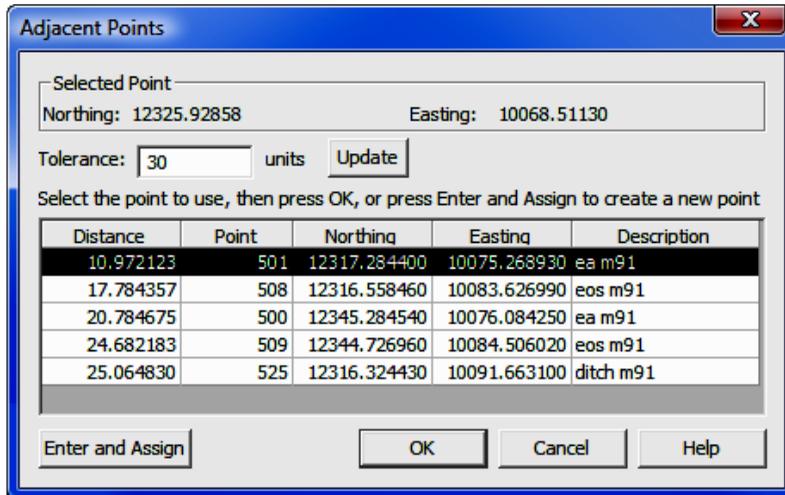
When picking points from the CAD window, "Sight" Survey will attempt to identify any existing points lying within the specified distance (the tolerance) from the mouse click. "Sight" Survey will find matches to the points in the coordinate file, even if those points are not plotted on the drawing. The tolerance distance units are the units you have selected under the **Local Configuration** menu ([LC - Section 5.05](#)) as either feet or meters. If no existing point is found within the specified tolerance, "Sight" Survey reports:



At this point you can: accept the point as picked; cancel this particular selection; or increase the **Tolerance** and click [**Update**] to expand the search for possible existing points.

If you want to accept the point as picked, click the [**Enter and Assign**] button. If you are using **Automatic Point Numbering** the point number will automatically be assigned. If not, an **Enter and Assign** dialog will appear (see below.) If you have selected **Prompt for Point Description** you will then be asked for a point description (see below). Finally, the point number will be drawn in CAD (if desired) and the point and coordinates will be entered into the coordinate file and reported in the **Text Output** window.

If "Sight" Survey finds any existing points the program reports:



At this point you can: select one of the found points; accept the point location as picked; increase the **Tolerance** and click [**Update**] to expand the search for possible existing points; or cancel this particular selection by clicking [**OK**] or [**Cancel**].

If the picked point matches one of the points returned, simply click on the found point in the table and click [**OK**] or [**Cancel**] to close this dialog, then pick another point in the drawing.

If you do not see a matching point and want to accept the point as picked, click the [**Enter and Assign**] button. If you are using **Automatic Point Numbering** the point number will automatically be assigned. If not, an **Enter and Assign** dialog will appear (see below.) If you have selected **Prompt for Point Description** you will then be asked for a point description (see below). Finally, the point number will be drawn in CAD (if desired) and the point and coordinates will be entered into the coordinate file and reported in the **Text Output** window.

If you are manually entering a point number for an accepted point, the **Enter and Assign** dialog appears. The Northing (Y) and Easting (X) coordinate fields will be populated with the values of the picked point. Enter a point number and an elevation (optional) and click [**Accept**].

Enter and Assign

Point	<input type="text"/>
Northing	<input type="text" value="12550.40624"/>
Easting	<input type="text" value="10327.60495"/>
Elevation	<input type="text" value="0.00000"/>

If you have selected **Prompt for Point Description** you will then be asked for a point description. Type in a description and press [**Enter**] or press [**Alt**][**#**] (where **#** is **1 - 6**) to select a description offered.

Enter Description for Pt. 1

Alt - 1	<input type="text" value="Found Iron Pin"/>
Alt - 2	<input type="text" value="Found Iron Pipe"/>
Alt - 3	<input type="text" value="Set Iron Pipe"/>
Alt - 4	<input type="text" value="Concrete Monument"/>
Alt - 5	<input type="text" value="Hub with Nail"/>
Alt - 6	<input type="text"/>

4.08 Select Distance (SD)

FUNCTION: When called from a **Distance** prompt, the **Select Distance** routine is used to compute the distance between two CAD points and then insert that distance into the **Distance** field.

Activate the **Select Distance** routine by picking from the **CAD** menu; by pressing [Alt][C], [S]; or by typing the two-letter command **SD** at any data entry prompt.



NOTE: If you are using the non-CAD interface, CAD point selection is not available to you and this routine functions like **Recall Distance** (see [Section 2.06](#)).

The **Select Distance** routine is meant to be called from within any **Distance** prompt, although you can run this routine anytime. Only when called from within a **Distance** prompt will it utilize the computed data in the distance field of the calling routine.

A screenshot of a software dialog box titled "Select Bearing or Distance". The dialog has a blue title bar with a red close button (X). Inside, it says "Right-click [Pts] to select from CAD". There are two input fields: "From Point" with the value "15" and a "Pts" button to its right; and "To Point" with the value "7" and a "Pts" button to its right. Below these are labels for "Bearing: 48.4210SW" and "Distance: 222.86". At the bottom are three buttons: "Go", "Cancel", and "Help".

When the dialog box first appears, the **From Point** and **To Point** fields are blank. Into each field you may:

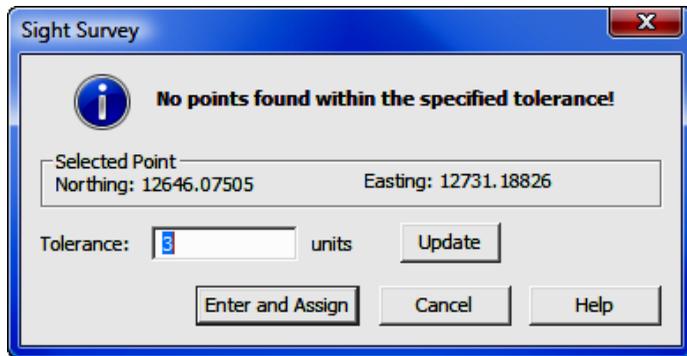
- Right-click [**Pts**] and select a point from the drawing.
- Left-click [**Pts**] and select a point from the **Point Manager (PM - [Section 6.09](#))**.
- Enter a point number.
-

When you have completed the point fields, a bearing and distance is computed between the points and displayed in the dialog box. Click [**Go**] to close the dialog box and have the computed distance inserted back into the distance field from which the **Select Distance** routine was called. Click [**Cancel**] to close the dialog box without returning a value to the distance field.

Selecting Points from CAD

If you are using Sight Survey's internal CAD engine, AutoCAD, MicroStation, IntelliCAD, or any other CAD with a supported API (applications programming interface), you may pick a point from the CAD window by right-clicking the [**Pts**] button located just to the right of the point field.

When picking points from the CAD window, "Sight" Survey will attempt to identify any existing points lying within the specified distance (the tolerance) from the mouse click. "Sight" Survey will find matches to the points in the coordinate file, even if those points are not plotted on the drawing. The tolerance distance units are the units you have selected under the **Local Configuration** menu ([LC - Section 5.05](#)) as either feet or meters. If no existing point is found within the specified tolerance, "Sight" Survey reports:

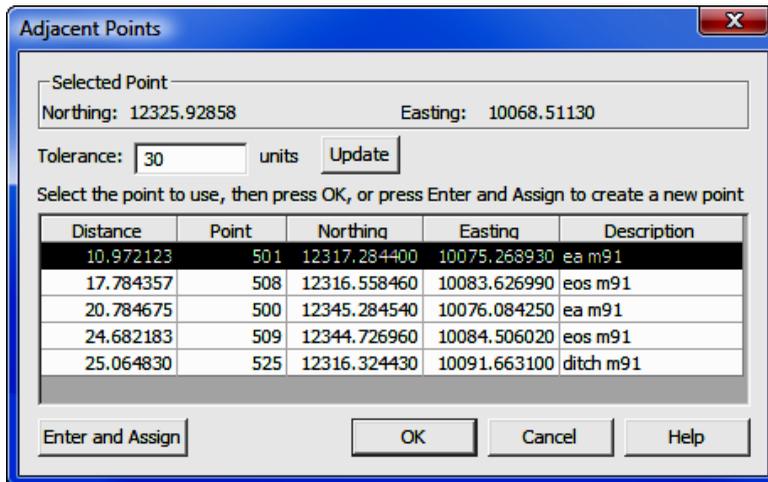


At this point you can: accept the point as picked; cancel this particular selection; or increase the **Tolerance** and click [**Update**] to expand the search for possible existing points.

If you want to accept the point as picked, left-click on the [**Enter and Assign**] button. If you are using **Automatic Point Numbering** the point number will automatically be assigned. If not, an **Enter and Assign** dialog will appear (see below.) If you have selected **Prompt for Point Description** you will then be

asked for a point description (see below). Finally, the point number will be drawn in CAD (if desired) and the point and coordinates will be entered into the coordinate file and reported in the **Text Output** window.

If "Sight" Survey finds any existing points the program reports:



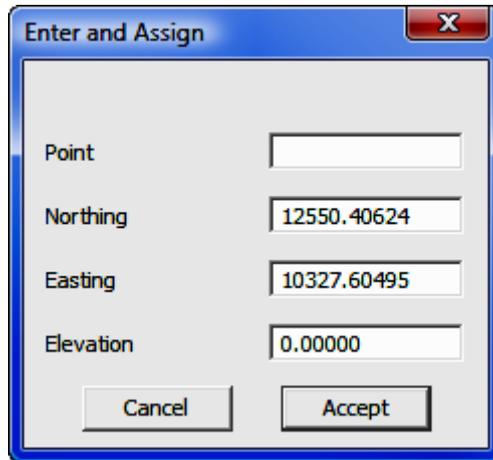
At this point you can: select one of the found points; accept the point location as picked; increase the **Tolerance** and click [**Update**] to expand the search for possible existing points; or cancel this particular selection by clicking [**OK**] or [**Cancel**].

If the picked point matches one of the points returned, simply click on the found point in the table and click [**OK**] or [**Cancel**] to close this dialog, then pick another point in the drawing.

If you do not see a matching point and want to accept the point as picked, click the [**Enter and Assign**] button. If you are using **Automatic Point Numbering** the point number will automatically be assigned. If not, an **Enter and Assign** dialog will appear (see below.) If you have selected **Prompt for Point Description** you will then be asked for a point description (see below). Finally, the point number will be drawn in CAD (if desired) and the point and coordinates will be entered into the coordinate file and reported in the **Text Output** window.

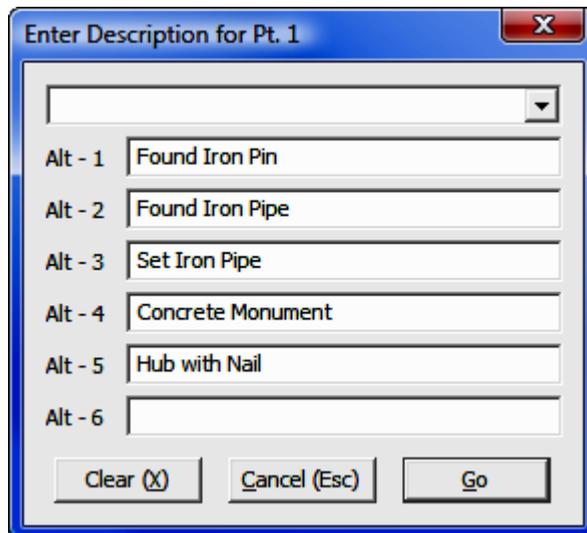
If you are manually entering a point number for an accepted point, the **Enter and Assign** dialog appears. The Northing (Y) and Easting (X) coordinate fields

will be populated with the values of the picked point. Enter a point number and an elevation (optional) and click [**A**cccept].



The 'Enter and Assign' dialog box has a blue title bar with a close button (X). The main area is light gray and contains four input fields stacked vertically. The first field is labeled 'Point' and is empty. The second is labeled 'Northing' and contains the value '12550.40624'. The third is labeled 'Easting' and contains '10327.60495'. The fourth is labeled 'Elevation' and contains '0.00000'. At the bottom of the dialog are two buttons: 'Cancel' on the left and 'Accept' on the right.

If you have selected **Prompt for Point Description** you will then be asked for a point description. Type in a description and press [**E**nter] or press [**A**lt][**#**] (where **#** is **1 - 6**) to select a description offered.



The 'Enter Description for Pt. 1' dialog box has a blue title bar with a close button (X). The main area is light gray and contains a list of six descriptions, each preceded by an 'Alt' key. The descriptions are: 'Found Iron Pin', 'Found Iron Pipe', 'Set Iron Pipe', 'Concrete Monument', 'Hub with Nail', and an empty field for 'Alt - 6'. At the bottom of the dialog are three buttons: 'Clear (X)' on the left, 'Cancel (Esc)' in the middle, and 'Go' on the right.

4.09 Measure Between CAD Points (MD)

FUNCTION: The **Measure Between CAD Points** routine is used to compute and display the bearing and distance between selected points. The data is reported only to your monitor and not to the **Text Output** window or the drawing. Points may be from memory, from the drawing, or mixed.

Activate the **Measure Between CAD Points** routine by picking from the **CAD** menu; by pressing **[Alt][C]**, **[M]**; or by typing the two-letter command **MD** at any data entry prompt.



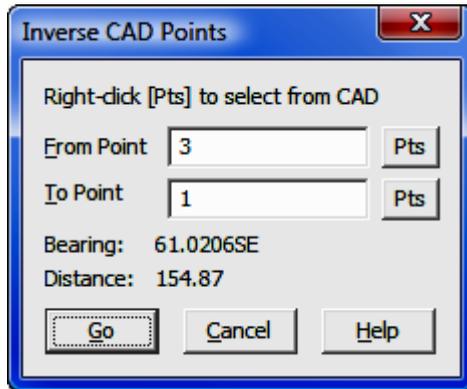
NOTES:

1. *If you are using the non-CAD interface, CAD point selection is not available to you.*
2. *If you run the **Select Bearing** (**SB** - [Section 4.07](#)) routine from any field other than a bearing field, or the **Select Distance** (**SD** - [Section 4.08](#)) routine from any field other than a distance field, you will actually be running this routine.*

The **Measure Between CAD Points** routine is a "non-reporting" way to inverse between:

- two CAD points;
- two points in memory;
- or one point in CAD and one point in memory.

By "non-reporting" we mean that this routine will not draw or annotate any results, nor will it print the results to the **Text Output** window. Results are simply reported in the dialog box.



When the dialog box first appears, the **From Point** and **To Point** fields are blank. Into each field you may:

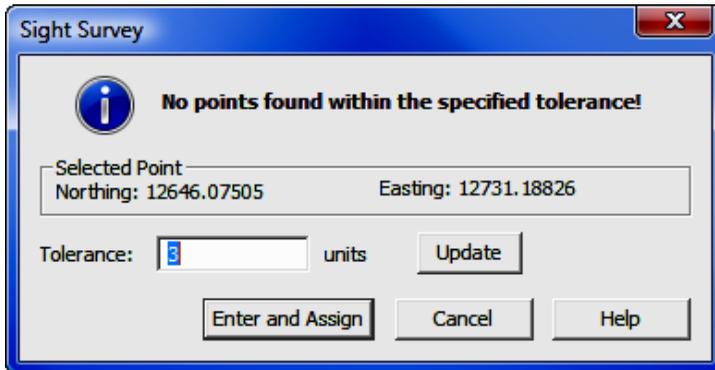
- Right-click [**Pts**] and select a point from the drawing.
- Left-click [**Pts**] and select a point from the **Point Manager (PM - [Section 6.09](#))**.
- Enter a point number.

When you have completed the point fields, a bearing and distance is computed between the points and displayed in the dialog box. Note that the bearing is shown in **d.mmss** format. The dialog box remains open for point entry and calculations until you click [**Go**] or [**Cancel**] to close the routine.

Selecting Points from CAD

If you are using Sight Survey's IntelliCAD CAD engine, AutoCAD, MicroStation, or any other CAD with a supported API (applications programming interface), you may pick a point from the CAD window by right-clicking the [**Pts**] button located just to the right of the point field.

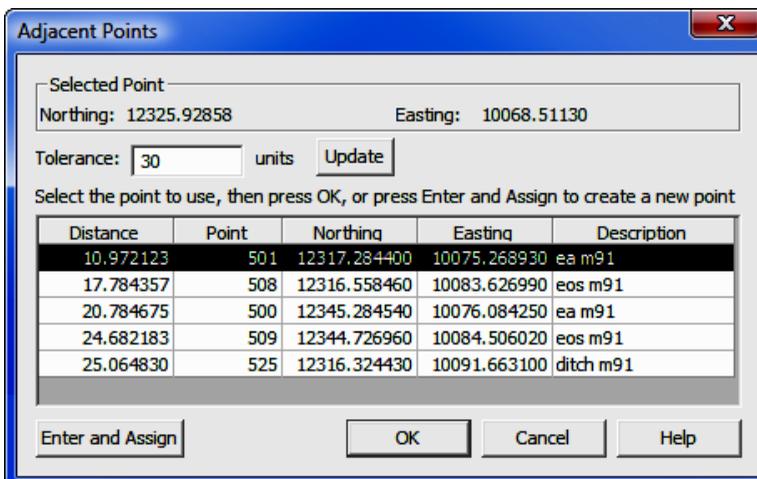
When picking points from the CAD window, "Sight" Survey will attempt to identify any existing points lying within the specified distance (the tolerance) from the mouse click. "Sight" Survey will find matches to the points in the coordinate file, even if those points are not plotted on the drawing. The tolerance distance units are the units you have selected under the **Local Configuration** menu (**LC - [Section 5.05](#)**) as either feet or meters. If no existing point is found within the specified tolerance, "Sight" Survey reports:



At this point you can: accept the point as picked; cancel this particular selection; or increase the **Tolerance** and click [**Update**] to expand the search for possible existing points.

If you want to accept the point as picked, click the [**Enter and Assign**] button. If you are using **Automatic Point Numbering** the point number will automatically be assigned. If not, an **Enter and Assign** dialog will appear (see below.) If you have selected **Prompt for Point Description** you will then be asked for a point description (see below). Finally, the point number will be drawn in CAD (if desired) and the point and coordinates will be entered into the coordinate file and reported in the **Text Output** window.

If "Sight" Survey finds any existing points the program reports:

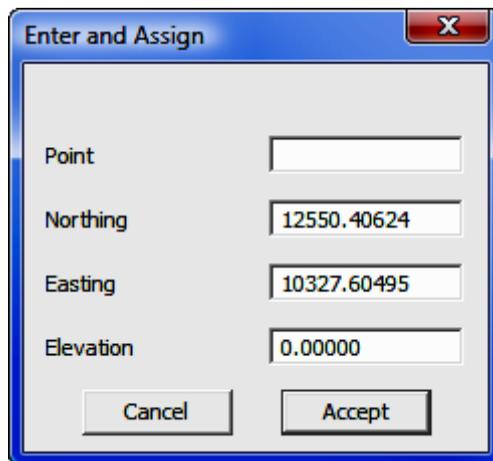


At this point you can: select one of the found points; accept the point location as picked; increase the **Tolerance** and click [**Update**] to expand the search for possible existing points; or cancel this particular selection by clicking [**OK**] or [**Cancel**].

If the picked point matches one of the points returned, simply click on the found point in the table and click [**OK**] or [**Cancel**] to close this dialog, then pick another point in the drawing.

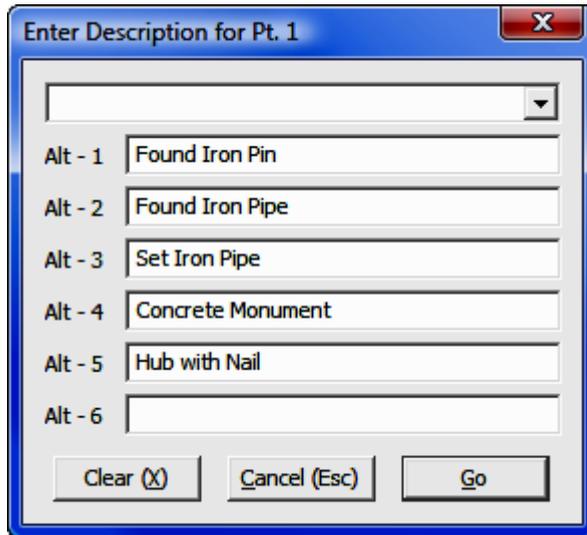
If you do not see a matching point and want to accept the point as picked, click the [**Enter and Assign**] button. If you are using **Automatic Point Numbering** the point number will automatically be assigned. If not, an **Enter and Assign** dialog will appear (see below.) If you have selected **Prompt for Point Description** you will then be asked for a point description (see below). Finally, the point number will be drawn in CAD (if desired) and the point and coordinates will be entered into the coordinate file and reported in the **Text Output** window.

If you are manually entering a point number for an accepted point, the **Enter and Assign** dialog appears. The Northing (Y) and Easting (X) coordinate fields will be populated with the values of the picked point. Enter a point number and an elevation (optional) and click [**Accept**].



Field	Value
Point	
Northing	12550.40624
Easting	10327.60495
Elevation	0.00000

If you have selected **Prompt for Point Description** you will then be asked for a point description. Type in a description and press [**Enter**] or press [**Alt**][**#**] (where **#** is **1 - 6**) to select a description offered.



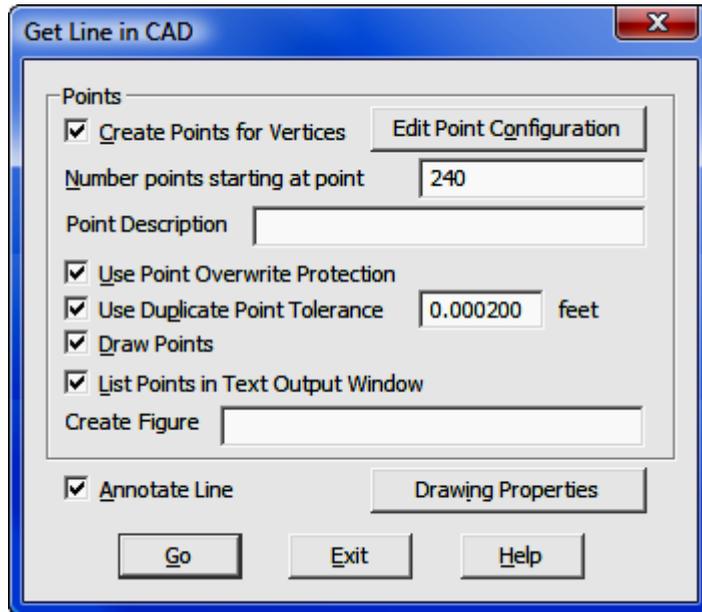
4.10 Get Line in CAD (GL)

FUNCTION: The **Get Line in CAD** routine is used to select lines and arcs in the CAD window, assign point numbers to the vertices, and add the new points to the coordinate file. This routine may also be used to create a defined figure (or point group) by selecting a polyline.

Activate the **Get Line in CAD** routine by picking from the **CAD** menu; or by pressing [**Alt**][**C**], [**L**]; or by typing the two-letter command **GL** at any data entry prompt.



NOTE: *If you are using the non-CAD interface, this option is not available to you.*



Create Points for Vertices: Select this option to instruct "Sight" Survey to create points at all vertices. When selected, "Sight" Survey computes the coordinates at each point and assigns them to a point number. Points are created at each endpoint of a line, and at each control point for a curve (PC, PT, Radius Point).

[**Edit Point Configuration**]: Click this button to activate the **Point Configuration** menu (**PC** - [Section 5.08](#)) to edit the appearance of plotted points.

Number points starting at point: Specify the starting point number to be used when auto-numbering the created points.

Point Description: If you want to add a point description to each point as it is created, enter the point description in this field. Leave the field blank to omit point descriptions.

Use Point Overwrite Protection: Select this option to prevent "Sight" Survey from using already existing point numbers when numbering points.

Use Duplicate Point Tolerance: When picking points while using a tolerance setting, "Sight" Survey will attempt to identify any existing points lying within the specified distance (the tolerance) from the mouse click. If the clicked point falls

within the positional X, Y tolerance of an existing point, "Sight" Survey will not create a new point thus avoiding the creation of duplicate points. The tolerance distance units are the units you have selected under the **Local Configuration** menu (**LC** - [Section 5.05](#)) as either feet or meters.

Draw Points: Select this option if you want "Sight" Survey to draw the points in your drawing using the parameters outlined in **Point Configuration** menu (**PC** - [Section 5.08](#)).

List points in Text Output Window: Select this option to list into the **Text Output** window any points created by this routine. These points will appear under a heading of **Assigned Points**.

Annotate Line: Select this option if you want "Sight" Survey to annotate the selected line(s) using the parameters outlined in the **Drawing Properties** menu (**PR** - [Section 5.10](#)).

Create Figure: "Sight" Survey can create a defined figure (or point group) from the vertices of selected line. To create a figure, enter a figure name into this field.



TIP: The **Get Line** allows you to select a single line or multiple lines. When creating a figure from the selected line(s), for best results pick and process only a single line at a time.

[**Drawing Properties**]: Click this button to activate the **Drawing Properties** menu (**PR** - [Section 5.10](#)) to edit the appearance of lines and line annotation.

[**Go**]: Click [**Go**] to accept the settings and begin selecting line(s) in CAD.

AutoCAD / IntelliCAD Users: Left-click your mouse on a line to select it. When you have completed selecting lines, press [**Space Bar**] or right-click the mouse in the CAD window to instruct the CAD program to process the selected line(s). You may select additional lines or press [**Esc**] to return focus to "Sight" Survey.

MicroStation Users: Left-click your mouse on a line to select it. When you have completed selecting lines, double-right-click your mouse while the mouse is still in the CAD window to instruct the CAD program to process the selected

line(s). You may select additional lines or single-right-click your mouse in the CAD window to return focus to "Sight" Survey.

[**Exit**]: Click [**Exit**] to close the **Get Line in CAD** routine.

4.11 **Save Current Drawing as DGN**

FUNCTION: The **Save Current Drawing as DGN** routine is used while in AutoCAD or IntelliCAD to save a copy of the current drawing to a MicroStation (DGN) format.

Activate the **Save Current Drawing as DGN** routine by picking from the **CAD** menu, or by pressing [**Alt**][**C**], [**V**]. There will be a few second delay while the conversion software opens in the background.



NOTE: *If you are using the non-CAD interface, this option is not available to you.*

To save the current drawing as a MicroStation DGN drawing, you must specify a target name and location for the converted file.

This routine activates a basic Windows file selection dialog box, similar to what you would see when saving a job. Using the navigational tools in the dialog box, select the drive and folder location for the new drawing file and click [**Save**].

4.12 **Convert DGN to DWG & Convert DWG to DGN**

FUNCTION: The **Convert DGN to DWG** and **Convert DWG to DGN** routines are used to convert any MicroStation DGN drawing to an AutoCAD DWG drawing, or vice-versa. The original drawing is retained and a copy is created.

Activate the **Convert DGN to DWG** routine by picking from the **CAD** menu, or by pressing [**Alt**][**C**], [**G**]. Activate the **Convert DWG to DGN** routine by picking from the **CAD** menu, or by pressing [**Alt**][**C**], [**W**].



NOTE: While there are two conversion routines on the menu, you may actually use either routine to make either conversion. The menu items simply set the **File Type** defaults, but you may override the default settings.

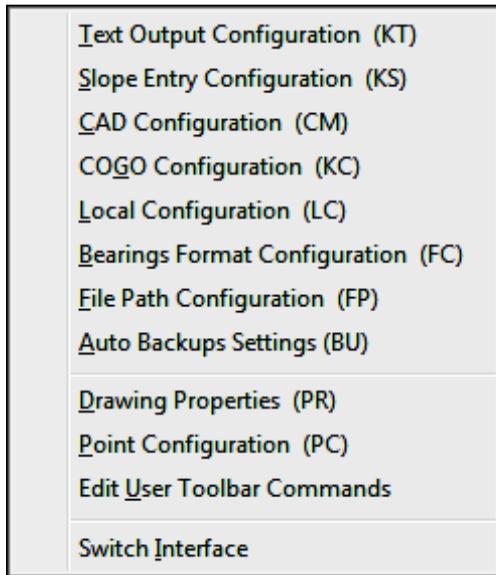
There are two basic steps required to convert a drawing: 1. Select the drawing to be converted; and 2. Specify a target name and location for the converted file.

1. Select the drawing to be converted: This routine activates a basic Windows file selection dialog box, similar to what you would see when selecting a job to load. In the **Files of Type** field at the bottom of the dialog box, click [▼] and specify the type of drawing you want to convert. Then using the navigational tools in the dialog box, find the drawing file you want to convert and either double-click on it, or select it and click [**Open**].

2. Specify a target name and location for the converted file: Once you have identified the drawing to be converted, "Sight" Survey uses another basic Windows file selection dialog box to select the target location. In the **Save as Type** field at the bottom of the dialog box, click [▼] and specify the type of drawing you want to save. Then using the navigational tools in the dialog box, select the drive and folder location for the new drawing file and click [**Save**].

Section 5

The **C**onfig Menu



The **C**onfig menu contains commands used to tailor the way "Sight" Survey works. Nearly every aspect of the operation of "Sight" Survey is controlled from one of the configuration menus.

- **Text Output:** Controls text printed to the Text Output window.
- **Slope Entry:** Parameters for entering slope distances.
- **CAD:** Scaling, and annotation parameters.
- **COGO:** Coordinate formats and point entry parameters.
- **Local:** Parameters for naming conventions, azimuth basis, distance units, report labeling, stationing, directional

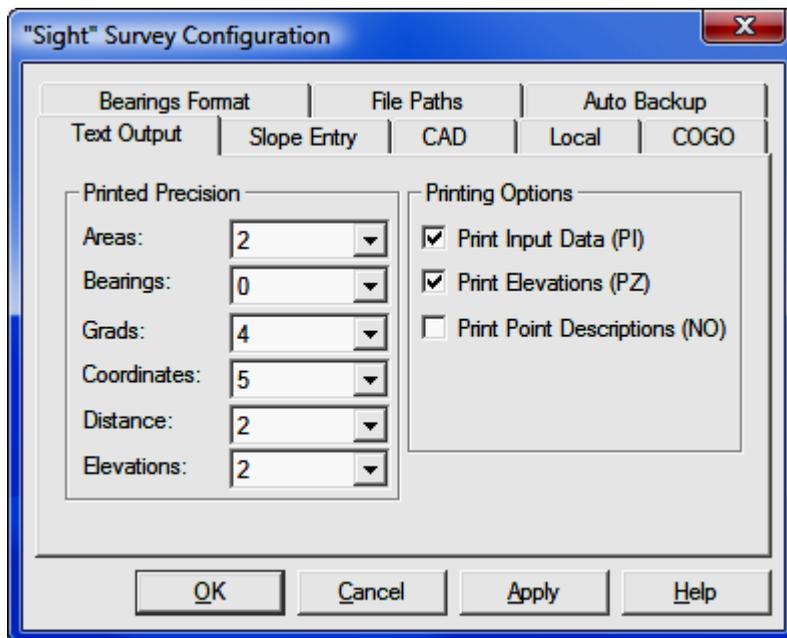
units, and default angle entries.

- **Bearings Format:** Formatting for directional output in both CAD and text.
- **File Path:** Set up default data and drawing paths.
- **Auto Backup:** Establish parameters for auto-save and backup files.
- **Drawing Properties:** Controls drawing object types, colors, and text properties.
- **Point Configuration:** Controls how points are drawn in CAD.
- **Edit User Toolbar Commands:** Assign two-letter command codes to a user toolbar.
- **Switch Interface:** Change CAD and non-CAD interfaces.

5.01 Text Output Configuration (KT)

FUNCTION: The **Text Output Configuration** menu controls the printed precision and other printing options for "Sight" Survey's Text Output window.

Activate the **Text Output Configuration** routine by picking from the **Config** menu; by pressing [**Alt**][**O**], [**T**]; or by typing the two-letter command **KT** at any data entry prompt.



CAUTION: Several configuration menu settings are dependent upon settings from other menus. For example, setting the directional units to Grads on the **Local Configuration** menu (**LC** - [Section 5.05](#)) will affect your options the **CAD**, **Text Output**, and **Bearings Format** menus. However, you must remember to click [**Apply**] at the bottom of the menu before any changes you make are accepted. Simply clicking on an item or changing a value does not change the setting unless you click [**OK**] or [**Apply**]. Clicking [**Apply**] will keep the configuration menu group open for multiple changes, while clicking [**OK**] will apply the changes and exit the menus.

Printed Precision: Printed precision is nothing more than the number of places to which your printed numerical data will be carried out *in the text output window*. Printed precision in drawings is set under the **CAD Configuration** menu (**CM** - [Section 5.03](#)). Settings for printed precision have nothing to do with the internal precision of calculations.

Click [**▼**] next to each field to set the precisions. Your choices are: **Area** - 0 to 6; **Bearings** - 0 to 3 (seconds value) , or nearest minute, or nearest degree in degrees; **Grads** - 0 to 6; **Coordinates** - 0 to 8; **Distances** - 0 to 6; **Elevations** - 0 to 6.

Printing Options: The **Printing Options** section contains three items which may be enabled or disabled with check boxes.

Print Input Data: When checked, **Print Input Data** includes your exact data entries in your text output. This is often helpful when entering field data for the first time, allowing you to spot data entry errors as they may occur.



*The two-letter code **PI** can be used at any time to toggle **Print Input Data** between **On** and **Off**.*

Print Elevations: When checked, **Print Elevations**, includes point elevations and differences in point elevations in your text output.



*The two-letter code **PZ** can be used at any time to toggle **Print Elevations** between **On** and **Off**.*

Print Point Descriptions: When checked, **Print Point Descriptions** includes 28 character point descriptions in your text output. (See also the **Prompt for Point Description** setting on the **COGO Configuration** menu (**KC** - [Section 5.04](#)).

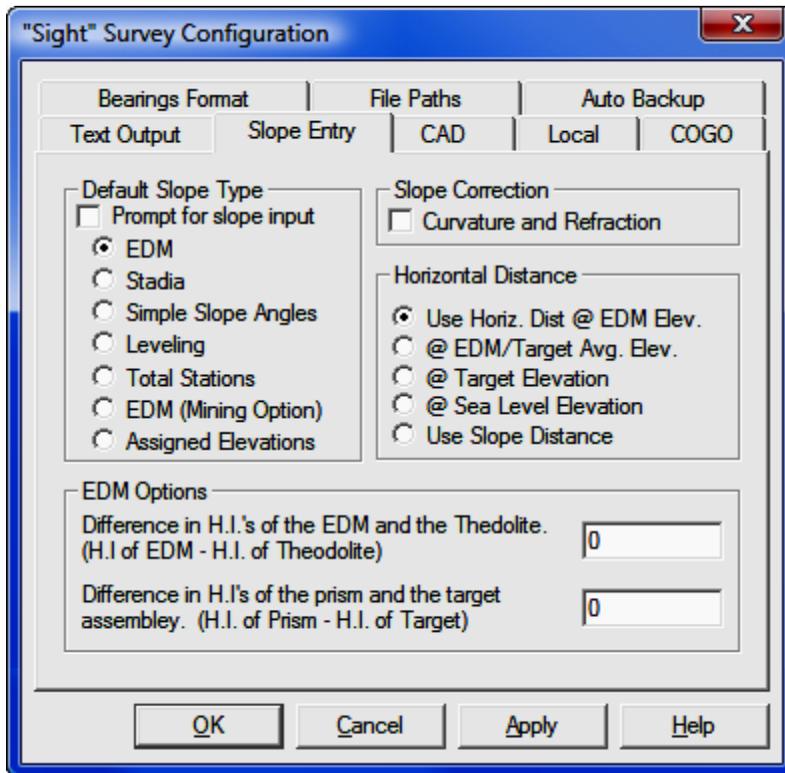


NOTE: *The two-letter code **NO** (for Names Output) can be used to toggle **Prompt for Point Description** between **On** and **Off**.*

5.02 Slope Entry Configuration (KS)

FUNCTION: The **Slope Configuration** menu controls the entry and reduction of slope distances in "Sight" Survey.

Activate the **Slope Configuration** routine by picking from the **Config** menu; by pressing [**Alt**][**O**], [**S**], or by typing the two-letter command **KS** at any data entry prompt.



CAUTION: Several configuration menu settings are dependent upon settings from other menus. For example, setting the directional units to Grads on the **Local Configuration** menu (**LC** - [Section 5.05](#)) will affect your options the **CAD**, **Text Output**, and **Bearings Format** menus. However, you must remember to click [**Apply**] at the bottom of the menu before any changes you make are accepted. Simply clicking

on an item or changing a value does not change the setting unless you click [OK] or [Apply]. Clicking [Apply] will keep the configuration menu group open for multiple changes, while clicking [OK] will apply the changes and exit the menus.

Prompt for slope input: When **Prompt for slope input** is active, every distance you enter will be met with a request for data in accordance with the slope type selected. If you only have an occasional slope distance, leave this item off. You can manually alert "Sight" Survey to a slope distance by placing a slash (/ or \) immediately after the typed distance such as **150.55/**. An easy way to remember this is to think of the slash as a *sloping line*.



NOTE: The two-letter code **SA** can be used to toggle **Slope Angle Prompting** between **On** and **Off**.

Default Slope Type: Select a **Default Slope Type** by selecting one of the seven option buttons. The option button control the type of slope reduction that "Sight" Survey will use when reducing slope distances to horizontal. Your choices are: **EDM**; **Stadia**; **Simple Slope Angles** (angle only, no instrument values); **Leveling**; **Total Stations**; **EDM (Mining Option)**; and **Assigned Elevations**.

Three of the slope type selections, **EDM**, **Stadia**, and **EDM (Mining Option)**, include additional setup options.

Slope Type - Stadia

If you have selected **Stadia** as your **Slope Type**, you may now enter values for:

Stadia Options	
Stadia Interval Constant (K)	100
Dist. from center of Insr. to Principal Focus (C)	0
<input type="checkbox"/> Check Interval vs tolerance	
Tolerance	0.05

Stadia Interval Constant (K): Type the stadia interval constant into the text entry box. This value is retained between sessions, and you will not need to enter it again unless your instrument setup changes.

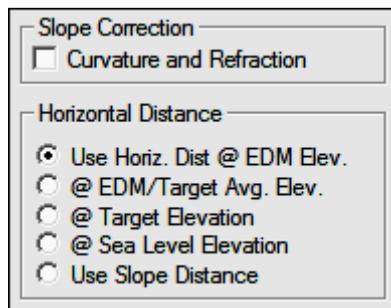
Distance from Center of Instrument to Principal Focus (C): Type the value for **C** into the text entry box. This value is retained between sessions, and you will not need to enter it again unless your instrument setup changes.

Check Interval for Tolerance: Select this option to have "Sight" Survey compare the difference between your top hair reading and the rod reading with the difference between your bottom hair reading and the rod reading. "Sight" Survey will compare this difference with the specified **Tolerance** and issue a warning if the difference lies outside the tolerance. For example, assume your top hair is 4.25, your reading is 4.02, your bottom hair is 3.68, and your tolerance is 0.05. The differences of $(4.25-4.02)$ and $(4.02-3.68)$ are compared: 0.24 vs. 0.34, or a difference of 0.11. Since the value of 0.11 is greater than the tolerance of 0.05, "Sight" Survey warns you that you might have recorded incorrect rod readings.

Tolerance: Enter a value for tolerance checking.

Slope Type - EDM

If you have selected **EDM** or **EDM (Mining Option)**, you may now enter values for:



Slope Correction

Curvature and Refraction

Horizontal Distance

Use Horiz. Dist @ EDM Elev.

@ EDM/Target Avg. Elev.

@ Target Elevation

@ Sea Level Elevation

Use Slope Distance

Curvature and Refraction: Select this option to correct readings for curvature and refraction. Many, if not most instruments handle corrections on-board, so be careful not to "double-correct."

Horizontal Distance: Select a **Horizontal Distance** option button to select the elevation at which your horizontal distance is computed.

EDM Options	
Difference in H.I.'s of the EDM and the Theodolite. (H.I. of EDM - H.I. of Theodolite)	<input type="text" value="0"/>
Difference in H.I.'s of the prism and the target assembly. (H.I. of Prism - H.I. of Target)	<input type="text" value="0"/>

Difference in H.I.'s of the EDM and the theodolite: Enter the difference between the H.I. of EDM and the H.I. of Theodolite. The default value is **0** (zero).

Difference in H.I.'s of the prism and the target assembly: Enter the difference between the H.I. of Prism and the H.I. of Target assembly. The default value is **0** (zero).

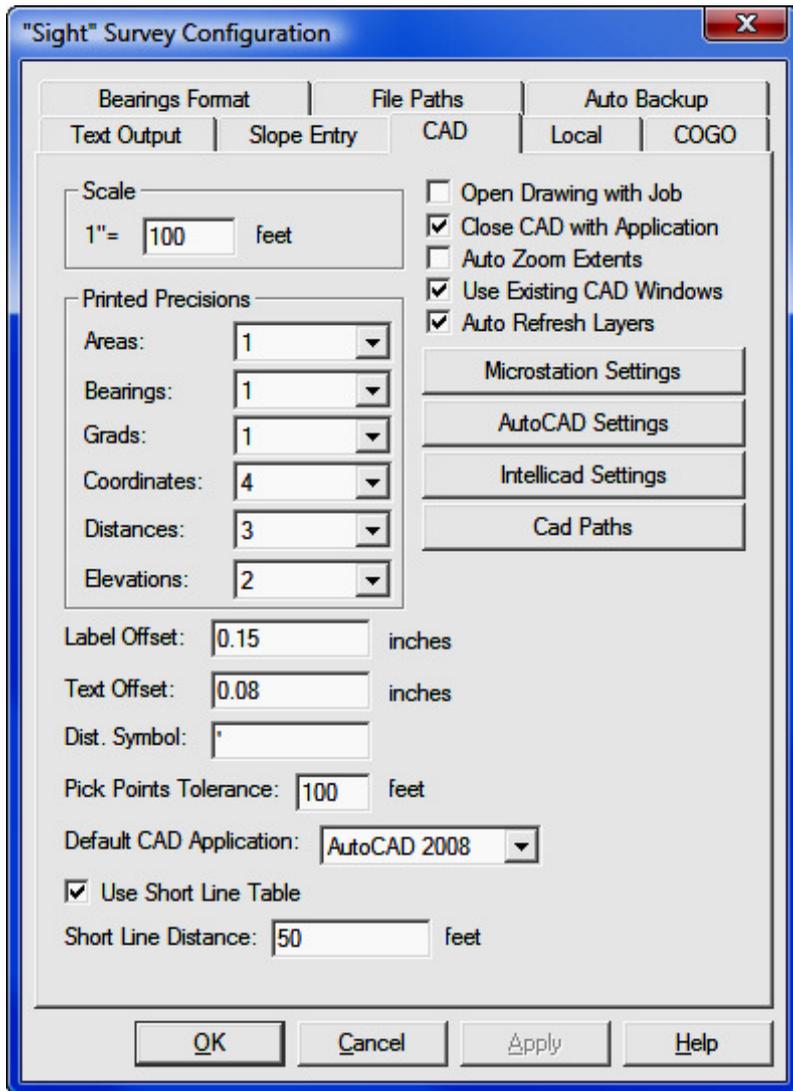
5.03 CAD Configuration (CM)

FUNCTION: The **CAD Configuration** menu controls scaling, printed precision of CAD annotation, and other CAD options.

Activate the **CAD Configuration** routine by picking from the **Config** menu; by pressing [**Alt**][**O**], [**C**], or by typing the two-letter command **CM** at any data entry prompt.



CAUTION: Several configuration menu settings are dependent upon settings from other menus. For example, setting the directional units to Grads on the **Local Configuration** menu (**LC** - [Section 5.05](#)) will affect your options the **CAD**, **Text Output**, and **Bearings Format** menus. However, you must remember to click [**Apply**] at the bottom of the menu before any changes you make are accepted. Simply clicking on an item or changing a value does not change the setting unless you click [**OK**] or [**Apply**]. Clicking [**Apply**] will keep the configuration menu group open for multiple changes, while clicking [**OK**] will apply the changes and exit the menus.



Scale: Enter your scale in English or metric units. The units are controlled by your selection of **Distance Units** in the **Local Configuration** menu ([LC - Section 5.05](#)). The value you enter here is your anticipated drawing scale and it is used to correctly size symbols and text annotation.

Printed Precisions: Printed precision is nothing more than the number of places to which your CAD annotation will be carried out. The settings here are for CAD annotation only. Printed precision for text output is set under the **Text Configuration** menu (**KT** - [Section 5.01](#)). Settings for printed precision have nothing to do with the internal precision of calculations.

Your choices are: **Area** - 0 to 6; **Bearings** - 0 to 3 (seconds value) , or nearest minute, or nearest degree in degrees, or 0 to 6 in grads; **Grads** - 0 to 6; **Coordinates** - 0 to 8; **Distances** - 0 to 6; **Elevations** - 0 to 6.

Label Offset: Enter the distance of separation from the point to the point label. This is the actual distance between the two elements when the drawing is plotted at the specified scale. The units are controlled by your selection of **Distance Units** in the **Local Configuration** menu (**LC** - [Section 5.05](#)).

Text Offset: Enter the distance of separation from line annotation to the line. This is the actual distance between the two elements when the drawing is plotted at the specified scale. The units are controlled by your selection of **Distance Units** in the **Local Configuration** menu (**LC** - [Section 5.05](#)).

Dist. Symbol: Enter the distance symbol you would like to have as a suffix to your numerical data. This could be a foot mark ('), or a letter or letters such as **m** for meters or **ft** for feet. The maximum field size is four characters.

Pick Points Tolerance: When selecting a point from the CAD window, "Sight" Survey will use a pick point tolerance to locate any point within the specified distance from the mouse cursor. To increase the tolerance or area when picking points, increase this value. For more on selecting points from the CAD window, see **Picking Points in CAD** in [Section 2.03](#)).

Default CAD Application: "Sight" Survey can work with a variety of CAD applications. Use this drop-down selection window to specify which CAD application you are using. If you are using a MicroStation application, click the [**Settings**] button to select the appropriate seed drawing file. Remember to use a 3d seed file if you plan on doing any contouring and/or surface construction. If you are not using a MicroStation application the [**Settings**] button will not be active.

Use Short Line Table: Check this box to place bearing and distance data into a table whenever the line length may be too short to support the annotation. Place the tabular data on the drawing using the **Draw > Insert > Line Table** routine (**SL** - [Section 12.04](#)).

Short Line Distance: Enter a distance that controls the population of the short line table. If **Short Line Table** is checked, any lines shorter than this distance will be labeled with an **Lx** (where **x** is a sequentially numbered line ID) and the actual length and bearing will be sent to the short line table. The following table is offered as a guide:

Text to place: **N 90° 00' 00" W**, Font: Arial (not Bold, not Italic)

Size	6	8	10	12	14	16	18
Length (inches)	0.65	0.75	0.90	1.10	1.30	1.49	1.68
Distance at 1" = 20'	13'	15'	18'	22'	26'	30'	34'
Distance at 1" = 50'	32'	37'	45'	55'	65'	75'	84'
Distance at 1" = 100'	65'	75'	90'	110'	130'	149'	168'
Distance at 1" = 200'	130'	150'	180'	220'	260'	298'	336'

Open Drawing with Job: When checked, the drawing associated with the job will automatically open.

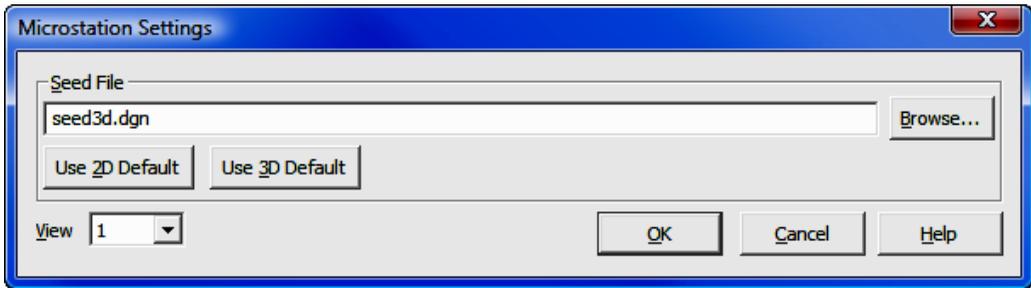
Close CAD with Application: When checked, "Sight" Survey will automatically shut down your CAD program when you exit your job.

Auto Zoom Extents: When checked, "Sight" Survey will automatically zoom extents whenever data is written to the drawing. You may also use the two-letter command **AZ** to toggle **Auto Zoom** on/off.

Use Existing CAD Windows: When checked, if a CAD window is open before opening a "Sight" Survey job, the open window will be used and a new window will not be opened.

Auto Refresh Layers: When you use this setting "Sight" Survey will read the drawing and assemble a list of the layers whenever a layer list is required. If you have a drawing containing an inordinate number of layers continually querying the drawing for a layer list may slow you down. In that case, do not select this item, and then periodically manually refresh the layer list using **CAD > Refresh Layer List** ([Section 4.06](#)).

[**MicroStation Settings**]: Click this button to set the default **Seed File** to be used when creating a new MicroStation drawing. A seed file may be customized to contain linetypes, layers, symbols, etc.



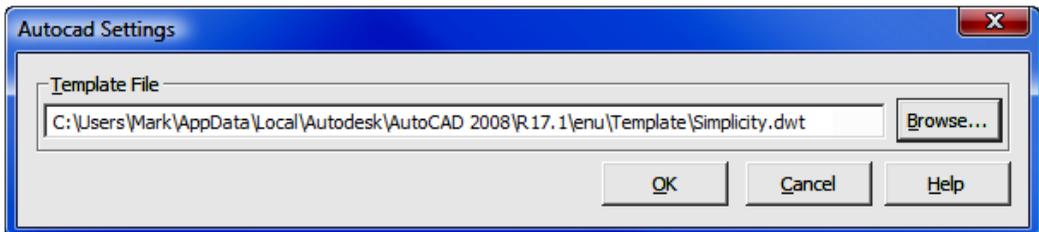
Seed File: Enter a seed file name or click [**Browse**] to locate one. You may select a default seed file by clicking [**Use 2D Default**] or [**Use 3D Default**]. If you are planning to have any 3D data in your drawing such as contours, select a 3D seed file.

View: This setting defines which view window will be the active view window when MicroStation initializes. Click [**▼**] to select view window **1** through **8**.

[**OK**]: Accept the settings and close the **MicroStation Settings** dialog box.

[**Cancel**]: Cancel the seed file selection and close the **MicroStation Settings** dialog box.

[**AutoCAD Settings**]: Click this button to set the default **Template File** to be used when creating a new AutoCAD drawing. A template file may be customized to contain linetypes and layers of which "Sight" Survey can utilize. If you do not want to use a template file, just click [**OK**] without entering anything in the dialog box.



[**Browse**]: Click the [**Browse**] button to find a template file. The path shown in the dialog box above is a typical location for AutoCAD drawing files.

If you create your own file, you may want to save the template file in a location that is easier to remember.

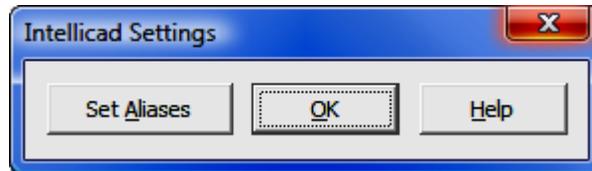
[**OK**]: Accept the settings and close the **AutoCAD Settings** dialog box.

[**Cancel**]: Cancel the template file selection and close the **AutoCAD Settings** dialog box.



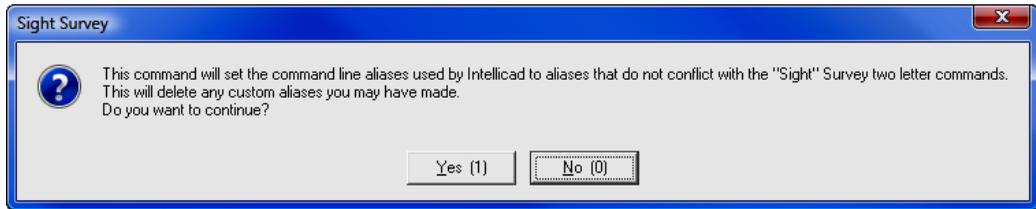
HINT: For information on creating template files, see [Section 3.01](#).

[**IntelliCAD Settings**]: Click this button to set certain alias commands.

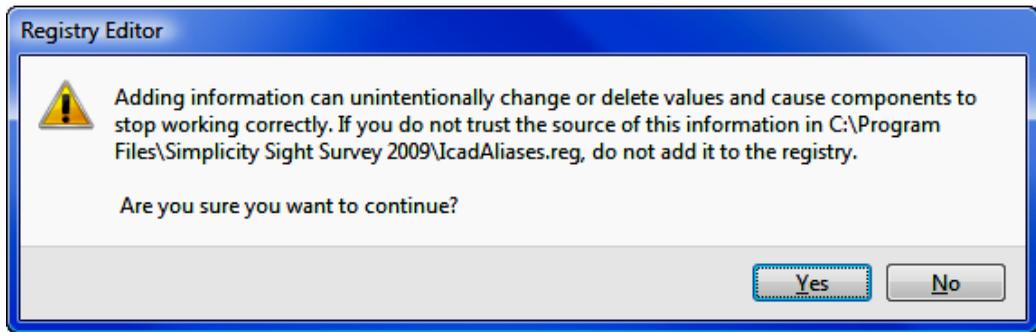


IntelliCAD has established several two-letter aliases which may be issued to call certain CAD routines from the command line. IntelliCAD also has the ability to pass two-letter commands back to "Sight" Survey. Approximately 30 two-letter commands from "Sight" Survey are used for other commands in IntelliCAD. So that you may use the "Sight" Survey commands, clicking the [**Set Aliases**] button will remap the IntelliCAD commands by simply placing a dash in front of the command. For example: In "Sight" Survey, the command **TR** is used for traverse. In IntelliCAD, **TR** is used to issue a trim command. After remapping the aliases, typing **TR [Enter]** in IntelliCAD will initiate the **Traverse** routine in "Sight" Survey. Typing **-TR** in IntelliCAD will initiate the **Trim** command.

When you click the [**Set Aliases**] button you will be asked to confirm your selection.



If you choose to continue (by clicking [**Yes**]) you will then see a warning about writing this new information to your system registry file.



After selecting [**Yes**] you will see a confirmation window. Once the aliases have been changed you will not need to do this again unless you reinstall "Sight" Survey and/or IntelliCAD.



HINT: Before overwriting the aliases, you may want to save a copy of the current alias file in IntelliCAD. There is no need to do this unless you have already customized the alias list in IntelliCAD. To save the current alias list, in Intellicad select **Tools > Customize**. Select the **Aliases** tab, then click [**Export**] and give the file a name.

Shown below is a listing of the aliases changed by the procedure outlined above. The new alias for each of these commands was produced by adding a dash to the original alias command.

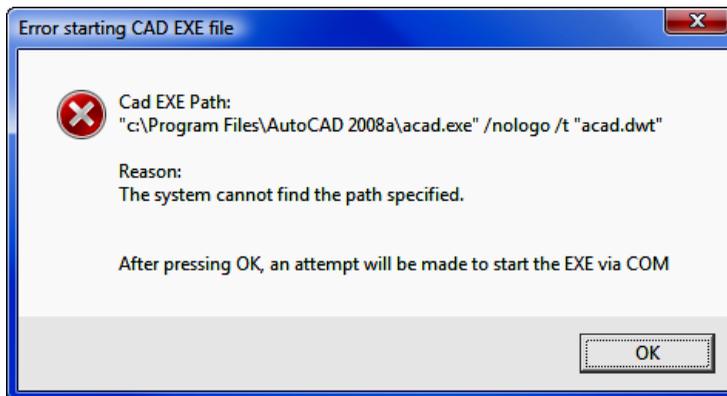
<u>ICAD Command</u>	<u>New Alias</u>	<u>ICAD Command</u>	<u>New Alias</u>	<u>ICAD Command</u>	<u>New Alias</u>
AREA	-AA	IDPOINT	-ID	CONFIG	-PR
ATTDISP	-AD	INTERSECT	-IN	PSPACE	-PS
APERTURE	-AP	ISOPLANE	-IS	REINIT	-RI
ARRAY	-AR	LIST	-LI	SCALE	-SC
BASE	-BA	LIST	-LS	FONT	-ST
COPY	-CO	MATCHPROP	-MA	TABLET	-TA
COPY	-CP	OPEN	-OP	TBCONFIG	-TO
DIST	-DI	SETESNAP	-ES	TRIM	-TR
DXFOUT	-DX	PASTESPEC	-PA	XREF	-XA
FILTER	-FI	POINT	-PO	INFLINE	-XL

[CAD Paths]: If you have multiple versions of a CAD application installed on your computer (for example AutoCAD 2006, 2008, & 2009; or MicroStation v8 & PowerDraft) click the **[CAD Paths]** button to set up the program path to each CAD application. These settings allow you to use any of the installed CAD applications with "Sight" Surveyy.

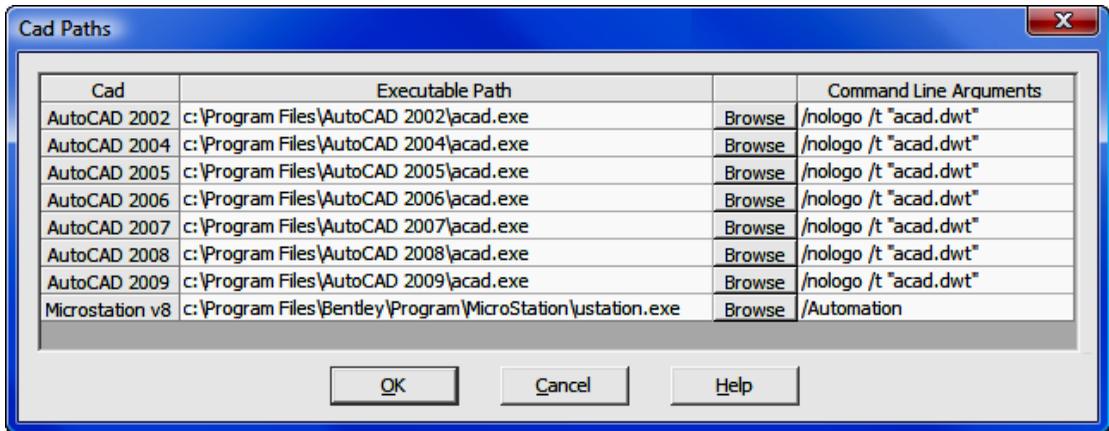


HINT: If you have only one version of a CAD application, you do not need to set the CAD path. **HOWEVER:** If you have LDD, AutoCAD Map, or some other flavor of AutoCAD that contains the actual CAD application, you must set the correct path. See **Using MAP, LDD, etc.** below.

If you start "Sight" Survey and get the following error screen, use **[CAD Paths]** to set the correct path.



When you click on [**CAD Paths**] you get this dialog screen:



The **Cad** column contains the versions supported by "Sight" Survey. The **Executable Path** column contains the actual path to the CAD application. Initially, default values are given. To change a path, click the [**Browse**] button and use the Windows File Selection dialog to find the correct path. The **Command Line Arguments** are used by the CAD application at startup. In AutoCAD, the argument **/nologo** suppresses the application start-up splash screen for faster loading; while the **/t "acad.dwt"** argument specifies the drawing template used to create a startup drawing. The actual "Sight" Survey drawing uses the template set by the [**AutoCAD Settings**] button when creating a new drawing. In MicroStation, the **/Automation** argument suppresses the startup screen and prompt for a drawing name. The command line arguments should not be changed.

Using MAP, LDD, etc.

You can use enhanced AutoCAD products that contain versions of AutoCAD by setting the CAD path. For example, if you want to use AutoCAD Map 2006, you would select [**CAD Paths**] then in the AutoCAD 2006 line, click [**Browse**] and find the location of the **acad.exe** file under the program folder containing AutoCAD Map. Then in "Sight" Survey you would select AutoCAD 2006 as your CAD program. You must take care to use the same year. In other words, you cannot put information for AutoCAD Map 2006 under the AutoCAD 2004 line.



NOTE: "Sight" Survey will not work with any version of AutoCAD LT.

5.04 COGO Configuration (KC)

FUNCTION: The **COGO Configuration** menu controls file formats and certain other startup options for "Sight" Survey.

Activate the **COGO Configuration** routine by picking from the **Config** menu; by pressing [**Alt**][**O**], [**G**], or by typing the two-letter command **KC** at any data entry prompt.

"Sight" Survey Configuration

Bearings Format	File Paths	Auto Backup
Text Output	Slope Entry	CAD
		Local
		COGO

Automatic Point Numbering (AN)
 Point Overwrite Protection (OP)
 Open Most Recent Job on Application Startup
 Prompt for Point Names (PN)

Default coordinate file format: Simplicity "Sight" Survey

X, Y Overlap Tolerance: feet
Z Overlap Tolerance: feet



CAUTION: Several configuration menu settings are dependent upon settings from other menus. For example, setting the directional units to Grads on the **Local Configuration** menu (**LC** - [Section 5.05](#)) will affect your options the **CAD**, **Text Output**, and **Bearings Format** menus. However, you must remember to click [**Apply**] at the bottom of the menu before any changes you make are accepted. Simply clicking on an item or changing a value does not change the setting unless you click [**OK**] or [**Apply**]. Clicking [**Apply**] will keep the configuration menu group open for multiple changes, while clicking [**OK**] will apply the changes and exit the menus.

Automatic Point Numbering: This check box will enable or disable automatic point numbering. When on, every prompt for a new point number will be populated with the next available point number.



NOTE: Use the **AN** routine code to toggle **Automatic Point Numbering** between **On** or **Off**.

Point Overwrite Protection: This check box will enable or disable automatic protection of already used points. When point overwrite protection is **On**, "Sight" Survey will warn you when you are about to overwrite an existing point. You may choose to either overwrite the point or enter a new point number. You may also manually override the point overwrite protection by placing an asterisk (*) immediately after the point number, such as **45***. Using the manual override method will suppress the warning message. We recommend that you always leave this setting **On**.

Open Most Recent Job on Application Startup: When this option is checked, "Sight" Survey will automatically open the last open job on startup.

Prompt for Point Description: When this option is checked, you will be asked to supply a point name or description of up to 28 characters in length whenever you enter or compute a new point. If you leave this option disabled, you can manually enter a point name using the **Identify Point** function (**ID** - [Section 6.03](#)).



NOTE: The two-letter code **NO** (for Names Output) can be used to toggle **Prompt for Point Description** between **On** and **Off**.

Default Coordinate File Format: Click [**▼**] to select the default coordinate file format. This format, unless changed on the **New Job** dialog (**NJ** - [Section 3.01](#)), will be used for coordinate file storage.

Offsets (OD): Selecting the [**Offsets (OD)**] button opens an **Offset Define** window. Using this window, you can add or delete offset values to be automatically used during **Traverse with Offset** routines (both line and arc). See [Section 6.21](#) for a complete discussion of the **Offset Define** function.

Constant Factor (CF): Selecting the [**Constant Factor (CF)**] button opens a dialog box into which you may enter a numerical constant that will be applied to each entered distance. Use constant factors for things such as: to convert feet to

meters (or any unit to another); to apply correction factors for steel tape measurements; to apply a grid factor, etc.

To invoke the constant factor on a particular distance, preface your distance entry with a semicolon (;) or follow the distance entry with the letter U, as in User defined constant. The letter's case does not matter. For example, if the multiplier is **0.90** and the measured distance is **300.00**, an entry of **;300** or **300u** would yield a distance entry of **270.00**, which equals **0.90 * 300**. To clear a **Constant Factor**, issue the **CF** command and enter a value of **1**.



The **Constant Factor** has several pre-programmed applications.

1. A value followed by the letter **T** will cause the correction factor to become a temperature correction for steel tapes. For example, the entry **88T** will convert to a factor for 88°F of $1+0.0000065*(88-68)$, ($1+0.000001161*(T-20)$ in metric units). The number entered may be the temperature in °F, or °C (if working in metric units). The formula assumes the tape was standardized at 68°F (or 20°C).
2. A distance value followed by any of the following letters indicates the distance is entered in units different than that specified as the working distance unit under the **Local Configuration** menu (**LC - Section 5.05**). Distances so entered are automatically converted to the specified local distance unit (US Survey Feet, International Feet, or Meters).

K = Kilometers

M = Meters

F = Feet*

I = Inches

C = Chains (66 US Survey feet)

L = Links (0.66 US Survey feet)

P = Pole or Perch (16.5 US Survey feet)

R = Rod (16.5 Survey feet)

U = The user defined Constant Factor

V = Vara (Value varies by region)

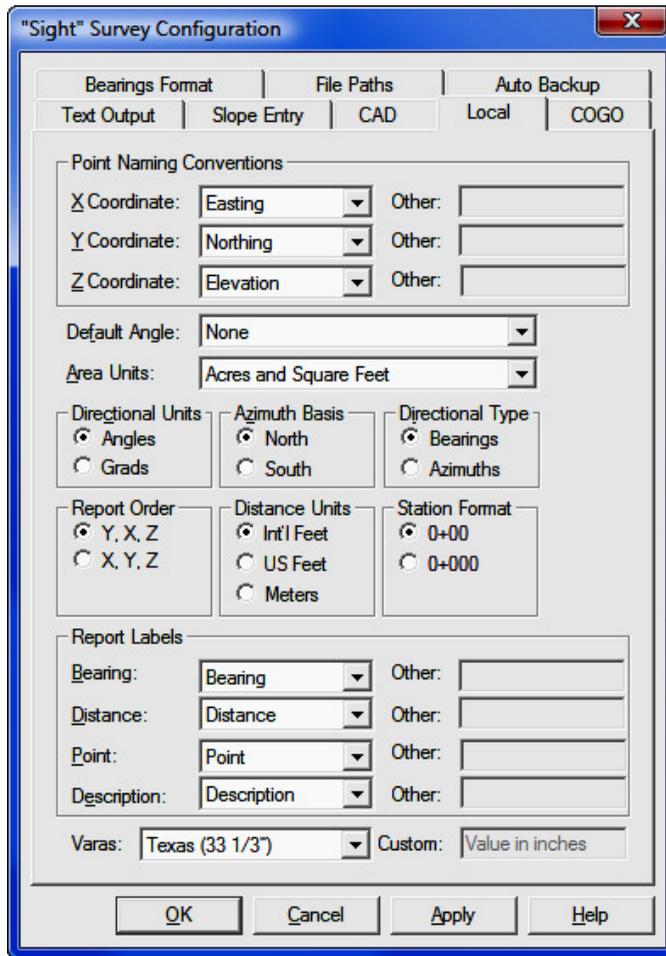
* When using the **F** (Feet) constant factor, "Sight" Survey will assume that it is the opposite of the specified local unit. For example, if the specified local unit is International Feet, an entry of 5280F would assume that you are entering 5280 US Survey Feet, which would convert to 5280.01056 International Feet.

See **Data Entry Basics - Distance Entry** ([Section 2.05](#)) for a complete listing of units and their conversion formulas. All conversions are computed by formula, not by conversion factors.

5.05 **L**ocal Configuration (LC)

FUNCTION: The **Local Configuration** menu allows you to set units, directional types, naming conventions, and reporting preferences.

Activate the **Local Configuration** routine by picking from the **Config** menu; by pressing [**Alt**][**O**], [**L**], or by typing the two-letter command **LC** at any data entry prompt.



CAUTION: Several configuration menu settings are dependent upon settings from other menus. For example, setting the directional units to Grads on the **Local Configuration** menu (**LC** - [Section 5.05](#)) will affect your options the **CAD**, **Text Output**, and **Bearings Format** menus. However, you must remember to click [**Apply**] at the bottom of the menu before any changes you make are accepted. Simply clicking on an item or changing a value does not change the setting unless you click [**OK**] or [**Apply**]. Clicking [**Apply**] will keep the configuration menu group open for multiple changes, while clicking [**OK**] will apply the changes and exit the menus.

Point Naming Conventions: "Sight" Survey allows you to choose titles for your coordinates. The choices you make here affect not only the reporting in the **Text Output** window, but also the prompting you see while using the program. Several choices are available. If you wish, you may even specify a custom title such as a foreign language word. Choose the coordinate names from the drop-down option list, or select **Other** to enter a custom title.

Default Angle: "Sight" Survey allows you to choose your default angle type. Choose from: **Azimuths**; **Angle Right**; **Deflect Right**; **Carlson**; and **None**. By setting a default angle type, "Sight" Survey will assume that any angular data NOT entered with a quad code is a default angle type (see **Data Entry Basics - Directional Entries** in [Section 2.06](#)). For example, if your default type is **Azimuths** and your azimuth basis is **North**, an angle entry of **135.1040** would be assumed to be a North azimuth of 135° 10' 40". You can override the default type by including a quad code, such as **17.3524SE**, and the entry would be treated as a bearing of S17° 35' 24"E.

The Carlson option allows directional entries in the same manner as other Carlson software products. In the Carlson option, the first number represents the quad code. This format allows you to complete your angle entry entirely from the numeric keypad. When using this option: 1 = NE; 2 = SE; 3 = SW; 4 = NW; 5 = Azimuth; 6 = angle left; 7 = angle right; 8 = deflect left; and 9 = deflect right.

If you want to enter quad codes for each entry, select a **Default Angle** of **None**.

Area Units: Choose how you want your area reported, as: **Square Feet**; **Square Feet & Acres**; **Square Meters**; or **Square Meters and Hectares**.



NOTE: *If you change the **Area Units**, "Sight" Survey will check for consistency with **Distance Units** and **Station Format**. You will be prompted to change any non-consistent settings.*

Directional Units: Choose your default directional unit as either **Degrees** or **Grads (gons)**. A grad is 1/400 of a circle. When entering grads, bear in mind that the entry is a decimal value, whereas even though a degree entry is keyed in as a decimal entry, it still represents a *d.mmss* format.

Azimuth Basis: Choose the basis for azimuth as either **North** or **South**.

Directional Type: This setting governs how directional data is presented in your drawing and in the **Text Output** window. Select either **Bearings** or **Azimuths**. If you select Azimuths, the data is reported with respect to the **Azimuth Basis**, North or South.

Report Order: this setting governs the column order in the **Text Output** window as well as the data entry order in "Sight" Survey's dialog boxes. The setting **Y, X, Z** corresponds to the commonly used Northing, Easting, Elevation. Dialog boxes will prompt for coordinates in the same order. The **X, Y, Z** setting would yield columns of Easting, Northing, Elevation and result in dialog boxes prompting in an Easting, Northing order.



NOTE: If you change the **Report Order**, a **Page Heading** indicating the new column titles will be automatically placed into your data print-out in the **Text Output** window. You may manually insert a page heading at any time by typing the two-letter command **PH**.

Distance Units: Set "Sight" Survey's default distance units as: International Feet; US Survey Feet; or Meters. This setting is used whenever you enter a distance using a constant factor. For example, if you are working in International Feet and enter a distance of 80C (80 chains), "Sight" Survey converts the entered distance to International Feet. (80C = 5280 US Survey Feet = 5280.01056 International Feet.) "Sight" Survey will report any change of distance units in the **Text Output** window.



NOTE: If you change the **Distance Units**, "Sight" Survey will check for consistency with **Area Units** and **Station Format**. You will be prompted to change any non-consistent settings.

Station Format: Choose how you enter and report stationing from two formats; **0+00**; and **0+000** (metric).



NOTE: If you change the **Station Format**, "Sight" Survey will check for consistency with **Area Units** and **Distance Units**. You will be prompted to change any non-consistent settings.

Report Labels: Just as "Sight" Survey allows you to select or customize **Point Naming Conventions**, you may also customize **Report Labels**. Several choices for each label are available. If you wish, you may even specify a custom

title such as a foreign language word. Choose the label names from the drop-down option lists, or select **Other** to enter a custom title.

Varas: The vara is a traditional unit of distance in Spanish and Portuguese speaking (or discovered) countries. The word *vara* means a stick or pole. In the US, descriptions containing the vara may be found in Texas, Florida, Colorado, and California. Further complicating matters is the fact that the length of a vara generally varies by region. "Sight" Survey contains eight pre-defined values from which to choose, or you may select **Custom** and enter a value to use. When entering a custom length, enter the value in inches.

Common vara definitions include: **Texas** (33 1/3"); **Colorado** (32.993"); **California** (33"); **Florida** (33.372"); **Mexico** (32.993") inches; southern **South America** (34"); **Spanish** (32.908"); **Portuguese** (43.3").

5.06 Bearings Format Configuration (FC)

FUNCTION: The **Bearings Format Configuration** menu is used to specify

Activate the **Bearings Format Configuration** routine by picking from the **Con-fig** menu; by pressing [**Alt**][**O**], [**B**], or by typing the two-letter command **FC** at any data entry prompt.

"Sight" Survey Configuration

Text Output | Slope Entry | CAD | Local | COGO

Bearings Format | File Paths | Auto Backup

Configure Bearing: Text Output CAD

Degrees

min. width:

fill char:

symbol:

Minutes

min. width:

fill char:

symbol:

Seconds

min. width:

fill char:

symbol:

Precision: ▼

Directional Indicators

North:

South:

East:

West:

Prefix:

Suffix:

Bearing Output Preview

Azimuth: (DMS)

Output Bearing: N 7° 04′ 05″ E



CAUTION: Several configuration menu settings are dependent upon settings from other menus. For example, setting the directional units to Grads on the **Local Configuration** menu (**LC** - [Section 5.05](#)) will affect your options the **CAD**, **Text Output**, and **Bearings Format** menus. However, you must remember to click [**Apply**] at the bottom of the menu before any changes you make are accepted. Simply clicking on an item or changing a value does not change the setting unless you click [**OK**] or [**Apply**]. Clicking [**Apply**] will keep the configuration menu group open for multiple changes, while clicking [**OK**] will apply the changes and exit the menus.

Configure Bearing: The **Bearings Format** dialog allows you to configure both text and CAD output. Select **Text Output** or **CAD**.

Degrees: Set the **min. width** (minimum width in # of characters), the **fill char** (fill character), and the **symbol**. The minimum width and fill character control the appearance of the numerical value. For example: an angle of 5 degrees can be shown as 5, 05, or 005 with respective min. width settings of 1, 2, 3 and a fill character of 0. The symbol can be whatever you want, such as the letter **d** or the degree symbol $^{\circ}$. To type a degree symbol, press & hold **[Alt]** while typing 246 from the numeric keypad. If you are working on a laptop without a numeric keypad, clicking the **[Reset to Defaults]** button will restore a degree symbol into this field. It is also a good idea (to increase the readability) to place a space after the degree symbol to introduce a space between the symbol and the first digit of the minutes value.

Minutes: Set the **min. width** (minimum width in # of characters), the **fill char** (fill character), and the **symbol**. The minimum width and fill character control the appearance of the numerical value. For example: a value of 5 minutes can be shown as 5 or 05 with respective min. width settings of 1 or 2 and a fill character of 0. The symbol can be whatever you want, such as a single apostrophe ('). It is also a good idea (to increase the readability) to place a space after the symbol to introduce a space between the symbol and the first digit of the seconds value.

Seconds: Set the **min. width** (minimum width in # of characters), the **fill char** (fill character), the **symbol**, and the **Precision**. (The **Precision** setting initially comes from the **Text Output** and **CAD Configuration** screens. Changes you make here will also be reflected on those screens.) The minimum width and fill character control the appearance of the numerical value. For example: a value of 5 seconds can be shown as 5 or 05 with respective min. width settings of 1 or 2 and a fill character of 0. The symbol can be whatever you want, such as a quote mark (").

Directional Indicators: When you are outputting bearings (as opposed to azimuths) you may set the directional indicators for North, South, East, and West. You may use an entire word, or an abbreviation. It is also a good idea (to increase the readability) to place a space after indicators that come before the numerical value, and a space before the indicators that come after the numerical value.

If you are using azimuths, a prefix of NAz or SAz will be added to **Text Output** entries. For CAD entries, type the prefix or suffix you want to add to the numerical entry. Again, include a space after a prefix, and before any suffix.

Prefix: Enter any text you want to prefix your bearing/azimuth entry.

Suffix: Enter any text you want to append to your bearing/azimuth entry.

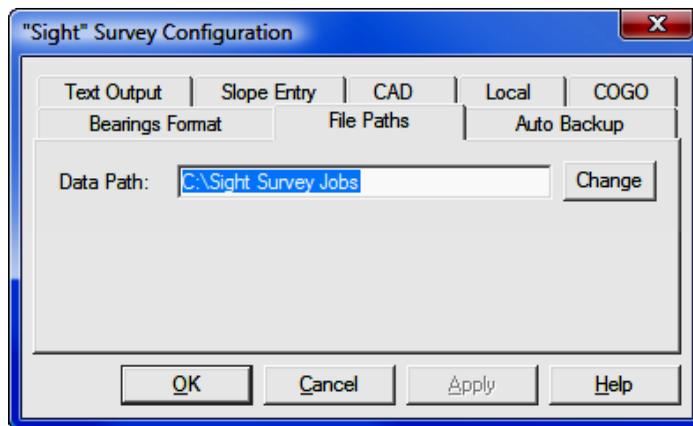
[Reset to Defaults]: Click this button to reset all the values to default values.

Bearing Output Preview: This window is used to test and preview your settings. Enter a bearing value in the format D.MMSS. We suggest using something like **7.0405**. The single digit degrees, minutes and seconds values will help you test your fill character settings. As you adjust your settings, a preview of your bearing or azimuth appears below the **Azimuth** entry box.

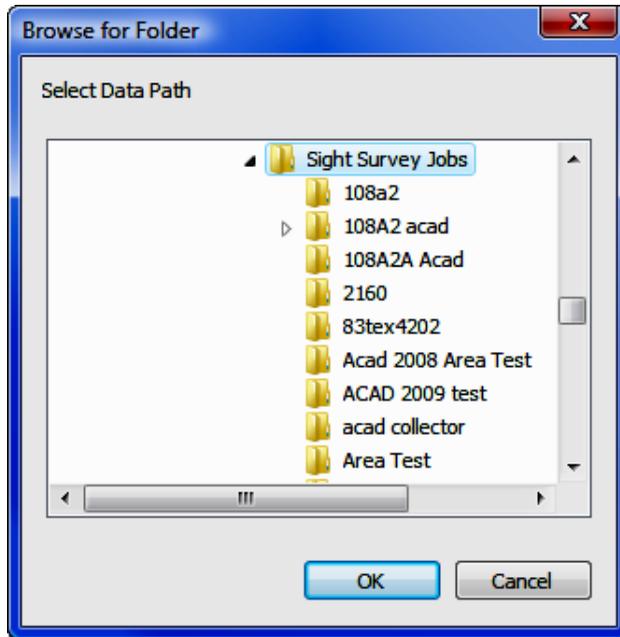
5.07 File Path Configuration (FP)

FUNCTION: The **File Path Configuration** menu is used to specify the default path to "Sight" Survey job files.

Activate the **File Path Configuration** routine by picking from the **Config** menu; by pressing [**Alt**][**O**], [**F**], or by typing the two-letter command **FP** at any data entry prompt.



Data Path: Select a new data path (the default location for "Sight" Survey jobs) by clicking on [**Change**] to open a selection dialog.

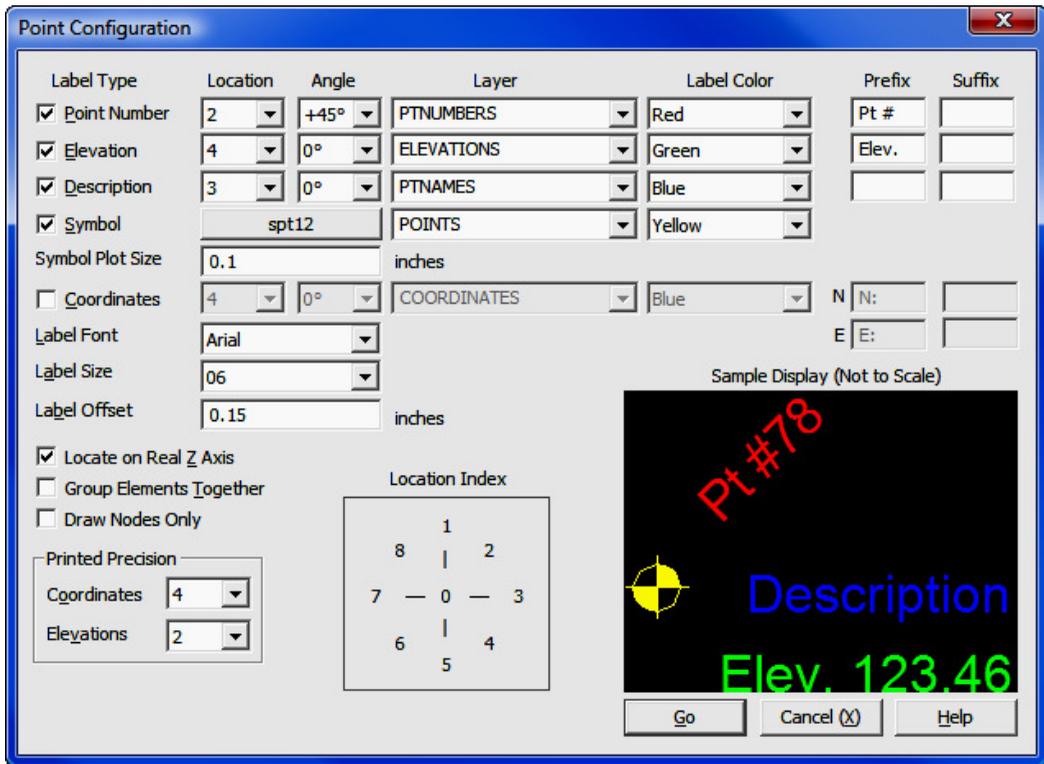


Use your mouse to select the new data path and click [**OK**] to close this window. Then click [**OK**] again to close the configuration menu window or click [**Apply**] and select another configuration menu.

5.08 Point Configuration (PC)

FUNCTION: The **Point Configuration** routine is a visual interface that allows you to setup how "Sight" Survey draws points on the drawing.

Activate the **Point Configuration** routine by picking from the **C**onfig menu; by pressing [**Alt**][**O**], [**P**], or by typing the two-letter command **PC** at any data entry prompt.



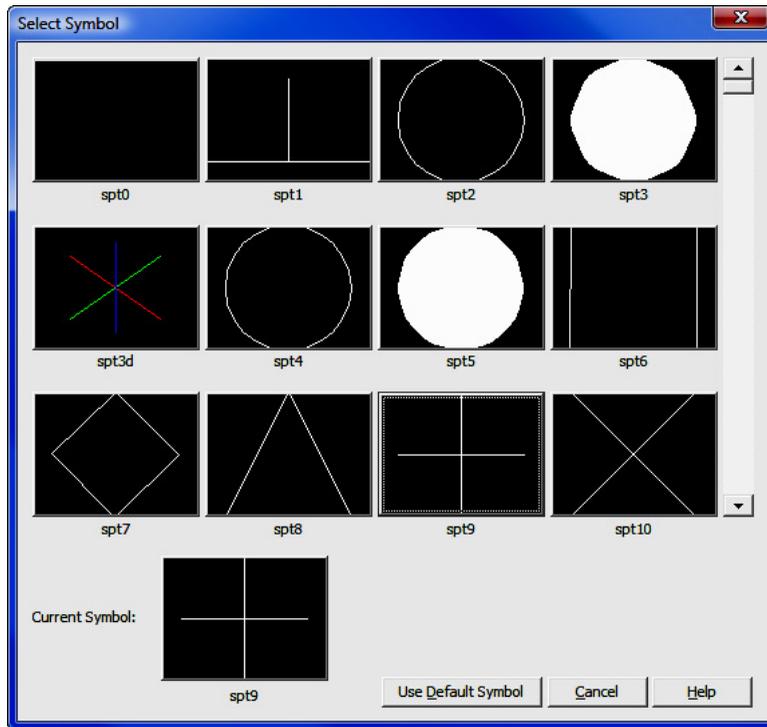
Label Type: Select the elements you want drawn at each point, then for each element select the parameters as described below. You may draw up to five elements at any point, including: point number; elevation; description; symbol; and coordinate values.

Symbol: Click the button to select a symbol to be drawn at the point. ***This symbol will be used unless a symbol has been previously assigned to a point by one these methods:***

1. If you have used the **Point Manager (PM - [Section 6.09](#))** to assign or change the symbol associated with the point, the setting in the **Point Manager** will override any symbol set in this **Point Configuration** routine.
2. If you have coded this information in the field, the **Draw Field to Finish (FF - [Section 6.33](#))** routine will use your field-coded symbols during field-to-finish processing. Once **Draw Field to Finish** has been run, these

symbols are assigned to their respective points. You may change the association by using the **Point Manager**, but running **Draw Field to Finish** again will reset it to the field-coded symbol.

To select a symbol, use the slider bar on the right side of the **Select Symbol** dialog until the desired symbol is visible, then left-click on the symbol.



Symbol Plot Size: Enter the size for plotted symbols. This size is relative to the selected drawing scale set in **CAD Configuration (CM - [Section 5.03](#))**. For example, if you have set your drawing scale to 1" = 100' and your symbol plot size to be 0.10", that is the size symbols will appear on your plotted drawing. If you should change your drawing scale to 1"=50', those same symbols would double in size and be plotted to 0.20".

Location: Click [▼] to select a location at which that particular element will be drawn. Refer to the **Location Index** to the left of the **Sample Display**.

Angle: Click [▼] to select an angle at which that particular element will be drawn. You may choose from **-90°** to **90°** (0° is horizontal), or at any 10° increment in between. There are also available settings at **45°** and **-45°**.

Layer: Click [▼] to select a layer upon which to draw the element. ***For Symbols, this layer will be used unless a point layer has been previously assigned to a point by one these methods:***

1. If you have used the **Point Manager (PM - [Section 6.09](#))** to assign or change the layer associated with the point, the setting in the **Point Manager** will override any symbol layer set in this **Point Configuration** routine.
2. If you have coded this information in the field, the **Draw Field to Finish (FF - [Section 6.33](#))** routine will use your field-coded symbols and layers during field-to-finish processing. Once **Draw Field to Finish** has been run, these symbols and layers are assigned to their respective points. You may change the association by using the **Point Manager**, but running **Draw Field to Finish** again will reset it to the field-coded symbol and layer.

Label Color: Click [▼] to select a color in which that particular element will be drawn.

Prefix: Enter an optional prefix to be placed as part of the element. For example, you might want to add **Pt #** as a prefix to your point numbers, or **Elev.** as a prefix to your elevation values. Be sure to include any spaces you may want to place between the prefix and the element.

Suffix: Enter an optional suffix to be placed as part of the element. For example, you might want to add **Elev.** as a suffix to your elevation values. Be sure to include any spaces you may want to place between the element and the suffix.

Label Font: Click [▼] to select a text font in which the labels will be drawn. While you can mix label colors, you cannot mix label fonts or sizes.

Label Size: Click [▼] to select a text size in which the labels will be drawn. While you can mix label colors, you cannot mix label fonts or sizes.

Label Offset: Enter the distance of separation from the point to the point label. This is the actual distance between the two elements when the drawing is

plotted at the specified scale. The units are controlled by your selection of **Distance Units** in the **Local Configuration** menu ([LC - Section 5.05](#)).

Locate on Real Z axis: Check this setting if you want the symbol and related elements to be placed into the drawing at the real elevation (z-axis) of the point. If unchecked, the elements will be drawn at a zero elevation.

Group Elements Together

: Check this setting if you want all the elements for each point to be grouped together. Grouping the elements will make it easier to move or remove a point and all associated elements from the drawing.

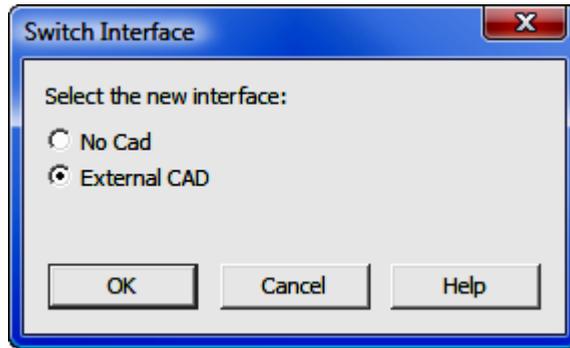
Draw Nodes Only: Select this setting to draw only the point entities (nodes) with no annotation. Points can act as nodes to which you can snap objects. You can specify a full three-dimensional location for a point. Node appearance is controlled in AutoCAD and IntelliCAD by the system variables **PDMODE** and **PDSIZE**. In MicroStation, the point node is actually a zero-length line. See [Section 6.11](#) for additional information.

Printed Precisions: Printed precision is nothing more than the number of places that your CAD annotation will be carried out to. The settings here are for CAD annotation only. Settings for printed precision have nothing to do with the internal precision of calculations. Your choices are: **Coordinates** - 0 to 6; **Elevations** - 0 to 3.

5.09 Switch Interface

FUNCTION: The **Switch Interface** routine is used to change to a different "Sight" Survey user interface. "Sight" Survey offers two user interfaces: external CAD; and no CAD.

Activate the **Switch Interface** routine by picking from the **Config** menu or by pressing [**Alt**][**O**], [**I**].



When the dialog appears, your current choice is selected. Click on any unselected choice and click [**OK**].

No CAD Interface: If you are originally in the **External CAD** interface and you switch to the **No CAD** interface, "Sight" Survey disconnects your CAD drawing and changes the interface. Your CAD program remains open, but unhooked from "Sight" Survey.

External CAD Interface: If you are originally in the **No CAD** interface and you switch to the **External CAD** interface, "Sight" Survey changes the interface and opens your external CAD program. If your **External CAD** program is AutoCAD and you have a .DWG file associated with the current job, it will be loaded. If your **External CAD** program is MicroStation and you have a .DGN file associated with the current job, it will be loaded. If there are no CAD files presently associated with the current job, a new drawing file will be opened.

5.10 Drawing Properties (PR)

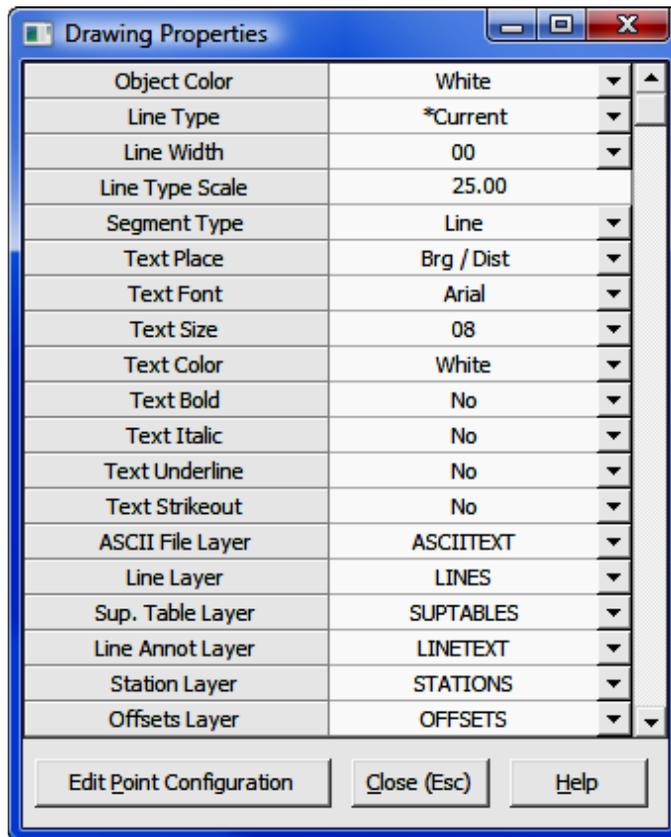
FUNCTION: The **Drawing Properties** menu contains items that affect the appearance of your drawing for objects and text placed in the drawing by COGO routines.

Activate the **Drawing Properties** routine by picking from the **Config** menu; by pressing [**Alt**][**O**], [**D**]; or by typing the two-letter command **PR** at any data entry prompt.



NOTE: Use the **Point Configuration (PC - [Section 5.08](#))** routine to set up text, layer, and symbol properties for point entities. Click the [**Edit Point Configuration**] button at the bottom of the **Drawing Properties** window to activate the **Point Configuration** dialog.

The **Drawing Properties** window allows you to tailor "Sight" Survey's drawing options to your own preference. "Sight" Survey uses these settings to create your drawing in the **Drawing** window. For example, when "Sight" Survey draws a line, it creates the line using the values set for the **Object Color**, **LineType**, **Line Width** and **Line Layer** properties.



Setting Values

To set a **Value** (right-hand column) for any **Property** (left-hand column), follow these general instructions:

1. Select a **Property** by clicking your mouse anywhere on the **Property's** name or in its **Value** box. A settings selection list will replace the **Value** box (except for **Line Type Scale** which takes a manual entry).
2. Use your keyboard up and down arrows to scroll through the available settings, or click the scroll bar next to the selection list to pull down a settings menu.
3. Select the desired setting with your mouse, or use your keyboard up and down arrows to highlight the desired setting and then press [**Enter**].
4. When you are done making selections in the **Properties** window, click [**Close**] to close the **Drawing Properties** window.



NOTE: If you prefer, you can leave the **Drawing Properties** window open and drag it to another screen location. Use the standard Windows technique for dragging windows to a new location.



HINT: Drawing properties set via the **Drawing Properties** window affect subsequent items placed into the drawing. Properties do not retroactively affect items already in the drawing. To change the properties of an existing item in the drawing, use the procedures dictated by your CAD application.

Available Settings

Object Color: The **Object Color** property is used to specify the color of the object (lines, arcs, etc., but not symbols or text) to be drawn.

When the **Object Color** is set to **BY LAYER**, "Sight" Survey will draw all lines in the pen color associated with the layer that is currently assigned to the line layer. To change the layer settings refer to the **Edit Layers (LA - [Section 4.05](#))** routine or use commands in your CAD application.

Line Type: The **Line Type** property is used to specify the type of line that is drawn between points. Several different line types may be available since this list reflects the line types contained within the drawing or drawing template.

When **Line Type** is set to **BY LAYER**, "Sight" Survey will draw all lines in the line type associated with the layer that is currently assigned to the line layer. To change the layer settings refer to the **Edit Layers** (**LA** - [Section 4.05](#)) routine, or use commands in your CAD application.

Line Width: The **Line Width** property is used to specify the width of line that is drawn between points. The available values range from **1** to **10**, where the unit is in tenths of a millimeter.

When **Line Width** is set to **BY LAYER**, "Sight" Survey will draw all lines in the line type associated with the layer that is currently assigned to the line layer. To change the layer settings refer to the **Edit Layers** (**LA** - [Section 4.05](#)) routine, or use commands in your CAD application.

Line Type Scale: The **Line Type Scale** property is used to control the visual scaling of line types in the drawing. When set to 1, there is no scaling. Generally, this value is determined by the drawing scale of the final printed drawing. For example, if you plan to plot a drawing at 1" = 50', set your **Line Type Scale** to **50** so that your dashed and custom lines will plot correctly. To set or change a value, simply type in the value. When changed, **Line Type Scale** will affect all lines placed subsequent to the change in scale. To change the **Line Type Scale** of an existing line: In AutoCAD and IntelliCAD, double-click on the line then set the new **Line Type Scale** in the properties window that appears; In MicroStation, select the line and in the Key-In box type **\LTSCALE x**, where **x** is the scale factor.

Segment Type: The **Segment Type** property is used to identify the nature of line segments to be drawn. You may choose from: **3D Polyline**; **2D Polyline**; and **Line**.



USING 3D POLYLINES IN AUTOCAD & INTELLICAD: *Be aware that in AutoCAD and IntelliCAD, 3D polylines cannot contain arcs, display linetypes, or show width or thickness. However, you can assign a linetype style to a 3D polyline and it will retain the information. Simply save the drawing, explode the 3D polylines before you plot, then undo to restore the 3D polylines.*

Text Place: The **Text Placement** property is used to specify how you want "Sight" Survey to annotate lines or place text on the drawing. The available options are:

- **/ Brg** - Annotates lines with the bearing below the line.
- **/ Brg Dist** - Annotates lines with both bearing and distance below the line.
- **/ Dist** - Annotates lines with the distance below the line.
- **/ Label** - Annotates lines with a label below the line. After you enter the label, "Sight" Survey will use that label for all lines drawn until a different text placement option is selected.
- **Brg /** - Annotates lines with the bearing above the line.
- **Brg / Dist** - Annotates lines with the bearing above the line and distance below the line.
- **Brg Dist /** - Annotates lines with both bearing and distance above the line.
- **Dist /** - Annotates lines with the distance above the line.
- **Dist / Brg** - Annotates lines with the distance above the line and the bearing below the line.
- **Label /** - Annotates lines with a label above the line. After you enter the label, "Sight" Survey will use that label for all lines drawn until a different text placement option is selected.
- **None** - Shuts off the line and arc annotation.

Text Font: The **Text Font** property is used to specify the name of the text font you want to use for the text on your drawing. "Sight" Survey does not contain any fonts. The drop-down list will contain all of the fonts installed on your computer.

Text Size: The **Text Size** property is used to specify the size of the text to be placed on your drawing. Sizes range from 1 to 100, where each increment equals $\frac{1}{100}$ of an inch. For those familiar with Leroy lettering templates, these sizes (x 10) will equal Leroy sizes; e.g. 8 = Leroy 80.

The actual plotted text size is determined entirely by the final scale that the drawing is plotted at. If you plot the final drawing at a scale that is different from what you entered for a final scale when you started the drawing in "Sight"

Survey, your text size will not be correct. For example, if you enter the final scale as 100 within "Sight" Survey, but you actually plot the drawing within CAD at a 50 scale, your text (and symbols) will be double their expected size.

When a line being annotated is too short to support the text being placed on it, a label will be assigned to the line and placed above the line. The label will begin with the letter "L" and follow with a number that represents that line in the **Short Line Table** (**SL** - [Section 12.04](#)) which can later be placed on your drawing. "Sight" Survey's course of action depends upon the **Short Line Distance** setting in the **CAD Configuration** menu (**CM** - [Section 5.03](#)).

Text Color: The **Text Color** property is used to specify the color of the annotation and notation text to be drawn. **Text Color** operations are basically identical to setting the **Object Color**.

When the **Text Color** property is set to **BY LAYER**, "Sight" Survey will place all text in the color associated with the layer that is currently assigned to the layer for the type of text being placed. For example, **Bearings** are placed in the color assigned to the **Line Annotation Layer**, etc.)

Text Bold: The **Text Bold** property is used to specify whether or not you want the drawing text to be placed in a bold typeface. When **Text Bold** is **Yes**, text will be placed in a darker, **bold typeface**. When **Text Bold** is **No**, the text will be placed in a regular typeface.

Text Italic: The **Text Italic** property is used to specify whether or not you want the drawing text to be placed in an italic typeface. When **Text Italic** is **Yes**, text will be placed in an *italic typeface*. When **Text Italic** is **No**, the text will be placed in a regular typeface.

Text Underline: The **Text Underline** property is used to specify whether or not you want the drawing text to be underlined. When **Text Underline** is **Yes**, text will be placed in an underlined typeface. When **Text Underline** is **No**, the text will be placed in a regular typeface.

Text Strikeout: The **Text Strikeout** property is used to specify whether or not you want the drawing text to be placed with a strikeout, such as ~~this~~. When **Text Strikeout** is **Yes**, text will be placed with a ~~strikeout~~. When **Text Strikeout** is **No**, the text will be placed in a regular typeface.

ASCII File Layer: The **ASCII File Layer** property is used to specify the name of the layer for imported ASCII text files. The default name for this layer is **ASCII TEXT**. Click [▼] to select a layer, or simply type in the name of a new or existing layer.



HINT: For any of the **Layer** properties, if the layer you wish to use has not yet been defined, add it by typing the new layer name into the **Value** (right-hand) column. New layers that are added in this manner (versus using **Edit Layers**) are only created and saved in the drawing file if they contain data or are set as the current value for a **Property** (left-hand column) when the file is closed.

Line Layer: The **Line Layer** property is used to specify the name of the layer for lines, arcs, random curves, circles, rectangles, and custom lines (including text and symbols placed along custom lines). The default name for this layer is **LINES**. Click [▼] to select a layer, or simply type in the name of a new or existing layer.

Sup. Table Layer: The **Supplemental Table Layer** property is used to specify the name of the layer for the curve and short-line tables. The default name for this layer is **SUPTABLES**. Click [▼] to select a layer, or simply type in the name of a new or existing layer.

Line Annotation Layer: The **Line Annotation Layer** property is used to specify the name of the layer for bearings, distances, curve lengths, curve labels, and short-line labels. The default name for this layer is **LINETEXT**. (Text characters drawn as a part of custom lines are placed on the **Lines Layer**.) Click [▼] to select a layer, or simply type in the name of a new or existing layer.

Station Layer: The **Station Layer** property is used to specify the name of the layer for stationing. The default name for this layer is **STATIONS**. Click [▼] to select a layer, or simply type in the name of a new or existing layer.

Offsets Layer: The **Offsets Layer** property is used to specify the name of the layer for offset lines and annotation when they are placed by the various perpendicular offset routines. The default name for this layer is **OFFSETS**. Click [▼] to select a layer, or simply type in the name of a new or existing layer.

[**Edit Point Configuration**]: Click this button to call the **Point Configuration** routine (**PC** - [Section 5.08](#)).

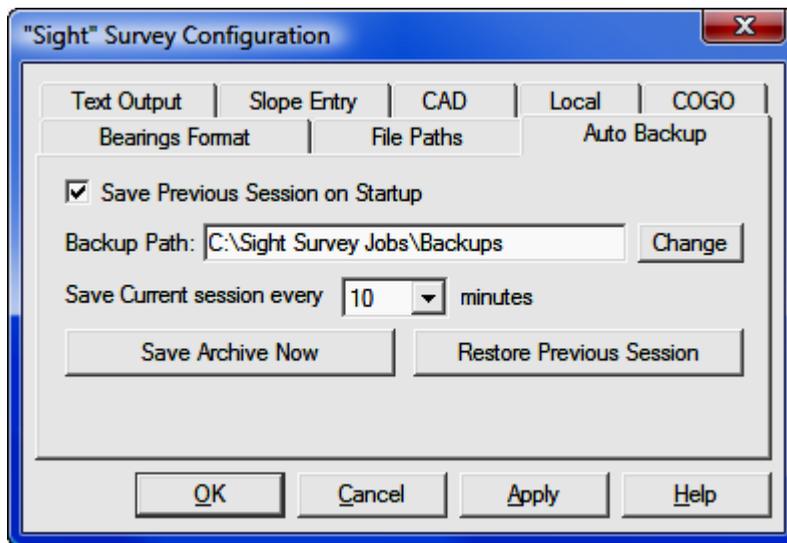
5.11 Auto Backup Settings (BU)

FUNCTION: The **Auto Backup Settings** routine allows you to set "Sight" Survey to automatically save your work at specified intervals ranging from 0 (off) to 60 minutes in 10 minute increments. This routine will also help you create an archive copy of your job and/or restore a job from the previous session.

Activate the **Auto Backup Settings** routine by picking from the **Config** menu; by pressing [**Alt**][**O**], [**A**], or by typing the two-letter command **BU** at any data entry prompt.



JOB FOLDERS ARE REQUIRED: In order to use **Auto Backup**, your job must be in its own job folder. Auto backup will not work on files that are directly located in the "Sight Survey Jobs" folder.



Save Previous Session on Startup: Check this box to have "Sight" Survey save an archive copy of your job as it is first loaded into memory. Saving an archive copy on start-up may cause a few moments of delay while the file is copying. Archive copies are stored under the **Backup Path** location in a job folder named the same as your working job folder. Archive files are not affected by incremental auto-backups; they are only created on startup of if you select [**Save Archive Now**].



NOTE: *If you select **Save Previous Session on Startup**, and an archive file already exists when "Sight" Survey starts, you will need to confirm your intention to create a new archive file. This is done to preserve your opportunity to restore a previous session before that previous session is overwritten by a new archive file.*

Backup Path: Click the [**Change**] button to set the path to your backup files. This path should not be the same location as your job file, nor does it even need to be on the same hard drive. Your job will be archived to this location when you start your job or click [**Save Archive Now**]. Auto-saves, or incrementally timed file-saves, will save to the existing job folder.

Save Current Session every ?? minutes: Click [**▼**] to set the save interval. Available settings are in 10 minute increments from **0** (no auto-backup) to **60** minutes. The auto-backup function does not create an archived backup file, but rather it simply saves your current work in the job folder.

[**Save Archive Now**]: Click this button to create an immediate archive copy of your current file. This backup copy will overwrite any archive copy for the current job that resides in the backup path. At the end of a session, you may want to use this function to archive a backup copy to a network drive or some other removable storage device. You will be asked to confirm your decision.

[**Restore Previous Session**]: Click this button to overwrite the current job files with the previously archived backup file. You will be asked to confirm your decision.



WARNING: *When you **Restore Previous Session**, note that this file is from a previous session and it may overwrite data that you wish to retain. Proceed at your own risk!*

[**Apply**]: Click this button to apply the auto-backup settings. The "**Sight**" **Survey Configuration** window stays open for other changes.

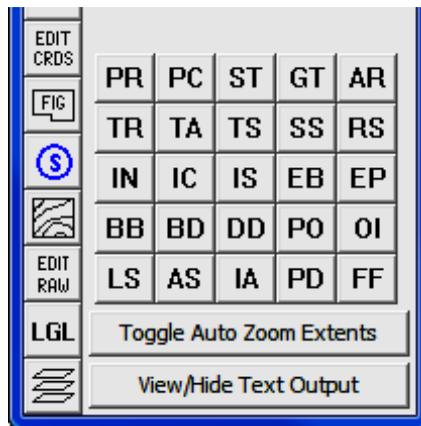
[**OK**]: Click this button to apply the auto-backup settings and exit "**Sight**" **Survey Configuration** window.

5.12 Edit User Toolbar Commands

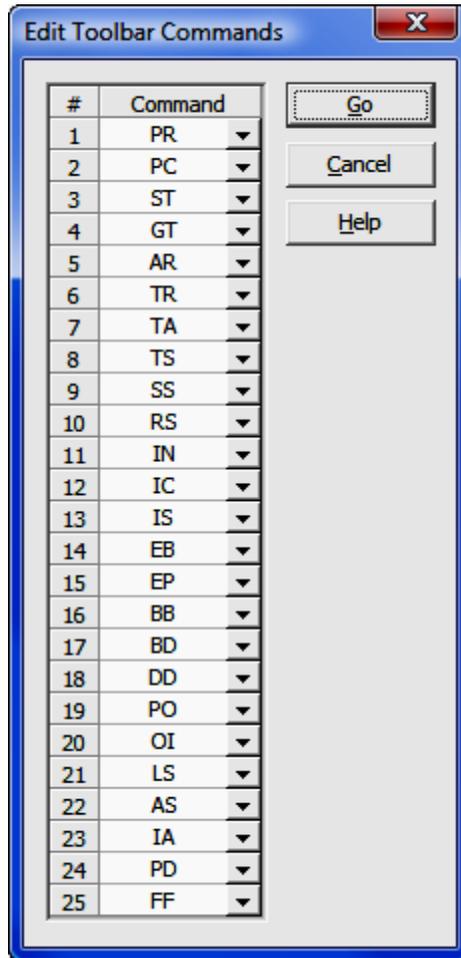
FUNCTION: The **Edit User Toolbar Commands** routine allows you to set up 25 buttons with Sight Survey command codes to quick launch designated routines. This user definable toolbar is located below the data entry area.

Activate the **Edit User Toolbar Commands** routine by picking from the **Config** menu; or by pressing [**A**lt][**O**], [**U**].

The user toolbar is a grouping of 25 buttons located toward the bottom of "Sight" Survey's main window. Two-letter routine commands may be assigned to these buttons in whatever order you prefer. Buttons are assigned left-to-right, by row.



When you activate the **Edit User Toolbar Commands** routine, "Sight" Survey starts the **Edit Toolbar Commands** dialog box.



To change or assign a command to a button, click [▼] and select a new routine code, or highlight the value already in the field and enter the code manually. Only two-letter commands work in the user-definable toolbar.

When you have finished editing and/or assigning commands to buttons, click [**Go**] to close the dialog box and update the toolbar.

Section 6

The Points Menu

Enter and Assign (EA)
Enter Elevation (EZ)
Identify Point (ID)
Enter Station (ES)
Start At (ST)
Go To (GT)
Enter Backsight Point (EP)
Enter Backsight Bearing (EB)
Point Manager (PM)
Point Plot (PP)
Draw All Points (DL)
List Coordinates (PM)
Blank Point Scan (BP)
Renumber Points (RP)
Copy Block of Points (CB)
Clear Coordinates (CC)
Clear Point Names (CN)
Clear Point Stations (CS)
Edit Default Descriptions (AP)
Define Figures (Point Groups) (DF or PG)
Define Offsets (OD)
Coordinate Transformation (CT) ▶
Rotation Point and Angle Known
Two Points in Each System Known
US Survey Feet to Meters
US Survey Feet to Int'l Feet
Meters to US Survey Feet
Meters to International Feet
International Feet to Meters
Int'l Feet to US Survey Feet
Lat/Lon to Grid
Grid to Lat/Lon
Grid to Grid
Draw Field to Finish (FF)
Delete Field to Finish (XF)
Compare Points

The **Points** menu contains commands that typically deal with an individual point and not with that point's relationship to other points. Here you will find commands to change aspects of a point such as the point's coordinates or station as well as commands to change information about the currently held position. Many of the items listed individually on the **Points** menu are also available through the use of the **Point Manager** (see [Section 6.09](#))

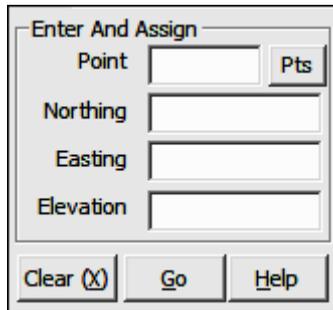
The **Point Manager** is a powerful tool for use in selecting points, editing points, and defining data sets as point groups. The **Point Manager** may be accessed by typing the two-letter command **PM**, or by left-clicking on the [**Pts**] button. You also have the option of opening the **Point Manager** immediately after opening a job file.

Also contained on this menu is the option to **Draw Field to Finish**, automatically producing a drawing from field-coded information.

6.01 Enter and Assign (EA)

FUNCTION: The **Enter and Assign** routine is used to assign Northing, Easting, and elevation coordinates to a point, or to edit coordinates of an existing point. Point descriptions may also be added or changed using this function.

Activate the **Enter and Assign** routine by picking from the **Points** menu; by pressing [**Alt**][**P**], [**E**]; or by typing the two-letter command **EA** at any data entry prompt.



Point: Type a point number and press [**Enter**] or [**Tab**]. If you have turned on automatic point numbering, that field will already be filled, but you may override the value it contains. To enter an alpha-numeric point number (e.g. **PIN3456**, or **22S30**) you must precede the point number with an apostrophe (') to alert "Sight" Survey that you are not attempting to enter a two-letter command to change routines. For example: '**PIN3456**', or '**22S30**'.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Northing: Type in a Northing (Y) coordinate value or accept any value shown and press [**Enter**] or [**Tab**].

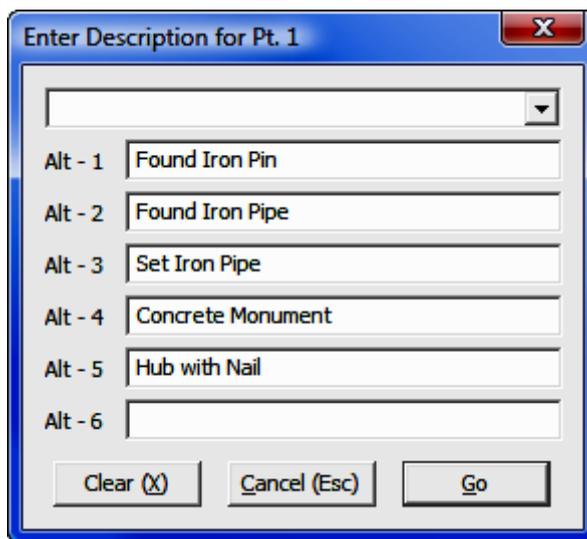
Easting: Type in a Easting (X) coordinate value or accept any value shown and press [**Enter**] or [**Tab**].

Elevation: Type in an elevation (Z) coordinate value or accept any value shown and press [**Enter**] or [**Tab**]. If you are not assigning an elevation to the point you may leave this field blank.

[**Clear**]: Click [**Clear**] to erase the contents of all the fields in the dialog box. The **Enter and Assign** routine remains active.

[**Go**]: Upon the conclusion of the data entry for each point, click [**Go**] or press [**Enter**]. "Sight" Survey will print the point number, ID, and its Northing, Easting and elevation into the **Text Output** window, and plot the point if a CAD drawing is active and your point properties are set to plot points under the **Point Configuration** menu (**PC** - [Section 5.08](#)). To exit the routine at any time, simply select another routine from the menus, or type a valid two-letter command in any data entry box.

If you have turned on the **Prompt for Point Names (PN** - [Section 5.04](#)) option, you will be prompted for a point description after you have entered the coordinate values. To enter a new description simply type the description and press [**Enter**] or click [**Go**]. You may select one of other descriptions shown by picking with your mouse, or by pressing [**Alt**][**#**], where **#** is **1** through **6**.

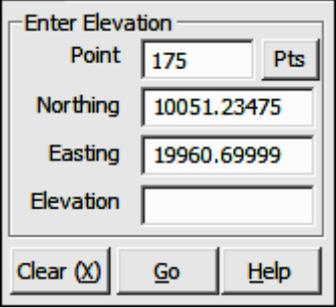


After entering or selecting a description, "Sight" Survey will print the point number, ID, and its Northing, Easting and elevation in the **Text Output** window and return you to the **Enter and Assign** dialog box. To exit the routine at any time, simply select another routine from the menus, or type a valid two-letter command in any data entry field.

6.02 Enter Elevation (EZ)

FUNCTION: The **Enter Elevation** routine is used to assign an elevation to an existing point, or to edit the elevation of an existing point. Northing and Easting coordinates and point descriptions may also be added or changed using this function.

Activate the **Enter Elevation** routine by picking from the **Points** menu; by pressing [**Alt**][**P**], [**Z**]; or by typing the two-letter command **EZ** at any data entry prompt.



Enter Elevation	
Point	175 Pts
Northing	10051.23475
Easting	19960.69999
Elevation	
Clear (X) Go Help	

Point: Type in the point number of the point to which you wish to assign an elevation and press [**Enter**] or [**Tab**]. To enter an alpha-numeric point number (e.g. **PIN3456**, or **22S30**) you must precede the point number with an apostrophe (') to alert "Sight" Survey that you are not attempting to enter a two-letter command to change routines. For example: '**PIN3456**, or '**22S30**.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Northing & Easting: These fields will be automatically populated with existing data. If the fields are blank, the point has not yet been assigned and you may treat the data entry as though you were in the **Enter and Assign** routine (**EA** - [Section 6.01](#)). If you change either of the existing coordinate values it will reassign the new coordinates to your point.

Elevation: If the point exists, the **Elevation** field will contain a blinking cursor (or it will be highlighted), waiting for you to type in a new value. Type the elevation for this point and click [**Go**] or press [**Enter**].

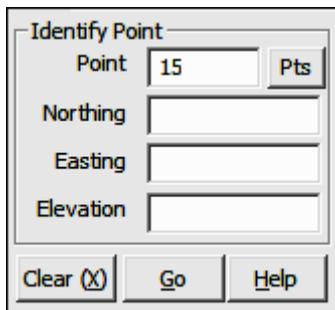
[**Clear**]: Click [**Clear**] to erase the contents of all the fields in the dialog box. The **Enter Elevation** routine remains active.

[**Go**]: "Sight" Survey will print the point number, ID, and its Northing, Easting and elevation into the **Text Output** window, and plot the point if a CAD drawing is active and your point properties are set to plot points under the **Point Configuration** menu (**PC** - [Section 5.08](#)). To exit the routine at any time, simply select another routine from the menus, or type a valid two-letter command in any data entry field.

6.03 Identify Point (ID)

FUNCTION: The **Identify Point** routine is used to add or change an identifying name (or point descriptor) on an existing point.

Activate the **Identify Point** routine by picking from the **Points** menu; by pressing [**Alt**][**P**], [**I**]; or by typing the two-letter command **ID** at any data entry prompt.



The image shows a dialog box titled "Identify Point". It has four input fields: "Point" (containing "15" and a "Pts" button), "Northing", "Easting", and "Elevation". At the bottom, there are three buttons: "Clear (X)", "Go", and "Help".

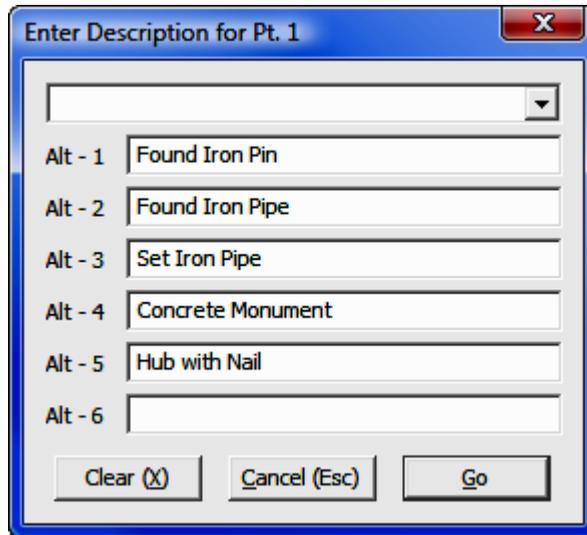
Point: Type a point number to which you want to assign a name (or descriptor) and press [**Enter**] or [**Tab**]. To enter an alpha-numeric point number (e.g. **PIN342**, or **22S30**) you must precede the point number with an apostrophe (') to alert "Sight" Survey that you are not attempting to enter a two-letter command to change routines. For example: '**PIN342**, or '**22S30**.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

If the point has not been previously assigned coordinates, the entry field for the Northing will be the highlighted field, and you may treat the data entry as though you were in the **Enter & Assign** routine (**EA** - [Section 6.01](#)).

If the point exists, the **Enter Description** dialog box will appear, awaiting your description entry. To enter a new description simply type the description and press [**Enter**] or click [**Go**]. You may select one of other descriptions shown by picking with your mouse, or by pressing [**Alt**][**#**], where **#** is **1** through **6**.



After entering or selecting a description, "Sight" Survey will assign the name to the point and return you to the **Identify Point** dialog box. To exit the routine at any time, simply select another routine from the menus, or type a valid two-letter command in any data entry field.



NOTE: The two-letter code **PN** (Point Names) can be used anywhere within "Sight" Survey to toggle **Prompt for Point Names** between **On** and **Off**.

6.04 Enter Station (ES)

FUNCTION: The **Enter Station** routine is used to add or change station information on an existing point. To use this routine, you must first activate stationing by using the **Traverse with Stations (TS** – see [Section 7.11](#)) or **Inverse with Stations (IS** – see [Section 7.12](#)) routine.

Activate the **Enter Station** routine by picking from the **Points** menu; by pressing **[Alt][P]**, **[T]** or by typing the two-letter command **ES** at any data entry prompt.

If you are not currently occupying a point, you will be reminded that you must first establish that point. Use the **Start At (ST** - [Section 6.05](#)) or **Go To (GT** - [Section 6.06](#)) routine.

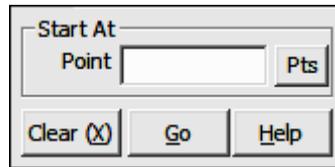


Type the station designation for the currently occupied point using the stationing format as specified by the **Local Configuration** menu (**LC** - [Section 5.05](#)) and press **[Enter]** or click **[Accept]**. When you accept your data entry, "Sight" Survey will print the point number, station, and its Northing, Easting and elevation into the **Text Output** window.

6.05 Start At (ST)

FUNCTION: The **Start At** routine is used to introduce a new currently occupied point into the COGO routines. This routine should be used before inverting for area calculations to clear the **Area Sum** and **Traverse Length** accumulator variables.

Activate the **Start At** routine by picking from the **Points** menu; by pressing [**Alt**][**P**], [**S**] or by typing **ST** at any data entry prompt.



Point: Type a point number and press [**Enter**] or [**Tab**]. To enter an alphanumeric point number (e.g. **PIN3456**, or **22S30**) you must precede the point number with an apostrophe (') to alert "Sight" Survey that you are not attempting to enter a two-letter command to change routines. For example: **'PIN3456**, or **'22S30**.

Press [**Enter**] or click [**Go**] after entering the data.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

If the point has not yet been assigned coordinates, the program will request them. Follow the **Enter and Assign** procedure (see [Section 6.01](#)) to assign coordinates and a description to the point.

"Sight" Survey will print the word **START** followed by the point number, ID, Northing, Easting and elevation into the **Text Output** window.



NOTES:

1. This routine is the only routine that clears the **Area Sum** and **Traverse Length** accumulators.
2. You **must** use this routine before beginning any area calculations.
3. You **must** use this routine when you begin a new traverse that you intend to balance.

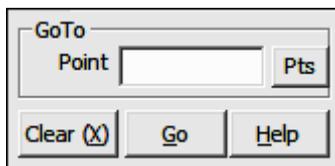


CAUTION: DO NOT use the **Start At** routine in the middle of an area calculation or your area will be cleared. Instead, use the **Go To** routine (**GT** - [Section 6.06](#)).

6.06 Go To (GT)

FUNCTION: The **Go To** routine is used to introduce a new currently occupied point into the COGO routines without clearing the **Area Sum** and **Traverse Length** accumulator variables.

Activate the **Go To** routine by picking from the **Points** menu; by pressing [**Alt**][**P**], [**G**] or by typing **GT** at any data entry prompt.



Point: Type a point number and press [**Enter**] or [**Tab**]. To enter an alpha-numeric point number (e.g. **PIN3456**, or **22S30**) you must precede the point number with an apostrophe (') to alert "Sight" Survey that you are not attempting to enter a two-letter command to change routines. For example: **'PIN3456**, or **'22S30**.

Press [**Enter**] or click [**Go**] after entering the data.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

If the point has not yet been assigned coordinates, the program will request them. Follow the **Enter and Assign** procedure (**EA** - [Section 6.01](#)) to assign coordinates and a description to the point.

"Sight" Survey will print the word **GOTO** followed by the point number, ID, Northing, Easting and elevation into the **Text Output** window.



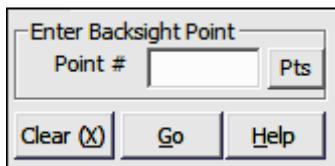
NOTES:

1. This routine does not clear the **Area Sum** and **Traverse Length** accumulators.
2. You **should not** use this routine when running any area calculations.

6.07 Enter Backsight Point (EP)

FUNCTION: The **Enter Backsight Point** routine is used to introduce a new backsight point to establish a backsight bearing for the upcoming COGO calculation. If you do not know or have not established a backsight point, but you do know the backsight bearing, use the **Enter Backsight Bearing** routine ([EB - Section 6.08](#)).

Activate the **Enter Backsight Point** routine by picking from the **Points** menu; by pressing [**Alt**][**P**], [**O**] or by typing **EP** at any data entry prompt.



Point: Type a point number and press [**Enter**] or [**Tab**]. To enter an alphanumeric point number (e.g. **PIN3456**, or **22S30**) you must precede the point number with an apostrophe (') to alert "Sight" Survey that you are not attempting to enter a two-letter command to change routines. For example: **'PIN3456**, or **'22S30**.

Press [**Enter**] or click [**Go**] after entering the data.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

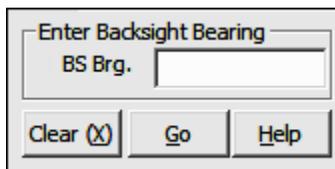
If the point has not yet been assigned coordinates, the program will request them. Follow the **Enter and Assign** procedure ([EA - Section 6.01](#)) to assign coordinates and a description to the point.

"Sight" Survey will print the backsight point and bearing into the **Text Output** window.

6.08 Enter Backsight Bearing (EB)

FUNCTION: The **Enter Backsight Bearing** routine is used to introduce a new backsight bearing for the upcoming COGO calculation. If you do not know or have not calculated a backsight bearing, but you do know the backsight point, use the **Enter Backsight Point** routine (**EP** - [Section 6.07](#)).

Activate the **Enter Backsight Bearing** routine by picking from the **Points** menu; by pressing [**Alt**][**P**], [**B**] or by typing **EB** at any data entry prompt.



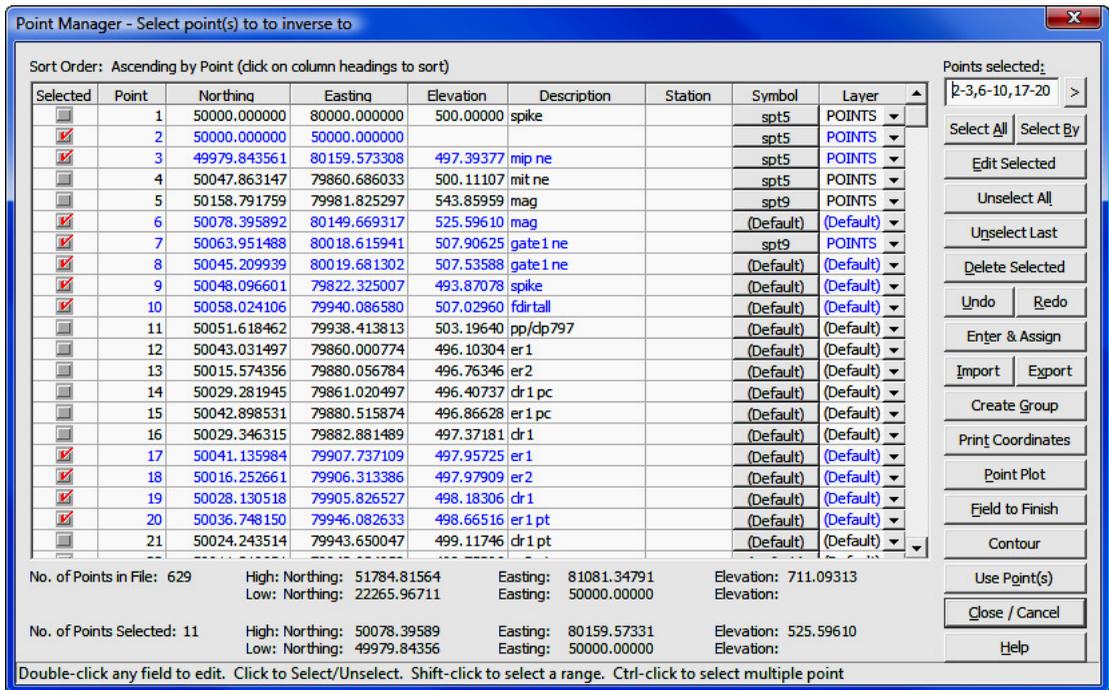
BS Brg: Enter the bearing or azimuth in your chosen format, or recall a bearing between any two points in memory (e.g. **15,20**). Press [**Enter**] or click [**Go**] after entering the data.

"Sight" Survey will print the new backsight bearing into the **Text Output** window.

6.09 Point Manager (PM)

FUNCTION: The **Point Manager** is a powerful tool used for selecting points, editing points, and defining data sets as point groups. It may also be used for simple coordinate translation and group editing of descriptions, symbols, and layers.

Activate the **Point Manager** routine by picking from the **Points** menu; by left-clicking the [**Pts**] button (whenever available) at any point number prompt, pressing [**Alt**][**P**], [**M**] or by typing **PM** at any data entry prompt. You also have the option of opening the **Point Manager** window immediately after opening a job file or importing points.



The **Point Manager** window is a primary focus window. In other words, when the **Point Manager** window is open you cannot switch to any other "Sight" Survey window simply by clicking on it. You must close the **Point Manager** window first before "Sight" Survey will allow you to change focus to another window.

The **Point Manager** window has several obvious features. First and foremost, is a point table containing all the information for each point in memory. Below the table you will see a summary of the file and also the set of selected points. This information shows the number of points (total and selected) along with then high and low values of the positional coordinates and the elevations.

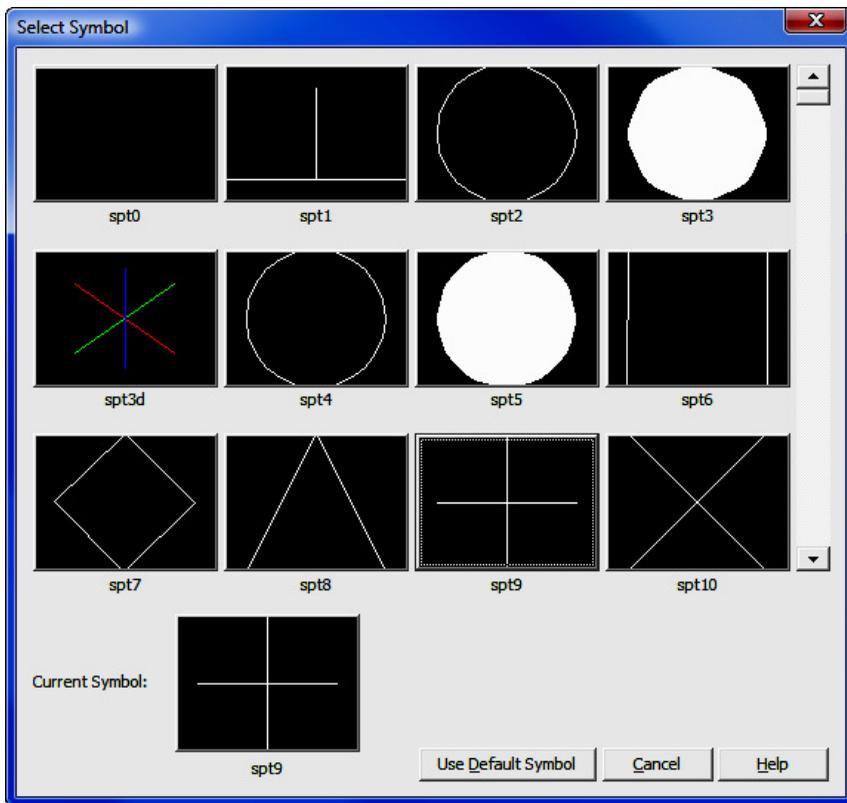
Resizing Columns: You can click, hold and drag a column border to resize the column width.

Editing Data in a Cell: You can directly **edit data** in any cell by double-clicking on the cell. If you make an error while typing data but have not yet pressed [**Enter**], press the [**Esc**] key on your keyboard and the original data will replace

your typo. If you have already pressed [**Enter**], then use the **Undo/Redo** functions described later in this section.

Sorting Data in the Table: By default, data is sorted by ascending point numbers, but you can **sort data** by any column parameter by left-clicking on a column heading. Data will be sorted in ascending order. Click the heading again to sort data in a descending order.

Symbols: To assign or change the symbol associated with a point, click the button in the **Symbol** column for the **Select Symbol** dialog. To select a symbol, use the slider bar on the right side of the **Select Symbol** dialog until the desired symbol is visible, then left-click on the symbol.



Layers: To change the layer assigned to the point, click the [▼] arrow and select from a layer list. If you want to use a layer that is not on the list (currently in the drawing) simply enter the name of the layer. When the point is drawn, the layer will be created.



SYMBOLS, LAYERS & POINT CONFIGURATION NOTES:

- 1. If you have used the **Point Manager (PM - [Section 6.09](#))** to assign or change the layer associated with the point, the setting in the **Point Manager** will override any symbol layer set in this **Point Configuration** routine.*
- 2. If you have coded this information in the field, the **Draw Field to Finish (FF - [Section 6.33](#))** routine will use your field-coded symbols and layers during field-to-finish processing. Once **Draw Field to Finish** has been run, these symbols and layers are assigned to their respective points. You may change the association by using the **Point Manager**, but running **Draw Field to Finish** again will reset it to the field-coded symbol and layer.*

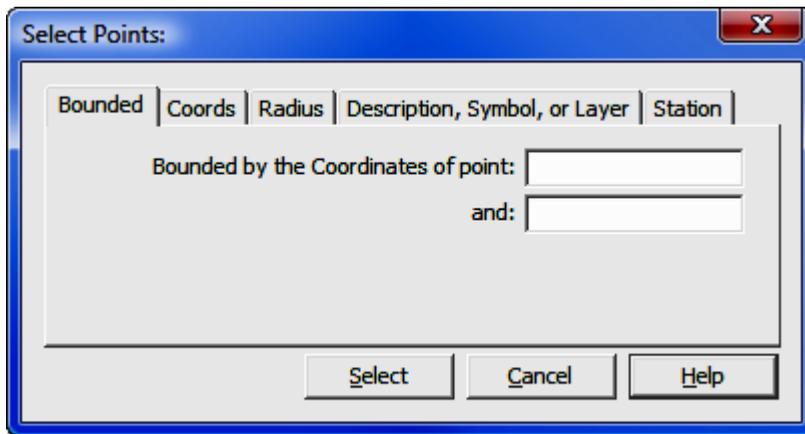
Selecting Points: To select points, click the checkbox in the **Selected** column, or type points into the **Points Selected** field as described below. The **Selected** column acts as a toggle and once selected, points will remain selected until they are unselected, again by clicking in the **Selected** column or by clicking the [**Unselect Last**] or [**Unselect All**] buttons. All selections are cleared when the **Point Manager** is closed.

Points Selected: The **Points Selected** field is a dual purpose data entry field. As you click in the table to select points the chosen points are shown as a string of data in the **Points Selected** field. You may also select points by typing point numbers and ranges directly into the **Points Selected** field. You may also mix your entry by clicking on some points and directly entering others. When entering points directly into this field, you need to press [**Enter**] or click [**>**] to the right of the field to complete the point entry. Only when the points actually show in the spreadsheet as "selected" are the points tagged for selection.

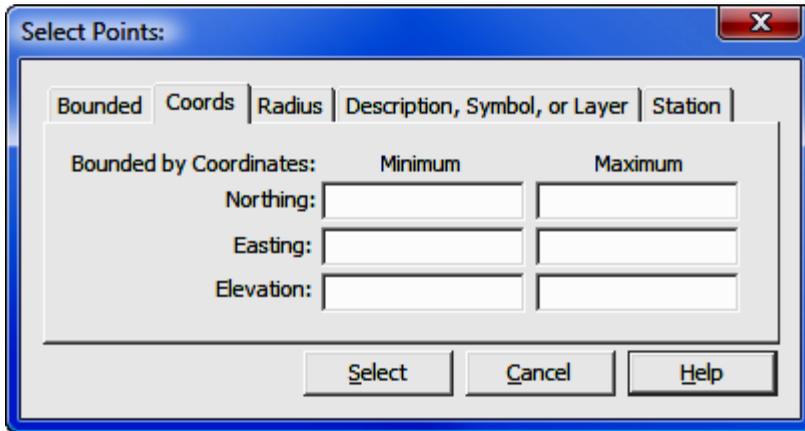
[**Select All**]: Quickly select all the points in the table by clicking this button or by pressing [**Alt**][**A**].

[Select By]: Click this button or press **[Alt][B]** to quickly select groups of points by various parameters. **Select By** presents several options in a single, tabbed window. Click on tabs to access these options:

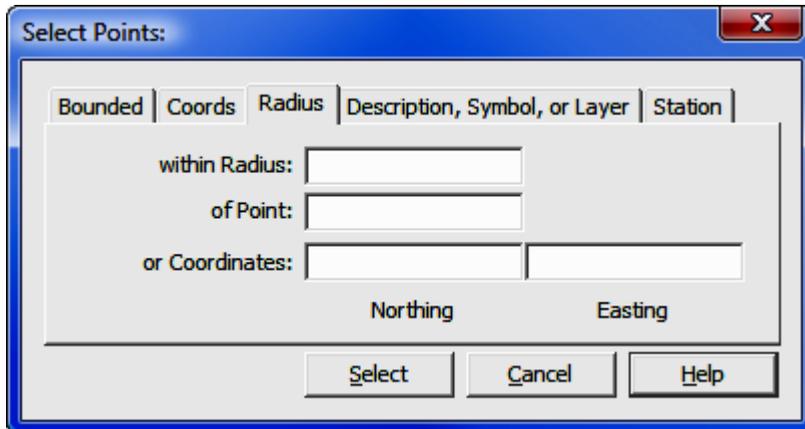
Bounded: This option allows you to identify two points and have "Sight" Survey select all the points that lie in the region bounded by the coordinates of those points. Enter the point numbers as prompted and click **[Select]** or press **[Enter]** or **[Alt][S]**.



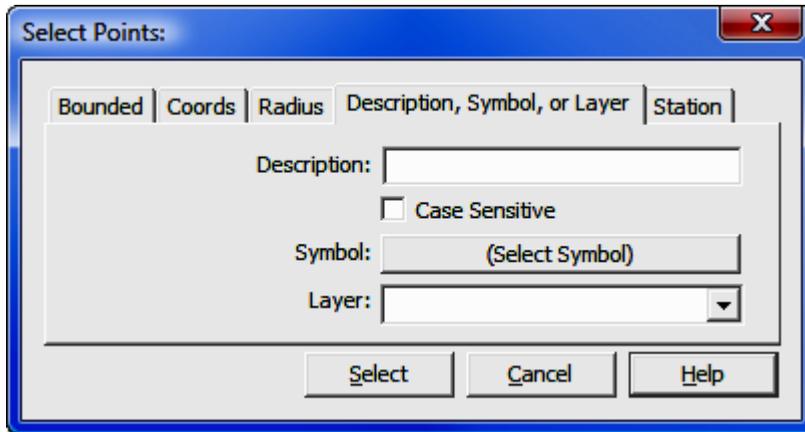
Coords: This option allows you to identify the selection region by coordinate values and "Sight" Survey select all the points that lie in the rectangular region bounded by those points. This option has the added advantage of allowing you to select points by using a single coordinate parameter. In other words, you can select points lying in a Northing range, irrespective of the Eastings and vice-versa. Or you can ignore the Northings and Eastings altogether and select points lying within a range of elevations. Enter the coordinate values as prompted and click **[Select]** or press **[Enter]** or **[Alt][S]**. To ignore a particular field, simply leave the field blank.



Radius: This option allows you to select all points within a radius distance of a known point or coordinates. Enter the radius values and either a point number or coordinates as prompted and click **Select** or press **[Enter]** or **[Alt][S]**. You cannot enter both a point number and coordinate values as an entry into either field will disable the other option.



Description, Symbol, or Layer: Use this option to define a selection set by any single parameter, or any combination of parameters.

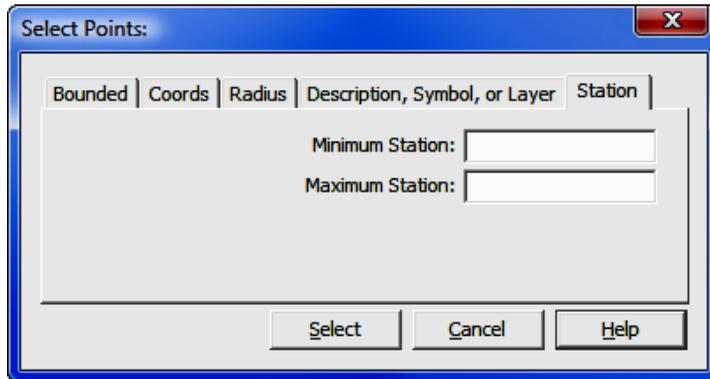


When searching for a description, you can use a wildcard character (*) to indicate partial matches. For example, an entry of **"*sidewalk"** would seek out all points where the description ended with the word "sidewalk." Similarly, **"sidewalk*"** would find points that begin with "sidewalk," and **"*sidewalk*"** would find all points having a description containing the word "sidewalk." Descriptions may be case sensitive.

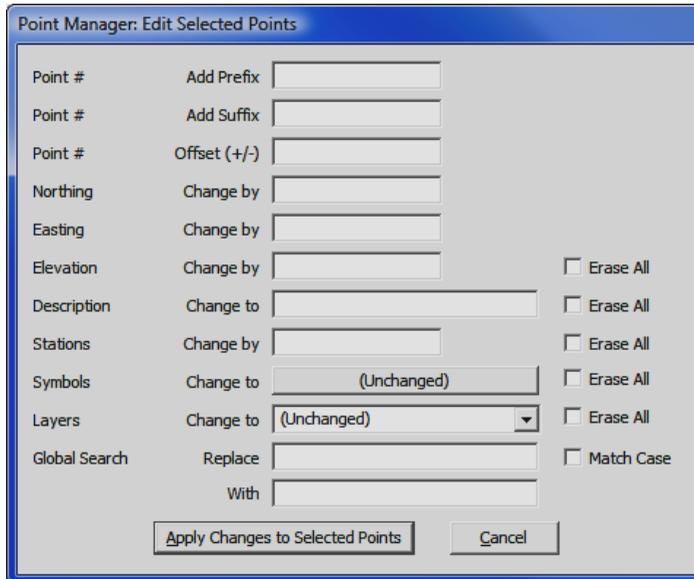
To choose a **Symbol** click the [**Select Symbol**] button and select a symbol from the graphical interface that appears.

To choose a **Layer**, click [**▼**] and pick from the drop down selection box or type in a value. After entering the values as prompted click [**Select**] or press [**Enter**] or [**Alt**][**S**].

Station: Enter a minimum and maximum station value and “Sight” Survey will find all stationing points within the specified range. You do not need to enter the + key when entering stations. For example, enter station 12+25.3 simply as 1225.3. After entering the stations as prompted click [**Select**] or press [**Enter**] or [**Alt**][**S**].



[Edit Selected]: Click this button or press [**Alt**][**E**] to edit certain aspects of the point selection set.



Using the **Edit Selected** function you can: perform simple coordinate translations; set elevations to null; change or clear point descriptions, stations, symbols, layers, and field codes; or use a global search and replace function to edit portions of descriptions.

When translating coordinates, the value in the **Change by** field may be either positive or negative. The value will be applied to all the coordinates in the selection set.

Once you have made your changes, click [**Apply Changes to Selected Points**] or press [**Alt**][**A**].

[**Unselect All**]: Click this button or press [**Alt**][**L**] to quickly unselect all selected points.

[**Unselect Last**]: Click this button or press [**Alt**][**N**] to unselect the last selected point(s). Continually using this function unselects points in the reverse order that they were selected.

[**Delete Selected**]: Click this button or press [**Alt**][**D**] to quickly delete all information from the selected points. You will be asked to confirm your intention to delete the points before they are actually deleted. You can recover deleted points by immediately clicking the **Undo** key or by pressing [**Alt**][**U**].

[**Undo & Redo**]: Click this button or press [**Alt**][**U**] to undo or roll-back previous operations, such as point deletion or edits. If you find you want to redo and undone action, click **Redo** or press [**Alt**][**R**].

[**Enter and Assign**]: Click this button or press [**Alt**][**T**] to enter a new point into the file. When you click this button, a blank line is added to the table of data and you can add point number, coordinates, descriptions, etc. to the line. Simply press [**Tab**] or [**Enter**] to move between fields.

[Import]: Click this button or press **[Alt][I]** to import point data from another file. Follow the instructions contained in **File > Import ASCII Files** (see [Section 3.08](#)).

[Export]: Click this button or press **[Alt][X]** to export point data to another file. Follow the instructions contained in **File > Export ASCII File** (see [Section 3.10](#)).

[Create Group]: Click this button or press **[Alt][G]** to create a point group. A point group (or **Defined Figure**) is a list of random and/or sequential point numbers which you access as a single entity, thus saving you from having to enter the particular point string each time you want to access it. Creating and using point groups is discussed in **Defined Figures (Point Groups)** routine (**DF** or **PG** - [Section 6.20](#)).

[Print Coordinates]: Click this button or press **[Alt][T]** to list selected points to your printer.

[Point Plot]: Click this button or press **[Alt][P]** to produce a point plot in the CAD window. Points and associated attributes are drawn according to the properties as set in the **Drawing Properties** menu (**PR** - [Section 5.10](#)).

[Field to Finish]: Click this button or press **[Alt][F]** to process and draw the selected points using your field codes with the **Field to Finish** routine (**FF** - [Section 6.33](#)).

[Contour]: Click this button or press **[Alt][T]** to draw a contour map using the selected points. This button transfers the selected points to the **Contour** routine (**CI** - [Section 11.02](#)).

[Use Point(s)]: Click this button or press **[Alt][O]** to return the selection set to the calling routine, i.e. the routine from which you called the **Point Manager**. For example, if you click the **[Pts]** button in the **To Point** field of the **Inverse**

routine and select several points in the **Point Manager**, those points will be returned to the **Inverse** routine for processing.

[**C**lose / **C**ancel]: Click this button or press [**Alt**][**C**] to cancel point selection and close the **Point Manager**.

6.10 Point Plot (PP)

FUNCTION: The **Point Plot** routine is used to draw a point selection set in CAD

Activate the **Point Plot** routine by picking from the **Points** menu; by pressing [**Alt**][**P**], [**P**] or by typing **PP** at any data entry prompt.

When activated, you are immediately presented with the **Point Manager** window (**PM** - [Section 6.09](#)) where you can select the points you wish to draw. After selecting points, click either the [**Point Plot**] button, or the [**Use Points**] button. Points are drawn to the CAD window using the parameters as set by the **Point Configuration** menu (**PC** - [Section 5.08](#)).



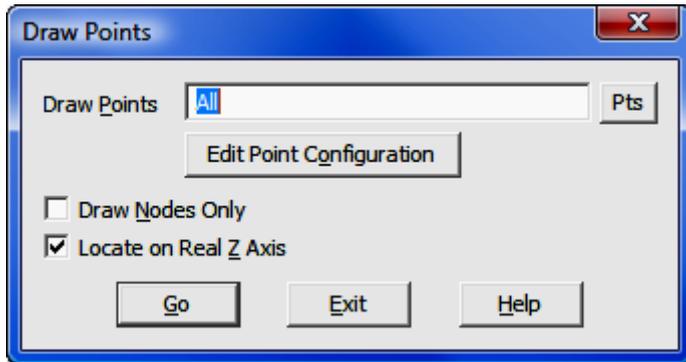
NOTES:

1. To quickly draw ALL Points without having to choose a selection set, use the **Draw All Points** routine. (**DL** - [Section 6.11](#))
2. To list coordinates in the **Text Output** window, use the **List Coordinates** routine. (**PM** - [Section 6.12](#))
3. To print a coordinate list, select the points in the **Point Manager** routine (**PM** - [Section 6.09](#)) and click [**Print Coordinates**].

6.11 Draw All Points (DL)

FUNCTION: The **Draw All Points** routine is used to quickly draw all of your data points in CAD, or to create point Nodes in AutoCAD or IntelliCAD.

Activate the **Draw All Points** routine by picking from the **Points** menu; by pressing [**Alt**][**P**], [**W**] or by typing **DL** at any data entry prompt.



Draw Points: Enter an individual point number, a point string, a point range, of type **DF** to recall a **Defined Figure** (see [Section 6.20](#)). If any point entered has not yet been assigned coordinates, the program will simply skip that point number.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager (PM)** - [Section 6.09](#). Right-click the [**Pts**] button to select a point from the CAD window (see **Picking Points in CAD** in [Section 2.03](#)). Note that if a CAD point has not been assigned you may assign a point number to it at this time. Follow the **Enter and Assign** procedure ([EA](#) - [Section 6.01](#)) to assign coordinates and a description to the point.

[**Edit Point Configuration**]: Activates the **Point Configuration** menu ([PC](#) - [Section 5.08](#)).

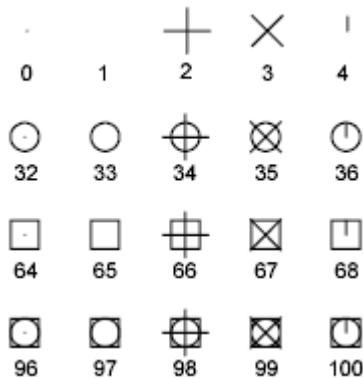
Draw Nodes Only: Select this setting to draw only the point entities (nodes) with no annotation. Points can act as nodes to which you can snap objects. You can specify a full three-dimensional location for a point.

Locate on Real Z axis: Select this setting if you want the point entities to be placed into the drawing at the real elevation (z-axis) of the points. If unchecked, the point entities will be drawn at a zero elevation.

AutoCAD/IntelliCAD Options: If you are using AutoCAD or IntelliCAD as your CAD engine, you have additional options available to you in the form of commands entered on the CAD command line. These commands control the appearance of the point nodes. If you are using MicroStation these options are not ap-

plicable, since the point node actually consists of a zero-length line and its appearance cannot be altered.

PDMODE: This CAD system variable control the appearance of point objects. **PDMODE** values 0, 2, 3, and 4 specify a figure to draw through the point. A value of 1 specifies that nothing is displayed. **PDMODE** values 32-36, 64-65, and 96-100 selects a shape to draw around the point, in addition to the figure drawn through it.



PDSIZE: This CAD system variable controls the size of the point figures, except for **PDMODE** values 0 and 1. A setting of 0 generates the point at 5 percent of the drawing area height. A positive **PDSIZE** value specifies an absolute size for the point figures. A negative value is interpreted as a percentage of the viewport size. The size of all points is recalculated when the drawing is regenerated.

You may change **PDMODE** and **PDSIZE** settings by entering them on the CAD command line. After you change **PDMODE** and/or **PDSIZE**, the appearance of existing points changes the next time the drawing is regenerated (**REGEN**, or "Sight" Survey command **RD**).

[Go]: Click this button to draw the specified point(s) in CAD window using the established parameters.

**NOTES:**

1. To draw a particular set of points, use the **Plot Points** routine. (**PP** - [Section 6.10](#))
2. To list coordinates in the **Text Output** window, use the **List Coordinates** routine. (**PM** - [Section 6.12](#))
3. To print a coordinate list, select the points in the **Point Manager** routine (**PM** - [Section 6.09](#)) and click [**Print Coordinates**].

6.12 List Coordinates (PM)

FUNCTION: The **List Coordinates** routine is used to list the coordinate data for a point selection set in the **Text Output** window.

Activate the **List Coordinates** routine by picking from the **Points** menu; by pressing [**Alt**][**P**], [**L**] or by typing **PM** (for the **Point Manager**) at any data entry prompt.

When activated, you are immediately presented with the **Point Manager** window (**PM** - [Section 6.09](#)) where you can select the points you wish to list. After you select the points, click the [**Use Points**] button. The point list is generated in the **Text Output** window.

To send the coordinate list to your printer:

1. Open the **Point Manager** window (**PM** - [Section 6.09](#)).
2. Select the points to be listed.
3. Select [**Print Coordinates**].

6.13 Blank Point Scan (BP)

FUNCTION: The **Blank Point Scan** routine is used to scan the point data and report all unused numeric point numbers.

Activate the **Blank Point Scan** routine by picking from the **Points** menu; by pressing [**Alt**][**P**], [**K**] or by typing **BP** at any data entry prompt.

"Sight" Survey will report all unused numeric point numbers found. Reported points are presented in a linear fashion, not in a column. Where applicable, points will be reported in ranges consisting of a beginning point, a dash to indicate a range of points, and an ending point. Ranges presented in this manner are all inclusive, that is the beginning and ending points specified have also been found to be blank. A typical report may look something like: **12, 15, 57-155, 175 and up**. Results are returned in the **Text Output** window.

6.14 Renumber Points (**RP**)

FUNCTION: The **Renumber Points** routine is used to relocate a block of points from their current numerical basis to a new numerical basis. The original point numbers are cleared.

Activate the **Renumber Points** routine by picking from the **Points** menu; by pressing [**Alt**][**P**], [**R**] or by typing **RP** at any data entry prompt.



CAUTION: You are about to alter the coordinates currently in memory. It is a good idea to issue a **Save Job** command (**SJ** or click the disk icon in the toolbar - [Section 3.03](#)) prior to performing this operation. Then if anything should go wrong, use **Open Job** (**OJ** - [Section 3.02](#)) **without saving the current job** and you will restore your original coordinate values.

Renumber Points		
From Pt	<input type="text"/>	Pts
To Point	<input type="text"/>	Pts
New Pt	<input type="text"/>	
Clear (X)	Go	Help



TIP: Activating **Point Overwrite Protection** (**OP**) guards against the accidental erasure of point data in the target range as "Sight" Survey rennumbers points. It is strongly recommended that you have **Point Overwrite Protection** enabled.

“Sight” Survey begins the routine by automatically performing a **Blank Point Scan** (listing the results in the **Text Output** window). This listing is provided as a guide for use in determining the target range for point relocation.



ALPHA-NUMERIC POINTS: *This routine may be used with alpha-numeric points, but only one point at a time may be renumbered. When using alpha-numeric points, the **From Pt** and **To Point** fields must match.*

From Pt: Enter the lowest point number of the block you want to renumber. (Note: You **may not** enter [**A**] for ALL points.) You may click [**Pts**] to select the point from the **Point Manager** (see [Section 6.09](#)). Only a single point number is allowed and a point range will not work in this routine.

To Point: Enter the highest point number of the block you want to renumber. (Note: You **may not** enter [**A**] for ALL points.) You may click [**Pts**] to select the point from the **Point Manager** (see [Section 6.09](#)). Only a single point number is allowed and a point range will not work in this routine.

New Pt: Enter the new starting point number and press [**Enter**] or click [**Go**]. This number should not lower than the **To Point** number.

[**Go**]: Click [**Go**] and the selected points are renumbered consecutively into the new location beginning with the **New Pt** number. Results are listed in the **Text Output** window.

6.15 Copy Block of Points (RP)

FUNCTION: The **Copy Block Points** routine is used to copy a block of numerically numbered points from their current numerical basis to a new numerical basis without clearing the original point numbers.

Activate the **Copy Block Points** routine by picking from the **Points** menu; by pressing [**Alt**][**P**], [**Y**] or by typing **CB** at any data entry prompt.



CAUTION: *You are about to alter the coordinates currently in memory. It is a good idea to issue a **Save Job** command (**SJ** or click the*

disk icon in the toolbar - [Section 3.03](#)) prior to performing this operation. Then if anything should go wrong, use **Open Job (OJ)** - [Section 3.02](#)) **without saving the current job** and you will restore your original coordinate values.



TIP: Activating **Point Overwrite Protection (OP)** guards against the accidental erasure of point data in the target range as "Sight" Survey re-locates points. It is strongly recommended that you have **Point Overwrite Protection** enabled.

Copy Block of Points		
From Pt	<input type="text"/>	Pts
To Point	<input type="text"/>	Pts
New Pt	<input type="text"/>	
Clear (X)	Go	Help

"Sight" Survey begins the routine by automatically performing a **Blank Point Scan** (listing the results in the **Text Output** window). This listing is provided as a guide for use in determining the target range for point relocation.



ALPHA-NUMERIC POINTS: This routine may be used with alpha-numeric points, but only one point at a time may be copied. When using alpha-numeric points, the **From Pt** and **To Point** fields must match.

From Pt: Enter the lowest point number of the block you want to copy. (Note: You **may not** enter [**A**] for ALL points.) You may click [**Pts**] to select the point from the **Point Manager** (see [Section 6.09](#)). Only a single point number is allowed and a point range will not work in this routine.

To Point: Enter the highest point number of the block you want to copy. (Note: You **may not** enter [**A**] for ALL points.) You may click [**Pts**] to select the point from the **Point Manager** (see [Section 6.09](#)). Only a single point number is allowed and a point range will not work in this routine.

New Pt: Enter the new starting point number and press [**Enter**] or click [**Go**].

[Go]: Click [Go] and the selected points are copied consecutively into the new location beginning with the **New Pt** number. Results are listed in the **Text Output** window. The original points are left intact at their original location.

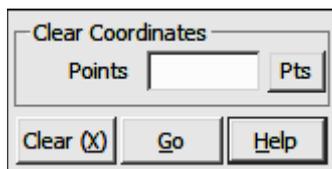
6.16 Clear Coordinates (CC)

FUNCTION: The **Clear Coordinates** routine is used to erase ALL information associated with a point or points. This includes all coordinate values, descriptions, stations, layers, field codes, etc.

Activate the **Clear Coordinates** routine by picking from the **Points** menu; by pressing [Alt][P], [C] or by typing **CC** at any data entry prompt.



CAUTION: You are about to alter the coordinates currently in memory. It is a good idea to issue a **Save Job** command (**SJ** or click the disk icon in the toolbar - [Section 3.03](#)) prior to performing this operation. Then if anything should go wrong, use **Open Job (OJ)** - [Section 3.02](#) **without saving the current job** and you will restore your original coordinate values.



Points: Enter the points you wish to erase and press [Enter] or click [Go]. You may enter individual points (e.g. **1, 2, 3**); point ranges (e.g. **1-10**); a mix of points (e.g. **1, 3-6, 8**); or [A] for ALL points. You may also click [Pts] to select points from the **Point Manager** (see [Section 6.09](#)).

"Sight" Survey clears the target points and reports the cleared points in the **Text Output** window.



NOTE: The [Clear] button does not clear points, but instead clears the **Points** data entry field.

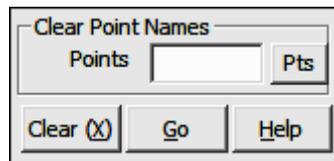
6.17 Clear Point Names (CN)

FUNCTION: The **Clear Point Names** routine is used to erase point names (descriptions) associated with a point or points.

Activate the **Clear Point Names** routine by picking from the **Points** menu; by pressing [**Alt**][**P**], [**N**] or by typing **CN** at any data entry prompt.



CAUTION: *You are about to alter the coordinates currently in memory. It is a good idea to issue a **Save Job** command (**SJ** or click the disk icon in the toolbar - [Section 3.03](#)) prior to performing this operation. Then if anything should go wrong, use **Open Job (OJ)** - [Section 3.02](#)) **without saving the current job** and you will restore your original coordinate values.*



Points: Enter the points from which you wish to clear point names and press [**Enter**] or click [**Go**]. You may enter individual points (e.g. **1, 2, 3**); point ranges (e.g. **1-10**); a mix of points (e.g. **1, 3-6, 8**); or [**A**] for ALL points. You may also click [**Pts**] to select points from the **Point Manager** (see [Section 6.09](#)).

"Sight" Survey clears the names from the target points and reports the cleared points in the **Text Output** window.



NOTE: *The [**Clear**] button does not clear point names, but instead clears the **Points** data entry field.*

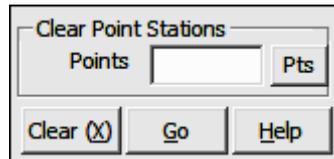
6.18 Clear Point Stations (CS)

FUNCTION: The **Clear Point Stations** routine is used to erase stationing data associated with a point or points.

Activate the **Clear Point Stations** routine by picking from the **Points** menu; by pressing [**Alt**][**P**], [**A**] or by typing **CS** at any data entry prompt.



CAUTION: You are about to alter the coordinates currently in memory. It is a good idea to issue a **Save Job** command (**SJ** or click the disk icon in the toolbar - [Section 3.03](#)) prior to performing this operation. Then if anything should go wrong, use **Open Job** (**OJ** - [Section 3.02](#)) **without saving the current job** and you will restore your original coordinate values.



Points: Enter the points from which you wish to clear stations and press [**Enter**] or click [**Go**]. You may enter individual points (e.g. **1, 2, 3**); point ranges (e.g. **1-10**); a mix of points (e.g. **1, 3-6, 8**); or [**A**] for ALL points. You may also click [**Pts**] to select points from the **Point Manager** (**PM** - [Section 6.09](#)).

"Sight" Survey clears the stations from the target points and reports the cleared points in the **Text Output** window.

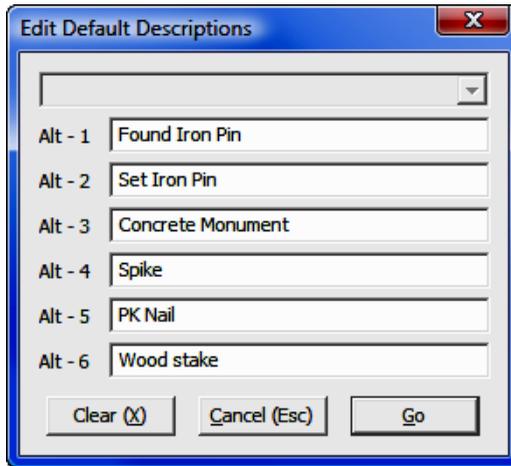


NOTE: The [**Clear**] button does not clear point stations, but instead clears the **Points** data entry field.

6.19 Edit Default Descriptions (AP)

FUNCTION: The **Edit Default Descriptions** routine is used to enter and edit a list of up to 6 commonly used point name descriptions.

Activate the **Edit Default Descriptions** routine by picking from the **Points** menu; by pressing [**Alt**][**P**], [**U**]; or by typing the two-letter command **AP** at any data entry prompt.



When this routine is activated, the cursor will be in the highlighted **Alt-1** field. Enter point descriptions into any of the alternate description fields. You can fill all the alternate fields while the dialog box is open by using your mouse or pressing **[Tab]** to move between fields. Press **[Enter]** after the last (**Alt-6**) field or click **[Go]** anytime to quit and accept the changes, or press **[Esc]** or click **[Cancel]** to quit and discard the changes.

[Clear]: Clicking **[Clear]** will clear only the current field (the active field containing the cursor).

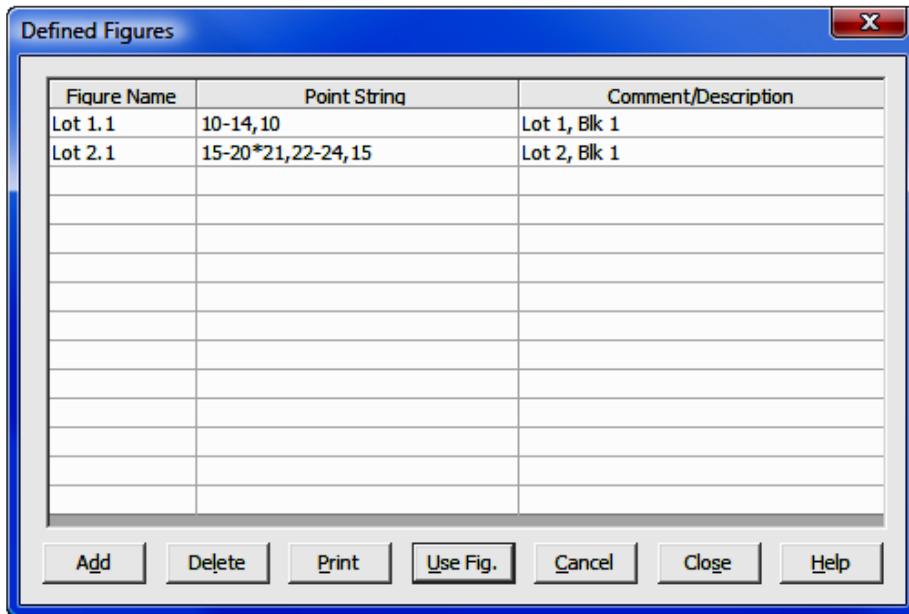
All descriptions entered into the alternate description fields are retained between "Sight" Survey sessions.

Default descriptions are easily used whenever you are prompted to enter a point description. You may either type in a point description or double-click a default description. You may also select a default description by pressing **[Alt][#]** where **#** is **1-6**.

6.20 Define Figures (DF or PG)

FUNCTION: The **Define Figures** (or Point Groups) routine is used to create a group of points that may be treated as a single, named entity.

Activate the **Define Figures** routine by picking from the **Points** menu; by pressing **[Alt][P]**, **[F]**; or by typing the two-letter command **DF** or **PG** at any data entry prompt.



When selected, this routine will open the **Defined Figures** edit window. Using this window, you can add, edit, delete, and print groups of points known as defined figures. A **defined figure** or **point group** is a list of random and/or sequential point numbers which you access as a single entity, thus saving you from having to enter the particular point string each time you want to access it.

The **Defined Figures** edit window will accommodate an unlimited number of figure entries, turning into a scrolling menu as needed. The figures are displayed in alphabetical order by **Figure Name**. Figures that are added to the end of the list are sorted into their correct alphabetical order the next time the routine is executed. You may also click on the Figure Name heading to sort name in ascending or descending order.

[Add]: To **Add** an entry, click the **[Add]** button or press **[Alt][D]**. The **Figure Name** field in the first available row will be highlighted, awaiting your entry. A figure name can be any combination of letters, numbers and spaces, up to 65 characters in length. Type in a name for your figure and press **[Enter]** or **[Tab]**.

The **Point String** field becomes highlighted, awaiting your entry. Point strings can be any combination of letters, numbers and spaces, up to 125 characters in length. Type in the point string (no point descriptions are allowed) according to the rules and examples found below and press [**Enter**] or [**Tab**].

A point string can include individual points and point ranges. Enter a point string by typing the point numbers separated by a comma, or a dash to indicate a range. For example, to define a figure from point 1 to 2 to 7 to 9 to 10 to 11 to 12 to 13 and back to 1, enter the string: **1,2,7,9-13,1**

Curves may also be included in a point string by the addition of a center point identifier character immediately preceding the number of the curve's center (or radius) point. Use the characters ***** or **<** to mark the center point of an **acute** curve (delta less than 180° or 200 grads). Use the character **>** to mark the center point of an **obtuse** curve (delta angle greater than or equal to 180° or 200 grads). For example, to inverse from point 1 to 2 to 7 (a PC) and then around an obtuse curve whose center point is 8 to 9 (the PT) to 10 to 11 and back to 1, enter the string: **1,2,7>8,9-11,1**

Multiple consecutive curves, having the same center point, may be addressed individually, or in a range. For example, to inverse from point 1 through 7 (a PC) and then around four acute curves whose curve points are 10, 15, 16 and 17, and then on a line back to 1, enter the string in any one of the four following ways:

1-7*8-10*8,15*8,16*8,17,1 or
1-7*8,10*8,15*8-17,1 or
1-7<8-10<8,15<8,16<8,17,1 or
1-7<8,10<8,15<8-17,1



NOTE: Point ranges are not allowed when working with **alpha-numeric** point numbers. Each point number must be entered individually, separated by commas. For example: **NE-CorL1,SECorL1,NWCorL2,NWCorL1**

Figures can also call **other** defined figures, overcoming any potential limitation of the 125 character point string length. For example, suppose the figure **BLOCK 1** contains the points 1, 7, 9, 5*8, 6 and figure **BLOCK 2** contains additional points that you would like to append to **BLOCK 1**. Simply define **BLOCK 1** as:
1,7,9,5*8,6,F:BLOCK 2

When figure **BLOCK 1** has been completed, figure **BLOCK 2** will be automatically run. Keep in mind though, that because figures can call other figures, it is possible to lock your computer into an endless loop. For example, **BLOCK 1** may call **BLOCK 2** which may call **BLOCK 3** which may call **BLOCK 1**, and so on. Use care when calling other figures as to avoid loops and lock-ups.

Another time saving feature allows you to place the code **AR** for **ARea** after a defined figure point string, which sends the program to the **Area Printout** routine to report the area enclosed by the figure (see [Section 10.01](#)). A comma should be placed **after** the last point number in the point string, and **before** the **AR** code. For example: **1-4,1,AR**

If you wish, you may use the **Comment** field to store additional information about the figure. This field can contain up to 255 characters and is provided strictly for your own information since it is not used anywhere else in "Sight" Survey.

To add another figure, press [**Alt**][**D**] or click [**Add**]. To exit the routine, click [**Close**] or press [**Alt**][**S**].



RULES FOR DEFINED FIGURES AND POINT STRINGS:

1. Separate single points by a comma, for example: **1,3,5,7**
2. Separate a consecutive range of **numeric** point numbers by a dash, for example: **1-7**
3. Enter all **alphanumeric** point numbers individually and separate them by a comma, for example: **PT1,PT3,PC8,NCorL1**
4. Preface any radius points with an asterisk (*****) or less than sign (**<**) for acute curves or a greater than sign (**>**) for obtuse curves, and use only the *****, **<**, or **>** to separate the PC and the radius point of a curve; for example **5*10,8** sets the acute curve from 5 through center point 10 to end point 8; and **5>10,8** sets the obtuse curve from 5 through center point 10 to end point 8. Don't place a comma after the 5.
5. Curve points may be entered within point ranges, if desired. For example: **1-7*8,10*8,15*8-17,1** is the same as entering points **1-7*8-10*8,15*8,16*8,17,1**.
6. **DO NOT** start your point string with a radius point (*****, **>**, or **<**) designation.

7. Preface any referenced figures with an **F:** and do not add any points after the referenced figure.
8. Use care when entering your point string since the program will not attempt to screen your entry for illegal characters or unassigned points.

Editing Figures: To **edit** the **Figure Name**, **Point String**, or **Comment** fields for any figure, double-click your mouse on the field you want to edit. Make your editing changes and press [**Enter**]. If you erroneously edit a figure, you can click [**Cancel**] or press [**Alt**][**C**] to cancel all deletions and editing. Changes made to the figures are not recorded until the [**Close**] button is clicked.

[**Delete**]: To select a figure to **delete**, move your mouse to the left of the **Figure Name** until the cursor becomes a check mark. Click on the figure you want to delete and then click [**Delete**] or press [**Alt**][**L**]. If you delete a figure by accident, you can click to cancel all deletions and editing. Changes made to the figures are not recorded until the [**Close**] button is clicked.

[**Print**]: To print a listing of all the defined figures in the current job, click [**Print**] or press [**Alt**][**P**]. When the **Print** dialog box appears, click to send the figure list to your printer or to the **Text Output** window.

[**Use Fig**]: There are two ways to use figures in the COGO Routines: type **F:** followed by the figure name; or press [**F11**] or type **DF** or **F:** to open the **Defined Figure** window for selection. To move quickly through the edit window, press and hold [**Ctrl**] while typing the first letter of the desired **Figure Name**. The cursor will move to the first figure which begins with that letter. Use your mouse or the arrow keys to make your selection and then click [**Use Fig**] or press [**Alt**][**U**]. The **Point String** will automatically be placed into the current text box in the COGO window. (The *current text box* is the field where the **Defined Figures** routine was executed.) Modify the point string if desired, and press [**Enter**] to use the selected point string.



NOTE:

Within the **Point Plot (PP - [Section 6.10](#))** and **List Coordinates (PM - see [Section 6.12](#))** routines, you can only access **Defined Figures** by pressing [**F11**].

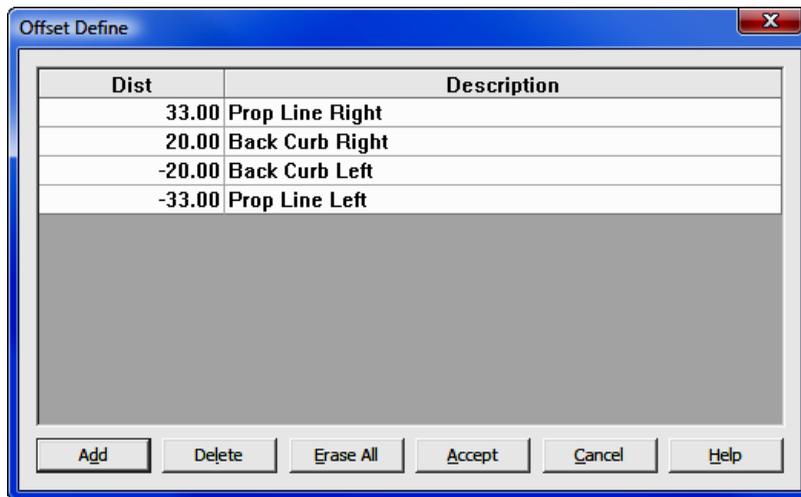
[**Cancel**]: To cancel all changes or deletions that you have made, click [**Cancel**] or press [**Alt**][**C**]. This will cancel *everything* that you have done since the **Defined Figures** edit window was last opened. If you made some changes that you wanted to keep, you will need to rerun the routine and make those changes again.

[**Close**]: To **exit** this routine and **save** any changes that you have made, click [**Close**] or press [**Alt**][**S**].

6.21 Define Offsets (OD)

FUNCTION: The **Define Offsets** function is used to populate a table of offset values that are automatically accessed during the **Traverse with Offset** routine (**TO** - [Section 7.10](#)) and the **Traverse Arc with Offset** routine (**AO** - [Section 8.11](#)).

Activate the **Define Figures** routine by picking from the **Points** menu, or by typing the two-letter command **OD** at any data entry prompt.



[**Add**]: To **Add** an offset entry to the table, click the [**Add**] button, or press [**Alt**][**D**].



O.S. Dist: Enter the offset distance with respect to the backsight: positive values will offset to the right; negative values will offset to the left. For example, an entry of **20.00** will set an offset point 20 feet to the right of the base point, relative to the foresight direction. An entry of **-20.00** will offset 20 feet to the left of the base point.

Description: Enter a description for the point, for example: **OS 20R back of sidewalk**. Descriptions are optional and this field may be left blank.



HINT: Editing Values: To edit a value or a description, simply double-click on the item you want to change and type in the revised value.

[Delete]: To delete an offset value from the table, click on the offset value and then click **[Delete]** or press **[Alt][L]**. You will be asked to confirm your action.

[Erase All]: Click the **[Erase All]** button or press **[Alt][E]** to clear the entire table. You will be asked to confirm your action.

[Accept]: When you have finished defining offsets, click **[Accept]** or press **[Alt][A]** to save the table and exit the routine.

6.22 Rotation Point and Angle Known (CTR)

FUNCTION: The **Coordinate Transformation** routines are used to project the coordinates of one plane onto another through the use of rotation, translation, scaling, or unit conversions. The option for **Rotation Point & Angle Known** is

used when the base point and angle of rotation around that base point are known.

Activate the **Rotation Point & Angle Known** routine by picking from the **Points: Coordinate Transformation** menu, by pressing **[Alt][P]**, **[D]**, **[R]**, or by typing **CTR** in any text box.



CAUTION: You are about to alter the coordinates currently in memory. It is a good idea to issue a **Save Job** command (**SJ** or click the disk icon in the toolbar - [Section 3.03](#)) prior to performing this operation. Then if anything should go wrong, use **Open Job** (**OJ** - [Section 3.02](#)) **without saving the current job** and you will restore your original coordinate values.

CT: Rotation & Angle

Base Point Pts

New North

New East

New Elev

Rotation

Scale

Points Pts

Clear (X) Go Help

Base Point: Enter the number of the point which is to serve as the basis for the transformation option. The specified point will be the point around which other points will be rotated, and the difference between the old and new coordinates of the specified point will serve as the basis for translation.



TIP: Left-click the **[Pts]** button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the **[Pts]** button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

New North: If you intend to change the base point coordinates as part of your coordinate transformation proceedings, enter a new Northing. To leave the Northing (Y coordinate) unchanged simply press [**Enter**] or [**Tab**].

New East: If you intend to change the base point coordinates as part of your coordinate transformation proceedings, enter a new Easting. To leave the Easting (X coordinate) unchanged simply press [**Enter**] or [**Tab**].

New Elev: If you intend to change the base point coordinates as part of your coordinate transformation proceedings, enter a new elevation. To leave the elevation (Z coordinate) unchanged simply press [**Enter**] or [**Tab**].

Rotation: You can either enter a rotation angle or rotate to a bearing. Rotation angles are entered as turned to the right, but left angles may be entered as negative values. Enter a rotation angle in your chosen angle entry format, or you can rotate to a bearing by: entering the bearing in your chosen angle entry format including the quad code; or recalling a bearing by point numbers.

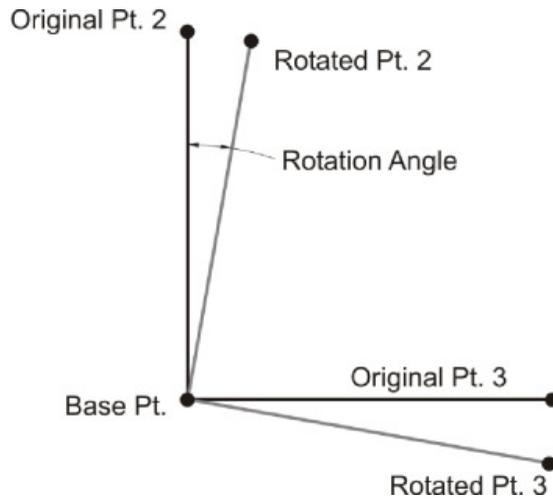
If you choose to rotate to a bearing, you will also need to supply a **Foresight Point** number after you select the points to be rotated. This point sets the initial (un-rotated) bearing from the base point. The foresight point number is entered after entering the points you wish to transform.

Scale If you want to enter a scale factor, for example to adjust to a state plane coordinate system, enter the factor. If you do not want to enter a scale factor, simply enter **1**.

Points: Enter the points you want to convert and press [**Enter**] or click [**Go**]. You may enter individual points (e.g. 1, 2, 3); point ranges (e.g. **1-10**); a mix of points (e.g. **1, 3-6, 8**); or **A** for ALL points. You may also click [**Pts**] to select points from the **Point Manager (PM - [Section 6.09](#))**.

"Sight" Survey prints the translation parameters and transforms the specified points. After transformation is complete you'll be returned to the **Points** prompt to transform additional points. Points may be viewed with the **List Coordinates** routine ([Section 6.12](#)) or the **Point Manager** window (**PM - [Section 6.09](#)**).

To exit this routine, simply enter a two-letter command at the **Points** prompt, or select a new routine using the "Sight" Survey menus.



6.23 Two Points in Each System Known (CTT)

FUNCTION: The **Coordinate Transformation** routines are used to project the coordinates of one plane onto another through the use of rotation, translation, scaling, or unit conversions. The option for **Two Points in Each System Known** is used when two corresponding points are know in each system. The rotation angle and scale factor are computed from the known points.

Activate the **Two Points in Each System Known** routine by picking from the **Points: Coordinate Transformation** menu, by pressing [**Alt**][**P**], [**D**], [**T**], or by typing **CTT** in any text box.



CAUTION: You are about to alter the coordinates currently in memory. It is a good idea to issue a **Save Job** command (**SJ** or click the disk icon in the toolbar - [Section 3.03](#)) prior to performing this operation. Then if anything should go wrong, use **Open Job** (**OJ** - [Section 3.02](#)) **without saving the current job** and you will restore your original coordinate values.

CT: Two Points Known

Base Pt 1 Pts

New North

New East

New Elev

Base Pt 2 Pts

New North

New East

New Elev

Points Pts

Clear (X) Go Help

Base Pt 1: Enter the number of the point which is to serve as the basis for the transformation.



TIP: Left-click the [Pts] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [Pts] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

New North: Enter the Northing for the point in the second system that corresponds to the base point. To leave the Northing (Y coordinate) unchanged simply press [Enter] or [Tab].

New East: Enter the Easting for the point in the second system that corresponds to the base point. To leave the Easting (X coordinate) unchanged simply press [Enter] or [Tab].

New Elev: Enter the elevation for the point in the second system that corresponds to the base point. To leave the elevation (Z coordinate) unchanged simply press [Enter] or [Tab].

Base Pt 2: Enter the number of the second known point in the first system.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

New North: Enter the Northing for the point in the second system that corresponds to the second known point. To leave the Northing (Y coordinate) unchanged simply press [**Enter**] or [**Tab**].

New East: Enter the Easting for the point in the second system that corresponds to the second known point. To leave the Easting (X coordinate) unchanged simply press [**Enter**] or [**Tab**].

New Elev: Enter the elevation for the point in the second system that corresponds to the second known point. To leave the elevation (Z coordinate) unchanged simply press [**Enter**] or [**Tab**].

Points: Enter the points you want to convert and press [**Enter**] or click [**Go**]. You may enter individual points (e.g. 1, 2, 3); point ranges (e.g. **1-10**); a mix of points (e.g. **1, 3-6, 8**); or **A** for ALL points. You may also click [**Pts**] to select points from the **Point Manager** (**PM** - [Section 6.09](#)).

The rotation angle and the scale factor are computed from the four known points. "Sight" Survey prints the translation parameters and transforms the specified points.

After transformation is complete you'll be returned to the **Points** prompt to transform additional points. Points may be viewed with the **List Coordinates** routine ([Section 6.12](#)) or the **Point Manager** window (**PM** - [Section 6.09](#)).

To exit this routine, simply enter a two-letter command at the **Points** prompt, or select a new routine using the "Sight" Survey menus.

6.24 US Survey Feet to Meters (CTM)

FUNCTION: The **Coordinate Transformation** routines are used to project the coordinates of one plane onto another through the use of rotation, translation, scaling, or unit conversions. The option for **US Survey Feet to Meters** is used to convert between two coordinate systems.

Activate the **US Survey Feet to Meters** routine by picking from the **Points: Coordinate Transformation** menu, by pressing [**Alt**][**P**], [**D**], [**M**], or by typing **CTM** in any text box.



CAUTION: You are about to alter the coordinates currently in memory. It is a good idea to issue a **Save Job** command (**SJ** or click the disk icon in the toolbar - [Section 3.03](#)) prior to performing this operation. Then if anything should go wrong, use **Open Job** (**OJ** - [Section 3.02](#)) **without saving the current job** and you will restore your original coordinate values.

From Unit: Defaults to **U.S. Feet**. (To convert from another unit, click [**▼**] and select the desired unit in the drop-down menu.)

To Unit: Defaults to **Meters**. (To convert to another unit, click [**▼**] and select the desired unit in the drop-down menu.)

Points: Enter the points you want to convert and press [**Enter**] or click [**Go**]. You may enter individual points (e.g. 1, 2, 3); point ranges (e.g. **1-10**); a mix of points (e.g. **1, 3-6, 8**); or **A** for ALL points. You may also click [**Pts**] to select points from the **Point Manager** (**PM** - [Section 6.09](#)).

“Sight” Survey prints the conversion parameters and converts the specified points. The conversion factor is: 1m = 39.37” or 1’ = 0.304800609601219m.

After transformation is complete you’ll be returned to the **Points** prompt to transform additional points. Points may be viewed with the **List Coordinates** routine ([Section 6.12](#)) or the **Point Manager** window (**PM** - [Section 6.09](#)).

To exit this routine, simply enter a two-letter command at the **Points** prompt, or select a new routine using the “Sight” Survey menus.

6.25 US Survey Feet to International Feet (CTI)

FUNCTION: The **Coordinate Transformation** routines are used to project the coordinates of one plane onto another through the use of rotation, translation, scaling, or unit conversions. The option for **US Survey Feet to International Feet** is used to convert between two coordinate systems.

Activate the **US Survey Feet to International Feet** routine by picking from the **Points: Coordinate Transformation** menu, by pressing [**Alt**][**P**], [**D**], [**I**], or by typing **CTI** in any text box.



CAUTION: You are about to alter the coordinates currently in memory. It is a good idea to issue a **Save Job** command (**SJ** or click the disk icon in the toolbar - [Section 3.03](#)) prior to performing this operation. Then if anything should go wrong, use **Open Job (OJ)** - [Section 3.02](#)) **without saving the current job** and you will restore your original coordinate values.

The image shows a dialog box titled "Coordinate Transform". It contains three main sections: "From Unit" with a dropdown menu set to "U.S. Feet", "To Unit" with a dropdown menu set to "Int'l Feet", and "Points" with an empty text input field and a "Pts" button. At the bottom of the dialog are three buttons: "Clear (X)", "Go", and "Help".

From Unit: Defaults to **U.S. Feet**. (To convert from another unit, click [**▼**] and select the desired unit in the drop-down menu.)

To Unit: Defaults to **Int'l Feet**. (To convert to another unit, click [**▼**] and select the desired unit in the drop-down menu.)

Points: Enter the points you want to convert and press [**Enter**] or click [**Go**]. You may enter individual points (e.g. 1, 2, 3); point ranges (e.g. **1-10**); a mix of points (e.g. **1, 3-6, 8**); or **A** for ALL points. You may also click [**Pts**] to select points from the **Point Manager (PM)** - [Section 6.09](#)).

"Sight" Survey prints the conversion parameters and converts the specified points. The conversion factor used is: 1' (US) = 1.000002000004' (Int'l).

After transformation is complete you'll be returned to the **Points** prompt to transform additional points. Points may be viewed with the **List Coordinates** routine ([Section 6.12](#)) or the **Point Manager** window (**PM** - [Section 6.09](#)).

To exit this routine, simply enter a two-letter command at the **Points** prompt, or select a new routine using the "Sight" Survey menus.

6.26 Meters to US Survey Feet (CTU)

FUNCTION: The **Coordinate Transformation** routines are used to project the coordinates of one plane onto another through the use of rotation, translation, scaling, or unit conversions. The option for **Meters to US Survey Feet** is used to convert between two coordinate systems.

Activate the **Meters to US Survey Feet** routine by picking from the **Points: Coordinate Transformation** menu, by pressing [**Alt**][**P**], [**D**], [**U**], or by typing **CTU** in any text box.



CAUTION: You are about to alter the coordinates currently in memory. It is a good idea to issue a **Save Job** command (**SJ** or click the disk icon in the toolbar - [Section 3.03](#)) prior to performing this operation. Then if anything should go wrong, use **Open Job** (**OJ** - [Section 3.02](#)) **without saving the current job** and you will restore your original coordinate values.

Coordinate Transform		
From Unit	Meters	
To Unit	U.S. Feet	
Points	Pts	
Clear (X)	Go	Help

From Unit: Defaults to **Meters**. (To convert from another unit, click [**▼**] and select the desired unit in the drop-down menu.)

To Unit: Defaults to **U.S. Feet**. (To convert to another unit, click [▼] and select the desired unit in the drop-down menu.)

Points: Enter the points you want to convert and press [**Enter**] or click [**Go**]. You may enter individual points (e.g. 1, 2, 3); point ranges (e.g. **1-10**); a mix of points (e.g. **1, 3-6, 8**); or **A** for ALL points. You may also click [**Pts**] to select points from the **Point Manager** (**PM** - [Section 6.09](#)).

“Sight” Survey prints the conversion parameters and converts the specified points. The conversion factor used is: 1m = 39.37” or 3.28083333333333’.

After transformation is complete you’ll be returned to the **Points** prompt to transform additional points. Points may be viewed with the **List Coordinates** routine ([Section 6.12](#)) or the **Point Manager** window (**PM** - [Section 6.09](#)).

To exit this routine, simply enter a two-letter command at the **Points** prompt, or select a new routine using the “Sight” Survey menus.

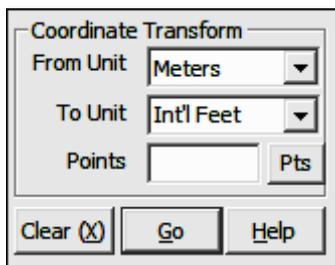
6.27 Meters to International Feet (CTN)

FUNCTION: The **Coordinate Transformation** routines are used to project the coordinates of one plane onto another through the use of rotation, translation, scaling, or unit conversions. The option for **Meters to International Feet** is used to convert between two coordinate systems.

Activate the **Meters to International Feet** routine by picking from the **Points: Coordinate Transformation** menu, by pressing [**Alt**][**P**], [**D**], [**N**], or by typing **CTN** in any text box.



CAUTION: You are about to alter the coordinates currently in memory. It is a good idea to issue a **Save Job** command (**SJ** or click the disk icon in the toolbar - [Section 3.03](#)) prior to performing this operation. Then if anything should go wrong, use **Open Job** (**OJ** - [Section 3.02](#)) **without saving the current job** and you will restore your original coordinate values.



From Unit: Defaults to **Meters**. (To convert from another unit, click [▼] and select the desired unit in the drop-down menu.)

To Unit: Defaults to **Int'l Feet**. (To convert to another unit, click [▼] and select the desired unit in the drop-down menu.)

Points: Enter the points you want to convert and press [Enter] or click [Go]. You may enter individual points (e.g. 1, 2, 3); point ranges (e.g. **1-10**); a mix of points (e.g. **1, 3-6, 8**); or **A** for ALL points. You may also click [Pts] to select points from the **Point Manager** (**PM** - [Section 6.09](#)).

"Sight" Survey prints the conversion parameters and converts the specified points. The conversion factor used is: $1\text{m} = 3.28083989501312'$ (Int'l). After transformation is complete you'll be returned to the **Points** prompt to transform additional points. Points may be viewed with the **List Coordinates** routine ([Section 6.12](#)) or the **Point Manager** window (**PM** - [Section 6.09](#)).

To exit this routine, simply enter a two-letter command at the **Points** prompt, or select a new routine using the "Sight" Survey menus.

6.28 International Feet to Meters (CTF)

FUNCTION: The **Coordinate Transformation** routines are used to project the coordinates of one plane onto another through the use of rotation, translation, scaling, or unit conversions. The option for **International Feet to Meters** is used to convert between two coordinate systems.

Activate the **International Feet to Meters** routine by picking from the **Points: Coordinate Transformation** menu, by pressing [**Alt**][**P**], [**D**], [**F**], or by typing **CTF** in any text box.



CAUTION: You are about to alter the coordinates currently in memory. It is a good idea to issue a **Save Job** command (**SJ** or click the disk icon in the toolbar - [Section 3.03](#)) prior to performing this operation. Then if anything should go wrong, use **Open Job** (**OJ** - [Section 3.02](#)) **without saving the current job** and you will restore your original coordinate values.

Coordinate Transform	
From Unit	Int'l Feet ▼
To Unit	Meters ▼
Points	<input type="text"/> Pts
Clear (X)	Go Help

From Unit: Defaults to **Int'l Feet**. (To convert from another unit, click [▼] and select the desired unit in the drop-down menu.)

To Unit: Defaults to **Meters**. (To convert to another unit, click [▼] and select the desired unit in the drop-down menu.)

Points: Enter the points you want to convert and press [**Enter**] or click [**Go**]. You may enter individual points (e.g. 1, 2, 3); point ranges (e.g. **1-10**); a mix of points (e.g. **1, 3-6, 8**); or **A** for ALL points. You may also click [**Pts**] to select points from the **Point Manager** (**PM** - [Section 6.09](#)).

“Sight” Survey prints the conversion parameters and converts the specified points. The conversion factor used is: 1’ (Int'l) = 0.3048m

After transformation is complete you’ll be returned to the **Points** prompt to transform additional points. Points may be viewed with the **List Coordinates** routine ([Section 6.12](#)) or the **Point Manager** window (**PM** - [Section 6.09](#)).

To exit this routine, simply enter a two-letter command at the **Points** prompt, or select a new routine using the “Sight” Survey menus.

6.29 International Feet to US Survey Feet (CTY)

FUNCTION: The **Coordinate Transformation** routines are used to project the coordinates of one plane onto another through the use of rotation, translation, scaling, or unit conversions. The option for **International Feet to US Survey Feet** is used to convert between two coordinate systems.

Activate the **International Feet to US Survey Feet** routine by picking from the **Points: Coordinate Transformation** menu, by pressing [**Alt**][**P**], [**D**], [**Y**], or by typing **CTY** in any text box.



CAUTION: You are about to alter the coordinates currently in memory. It is a good idea to issue a **Save Job** command (**SJ** or click the disk icon in the toolbar - [Section 3.03](#)) prior to performing this operation. Then if anything should go wrong, use **Open Job (OJ** - [Section 3.02](#)) **without saving the current job** and you will restore your original coordinate values.

Coordinate Transform

From Unit: Int'l Feet

To Unit: U.S. Feet

Points: Pts

Clear (X) Go Help

From Unit: Defaults to **Int'l Feet**. (To convert from another unit, click [**▼**] and select the desired unit in the drop-down menu.)

To Unit: Defaults to **U.S. Feet**. (To convert to another unit, click [**▼**] and select the desired unit in the drop-down menu.)

Points: Enter the points you want to convert and press [**Enter**] or click [**Go**]. You may enter individual points (e.g. 1, 2, 3); point ranges (e.g. **1-10**); a mix of points (e.g. **1, 3-6, 8**); or **A** for ALL points. You may also click [**Pts**] to select points from the **Point Manager (PM** - [Section 6.09](#)).

"Sight" Survey prints the conversion parameters and converts the specified points. The conversion factor used is: 1' (int'l) = 0.999998' (US).

After transformation is complete you'll be returned to the **Points** prompt to transform additional points. Points may be viewed with the **List Coordinates** routine ([Section 6.12](#)) or the **Point Manager** window (**PM** - [Section 6.09](#)).

To exit this routine, simply enter a two-letter command at the **Points** prompt, or select a new routine using the "Sight" Survey menus.

6.30 Lat/Lon to Grid (CTL)

FUNCTION: The **Coordinate Transformation** routines are used to project the coordinates of one plane onto another through the use of rotation, translation, scaling, or unit conversions. The option for **Lat/Lon to Coordinates** is used to convert from Latitude and Longitude coordinates to a grid coordinate.

Activate the **Coordinate Transformation > Lat/Lon to Coordinates** routine by picking from the **Points: Coordinate Transformation** menu, by pressing [**Alt**][**P**], [**D**], [**L**], or by typing **CTL** in any text box.



NOTE: "Sight" Survey cannot work with Latitudes and Longitudes, however this transformation routine is available to assist you with producing usable grid coordinates from Lat/Lon files.



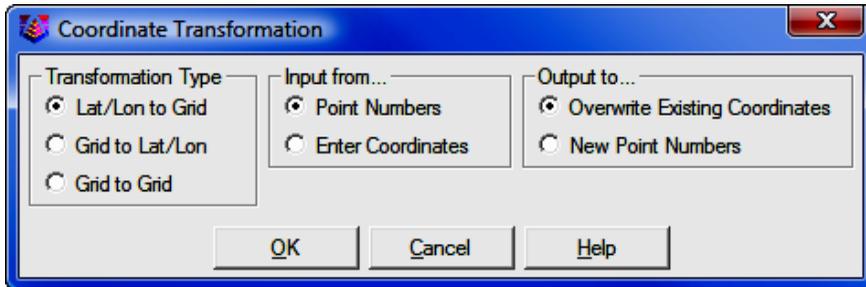
CAUTION: You are about to alter the coordinates currently in memory. It is a good idea to issue a **Save Job** command (**SJ** or click the disk icon in the toolbar - [Section 3.03](#)) prior to performing this operation. Then if anything should go wrong, use **Open Job** (**OJ** - [Section 3.02](#)) **without saving the current job** and you will restore your original coordinate values.

General Procedure for converting Lat/Lon coordinates to Grid coordinates

1. Start a **New Job** (**NJ** - [Section 3.01](#)). You may also import into an existing job.
2. **Import an ASCII Coordinate file** of Lat/Lon coordinates (see [Section 3.08](#)). If you are importing into an existing job, be sure to use **Point**

Overwrite Protection (OP), and it is a good idea to renumber your imported data to a higher numbered area in the coordinate file.

3. **Transform Lat/Lon to Grid** and **Overwrite Existing Coordinates**.
4. Delete the Lat/Lon points (if you imported into an existing file).
5. **Save the Job** (**SJ** - [Section 3.03](#)).



Transformation Type: When entering this routine, the **Transformation Type** will be set but may be changed if necessary.

Input from: Select input from **Point Numbers** (using your existing data in memory) or **Enter Coordinates** manually.



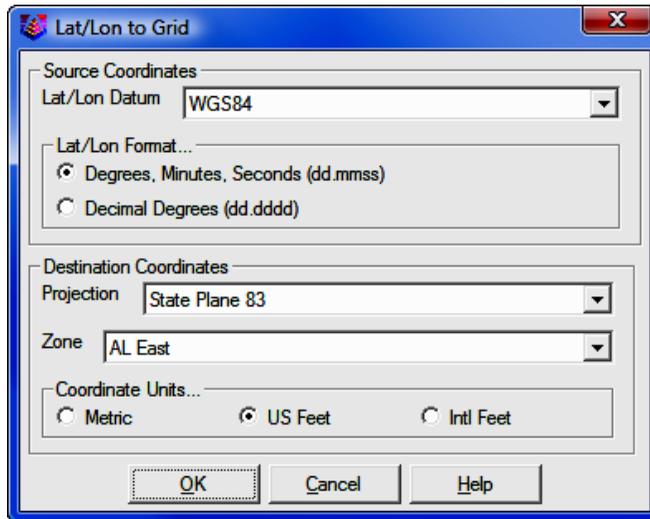
ALPHA-NUMERIC POINTS: This transformation routine will handle alpha-numeric points, but not as part of a point range. If you want to transform alpha-numeric points you must select to **Input from...Enter Coordinates**, where you will be able to enter alpha-numeric points individually.

Output to: If you chose to input from **Point Numbers**, you then have the option to **Overwrite Existing Coordinates** or output to **New Point Numbers**. If you chose to **Enter Coordinates** manually you must also manually assign new point numbers.



WARNING: If you choose to write to **New Point Numbers**, "Sight" Survey will not be able to use the Lat/Lon points in memory. You should use the **Overwrite Existing Coordinate** option so you will delete the Lat/Lon points from the coordinate file. This will not harm the input file.

After setting your initial parameters and clicking [OK] you are asked to select the **Projection**, **Zone** and **Coordinate Units** for the **Source Coordinates**; and the **Datum** and **Lat/Lon Format** for the **Destination Coordinates**.



Source Coordinates:

Lat/Lon Datum: Click [▼] and select the lat/lon datum.

Lat/Lon Format: Select the lat/lon format the destination coordinates.

Destination Coordinates:

Projection: Click [▼] and select the projection to use.

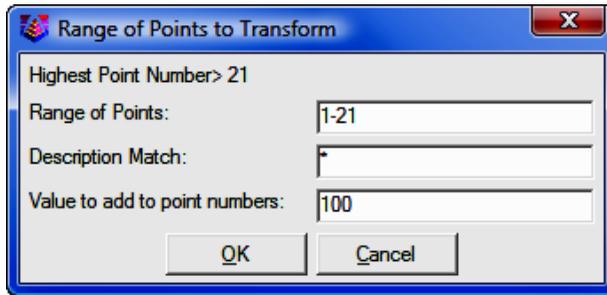
Zone: Click [▼] and select the appropriate zone.

Coordinate Units: Select the coordinate units of the source coordinates.

Click [OK] after setting your source and destination parameters.

Input From... Point Numbers

If you elected to **Input From... Point Numbers**, you must now specify which points to transform.



Range of Points: Enter the point range in typical "Sight" Survey fashion. For example you may enter a range (**1-20**); individual point numbers (**1,3,8,12,6**); or any mix (**1,2,5-10,17,20-30**). You may also enter "**A**" for all points. A range of points is required. Alpha-numeric points are not accepted.

Description Match: You may further define the points to transform as a subset of the point range by using the **Description Match** option. "Sight" Survey will search through the defined point range, but only transform those points that match the description. To match all point in the range, use an asterisk (*) for the **Description Match**. The asterisk is a wild card character and may be used along with other characters. For example, an entry of **IRON*** would match anything having the word **IRON** as the first four characters, such as **IRON PIPE** or **IRON PIN**. Likewise, an entry of ***CORNER** would match **PROPERTY CORNER**, **BUILDING CORNER**, etc; any description ending with the word **CORNER**. **Description Match** is not case sensitive.

Value to add to point numbers: At the top of the dialog the **Highest Point Number** in the current file is identified. You should add a sufficient value to this number to assure that no existing data points are overwritten. **CAUTION:** *There is no point overwrite protection for this routine.*



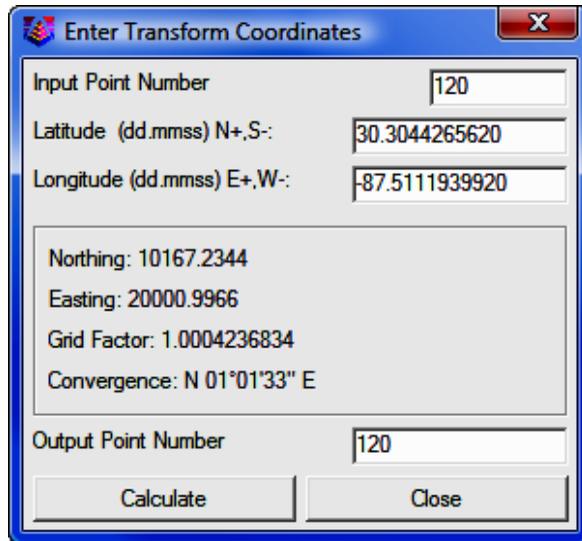
NOTE: *The **Value to add to point numbers** field is not shown if you have elected to **Overwrite Point Numbers** on the initial dialog screen.*

[**OK**]: When you click [**OK**], the transformation is completed and you will be returned to the regular "Sight" Survey screen. Click the [**Pts**] button or type **PM** to view the transformed coordinates in the **Point Manager** (see [Section 6.09](#)).

At this point you should use the **Point Manager** to delete the Lat/Lon points from the current file. Remember, "Sight" Survey cannot work with Lat/Lon coordinates so you should remove the points from memory to avoid using them.

Input From... Enter Coordinates

If you elected to **Input From... Enter Coordinates**, you must now specify which points to transform.



Input Point Number: You may enter a point number (numeric or alpha-numeric) into this field. You may not enter any range of points, only a single point at a time. If you enter an existing point, the grid coordinates will be displayed. If you are converting coordinates but do not have a point number, leave this field blank and simply enter the coordinates.

Latitude & Longitude: This field displays the existing Lat/Lon coordinates for the point number entered above, or if you have no point number, you must enter the Latitude and Longitude here.

Output Point Number: Enter the point number to which the Grid Coordinate value will be assigned. This may be either a numeric or alpha-numeric value.

CAUTION: There is no point overwrite protection for this routine.

[**Calculate**]: When you are ready to compute the Grid Coordinates for this point, click the [**Calculate**] button. While it appears that nothing has happened, the point has been written to memory and you may enter a new point (or coordinates) and output point number for the next transformation.

[**Close**]: Click [**Close**] to end this routine and you will be returned to the regular "Sight" Survey screen. Click the [**Pts**] button or type **PM** to view transformed coordinates in the **Point Manager** (see [Section 6.09](#)).

At this point you should use the **Point Manager** to delete the Lat/Lon points from the current file. Remember, "Sight" Survey cannot work with Lat/Lon coordinates so you should remove the points from memory to avoid using them.

6.31 Grid to Lat/Lon (CTD)

FUNCTION: The **Coordinate Transformation** routines are used to project the coordinates of one plane onto another through the use of rotation, translation, scaling, or unit conversions. The option for **Grid to Lat/Lon** is used to convert from grid coordinates to Latitudes and Longitudes.

Activate the **Coordinate Transformation > Grid to Lat/Lon** routine by picking from the **Points: Coordinate Transformation** menu, by pressing [**Alt**][**P**], [**D**], [**D**], or by typing **CTD** in any text box.



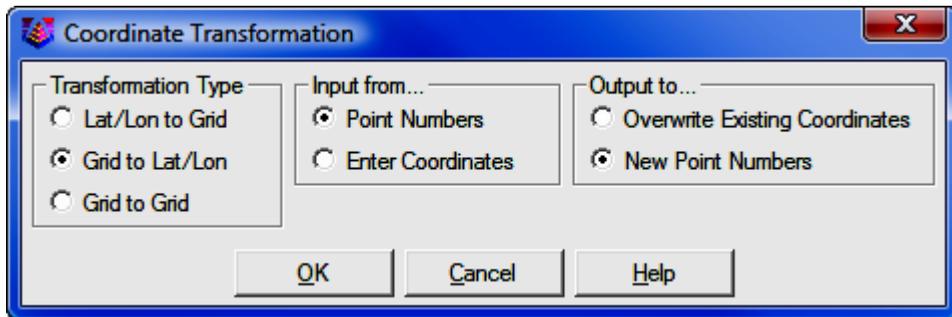
NOTE: "Sight" Survey cannot work with Latitudes and Longitudes, however this transformation routine is available to assist you with producing Lat/Lon files for use in other applications.



CAUTION: You are about to alter the coordinates currently in memory. It is a good idea to issue a **Save Job** command (**SJ** or click the disk icon in the toolbar - [Section 3.03](#)) prior to performing this operation. Then if anything should go wrong, use **Open Job** (**OJ** - [Section 3.02](#)) **without saving the current job** and you will restore your original coordinate values.

General Procedure for converting Grid coordinates to Lat/Lon coordinates

1. **Open a Job** ([OJ](#) - [Section 3.02](#)).
2. **Transform Lat/Lon to Grid** and write to **New Point Numbers**.
3. **Export an ASCII Coordinate file** of the Lat/Lon coordinates (see [Section 3.10](#)).
4. Delete the Lat/Lon points using the **Point Manager** ([PM](#) - [Section 6.09](#)).



Transformation Type: When entering this routine, the **Transformation Type** will be set but may be changed if necessary.

Input from: Select input from [Point Numbers](#) (using your existing data in memory) or [Enter Coordinates](#) manually.



ALPHA-NUMERIC POINTS: *This transformation routine will handle alpha-numeric points, but not as part of a point range. If you want to transform alpha-numeric points you must select to **Input from...Enter Coordinates**, where you will be able to enter alpha-numeric points individually.*

Output to: If you chose to input from **Point Numbers**, you then have the option to **Overwrite Existing Coordinates** or output to **New Point Numbers**. If you chose to **Enter Coordinates** manually you must also manually assign new point numbers.



WARNING: If you choose to **Overwrite Existing Coordinates**, "Sight" Survey will not be able to use the coordinate file once it has been saved in a Lat/Lon format. You should use the **New Point Numbers** option so you can export the Lat/Lon portion of the file to another file, then delete the Lat/Lon points from the coordinate file. **THERE IS NO POINT OVERWRITE PROTECTION AVAILABLE FOR THIS ROUTINE!**

After setting your initial parameters and clicking [OK] you are asked to select the **Projection**, **Zone** and **Coordinate Units** for the **Source Coordinates**; and the **Datum** and **Lat/Lon Format** for the **Destination Coordinates**.

The screenshot shows a dialog box titled "Grid to Lat/Lon". It is divided into two main sections: "Source Coordinates" and "Destination Coordinates".

- Source Coordinates:**
 - Projection:** A dropdown menu showing "State Plane 83".
 - Zone:** A dropdown menu showing "AL East".
 - Coordinate Units...:** Three radio buttons: "Metric" (unselected), "US Feet" (selected), and "Intl Feet" (unselected).
- Destination Coordinates:**
 - Lat/Lon Datum:** A dropdown menu showing "WGS84".
 - Lat/Lon Format...:** Two radio buttons: "Degrees, Minutes, Seconds (dd.mmss)" (selected) and "Decimal Degrees (dd.dddd)" (unselected).

At the bottom of the dialog box are three buttons: "OK", "Cancel", and "Help".

Source Coordinates:

Projection: Click [▼] and select the projection to use.

Zone: Click [▼] and select the appropriate zone.

Coordinate Units: Select the coordinate units of the source coordinates.

Destination Coordinates:

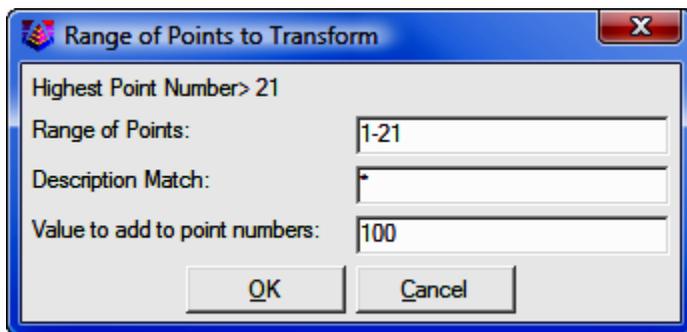
Lat/Lon Datum: Click [▼] and select the lat/lon datum.

Lat/Lon Format: Select the lat/lon format the destination coordinates.

Click [OK] after setting your source and destination parameters.

Input From... Point Numbers

If you elected to **Input From... Point Numbers**, you must now specify which points to transform.



Range of Points: Enter the point range in typical "Sight" Survey fashion. For example you may enter a range (**1-20**); individual points (**1,3,8,12,15**); or any mix (**1,2,5-10,17,20-30**). You may also enter "**A**" for all points. A range of points is required. Alpha-numeric points are not accepted.

Description Match: You may further define the points to transform as a subset of the point range by using the **Description Match** option. "Sight" Survey will search through the defined point range, but only transform those points that match the description. To match all point in the range, use an asterisk (*) for the **Description Match**. The asterisk is a wild card character and may be used along with other characters. For example, an entry of **IRON*** would match anything having the word **IRON** as the first four characters, such as **IRON PIPE** or **IRON PIN**. Likewise, an entry of ***CORNER** would match **PROPERTY CORNER**, **BUILDING CORNER**, etc; any description ending with the word **CORNER**. **Description Match** is not case sensitive.

Value to add to point numbers: *This field is not shown if you have elected to **Overwrite Point Numbers** on the initial dialog screen.* At the top of the dialog the **Highest Point Number** in the current file is identified. You should add a sufficient value to this number to assure that no existing data points are overwritten. **CAUTION: There is no point overwrite protection for this routine.**



NOTE: The **Value to add to point numbers** field is not shown if you have elected to **Overwrite Point Numbers** on the initial dialog screen.

[OK]: When you click [OK], the transformation is completed and you will be returned to the regular "Sight" Survey screen. Click the [Pts] button or type **PM** to view the transformed coordinates in the **Point Manager** (see [Section 6.09](#)).

At this point you should export your transformed points to a new file using the **File > Export > ASCII Files** routine (see [Section 3.10](#)), after which you should use the **Point Manager** to delete the transformed points from the current file. Remember, "Sight" Survey cannot work with Lat/Lon coordinates so you should remove the points from memory to avoid using them.

Input From... Enter Coordinates

If you elected to **Input From... Enter Coordinates**, you must now specify which points to transform.

Enter Transform Coordinates

Input Point Number

Northing: 10126.2347500000

Easting: 19960.0000000000

Latitude (dd.mmss): 30°30'43.85279"

Longitude (dd.mmss): -87°51'12.39991"

Grid Factor: 1.0004237432

Convergence: N 01°01'35" E

Output Point Number 122

Calculate Close

Input Point Number: You may enter a point number (numeric or alphanumeric) into this field. You may not enter any range of points, only a single

point at a time. If you enter an existing point, the grid coordinates will be displayed. If you are converting coordinates but do not have a point number, leave this field blank and simply enter the coordinates.

Northing & Easting: This field displays the existing grid coordinates for the point number entered above, or if you have no point number, you must enter the grid Northing and Easting coordinates here.

Output Point Number: Enter the point number to which the Lat/Lon values will be assigned. This may be either a numeric or alpha-numeric value. **CAUTION: There is no point overwrite protection for this routine.**

[**Calculate**]: When you are ready to compute the Lat/Lon for this point, click the [**Calculate**] button. While it appears that nothing has happened, the point has been written to memory and you may enter a new point (or coordinates) and output point number for the next transformation.

[**Close**]: Click [**Close**] to end this routine and you will be returned to the regular "Sight" Survey screen. Click the [**Pts**] button or type **PM** to view the transformed coordinates in the **Point Manager** (see [Section 6.09](#)).

At this point you should export your transformed points to a new file using the **File > Export > ASCII Files** routine (see [Section 3.10](#)), after which you should use the **Point Manager** to delete the transformed points from the current file. Remember, "Sight" Survey cannot work with Lat/Lon coordinates so you should remove the points from memory to avoid using them.

6.32 Grid to Grid (CTG)

FUNCTION: The **Coordinate Transformation** routines are used to project the coordinates of one plane onto another through the use of rotation, translation, scaling, or unit conversions. The option for **Grid to Grid** is used to convert values between different coordinate grids.

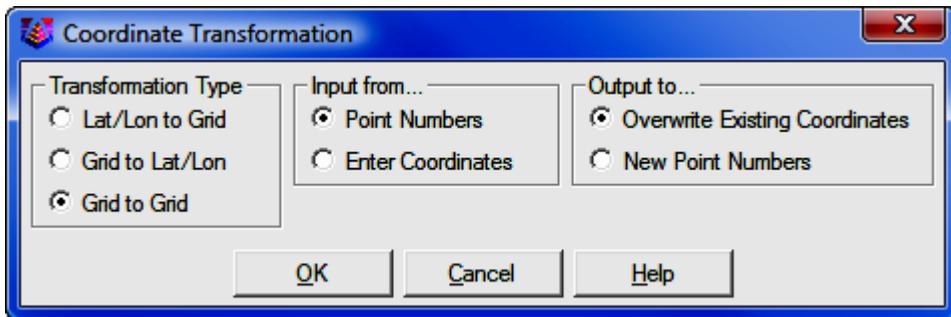
Activate the **Coordinate Transformation > Grid to Grid** routine by picking from the **Points: Coordinate Transformation** menu, by pressing [**Alt**][**P**], [**D**], [**G**], or by typing **CTG** in any text box.



CAUTION: You are about to alter the coordinates currently in memory. It is a good idea to issue a **Save Job** command (**SJ** or click the disk icon in the toolbar - [Section 3.03](#)) prior to performing this operation. Then if anything should go wrong, use **Open Job** (**OJ** - [Section 3.02](#)) **without saving the current job** and you will restore your original coordinate values..

General Procedure for converting coordinates Grid to Grid

1. **Open a Job** (**OJ** - [Section 3.02](#)) or start a **New Job** (**NJ** - [Section 3.01](#))
2. If the coordinate to transform are not already in memory, **Import an ASCII Coordinate File** (see [Section 3.08](#)) or **Import a Coordinate File** (see [Section 3.09](#)). If you are importing into an existing job, be sure to use **Point Overwrite Protection** (**OP**), and it is a good idea to renumber your imported data to a higher numbered area in the coordinate file.
3. **Transform Grid to Grid** and **Overwrite Existing Coordinates**.
4. **Save the Job** (**SJ** - [Section 3.03](#))



Transformation Type: When entering this routine, the **Transformation Type** will be set but may be changed if necessary.

Input from: Select input from **Point Numbers** (using your existing data in memory) or **Enter Coordinates** manually.



ALPHA-NUMERIC POINTS: This transformation routine will handle alpha-numeric points, but not as part of a point range. If you want to transform alpha-numeric points you must select to **Input from...Enter**

Coordinates, where you will be able to enter alpha-numeric points individually.

Output to: If you chose to input from **Point Numbers**, you then have the option to **Overwrite Existing Coordinates** or output to **New Point Numbers**. If you chose to **Enter Coordinates** manually you must also manually assign new point numbers.



AVOIDING MIXED GRIDS: To avoid the possibility of having coordinates from two different grids in your file, you should choose to **Overwrite Existing Coordinates**. This will replace the coordinates for each point during the transformation.

After setting your initial parameters and clicking [**OK**] you are asked to select the **Projection**, **Zone** and **Coordinate Units** for the **Source Coordinates**; and the **Datum** and **Lat/Lon Format** for the **Destination Coordinates**.

The image shows a 'Grid to Grid' dialog box with the following settings:

- Transformation: State Plane 27 to State Plane 83
- Source Zone: AL East
- Source Coordinate Units: US Feet (selected)
- Destination Zone: AL East
- Destination Coordinate Units: US Feet (selected)

Transformation: Click [**▼**] and select the transformation type.

Source Zone: Click [**▼**] and select the source zone.

Source Coordinate Units: Select the coordinate units of the source coordinates.

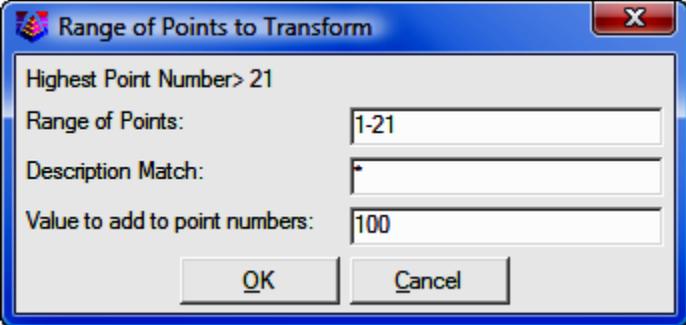
Destination Zone: Click [▼] and select the destination zone.

Destination Coordinate Units: Select the coordinate units of the destination coordinates.

Click [OK] after setting your source and destination parameters.

Input From... Point Numbers

If you elected to **Input From... Point Numbers**, you must now specify which points to transform.



The screenshot shows a dialog box titled "Range of Points to Transform". It has a standard Windows-style title bar with a red close button. The dialog contains three input fields: "Highest Point Number" with the value "> 21", "Range of Points" with the value "1-21", and "Description Match" with the value "*". Below the fields are two buttons: "OK" and "Cancel".

Range of Points: Enter the point range in typical "Sight" Survey fashion. For example you may enter a range (**1-20**); individual points (**1,3,8,12,15**); or any mix (**1,2,5-10,17,20-30**). You may also enter "**A**" for all points. A range of points is required. Alpha-numeric points are not accepted.

Description Match: You may further define the points to transform as a subset of the point range by using the **Description Match** option. "Sight" Survey will search through the defined point range, but only transform those points that match the description. To match all point in the range, use an asterisk (*****) for the **Description Match**. The asterisk is a wild card character and may be used along with other characters. For example, an entry of **IRON*** would match anything having the word **IRON** as the first four characters, such as **IRON PIPE** or **IRON PIN**. Likewise, an entry of ***CORNER** would match **PROPERTY CORNER**, **BUILDING CORNER**, etc; any description ending with the word **CORNER**. **Description Match** is not case sensitive.

Value to add to point numbers: *This field is not shown if you have elected to **Overwrite Point Numbers** on the initial dialog screen. At the top of the dialog the **Highest Point Number** in the current file is identified. You should add a sufficient value to this number to assure that no existing data points are overwritten. **CAUTION: There is no point overwrite protection for this routine.***



NOTE: *The **Value to add to point numbers** field is not shown if you have elected to **Overwrite Point Numbers** on the initial dialog screen.*

[OK]: When you click [OK], the transformation is completed and you will be returned to the regular "Sight" Survey screen. Click the [Pts] button or type **PM** to view the transformed coordinates in the **Point Manager** (see [Section 6.09](#)).

If you did not overwrite point numbers you should use the **Point Manager** to delete the un-transformed points from the current file.

Input From... Enter Coordinates

If you elected to **Input From... Enter Coordinates**, you must now specify which points to transform.

The screenshot shows a dialog box titled "Enter Transform Coordinates" with a close button (X) in the top right corner. The dialog contains the following fields and information:

- Input Point Number:** A text box containing the value "4".
- Northing:** A text box containing the value "10052.2347500000".
- Easting:** A text box containing the value "19825.5000000000".
- Output Point Number:** A text box containing the value "4".
- Information Panel:** A shaded area containing the following text:
 - Northing: 10123.1414
 - Easting: 176010.3522
 - Grid Factor: 1.0002241385
 - Convergence: N 00°46'28" E
- Buttons:** "Calculate" and "Close" buttons at the bottom.

Input Point Number: You may enter a point number (numeric or alpha-numeric) into this field. You may not enter any range of points, only a single point at a time. If you enter an existing point, the grid coordinates for that point will be displayed. If you are converting coordinates but do not have a point number, leave this field blank and simply enter the coordinates.

Northing & Easting: This field displays the grid coordinates for the point number entered above, or if you have no point number, you must enter the grid Northing and Easting coordinates here.

Output Point Number: Enter the point number to which the new grid values will be assigned. This may be either a numeric or alpha-numeric value. **CAUTION: There is no point overwrite protection for this routine.**

[**Calculate**]: When you are ready to compute new grid coordinates for this point, click the [**Calculate**] button. While it appears that nothing has happened, the point has been written to memory and you may enter a new point (or coordinates) and output point number for the next transformation.

[**Close**]: Click [**Close**] to end this routine and you will be returned to the regular "Sight" Survey screen. Click the [**Pts**] button or type **PM** to view the transformed coordinates in the **Point Manager** (see [Section 6.09](#)).

If you did not overwrite point numbers you should use the **Point Manager** to delete the un-transformed points from the current file.

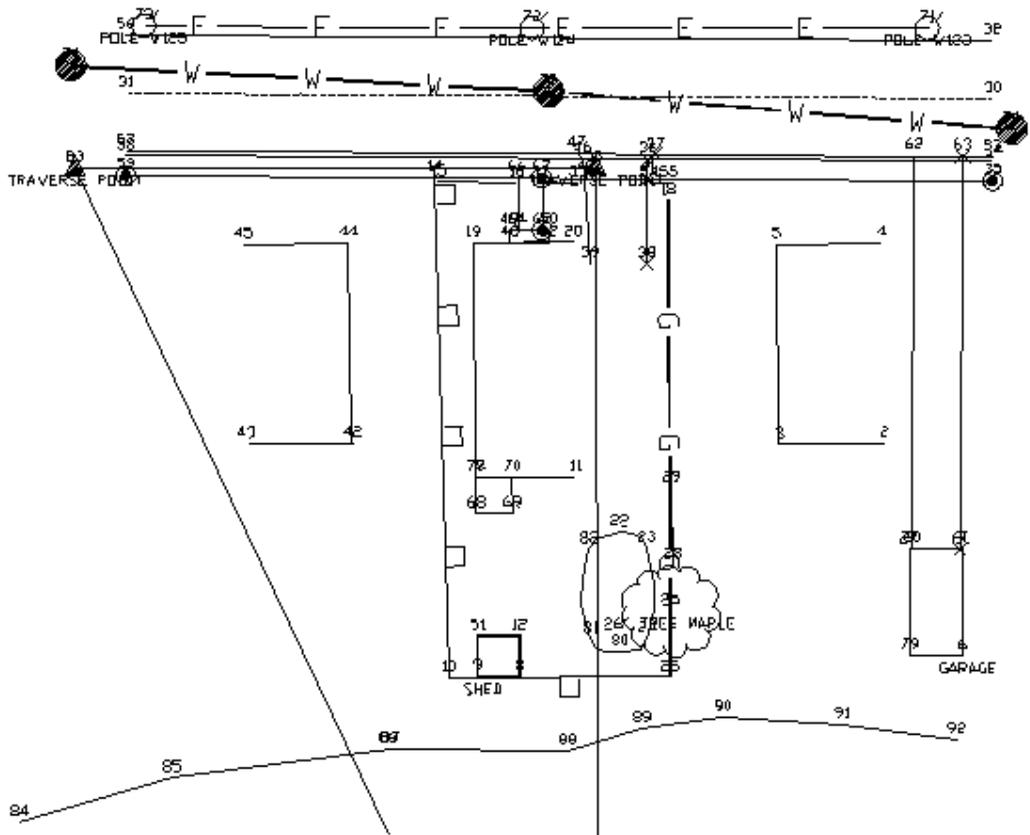
6.33 Draw Field to Finish (FF)

FUNCTION: The **Draw Field to Finish** routine is used to turn data collector field notes into a final CAD 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 the layer, symbol, size and linetype.

Activate the **Draw Field to Finish** routine by picking from the **Points** menu, by pressing [**Alt**][**P**], [**H**], or by typing **FF** in any text box.

This section covers these main dialog screens, along with their peripheral dialog screens.

- [Split Multiple Codes](#)
- [Draw field to Finish](#)
- [Additional Draw Options](#)
- [Edit Codes](#)
- [Code Table Settings](#)
- [Special Codes](#)
- [Code Definitions](#)
- [PointCAD Coding](#)



Example drawing results using the example points and example code definitions

Two files are used in **Draw Field to Finish** - a coordinate file and a field code definition file. The coordinate file consists of x,y,z points with text description fields. The description fields contain codes for the **Draw Field to Finish** processing. The coordinate file can be a Carlson coordinate (.CRD) file, C&G CRD file, C&G CGC file, Land Desktop MDB file or Simplicity Systems ZAK file. An ASCII data file can be converted into a coordinate file using the **File > Import > ASCII Files** (see [Section 3.08](#)) routine. The field code definition file defines the layer, symbol, size and other actions to apply with each code.

Draw Field to Finish can translate the field points into Carlson points (also called coordinate geometry points or cogo 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 can be found in the **Additional Draw Options** of the **Draw Field to Finish** dialog box. The **Draw All Points (DL - [Section 6.11](#))** command has these point settings stored separately using the **Point Configuration (PC - [Section 5.08](#))** menu. **Draw All Points** provides a simpler method for drawing points compared with **Draw 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, both 2D and 3D 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 **Draw 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. Other PointCAD special codes are: +4 starts a curved 2D polyline, *4 starts a closed curved 2D polyline, +1 begins a 3-point arc, +5 starts a 3D polyline, *5 starts a closed 3D polyline, +6 starts a 2D polyline, *6 starts a closed 2D polyline, +7 starts a line whose type is specified by the field code definition, -05 starts a curved 3D polyline section, -50 ends that section, +8 starts a 2D and 3D polyline combination, *8 starts a closed 2D and 3D polyline combination, -08 starts a 2D and 3D polyline combination curved section, -80 ends that section. //, followed by a field code, concatenates that field code's description on to the point's description. For example, OAK//04 might become LIVE OAK TREE 4" if the field code OAK translates to LIVE OAK TREE and the field code 04 translates to 4".

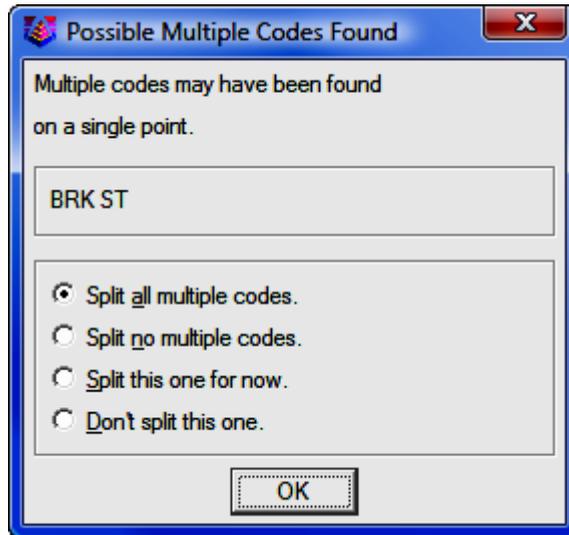
The advantage to the PointCAD method is that you don't have to keep track of line numbers. For example, if you are surveying 50 curb lines, the first method would require you to use 50 distinct curb numbers. The advantage to the first method is that you don't have to use the start and end codes. Also the **Nearest Found** connection option applies to the first method.

Split Multiple Codes

When "Sight" Survey first begins the **Draw Field-to-Finish** routine, your data file is scanned for multiple codes. If any are found, this is the first dialog you will see.

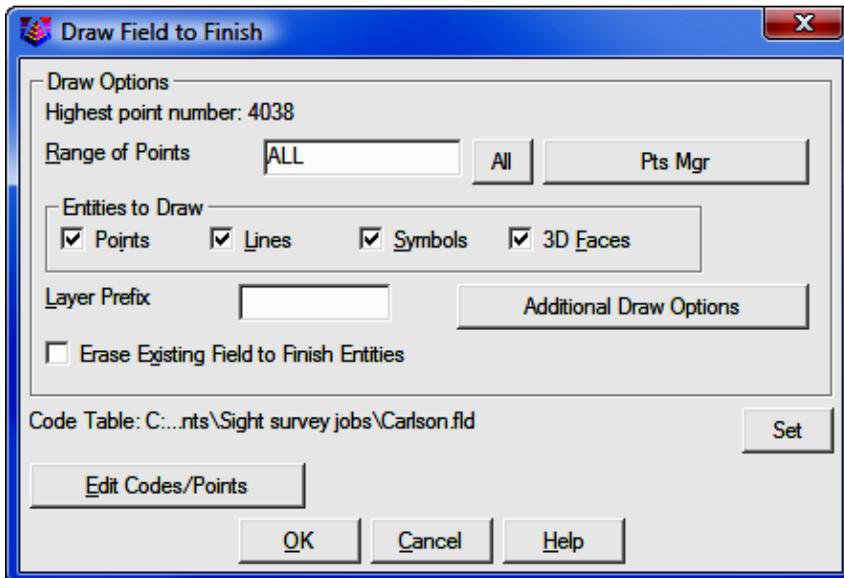
Multiple codes are defined by including each code in the point description field separated by a space. A single data point can be used in different lines by assigning it multiple codes. For instance, a point might be part of both a curb line and a driveway line with a description of "CURB DRW". Field-to-Finish 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 options for the handling of multiple codes when encountered. The **Split All** option will split all multiple codes and process each code based upon their code definition. When **Split No** is selected both codes will be processed based upon their code definition. When field-to-finish detects multiple codes on a point the following dialog will be displayed with options for handling the codes.



Draw Field to Finish

The main dialog box for **Draw Field to Finish** is shown below:



Range of Points: Specify the range of points to draw. Click [**All**] to process all points in the file, or click [**Pts Mgr**] to use the **Point Manager (PM - [Section 6.09](#))** to select the points to use.

Entities To Draw: The **Points** option draws only the points and point attributes; the **Lines** option draws only the linework; the **Symbols** draws only the symbols; and **3D Faces** draws only the 3D faces. Any combination of these options can be processed as well as individual processing of each entity.

Layer Prefix: Optional layer prefix added to all entities drawn with **Draw 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.

[**Additional Draw Options**]: Click [**Additional Draw Options**] to select additional options. ([See below](#))

[**Set**]: Click [**Set**] to select the code table to use for field-to-finish processing.

[**Edit Codes/Points**]: Click [**Edit Codes/Points**] to edit the field codes. ([See below](#))

Additional Draw Options

Additional Draw Options

Point Label Settings

- Point Numbers
- Descriptions
- Point Notes

Elev Label Settings

- Elevations
- Label Zeros
- Prefix and Suffix By Code
- Prefix:
- Suffix:
- 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 Sequential Arcs Best Fit

Creating Point Groups

- Automatically By Code
- Ignore Code Suffix
- By Code Definition
- Group Name Prefix:

Creating Point Notes

- Create Drawing Description Notes
- Create Special Code Notes

Flip Text for Twist Screen (for Rotate to Line)

Pause on Undefined Codes Auto Zoom Extents

Point Label Settings: Specify whether you want **Draw 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 pa-

renthesis 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 (**On**), all at zero elevation (**Off**), or to use the real Z setting as defined in the individual codes (**By Code**).

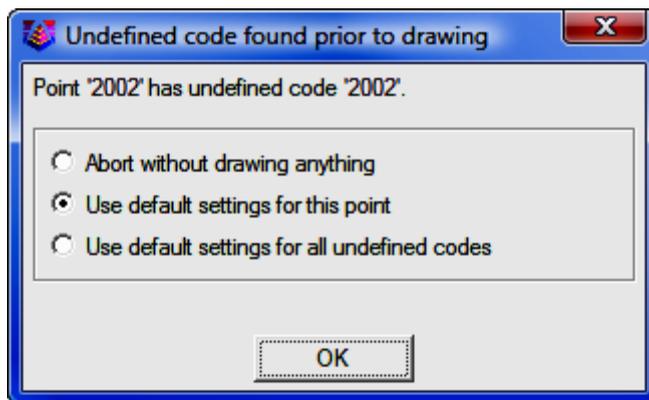
PC-PT Curve Type: Sets the method for drawing curves with more than 3 points. The Bezier option draws a smooth polyline through all the curve points. The Sequential Arcs method draws multiple arcs with arc end points at each of the curve points. These arcs are tangent to the preceding line segment. The Best Fit method creates a single best-fit curve for all the curve points between the PC and PT.

Creating Point Groups: This option is not currently supported by "Sight" Survey.

Creating Point Notes: This option is not currently supported by "Sight" Survey.

Flip Text for Twist Screen: This option is not currently supported by "Sight" Survey.

Pause on Undefined Codes: When checked, **Draw 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 **Draw Field to Finish** routine. Run **Draw Field to Finish** again to correct the code table.

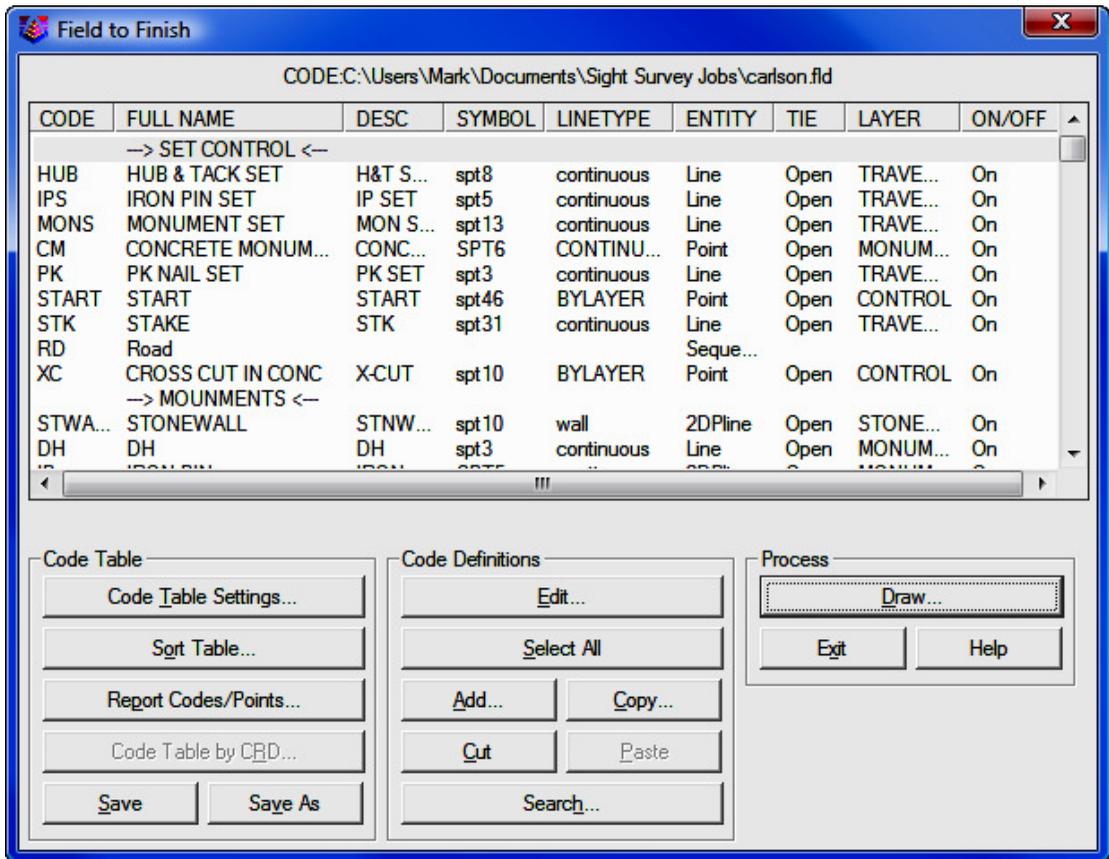
Use the default settings for this point: This option draws a point in the "MISC" layer with no linework. To set your own default, define a code called "SC_DFLT".

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.

Auto Zoom Extents: When checked, this will force a zoom extents after **Draw Field to Finish** is done.

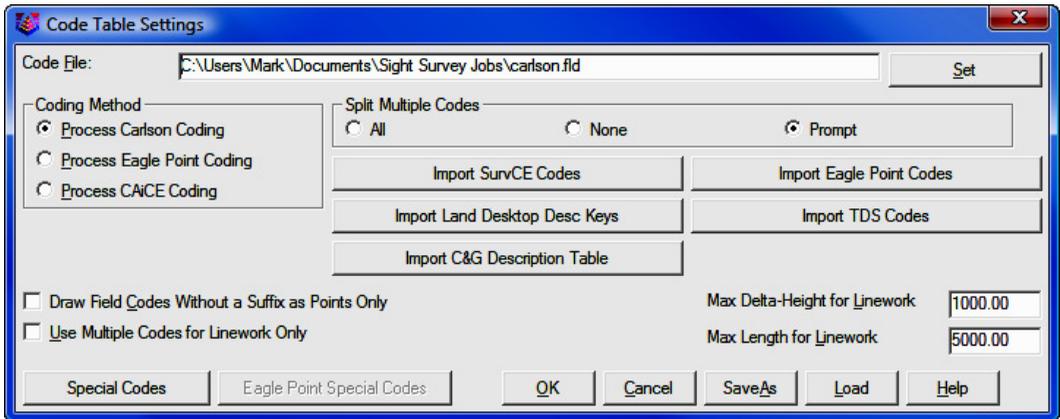
Edit Codes / Points

The **Field to Finish** dialog box (shown below) allows you to load the coordinate and field code definition files, view and edit the code definitions, view and edit the coordinate file, view reports, and then return to the **Draw Field to Finish** dialog box to 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 **Draw Field to Finish**.



Code Table Settings

Click the [**Code Table Settings**] button for options that 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.

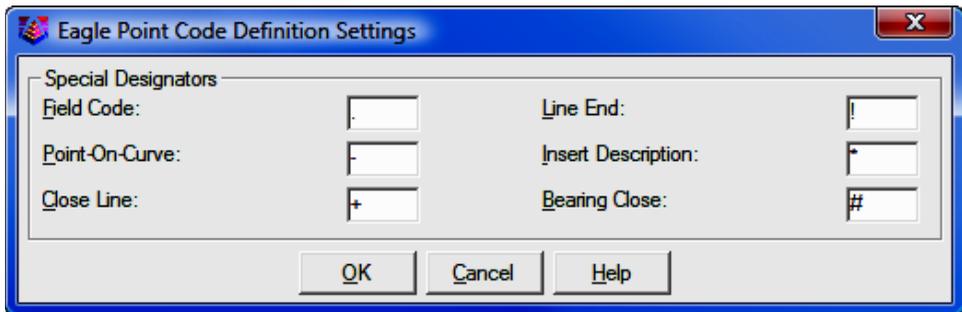


[**Set**]: Choose this button to specify a new code table. The name of the current table is shown in the field to the left of this button.

Coding Method

Three **Coding Methods** are offered: **Carlson**; **Eagle Point**; and **CAiCE**.

- Ⓐ **Process Carlson Coding:** When selected, this option interprets and processes coordinate files based upon the Carlson Coding method and data collection method.
- Ⓐ **Process Eagle Point Coding:** When selected, coordinate files are processed based on the Eagle Point Data Collection method and the **Eagle Point Codes** button becomes available for selection displaying the following dialog. This dialog allows for customization of the eagle point special designators.



Currently the supported designators include, **Field Code, Point-On-Curve, Close Line, Line End, 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.

The use of the **Use Multiple Codes for Linework Only** toggle is recommended when using Eagle Point Coding.

Ⓞ **Process CAiCE Coding:** When selected, coordinate files are processed based on the CAiCE Data Collection method. Examples of supported coding are as follows:

169 is just the code 169.

145C10 is the code 145 and line #10.

169C25C is the code 169, line #25, and the point is on a curve.

172C12B is the code 172, line #12, and this point closes the line.

Split Multiple Codes: The **All** option will split all multiple codes and then process each code based upon their code definition. When **None** is selected both codes will be processed based upon their code definition. When **Prompt** is selected and Field-to-Finish detects multiple codes on a point a dialog will be displayed with options for handling the codes.

Import Eagle Point Codes: This option imports Eagle Point codes into the Carlson Field to Finish (fld) code definition file.

Import Land Desktop Desc Key: This option imports and converts a **Land Desktop Description Key** into a Field to Finish (fld) code definition file. The Land Desktop Description Key file is an 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 Field to Finish (fld) code definition file.

Import C&G Description Table: This option imports **C&G code tables** (tbl) into the Field to Finish (fld) code definition file.

Import SurvCE Codes: This option imports a **SurvCE Feature Code List** (fcl) into a 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.

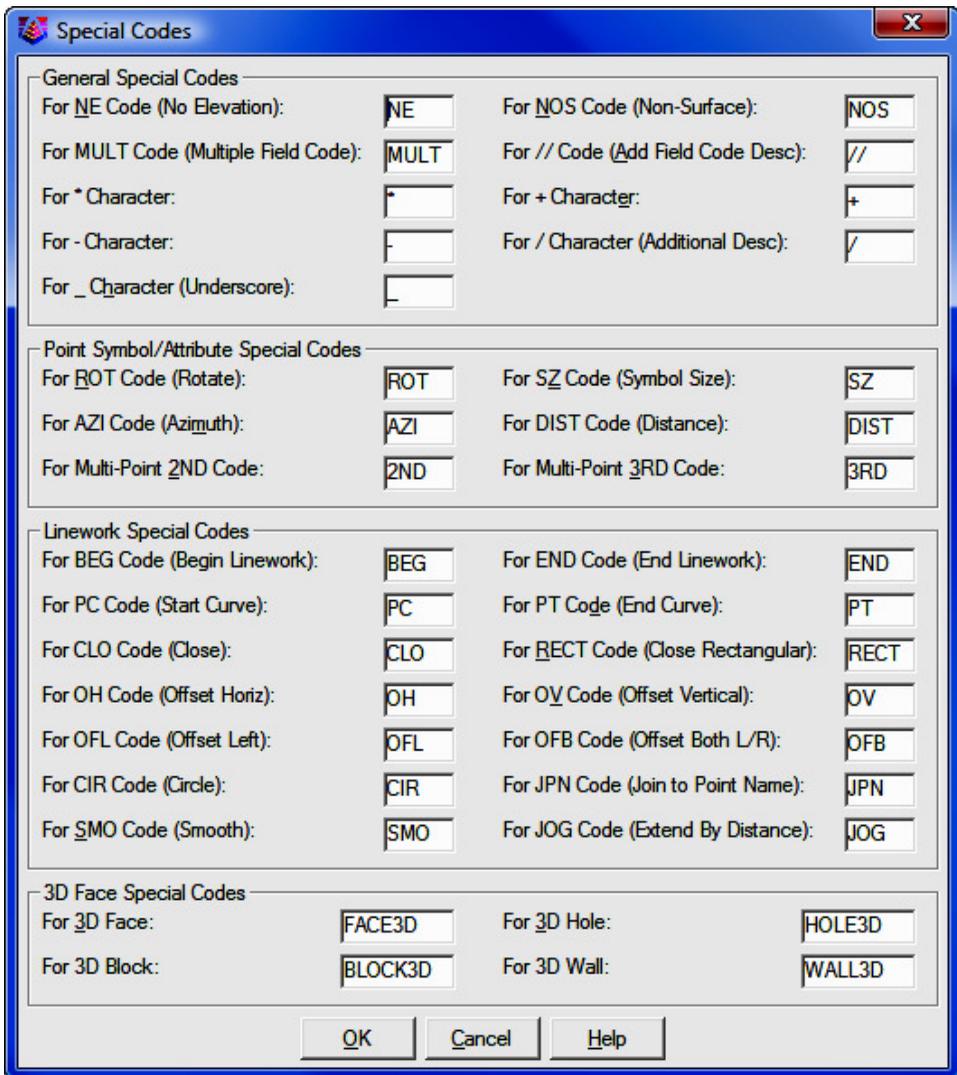
Use Multiple Codes for Linework Only: When checked, and when multiple codes are detected, only linework will be drawn for the secondary codes. Points are only created based on the primary code. If you want symbols for all multiple codes, then this setting should not be checked.

Max Delta-Height for Linework: Use this option to specify the maximum elevation difference that **Draw 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 **Draw Field to Finish** should draw any section of linework.

Special Codes

This section allows you to substitute the existing predefined special codes and characters with your own. **Draw Field to Finish** recognizes several special codes. A special code is placed before or after the regular code with a space separating the code and special code. Here is a listing of the default special codes and characters.



The 'Special Codes' dialog box is organized into four sections, each with a title bar and a list of labels and text input fields. The labels are underlined to indicate the special code character. The input fields contain the default special codes.

General Special Codes			
For <u>N</u> E Code (No Elevation):	NE	For <u>N</u> OS Code (Non-Surface):	NOS
For <u>M</u> ULT Code (Multiple Field Code):	MULT	For // Code (<u>A</u> dd Field Code Desc):	//
For * Character:	*	For + Character:	+
For - Character:	-	For / Character (<u>A</u> dditional Desc):	/
For _ Character (<u>U</u> nderscore):	_		

Point Symbol/Attribute Special Codes			
For <u>R</u> OT Code (Rotate):	ROT	For <u>S</u> Z Code (Symbol Size):	SZ
For <u>A</u> ZI Code (Azimuth):	AZI	For <u>D</u> IST Code (Distance):	DIST
For Multi-Point <u>2</u> ND Code:	2ND	For Multi-Point <u>3</u> RD Code:	3RD

Linework Special Codes			
For <u>B</u> EG Code (Begin Linework):	BEG	For <u>E</u> ND Code (End Linework):	END
For <u>P</u> C Code (Start Curve):	PC	For <u>P</u> T Code (End Curve):	PT
For <u>C</u> LO Code (Close):	CLO	For <u>R</u> ECT Code (Close Rectangular):	RECT
For <u>O</u> H Code (Offset Horiz):	OH	For <u>O</u> V Code (Offset Vertical):	OV
For <u>O</u> FL Code (Offset Left):	OFL	For <u>O</u> FB Code (Offset Both L/R):	OFB
For <u>C</u> IR Code (Circle):	CIR	For <u>J</u> PN Code (Join to Point Name):	JPN
For <u>S</u> MO Code (Smooth):	SMO	For <u>J</u> OG Code (Extend By Distance):	JOG

3D Face Special Codes			
For <u>3</u> D Face:	FACE3D	For <u>3</u> D Hole:	HOLE3D
For 3D Block:	BLOCK3D	For 3D Wall:	WALL3D

Buttons: OK, Cancel, Help

Special Characters

The characters (*, -, +, /, and _) can be used and substituted in **Draw 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.

Special Codes

"/"

Carlson points in the drawing have point attributes including point descriptions. When Field-to-Finish draws the points, the point description from the coordinate 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 forward slash or 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 and no further substitution is done on it. 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 code causes text after the "//" to be interpreted as a field code. That field code's description is then appended to the first field code's description. For example, if the field code 02 has the description 2" and the field code OAK has the description *oak tree*, then 02//OAK will result in the point having the description of 2" *oak tree*. If the "/" character has been replaced with a different character, for example with a & character, then the "//" code would become "&&".

PC

This code begins a three point arc or a curved line when used with the "PT" code (see below). 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 or a tangent two-point curve. 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. If no points are found between the "PC" and "PT", then the point prior to the "PC" and the point after the "PT" are used to create tangents for the resulting curve.

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.

NOS

This code indicates that the point should be "non-surface"; that is, that it should be ignored when contouring or creating surfaces. This can also be controlled per-field code by turning on the Non-Surface toggle in the **Edit Field Code Definition** dialog box.

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 north-east 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 or straight 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. Finally, "S#" can be used to make an offset straight ahead by using a positive # or behind by using a negative #. For example, "BLDG JOG S10.1 R5 L12.2 L5 L12.2" or equivalently "BLDG JOG S10.1 5 -12.2 -5 -12.2" advances 10.1 units and then 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.

CIR

The "CIR" special code stops the linework on the previous point and causes this point to create a circle in one of three different ways. The first way uses just the current point as the center with the CIR special code followed immediately by the radius. For example "CIR5.0" will create a circle centered on this point with radius 5 and at the elevation of the current point. The second method uses two points, the first point specifying the center and the elevation, and the second point specifying the radius. The third method uses 3 points that specify the perimeter of the circle in 2D with the first point specifying the elevation. The "CIR" code can be used with all of the linetypes including "points only". The circles are always parallel to the X-Y plane.

For Multi-Point 2ND Code

When used on the first point of a multi-point symbol, the "2ND" code indicates that the second point of the sequence (i.e., the next point after the current one) should be used as the second symbol insertion point for a multi-point symbol. Please refer to **Symbol Pts** in the **Edit Field Code Definition** section below.

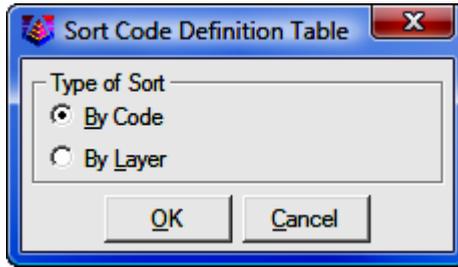
For Multi-Point 3RD Code

When used on the first point of a multi-point symbol, the "3RD" code indicates that the third point of the sequence should be used as the third symbol insertion point. The "3RD" code should be used with the "2ND" code. Please refer to **Symbol Pts** in the **Edit Field Code Definition** section below.

(Edit Codes / Points) dialog continued...

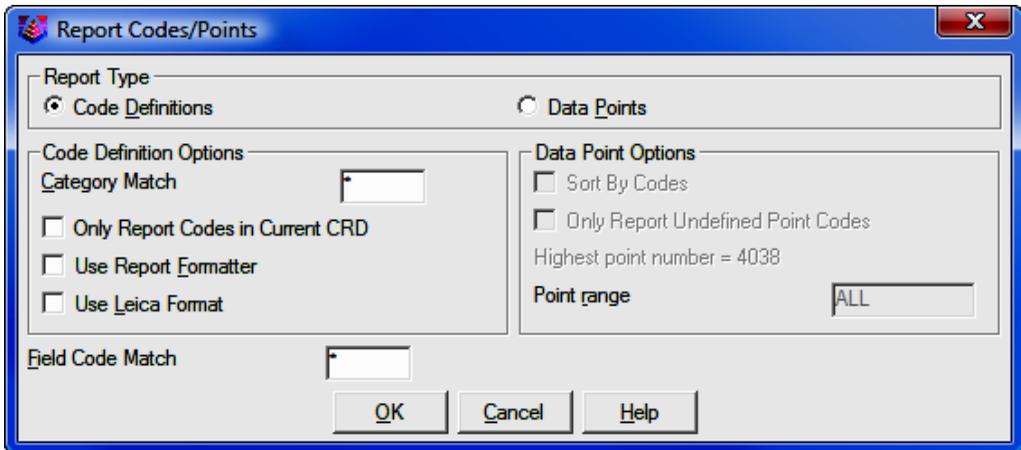
Sort Table

Click the [**Sort Table**] button to sort the code table by either code name or layer.



Report Codes/Points

Click the [**Report Codes/Points**] button to print 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

Click the [**Code Table by CRD**] button to create code table definitions based on the coordinate file field descriptions. This is useful when creating a code table from scratch.

Save

Click the [**Save**] button to save the Field to Finish field code definition (.FLD) file.

Save As

Click the [**Save As**] button to save the Field-to-Finish field code definition (.FLD) file. but allow for the specification of a different file name and location to save to.

Code Definitions

[**Edit**]: If only one field code is selected, then this command opens the **Edit Field Code Definition** dialog box. If multiple field codes are selected (by holding down the control key or shift key and clicking on the rows), then the **Multiple Set** dialog box will open.

Edit Field Code Definition

Category Processing ON Sequence Companion Codes...

Code: Define Code Sequence...

Full Name: Point Group:

Description: Use Raw Description

Main Layer: Set Linetype:

Distinct Point Layer Set

Dual 3D Polyline Layer: Set

Attribute Format: Set Symbol:

Separate Attribute Layers: Set

Color: Unit Symbol

Symbol Size Scaler: Text Size Scaler: Line Width:

Line Type Spacing Scaler: Line Type Text Scaler:

Entity Type: 3D Polyline Connection Order: Locate Pts on Real Z

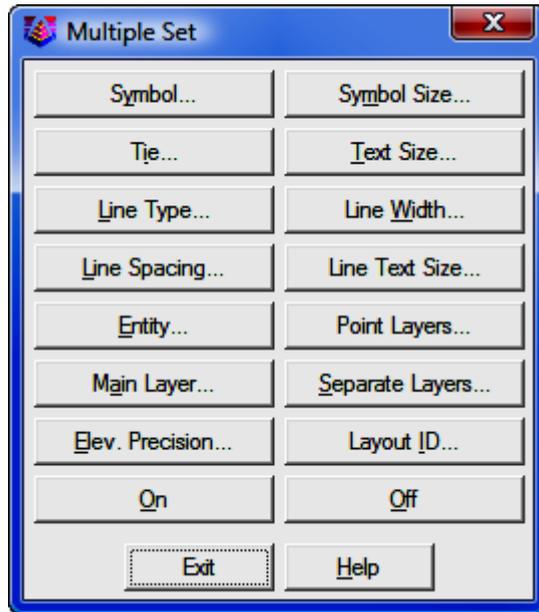
3D and 2D Tie: Non-Surface

2D Polyline Attribute Layout ID: Random Rotate

Line Elevation Integers: Decimals: Rotate to Line

Points Only Elevation Prefix: Suffix: Smooth Polyline

Hard Breakline



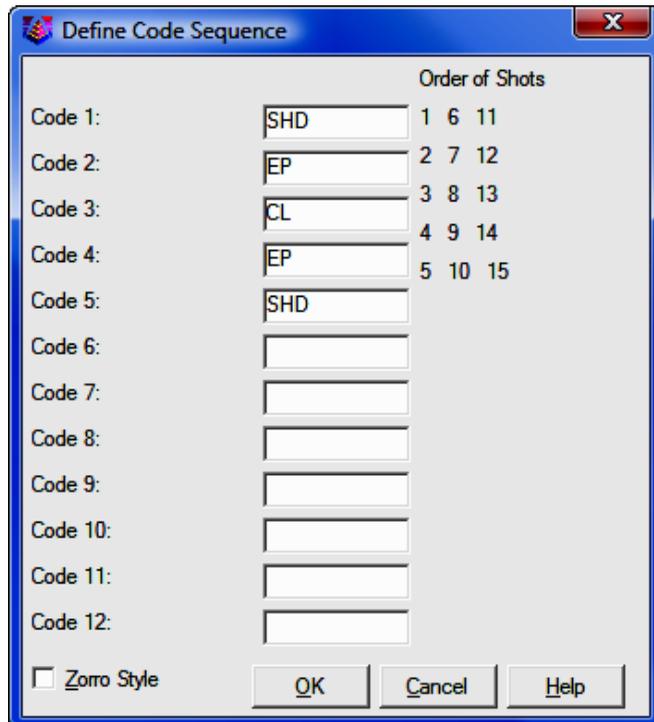
Field-to-Finish will layerize the points and linework according to the code definitions. If the layers to use are not already defined, Field-to-Finish will create the necessary layers and assign different colors. To have the same colors for these layers in all your drawings, define the layers in the 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**. The default drawing template that is used is named 18SCDRAW.DWT. This template name will correspond to the version of AutoCAD that is being used, for example 16SCDRAW for AutoCAD 2004 users. You can overwrite this default template or make a new drawing template.

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 click the [**Define Code Sequence**] button to bring 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 (i.e. SHD as a 3D polyline). In the field, the one template code is used for all the cross-sections shots (i.e. RD for all the points). Then **Draw Field to Finish** will substitute this template code with the sequence codes (i.e. substitute RD with SHD).

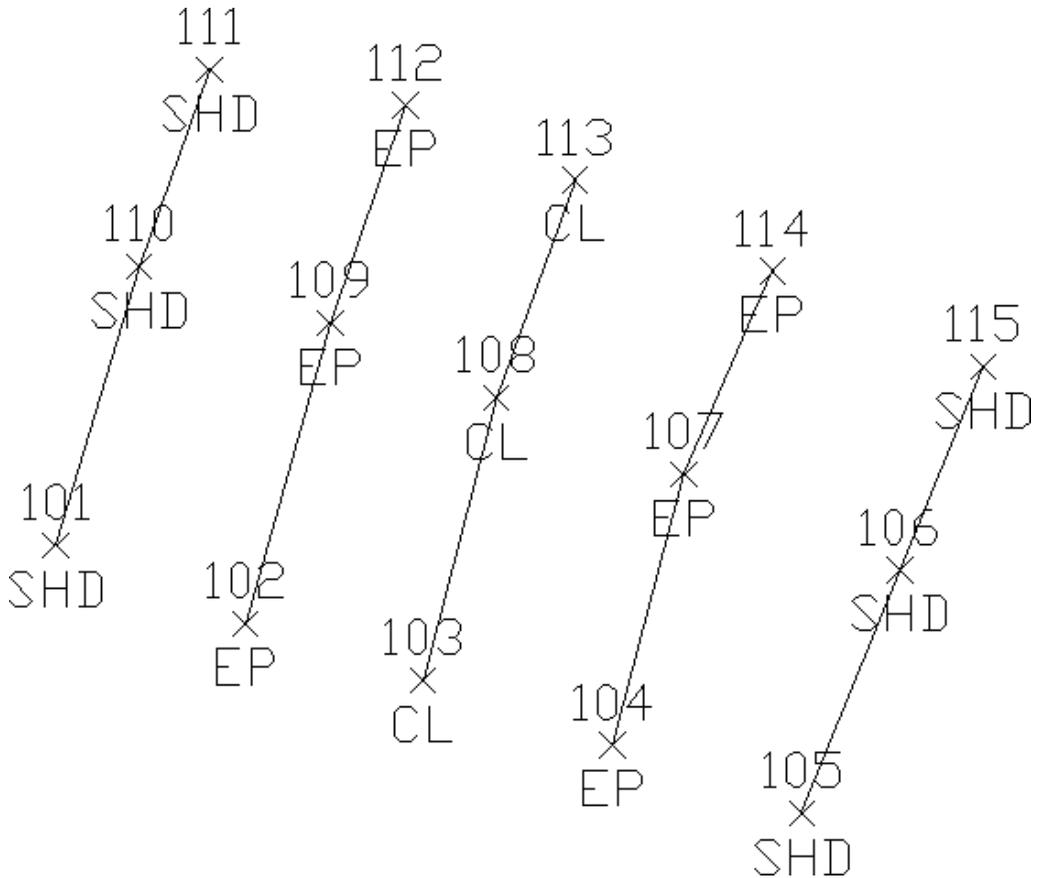


The image shows a dialog box titled "Define Code Sequence" with a close button (X) in the top right corner. The dialog contains a table with two columns: "Code" and "Order of Shots". The "Code" column lists "Code 1" through "Code 12". The "Order of Shots" column lists numbers 1 through 15. The first five rows have text boxes containing "SHD", "EP", "CL", "EP", and "SHD" respectively. The remaining seven rows have empty text boxes. At the bottom left, there is a checkbox labeled "Zorro Style" which is currently unchecked. At the bottom right, there are three buttons: "OK", "Cancel", and "Help".

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:	

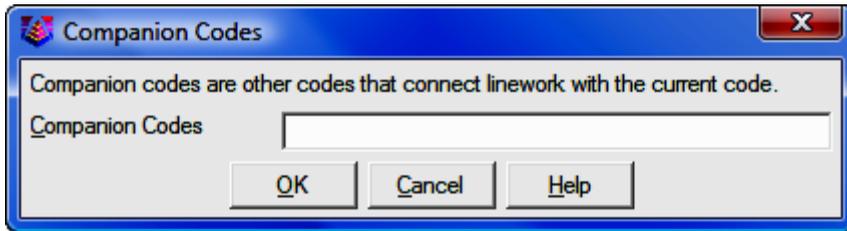
Zorro Style

OK Cancel Help



Resulting points and linework showing Zorro style template

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 **Draw 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.

Point Group: This option is not currently utilized by "Sight" Survey.

Description: This value is assigned to the point description attribute when the point is drawn. 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.

Main Layer: The point and line work for the code will be created in this layer.

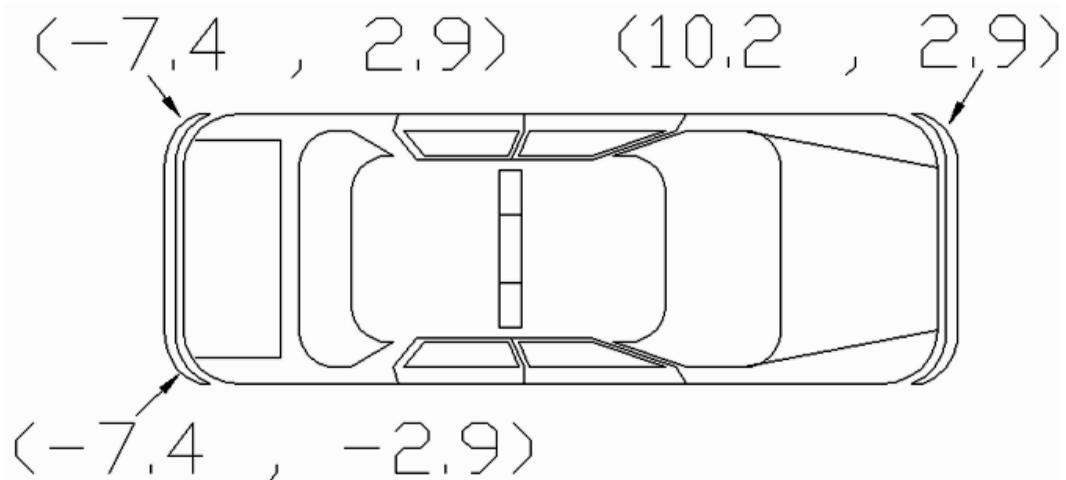
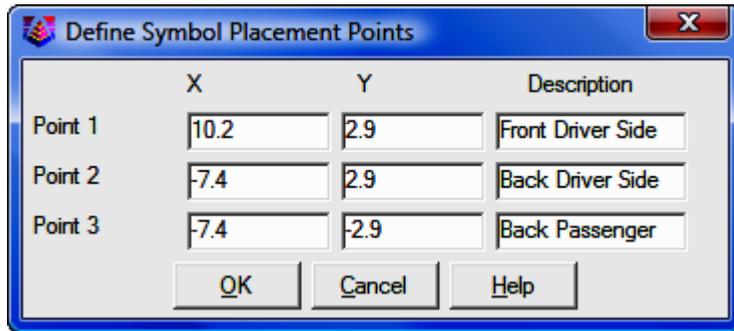
Distinct Point Layer: When this toggle is selected, the line work is created in the layer defined in the Layer field and the points are created in the specified distinct point layer. For example, you could have DRIVEWAY for linework and DRIVEWAY_PNT for the points.

Dual 3D Polyline Layer: Displays the layer that the 3d polyline will drawn on when using an Entity Type of 3D and 2D. The layer name can be typed in this field.

Linetype: Line work can be drawn in any of the special linetypes or with the linetype for the layer ("BYLAYER"). The spacing and size of the special linetypes is determined by the AutoCAD LTSCALE system variable and by the field code settings *Line Type Spacing Scaler* and *Line Type Text Scaler*. 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.

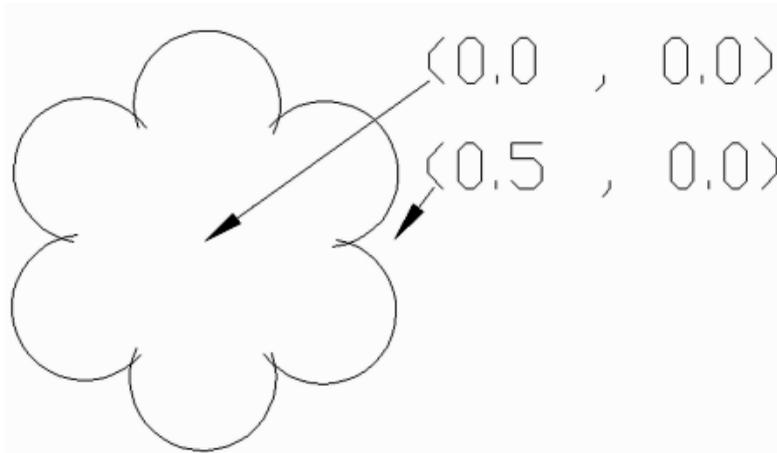
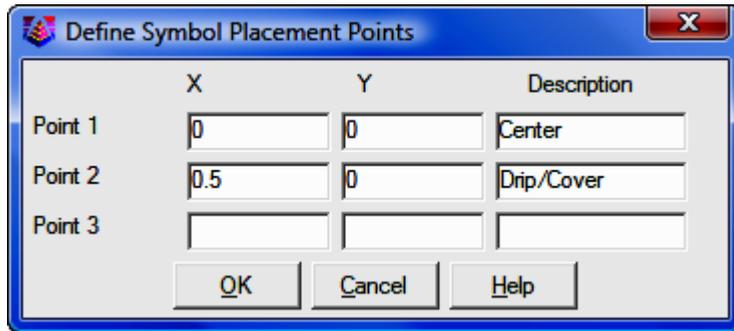
Symbol: This is the point symbol for the code. To avoid drawing a symbol, use the Carlson symbol named **SPT0**.

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.



Three Point Symbol Drawing

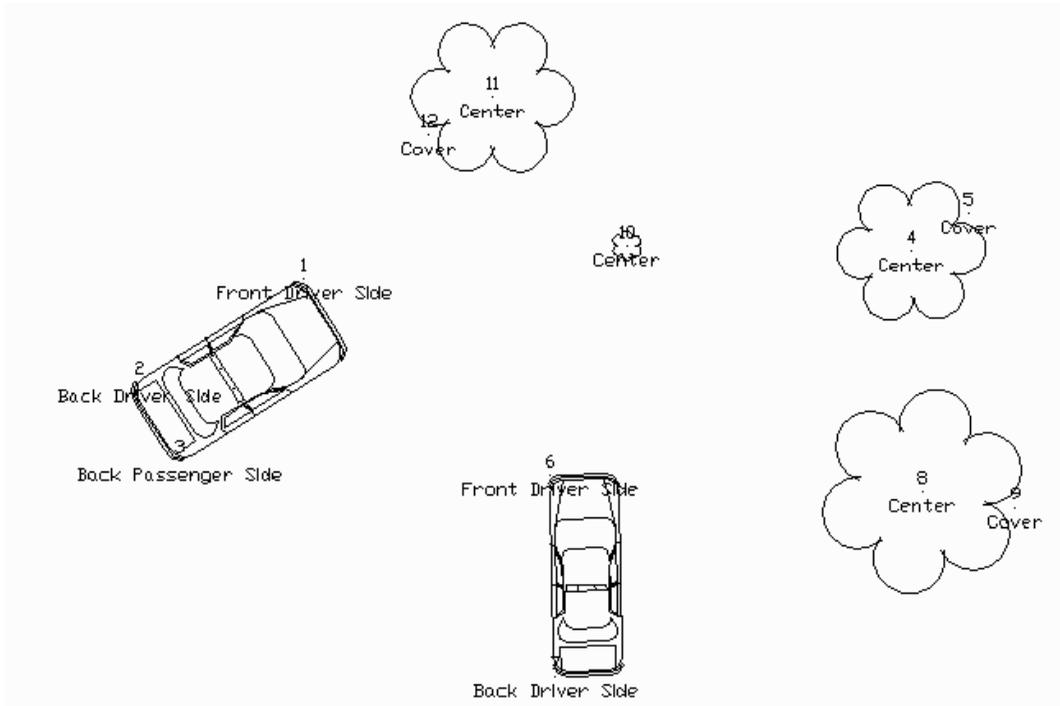
The coordinates for the insertion point definitions are for the symbol at unit size. To figure these coordinates, you will need to open the symbol drawing (.DWG) file. By default, the symbols are located in the \Simplicity Sight Survey 2009\Symbol folder. For example to make an insertion point for the 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).



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

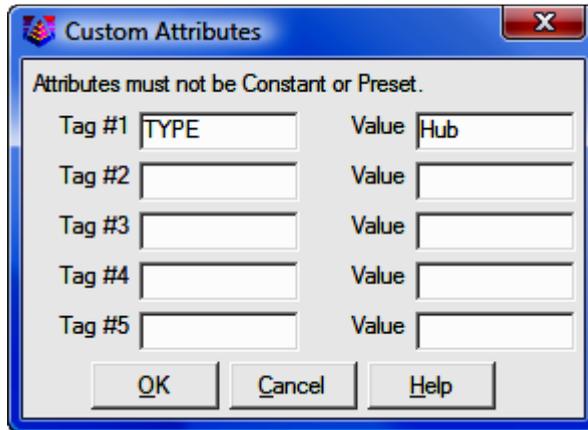
points with the "CAR" description will be used as the second and third symbol insertion points.



Multi-Point Symbol Drawing

Custom Attributes: This feature allows you to use customized blocks that have customized attributes (the tag/value pairs). This feature works for both point attribute blocks and symbols. For attribute blocks, Field-to-Finish looks for attributes with the tags "PT#", "ELEV2", and "DESC2". The custom attributes feature allows you to define up to an additional 5 attributes in their custom blocks on a per-field code basis. For example, the custom block could have an attribute with the tag "TREE_SPECIES" and there's a separate field code for each species of tree. Each of those field codes can specify the value that should be assigned to the attribute that has the TREE_SPECIES tag. Then when the points are drawn, the tree species is shown. Note that the custom attributes must have their **Constant** and **Preset** properties set to "no". The custom attributes settings in F2F should not

use those tags that the software already handles (PT#, ELEV2, and DESC2), or the setting will be ignored.



Set Color: The line work will be drawn in this color. The default is **BY-LAYER**.

Text Size Scaler: This is a scaler value that is multiplied by the horizontal scale to obtain the actual size.

Symbol Size Scaler: This is a scaler value that is multiplied by the horizontal scale to obtain the actual size in AutoCAD. The horizontal scale can be set in **CAD Configuration (CM - [Section 5.03](#))**.

Line Width: This controls the width for the linework, and it only applies to 2D polylines.

Line Type Spacing Scaler: This is a scaler value that is multiplied by the AutoCAD LTSCALE system variable to give the distance between symbols in the line.

Line Type Text Scaler: This is a scaler value that is multiplied by the AutoCAD LTSCALE system variable to give the size of the text in a line.

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 Carlson Civil Design module, and is not used by "Sight" Survey.

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.

Attribute Format: This chooses the type of point entities to create. The **Attribute Block** format creates the Carlson point entity which is a block with attributes for point#, elevation and description. The **Text Attribute** format creates text entities for each of the point attributes. When the **Text Attribute** format is selected, the [Set] button is available where you can control which attributes to draw as text and the position, decimals, style, prefix, suffix and layer for each attribute.

Point Attributes as Text Settings

Position of Text

Left Side Centered Right Side
 Lower Left Centered Below Lower Right

Number of Decimal Places

Northing/Easting: 0.00
Elevation: 0.00

Attribute	Rotation	Prefix	Suffix	Layer	Action
<input checked="" type="checkbox"/> Point#	0.0	PN#-		PNTTXT	Set
<input checked="" type="checkbox"/> Northing	0.0	N-		PNTTXT	Set
<input checked="" type="checkbox"/> Easting	0.0	E-		PNTTXT	Set
<input checked="" type="checkbox"/> Elevation	0.0	Z-		PNTTXT	Set
<input checked="" type="checkbox"/> Description	0.0	D-		PNTTXT	Set

Style: [] Select Create as MTEXT Layer: PNTTXT Set

OK Cancel Help

Separate Attribute 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".

Hard Breakline: This will tag the 3D polylines created with this code as hard breaklines. In **Contour**, (**CI** - [Section 11.02](#)) contours are not smoothed as they cross hard barriers.

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.

Elevation Integers: This controls the number of digits to display to the left of the decimal point for the elevation label. The **All** setting will show the full elevation digits. The other settings allow you to limit the number of digits to display for the purpose of reducing the amount of space the elevation labels take up in the drawing. For example, if a site is in the 4000 foot elevation range, then this setting could be set to three digits (000) and an elevation of 4321 would be labeled as 321.

Elevation Decimals: This controls the display precision for the elevation label.

Elevation Prefix/Suffix: These set the prefix and suffix for the elevation label per code. In the **Draw** function under **Additional Draw Settings**, there is an override to set the elevation prefix/suffix for all the codes.

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 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 drawn 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.

Rotate to Line: This option applies to points that are part of Field-to-Finish linework. This option will align the point attributes and symbol to the associated linework.

(Field to Finish) dialog continued...

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.

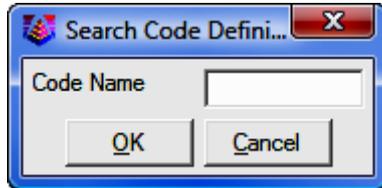
Add: The new code definition is inserted in the list in the position after the currently selected one. If none are selected for positioning, the new code is placed at the top. Only one code definition may be highlighted before running this routine.

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.



Process Draw: This command returns to the **Draw Field to Finish** dialog box.

PointCAD Coding

Field-to-Finish supports an early Carlson style of linework coding called PointCAD. The PointCAD codes use numbers with +, -, * symbols as follows:

- +0 Starts a regular 2D line (not a polyline) that is open.
- *0 Starts a regular 2D line that is closed.
- +4 Starts a curved 2D polyline that is open.
- *4 Starts a curved 2D polyline that is closed.
- +1 Begins a 3-point arc.
- 0 or Ends a line.
- 1 or
- 3

- 4 or Ends a line.
- 5 or
- 6 or
- 7

- +5 Starts a 3D polyline that is open.
- *5 Starts a 3D polyline that is closed.

- +6 Starts a 2D polyline that is open.
- *6 Starts a 2D polyline that is closed.

- +7 Starts line whose type (2D line, 2D polyline, 3D polyline) is specified by the point's field code definition. If the field code definition is to use points, then a 2D line is started.

- +2 Middle point of 3 point arc.

- 05 Starts a curved 3D polyline section.
- 50 Ends a curved 3D polyline section.

- +8 Starts a 2D and 3D polyline combination that is open.
- *8 Starts a 2D and 3D polyline combination that is closed.

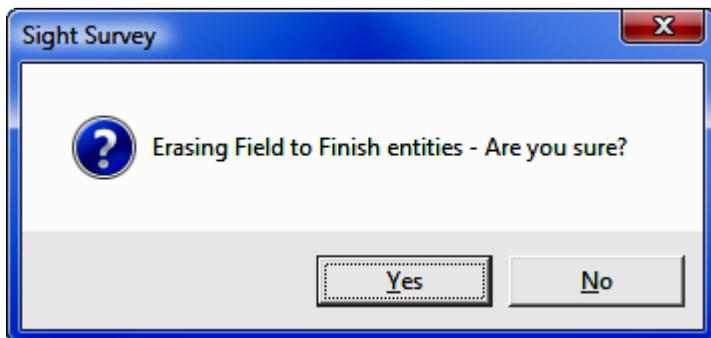
- 8 Ends a 2D and 3D polyline combination.

- 08 Starts a 2D and 3D polyline combination curve that is open.
- 80 Reverts back to a straight 2D and 3D polyline combination.

6.34 Delete Field to Finish (XF)

FUNCTION: The **Delete Field to Finish** routine is used to remove all elements that were placed into your drawing by the **Draw Field to Finish** routine (**FF** - [Section 6.33](#)).

Activate the **Delete Field to Finish** routine by picking from the **Points** menu, by pressing [**Alt**][**P**], [**X**], or by typing **XF** in any text box.



Click [**Yes**] or press [**Y**] to erase all field to finish entries from the drawing. Click [**No**] or press [**N**] to cancel this procedure.



CAUTION: This routine erases **ALL** field to finish entries in the current drawing, even those placed into your drawing in earlier "Sight" Survey sessions.

6.35 Compare Points

FUNCTION: The **Compare Points** routine is used to compare the coordinates of points contained in memory, or to compare points multiple files. "Sight" Survey reports the change in coordinates and elevation between each compared point.

Activate the **Compare Points** routine by picking it from the **Points** menu.



NOTE: Compare Points only works with numeric points, or numeric points stored in an alphanumeric file format. You cannot compare any points containing alpha characters in the point number.

The screenshot shows the 'Compare Points' dialog box with the following settings:

- Base Point Source:** Job Points (selected), Coordinate File, ASCII File. 11 base point(s) selected.
- Mode:** Multiple File Comparison (selected), Single File Comparison using Date Stamps. Select Files button. 0 file(s), 0 point(s) selected.
- Points:** ALL
- Report:** Coordinate Differences (selected), Bearing & Distance, Both.
- Highlight Thresholds:** Off (unchecked), Coordinates: 0.001, Elevations: 0.01, Distances: 0.001.
- Output Precision:** Coordinates: 5, Elevations: 2, Distances: 2.
- Output To:** Text Output (checked), CSV File (unchecked), HTML File (checked).

Buttons: OK, Cancel, Help.

Base Point Source: Select **Job Points** to identify the points that are already loaded into the program as the base point data. If you do not want to include the currently loaded points in your comparison, select either **Coordinate File** (Simplicity, Carlson, C&G, etc.) or **ASCII File** as the base point source. You will be asked to select a file using procedures similar to importing a file (see **Import > ASCII File** - [Section 3.08](#); or **Import > Coordinate File** - [Section 3.09](#)).

Mode: Select the comparison mode; either **Single File** or **Multiple File**. You may compare any number of files, and the files may be of mixed type (i.e. ASCII files and coordinate files).

Single File Comparison: When using **Single File** mode, "Sight" Survey expects that the variations for each point will be numerically tagged to identify the point set. For example, you may have points 1-100 in an original file that you want to compare to points 1-100 from another file. Start by loading or importing the original file. Next, import the second file and add a suffix such as a **.2** or perhaps the date as **.yymmdd** to identify the file set. You may continue to load data sets giving each file a different suffix when loading. You may then end up with a file containing for example, the following points: 100, 100.080630, 100.080927, 100.081121. Those four points reflect the coordinates of the same point, but measured at four different times. When you compare points, "Sight" Survey first looks at the root point number (100 in this example) and compares each set of points having the same root point number.

The **Single File** mode is helpful when you wish to save the points in a single file, but still need to differentiate between the points. The major disadvantage of using this method is the limitation on the length of available point numbers. If you store your data as an ASCII file, you are limited to 12 characters, including the decimal. If you store your file in one of the other available formats, you are limited to the point number length as shown in the table below.

Carlson Numeric Only	5
Carlson Alphanumeric	9
C&G Alphanumeric	10
C&G Numeric	8
SS3 (.zak)	8
LDD (Points.mdb)	7

Multiple File Comparison: When using **Multiple File** mode, you do not have to tag the points with a decimal suffix. You simply select the files you want to compare and "Sight" Survey will identify the file for each point in the report. The **Multiple File** method thus allows for larger point numbers in the data files. Choose files by clicking the [**Select Files**] button and select files using procedures similar to importing a file (see **Import > ASCII File** - [Section 3.08](#); or **Import > Coordinate File** - [Section 3.09](#)).

Points: Select the points you want to compare by entering a point string or range (e.g. **1-100** or **1,2,5,10-50**) or type **A** for all.

Report: You may report the comparison by **Bearing & Distance**, **Coordinate Differences**, or by **Both**.

Highlight Thresholds: To facilitate quick scanning of the report in the **Text Output** window, "Sight" Survey can highlight in red those coordinate differences that match or exceed specified threshold values. The highlighted text will only appear if you output the report to the **Text Output** window and/or to an **HTML** file, since a csv file cannot contain any formatting.

Output Precision: Select the reporting precision for coordinates, elevations, and distances.

Output To: You may output your report to a **CSV File**, an **HTML** file, the **Text Output** window, or any combination of those locations. If you output to a csv and/or HTML file you will need to supply a filename(s). The csv file is simply a comma delimited text file that may be opened in **Microsoft Excel** or other comparable application, and reformatted as desired into a final report. An **HTML** file may be loaded into a browser (such as Mozilla Firefox or Microsoft Internet Explorer) for viewing and/or printing. HTML files retain all formatting including the highlighting of coordinate differences the **Highlight Thresholds**.

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Section 7

The Lines Menu



The **Lines** menu contains functions that define one point's position, in linear relation to another point. Routines such as traverse and several types of inverse are located here, as are several routines that deal with stations and offsets. The radial stakeout and radial inverse routines are also accessed through this menu.

The Lines menu also contains the **Traverse Closure** routine which is used for deed checks and also as a precursor to traverse adjustment through the use of the **Edit Process Raw File** routine (**ER** - [Section 11.11](#)).

7.01 Inverse (IN)

FUNCTION: The **Inverse** routine is used to compute and report the bearing, horizontal distance, and difference in elevation between two points.

Activate the **Inverse** routine by picking from the **Lines** menu; by pressing [**Alt**][**L**], [**I**], or by typing command **IN** at any data entry prompt.

Inverse		
From Point	21	Pts
To Point		Pts
Clear (X)	Go	Help

From Point: When you enter the **Inverse** routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

To Point: Enter an individual foresight point number, a point string, a point range, of type **DF** to recall a **Defined Figure** (see [Section 6.20](#)). If the point has not yet been assigned coordinates, the program will request them. Follow the **Enter and Assign** procedure (**EA** - [Section 6.01](#)) to assign coordinates and a description to the point.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

“Sight” Survey responds to an accepted foresight point by printing into the **Text Output** window the computed bearing and the horizontal and vertical distances from the currently occupied point to the foresight point, the foresight point number, ID, and its Northing, Easting and elevation. The foresight point becomes the currently occupied point and the reference bearing becomes the bearing just inverted.

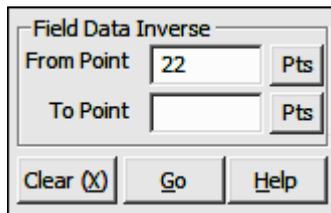
To inverse from your point through a series of consecutive points, enter your **To Point** as the negative value of the last point number in the series. For example, if you are at point 3 and you want to inverse to 4, 5, 6, 7, 8, 9, and 10, in the **To Point** text box, enter **-10**. To inverse through all points in a consecutive manner, enter **A**. You may also inverse a random series of points such as **1,3,17,14**

or even recall a **Defined Figure** or point group (**DF** or **PG** - [Section 6.20](#)). Finally, you may even include arc segments in the point series by designating the arc center point with an asterisk or less than sign (***** or **<**) for an acute curve, or a greater than sign (**>**) for an obtuse curve. For example, suppose your occupied point is 14. Entering a **To Point** of ***19,15** will inverse the acute curve from 14 to 15, using the center point 19.

7.02 **Field Data Inverse (FD)**

FUNCTION: The **Field Data Inverse** routine is used to compute and report the field angle (as turned to the right from the previous backsight), horizontal distance, and difference in elevation between two points.

Activate the **Field Data Inverse** routine by picking from the **Lines** menu; by pressing [**Alt**][**L**], [**F**], or by typing command **FD** at any data entry prompt.



From Point: When you enter the **Field Data Inverse** routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

To Point: Enter an individual foresight point number. If the point has not yet been assigned coordinates, the program will request them. Follow the **Enter and Assign** procedure (**EA** - see [Section 6.01](#)) to assign coordinates and a description to the point.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

“Sight” Survey responds to an accepted foresight point by printing into the **Text Output** window the computed bearing and the horizontal and vertical distances from the currently occupied point to the foresight point, the foresight point number, ID, and its Northing, Easting and elevation. The foresight point becomes the currently occupied point and the reference bearing becomes the bearing just inverted.

To inverse from your point through a series of consecutive points, enter your **To Point** as the negative value of the last point number in the series. For example, if you are at point 3 and you want to inverse to 4, 5, 6, 7, 8, 9, and 10, in the **To Point** text box, enter **-10**. To inverse through all points in a consecutive manner, enter **A**. You may also inverse a random series of points such as **1,3,7,14,10** or even recall a **Defined Figure** or point group (**DF** or **PG** - [Section 6.20](#)).



NOTE: If you use a point string or defined figure in the **To Point** field, “Sight” Survey will ignore any radius point designations but will still include the radius point in the point string to be used.

7.03 Slope Inverse (SI)

FUNCTION: The **Slope Inverse** routine is used to compute and report the bearing, slope distance, and difference in elevation between two points.

Activate the **Slope Inverse** routine by picking from the **Lines** menu; by pressing [**Alt**][**L**], [**P**], or by typing command **SI** at any data entry prompt.

Slope Inverse		
From Point	22	Pts
To Point		Pts
Clear (X)	Go	Help

From Point: When you enter the **Slope Inverse** routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

To Point: Enter an individual foresight point number. If the point has not yet been assigned coordinates, the program will request them. Follow the **Enter and Assign** procedure (**EA** - [Section 6.01](#)) to assign coordinates and a description to the point.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

"Sight" Survey responds to an accepted foresight point by printing into the **Text Output** window the computed bearing and the slope and vertical distances from the currently occupied point to the foresight point, the foresight point number, ID, and its Northing, Easting and elevation. The foresight point becomes the currently occupied point and the reference bearing becomes the bearing just inverted.

To inverse from your point through a series of consecutive points, enter your **To Point** as the negative value of the last point number in the series. For example, if you are at point 3 and you want to inverse to 4, 5, 6, 7, 8, 9, and 10, in the **To Point** text box, enter **-10**. To inverse through all points in a consecutive manner, enter **A**. You may also inverse a random series of points such as **1,3,7,14,10** or even recall a **Defined Figure** or point group (**DF** or **PG** - [Section 6.20](#)).



NOTE: If you use a point string or defined figure in the **To Point** field, "Sight" Survey will ignore any radius point designations but will still include the radius point in the point string to be used.

7.04 Radial Inverse (RI)

FUNCTION: The **Radial Inverse** routine is used to compute and report the bearing, horizontal distance, and difference in elevation between the currently occupied point and a series of foresight points.

Activate the **Radial Inverse** routine by picking from the **Lines** menu; by pressing [Alt][L], [R], or by typing command **RI** at any data entry prompt.



From Point: When you enter the **Radial Inverse** routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [Pts] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [Pts] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

To Point: Enter an individual foresight point number. If the point has not yet been assigned coordinates, the program will request them. Follow the **Enter and Assign** procedure (**EA** - [Section 6.01](#)) to assign coordinates and a description to the point.



TIP: Left-click the [Pts] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [Pts] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

“Sight” Survey responds to an accepted foresight point by printing into the **Text Output** window the computed bearing and the horizontal and vertical distances from the currently occupied point to the foresight point, the foresight point num-

ber, ID, and its Northing, Easting and elevation. The currently occupied point and the reference bearing remain unchanged.

To inverse from your point through a series of consecutive points, enter your **To Point** as the negative value of the last point number in the series. For example, if you are at point 3 and you want to inverse to 4, 5, 6, 7, 8, 9, and 10, in the **To Point** text box, enter **-10**. To inverse through all points in a consecutive manner, enter **A**. You may also inverse a random series of points such as **1,3,17,14** or even recall a **Defined Figure** or point group (**DF** or **PG** - [Section 6.20](#)).



NOTE: If you use a point string or defined figure in the **To Point** field, "Sight" Survey will ignore any radius point designations but will still include the radius point in the point string to be used.

7.05 Deflection Inverse (DI)

FUNCTION: The **D**eflection Inverse routine is used to compute and report the deflection angle (as turned to the right from the previous foresight), horizontal distance, and difference in elevation between two points.

Activate the **D**eflection Inverse routine by picking from the **L**ines menu; by pressing [**Alt**][**L**], [**D**], or by typing command **DI** at any data entry prompt.

A screenshot of a software dialog box titled "Deflection Inverse". It contains two input fields: "From Point" with the value "22" and "To Point" which is empty. Each input field has a "Pts" button to its right. At the bottom of the dialog are three buttons: "Clear (X)", "Go", and "Help".

From Point: When you enter the **D**eflection Inverse routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

To Point: Enter an individual foresight point number. If the point has not yet been assigned coordinates, the program will request them. Follow the **Enter and Assign** procedure (**EA** - [Section 6.01](#)) to assign coordinates and a description to the point.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

"Sight" Survey responds to an accepted foresight point by printing into the **Text Output** window the computed deflection angle from the previous foresight, and the horizontal and vertical distances from the currently occupied point to the foresight point, the foresight point number, ID, and its Northing, Easting and elevation. The foresight point becomes the currently occupied point and the reference bearing becomes the bearing just inverted.

To inverse from your point through a series of consecutive points, enter your **To Point** as the negative value of the last point number in the series. For example, if you are at point 3 and you want to inverse to 4, 5, 6, 7, 8, 9, and 10, in the **To Point** text box, enter **-10**. To inverse through all points in a consecutive manner, enter **A**. You may also inverse a random series of points such as **1,3,17,14** or even recall a **Defined Figure** or point group (**DF** or **PG** - [Section 6.20](#)).



NOTE: If you use a point string or defined figure in the **To Point** field, "Sight" Survey will ignore any radius point designations but will still include the radius point in the point string to be used.

7.06 Radial Stake Out (RS)

FUNCTION: The **Radial Stake Out** routine is used to compute and report the angle (as turned to the right, from a known backsight point), the horizontal distance and difference in elevation between the currently occupied point and a

series or range of foresight points of known coordinates. The currently occupied point and backsight bearing are held constant throughout this routine.

Activate the **Radial Stake Out** routine by picking from the **Lines** menu; by pressing [**Alt**][**L**], [**A**], or by typing command **RS** at any data entry prompt.

Radial Stake Out		
From Point	1	Pts
B.S. Point	47	Pts
Max Dist	300.00	
To Points	2-18	Pts
<input checked="" type="checkbox"/> Draw Points		
Clear (X)	Go	Help

From Point: This is the currently occupied point. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)). Enter the instrument point location.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

B.S. Point: Enter the number of the backsight point.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Max Dist: Enter the maximum foresight distance desired from this set up. If you want all of the points in the data file to be included, press [**Enter**] without entering any distance value.

To Points: Enter an individual foresight point number. If the point has not yet been assigned coordinates, the program will request them. Follow the **Enter**

and Assign procedure (**EA** - see [Section 6.01](#)) to assign coordinates and a description to the point.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Draw Points: Check this box to have the foresight points plotted on the drawing. If not checked, the data will only appear in the **Text Output Window**.

“Sight” Survey responds to an accepted foresight point by printing the computed angle right from the backsight point, and the horizontal and vertical distances from the currently occupied point to the foresight point, the foresight point number, ID, and its Northing, Easting and elevation. The currently occupied point and the reference bearing becomes the bearing just inversed.

To stake out from your point through a series of consecutive points, enter your **To Point** as the negative value of the last point number in the series. For example, if you are at point 3 and you want to inverse to 4, 5, 6, 7, 8, 9, and 10, in the **To Point** text box, enter **-10**. To inverse through all points in a consecutive manner, enter **A**. You may also inverse a random series of points such as **1,3,17,14** or even recall a **Defined Figure** or point group (**DF** or **PG** - [Section 6.20](#)).

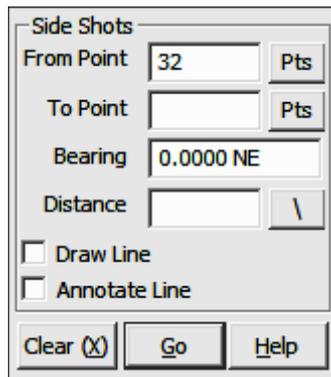


NOTE: If you use a point string or defined figure in the **To Points** field, “Sight” Survey will ignore any radius point designations but will still include the radius point in the point string to be used.

7.07 Side Shot (SS)

FUNCTION: The **Side Shot** routine is similar to a **Traverse** routine (**TR** - [Section 7.09](#)) in that it is used to compute the coordinates for a point when given a bearing (or angle from a backsight) and a distance from the currently occupied point. Both the currently occupied and the backsight bearing are held constant throughout the computation of all side shot points relative to a particular occupied point.

Activate the **Side Shot** routine by picking from the **L**ines menu; by pressing **[Alt][L]**, **[S]**, or by typing command **SS** at any data entry prompt.



The image shows a dialog box titled "Side Shots". It has four input fields: "From Point" with the value "32", "To Point" (empty), "Bearing" with the value "0.0000 NE", and "Distance" (empty). Below these fields are two checkboxes: "Draw Line" and "Annotate Line", both of which are unchecked. At the bottom of the dialog are three buttons: "Clear (X)", "Go", and "Help".

BS Point: This is an informational field showing you the backsight point. You cannot enter data into this field. To change the backsight point, use the **Enter Backsight Point** routine by typing **EP** in any data entry box (see [Section 6.07](#)).

BS Bearing: This is an informational field showing you the backsight bearing. You cannot enter data into this field. To change the backsight bearing, use the **Enter Backsight Bearing** routine by typing **EB** in any data entry box (see [Section 6.08](#)).

From Point: This is the currently occupied point. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)), and will change the **BS Bearing**, but not the **Backsight Point**.



TIP: Left-click the **[Pts]** button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the **[Pts]** button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

To Point: Enter the number of the foresight point or press **[+]** for the next unused point number.

Bearing: Enter the bearing, angle, deflection or azimuth in your chosen format or recall a bearing between any two points in memory (e.g. **15,20**).

Distance: Enter the distance, or recall a distance between two existing points (e.g. **15,20**). If you are entering a slope distance, click the [****] button next to the distance field, or press [**/**] or [****] on your keyboard and to enter your slope data according to the method you specified on the **Slope Entry Configuration** menu (**KS** - [Section 5.02](#)).

Draw Line: Check this box to have a line drawn from the occupied point to the side shot point. The line type properties are set through the use of the **Drawing Properties** menu (**PR** - [Section 5.10](#)).

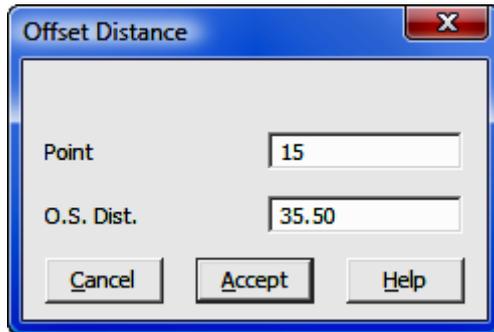
Annotate Line: Check this box to annotate bearing and/or distance data from the occupied point to the side shot point. Annotation properties are set through the use of the **Drawing Properties** menu (**PR** - [Section 5.10](#)).

"Sight" Survey will print into the **Text Output** window the bearing, horizontal and vertical distances from the currently occupied point to the side shot point, and also the point number, ID, Northing, Easting and elevation of the side shot point. The currently occupied point and the reference bearing remain unchanged.

7.08 **Offset (OS)**

FUNCTION: The **Offset** routine is similar to a **Side Shot** routine (**SS** - [Section 7.07](#)) in that it is used to compute the coordinates for a point while holding both the currently occupied point and the backsight bearing. Offsets are set perpendicular to the current backsight bearing, with left (negative)/right (positive) directions relative to the foresight.

Activate the **Offset** routine by picking from the **Lines** menu; by pressing [**Alt**][**L**], [**O**], or by typing command **OS** at any data entry prompt.



Point: Enter a number for the offset point or press [+] for the next unused point number.

O.S. Dist. Enter the distance from the offset point to the point of offset. If the offset is to the left of the line, relative to the direction of the foresight, enter the distance as a negative value.

"Sight" Survey will print into the **Text Output** window the bearing and horizontal distances from the currently occupied point to the offset point, and also the point number, ID, Northing, Easting and elevation of the offset point. The currently occupied point and the reference bearing remain unchanged.



NOTE: You can automatically set multiple offsets while traversing by using the **Traverse with Offsets** routine (**TO** - [Section 7.10](#)).

7.09 Traverse (TR)

FUNCTION: The **T**raverse routine is used to compute the coordinates of a new point along a line of known bearing and distance from the currently occupied point.

Activate the **T**raverse routine by picking from the **L**ines menu; by pressing [**Alt**][**L**], [**T**], or by typing command **TR** at any data entry prompt.

From Point: This is the currently occupied point. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)), and will change the **BS Bearing**, but not the **Backsight Point**.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

To Point: Enter the number of the foresight point or press [**+**] for the next unused point number.

Bearing: Enter the bearing, angle, deflection or azimuth in your chosen format or recall a bearing between any two points in memory (e.g. **15,20**).

Distance: Enter the distance, or recall a distance between two existing points (e.g. **15,20**). If you are entering a slope distance, click the [****] button next to the distance field, or press [**/**] or [****] on your keyboard and to enter your slope data according to the method you specified on the **Slope Entry Configuration** menu (**KS** - [Section 5.02](#)).



TIP: When you are **Traversing with Stations**, "Sight" Survey will accept a station entry (e.g. **1+37.25**) in the **Distance** field and use the difference between that station and the previous station to compute the actual horizontal distance.

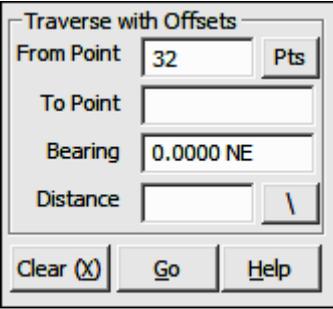
"Sight" Survey will print the bearing, horizontal and vertical distances from the currently occupied point to the foresight point, and also the point number, ID, Northing, Easting and elevation of the foresight point. The foresight point be-

comes the currently occupied point, and the reference bearing becomes the bearing just traversed.

7.10 Traverse with Offsets (TO)

FUNCTION: The **Traverse with Offsets** routine is used to compute the coordinates of a new point along a line of known bearing and distance from the currently occupied point, and then set perpendicular offsets at the foresight point

Activate the **Traverse with Offsets** routine by picking from the **L**ines menu; by pressing [**Alt**][**L**], [**V**], or by typing command **TO** at any data entry prompt.



Traverse with Offsets	
From Point	32 Pts
To Point	
Bearing	0.0000 NE
Distance	\
Clear (X) Go Help	

From Point: This is the currently occupied point. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)), and will change the **BS Bearing**, but not the **Backsight Point**.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

To Point: Enter the number of the foresight point or press [**+**] for the next unused point number.

Bearing: Enter the bearing, angle, deflection or azimuth in your chosen format or recall a bearing between any two points in memory (e.g. **15,20**).

Distance: Enter the distance, or recall a distance between two existing points (e.g. **15,20**). If you are entering a slope distance, click the [****] button next to the distance field, or press [**/**] or [****] on your keyboard and to enter your slope data according to the method you specified on the **Slope Entry Configuration** menu (**KS** - [Section 5.02](#)).



TIP: When you are **Traversing with Stations**, "Sight" Survey will accept a station entry (e.g. **1+37.25**) in the **Distance** field and use the difference between that station and the previous station to compute the actual horizontal distance.

"Sight" Survey will print the bearing, horizontal and vertical distances from the currently occupied point to the foresight point, and also the point number, ID, Northing, Easting and elevation of the foresight point. The foresight point becomes the currently occupied point, and the reference bearing becomes the bearing just traversed.

If an **Offset Table** has been defined (**OD** - [Section 6.21](#)) "Sight" Survey will place points at the offsets enumerated in the table. If **Automatic Point Numbering** (**AN** - [Section 2.10](#)) has been turned on, the computation is fully automatic. If you are manually numbering your points, you will be prompted for each point number until all the table values have been exhausted.



TIP: To use the next available point number, just press [**+**] instead of entering a number.

After setting the predefined offset points, or if there are no predefined offsets, you may enter individual offsets through this dialog box:

Field	Value
Point	15
O.S. Dist.	35.50

Buttons: Cancel, Accept, Help

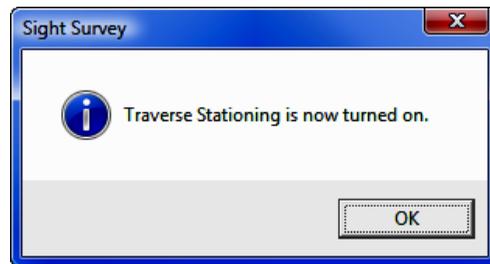
Point: Enter a number for the offset point or press [**+**] for the next unused point number. If **Automatic Point Numbering** (**AN** - [Section 2.10](#)) has been turned on you will only need to enter an offset distance.

O.S. Dist: Enter a positive distance value to offset to the right with respect to the foresight direction. Likewise, enter a negative distance value to offset to the left with respect to the foresight direction. To exit the offset entry, simply click [**Cancel**] or leave the **O.S. Dist.** field blank and press [**Enter**].

7.11 Traverse with Stations (TS)

FUNCTION: The **Traverse with Stations** routine is used to toggle the stationing mode on and off. When active, the stationing mode computes horizontal stationing data along the traversed course. Stationing always proceeds in an increasing fashion.

Activate the **Traverse with Stations** routine by picking from the **Lines** menu; by pressing [**Alt**][**L**], [**E**], or by typing command **TS** at any data entry prompt.



This routine toggles **Traverse Stationing** on and off.

The value of the initial station will be whatever has been assigned to the currently occupied point. If no value is assigned, the station is set to zero. Stations may be formatted in either English (**0+00**) or metric notation (**0+000**) as defined on the **Local Configuration** menu (**LC** - [Section 5.05](#)).

To assign a station to the currently occupied point, use the **Enter Station** dialog (**ES** - [Section 6.04](#)).



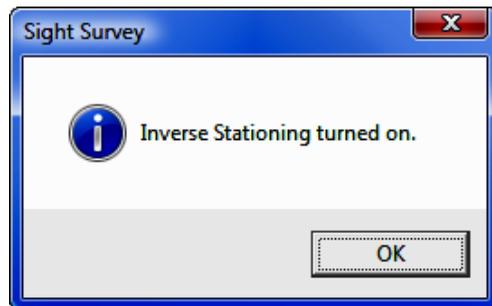
Key in the station in the correct format and press [**Enter**] or click [**Accept**]. The point and station information will be written into the **Text Output** window.

After turning the stationing feature on, each straight leg (and/or arc) traversed will also have a station computed. This station will be carried along with the point.

7.12 **I**nverse with Stations (IS)

FUNCTION: The **I**nverse with Stations routine is used to toggle the stationing mode on and off. When active, the stationing mode computes horizontal stationing data along the inversed course. Stationing always proceeds in an increasing fashion.

Activate the **I**nverse with Stations routine by picking from the **L**ines menu; by pressing [**Alt**][**L**], [**N**], or by typing command **IS** at any data entry prompt.



This routine toggles **I**nverse Stationing on and off.

The value of the initial station will be whatever has been assigned to the currently occupied point. If no value is assigned, the station is set to zero. Stations may be formatted in either English (**0+00**) or metric notation (**0+000**) as defined on the **Local Configuration** menu (**LC** - [Section 5.05](#)).

To assign a station to the currently occupied point, use the **Enter Station** dialog (**ES** - [Section 6.04](#)).



Key in the station in the correct format and press [**Enter**] or click [**Accept**]. The point and station information will be written into the **Text Output** window.

After turning the stationing feature on, each straight leg (and/or arc) inverted will also have a station computed. This station will be carried along with the point.

7.13 Traverse Right of Way (RW)

FUNCTION: The **Traverse Right of Way** routine functions as a multiple offset intersection routine to lay out one or two lines parallel to a known line.

Activate the **Traverse Right of Way** routine by picking from the **L**ines menu; by pressing [**Alt**][**L**], [**W**], or by typing command **RW** at any data entry prompt.

Traverse Right of Way		
From Point	20	Pts
B.S. Point	19	Pts
L. Offset	40	
R. Offset	20	
Next Point	21-27	Pts
<input checked="" type="checkbox"/> Draw Lines		
Clear (X)	Go	Help

From Point: This is the currently occupied point. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine, and will change the **BS Bearing**.



TIP: Left-click the [Pts] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [Pts] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

BS Point: This is the current backsight point. This point is used to establish a perpendicular direction for the offset points placed at the beginning of the right of way. If this point is the same as the **From Point**, offsets at this point will be placed perpendicular to the leg extending from the occupied point to the first foresight point.



TIP: Left-click the [Pts] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [Pts] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Left Offset: Enter the offset distance to the left, with respect to the forward direction of travel. If you do not want to set a right-of-way on the left side, just press [Enter].

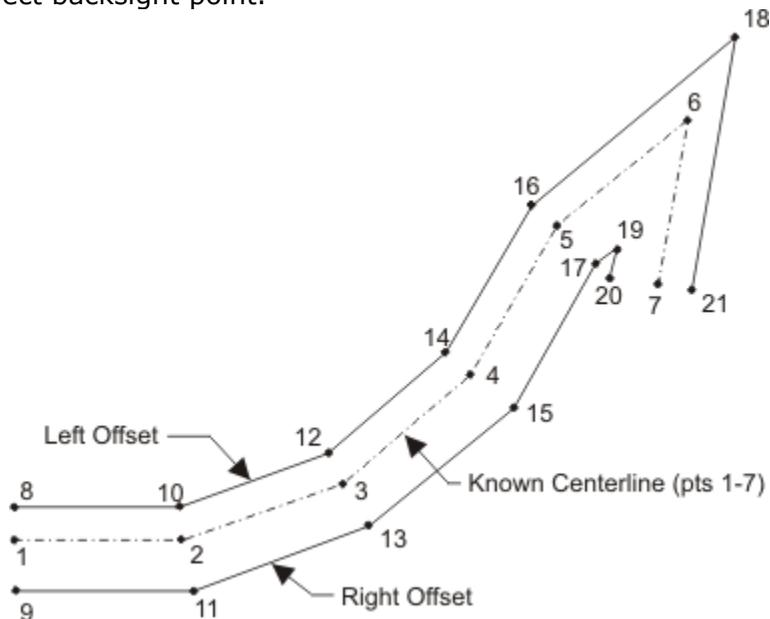
Right Offset: Enter the offset distance to the right, with respect to the forward direction of travel. If you do not want to set a right-of-way on the right side, just press [**Enter**].

Next Point: Type in individual point numbers, pressing [**Enter**] after each number, or press [**+**] for the next unused point number. You may also enter a point string into this field or even recall a **Defined Figure** or point group (**DF** or **PG** - [Section 6.20](#)).



TIP: When ending your right of way: *If the foresight point specified is the same as the occupied point, the offsets will be placed perpendicular to the leg extending from the backsight point to the currently occupied point.*

“Sight” Survey will respond to each accepted right-of-way point by computing and printing into the **Text Output** window the offset point coordinates and a point name. Offset point numbers are automatically assigned. “Sight” Survey will also update the data entry screen by correctly displaying the current point and the correct backsight point.

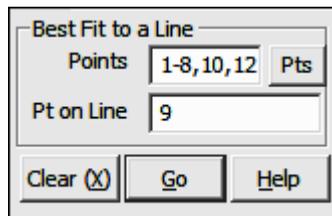


In this example, set your initial **From Point** to **1** and your **BS Point** to **2** (to set offsets 8 and 9 at point 1 perpendicular to line 1-2). Enter your **Next Point** as **2-7**. When point 7 is your **From Point**, set the **Next Point** to also be **7** and points 20 and 21 will be set perpendicular to line 7-6.

7.14 Best Fit Line (BF)

FUNCTION: The **Best Fit Line** routine is used to compute and report the bearing of a line which best fits the coordinates of any three or more known points. The routine also calculates coordinates for a point on the best fit line.

Activate the **Best Fit Line** routine by picking from the **Lines** menu; by pressing [**Alt**][**L**], [**L**], or by typing command **BF** at any data entry prompt.



Best Fit to a Line

Points 1-8,10,12 Pts

Pt on Line 9

Clear (X) Go Help

Points: Type in a string of individual point numbers and/or point ranges and press [**Enter**]. You may also recall a defined figure (or point group) by typing **DF** or **PG** and selecting one from the list (**DF** or **PG** - [Section 6.20](#)).

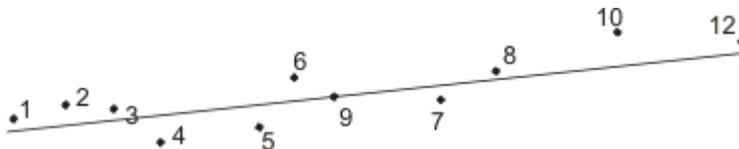


TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Pt on Line: Type in a point number that will be assigned to a location through which the best fit line will pass, and press [**Enter**].

“Sight” Survey will compute and print (into the **Text Output Window**) the bearing of the best fit line, and the coordinates of a point through which the line passes.

In the example shown below, the points along the line are 1-8, 10 and 12. The point computed on the best fit line is point 9.



7.15 Traverse Closure (TC)

FUNCTION: The **Traverse Closure** routine is used to enter the bearing of a line which closes a traverse, then report on the accuracy of closure.

Activate the **Traverse Closure** routine by picking from the **Lines** menu; by pressing [Alt][L], [U], or by typing command **TC** at any data entry prompt.



WHEN TO USE: *Traverse Closure* must only be activated before entering the final, or closing leg, of a traverse.

Traverse Close	
From Point	4 Pts
Close to	1 Pts
Bearing	89.3211AR
Distance	257.52 \
Clear (X)	Go Help

BS Point: This is an informational field showing you the backsight point. You cannot enter data into this field. To change the backsight point, use the **Enter Backsight Point** routine by typing **EP** in any data entry box (see [Section 6.07](#)).

BS Bearing: This is an informational field showing you the backsight bearing. You cannot enter data into this field. To change the backsight bearing, use the **Enter Backsight Bearing** routine by typing **EB** in any data entry box (see [Section 6.08](#)).

From Point: This is the currently occupied point. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)), and will change the **BS Bearing**, but not the **Backsight Point**.



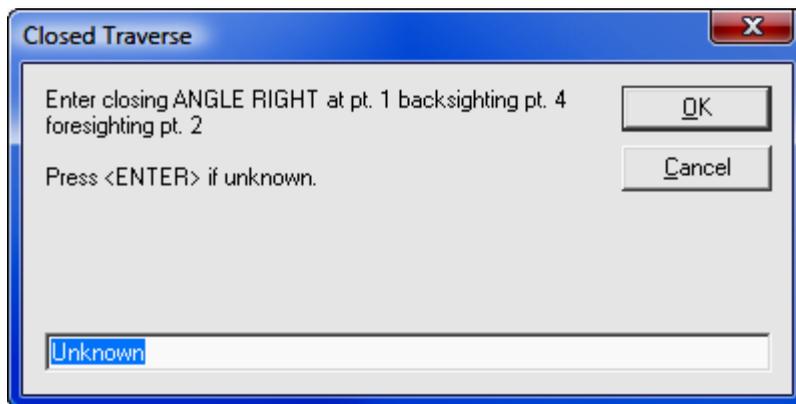
TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Close To: Enter the number of the known closing point. If the closing point has not yet been assigned coordinates, the program will request them. Follow the **Enter and Assign** procedure (**EA** - [Section 6.01](#)) to assign coordinates and a description to the point.

Bearing: Enter the bearing, angle, deflection or azimuth in your chosen format or recall a bearing between any two points in memory (e.g. **15,20**).

Distance: Enter the distance, or recall a distance between two existing points (e.g. **15,20**). If you are entering a slope distance, click the [****] button next to the distance field, or press [**/**] or [****] on your keyboard and to enter your slope data according to the method you specified on the **Slope Entry Configuration** menu (**KS** - [Section 5.02](#)).

After accepting the distance entry "Sight" Survey will prompt for a closing angle.



If you do not know the angle, just click [**OK**].

"Sight" Survey will print the bearing, horizontal and vertical distances from the currently occupied point to the computed closing point, and also Northing, Easting and elevation of the computed closing point. "Sight" Survey then inverts from the computed closing point to the actual closing point coordinates to determine the error of closure. Closure statistics are printed in the **Text Output** window. Open the **Text Output** window to see the results:

```
Precision Ratio = 1:37  
Length Traversed = 1664.33  
Length to Close = 45.33  
Error in Latitude = -44.01  
Error in Departure = 10.84  
Area = 3.533 Acres or 153892.116 Sq Feet  
Total Angular Error = 0° 00' 17"  
Error per Station = 0° 00' 04.3"
```

Corrections and Adjustments: If you wish to review, correct, rerun, and/or balance the traverse, type **ER** or click the **Edit Raw** button on the toolbar to activate the **Tools > Edit Process Raw Files > Carlson Editor** routine. Your raw file will be automatically loaded into the editor. See [Section 11.11](#) for information on the use of this routine. You may also wish to refer to the **Traverse Closure** example ([Section 13.07](#)) for information on traverse correction and adjustment.

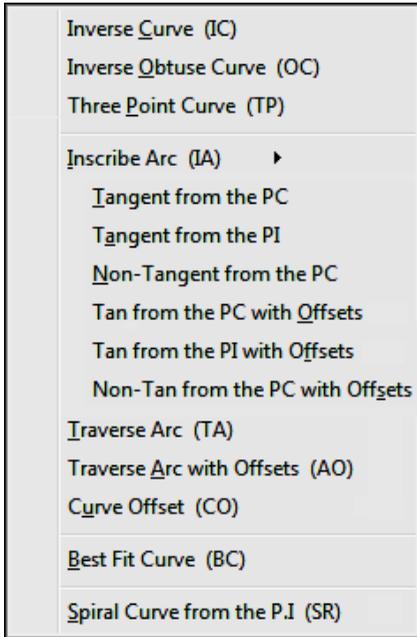


NOTE: You cannot use the C&G Raw Editor for traverse adjustment and balancing; it is only used for Network Least Squares adjustment.

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Section 8

The Curve Menu

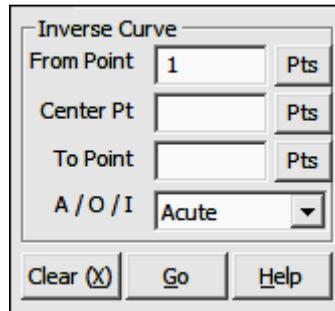


The **Curve** menu contains functions that are used to define the relationship of points based on curves. Here you will find such routines as **Inverse Curve**, **Traverse Arc**, **Inscribe Arc**, **Curve Offsets**, and **Best Fit Curve**. **Spiral** and **Vertical Curve** solutions are also offered. The **Inscribe Arc** sub-menu includes several options for creating tangent and non-tangent curves.

8.01 Inverse Curve (IC)

FUNCTION: The **Inverse Curve** routine is used to calculate and report the measurement data along an acute (by default) circular arc, having a delta angle of less than 180° (200 grads). This routine calculates the central angle, arc length, chord, chord bearing, tangent and radius of a curve when given the coordinates of the point of curvature (PC), the circle's center point and the curve's end point. The routine may also be set to inverse an obtuse curve or divide an arc into equal segments or intervals.

Activate the **Inverse Curve** routine by picking from the **Curves** menu; by pressing **[Alt][V]**, **[C]**; or by typing the two-letter command **IC** at any data entry prompt.



Inverse Curve		
From Point	1	Pts
Center Pt		Pts
To Point		Pts
A / O / I	Acute	
Clear (X)	Go	Help

From Point: This is the currently occupied point, which is also the PC. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the **[Pts]** button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the **[Pts]** button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Center Point: Enter the circle's center point number. If the center point has not been assigned coordinates, the program will prompt for them and you must respond as you would to an **Enter and Assign** routine (**EA** - [Section 6.01](#)).



TIP: Left-click the **[Pts]** button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the **[Pts]** button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

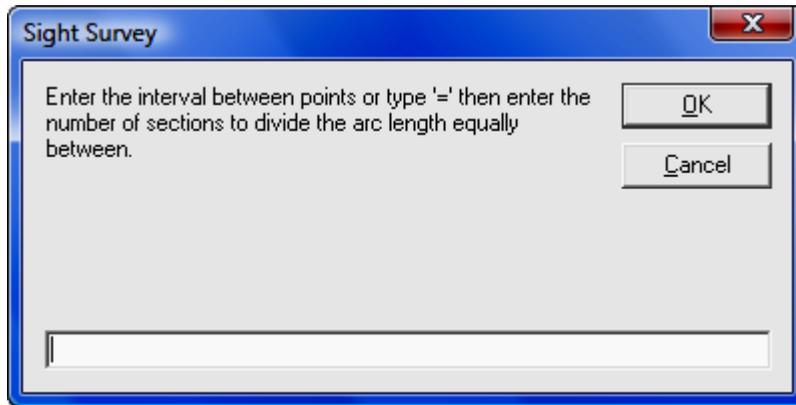
To Point: Enter the point number of the circle's end point. If the end point has not been assigned coordinates, the program will prompt for them and you must respond as you would to an **Enter and Assign** routine (**EA** - [Section 6.01](#)).



TIP: Left-click the **[Pts]** button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the **[Pts]** button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

1) A 2) O 3) I: Enter an **A** or a **1** if you want the calculations to be based on an acute central angle. Enter the letter **O** or a **2** for the obtuse angle, and enter an **I** or a **3** to divide the arc into a desired number of intervals.

If you choose to enter an interval, you have two choices: You may enter either an arc distance for the intervals, or the number of equal intervals per arc.



To enter an arc length for each interval, simply enter the distance and click [**OK**] or press [**Enter**]. To specify the number of intervals per arc, enter an equal sign followed by the number of intervals. For example, an entry of **=3** would divide the arc into three intervals

"Sight" Survey will respond to an accepted end point (and interval if so specified) by first checking for a radii match. If the measured difference in radii is greater than 0.01 feet, the message "**The radii do not match!**" will be displayed.

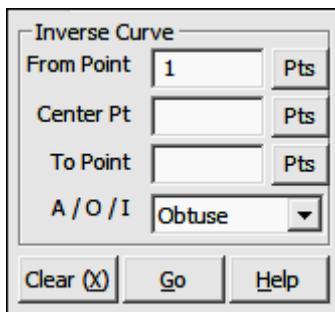
In a standard **Inverse Curve** procedure, if the radii match successfully, the program will compute and print into the **Text Output** window the Central Angle, Radius, Arc Length, Tangent, Chord, and Chord Bearing from the P.C. to the end point. The end point becomes the currently occupied point and the bearing from the end point to the center point becomes the reference bearing for use in the next calculation.

If you have chosen to inverse the curve by interval, the curve will be sub-divided and point numbers will be automatically assigned to the interval points. "Sight" Survey will report the interval points but will not inverse the curve data for each segment.

8.02 Inverse Obtuse Curve (OC)

FUNCTION: The **Inverse Obtuse Curve** routine is used to calculate and report the measurement data along an obtuse circular arc, having a delta angle greater than 180° (200 grads). This routine calculates the central angle, arc length, chord, chord bearing, tangent and radius of a curve when given the coordinates of the point of curvature (PC), the circle's center point and the curve's end point. The routine may also be set to inverse an acute curve or divide an arc into equal segments or intervals.

Activate the **Inverse Obtuse Curve** routine by picking from the **Curves** menu; by pressing [**Alt**][**V**], [**O**]; or by typing the two-letter command **IC** at any data entry prompt.



Inverse Curve		
From Point	1	Pts
Center Pt		Pts
To Point		Pts
A / O / I	Obtuse	
Clear (X)	Go	Help

From Point: This is the currently occupied point, which is also the PC. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Center Point: Enter the circle's center point number. If the center point has not been assigned coordinates, the program will prompt for them and you must respond as you would to an **Enter and Assign** routine (**EA** - [Section 6.01](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

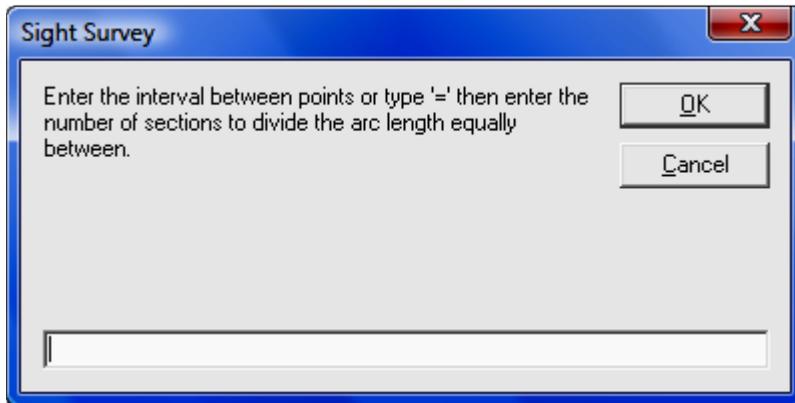
To Point: Enter the point number of the circle's end point. If the end point has not been assigned coordinates, the program will prompt for them and you must respond as you would to an **Enter and Assign** routine (**EA** - [Section 6.01](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

1) A 2) O 3) I: Enter an **A** or a **1** if you want the calculations to be based on an acute central angle. Enter the letter **O** or a **2** for the obtuse angle, and enter an **I** or a **3** to divide the arc into a desired number of intervals.

If you choose to enter an interval, you have two choices: You may enter either an arc distance for the intervals, or the number of equal intervals per arc.



To enter an arc length for each interval, simply enter the distance and click [**OK**] or press [**Enter**]. To specify the number of intervals per arc, enter an equal sign followed by the number of intervals. For example, an entry of **=3** would divide the arc into three intervals.

"Sight" Survey will respond to an accepted end point (and interval if so specified) by first checking for a radii match. If the measured difference in radii is greater than 0.01 feet, the message "**The radii do not match!**" will be displayed.

In a standard **Inverse Curve** procedure, if the radii match successfully, the program will compute and print into the **Text Output** window the Central Angle, Radius, Arc Length, Tangent, Chord, and Chord Bearing from the P.C. to the end

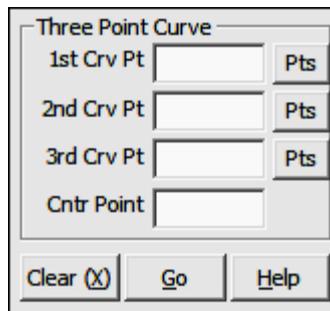
point. The end point becomes the currently occupied point and the bearing from the end point to the center point becomes the reference bearing for use in the next calculation.

If you have chosen to inverse the curve by interval, the curve will be sub-divided and point numbers will be automatically assigned to the interval points. "Sight" Survey will report the interval points but will not inverse the curve data for each segment.

8.03 Three Point Curve (TP)

FUNCTION: The **Three Point Curve** routine is used to compute the center point of a curve that passes through three known points.

Activate the **Three Point Curve** routine by picking from the **Curves** menu; by pressing [**Alt**][**V**], [**P**]; or by typing the two-letter command **TP** at any data entry prompt.



Three Point Curve	
1st Crv Pt	Pts
2nd Crv Pt	Pts
3rd Crv Pt	Pts
Cntr Point	
Clear (X)	Go Help

1st Crv Pt: This is the currently occupied point. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

2nd Crv Pt: Enter the number of a second point on the curve. If the point has not been assigned coordinates, the program will prompt for them and you must respond as you would to an **Enter and Assign** routine (**EA** - [Section 6.01](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

3rd Crv Pt: Enter the number of a third point on the curve. If the point has not been assigned coordinates, the program will prompt for them and you must respond as you would to an **Enter and Assign** routine (**EA** - [Section 6.01](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Cntr Point: Enter a point number to be assigned to the computed center point for the curve which fits the three known curve points.

“Sight” Survey will respond to your completed point entries by calculating the coordinates of the center point of an (acute) arc that passes through the three known points. The center point number and coordinates will be printed in the **Text Output** window. Use the **Inverse Curve** routine (**IC** - [Section 8.01](#)) to view the curve data.

8.04 Intangent from the PC (**IAT**)

FUNCTION: The **Inscribe Arc: Intangent from the PC** routine is used to compute the center point and tangent point from a known point of curvature.

Activate the **Intangent from the PC** routine by picking from the **Curves: Inscribe Arc** menu; by pressing [**Alt**][**V**], [**I**], [**T**], or by typing command **IAT** at any data entry prompt

Inscribe Arc: Tan. from PC

P.C.	1	Pts
Center Pt	20	
End Pt	21	
Delta	45	
Chord		
Arc	500	
Tangent		
Radius		
Direction		

Clear (X) Go Help

This routine may be solved by any of the following criteria:

- ▶ Delta & Chord known
- ▶ Chord & Tangent known
- ▶ Delta & Arc known
- ▶ Chord & Radius known
- ▶ Delta & Tangent known
- ▶ Arc & Radius known
- ▶ Delta & Radius known
- ▶ Tangent & Radius known

Enter data for at least two of these known items. If you have additional data, you may enter it but it is not necessary to do so. Insufficient data will result in an incorrect solution.

P.C.: This is the currently occupied point, which is also the PC. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine ([GT -Section 6.06](#)), and will change the **BS Bearing**.



TIP: Left-click the [Pts] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [Pts] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Center Point: Enter a point number for the center point to be computed.

End Point: Enter a point number for the end point to be computed.

Delta: Enter the delta angle. If unknown, just press [**Enter**] or [**Tab**].

Chord: Enter the chord length. If unknown, just press [**Enter**] or [**Tab**].

Arc: Enter the arc length. If unknown, just press [**Enter**] or [**Tab**].

Tangent: Enter the tangent length. If unknown, just press [**Enter**] or [**Tab**].

Radius: Enter the radius length. If unknown, just press [**Enter**] or [**Tab**].

Curve Direction: Press [**0**] or [**L**] if the curve proceeds to the left, or press [**1**] or [**R**] if the curve proceeds to the right. The direction of the curve is relative to the forward direction of travel.

“Sight” Survey will respond to correct and sufficient data by computing the arc center point and end point, and then printing the center point number and coordinates, the central angle, arc, radius, tangent, chord length and chord bearing; and the arc end point number and coordinates.

8.05 Tangent from the PI (IAA)

FUNCTION: The Inscribe Arc: Tangent from the PI routine is used to compute the PC, center point, and tangent point from a known point of intersection (PI) of the arc's tangent legs.

Activate the Tangent from the PI routine by picking from the **Curves: Inscribe Arc** menu; by pressing [**Alt**][**V**], [**I**], [**A**], or by typing command **IAA** at any data entry prompt.

Inscribe Arc: Tan. from PI	
P.I.	20 <input type="button" value="Pts"/>
P.C.	10
Center Pt	11
End Pt	12
Delta	
Chord	750.25
Arc	
Tangent	
Radius	465.00
Direction	
<input type="button" value="Clear (X)"/> <input type="button" value="Go"/> <input type="button" value="Help"/>	

This routine may be solved by any of the following criteria:

- ▶ Delta & Chord known
- ▶ Delta & Arc known
- ▶ Delta & Tangent known
- ▶ Delta & Radius known
- ▶ Chord & Tangent known
- ▶ Chord & Radius known
- ▶ Arc & Radius known
- ▶ Tangent & Radius known

Enter data for at least two of these known items. If you have additional data, you may enter it but it is not necessary to do so. Insufficient data will result in an incorrect solution.

P.I.: This is the currently occupied point, which is also the PI. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)), and will change the **BS Bearing**.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

P.C.: Enter a point number for the PC point to be computed.

Center Point: Enter a point number for the center point to be computed.

End Point: Enter a point number for the end point to be computed.

Delta: Enter the delta angle. If unknown, just press [**Enter**] or [**Tab**].

Chord: Enter the chord length. If unknown, just press [**Enter**] or [**Tab**].

Arc: Enter the arc length. If unknown, just press [**Enter**] or [**Tab**].

Tangent: Enter the tangent length. If unknown, just press [**Enter**] or [**Tab**].

Radius: Enter the radius length. If unknown, just press [**Enter**] or [**Tab**].

Curve Direction: Press [**0**] or [**L**] if the curve proceeds to the left, or press [**1**] or [**R**] if the curve proceeds to the right. The direction of the curve is relative to the forward direction of travel.

“Sight” Survey will respond to correct and sufficient data by computing the arc PC, center point, and end point, and then printing the PC point number and coordinates, center point number and coordinates, the central angle, arc, radius, tangent, chord length and chord bearing; and the arc end point number and coordinates. Data will be printed to the **Text Output** window.

8.06 Non-Tangent from the PC (IAN)

FUNCTION: The **Inscribe Arc: Non-Tangent from the PC** routine is used to compute the center point and tangent point of a non-tangent arc from a known point of curvature.

Activate the **Non-Tangent from the PC** routine by picking from the **Curves: Inscribe Arc** menu; by pressing [**Alt**][**V**], [**I**], [**N**], or by typing command **IAN** at any data entry prompt.

Inscribe Arc: Non-Tangent

P.C.	1	Pts
Center Pt	20	
End Pt	21	
Delta	45	
Chord		
Arc	500	
Tangent		
Radius		
Direction		

Clear (X) Go Help

This routine may be solved by any of the following criteria:

- ▶ Delta & Chord known
- ▶ Delta & Arc known
- ▶ Delta & Tangent known
- ▶ Delta & Radius known
- ▶ Chord & Tangent known
- ▶ Chord & Radius known
- ▶ Arc & Radius known
- ▶ Tangent & Radius known

Enter data for at least two of these known items. If you have additional data, you may enter it but it is not necessary to do so. Insufficient data will result in an incorrect solution.

P.C.: This is the currently occupied point, which is also the PC. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)), and will change the **BS Bearing**.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Center Point: Enter a point number for the center point to be computed.

End Point: Enter a point number for the end point to be computed.

Delta: Enter the delta angle. If unknown, just press [**Enter**] or [**Tab**].

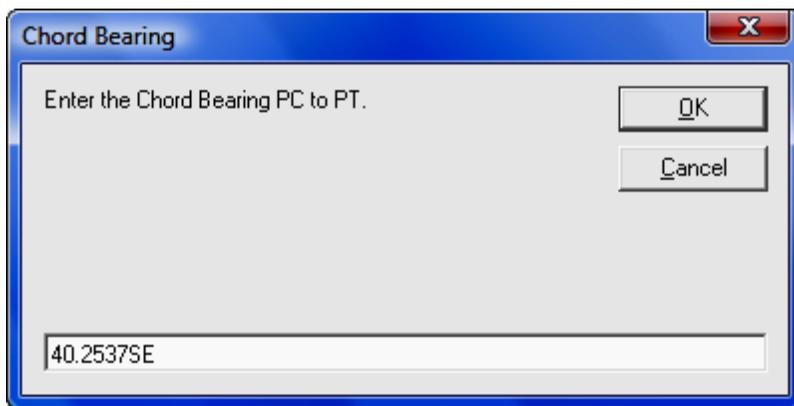
Chord: Enter the chord length. If unknown, just press [**Enter**] or [**Tab**].

Arc: Enter the arc length. If unknown, just press [**Enter**] or [**Tab**].

Tangent: Enter the tangent length. If unknown, just press [**Enter**] or [**Tab**].

Radius: Enter the radius length. If unknown, just press [**Enter**] or [**Tab**].

Curve Direction: Press [**0**] or [**L**] if the curve proceeds to the left, or press [**1**] or [**R**] if the curve proceeds to the right. The direction of the curve is relative to the forward direction of travel.



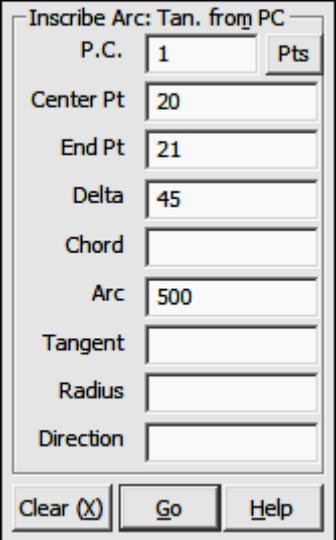
Chord Bearing: Enter the bearing of the chord as it proceeds from the PC to the PT. Make sure you include a quad code if you are not computing in azimuth mode as set under the **Local Configuration** menu (**LC** - [Section 5.05](#))

"Sight" Survey will respond to correct and sufficient data by computing the arc center point and end point, and then printing the center point number and coordinates, the central angle, arc, radius, tangent, chord length and chord bearing; and the arc end point number and coordinates.

8.07 Tangent from the PC with Offsets (IAO)

FUNCTION: The **Inscribe Arc: Tangent from the PC with Offsets** routine is used to compute the center point and tangent point from a known point of curvature, and then set offsets at the curve end point.

Activate the **Tangent from the PC with Offsets** routine by picking from the **Curves: Inscribe Arc** menu; by pressing [**Alt**][**V**], [**I**], [**O**], or by typing command **IAO** at any data entry prompt



Inscribe Arc: Tan. from PC

P.C.	1	Pts
Center Pt	20	
End Pt	21	
Delta	45	
Chord		
Arc	500	
Tangent		
Radius		
Direction		

Clear (X) Go Help

This routine may be solved by any of the following criteria:

- ▶ Delta & Chord known
- ▶ Delta & Arc known
- ▶ Delta & Tangent known
- ▶ Delta & Radius known
- ▶ Chord & Tangent known
- ▶ Chord & Radius known
- ▶ Arc & Radius known
- ▶ Tangent & Radius known

Enter data for at least two of these known items. If you have additional data, you may enter it but it is not necessary to do so. Insufficient data will result in an incorrect solution.

P.C.: This is the currently occupied point, which is also the PC. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)), and will change the **BS Bearing**.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Center Point: Enter a point number for the center point to be computed.

End Point: Enter a point number for the end point to be computed.

Delta: Enter the delta angle. If unknown, just press [**Enter**] or [**Tab**].

Chord: Enter the chord length. If unknown, just press [**Enter**] or [**Tab**].

Arc: Enter the arc length. If unknown, just press [**Enter**] or [**Tab**].

Tangent: Enter the tangent length. If unknown, just press [**Enter**] or [**Tab**].

Radius: Enter the radius length. If unknown, just press [**Enter**] or [**Tab**].

Curve Direction: Press [**0**] or [**L**] if the curve proceeds to the left, or press [**1**] or [**R**] if the curve proceeds to the right. The direction of the curve is relative to the forward direction of travel.

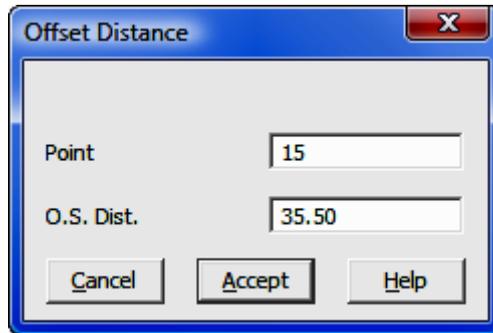
"Sight" Survey will respond to correct and sufficient data by computing the arc center point and end point, and then printing the center point number and coordinates, the central angle, arc, radius, tangent, chord length and chord bearing; and the arc end point number and coordinates.

If an **Offset Table** has been defined (**OD** - [Section 6.21](#)) "Sight" Survey will place points at the offsets enumerated in the table. If **Automatic Point Numbering** (**AN** - [Section 2.10](#)) has been turned on, the computation is fully automatic. If you are manually numbering your points, you will be prompted for each point number until all the table values have been exhausted.



TIP: To use the next available point number, just press [**+**] instead of entering a number.

After setting the predefined offset points, or if there are no predefined offsets, you may enter individual offsets through this dialog box:



Point: Enter a number for the offset point or press [**+**] for the next unused point number. If **Automatic Point Numbering (AN - [Section 2.10](#))** has been turned on you will only need to enter an offset distance.

O.S. Dist: Enter a positive distance value to offset to the right with respect to the foresight direction. Likewise, enter a negative distance value to offset to the left with respect to the foresight direction. To exit the offset entry, simply click [**Cancel**] or leave the **O.S. Dist.** field blank and press [**Enter**].

8.08 Tangent from the PI with Offsets (IAF)

FUNCTION: The **Inscribe Arc: Tangent from the PI with Offsets** routine is used to compute the PC, center point, and tangent point from a known point of intersection (PI) of the arc's tangent legs, and then set offsets at the curve end point.

Activate the **Tangent from the PI with Offsets** routine by picking from the **Curves: Inscribe Arc** menu; by pressing [**Alt**][**V**], [**I**], [**F**], or by typing command **IAF** at any data entry prompt.

Inscribe Arc: Tan. from PI	
P.I.	20 <input type="button" value="Pts"/>
P.C.	10
Center Pt	11
End Pt	12
Delta	
Chord	750.25
Arc	
Tangent	
Radius	465.00
Direction	
<input type="button" value="Clear (X)"/> <input type="button" value="Go"/> <input type="button" value="Help"/>	

This routine may be solved by any of the following criteria:

- ▶ Delta & Chord known
- ▶ Chord & Tangent known
- ▶ Delta & Arc known
- ▶ Chord & Radius known
- ▶ Delta & Tangent known
- ▶ Arc & Radius known
- ▶ Delta & Radius known
- ▶ Tangent & Radius known

Enter data for at least two of these known items. If you have additional data, you may enter it but it is not necessary to do so. Insufficient data will result in an incorrect solution.

P.I.: This is the currently occupied point, which is also the PI. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)), and will change the **BS Bearing**.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

P.C.: Enter a point number for the PC point to be computed.

Center Point: Enter a point number for the center point to be computed.

End Point: Enter a point number for the end point to be computed.

Delta: Enter the delta angle. If unknown, just press [**Enter**] or [**Tab**].

Chord: Enter the chord length. If unknown, just press [**Enter**] or [**Tab**].

Arc: Enter the arc length. If unknown, just press [**Enter**] or [**Tab**].

Tangent: Enter the tangent length. If unknown, just press [**Enter**] or [**Tab**].

Radius: Enter the radius length. If unknown, just press [**Enter**] or [**Tab**].

Curve Direction: Press [**0**] or [**L**] if the curve proceeds to the left, or press [**1**] or [**R**] if the curve proceeds to the right. The direction of the curve is relative to the forward direction of travel.

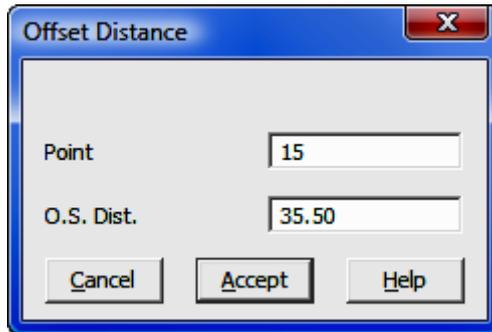
"Sight" Survey will respond to correct and sufficient data by computing the arc PC, center point, and end point, and then printing the PC point number and coordinates, center point number and coordinates, the central angle, arc, radius, tangent, chord length and chord bearing; and the arc end point number and coordinates. Data will be printed to the **Text Output** window.

If an **Offset Table** has been defined (**OD** - [Section 6.21](#)) "Sight" Survey will place points at the offsets enumerated in the table. If **Automatic Point Numbering** (**AN** - [Section 2.10](#)) has been turned on, the computation is fully automatic. If you are manually numbering your points, you will be prompted for each point number until all the table values have been exhausted.



TIP: To use the next available point number, just press [**+**] instead of entering a number.

After setting the predefined offset points, or if there are no predefined offsets, you may enter individual offsets through this dialog box:



Point: Enter a number for the offset point or press [**+**] for the next unused point number. If **Automatic Point Numbering (AN - [Section 2.10](#))** has been turned on you will only need to enter an offset distance.

O.S. Dist: Enter a positive distance value to offset to the right with respect to the foresight direction. Likewise, enter a negative distance value to offset to the left with respect to the foresight direction. To exit the offset entry, simply click [**Cancel**] or leave the **O.S. Dist.** field blank and press [**Enter**].

8.09 Non-Tangent from the PC with Offsets (IAS)

FUNCTION: The **Inscribe Arc: Non-Tangent from the PC with Offsets** routine is used to compute the center point and tangent point of a non-tangent arc from a known point of curvature, and then set offsets at the curve end point.

Activate the **Non-Tangent from the PC with Offsets** routine by picking from the **Curves: Inscribe Arc** menu; by pressing [**Alt**][**V**], [**I**], [**S**], or by typing command **IAS** at any data entry prompt.

Inscribe Arc: Non-Tangent

P.C.	1	Pts
Center Pt	20	
End Pt	21	
Delta	45	
Chord		
Arc	500	
Tangent		
Radius		
Direction		

Clear (X) Go Help

This routine may be solved by any of the following criteria:

- ▶ Delta & Chord known
- ▶ Delta & Arc known
- ▶ Delta & Tangent known
- ▶ Delta & Radius known
- ▶ Chord & Tangent known
- ▶ Chord & Radius known
- ▶ Arc & Radius known
- ▶ Tangent & Radius known

Enter data for at least two of these known items. If you have additional data, you may enter it but it is not necessary to do so. Insufficient data will result in an incorrect solution.

P.C.: This is the currently occupied point, which is also the PC. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)), and will change the **BS Bearing**.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Center Point: Enter a point number for the center point to be computed.

End Point: Enter a point number for the end point to be computed.

Delta: Enter the delta angle. If unknown, just press [**Enter**] or [**Tab**].

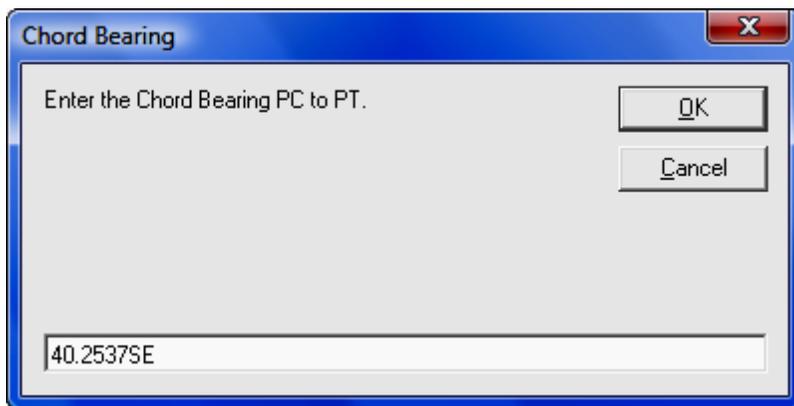
Chord: Enter the chord length. If unknown, just press [**Enter**] or [**Tab**].

Arc: Enter the arc length. If unknown, just press [**Enter**] or [**Tab**].

Tangent: Enter the tangent length. If unknown, just press [**Enter**] or [**Tab**].

Radius: Enter the radius length. If unknown, just press [**Enter**] or [**Tab**].

Curve Direction: Press [**0**] or [**L**] if the curve proceeds to the left, or press [**1**] or [**R**] if the curve proceeds to the right. The direction of the curve is relative to the forward direction of travel.



Chord Bearing: Enter the bearing of the chord as it proceeds from the PC to the PT. Make sure you include a quad code if you are not computing in azimuth mode as set under the **Local Configuration** menu (**LC** - [Section 5.05](#))

"Sight" Survey will respond to correct and sufficient data by computing the arc center point and end point, and then printing the center point number and coordinates, the central angle, arc, radius, tangent, chord length and chord bearing; and the arc end point number and coordinates.

If an **Offset Table** has been defined (**OD** - [Section 6.21](#)) "Sight" Survey will place points at the offsets enumerated in the table. If **Automatic Point Numbering** (**AN** - [Section 2.10](#)) has been turned on, the computation is fully automatic. If you are manually numbering your points, you will be prompted for each point number until all the table values have been exhausted.



TIP: To use the next available point number, just press [+] instead of entering a number.

After setting the predefined offset points, or if there are no predefined offsets, you may enter individual offsets through this dialog box:

The image shows a dialog box titled "Offset Distance". It has a standard Windows-style title bar with a close button (X) in the top right corner. The dialog contains two input fields. The first is labeled "Point" and contains the number "15". The second is labeled "O.S. Dist." and contains the number "35.50". Below the input fields are three buttons: "Cancel", "Accept", and "Help".

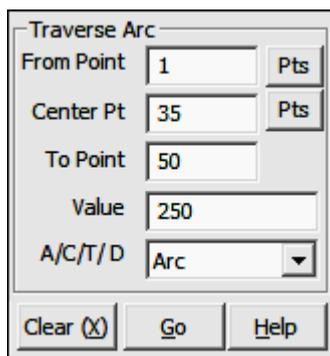
Point: Enter a number for the offset point or press [+] for the next unused point number. If **Automatic Point Numbering** (**AN** - [Section 2.10](#)) has been turned on you will only need to enter an offset distance.

O.S. Dist: Enter a positive distance value to offset to the right with respect to the foresight direction. Likewise, enter a negative distance value to offset to the left with respect to the foresight direction. To exit the offset entry, simply click [**Cancel**] or leave the **O.S. Dist.** field blank and press [**Enter**].

8.10 Traverse Arc (TA)

FUNCTION: The **T**raverse Arc routine is used to compute the coordinates of a point lying along an arc when given the coordinates of the point of curvature, the coordinates of the center point of the arc and one other of the following four parameters: the arc length; the chord length; the tangent length; or the central angle (delta) of the arc.

Activate the **T**raverse Arc routine by picking from the **Curves** menu; by pressing **[Alt][V]**, **[T]**, or by typing command **TA** at any data entry prompt.



Traverse Arc	
From Point	1 Pts
Center Pt	35 Pts
To Point	50
Value	250
A/C/T/D	Arc
Clear (X) Go Help	

BS Point: This is an informational field showing you the backsight point. You cannot enter data into this field. To change the backsight point, use the **Enter Backsight Point** routine by typing **EP** in any data entry box (see [Section 6.07](#)).

BS Bearing: This is an informational field showing you the backsight bearing. You cannot enter data into this field. To change the backsight bearing, use the **Enter Backsight Bearing** routine by typing **EB** in any data entry box (see [Section 6.08](#)).

From Point: This is the currently occupied point, which is also the PC. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)), and will change the **BS Bearing**.



TIP: Left-click the **[Pts]** button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the **[Pts]** button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Center Point: Enter the number of the center point of the arc.



TIP: Left-click the [Pts] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [Pts] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

To Point: Enter the number of the point you which you are traversing, the point you want to establish.

Value: Enter the known item of data, (Arc, Chord, Tangent or Delta). The numeric sign of the data entered determines the direction to be traversed. **If you are traversing in a CLOCKWISE direction, enter your data as POSITIVE value. Use a NEGATIVE value if you are traversing COUNTER-CLOCKWISE.**

A/C/T/D: Indicate the nature of the value you entered at the **Value** prompt. Press [A] if the value was an **A**rc length; [C] if the value was a **C**hord length; [T] if the value was a **T**angent length; or [D] if the value was a **D**elta angle.

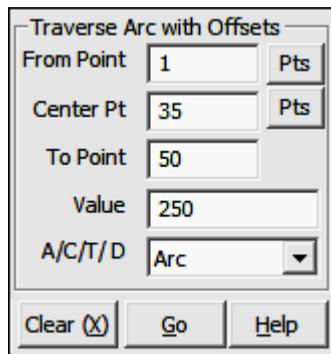
"Sight" Survey will compute and print to the **Text Output** window the coordinates for the new PT point, print the Central Angle, Radius, Arc, and Tangent Length, Chord and Chord Bearing from PC to the PT.

At this point, two events have occurred. The PT has become the currently occupied point, which is also the new PC should you continue to traverse along the arc. Also, the bearing from the PT back to the Center Point is now the reference bearing, if one is needed for the next calculation. Therefore, to proceed away from the PT tangent to the traversed arc, you would enter the **Traverse** routine (**TR** - [Section 7.09](#)) and input an angle of **90** degrees (or 100 grads) **AR** or **AL** as the case may be.

8.11 Traverse Arc with Offset (AO)

FUNCTION: The **Traverse Arc with Offset** routine is used to compute the coordinates of a point lying along an arc when given the coordinates of the point of curvature, the coordinates of the center point of the arc and one other of the following four parameters: the arc length; the chord length; the tangent length; or the central angle (delta) of the arc. This routine will also set offset points at the curve end point.

Activate the **Traverse Arc with Offset** routine by picking from the **Curves** menu; by pressing [Alt][V], [A], or by typing command **AO** at any data entry prompt.



Traverse Arc with Offsets	
From Point	1 Pts
Center Pt	35 Pts
To Point	50
Value	250
A/C/T/D	Arc
Clear (X)	Go Help

BS Point: This is an informational field showing you the backsight point. You cannot enter data into this field. To change the backsight point, use the **Enter Backsight Point** routine by typing **EP** in any data entry box (see [Section 6.07](#)).

BS Bearing: This is an informational field showing you the backsight bearing. You cannot enter data into this field. To change the backsight bearing, use the **Enter Backsight Bearing** routine by typing **EB** in any data entry box (see [Section 6.08](#)).

From Point: This is the currently occupied point, which is also the PC. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)), and will change the **BS Bearing**.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Center Point: Enter the number of the center point of the arc.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

To Point: Enter the number of the point you which you are traversing, the point you want to establish.

Value: Enter the known item of data, (Arc, Chord, Tangent or Delta). The numeric sign of the data entered determines the direction to be traversed. If you are traversing in a CLOCKWISE direction, enter your data as POSITIVE value. Use a NEGATIVE value if you are traversing COUNTER-CLOCKWISE.

A/C/T/D: Indicate the nature of the value you entered at the **Value** prompt. Press [**A**] if the value was an **Arc** length; [**C**] if the value was a **Chord** length; [**T**] if the value was a **Tangent** length; or [**D**] if the value was a **Delta** angle.

"Sight" Survey will compute and print to the **Text Output** window the coordinates for the new PT point, print the Central Angle, Radius, Arc, and Tangent Length, Chord and Chord Bearing from PC to the PT.

At this point, two events have occurred. The PT has become the currently occupied point, which is also the new PC should you continue to traverse along the arc. Also, the bearing from the PT back to the Center Point is now the reference bearing, if one is needed for the next calculation. Therefore, to proceed away from the PT tangent to the traversed arc, you would enter the **Traverse** routine (**TR** - [Section 7.09](#)) and input an angle of **90** degrees (or 100 grads) **AR** or **AL** as the case may be.

If an **Offset Table** has been defined (**OD** - [Section 6.21](#)) "Sight" Survey will place points at the offsets enumerated in the table. If **Automatic Point Numbering** (**AN** - [Section 2.10](#)) has been turned on, the computation is fully automatic. If you are manually numbering your points, you will be prompted for each point number until all the table values have been exhausted.



TIP: To use the next available point number, just press [+] instead of entering a number.

After setting the predefined offset points, or if there are no predefined offsets, you may enter individual offsets through this dialog box:

The image shows a software dialog box titled "Offset Distance". It has a standard Windows-style title bar with a close button (X) in the top right corner. The main area of the dialog is light gray and contains two text input fields. The first field is labeled "Point" and contains the number "15". The second field is labeled "O.S. Dist." and contains the number "35.50". Below these fields are three buttons: "Cancel", "Accept", and "Help", each with a small icon and text.

Point: Enter a number for the offset point or press [+] for the next unused point number. If **Automatic Point Numbering (AN)** - [Section 2.10](#) has been turned on you will only need to enter an offset distance.

O.S. Dist: Enter a positive distance value to offset to the right with respect to the foresight direction. Likewise, enter a negative distance value to offset to the left with respect to the foresight direction. To exit the offset entry, simply click [**Cancel**] or leave the **O.S. Dist.** field blank and press [**Enter**].

8.12 Curve Offset (CO)

FUNCTION: The **Curve Offset** routine is used to set radial offsets to a point on a curve.

Activate the **Curve Offset** routine by picking from the **Curves** menu; by pressing [Alt][V], [U], or by typing command **CO** at any data entry prompt.



Offset Distance

Point 15

O.S. Dist. 35.50

Cancel Accept Help



NOTE: This routine requires that a curve be current in memory. You may only run this routine **immediately** after setting or accessing a point through the **Traverse Arc (TA - [Section 8.10](#))**, **Inverse Curve (IC - [Section 8.01](#))** or **Inverse Obtuse Curve (OC - [Section 8.02](#))** routines. You must currently be in one of these routines to use the **Curve Offset** routine.

Point: Enter a number for the offset point or press [+] for the next unused point number.

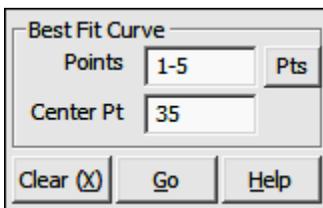
O.S. Dist. Enter the distance from the offset point to the point of offset. If the offset is to the left of the curve relative to the direction of travel, enter the distance as a negative value.

"Sight" Survey will print into the **Text Output** window the bearing and horizontal distances from the currently occupied point to the offset point, and also the point number, ID, Northing, Easting and elevation of the offset point.

8.13 Best Fit Curve (BC)

FUNCTION: The **Best Fit Line** routine is used to compute the center point (or radius point) of a curve which best fits the coordinates of any three or more known points.

Activate the **Best Fit Curve** routine by picking from the **Curves** menu; by pressing [Alt][V], [B], or by typing command **BC** at any data entry prompt.



Points: Type in a string of individual point numbers and/or point ranges and press [Enter]. You may also recall a **Defined Figure** or point group (**DF** or **PG** - [Section 6.20](#)).



TIP: Left-click the [Pts] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [Pts] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Center Pt: Type in a point number that will be assigned to the location marking the center point of the best fit curve and press [Enter].

“Sight” Survey will compute and print into the **Text Output** window the radius of the curve and the coordinates of the center point.

8.14 Spiral Curve (SR)

FUNCTION: The **Spiral Curve** routine is used to compute points (stations) along a spiral curve set from the PI of the spiral's tangents.

Activate the **Spiral Curve** routine by picking from the **Curves** menu; by pressing [Alt][V], [S], or by typing command **SR** at any data entry prompt.

Spiral Curve	
P.I. Point	15 <input type="button" value="Pts"/>
Spiral Len.	750
R / A / C	Radius <input type="button" value="▼"/>
Value	500
P.I. / T.S.	P.I. Station <input type="button" value="▼"/>
Station	13+35.5
Spiral Int.	25
Curve Int.	50
Angle @ PI	77.2415
Direction	R
<input type="button" value="Clear (X)"/> <input type="button" value="Go"/> <input type="button" value="Help"/>	

P.I. Point: This is the currently occupied point, which is also the PI of the spiral's tangents. If you have an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)), and will change the **BS Bearing**. To select a new backsight bearing use either the **Enter Backsight Bearing** routine (**EB** - [Section 6.08](#)) or the **Enter Backsight Point** routine (**EP** - [Section 6.07](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Spiral Len: Enter the length of the spiral and press [**Enter**] or [**Tab**].

R/A/C: Click [**▼**] and choose the central curve parameter known: Radius; (degree of curve) Arc; or (degree of curve) Chord.

Value: Enter the value for the central curve parameter selected in the previous prompt and press [**Enter**] or [**Tab**].

PT / TS: Click [**▼**] and choose the point of known station.

Station: Enter the station of the point chosen in the previous prompt and press [**Enter**] or [**Tab**].

Spiral Int: Enter the interval between stations to be computed along the spiral and press [**Enter**] or [**Tab**].

Curve Int: Enter the interval between stations to be computed along the central curve and press [**Enter**] or [**Tab**].

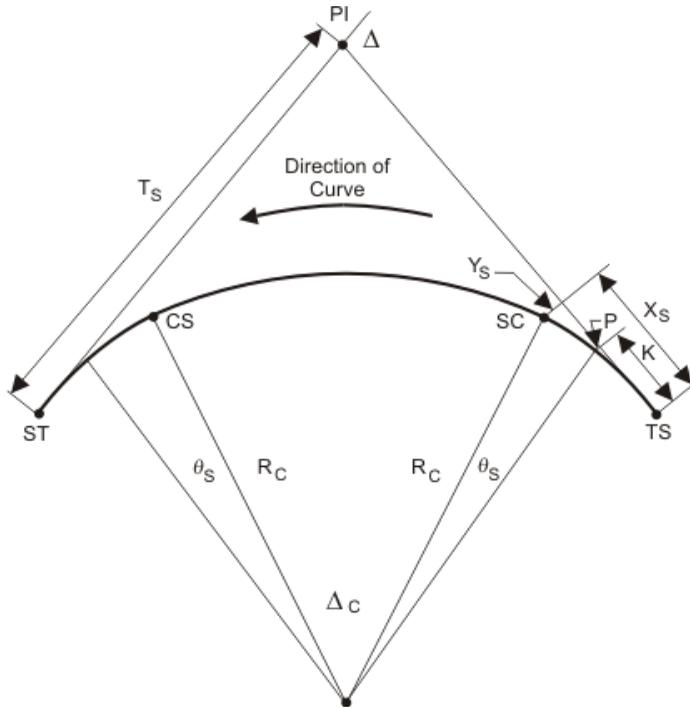
Angle @ PI: Enter the angle and press [**Enter**] or [**Tab**].

Direction: Enter the direction of the curve relative to the forward direction of travel by typing **L** (for curving to the left) or **R** (for curving to the right) and press [**Enter**][**Enter**], or [**Tab**][**Enter**], or click [**Go**].

"Sight" Survey responds to your data entry by first printing into the Text Output window a table of stations, deflections and offsets for all the computed points; then establishes coordinates for all computed points by using an automated Side Shot routine. If your drawing functions are active, the Side Shot routine also plots your points. You may then use the Inverse routine to connect the points with linework.



TIP: To draw parallel spirals use the **Traverse Right of Way** routine (**RW** - [Section 7.13](#)). Make sure you set your **Spiral Interval** to a lower value so you can produce enough points to approximate the offset spiral.



- TS = Tangent to Spiral
- SC = Spiral to Curve
- CS = Curve to Spiral
- ST = Spiral to Tangent
- θ_s = Total Spiral Angle
- Δ = Intersection Angle of Tangents at the PI
- Δ_c = Central Angle of Circular Curve
- Y_s = Tangent Offset at SC
- X_s = Tangent Distance from TS at SC
- R_c = Radius of Osculating Circle
- P = Offset from Tangent to PC of Osculating Circle
- K = Tangent Distance from TS to Shifted PC
- T_s = Total Tangent Distance from the PI to the ST (or TS)

Section 9

The Intersect Menu

<u>A</u> rc - Arc Intersection (AA)
<u>A</u> rc - Bearing Intersection (AB)
<u>A</u> rc - Distance Intersection (AD)
<u>B</u> earing - Arc Intersection (BA)
<u>B</u> earing - Bearing Intersection (BB)
<u>B</u> earing - Distance Intersection (BD)
<u>D</u> istance - Arc Intersection (DA)
<u>D</u> istance - Bearing Intersection (DB)
<u>D</u> istance - Distance Intersection (DD)
<u>P</u> erpendicular Offset (PO)
<u>O</u> ffset Intersection (OI)
<u>L</u> ine Station and Offset (LS)
<u>A</u> rc Station and Offset (AS)
<u>3</u> Point Resection (RN)

The **Intersect** menu contains functions that are used to compute the locations of points of intersection between various configurations of lines and arcs. Several of these routines include intersections of lines with known arcs, and even the intersection of two arcs. In cases where one of the known entities is an arc, "Sight" Survey computes the complete curve data for the resulting arc segment as well.

Other routines in this section are used to calculate offset intersection points and perpendicular offsets from a point to a base line, particularly helpful when figuring offsets from a property line to a building corner. Finally, a three point resection is also included to compute coordinates of a point from three known points when only angular data is known.

9.01 Arc-Arc Intersection (AA)

FUNCTION: The **Arc-Arc Intersection** routine is used to calculate the coordinates of a point generated by the intersection of two arcs.

Activate the **Arc-Arc Intersection** routine by picking from the **Intersect** menu; by pressing [**Alt**][**I**], [**A**]; or by typing the two-letter command **AA** at any data entry prompt.

Type: This field displays the type of intersection to be solved. Click [▼] to change the intersection type if desired.

From Pt: When you enter the routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

1st Ctr Pt: Enter the center point of the first arc. After the acceptance of a point number the program will internally inverse the distance from the first center point to the PC to establish the first radius distance.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Inter. Pt: Enter the number of the intersection point.

2nd Ctr Pt: Enter the center point of the second arc. After the acceptance of a point number the program will internally inverse the distance from the second center point to the closing point to establish the second radius distance.



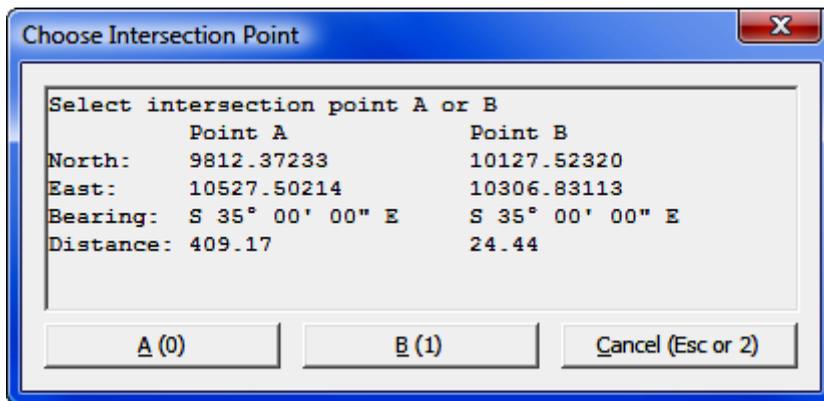
TIP: Left-click the [Pts] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [Pts] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Close Pt: Enter the number of the closing point.



TIP: Left-click the [Pts] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [Pts] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

"Sight" Survey will calculate the solution. If there are two solutions to the problem, you will be prompted to select the desired solution by clicking button [A or 0] or [B or 1]. You may also answer by pressing [A] or [0] for solution A, or [B] or [1] for solution B. The bearing and distance given in the solution is for the chord.



"Sight" Survey will print to the **Text Output** window the central angle, radius, arc, tangent length, chord and chord bearing from the PC to the intersection point, the intersection point number, ID, Northing and Easting, and the central angle, radius, arc, tangent length, chord and chord bearing from the intersection point to the closing point. The closing point becomes the currently occupied point, and the bearing from the closing point to the center point of the second arc becomes the reference bearing. If CAD is active, the two arcs will be drawn and annotated.

Type: This field displays the type of intersection to be solved. Click [▼] to change the intersection type if desired.

From Pt: When you enter the routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will be automatically filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Center Pt: Enter the center point of the arc. After the acceptance of a point number the program will internally inverse the distance from the center point to the PC to establish the radius distance.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Inter. Pt: Enter the number of the intersection point.

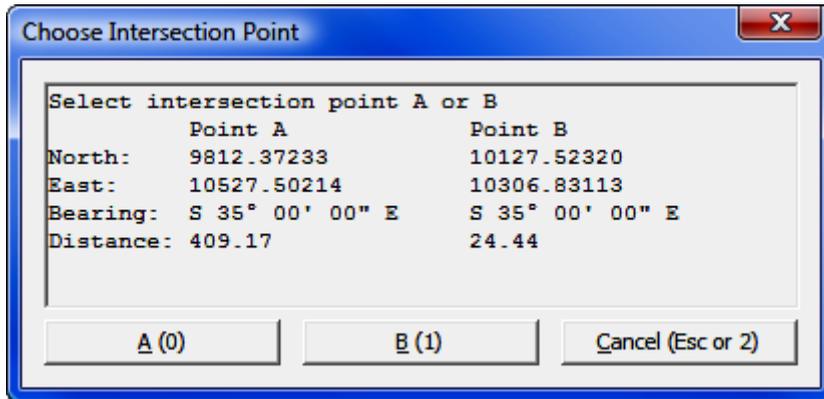
Bearing: Enter a bearing or azimuth from the intersection point to the closing point.

Close Pt: Enter the number of the closing point.

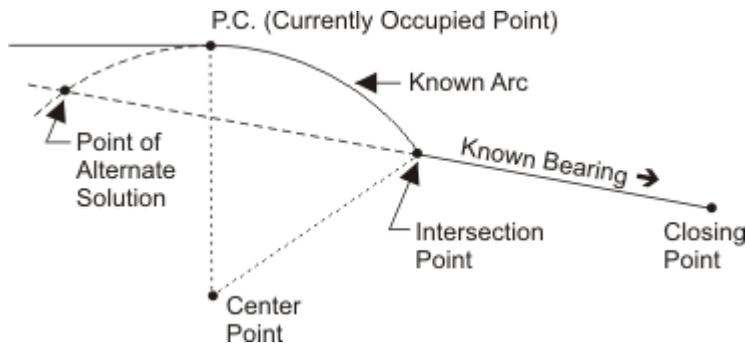


TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

"Sight" Survey will calculate the solution. If there are two solutions to the problem, you will be prompted to select the desired solution by clicking button [**A or 0**] or [**B or 1**]. You may also answer by pressing [**A**] or [**0**] for solution **A**, or [**B**] or [**1**] for solution **B**. The bearing and distance given in the solution is for the chord.



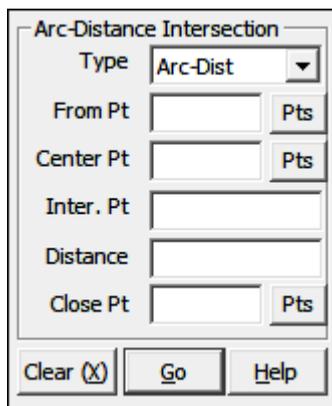
"Sight" Survey will print to the **Text Output** window the central angle, radius, arc, tangent length, chord and chord bearing from the PC to the intersection point, the intersection point number, ID, Northing and Easting, and the bearing and horizontal distance from the intersection point to the closing point. The closing point becomes the currently occupied point, and the bearing from the closing point to the intersection point becomes the reference bearing. If CAD is active, the arc and line will be drawn and annotated.



9.03 Arc-Distance Intersection (AD)

FUNCTION: The **Arc-Distance Intersection** routine is used to calculate the coordinates of a point generated by the intersection of an arc with a line of known distance.

Activate the **Arc-Distance Intersection** routine by picking from the **Intersect** menu; by pressing **[Alt][I]**, **[C]**; or by typing the two-letter command **AD** at any data entry prompt.



Type: This field displays the type of intersection to be solved. Click **[▼]** to change the intersection type if desired.

From Pt: When you enter the routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).

Center Pt: Enter the center point of the arc. After the acceptance of a point number the program will internally inverse the distance from the center point to the PC to establish the radius distance.



TIP: Left-click the **[Pts]** button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the **[Pts]** button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Inter. Pt: Enter the number of the intersection point.

Distance: Enter the horizontal distance from the intersection point to the closing point. DO NOT enter a slope distance.

Close Pt: Enter the number of the closing point.

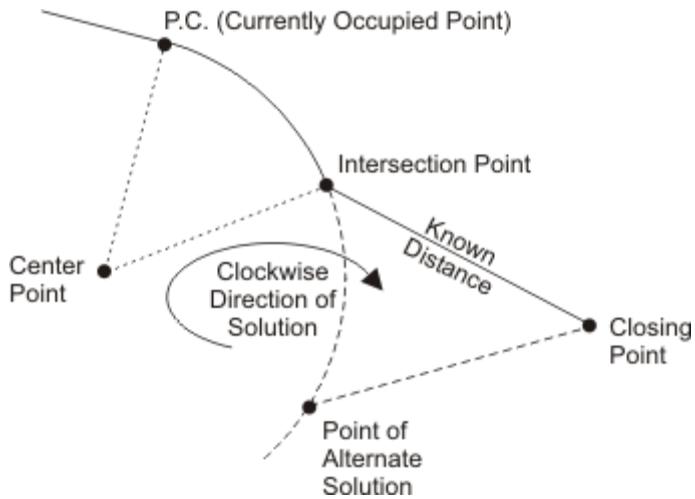


TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

"Sight" Survey will calculate the solution. If there are two solutions to the problem, you will be prompted to select the desired solution by clicking button [**A or 0**] or [**B or 1**]. You may also answer by pressing [**A**] or [**0**] for solution **A**, or [**B**] or [**1**] for solution **B**. The bearing and distance given in the solution is for the chord.

	Point A	Point B
North:	9812.37233	10127.52320
East:	10527.50214	10306.83113
Bearing:	S 35° 00' 00" E	S 35° 00' 00" E
Distance:	409.17	24.44

"Sight" Survey will print to the **Text Output** window the central angle, radius, arc, tangent length, chord and chord bearing from the PC to the intersection point, the intersection point number, ID, Northing and Easting, and the bearing and horizontal distance from the intersection point to the closing point. The closing point becomes the currently occupied point, and the bearing from the closing point to the intersection point becomes the reference bearing. If CAD is active, the arc and line will be drawn and annotated.



9.04 Bearing-Arc Intersection (BA)

FUNCTION: The **Bearing-Arc Intersection** routine is used to calculate the coordinates of a point generated by the intersection of a line of known bearing with an arc.

Activate the **Bearing-Arc Intersection** routine by picking from the **Intersect** menu; by pressing [**Alt**][**I**], [**B**]; or by typing the two-letter command **BA** at any data entry prompt.

Bearing-Arc Intersection	
Type	Brg-Arc
From Pt	<input type="text"/> Pts
Bearing	<input type="text"/>
Inter. Pt	<input type="text"/>
Center Pt	<input type="text"/> Pts
Close Pt	<input type="text"/> Pts
Clear (X)	Go Help

Type: This field displays the type of intersection to be solved. Click [▼] to change the intersection type if desired.

From Pt: When you enter the routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Bearing: Enter a bearing or azimuth from the currently occupied point to the intersection point.

Inter. Pt: Enter the number of the intersection point.

Center Pt: Enter the center point of the arc. After the acceptance of a point number the program will internally inverse the distance from the center point to the closing point to establish the radius distance.



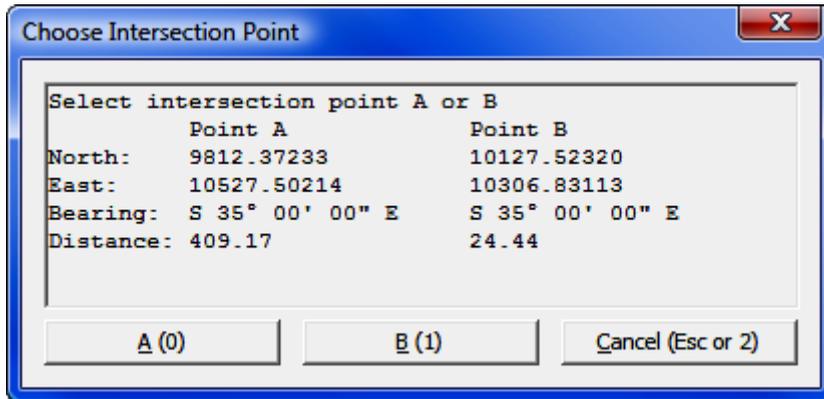
TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Close Pt: Enter the number of the closing point.

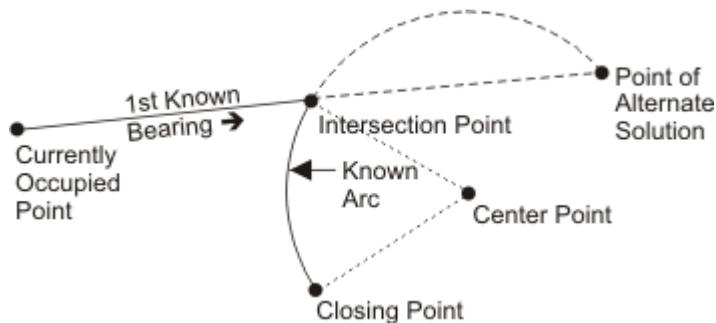


TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

"Sight" Survey will calculate the solution. If there are two solutions to the problem, you will be prompted to select the desired solution by clicking button [**A or O**] or [**B or 1**]. You may also answer by pressing [**A**] or [**O**] for solution **A**, or [**B**] or [**1**] for solution **B**. The bearing and distance given in the solution is for the chord.



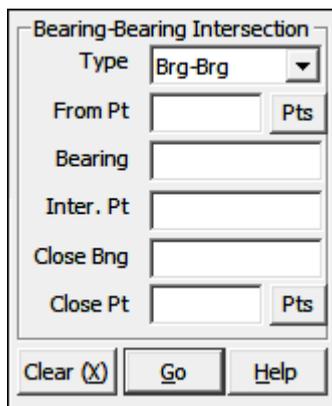
"Sight" Survey will print to the **Text Output** window the bearing and the horizontal distance from the occupied point to the intersection point, the intersection point number, ID, Northing and Easting, and the central angle, radius, arc, tangent length, chord and chord bearing from the intersection point to the closing point. The closing point becomes the currently occupied point, and the bearing from the closing point to the intersection point becomes the reference bearing. If CAD is active, the arc and line will be drawn and annotated.



9.05 Bearing-Bearing Intersection (BB)

FUNCTION: The **Bearing-Bearing Intersection** routine is used to calculate the coordinates of a point generated by the intersection of two lines of known bearing.

Activate the **Bearing-Bearing Intersection** routine by picking from the **Intersect** menu; by pressing [**Alt**][**I**], [**E**]; or by typing the two-letter command **BB** at any data entry prompt.



Type: This field displays the type of intersection to be solved. Click [**▼**] to change the intersection type if desired.

From Pt: When you enter the routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Bearing: Enter a bearing or azimuth from the currently occupied point to the intersection point.

Inter. Pt: Enter the number of the intersection point.

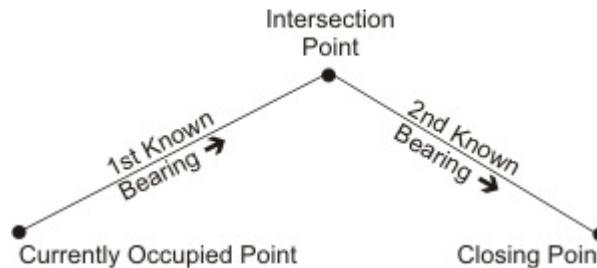
Close Brg: Enter a bearing or azimuth from the intersection point to the closing point.

Close Pt: Enter the number of the closing point.



TIP: Left-click the [Pts] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [Pts] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

"Sight" Survey will print to the **Text Output** window the bearing and horizontal distance from the currently occupied point to the intersection point, the intersection point number, ID, Northing and Easting, and the bearing and horizontal distance from the intersection point to the closing point. The closing point becomes the currently occupied point, and the bearing from the intersection point to the closing point becomes the reference bearing.



9.06 Bearing-Distance Intersection (BD)

FUNCTION: The **Bearing-Distance Intersection** routine is used to calculate the coordinates of a point generated by the intersection of a line of known bearing with a line of known distance.

Activate the **Bearing-Distance Intersection** routine by picking from the **Intersect** menu; by pressing [Alt][I], [I]; or by typing the two-letter command **BD** at any data entry prompt.

Type: This field displays the type of intersection to be solved. Click [▼] to change the intersection type if desired.

From Pt: When you enter the routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Bearing: Enter a bearing or azimuth from the currently occupied point to the intersection point.

Inter. Pt: Enter the number of the intersection point.

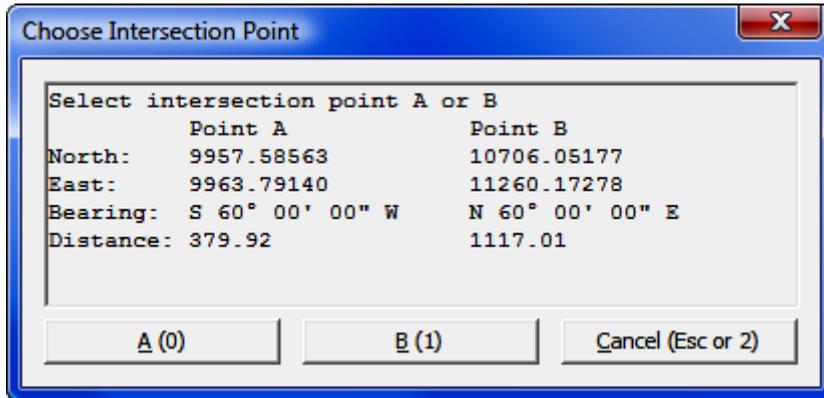
Close Dist: Enter the horizontal distance from the intersection point to the closing point. DO NOT enter a slope distance.

Close Pt: Enter the number of the closing point.

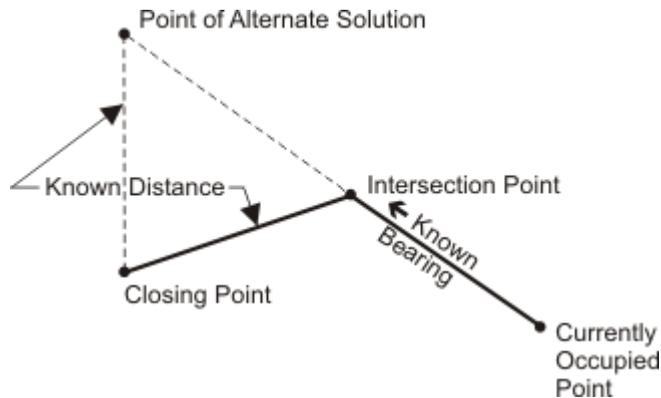


TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

"Sight" Survey will calculate the solutions. You will be prompted to select the desired solution by clicking button [A or 0] or [B or 1]. You may also answer by pressing [A] or [0] for solution A, or [B] or [1] for solution B. The bearing and distance given in the solution is for the chord.



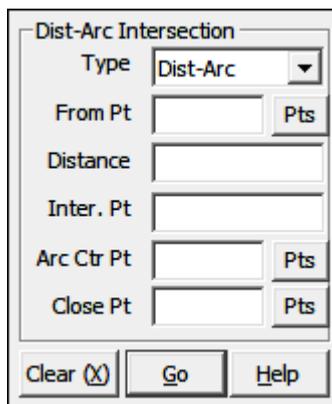
"Sight" Survey will print to the **Text Output** window the bearing and horizontal distance from the currently occupied point to the intersection point, the intersection point number, ID, Northing and Easting, and the bearing and horizontal distance from the intersection point to the closing point. The closing point becomes the currently occupied point, and the bearing from the intersection point to the closing point becomes the reference bearing. If CAD is active, the arc and line will be drawn and annotated.



9.07 Distance-Arc Intersection (DA)

FUNCTION: The **Distance-Arc Intersection** routine is used to calculate the coordinates of a point generated by the intersection of an arc with a line of known distance.

Activate the **Distance-Arc Intersection** routine by picking from the **Intersect** menu; by pressing **[Alt][I]**, **[D]**; or by typing the two-letter command **DA** at any data entry prompt.



Type: This field displays the type of intersection to be solved. Click [**▼**] to change the intersection type if desired.

From Pt: When you enter the routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Distance: Enter the horizontal distance from the currently occupied point to the intersection point. DO NOT enter a slope distance.

Inter. Pt: Enter the number of the intersection point.

Arc Ctr Pt: Enter the center point of the arc. After the acceptance of a point number the program will internally inverse the distance from the center point to the closing point to establish the radius distance.



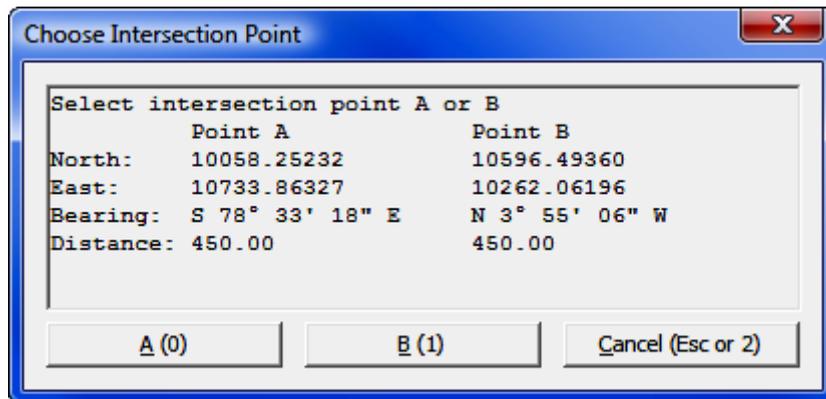
TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Close Pt: Enter the number of the closing point.



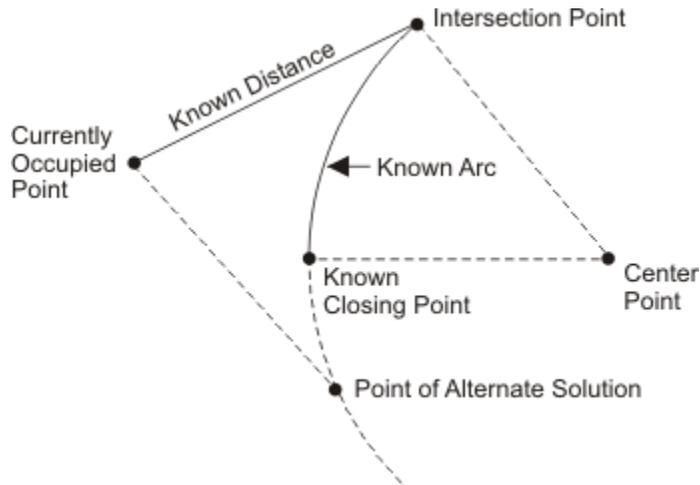
TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

"Sight" Survey will calculate the solution. If there are two solutions to the problem, you will be prompted to select the desired solution by clicking button [**A or 0**] or [**B or 1**]. You may also answer by pressing [**A**] or [**0**] for solution **A**, or [**B**] or [**1**] for solution **B**. The bearing and distance given in the solution is for the chord.



"Sight" Survey will print to the **Text Output** window the bearing and horizontal distance from the occupied point to the intersection point, the intersection point number, ID, Northing and Easting, and the central angle, radius, arc, tangent

length, chord and chord Bearing from the intersection point to the closing point. The closing point becomes the currently occupied point, and the bearing from the closing point to the arc center point becomes the reference bearing. If CAD is active, the arc and line will be drawn and annotated.



9.08 Distance-Bearing Intersection (DB)

FUNCTION: The **Distance-Bearing Intersection** routine is used to calculate the coordinates of a point generated by the intersection of a line of known distance with a line of known bearing.

Activate the **Distance-Bearing Intersection** routine by picking from the **Intersect** menu; by pressing **[Alt][I], [S]**; or by typing the two-letter command **DB** at any data entry prompt.

Type: This field displays the type of intersection to be solved. Click [▼] to change the intersection type if desired.

From Pt: When you enter the routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Distance: Enter the horizontal distance from the currently occupied point to the intersection point. DO NOT enter a slope distance.

Inter. Pt: Enter the number of the intersection point.

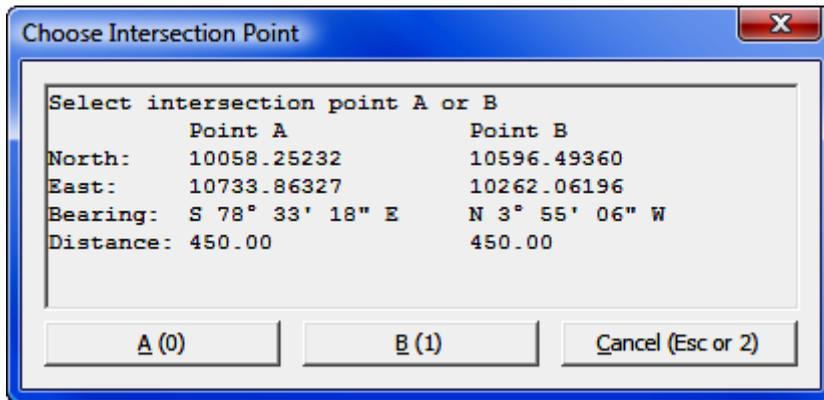
Close Brg: Enter a bearing or azimuth from the intersection point to the closing point.

Close Pt: Enter the number of the closing point.

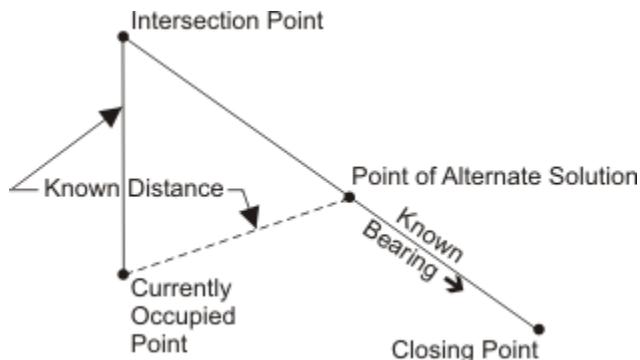


TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

"Sight" Survey will calculate the solutions. You will be prompted to select the desired solution by clicking button [**A or 0**] or [**B or 1**]. You may also answer by pressing [**A**] or [**0**] for solution **A**, or [**B**] or [**1**] for solution **B**. The bearing and distance given in the solution is for the chord.



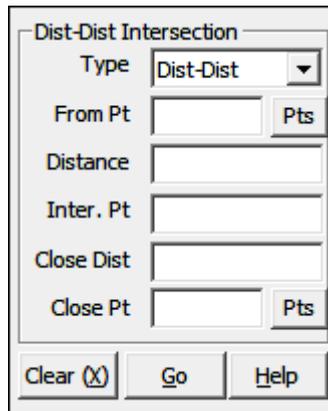
"Sight" Survey will print to the **Text Output** window the bearing and horizontal distance from the currently occupied point to the intersection point, the intersection point number, ID, Northing and Easting, and the bearing and horizontal distance from the intersection point to the closing point. The closing point becomes the currently occupied point, and the bearing from the intersection point to the closing point becomes the reference bearing. If CAD is active, the lines will be drawn and annotated.



9.09 Distance-Distance Intersection (DD)

FUNCTION: The **Distance-Distance Intersection** routine is used to calculate the coordinates of a point generated by the intersection of two lines of known distance.

Activate the **Distance-Distance Intersection** routine by picking from the **Intersect** menu; by pressing [Alt][I], [T]; or by typing the two-letter command **DD** at any data entry prompt.



Type: This field displays the type of intersection to be solved. Click [▼] to change the intersection type if desired.

From Pt: When you enter the routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [Pts] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [Pts] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Distance: Enter the horizontal distance from the currently occupied point to the intersection point. DO NOT enter a slope distance.

Inter. Pt: Enter the number of the intersection point.

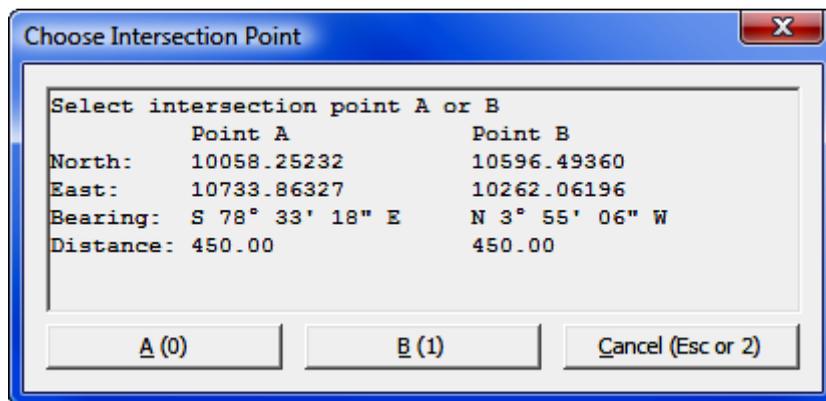
Close Dist: Enter the horizontal distance from the intersection point to the closing point. DO NOT enter a slope distance.

Close Pt: Enter the number of the closing point.

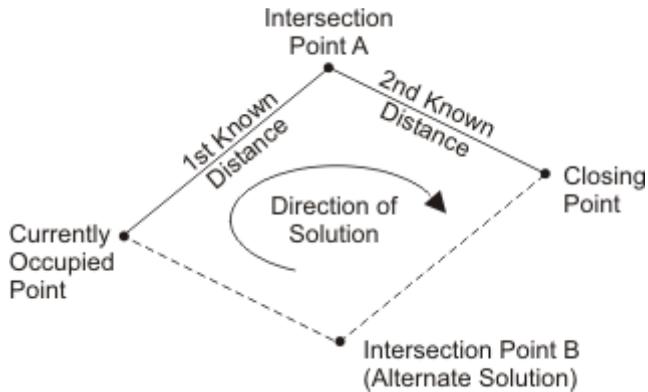


TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

"Sight" Survey will calculate the solutions. You will be prompted to select the desired solution by clicking button [**A or 0**] or [**B or 1**]. You may also answer by pressing [**A**] or [**0**] for solution **A**, or [**B**] or [**1**] for solution **B**. The bearing and distance given in the solution is for the chord.



"Sight" Survey will print to the **Text Output** window the bearing and horizontal distance from the currently occupied point to the intersection point, the intersection point number, ID, Northing and Easting, and the bearing and horizontal distance from the intersection point to the closing point. The closing point becomes the currently occupied point, and the bearing from the intersection point to the closing point becomes the reference bearing. If CAD is active, the lines will be drawn and annotated.



9.10 Perpendicular Offset (PO)

FUNCTION: The **Perpendicular Offset** routine is used to calculate the right angle offset horizontal distance from a point (or points) to a known baseline. The horizontal distance along the baseline from the currently occupied point to the point(s) of intersection is also calculated.

Activate the **Perpendicular Offset** routine by picking from the **Intersect** menu; by pressing [**Alt**][**I**], [**P**]; or by typing the two-letter command **PO** at any data entry prompt.

Perpendicular Offset	
Base Point	<input type="text"/> Pts
Bearing	<input type="text"/>
Offset Pts	<input type="text"/> Pts
<input type="checkbox"/> Draw Line	
<input type="checkbox"/> Annotate Offset Distance	
Clear (X)	Go Help

Base Point: When you enter the routine, the **Base Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Bearing: Enter or recall the bearing or azimuth proceeding away from the base point.

Offset Pts: Enter an individual offset point number, a point string, a point range, of type **DF** to recall a **Defined Figure** (see [Section 6.20](#)). If a point has not yet been assigned coordinates, the program will request them. Follow the **Enter and Assign** procedure (**EA** - [Section 6.01](#)) to assign coordinates and a description to the point.

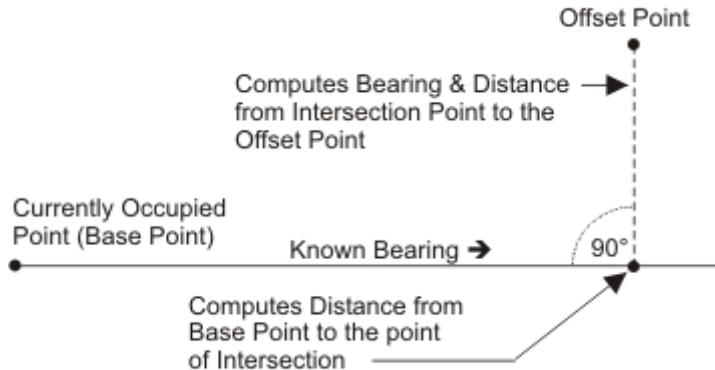
Draw Line: Check this box if you want a line drawn in CAD from the offset point to the perpendicular intersection with the base line. The line will be placed on the **Offsets Layer** using the object and line properties specified in the **Drawing Properties** menu (**PR** - [Section 5.10](#)).

Annotate Offset Distance: Check this box to have the offset distance (the distance from the base line to the offset point) annotated in CAD. The text will be placed on the **Offsets Layer** using the text properties specified in the **Drawing Properties** menu (**PR** - [Section 5.10](#)).

“Sight” Survey will compute and report to the **Text Output** window the baseline and offset distance and you may continue entering points as needed. If you have entered a point string and the routine encounters an undefined point, the point will be skipped.

Offset distances will be reported as left or right of the line, relative to the fore-sight direction.

Coordinates of the intersection point on the baseline are not retained. Use the **Enter and Assign** procedure (**EA** - [Section 6.01](#)) to assign coordinates and a description to any intersection point you wish to retain.



9.11 Offset Intersection (OI)

FUNCTION: The **Offset Intersection** routine is used to calculate the coordinates of a point generated by the intersection of two lines lying at known perpendicular distances from two lines of known bearing.

Activate the **Offset Intersection** routine by picking from the **I**ntersect menu; by pressing [**Alt**][**I**], [**O**]; or by typing the two-letter command **OI** at any data entry prompt.

Offset Intersection	
From Point	54 <input type="button" value="Pts"/>
Inter. Pt	52
1st Brg.	72.3517SE
1st Dist.	40
2nd Brg.	65.30SW
2nd Dist.	-40
<input type="button" value="Clear (X)"/> <input type="button" value="Go"/> <input type="button" value="Help"/>	

From Point: When you enter the routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will be

automatically filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Inter. Point: Enter the number of the intersection point. See the [example below](#).

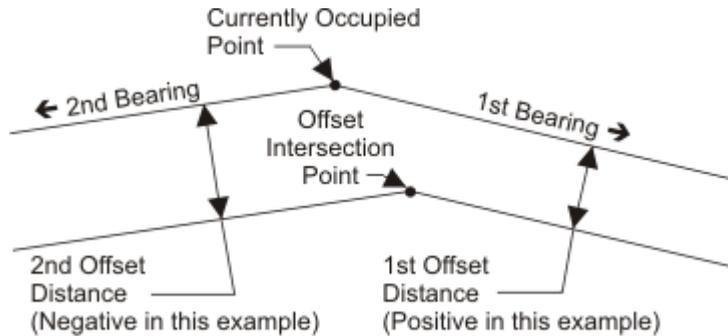
1st Brg: Enter or recall the first bearing or azimuth proceeding away from the occupied point. See the [example below](#).

1st Dist: Enter a positive or negative horizontal offset distance. The sign of the offset distance is relative to the direction of the 1st bearing. Enter an offset lying to the right as a positive value. Likewise, enter an offset lying to the left as a negative value. DO NOT enter a slope distance. See the [example below](#).

2nd Brg: Enter or recall the second bearing or azimuth proceeding away from the occupied point. The 2nd offset bearing must lie clockwise from the 1st bearing at an angle of less than 180 degrees. See the [example below](#).

2nd Dist: Enter a positive or negative horizontal offset distance. The sign of the offset distance is relative to the direction of the 1st bearing. Enter an offset lying to the right as a positive value. Likewise, enter an offset lying to the left as a negative value. DO NOT enter a slope distance. See the [example below](#).

"Sight" Survey will print to the **Text Output** window the Northing and Easting of the offset intersection point, along with the intersection point number. As a matter of record, the program will also print the 1st and 2nd offset bearings and distances, and also the Northing, Easting and elevation of the point used to set the intersection, along with its point number.



9.12 Line Station & Offset (LS)

FUNCTION: The **Line Station & Offset** routine is used to calculate the right angle offset horizontal distance from a point (or points) to a known baseline. The horizontal distance and the stationing along the baseline from the currently occupied point to the point(s) of intersection is also calculated.

Activate the **Line Station & Offset** routine by picking from the **Intersect** menu; by pressing **[Alt][I]**, **[L]**; or by typing the two-letter command **LS** at any data entry prompt.

Perp. Line Station & Offset	
Base Point	14 Pts
Bearing	84.3515NE
Offset Pts	17,21,33 Pts
<input type="checkbox"/>	Draw Line
<input type="checkbox"/>	Annotate Offset Distance
<input type="checkbox"/>	Annotate Station
Clear (X)	Go Help

Base Point: When you enter the routine, the **Base Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. This point should also contain the beginning stationing number as a part of the point name. If no stationing data is available, the stationing will be assumed to be **0+00**. Stationing may be entered through the **Enter**

Station routine (**ES** - [Section 6.04](#)). Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Bearing: Enter or recall the bearing or azimuth proceeding away from the base point.

Offset Pts: Enter an individual offset point number, a point string, a point range, of type **FD** to recall a **Defined Figure** (see [Section 6.20](#)). If a point has not yet been assigned coordinates, the program will request them. Follow the **Enter and Assign** procedure (**EA** - [Section 6.01](#)) to assign coordinates and a description to the point. If you have entered a point string and the routine encounters an undefined point, the point will be skipped.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Draw Line: Selecting this option will draw a line from the base point to the offset point. The line will be drawn using **By Layer** settings on the **Offsets** layer as defined by the **Drawing Properties** menu (**PR** - [Section 5.10](#)). You may want to use **Edit Layers** (**LA** - [Section 4.05](#)) to set specific layer properties (linetype, color, text) to differentiate offset data from other data in your drawing.

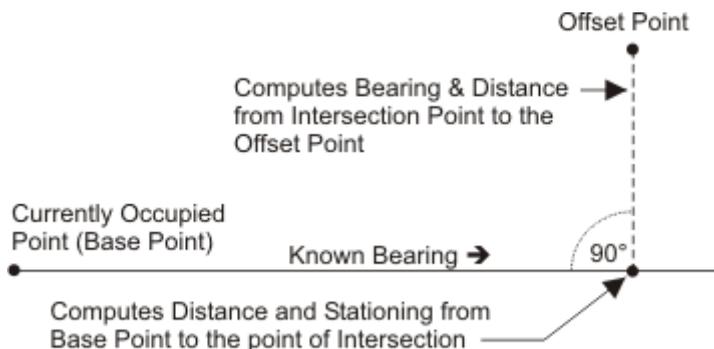
Annotate Offset Distance: Selecting this option will annotate the offset distance from the base point to the offset point. This information will appear on the **Offsets** layer (see **Draw Line** above).

Annotate Station: Selecting this option will annotate the station along the base line at the offset point. This information will appear on the **Offsets** layer (see **Draw Line** above).

“Sight” Survey will compute report the baseline distance, the station of the perpendicular offset, and the offset distance. Continue entering points as needed.

Offset distances will be reported as left or right of the line, relative to the foresight direction.

Coordinates of the intersection point on the baseline are not retained. Use the **Enter and Assign** procedure ([EA - Section 6.01](#)) to assign coordinates and a description to any intersection point you wish to retain.



9.13 Arc Station & Offset (AS)

FUNCTION: The **Arc Station & Offset** routine is used to calculate the perpendicular offset distance from a point to a defined arc and also the baseline station at the point of intersection normal to the arc.

Activate the **Arc Station & Offset** routine by picking from the **Intersect** menu; by pressing **[Alt][I]**, **[N]**; or by typing the two-letter command **AS** at any data entry prompt.

Perp. Arc Station & Offset		
Base Point	2	Pts
Center Pt	27	Pts
Offset Pts	31,32	Pts
<input type="checkbox"/> Draw Line <input type="checkbox"/> Annotate Offset Distance <input type="checkbox"/> Annotate Station		
Clear (X)	Go	Help

Base Point: When you enter the routine, the **Base Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. This point should also contain the beginning station number as a part of the point name. If no stationing data is available, the station will be assumed to be **0+00**. Stationing may be entered through the **Enter Station** routine (**ES** - [Section 6.04](#)). Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Center Pt: Enter the point number of the center point of the arc.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Offset Pts: Enter an individual offset point number, a point string, a point range, of type **FD** to recall a **Defined Figure** (see [Section 6.20](#)). If a point has not yet been assigned coordinates, the program will request them. Follow the **Enter and Assign** procedure (**EA** - [Section 6.01](#)) to assign coordinates and a description to the point. If you have entered a point string and the routine encounters an undefined point, the point will be skipped.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Draw Line: Selecting this option will draw a line from the base point to the offset point. The line will be drawn using **By Layer** settings on the **Offsets** layer as defined by the **Drawing Properties** menu (**PR** - [Section 5.10](#)). You may want to use **Edit Layers** (**LA** - [Section 4.05](#)) to set specific layer properties (linetype, color, text) to differentiate offset data from other data in your drawing.

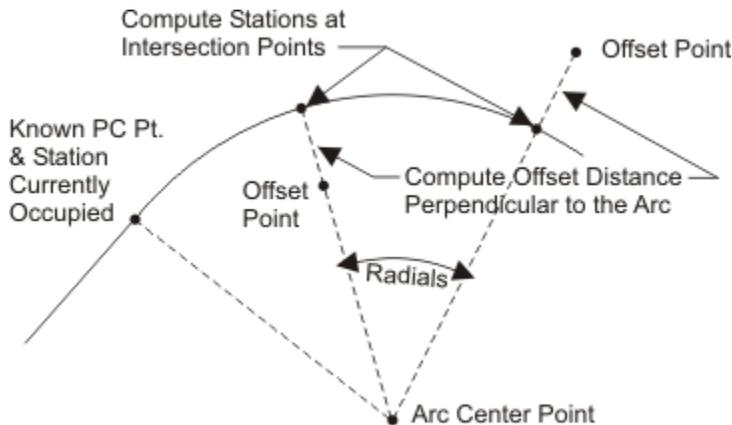
Annotate Offset Distance: Selecting this option will annotate the offset distance from the base point to the offset point. This information will appear on the **Offsets** layer (see **Draw Line** above).

Annotate Station: Selecting this option will annotate the station along the base line at the offset point. This information will appear on the **Offsets** layer (see **Draw Line** above).

"Sight" Survey will print to the **Text Output** window the station, offset distance, and the curve data to the arc station point. The curve data includes the delta angle, arc length and radius. Continue entering points as needed.

Offset distances will be reported as left or right of the line, relative to the forward direction of travel away from the base point.

Coordinates of the intersection point on the arc are not retained. Use the **Enter and Assign** procedure ([EA - Section 6.01](#)) to assign coordinates and a description to any intersection point you wish to retain.



9.14 3 Point Resection (RN)

FUNCTION: The 3 Point Resection routine is used to compute the coordinates of an unknown point using angles turned to three known points.

Activate the 3 Point Resection routine by picking from the **Intersect** menu; by pressing [**Alt**][**I**], [**3**]; or by typing the two-letter command **RN** at any data entry prompt.

3 Point Resection		
Exist Pt A	<input type="text"/>	Pts
Exist Pt B	<input type="text"/>	Pts
Exist Pt C	<input type="text"/>	Pts
Target Pt.	<input type="text"/>	
Angle APB	<input type="text"/>	
Angle APC	<input type="text"/>	
Clear (X)	Go	Help

Point A: Enter the number of this known point. Refer to the diagram below for the point's relative location. If the point has not yet been assigned coordinates, the program will request them. Follow the **Enter and Assign** procedure ([EA - Section 6.01](#)) to assign coordinates and a description to the point.



TIP: Left-click the [Pts] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [Pts] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Point B: Enter the number of this known point. Refer to the diagram below for the point's relative location. If the point has not yet been assigned coordinates, the program will request them. Follow the **Enter and Assign** procedure ([EA - Section 6.01](#)) to assign coordinates and a description to the point.



TIP: Left-click the [Pts] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [Pts] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Point C: Enter the number of this known point. Refer to the diagram below for the point's relative location. If the point has not yet been assigned coordinates, the program will request them. Follow the **Enter and Assign** procedure ([EA - Section 6.01](#)) to assign coordinates and a description to the point.



TIP: Left-click the [Pts] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [Pts] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

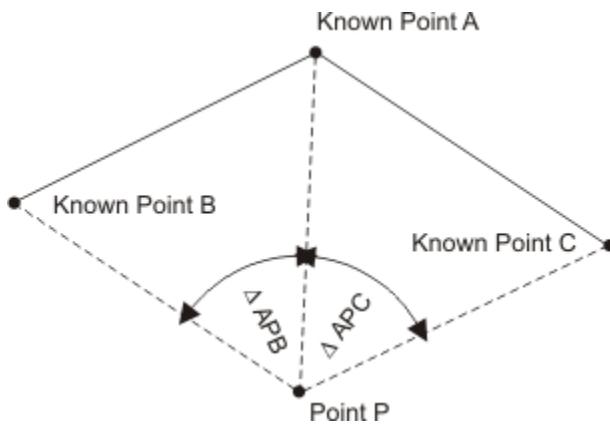
Point P: Enter the number of the point to be located. Refer to the diagram below for the point's relative location. This is the point from which you will turn angles to the known points A, B, and C.

Angle APB: Enter the angle **APB** turned at point **P**.

Angle APC: Enter the angle **APC** turned at point **P**.

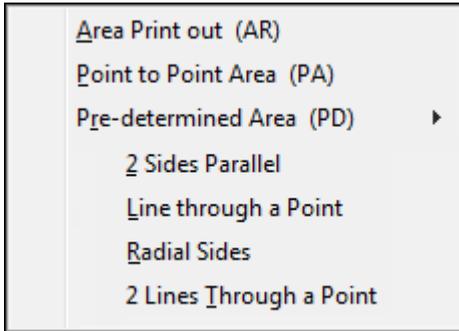
"Sight" Survey will compute and print to the **Text Output** window the coordinates of the resection point P, along with the coordinates of points A, B and C and the turned angles. If CAD is active, point P will also be drawn.

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Section 10

The Area Menu



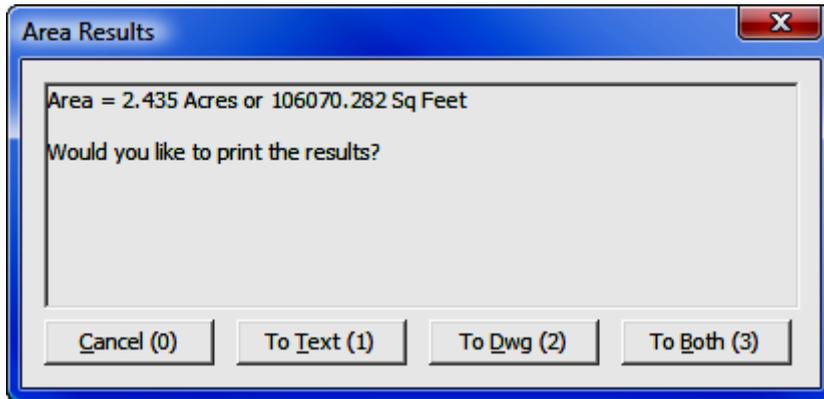
The **Area** menu contains two functions that are used to compute the areas of closed figures: **Area Print Out** and **Point to Point Area**. Point to Point Area may be used when you do not want to print the courses to the **Text Output** window, and is well suited for area calculations of defined figures (point groups) for lot summaries. This menu also contains four functions used to compute the unknown bearings and distances of tracts of known (or pre-determined) area.

10.01 Area Print Out (AR)

FUNCTION: The **Area Print Out** routine is used to obtain the area of a closed plane figure.

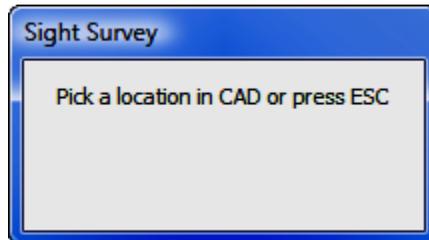
Activate the **Area Print Out** routine by picking from the **Area** menu; by pressing [**Alt**][**A**], [**A**]; or by typing the two-letter command **AR** at any data entry prompt.

If you have specified your units of area measurement as **Acres and/or Square Feet** on the **Local Configuration Menu** (**LC** - [Section 5.05](#)) the program will report the area in square feet and acres. Likewise, you may choose to report the area in **Hectares and Square Meters** or in **Cuerdas and Square Meters**.



"Sight" Survey offers you the option of printing your results to the **Text Output** window, to your drawing, or to both locations. To print the results only to the **Text Output** window, click [**To Text (1)**] or press [**T**] or [**1**]. To print the results only to the drawing, click [**To Dwg (2)**] or press [**D**] or [**2**]. To print the results to both locations, click [**To Both (3)**] or press [**B**] or [**3**]. You may encounter instances where the area shown is obviously incorrect. In those cases, click [**Cancel (0)**] or press [**C**] or [**0**] to try again.

If you have elected to print the area to the drawing, you will be prompted:



Click the location your drawing at which you want to write the area text. The location you pick is the center of the text string so you need not concern yourself with left or right text justification. In some CAD programs you may notice that you need to click twice; the first click activates the CAD window while the second click places the text. If this is the case, you will notice that the prompt window remains open until the area text is actually written to the drawing.

After reporting the area, the internal area accumulator is cleared to make ready for the next calculation. The starting point for the next routine is the same as

the last point number entered prior to calling the area routine. To begin from a different point, use the **Start At** routine (**ST** - [Section 6.05](#)).

You may obtain the area of any closed figure, including curves, provided you began your traversed and/or inversed path with the **Start At** routine.

If the subject figure contains any curved segments having a central angle of greater than 180 degrees, you must use the **Inverse Obtuse Curve** routine (**OC** - [Section 8.02](#)) to obtain an accurate area.



WARNINGS:

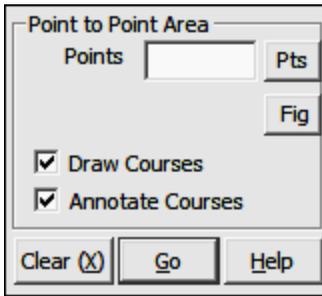
Area calculations are valid only for closed figures. *If the Northing and Easting coordinates of your starting point do not match the Northing and Easting coordinates of your ending point, the area calculated and reported by this routine will be grossly in error.*

Area calculations are not valid for figures containing crossing boundary lines. *If any course in the figure crosses any other course in the figure, the area calculated and reported by this routine will be grossly in error.*

10.02 Point to Point Area (PA)

FUNCTION: The **Point to Point Area** routine is used to calculate the area of a figure (defined by a point string) without printing out the bearings and distances of the boundaries. Printing the individual courses is optional. This routine is well-suited to producing lot size summaries.

Activate the **Point to Point Area** routine by picking from the **Area** menu; by pressing [**Alt**][**A**], [**P**]; or by typing the two-letter command **AP** at any data entry prompt.



Points: Enter the point string using the basic **Rules for Defined Figures and Point Strings** as described in [Section 6.20](#). You may also type **DF** or click [**Fig**] to select a **Defined Figure (DF - Section 6.20)**.

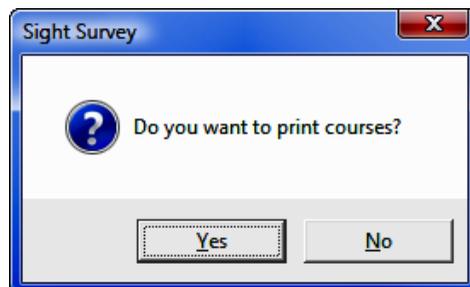


TIP: Although it does not hurt to do so, you do not need to specify the same starting and ending point in this routine. "Sight" Survey will automatically close the figure. For example, the entry of 1-10 will automatically close back to point 1 to compute the area. The entry 1-10,1 will yield the same results.

Draw Courses: Check this box if you would like to have the courses drawn in **CAD** window. If you intend to draw courses, you must check this box before entering any point string.

Annotate Courses: Check this box if you would like to have the courses annotated in **CAD** window. If **Draw Courses** is unchecked, this option will be unavailable. If you intend to annotate courses, you must check this box before entering any point string.

Print Courses: After a point string and pressing [**Enter**] or clicking [**Go**], you must enter one last prompt:



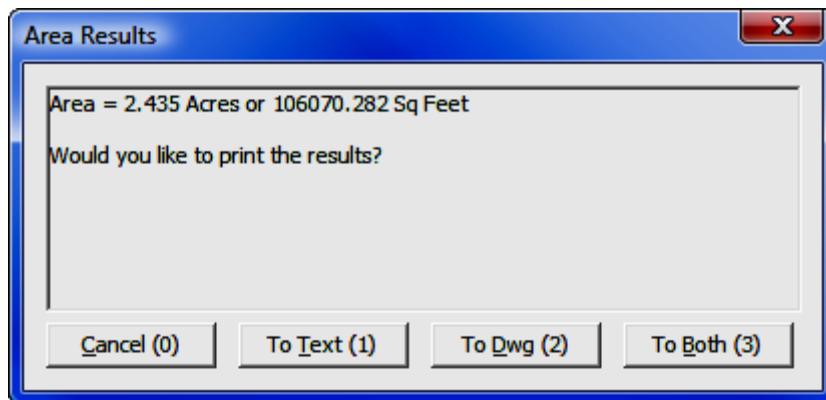
You have an option to print the courses into the **Text Output** window. If you elect not to print the courses to the **Text Output** window "Sight" Survey will only report the routine name, the points involved, and the results of the area computation.

Click [**Yes**] or press [**Y**] to print courses, or click [**No**] or press [**N**] to decline printing.



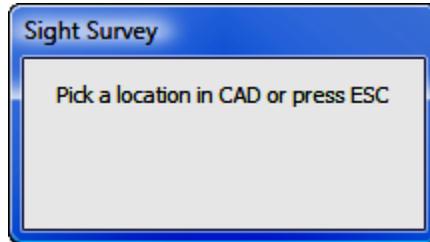
TIP: The option to **Print Courses** appears only once each time you enter this routine. This allows you to run several areas without have to make this choice each time. If you are running areas with or without printing courses and you want to switch to the other setting, exit and re-enter the routine. For example, type **ST** (for Start), then in the point field type **PA**.

If you have specified your units of area measurement as **Acres and/or Square Feet** on the **Local Configuration Menu (LC - Section 5.05)** the program will report the area in square feet and acres. Likewise, you may choose to report the area in **Hectares and Square Meters** or in **Cuerdas and Square Meters**.



"Sight" Survey offers you the option of printing your results to the **Text Output** window, to your drawing, or to both locations. To print the results only to the **Text Output** window, click [**To Text (1)**] or press [**T**] or [**1**]. To print the results only to the drawing, click [**To Dwg (2)**] or press [**D**] or [**2**]. To print the results to both locations, click [**To Both (3)**] or press [**B**] or [**3**]. You may encounter instances where the area shown is obviously incorrect. In those cases, click [**Cancel (0)**] or press [**C**] or [**0**] to try again.

If you have elected to print the area to the drawing, you will be prompted:



Click the location your drawing at which you want to write the area text. The location you pick is the center of the text string so you need not concern yourself with left or right text justification. In some CAD programs you may notice that you need to click twice; the first click activates the CAD window while the second click places the text. If this is the case, you will notice that the prompt window remains open until the area text is actually written to the drawing. The text will be placed as a single line. If you prefer a multi-line label, you can edit the text in CAD.

After reporting the area, the internal area accumulator is cleared to make ready for the next calculation. The starting point for the next routine is the same as the last point number entered prior to calling the area routine. To begin from a different point, use the **Start At** routine (**ST** - [Section 6.05](#)).

10.03 2 Sides Parallel (PD2)

FUNCTION: The 2 Sides Parallel routine is used to compute the length of three sides of a four sided tract of known area. This routine requires the subject tract to have two sides that are parallel. Additionally, the directions of the non-parallel sides and the coordinates of the end points of one of the parallel line segments must be known.

Activate the 2 Sides Parallel routine by picking from the **Area: Pre-determined Area** menu, by pressing **[Alt][A]**, **[R]**, **[2]**, or by typing the command **PD2** at any data entry prompt.

Pre-det. Area: 2 Sides Parallel		
Base Pt 1	1	Pts
Base Pt 2	2	Pts
Pt on line 1	3	
Pt on line 2	4	
1st Brg.	10.1722ne	
2nd Brg.	20.0051ne	
Req'd Area	43560	
<input checked="" type="checkbox"/> Draw Figure		
<input checked="" type="checkbox"/> Annotate Area		
Clear (X)	Go	Help

Base Pt 1: When you enter the routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)). Refer to the [example drawing below](#) for the location of this point.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Base Pt 2: Enter the number of the second base point. Refer to the [example drawing below](#) for the location of this point.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Pt on line 1: Enter the number of the end point that lies along the line proceeding away from point 1. Refer to the [example drawing below](#) for the location of this point.

Pt on line 2: Enter the number of the end point that lies along the line proceeding away from point 2. Refer to the [example drawing below](#) for the location of this point.

1st Brg: Enter a bearing or azimuth from **Base Pt 1** to the **Pt on line 1**. Refer to the [example drawing below](#) for the location of this line.

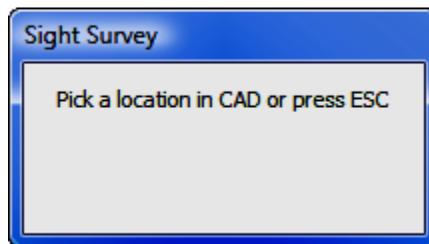
2nd Brg: Enter a bearing or azimuth from **Base Pt 2** to the **Pt on line 2**. Refer to the [example drawing below](#) for the location of this line.

Required Area: Enter the required in either square feet or square meters, as configured under the **Local Configuration** menu (**LC** - [Section 5.05](#)).

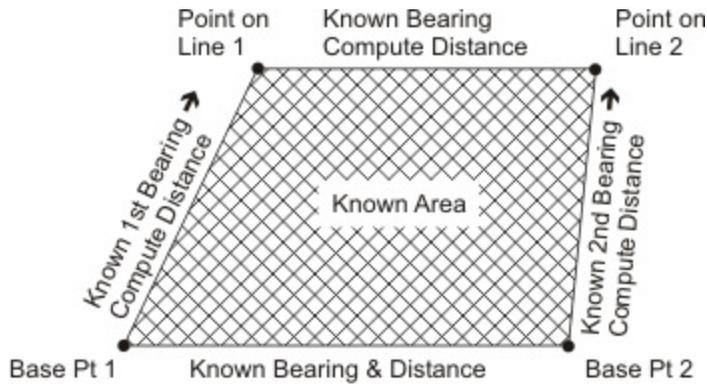
Draw Figure: Check this box if you want the completed figure drawn in CAD.

Annotate Area: Check this box to have the completed figure annotated in CAD. This option is not available unless the **Draw Figure** option has been selected.

If a solution is possible, "Sight" Survey will print the inversed courses and the area to the **Text Output** window. If CAD is active and you have selected an option to draw the figure, it will be drawn. If you have selected to annotate the area, you will be prompted:



Click the location your drawing at which you want to write the area text. The location you pick is the center of the text string so you need not concern yourself with left or right text justification. In some CAD programs you may notice that you need to click twice; the first click activates the CAD window while the second click places the text. If this is the case, you will notice that the prompt window remains open until the area text is actually written to the drawing.



10.04 Line Through a Point (PDL)

FUNCTION: The Line Through a Point routine is used to compute the length of two sides of a three sided tract of known area. This routine requires coordinates of the end points of one of the line segments and also the direction of one of the other two line segments.

Activate the Line Through a Point routine by picking from the **Area: Pre-determined Area** menu, by pressing [**Alt**][**A**], [**R**], [**L**], or by typing the command **PDL** at any data entry prompt.

Pre-det. Area: Line through Pt		
Base Pt 1	1	Pts
Base Pt 2	2	Pts
Pt on line 2	3	
Bearing	45.25NE	
Req'd Area	43560	
<input checked="" type="checkbox"/>	Draw Figure	
<input checked="" type="checkbox"/>	Annotate Area	
Clear (X)	Go	Help

Base Pt 1: When you enter the routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)). Refer to the [example drawing below](#) for the location of this point.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Base Pt 2: Enter the number of the second base point. Refer to the [example drawing below](#) for the location of this point.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Pt on line 2: Enter the number of the end point that lies along the line proceeding away from point 2. Refer to the [example drawing below](#) for the location of this point.

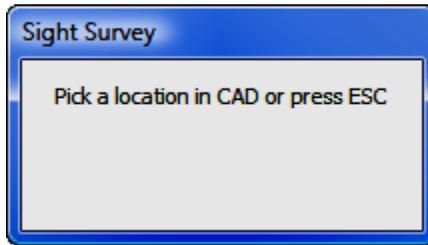
Bearing: Enter a bearing or azimuth from **Base Pt 2** to the **Pt on line 2**. Refer to the [example drawing below](#) for the location of this line.

Required Area: Enter the required in either square feet or square meters, as configured under the **Local Configuration** menu (**LC** - [Section 5.05](#)).

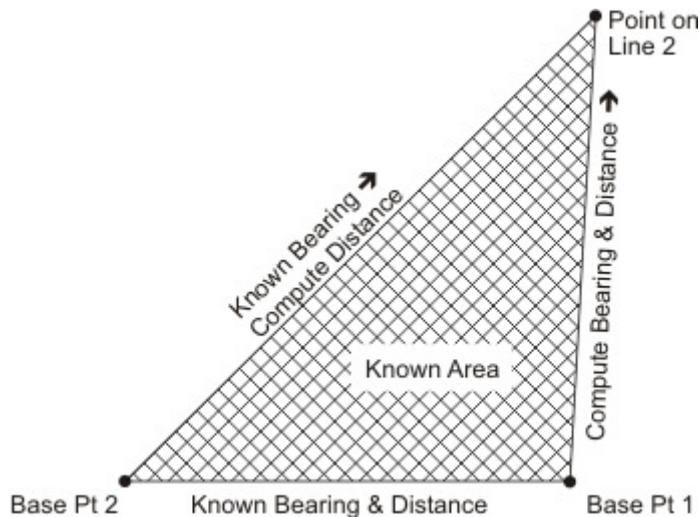
Draw Figure: Check this box if you want the completed figure drawn in CAD.

Annotate Area: Check this box to have the completed figure annotated in CAD. This option is not available unless the **Draw Figure** option has been selected.

If a solution is possible, "Sight" Survey will print the inversed courses and the area to the **Text Output** window. If CAD is active and you have selected an option to draw the figure, it will be drawn. If you have selected to annotate the area, you will be prompted:



Click the location your drawing at which you want to write the area text. The location you pick is the center of the text string so you need not concern yourself with left or right text justification. In some CAD programs you may notice that you need to click twice; the first click activates the CAD window while the second click places the text. If this is the case, you will notice that the prompt window remains open until the area text is actually written to the drawing.



10.05 Radial Sides (PDR)

FUNCTION: The **Radial Sides** routine is used to compute the three unknown sides of a four sided tract of known area, when the tract has a curved side of known radius. This routine requires the coordinates of the end points of one of the line segments and also the direction of the straight line segment lying adjacent to the known line segment. The coordinates of the center point of the arc must also be known.

Activate the **Radial Sides** routine by picking from the **Area: Pre-determined Area** menu, by pressing **[Alt][A]**, **[R]**, **[R]**, or by typing the command **PDR** at any data entry prompt.

Pre-det. Area: Radial Sides		
Base Pt 1	1	Pts
Base Pt 2	2	Pts
Pt on line 2	3	
Pt on arc 1	4	
Radius Pt	5	Pts
Brg. line 2	88.1520ne	
Req'd Area	43560	
<input checked="" type="checkbox"/> Draw Figure		
<input checked="" type="checkbox"/> Annotate Area		
Clear (X) Go Help		

Base Pt 1: When you enter the routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)). Refer to the [example drawing below](#) for the location of this point.



TIP: Left-click the **[Pts]** button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the **[Pts]** button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Base Pt 2: Enter the second base point. Refer to the [example drawing below](#) for the location of this point.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Pt on line 2: Enter the number of the end point that lies along the line proceeding away from point 2. Refer to the [example drawing below](#) for the location of this point.

Pt on arc 1: Enter the number of the end point that lies along the arc proceeding away from point 1. This is the point of intersection of the arc and a line extending from the radius point of the to the point on line 2. Refer to the [example drawing below](#) for the location of this point.

Radius Pt: Enter the radius point for the arc. Refer to the [example drawing below](#) for the location of this point.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

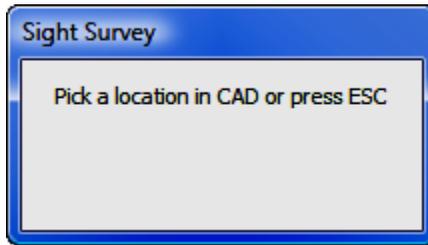
Brg. line 2: Enter a bearing or azimuth of the line extending from **Base Pt 2**. Refer to the [example drawing below](#) for the location of this line.

Required Area: Enter the required in either square feet or square meters, as configured under the **Local Configuration** menu (**LC** - [Section 5.05](#)).

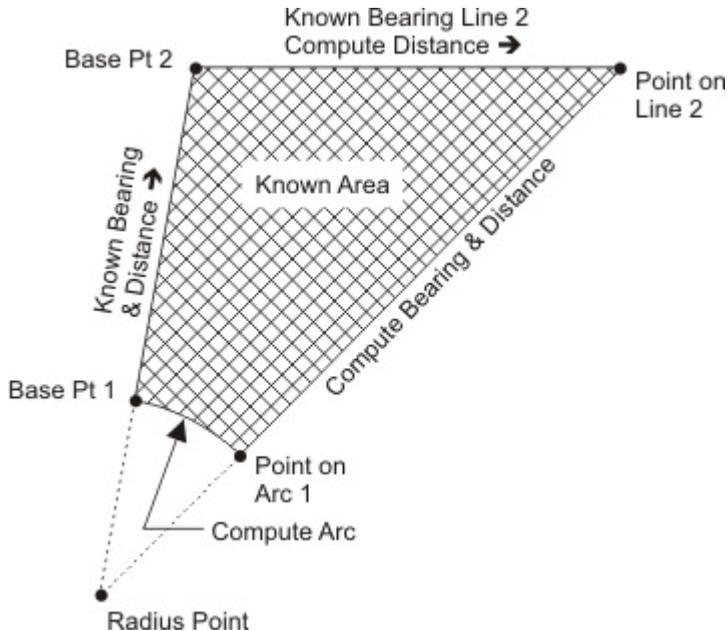
Draw Figure: Check this box if you want the completed figure drawn in CAD.

Annotate Area: Check this box to have the completed figure annotated in CAD. This option is not available unless the **Draw Figure** option has been selected.

If a solution is possible, "Sight" Survey will print the inversed courses and the area to the **Text Output** window. If CAD is active and you have selected an option to draw the figure, it will be drawn. If you have selected to annotate the area, you will be prompted:



Click the location your drawing at which you want to write the area text. The location you pick is the center of the text string so you need not concern yourself with left or right text justification. In some CAD programs you may notice that you need to click twice; the first click activates the CAD window while the second click places the text. If this is the case, you will notice that the prompt window remains open until the area text is actually written to the drawing.



10.06 Two Lines Through a Point (PDT)

FUNCTION: The **2 Lines Through a Point** routine is used to compute the two unknown sides of a three sided tract of known area. This routine requires the coordinates of the intersection point of two of the line segments and also the direction of the two line segments that intersect at the know point.

Activate the **2 Lines Through a Point** routine by picking from the **Area: Pre-determined Area** menu, by pressing **[Alt][A]**, **[R]**, **[T]**, or by typing the command **PDT** at any data entry prompt.

Pre-det. Area: 2 In through Pt	
Base Pt 1	1 <input type="button" value="Pts"/>
Brg line 1	34sw
Pt on line 1	2
Brg line 2	86.30se
Pt on line 2	3
Req'd Area	43560
<input checked="" type="checkbox"/> Draw Figure	
<input checked="" type="checkbox"/> Annotate Area	
<input type="button" value="Clear (X)"/>	<input type="button" value="Go"/> <input type="button" value="Help"/>

Base Pt 1: When you enter the routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)). Refer to the [example drawing below](#) for the location of this point.



TIP: Left-click the **[Pts]** button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the **[Pts]** button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Brg line 1: Enter a bearing or azimuth from the currently occupied point to the intersection point. Refer to the [example drawing below](#) for the location of this line.

Pt on line 1: Enter the number of the end point that lies along the first bearing proceeding away from point 1. Refer to the [example drawing below](#) for the location of this point.

Brg line 2: Enter a bearing or azimuth from the currently occupied point to the intersection point. Refer to the [example drawing below](#) for the location of this line.

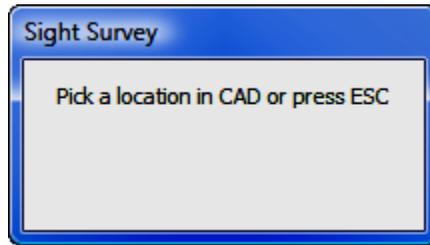
Pt on line 2: Enter the number of the end point that lies along the second bearing proceeding away from point 1. Refer to the [example drawing below](#) for the location of this point.

Required Area: Enter the required in either square feet or square meters, as configured under the **Local Configuration** menu (**LC** - [Section 5.05](#)).

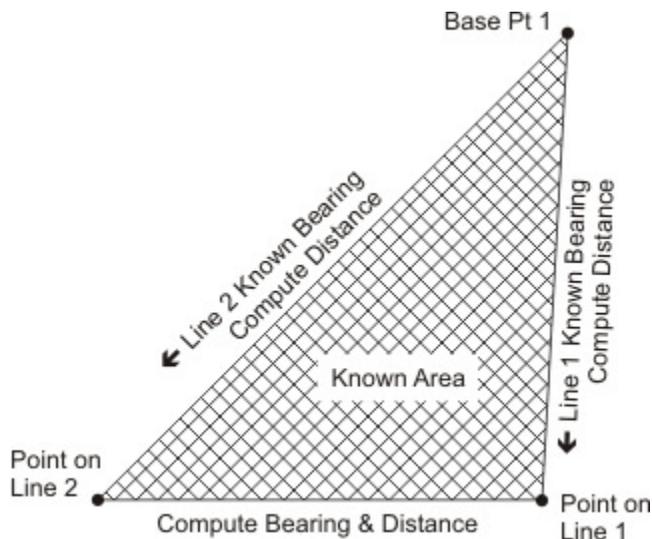
Draw Figure: Check this box if you want the completed figure drawn in CAD.

Annotate Area: Check this box to have the completed figure annotated in CAD. This option is not available unless the **Draw Figure** option has been selected.

If a solution is possible, "Sight" Survey will print the inversed courses and the area to the **Text Output** window. If CAD is active and you have selected an option to draw the figure, it will be drawn. If you have selected to annotate the area, you will be prompted:



Click the location your drawing at which you want to write the area text. The location you pick is the center of the text string so you need not concern yourself with left or right text justification. In some CAD programs you may notice that you need to click twice; the first click activates the CAD window while the second click places the text. If this is the case, you will notice that the prompt window remains open until the area text is actually written to the drawing.



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Section 11

The Tools Menu



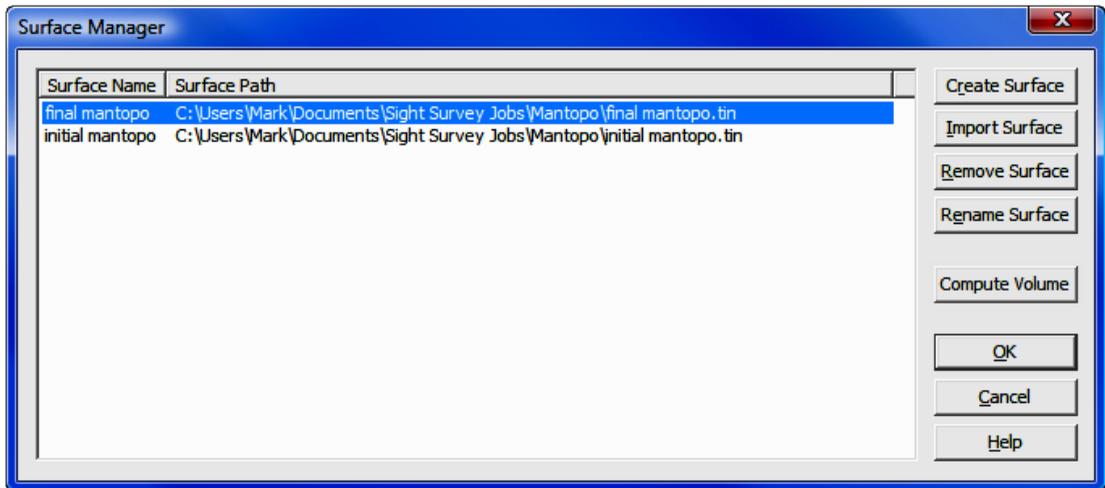
The **Tools** menu contains commands that wouldn't normally fit under other menus. These items include: creating and managing surfaces; creating contours; figuring volumes; data transfer to and from data collectors; editing and processing raw data files; network least squares; and legal descriptions.

11.01 Surface Manager (SM)

FUNCTION: The **Surface Manager** routine is used to create and manage surface (.TIN) files and select those files for use in contouring and volume computations.

Activate the **Surface Manager** routine by picking from the **Tools** menu; by pressing [**Alt**][**T**], [**S**], [**S**]; or by typing the two-letter command **SM** at any data entry prompt.

When initially called, the **Surface Manager** will not contain any surface files in the selection list. Populate the list by either creating or importing files. Once the list is populated, these files will appear whenever **Surface Manager** or a **Select Surface** dialog box is accessed.

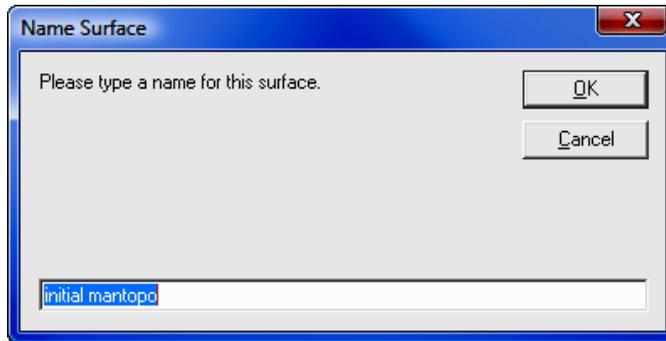


Using this dialog it is also possible to [**Create Surface**], [**Import Surface**], [**Remove Surface**], [**Rename Surface**], or [**Compute Volume**].

[**Remove Surface**]: Clicking this button removes the highlighted file from the list. The file is not deleted, simply removed from the selection list. To actually delete a surface file, use **Windows Explorer (My Computer)**.

[**Rename Surface**]: Clicking this button will allow you to rename a surface for ease in identification. Renaming only affects the selection list, not the file it-

self. In other words, when looking at the **Select a Surface** dialog box, the **Surface Name** changes, but the **Surface Path** (or original file name) does not.



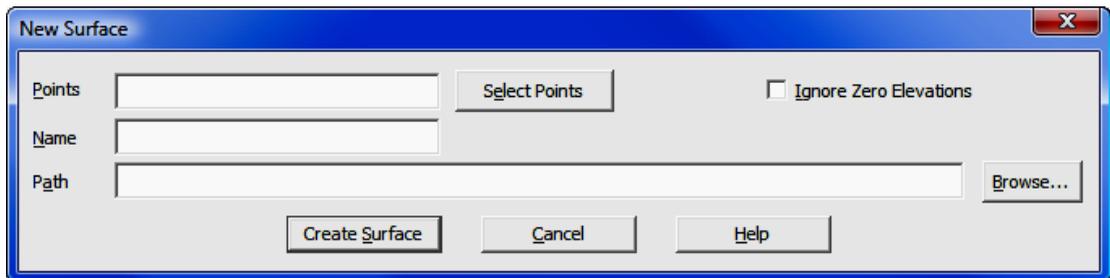
[**Create Surface**]: This feature is described below.

[**Import Surface**]: This is described following the **Create Surface** section.

[**OK**]: Accepts any changes and exits this routine.

Create Surface

Click [**Create Surface**] to build a new surface.



Points: Enter the point numbers (or ranges) that will be used to construct the new surface. Click [**Select Points**] to select points using the **Point Manager** (**PM** - [Section 6.09](#)).

Ignore Zero Elevations: Select this option to disregard any points in the selection set that have a zero elevation.

Name: Enter a name for the surface. This name will appear in the **Select a Surface** dialog and while it does not have to match the actual surface file name, it will appear along with the **Path** in the next data entry field.



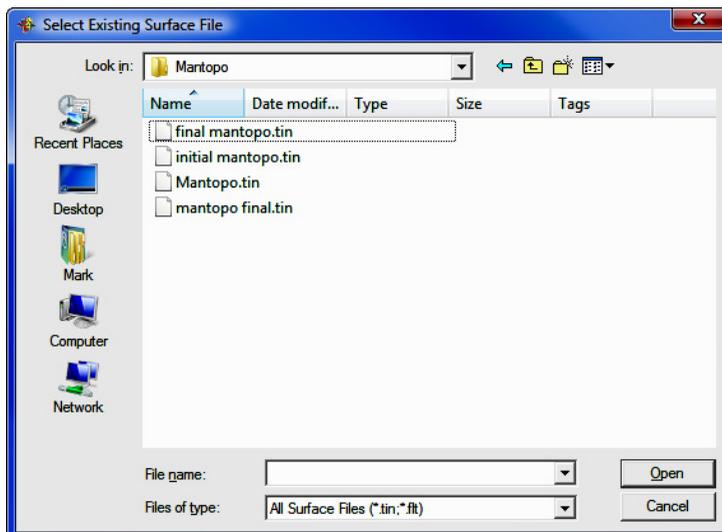
HINT: If you intend to change the path, **DO NOT** press [**Enter**] after entering the file name. Press [**Tab**] or click into the **Path** field. Pressing [**Enter**] is the same as clicking [**Create Surface**].

Path: By default, the path will set to the folder for the current job, and the actual name of the surface file will default to the **Name** specified above. If you want the actual file name to be something different, you may edit the Path line. To select a different path, click [**Browse**]. After entering a path, press [**Enter**] or click [**Create Surface**].

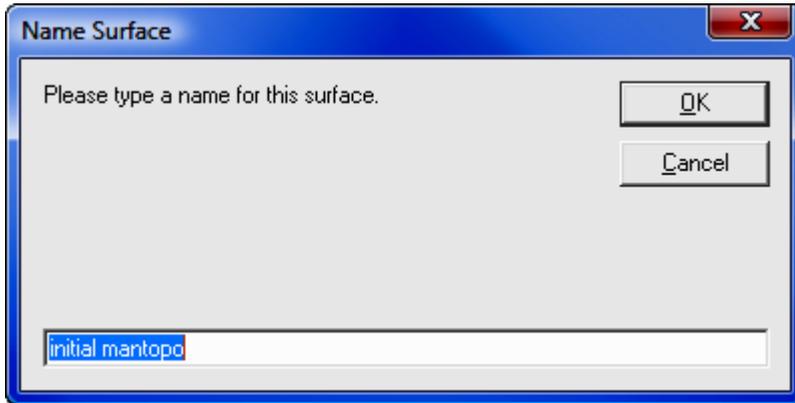
[**Create Surface**]: Click this button to create the surface. The **New Surface** dialog closes and you are returned to the **Select a Surface** dialog, where your new surface will appear on the surface selection list. To use the newly created surface, click [**Use this Surface**].

Import Surface

Using a standard Windows file selection dialog, select an existing **Surface** file to import and click [**Open**]. The file selection dialog will close and the selected file will be imported to the **Select a Surface** dialog.



After selecting the file to import, you may give the surface a more descriptive name that will appear on the selection list. Renaming only affects the selection list, not the file itself. In other words, when looking at the **Select a Surface** dialog box, the **Surface Name** changes, but the **Surface Path** (or original file name) does not.



Compute Volume

Selecting this option starts the **Calculate Volume** routine (**CV** - [Section 11.06](#)).

11.02 Contour (CI)

FUNCTION: The **Contour** routine is used to create and label contours. This routine is also capable of creating a TIN surface file.

Activate the **Contour** routine by picking from the **Tools** menu; by pressing [**Alt**][**T**], [**S**], [**C**]; or by typing the two-letter command **CI** at any data entry prompt. You may also enter the **Contour** routine from within the **Point Manager** (**PM** - [Section 6.09](#)) by first selecting your points and clicking the [**Contour**] button.

Contour [X]

Contour By Points Contour By Surface

Points:

Breakline Layer(s):

Inclusion Layer(s):

Exclusion Layer(s):

Contour Lines

Contour Layer:

Contour Color: Linetype:

Interval: Line Weight:

Draw Index Contours Ignore Zero Elevations

Index Layer:

Index Color: Linetype:

Index Interval: Line Weight:

Bezier Smoothing Factor = 0 (off)

Erase Previous Contours/Labels

Surface

Show Triangles Erase Previous Triangles

Triangle Layer:

Triangle Color:

Create Surface File: Surface Name:

Surface Path:

Labels

Label Layer:

Label Color: Label Font:

Label Precision: Label Size:

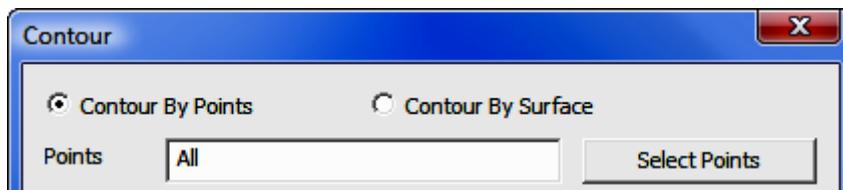
The **Contour** window is a multi-purpose dialog box. Using this single screen you can:

- **Create a Contour using Points**, while specifying the contour line color, layer, type, weight and the contour interval.
- **Create a Contour using a Surface File**, while specifying the contour line color, layer, type, weight and the contour interval.
- **Specify Breaklines, Inclusion and Exclusion perimeters** (by layer)
- **Draw Breaklines, Inclusion and Exclusion perimeters**
- **Draw Index Contours**, while specifying the contour line color, layer, type, weight and the contour interval.
- **Erase Previous Contours**
- **Draw Surface Triangles**, while specifying the triangle line color and layer.
- **Erase Previous Triangles**
- **Construct a Surface File**
- **Label Contour Lines**, while specifying the text color, layer, text font, text size, and label precision.
- Activate the **Calculate Volume** routine (**CV** - [Section 11.06](#))

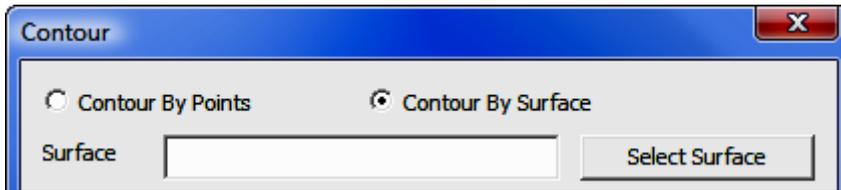
Contour Construction Parameters

The top section of the dialog contains the basic parameters for contour construction. Here you will specify **Contours by Points** or **Contours by Surface**; **Breakline Layer(s)**; **Inclusion Areas**; and **Exclusion Areas**.

Contour By Points: Select this option to construct contours by using points. Enter the **Points** (numbers or ranges), or click [**Select Points**] to select points using the **Point Manager** (**PM** - [Section 6.09](#)).



Contour By Surface: Select this option to construct contours by using a surface file. Enter the **Surface** or click [**Select Surface**] to select points from the **Select Surface** dialog.



Breakline, Inclusion, and Exclusion Layers: Breaklines, Inclusion and Exclusion perimeters are defined as 2D or 3D-Polylines on specified layers.



WHAT THEY ARE: Breaklines, Inclusion Perimeters, and Exclusion Perimeters

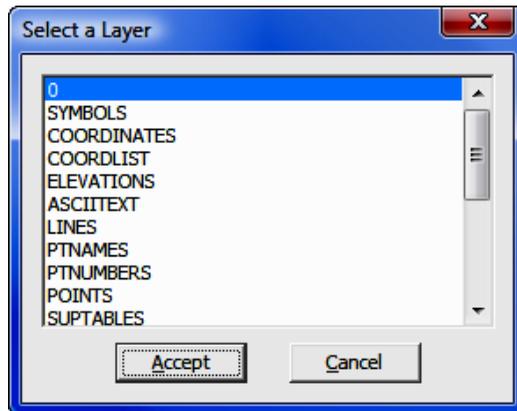
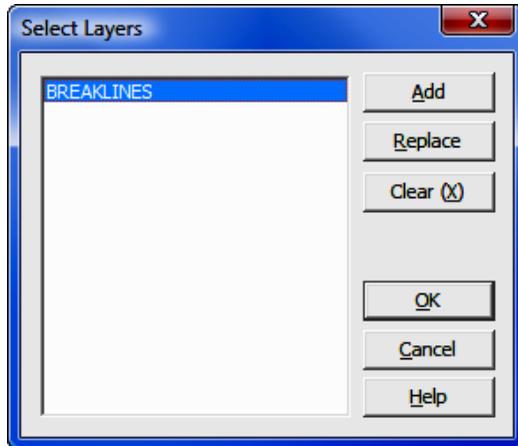
Breaklines: Breaklines are line segments that have the ability to modify the surface model by locally adjusting the triangulation. Breaklines are helpful for defining objects such as building slabs, retaining walls, grade lines, ditch bottoms, roadbeds, etc. Breaklines may consist of segments and do not have to be closed polylines. You may specify multiple breaklines.

Inclusion Perimeters: If an **Inclusion Perimeter** is specified, "Sight" Survey will generate contours only within the specified perimeter, regardless of number of points in the data set. You **may** specify multiple inclusion perimeters. You **may not** specify inclusion perimeters that lie within an exclusion perimeter.

Exclusion Perimeter: If an **Exclusion Perimeter** is specified, "Sight" Survey will not generate contours within the specified perimeter. You **may** specify multiple inclusion perimeters. You **may** also specify an exclusion perimeter that lies within an inclusion perimeter.

Breakline Layer(s)	<input type="text"/>	Layers	Draw	Pick (0)
Inclusion Layer(s)	<input type="text"/>	Layers	Draw	Pick (0)
Exclusion Layer(s)	<input type="text"/>	Layers	Draw	Pick (0)

Select or enter the layer(s), or click [**Select Layer(s)**]



The **Select Layers** dialog shows the layer(s) designated to contain breaklines. Clicking on [**Add**] or [**Replace**] will display a **Select a Layer** dialog box showing a complete listing of the active layers in the drawing. This is your "select from" list.

To **Add** a layer, click [**Add**] and pick a layer from the **Select a Layer** list that appears, then click [**Accept**].

To **Replace** a layer, select the layer you want to replace, then click [**Replace**] and pick a layer from the layer list that appears, then click [**Accept**]. You may elect to replace multiple layers with a single layer selection. To select multiple layers in the Select Layer dialog, simply click on each layer you want to select.

To **Clear** the entire list, click [**Clear (X)**].

When you have completed your layer selections, click [**OK**].

[**Draw**]: This button activates the **Draw Polyline** routine (**DP** - [Section 12.32](#)). Use this routine to easily construct breaklines, inclusion perimeters, and exclusion perimeters. Any polyline drawn for use as an inclusion or exclusion area must be a closed polyline.

[**Pick (0)**]: Select this button to pick the polyline from the drawing. You may pick more than one polyline, and the number in parentheses on the button face indicates the number of selected polylines.

In AutoCAD or IntelliCAD, end the selection process by pressing [**Enter**] or [**Space Bar**]. To clear your selections, right-click the [**Pick (1)**] button. To end the selection process without selecting a polyline, press [**Esc**].

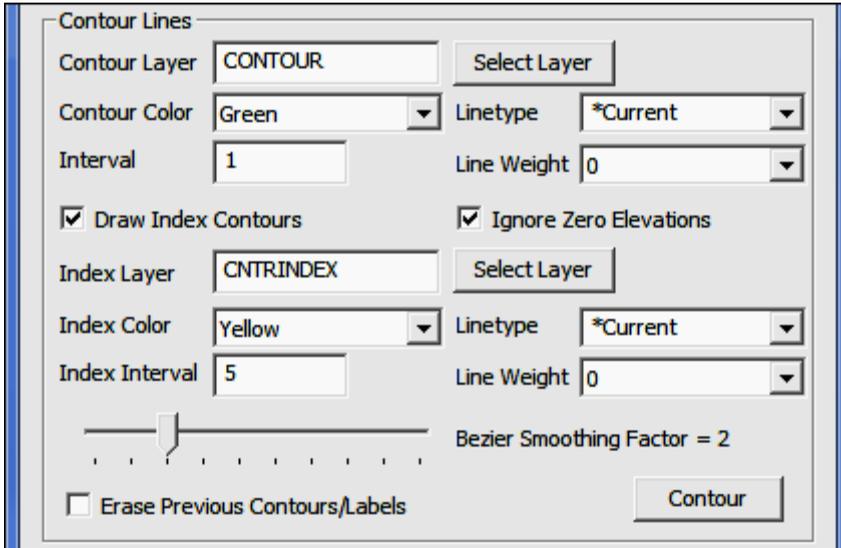
In MicroStation, end the selection process by double-right-clicking your mouse. To clear your selections, right-click the button. To end the selection process without selecting a polyline, double-right-click your mouse to return to the Contour dialog, then right-click the [**Pick (1)**] button.



IMPORTANT: *Inclusion and Exclusion perimeters must be closed polylines or contouring errors will occur. When entering a point string you do not have to conclude the string with the starting point number unless the the last point number listed is a point on a curve. In that case, the ending point and starting point must match.*

Contour Line Setup

This section of the **Contour** dialog contains the settings used to draw the contour lines.



The screenshot shows the 'Contour Lines' dialog box with the following settings:

- Contour Layer:** CONTOUR (with a 'Select Layer' button)
- Contour Color:** Green (dropdown menu)
- Linetype:** *Current (dropdown menu)
- Interval:** 1 (text input)
- Line Weight:** 0 (dropdown menu)
- Draw Index Contours**
- Ignore Zero Elevations**
- Index Layer:** CNTRINDEX (with a 'Select Layer' button)
- Index Color:** Yellow (dropdown menu)
- Linetype:** *Current (dropdown menu)
- Index Interval:** 5 (text input)
- Line Weight:** 0 (dropdown menu)
- A slider control for Bezier Smoothing Factor, currently set to 2.
- Erase Previous Contours/Labels**
- Contour** (button)

Contour Layer: Enter the name of a layer upon which the contours will be drawn, or click [**Select Layer**] to pick one of the active layers. If you enter a name of a layer that is not currently in the drawing, that layer will be created.

Contour Color: Select a contour color from the drop-down list by clicking [▼]. The selection list contains 16 basic colors. If you want to use a different color or color palette, use the **Edit Layers/Levels** routine (**LA** - [Section 4.05](#)) to set the contour layer color, then for **Contour Color** use the **By Layer** setting.

Linetype: Select a contour linetype from the drop-down list by clicking [▼]. The list will contain linetypes currently in the drawing.

Interval: Enter the contour interval.

Line Weight: Select a contour linetype from the drop-down list by clicking [▼].

Draw Index Contours: Select this option if you want to include **Index Contours** in your drawing.

Ignore Zero Elevations: Select this option to disregard any point with an elevation of zero.

Index Layer: Enter the name of a layer upon which the index contours will be drawn, or click [**Select Layer**] to pick one of the active layers. If you enter a name of a layer that is not currently in the drawing, that layer will be created.

Index Color: Select an index contour color from the drop-down list by clicking [▼]. The selection list contains 16 basic colors. If you want to use a different color or color palette, use the **Edit Layers/Levels** routine (**LA** - [Section 4.05](#)) to set the index layer color, then for **Index Color** use the **By Layer** setting.

Linetype: Select an index contour linetype from the drop-down list by clicking [▼]. The list will contain linetypes currently in the drawing.

Index Interval: Enter the index contour interval.

Bezier Smoothing Factor: This factor controls the amount of smoothing of the contour lines. Typically, less is better. High amounts of smoothing may cause "looping" of some contour lines. To adjust smoothing, grab the slider (left-click and hold your mouse button down) on the slider and move it to the desired position. You may also click on the scale bar either to the left or right of the slider to move the slider one step at a time.

Erase Previous Contours/Labels: Select this option to erase any previous contours and labels from the drawing before drawing new contours.

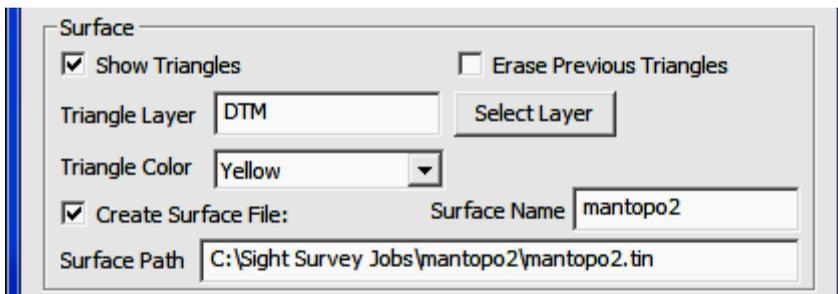
[**Contour**]: Click this button to draw the contours and/or create a surface file. A completed contour map example with labels is shown below the **Label** section. Triangles were not drawn.



HINT: If you want to construct a surface file and create contours at the same time, complete the **Surface** portion of the **Contour** dialog before clicking [**Contour**].

Surface

This section of the **Contour** dialog contains the settings used to create a surface file.



The screenshot shows a dialog box titled "Surface" with the following settings:

- Show Triangles
- Erase Previous Triangles
- Triangle Layer: DTM (with a "Select Layer" button)
- Triangle Color: Yellow (dropdown menu)
- Create Surface File:
- Surface Name: mantopo2
- Surface Path: C:\Sight Survey Jobs\mantopo2\mantopo2.tin

Show Triangles: Select this option to draw the surface triangles.

Erase Previous Triangles: Select this option to erase any previous triangles from the drawing before drawing new triangles.

Triangle Layer: Enter the name of a layer upon which the surface triangles will be drawn, or click [**Select Layer**] to pick one of the active layers. If you enter a name of a layer that is not currently in the drawing, that layer will be created.

Triangle Color: Select a triangle color from the drop-down list by clicking [**▼**]. The selection list contains 16 basic colors. If you want to use a different color or color palette, use the **Edit Layers/Levels** routine (**LA** - [Section 4.05](#)) to set the triangle layer color, then for **Triangle Color** use the **By Layer** setting.

Create Surface File: Select this option to create a surface file during the contouring operation.

Surface Name: Enter a name for your surface. This is the name that will be shown on the list of available surfaces.

Surface Path: Enter a location for the surface file. The default location is in the current job folder, using the surface name (.tin) as the filename. Your filename does not have to match your surface name.



HINT: Surface file construction occurs when you click [**Contour**]. You can also create surfaces using the **Surface Manager (SM - Section 11.01)**, within the **View Triangles** routine (**VT - Section 11.03**), or within the **Calculate Volume (CV - Section 11.06)**.

Labels

This section of the **Contour** dialog contains the settings used to label the contour lines.

Label Layer	CNTRLABEL	Select Layer		
Label Color	Yellow	Label Font	Arial	
Label Precision	0	Label Size	6	
Label Contour Lines		Volumes	Cancel	Help

Label Layer: Enter the name of a layer upon which the contour labels will be written, or click [**Select Layer**] to pick one of the active layers. If you enter a name of a layer that is not currently in the drawing, that layer will be created.

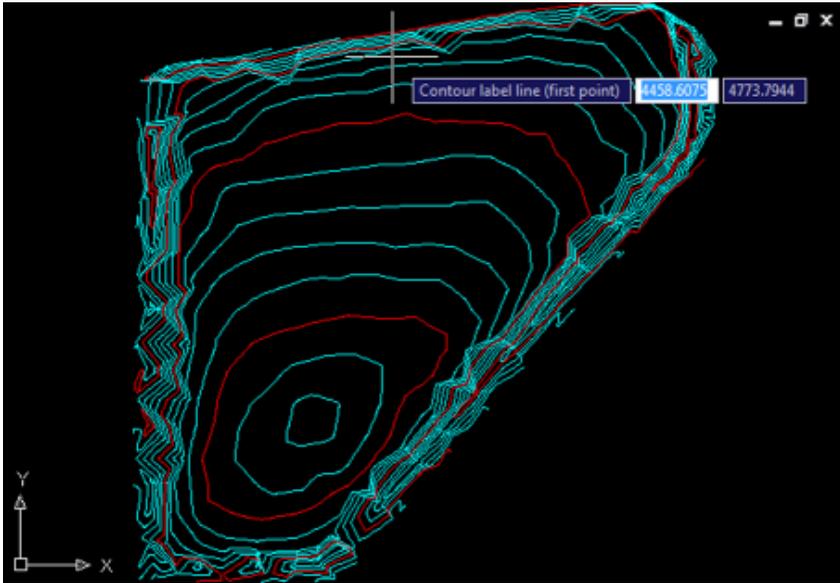
Label Color: Select a label text color from the drop-down list by clicking [**▼**].

Label Font: Select a label text font from the drop-down list by clicking [**▼**].

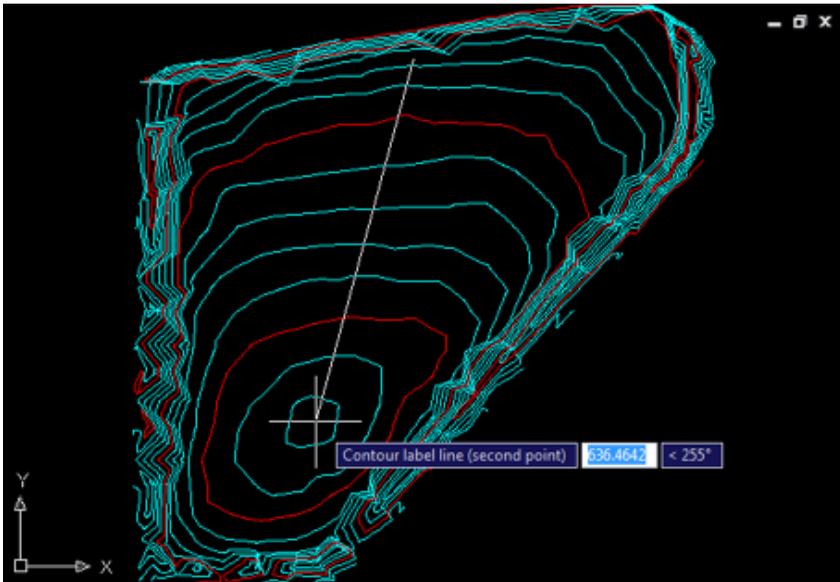
Label Precision: Select a label precision from the drop-down list by clicking [**▼**]. Label precision is the number of decimal places you want showing on your contour labels.

Label Size: Select a label size from the drop-down list by clicking [**▼**].

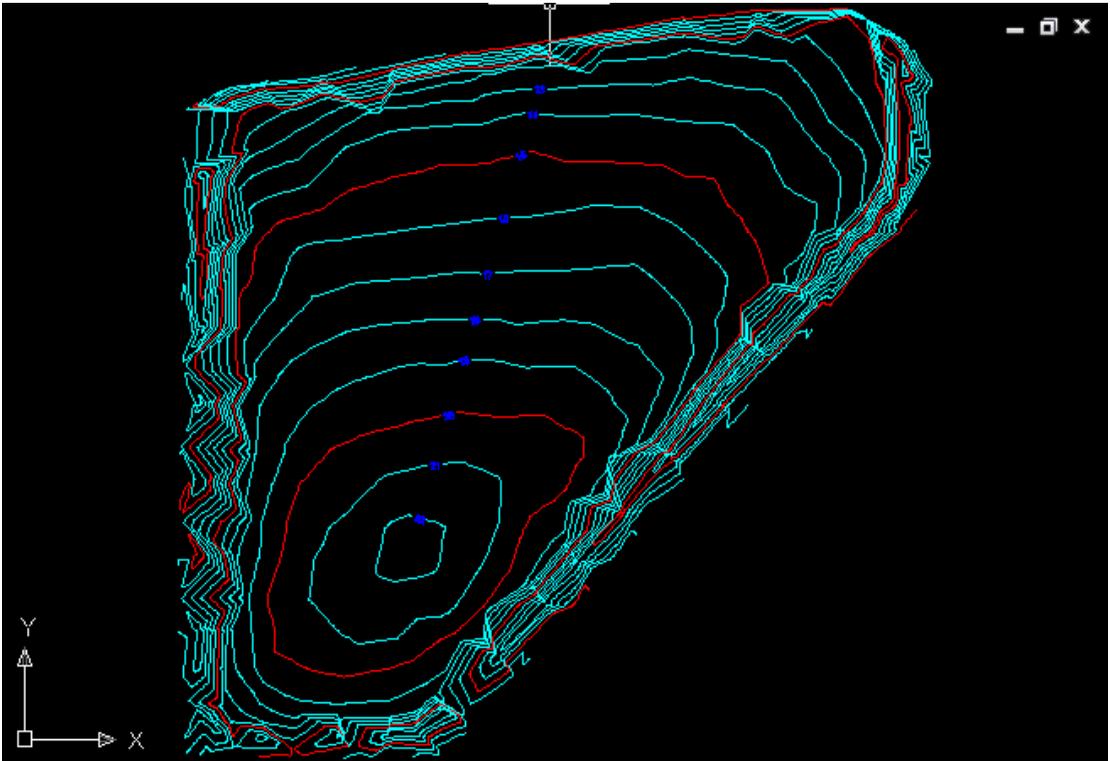
[**Label Contour Lines**]: Click this button to label contours; control will switch to the CAD window. Label locations are determined by a line you strike across the contour lines in the CAD window. You will be prompted (in CAD): **Contour Label Line (first point)**. Click a starting position.



CAD then prompts: **Contour label line (second point)**. Stretch the rubber-banded line across the contour lines until it is in the position you want to apply labels, then click.

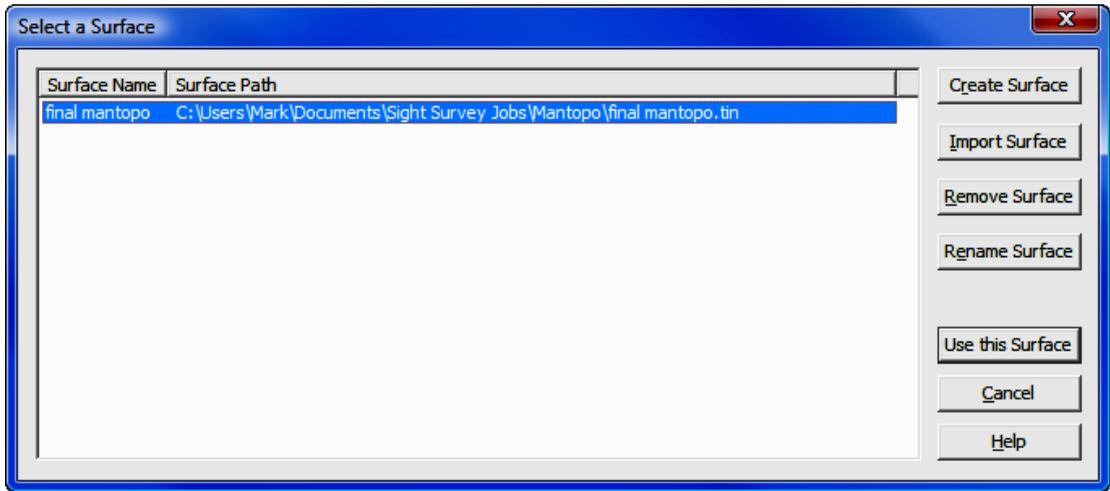


Contour labels are drawn along the line's position as it intersects with each contour line.



Select Surface

If you are selecting a surface, a dialog box will appear with the available surfaces. You may choose one of the surfaces shown and click [**Use this Surface**] which will insert the file name into the **Surface Name** field in the main dialog.



Using this dialog it is also possible to [**Create Surface**], [**Import Surface**], [**Remove Surface**], or [**Rename Surface**].

[**Remove Surface**]: Clicking this button removes the highlighted file from the list. The file is not deleted, simply removed from the selection list. To actually delete a surface file, use **Windows Explorer (My Computer)**.

[**Rename Surface**]: Clicking this button will allow you to rename a surface for ease in identification. Renaming only affects the selection list, not the file itself. In other words, when looking at the **Select a Surface** dialog box, the **Surface Name** changes, but the **Surface Path** (or original file name) does not.

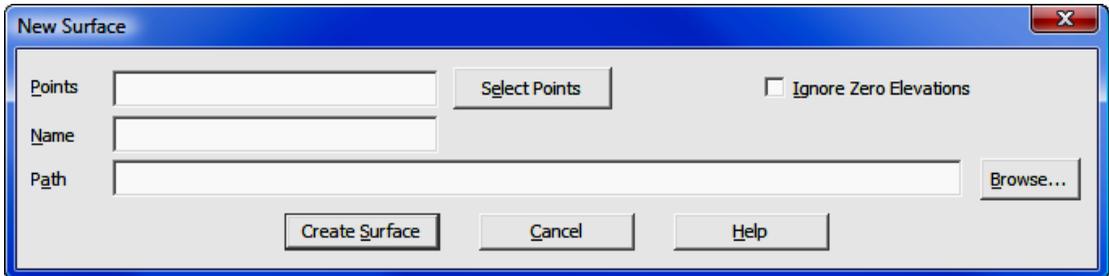


[**Create Surface**]: This feature is described below.

[**Import Surface**]: This feature is described following the **Create Surface** section.

Create Surface

Click [**Create Surface**] to build a new surface.



Points: Enter the point numbers (or ranges) that will be used to construct the new surface. Click [**Select Points**] to select points using the **Point Manager (PM - Section 6.09)**.

Ignore Zero Elevations: Select this option to disregard any points in the selection set that have a zero elevation.

Name: Enter a name for the surface. This name will appear in the **Select a Surface** dialog and while it does not have to match the actual surface file name, it will appear along with the **Path** in the next data entry field.



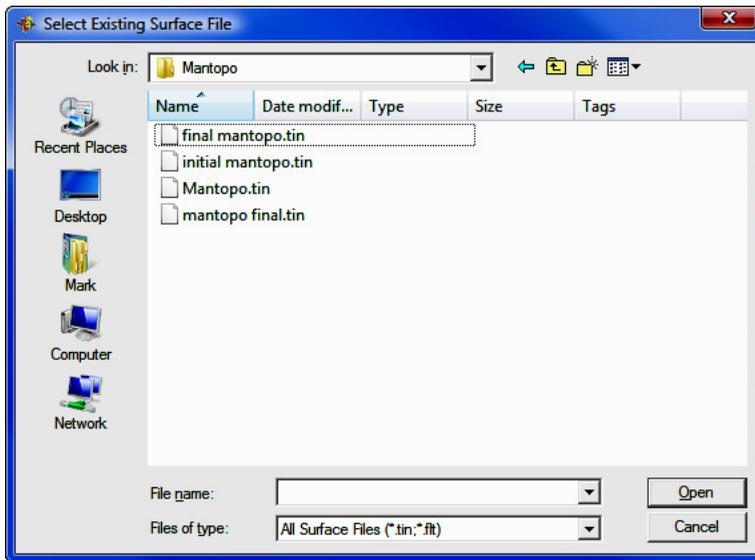
HINT: If you intend to change the path, **DO NOT** press [**Enter**] after entering the file name. Press [**Tab**] or click into the **Path** field. Pressing [**Enter**] is the same as clicking [**Create Surface**].

Path: By default, the path will set to the folder for the current job, and the actual name of the surface file will default to the **Name** specified above. If you want the actual file name to be something different, you may edit the **Path** line. To select a different path, click [**Browse**]. After entering a path, press [**Enter**] or click [**Create Surface**].

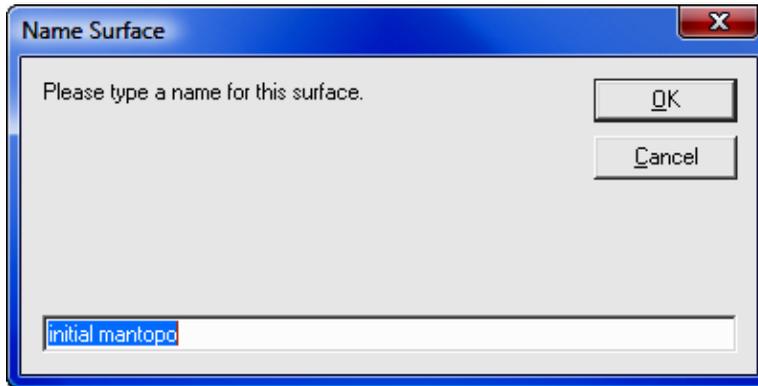
[**Create Surface**]: Click this button to create the surface. The **New Surface** dialog closes and you are returned to the **Select a Surface** dialog, where your new surface will appear on the surface selection list. To use the newly created surface, click [**Use this Surface**].

Import Surface

Using a standard Windows file selection dialog, select an existing **Surface** file to import and click [**Open**]. The file selection dialog will close and the selected file will be imported to the **Select a Surface** dialog.



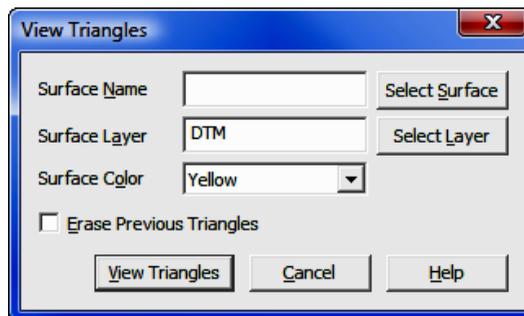
After selecting the file to import, you may give the surface a more descriptive name that will appear on the selection list. Renaming only affects the selection list, not the file itself. In other words, when looking at the **Select a Surface** dialog box, the **Surface Name** changes, but the **Surface Path** (or original file name) does not.



11.03 View Triangles (VT)

FUNCTION: The **View Triangles** routine is used to display the triangles created by contouring and surface construction.

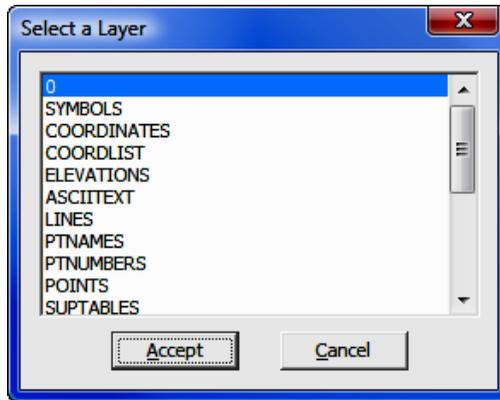
Activate the **View Triangles** routine by picking from the **Tools** menu; by pressing [**Alt**][**T**], [**S**], [**T**]; or by typing the two-letter command **VT** at any data entry prompt.



Surface Name: Enter the surface name, or click [**Select Surface**] to choose a surface file.

Surface Layer: Press [**Tab**] or [**Enter**] to accept the layer name shown, or enter a layer name or click [**Select Layer**] to select a layer from a list of existing

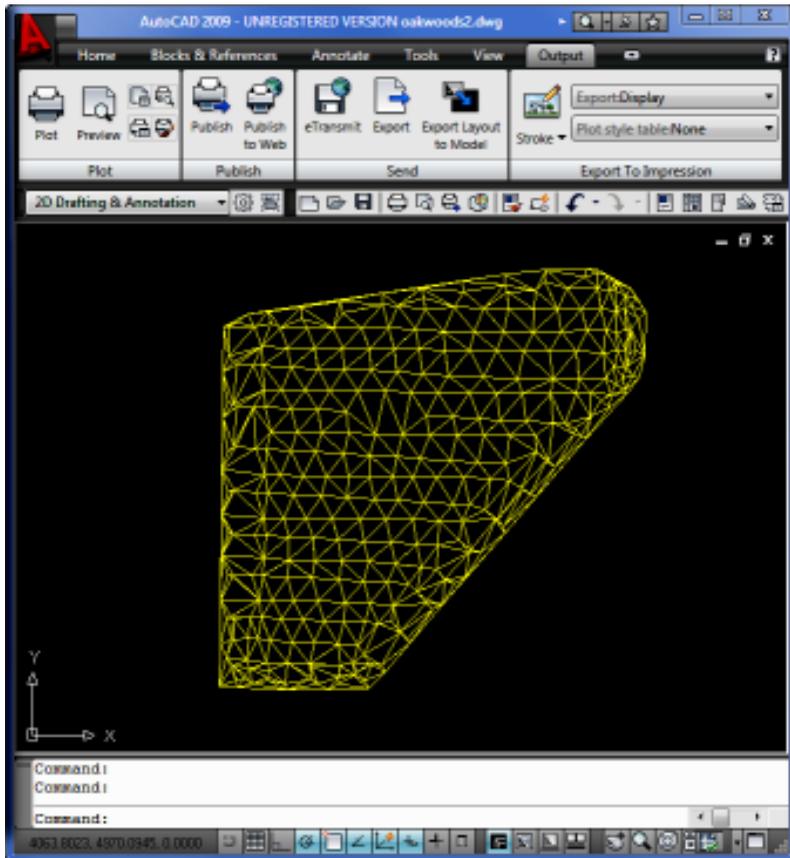
layers. If you choose to enter a layer name and the name entered is of a non-existent layer, a new layer will be created.



Surface Color: Select a plot color for the surface triangles from the drop down list by clicking [▼].

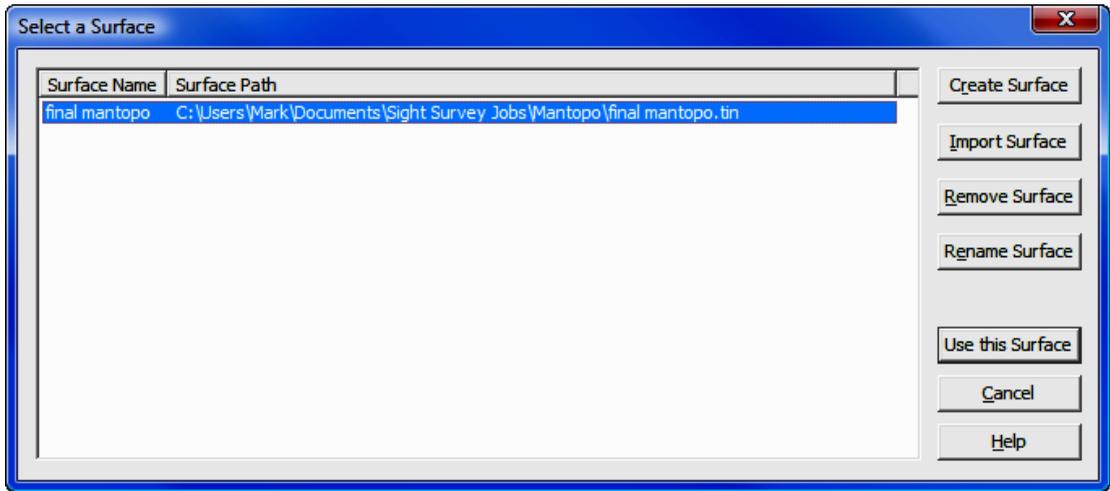
Erase Previous Triangles: Choosing this option will erase any existing surface triangles before the new surface triangles are drawn.

[**View Triangles**]: When you have all the parameters set to your satisfaction, click [**View Triangles**] to actually construct the triangles in your drawing.



Select Surface

If you are selecting a surface, a dialog box will appear with the available surfaces. You may choose one of the surfaces shown and click [**Use this Surface**] which will insert the file name into the **Surface Name** field in the main **View Triangles** dialog.



Using this dialog it is also possible to [**Create Surface**], [**Import Surface**], [**Remove Surface**], or [**Rename Surface**].

[**Remove Surface**]: Clicking this button removes the highlighted file from the list. The file is not deleted, simply removed from the selection list. To actually delete a surface file, use **Windows Explorer (My Computer)**.

[**Rename Surface**]: Clicking this button will allow you to rename a surface for ease in identification. Renaming only affects the selection list, not the file itself. In other words, when looking at the **Select a Surface** dialog box, the **Surface Name** changes, but the **Surface Path** (or original file name) does not.

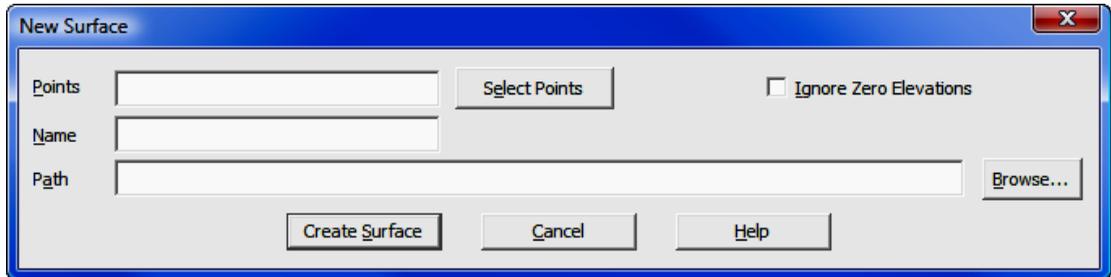


[**Create Surface**]: This feature is described below.

[**Import Surface**]: This feature is described following the **Create Surface** section.

Create Surface

Click [**Create Surface**] to build a new surface.



The screenshot shows a dialog box titled "New Surface" with a blue title bar and a red close button. Inside the dialog, there are three input fields: "Points", "Name", and "Path". The "Points" field has a "Select Points" button to its right. To the right of the "Points" field is a checkbox labeled "Ignore Zero Elevations". The "Path" field has a "Browse..." button to its right. At the bottom of the dialog are three buttons: "Create Surface", "Cancel", and "Help".

Points: Enter the point numbers (or ranges) that will be used to construct the new surface. Click [**Select Points**] to select points using the **Point Manager** (**PM** - [Section 6.09](#)).

Ignore Zero Elevations: Select this option to disregard any points in the selection set that have a zero elevation.

Name: Enter a name for the surface. This name will appear in the **Select a Surface** dialog and while it does not have to match the actual surface file name, it will appear along with the **Path** in the next data entry field.



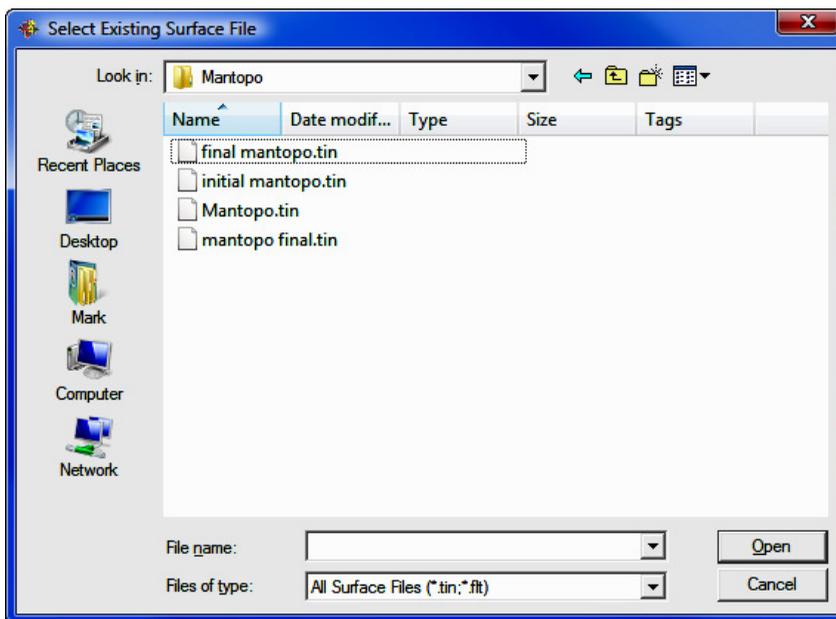
HINT: If you intend to change the path, **DO NOT** press [**Enter**] after entering the file name. Press [**Tab**] or click into the **Path** field. Pressing [**Enter**] is the same as clicking [**Create Surface**].

Path: By default, the path will set to the folder for the current job, and the actual name of the surface file will default to the **Name** specified above. If you want the actual file name to be something different, you may edit the Path line. To select a different path, click [**Browse**]. After entering a path, press [**Enter**] or click [**Create Surface**].

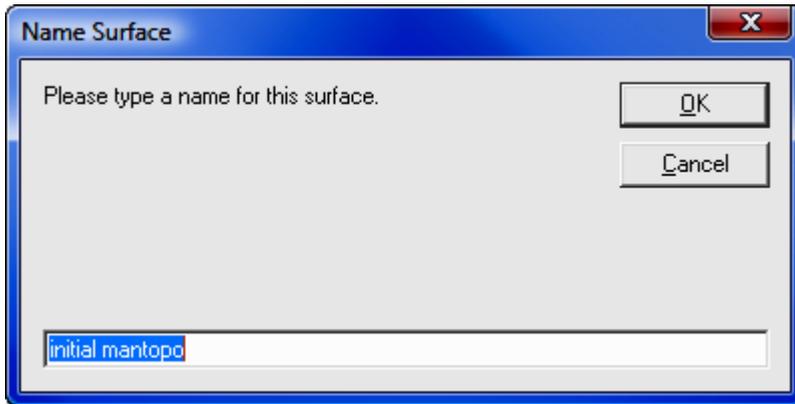
[**Create Surface**]: Click this button to create the surface. The **New Surface** dialog closes and you are returned to the **Select a Surface** dialog, where your new surface will appear on the surface selection list. To use the newly created surface, click [**Use this Surface**].

Import Surface

Using a standard Windows file selection dialog, select an existing **Surface** file to import and click [**Open**]. The file selection dialog will close and the selected file will be imported to the **Select a Surface** dialog.



After selecting the file to import, you may give the surface a more descriptive name that will appear on the selection list. Renaming only affects the selection list, not the file itself. In other words, when looking at the **Select a Surface** dialog box, the **Surface Name** changes, but the **Surface Path** (or original file name) does not.



11.04 Hide Triangles (HT)

FUNCTION: The **Hide Triangles** routine is used to hide the display of triangles created by contouring and surface construction.

Activate the **Hide Triangles** routine by picking from the **Tools** menu; by pressing [**Alt**][**T**], [**S**], [**H**]; or by typing the two-letter command **HT** at any data entry prompt.

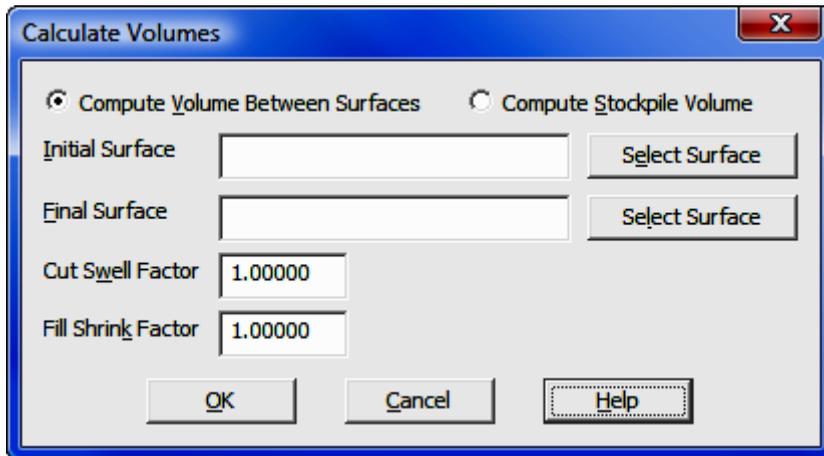
Activating this routine simply removes the surface triangles (TIN) from the drawing, and requires no further user input. To view triangles use the **View Triangles** routine (**VT** - [Section 11.03](#)).

11.06 Calculate Volumes (CV)

FUNCTION: The **Calculate Volumes** routine is used to compute the volume between two surface files, or to compute the volume of a stockpile.

Activate the **Calculate Volumes** routine by picking from the **Tools** menu; by pressing [**Alt**][**T**], [**S**], [**V**]; or by typing the two-letter command **CV** at any data entry prompt.

Volumes Between Surfaces



The screenshot shows a dialog box titled "Calculate Volumes" with a close button (X) in the top right corner. The dialog contains two radio buttons: "Compute Volume Between Surfaces" (which is selected) and "Compute Stockpile Volume". Below the radio buttons are four input fields: "Initial Surface" and "Final Surface" each followed by a "Select Surface" button; "Cut Swell Factor" and "Fill Shrink Factor" both containing the value "1.00000". At the bottom of the dialog are three buttons: "OK", "Cancel", and "Help".

Compute Volume Between Surfaces: Select this option to calculate the volume between two specified surfaces, then enter or select the surfaces using the **Initial Surface** and **Final Surface** fields.

Compute Stockpile Volume: Select this option to calculate a stockpile volume. Stockpiles require only a single surface. This selection makes a change to the initial dialog box. See the **Stockpile Volume** section below for instructions.



HINT: After each field has been entered, **DO NOT** press [**Enter**] to move to the next field. Press [**Tab**] or click into the field. Pressing [**Enter**] is the same as clicking [**OK**].

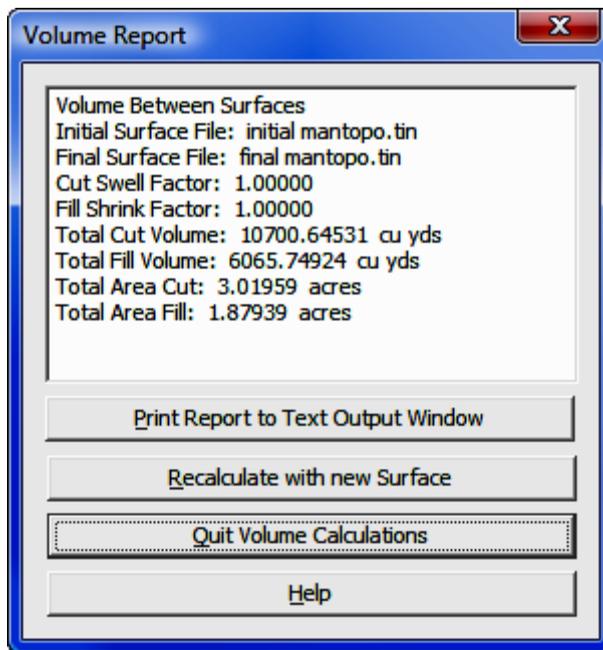
Initial Surface: Enter the initial surface name, or click [**Select Surface**] to choose a surface file. For instructions on surface selection, see the **Select Surface** section below.

Final Surface: Enter the final surface name, or click [**Select Surface**] to choose a surface file. For instructions on surface selection, see the **Select Surface** section below.

Cut Swell Factor: Enter a swell factor to be applied to the cut volume.

Fill Shrink Factor: Enter a shrink factor to be applied to the fill volume.

[**OK**]: When you have all the parameters set to your satisfaction, click [**OK**] to actually compute the volume and generate a report.

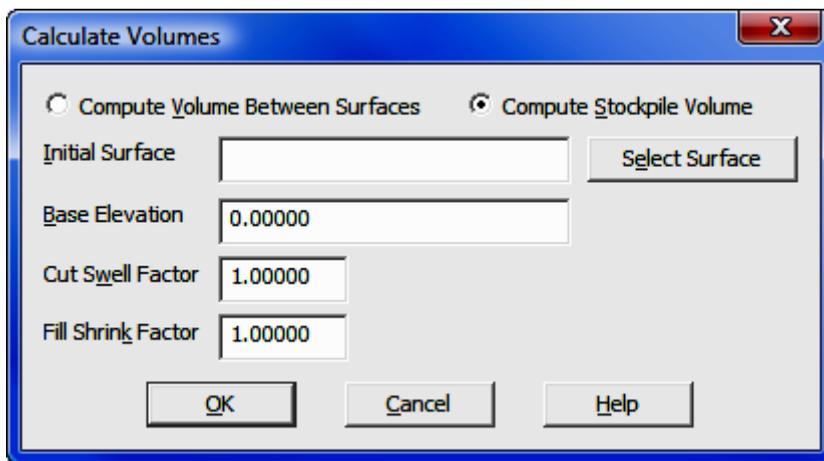


[**Print Report to Text Output Window**]: Select this button to print the report results into the **Text Output** window, and exit this routine.

[**Recalculate with new Surface**]: Select this button to discard the results and re-start the routine for another calculation.

[**Quit Volume Calculations**]: Select this button to discard the results and exit this routine.

Stockpile Volumes



Calculate Volumes

Compute Volume Between Surfaces Compute Stockpile Volume

Initial Surface

Base Elevation

Cut Swell Factor

Fill Shrink Factor

Compute Volume Between Surfaces: Select this option to calculate the volume between two specified surfaces, then enter or select the surfaces using the **Initial Surface** and **Final Surface** fields. See the **Volumes Between Surfaces** section above for additional instructions.

Compute Stockpile Volume: Select this option to calculate a stockpile volume. Stockpiles require only a single surface. This selection makes a change to the initial dialog box.



HINT: After each field has been entered, **DO NOT** press [**Enter**] to move to the next field. Press [**Tab**] or click into the field. Pressing [**Enter**] is the same as clicking [**OK**].

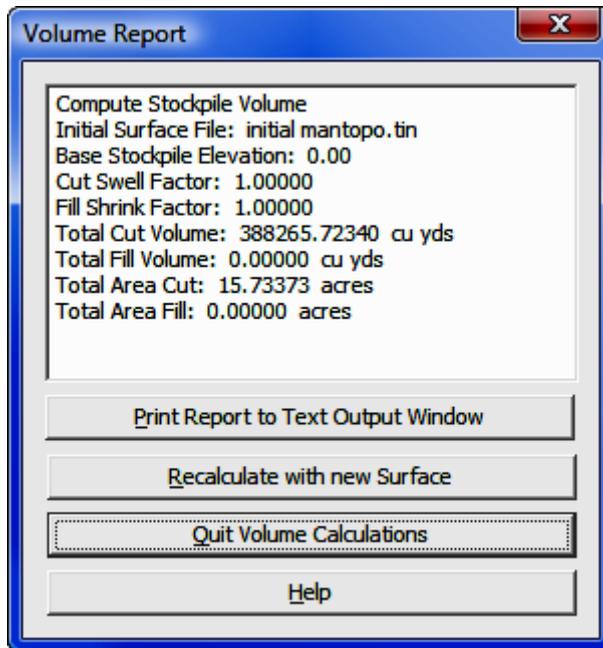
Initial Surface: Enter the initial surface name, or click [**Select Surface**] to choose a surface file. For instructions on surface selection, see the **Select Surface** section below.

Base Elevation: Enter an elevation down to which the stockpile volume will be computed. Generally, this will be the elevation at the base of the stockpile.

Cut Swell Factor: Enter a swell factor to be applied to the cut volume.

Fill Shrink Factor: Enter a shrink factor to be applied to the fill volume.

[**OK**]: When you have all the parameters set to your satisfaction, click [**OK**] to actually compute the volume and generate a report.



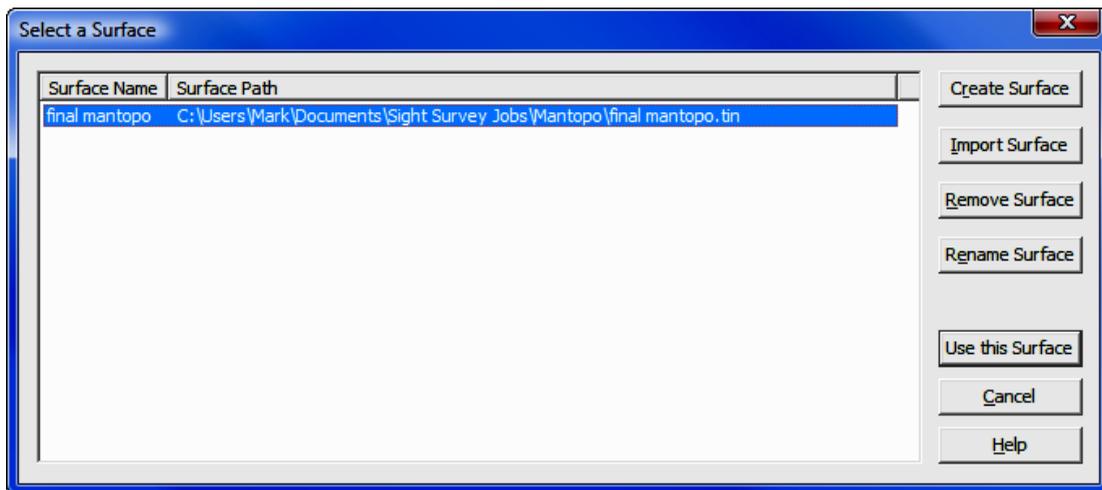
[**Print Report to Text Output Window**]: Select this button to print the report results into the **Text Output** window, and exit this routine.

[**Recalculate with new Surface**]: Select this button to discard the results and re-start the routine for another calculation.

[Quit Volume Calculations]: Select this button to discard the results and exit this routine.

Select Surface

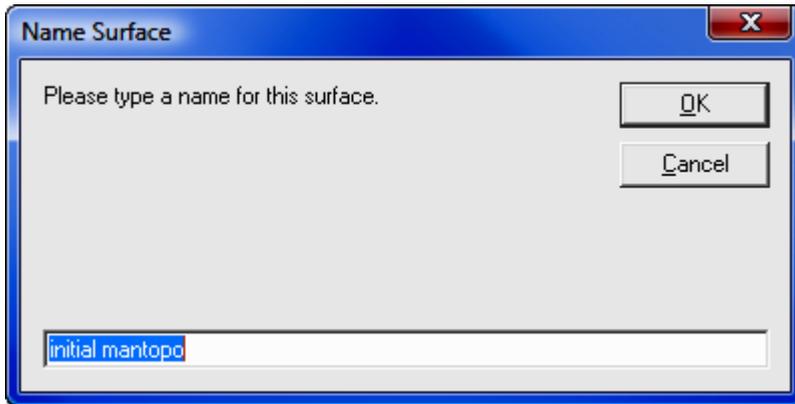
If you are selecting a surface, a dialog box will appear with the available surfaces. You may choose one of the surfaces shown and click **[Use this Surface]** which will insert the file name into the **Surface Name** field in the main dialog.



Using this dialog it is also possible to **[Create Surface]**, **[Import Surface]**, **[Remove Surface]**, or **[Rename Surface]**.

[Remove Surface]: Clicking this button removes the highlighted file from the list. The file is not deleted, simply removed from the selection list. To actually delete a surface file, use **Windows Explorer (My Computer)**.

[Rename Surface]: Clicking this button will allow you to rename a surface for ease in identification. Renaming only affects the selection list, not the file itself. In other words, when looking at the **Select a Surface** dialog box, the **Surface Name** changes, but the **Surface Path** (or original file name) does not.

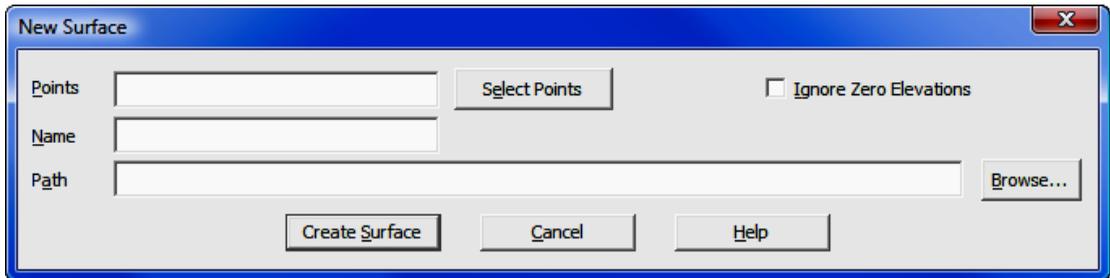


[**Create Surface**]: This feature is described below.

[**Import Surface**]: This feature is described following the **Create Surface** section.

Create Surface

Click [**Create Surface**] to build a new surface.



Points: Enter the point numbers (or ranges) that will be used to construct the new surface. Click [**Select Points**] to select points using the **Point Manager** (**PM** - [Section 6.09](#)).

Ignore Zero Elevations: Select this option to disregard any points in the selection set that have a zero elevation.

Name: Enter a name for the surface. This name will appear in the **Select a Surface** dialog and while it does not have to match the actual surface file name, it will appear along with the **Path** in the next data entry field.



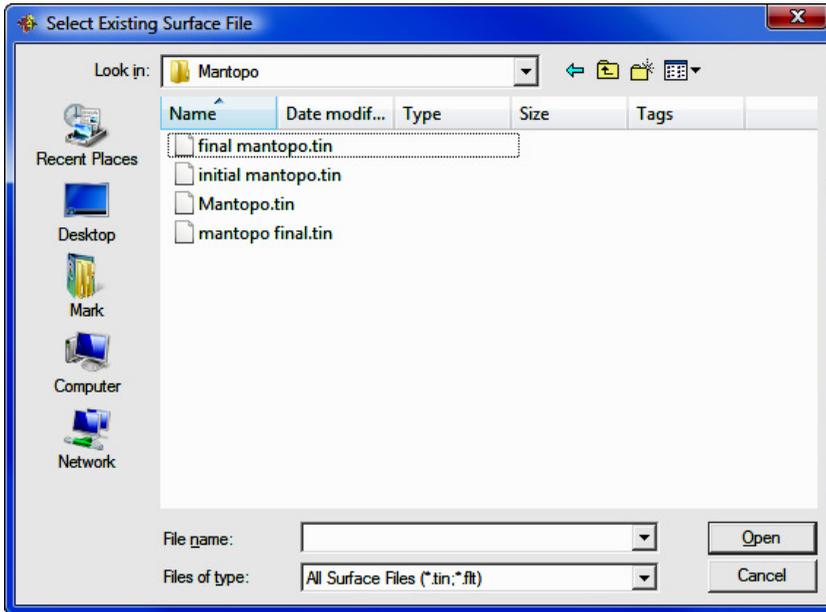
HINT: *If you intend to change the path, **DO NOT** press [Enter] after entering the file name. Press [Tab] or click into the **Path** field. Pressing [Enter] is the same as clicking [Create Surface].*

Path: By default, the path will set to the folder for the current job, and the actual name of the surface file will default to the **Name** specified above. If you want the actual file name to be something different, you may edit the Path line. To select a different path, click [**Browse**]. After entering a path, press [**Enter**] or click [**Create Surface**].

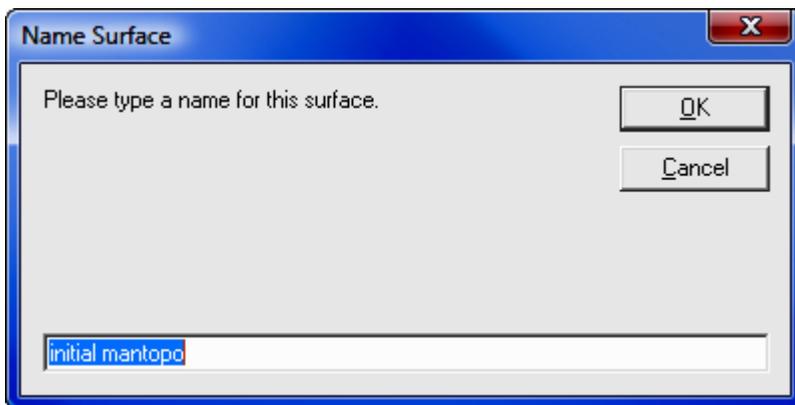
[**Create Surface**]: Click this button to create the surface. The **New Surface** dialog closes and you are returned to the **Select a Surface** dialog, where your new surface will appear on the surface selection list. To use the newly created surface, click [**Use this Surface**].

Import Surface

Using a standard Windows file selection dialog, select an existing **Surface** file to import and click [**Open**]. The file selection dialog will close and the selected file will be imported to the **Select a Surface** dialog.



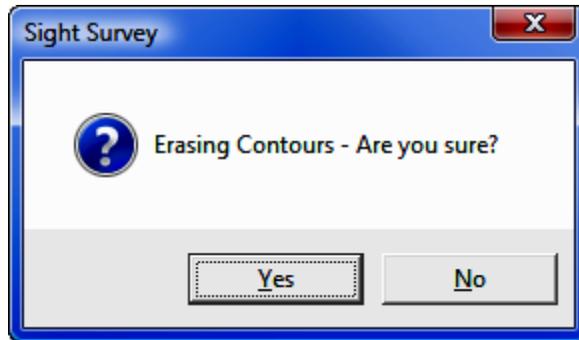
After selecting the file to import, you may give the surface a more descriptive name that will appear on the selection list. Renaming only affects the selection list, not the file itself. In other words, when looking at the **Select a Surface** dialog box, the **Surface Name** changes, but the **Surface Path** (or original file name) does not.



11.07 Delete Contours (XC)

FUNCTION: The **Delete Contours** routine is used to erase contours from the drawing.

Activate the **Delete Contours** option by picking from the **Tools** menu; by pressing [**Alt**][**T**], [**S**], [**S**]; or by typing the two-letter command **XC** at any data entry prompt.



Select [**Yes**] to erase all the contours in the drawing, or [**No**] to cancel this operation.



WARNING: This routine does not hide the contour layer, it erases the contours. Once deleted, contours must be recomputed in order to once again make them visible.

11.08 C&G Transfer

FUNCTION: The **Data Transfer** routine is used to download/upload data from/to your data collector. The **C&G Transfer** option uses the C&G communications program and is the best choice for communicating with any data collectors not running SurvCE data collection.



NOTE: If you are transferring files to/from **Carlson SurvCE**, use the **SurvCom** transfer program. See [Section 11.09](#).

Activate the **C&G Transfer** option by picking from the **T**ools menu, or by pressing [**Alt**][**T**], [**D**], [**C**].

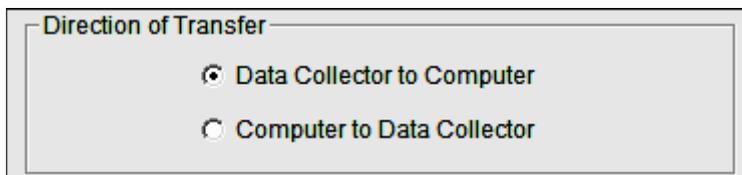


HINT: Before using the data collector program, make sure the correct data collector, communication port and communication parameters have been selected in the **Settings** dialog box.

The screenshot shows the 'C&G Data Collector Transfer' dialog box. It is divided into several sections:

- Direction of Transfer:** Two radio buttons are present: 'Data Collector to Computer' (selected) and 'Computer to Data Collector'.
- Data Collector Options:** Includes a 'Type' dropdown menu set to 'TDS', a checked 'Use Data Collector' checkbox, an unchecked 'Use Disk File' checkbox, a 'File name:' text box with a 'Browse...' button, and two checkboxes: 'Transfer Coordinates with Raw' (unchecked) and 'Transfer Description with Coord' (unchecked).
- Computer Options:** Includes a 'File Type' dropdown menu set to 'Coordinate', a 'Select Points' button, a 'File Format' dropdown menu set to 'Simplicity (*.zak)', an 'All' button, a 'File name:' text box containing 'C:\data\oakwoods.zak' with a 'Browse...' button, and a 'Description Table' section with a 'File name:' text box and a 'Browse...' button, and a 'Use Description Table' checkbox with an 'Edit' button.
- Instructions:** A 'Step 1' button is visible above a large text area containing the word 'Welcome'.
- Current status:** A text box at the bottom left.
- Buttons:** Three buttons are located at the bottom: 'Transfer', 'Settings', and 'Exit'.

Direction of Transfer



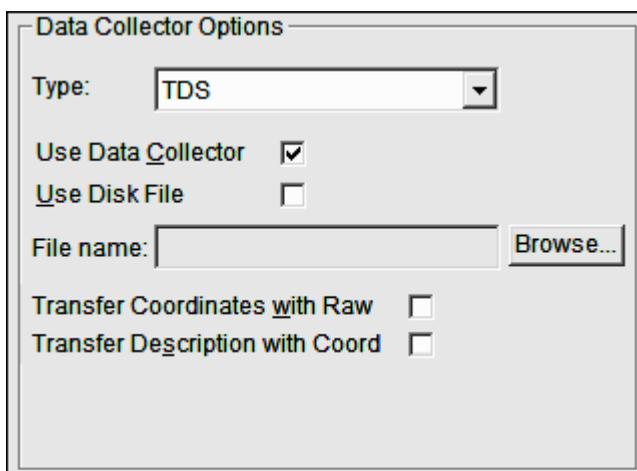
Direction of Transfer

Data Collector to Computer

Computer to Data Collector

Choose either **Data Collector to Computer** or **Computer to Data Collector**.

Data Collector Options



Data Collector Options

Type: TDS

Use Data Collector

Use Disk File

File name: Browse...

Transfer Coordinates with Raw

Transfer Description with Coord

Type: Pressing the down arrow will bring up the list of data collectors to choose. From the list select the type of data collector being used.

Use Data Collector: Check this box to transfer data to/from the data collector. You can also transfer to a file instead of a data collector.

Use Disk File: Check this box if the data is in computer file. The data must be in the format of the data collector selected.

File Name: To select the file path click on [**Browse**] to open a standard Windows file selection dialog box. In the file dialog box specify the path and file name of the file to be opened. Select or enter the path and file name of the file.

Transfer Coordinates with Raw: Some field software allows unadjusted coordinates to be carried in the raw file as the field data is collected. This gives you the option to transfer this data or not. If you do not want approximate coordinates calculated in the field to be confused with control when processing the raw data, leave this box unchecked.

Computer Options

File type: Choose the file type you are transferring/converting. If you are sending data from the **Data Collector** to the **Computer**, your choices are: **Raw Data**; or **Coordinate**. If you are sending from the **Computer** to the **Data Collector**, you can send: a **Coordinate** file; an **ASCII** file; or a **Description Table**.

File Format: C&G Transfer will import and export several types of file formats for both **Raw** and **Coordinate** files.

Raw File formats

C&G (*.cgr)
 C&G (*.raw)
 OBS (*.obs)
 Geolab (*.iob)
 StarNet (*.dat)
 SDR2x (*.dat)
 SDR33 (*.dat)

Coordinate File formats

C&G Alphanumeric (*.cgc)
 C&G Numeric (*.crd)
 Carlson Alphanumeric (*.crd)
 Carlson Numeric (*.crd)
 ASCII (*.nez or *.asc)
 Geolab (*.neo)
 StarNet (*.pts)

SDR2x (*.dat)
 SDR33 (*.dat)
 Simplicity (*.zak)
 LDT (*.mdb)

File Name: To select the file path and name click on [**Browse**] to open a standard Windows file selection dialog box. In the file dialog box specify the path and file name of the file to be opened. Select or enter the path and file name of the file desired file.

Description Table: To use a description table check **Use Description Table** box. You have the ability to use multiple description tables. Examples of that might be: **State DOT**; **Boundary**; **As-Built**; and **Topography**.

Each of these could have different codes and descriptions and this option would allow you to choose which description table to use for the reduction of this file. To change the description table click the [**Browse**] button or directly edit the file name. Below is an example of a description table:

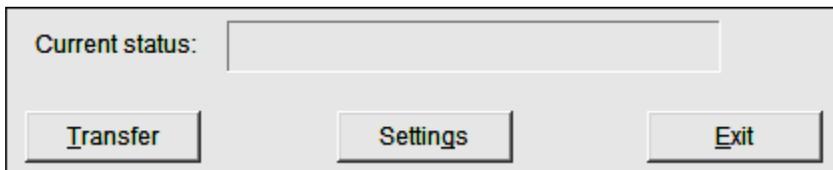
Num	Description
1	TRAV_PT
2	IPF_#4RR
3	IPF_OTP
4	IPF_CTP
5	CMF
6	IPS_#4RR
7	RAD_PNT
8	COMP_PT
9	WORK_PT
10	WORK_PT2
11	BOC
12	FOC
13	CL
14	EDGR_PVMT
15	CL_PVMT
16	S_WALKS
17	

Instructions



Depending on the type of data collector, type of file and the direction of transfer, this option will give you step by step directions on how to proceed. It will guide you step by step through the transfer routine. To begin, click on the [**Step 1**] button, after which you may continue by clicking [**Next**] and/or [**Previous**].

Current Status



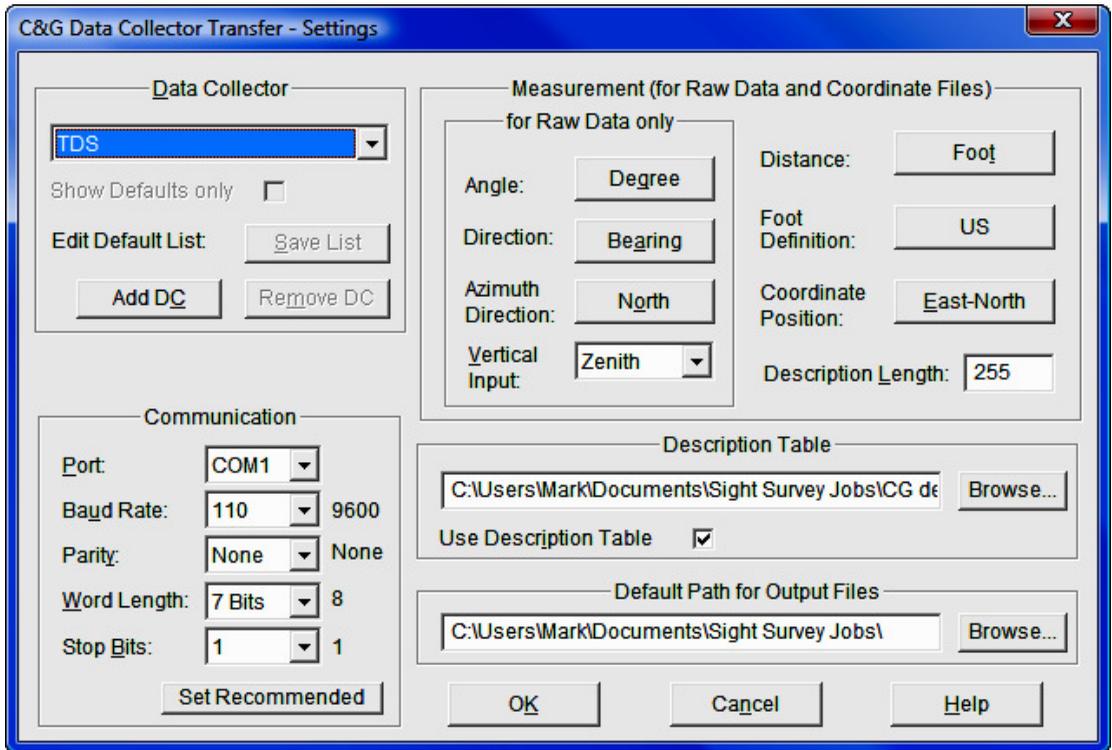
This line will indicate the status of the transfer

Transfer

Once all of the settings are set correctly clicking on the [**Transfer**] button will begin the transfer between the data collector/file and the desktop.

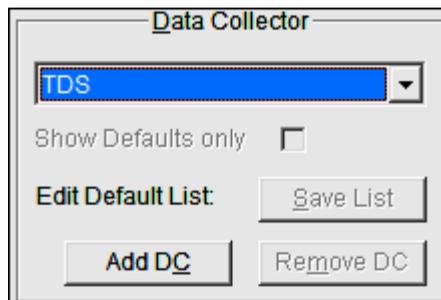
Settings

At the bottom middle of the main screen is the [**Settings**] option that allows you set more detailed information as well as set defaults for future use.



Data Collector

This dialog box allows you to select the type of data collector you are transferring to and/or from.



When you select the down button [▼] to the right of the data collector shown and the **Show Defaults only** box is unchecked, you will see the complete list of all the data collectors that C&G Transfer interfaces with. Currently this list includes:

CGFIELD	SMI v5.0	Topcon FC-2
CGFIELD+	SMI v6.0/7.0/8.0	Topcon FC-4
Geodat 122	Sokkia SDR2	Topcon FC-48/95
Geodat 126	Sokkia SDR33 (14 Char Pt#)	Topcon FC-5
Geodat 400	Sokkia SDR33 (4 Digit Pt#)	Topcon PROPAC
Geodat 500	SurvCE	Wild GIF-10
Leica 1200	TDS	Wild GIF-10/WS
Leica Data Pro	TDS (Australia)	Wild GIF-10/WS2
Nikon	Topcon CR2	Wild GIF-2
Nikon DTM 300	Topcon FC-1	Wild Topos

You also can create a **Default List**. This default list should consist of the various data collectors your company may have and/or interface with on an everyday basis. You can use the **Show Defaults only** check box to limit the data collectors which may be selected from the **Data Collector** list on the main **Data Collector Transfer Screen**. If this box is checked, only those data collectors you have specified for the default list will be shown.

To add a data collector to the default data collector list:

- Make sure the **Show Defaults only** box is unchecked.
- Select a data collector from the list by scrolling up and down the list using the arrow keys.
- When the new data collector is selected the **Communications Dialog** will open and you can set all the default values for the data collector.
- Once the settings are correct, click [**Add DC**].
- Click [**Save List**] to save the changes to the list.
- Re-check the **Show Defaults only** box

To remove a data collector from the default list:

- Make sure the **Show Defaults only** is checked.
- Highlight the data collector you wish to remove from list.
- Click [**Remove DC**].

- Click [**Save List**] to save the changes to the list.
- Chose [**OK**] and verify that the data collector is no longer in the default listing.

Communications

The Communication box allows you to manually set the communication protocols.

The image shows a dialog box titled "Communication" with the following settings:

Port:	COM1	
Baud Rate:	110	9600
Parity:	None	None
Word Length:	7 Bits	8
Stop Bits:	1	1

At the bottom of the dialog box is a button labeled "Set Recommended".

You may set: **Port**; **Baud Rate**; **Parity**; **Word Length**; and **Stop Bits**.

When a data collector is selected, C&G Transfer reads a list of default settings and compares it to the settings currently shown. If the current settings are different than those recommended the defaults will be displayed and a [**Set Recommended**] button will be displayed. This allows you to automatically set the recommended communication parameters for your data collector.

Measurement

The **Measurement** portions of the **Settings** dialog box pertains to **RAW** and **Coordinate** data input, whether entered by hand or transferred by data collector.

Measurement (for Raw Data and Coordinate Files)

for Raw Data only

Angle:	<input type="text" value="Degree"/>	Distance:	<input type="text" value="Foot"/>
Direction:	<input type="text" value="Bearing"/>	Foot Definition:	<input type="text" value="US"/>
Azimuth Direction:	<input type="text" value="North"/>	Coordinate Position:	<input type="text" value="East-North"/>
Vertical Input:	<input type="text" value="Zenith"/>	Description Length:	<input type="text" value="255"/>

Using this dialog box you may set:

- **Angle Mode:** select **Degrees** or **Grads**
- **Direction Mode:** select **Bearing** or **Azimuth**
- **Azimuth Direction:** select **North** or **South**
- **Vertical Input:** select **Zenith**, **Nadir**, or **Horizontal**
- **Distance:** select **Foot** or **Meter**
- **Foot Definition:** select **U.S.** or **International**
- **Coordinate Position:** select **North-East** or **East-North**
- **Description Length:** select the number of characters up to the maximum shown.

Description Table

The **Description Table** portion of the **Settings** dialog allows you to select the default description table.

Description Table

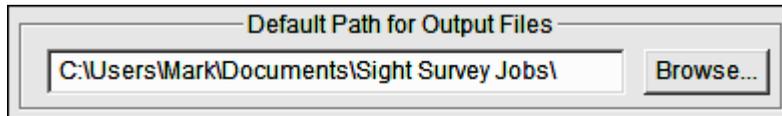
Use Description Table

As mentioned earlier you can have multiple description tables; here is where you would select the description table to use.

The **Use Description Table** option, when checked, will replace any integer description found in the raw data file with corresponding description found on the description table. When this check box is not checked data will be transferred as entered.

Default Path for Output Files

This setting allows you to set the default location for storing transferred files.



To change the **Default Path for Output Files** click [**Browse**] or directly edit the path.

Receiving Coordinates from Data Collectors

When receiving coordinates from a data collector into an existing coordinate file, C&G Transfer has a point protection feature in place to protect your existing points.

Point Overwrite

WARNING: POINT WILL BE OVERWRITTEN !

Point ID 1

	Current Values	New Values	Delta Values
Northing	7036366.97	7036366.97	0.00
Easting	3547556.76	3547556.76	0.00
Elevation	100.00	100.00	0.00
Code			
Description	pk nail	pk nail	

Do Not Ask Again
(During Current Operation)

Cancel Overwrite Do Not Overwrite

You are given the coordinate data for both the existing point and the incoming point, and you must instruct C&G Transfer how to handle the duplicate. You have five options:

- Click [**Cancel**] to cease downloading.
- Click [**Overwrite**] to overwrite existing point or points.
- Click [**Do Not Overwrite**] to skip the point.

If the **Do Not Ask Again** option is selected:

- Click [**Overwrite**] to overwrite all existing points.
- Click [**Do Not Overwrite**] to import only new points.

Transfer Options

Depending on the type of data collector that you are using, you will be able to perform some or all of the following functions:

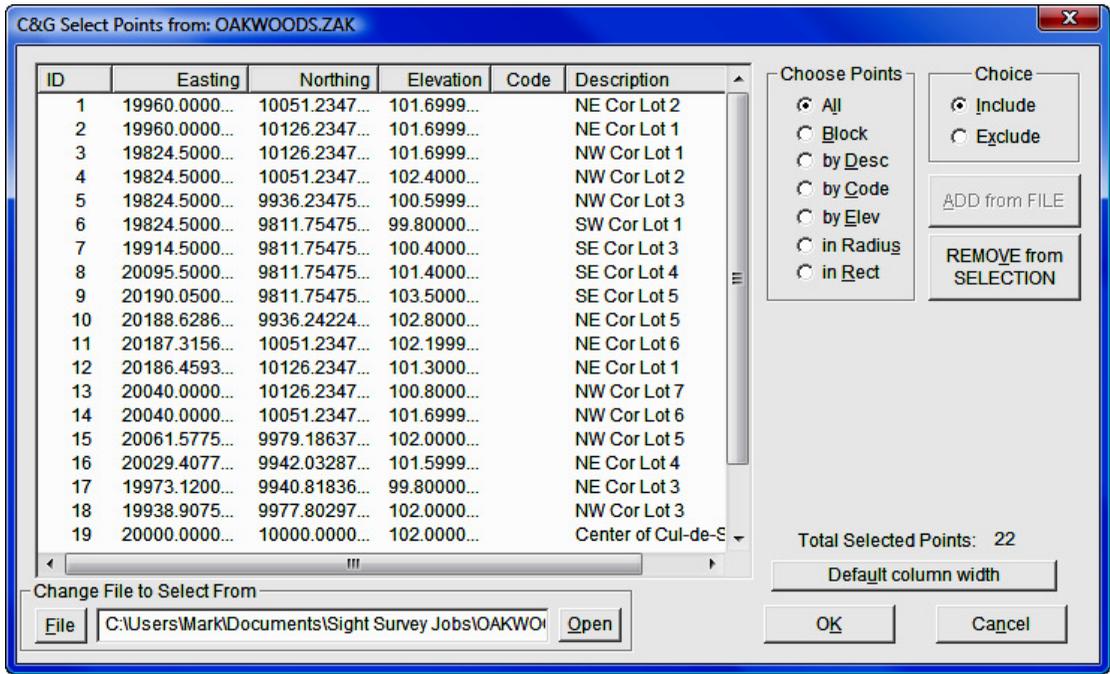
- Receive raw data from the data collector.
- Receive raw data from a file.
- Send raw data to the data collector.
- Receive coordinates from the data collector.
- Receive coordinates from the data collector file.
- Send coordinates to the data collector.
- Send a program to the data collector.
- Execute a program on the data collector.
- Delete files on data collector
- View files on data collector

As data is received from a particular data collector or file, it is converted to a .C&G compatible Raw or Coordinate file. Data that is sent to the data collector is converted from the coordinate or raw file format to the data collector format.

The remainder of this section discusses specific data collectors and software.

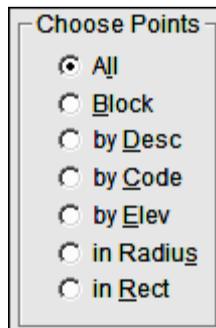
Select Points

When transferring coordinates to the data collector this option allows you to choose which points are to be transferred. When you click on the [**Select Points**] button under the **Computer Options** section the following dialog box comes up.



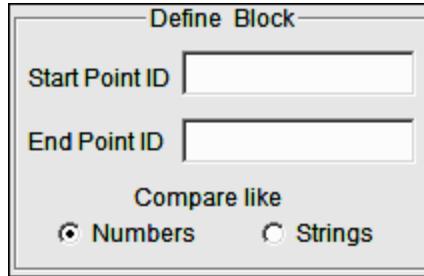
Change file to Select From: Click the [File] button to select the coordinate file that you want to transfer coordinates from. After selecting the file click [Open] button.

Choose Points: This option allows you to select groups of points to be included or excluded from the file you have opened.



☉ **All Points:** Choose all the points in the selected file.

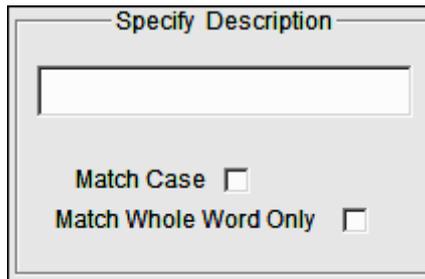
Ⓒ **Block:** Select blocks of points.



The 'Define Block' dialog box contains two text input fields labeled 'Start Point ID' and 'End Point ID'. Below these fields is a section titled 'Compare like' with two radio button options: 'Numbers' (which is selected) and 'Strings'.

Enter **Start Point ID** and **End Point ID**. If points are numeric, select **Compare like Numbers**. If points are alphanumeric, select **Compare like Strings**.

Ⓒ **Desc:** Select points by description.



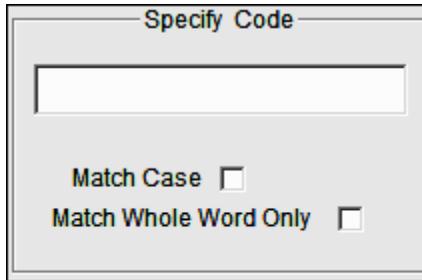
The 'Specify Description' dialog box features a large text input field at the top. Below it are two checkboxes: 'Match Case' and 'Match Whole Word Only', both of which are currently unchecked.

Specify the description to match and select any options.

Match Case: Match the case of the text

Match Whole Word Only: For example, if this box is NOT checked point with the descriptions BOC; BOC1 and BOC2 would all be included. If the box is checked, only points with the description BOC would be included.

⊙ **Code:** Select points by code.



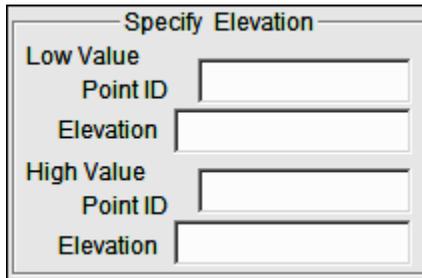
The image shows a dialog box titled "Specify Code". It contains a large empty text input field at the top. Below the input field are two checkboxes: "Match Case" and "Match Whole Word Only", both of which are currently unchecked.

Specify the code to match and select any options.

Match Case: Match the case of the text

Match Whole Word Only: For example, if this box is NOT checked point with the descriptions BOC; BOC1 and BOC2 would all be included. If the box is checked, only points with the description BOC would be included.

⊙ **Elevation:** Select points by elevation.



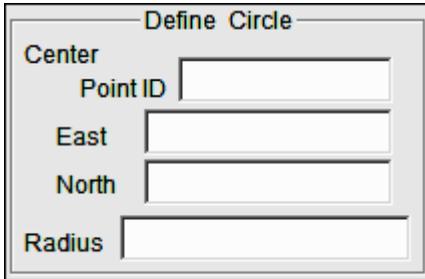
The image shows a dialog box titled "Specify Elevation". It is divided into two main sections: "Low Value" and "High Value". Each section contains two input fields: "Point ID" and "Elevation".

Low Value: Enter the **Point ID** OR the **Elevation** for the **Low Value**.

High Value: Enter the **Point ID** OR the **Elevation** for the **High Value**.

If a point number is entered in the **Point ID** box the elevation for that point will be used for either the high or low elevation. If only an elevation is entered (no point number) the block of points will be selected strictly based on elevation.

⊙ **In Radius:** Select all points within a given radius.



The 'Define Circle' dialog box contains the following fields:

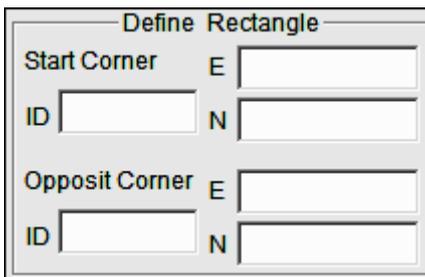
Center	Point ID	<input type="text"/>
East		<input type="text"/>
North		<input type="text"/>
Radius		<input type="text"/>

Center Point ID: If a point number is entered in the **Point ID** box the northing and easting of that point will be used for the center of the search circle.

East/North: To manually enter a easting and northing leave the **Point ID** box empty and enter the **East** and **North** coordinates for the center of the search circle.

Radius: Enter the radius for the search circle, in feet or meters.

⊙ **In Rect.:** Select all points within a given rectangle.



The 'Define Rectangle' dialog box contains the following fields:

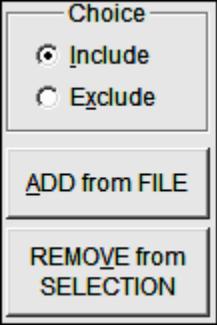
Start Corner	E	<input type="text"/>
ID	N	<input type="text"/>
Opposit Corner	E	<input type="text"/>
ID	N	<input type="text"/>

If a point number is entered in the **Point ID** box the northing and easting of that point will be used for that corner of the rectangle.

To manually enter a northing and easting leave the **Point ID** box empty and enter the northing and easting for the corner.

The two points define the diagonal corners of the rectangle.

Choice: This option allows you to choose to include or exclude points previously selected in the **Select Points** dialog box.



The image shows a vertical dialog box titled "Choice". It contains two radio buttons: "Include" (which is selected) and "Exclude". Below the radio buttons are two buttons: "ADD from FILE" and "REMOVE from SELECTION".

Example: In the **Choose Points** dialog box, select **by Desc.** and type in **GS** as the description. In the **Choice** dialog box select **Exclude**, then click [**REMOVE from SELECTION**]. Any points that have **GS** in the description field would be removed from the selection set.

Total Selected Points: The total number of selected points is displayed in the lower right corner of **Select** dialog box.

Default column width: The columns ID, Northing, Easting, Elevation, Code and Description columns have a default width. If you have changed the widths of the columns, selecting [**Default column width**] will reset the column widths to their original configuration.

Data Collector Settings:

This manual is not a substitute for you data collector documentation. Specific settings for various data collectors may be found in **Chapter 12** of the PDF version of the actual **C&G Data Collection** manual. That manual, **M-12 CGData Collection.PDF**, is available on the Simplicity installation CD.

11.09 SurvCom Transfer

FUNCTION: The **Data Transfer** routine is used to download/upload data from/to your data collector. The **SurvCom Transfer** option uses the Carlson SurvCom program and is the best choice for communicating with Carlson data collectors running SurvCE data collection. Carlson Software products use the same native file formats as SurvCE, so no file conversion occurs — only transfer.



NOTE: *If you are transferring files to/from any data collection system other than Carlson SurvCE, use the **C&G Transfer** program. See [Section 11.08](#).*

Before starting SurvCom: Connect your serial cable to your PC and data collector.

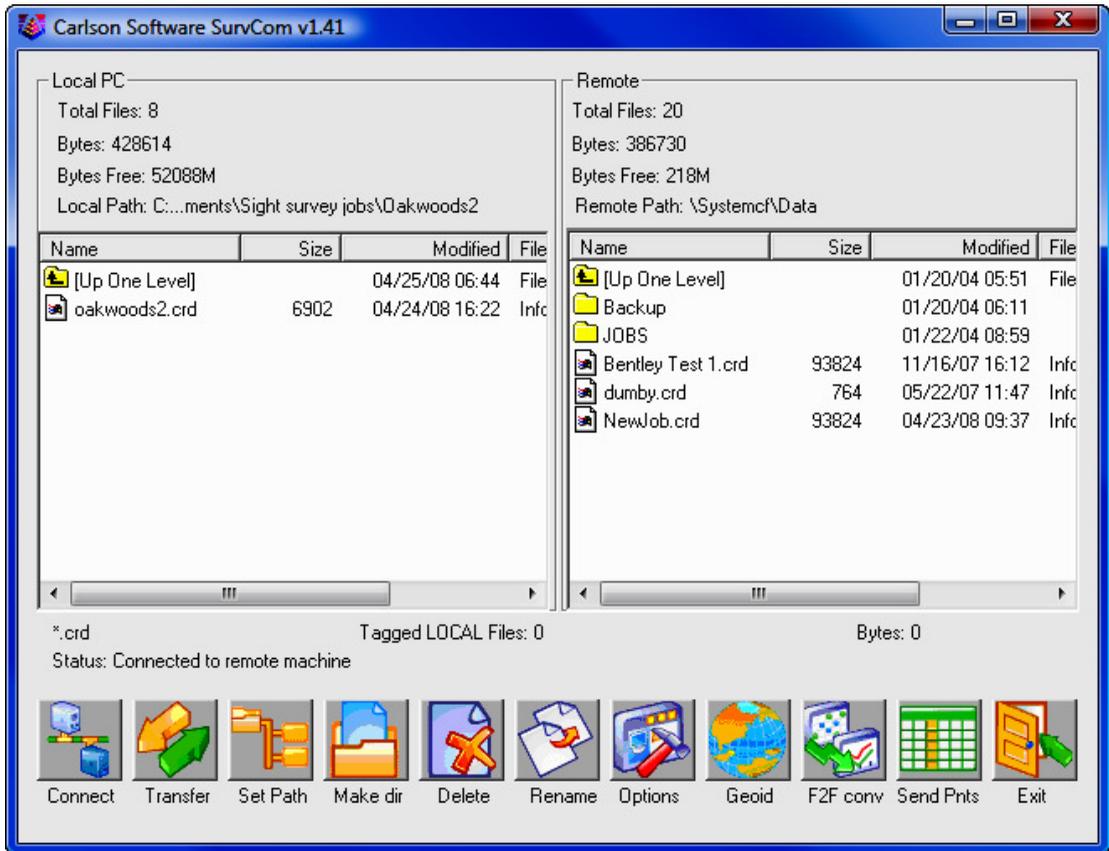
In SurvCE: Select **Data Transfer** from the **File** menu. Choose **Carlson/C&G Transfer**. This leads to a **File Transfer** screen on SurvCE, which prompts: **Awaiting Connection**.

All further action takes place on the PC side and there is no time delay in this handshake; SurvCE will wait for the PC program to catch up. When you connect the cable from SurvCE to the PC, **Microsoft ActiveSync** may interfere and display: **Connect to PC?** If you get this question, select **No** and on your PC, disable the Microsoft ActiveSync serial linkage if it is on.

In "Sight" Survey: Activate the **SurvCom Transfer** option by picking from the **Tools** menu, or by pressing [**Alt**][**T**], [**D**], [**S**].

If you get an error such as: **Failed to open COM 1 error code -3**, the most likely errors are lack of cable connection or interference by Microsoft ActiveSync. An error such as **Failed to open COM 1 error code 14** typically means an incorrect COM port setting on the computer. Remedy this error by selecting the **Options** icon in SurvCOM and resetting the **COM** port. After clicking [**OK**], a connection will be attempted.

When the connection is established, SurvCE will display: **Connected to PC**.



If only the left side of the screen on the PC 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 will show the files located in the designated path on the data collector. You can change directories by scrolling to the top of the file list and choosing **Up One Level** (just like in Windows). In the above dialog, a filter is applied so that only files in the form of *.crd are displayed. Filters such as this can be setup using the **Options** button.

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 [**Ctrl**] 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 display **Transfer Complete** and will then proceed to update the file lists on the PC and the data collector.

Note: The process of importing points to the data collector mimics the process of exporting points to the office computer, but in reverse. If a point is found to already exist on the data collector, options appear to **Overwrite All (Yes All)** or **Cancel All (No All)**.

SurvCom Commands

These commands are found and can be seen in the SurvCom dialog box shown above.



Connect: After selecting **Data Transfer** from SurvCom's **File** menu, press this button to connect to the PC. Once connection is made, the status line on the file transfer utility dialog box will show: **Connected to the remote machine.**

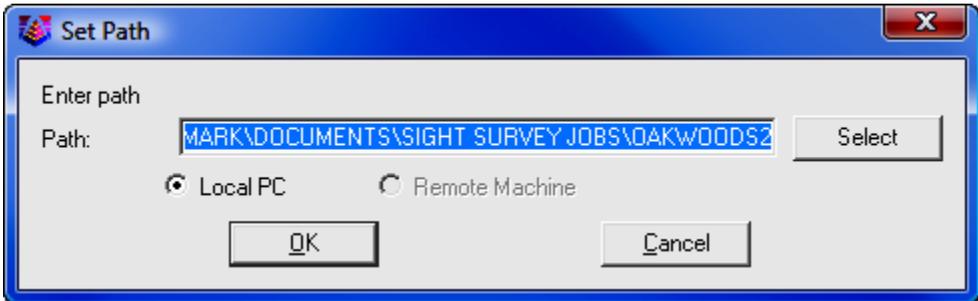


Transfer: Pressing this button transfers selected files from either the Remote to the PC, or the PC to the Remote.

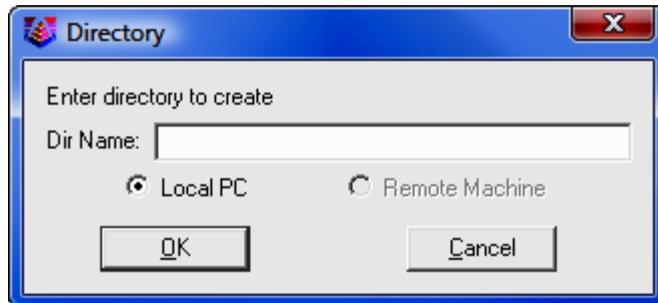


Set Path: This option allows for the specification of the desired source and destination drives and folders for both the PC and the Remote device. For example, if you were downloading, or copying files from the Remote device to the PC, to specify a source path on the remote device, select the **Remote Machine** toggle and then type in the desired path in the path field. To specify a destination path on the PC, select the **Local**

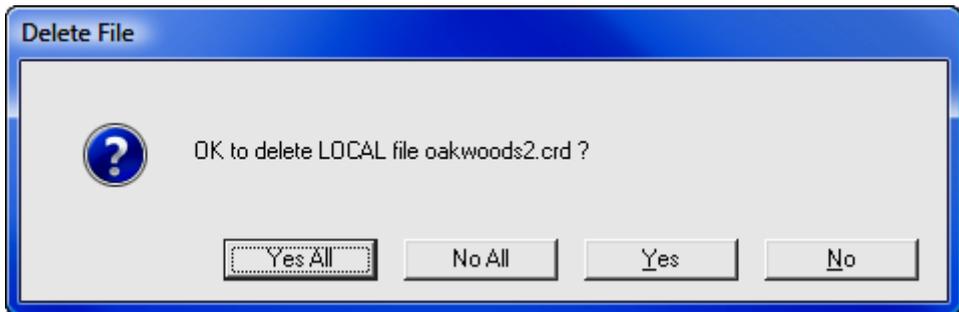
PC toggle and type in the desired path the path field. When a change to either path is made, the transfer utility will retrieve a new file list from the specified paths.



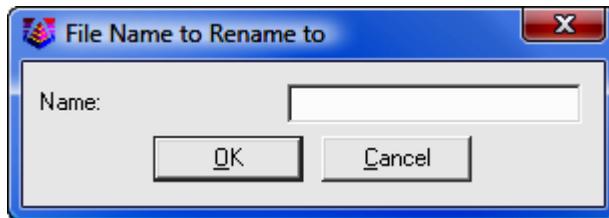
Make Dir: This option allows for creation of directories on both the PC and the Remote device. Specify the machine to create the directory on and then enter the directory name.



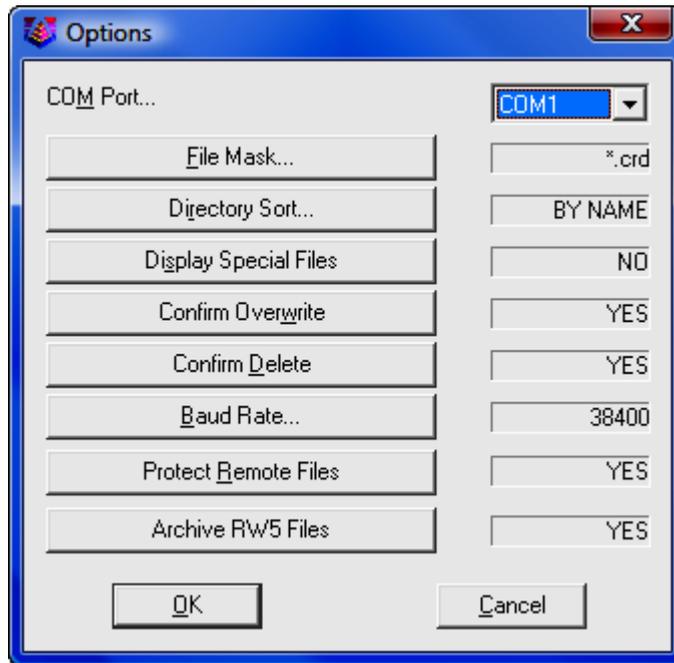
Delete: This option allows you to delete the tagged files.



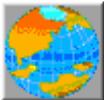
Rename: Select a file and rename it.



Options: This command allows you to set various options for data transfer. The dialog shown in the figure below will appear.



- **Com Port:** You must select which com port on the PC to use.
- **File Mask:** You must select a file filtering syntax.
- **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:** Toggle **YES** or **NO**.



Geoid: This command will carve out a portion of the Geoid 99, EGM96, Canadian CGG2000, Canadian HT2.0, Canadian HT1.01, Australian GDA94 and Great Britain OSG-MO2 grid files and send it to SurvCE. Since these geoid grids are very large, the program 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.

Set Geoid Area

Geoid Grid Files Dir

Geoid Type

Enter Lat/Lon near center of job.

Latitude(dd.mmss) N S

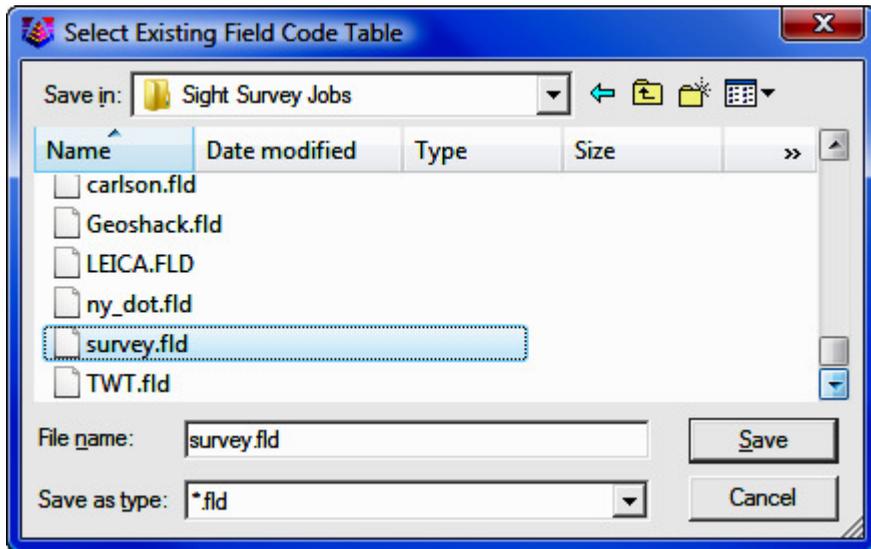
Longitude (dd.mmss) E W

Grid size miles km deg

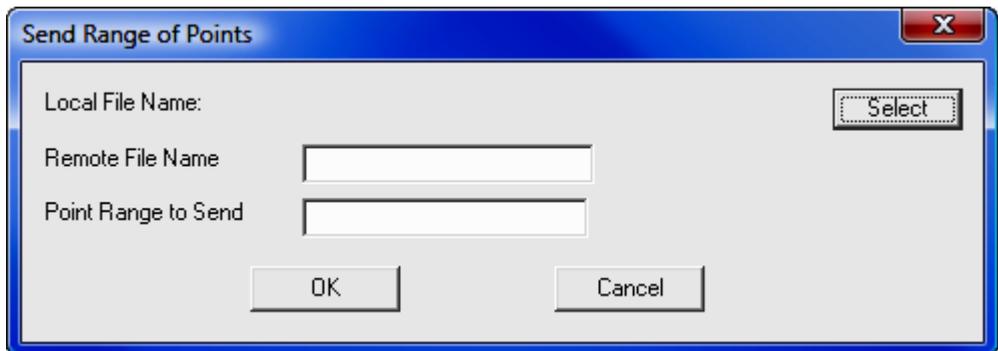
Grid Name

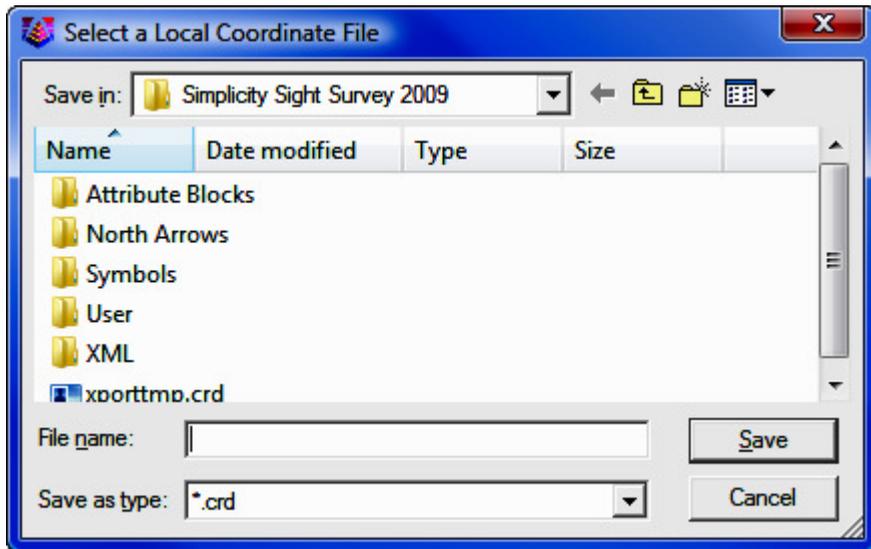


F2F Conversion: This converts the more thorough and detailed Carlson Survey field code file (for field-to-finish work) to the more simplified **Feature Code List** that runs in SurvCE. The **Feature Code List** in SurvCE handles **Linework** (on or off), **Line Type** (2D or 3D), **Layer** (= Code) and **Full Text** (Description). Select the **F2F** file and click [**Send**].



Send Points: The command allows for the sending of a range of points. Start by selecting the **Local File Name** and the **Remote File Name**, then specify the points to send.





Exit: This command will exit SurvCom.

Additional Options

The following two options appear in the **Data Transfer** dialog only if detected or available:

- **Infrared Transfer:** This command leads to a send and receive screen that works with the Window Socket IrDA server/client objects only between two CE mobile devices. This is a readily available data transfer program. It works, for example, from Ranger to Ranger. Please make sure you align your devices so that the infrared transceivers are within one meter of each other, and the transceivers are pointing at each other. For an easy connection it is preferable to start first the server (the device that will receive the data file) and after that start the client (the device from which the data file will be sent).

- **Bluetooth Transfer:** If the mobile device has a Bluetooth emulated serial COM port, the user will be able to select it from the list, and transfer data from/to another device that has Bluetooth available.

You've Transferred Files... Now What?

At this point, all you have done is transfer a data file or files. If you have transferred files from the Remote, you still need to import the files into "Sight" Survey. Select **File > Import Coordinate File** ([Section 3.09](#)) to initiate the import operation.

11.10 C&G Editor

FUNCTION: The **Edit Process Raw File** routine is used to edit and re-run traverse courses. It is also used to compute closures and do traverse adjustments. The **C&G Editor** option uses the raw editor common to C&G Software products.

Activate the **C&G Editor** by picking from the **Tools** menu, or by pressing [**Alt**][**T**], [**E**], [**C**].



*By default, "Sight" Survey uses the **Carlson Raw Editor** and .RW5 files for **Traverse Closure**, **Deed Check**, and adjustments (including adjustments other than **Network Least Squares**). The **C&G Raw Editor** is available for data transfer and **Network Least Squares**. If you want to transfer a C&G raw file (.CGR) from your collector and then run a **Compass**, **Crandall**, **Transit**, or **No Adjust**, you need to download the .CGR file, then open the **Carlson Raw Editor** (see [Section 11.11](#)) and import the C&G file (using **Tools > Import Raw Data > C and G**).*

The SurvNET (or C&G) Editor in "Sight" Survey is a sub-set of the full CG Editor program common to C&G software. This subset has been designed to work with SurvNET. If you are familiar with the full CG Editor, you may find it lacks certain features and file support. For example, this sub-set editor can only handle C&G Raw file (.cgr), and not Map Check files, Cross-Section files, or Template files.

File support

The CGEditor can create and/or edit C&G Raw Data Files (.cgr). Raw data files contain information pertaining to a field traverse. These files are typically downloaded from the data collector and converted to the C&G raw data file format.

Opening Files

To open an existing file, select **File > Open**. You can then use the file dialog box to browse to the desired file. Click on the desired file to highlight it then click the [**Open**] button.

Creating Files

To create a new file, select **File > New**. A spreadsheet type window will open but, since it is a new file, it will not contain any data input lines yet. You must first add the desired records before typing in the data.

Cut and Paste operations

With the CGEditor you can use the **Edit** menu to cut and paste or you can use the standard Windows keyboard shortcuts for cutting ([**Ctrl**][**X**]), pasting ([**Ctrl**][**V**]), copying ([**Ctrl**][**C**]) and undo ([**Ctrl**][**Z**]). You simply highlight the data then use the shortcut keys or the menu item to issue the command. To highlight a field simply click on it or, to highlight a record, click on the first column in the record (labeled either **Type** or **Row**). To highlight several records use the left mouse button to click on the first column then hold down the mouse button and move the mouse until the desired records are highlighted then release the mouse button.

Menu Shortcut Keys

Please note that many menu items have short cut keys that make it unnecessary to actually access the menu to accomplish a given task. These short cuts are noted on the menu and require that you press and release two or three keys at the same time. The first one or two keys will be one or a combination of [**Ctrl**], [**Ctrl**], or [**Ctrl**] and the last key is a letter. For example, the **Copy** menu item is specified in the menu as **Copy Ctrl + C**. This means that when you press and release the [**Ctrl**] and [**C**] keys at the same time, the copy command will run.

Automatic conversion of distance during data entry

You can automatically convert a distance entry's units by adding a "*" after any distance entry. If Distance Units are set to Feet in the **Settings** dialog, the entry is assumed to be in meters and is converted to feet. The opposite is true if Distance Units are set to Meters.

C&G Raw Data Files

- The raw data file contains data pertaining to one or more traverses.
- There are three basic types of traverses:
 - Closed Loop Traverse
 - Closed Traverse Beginning and Ending at Known Points
 - Open Traverse and Side Shots
- Figures 1, 2, 3 and 4 show illustrations of each of these traverse types. Below each illustration you will also see the accompanying raw data as seen in the **CGEditor**.

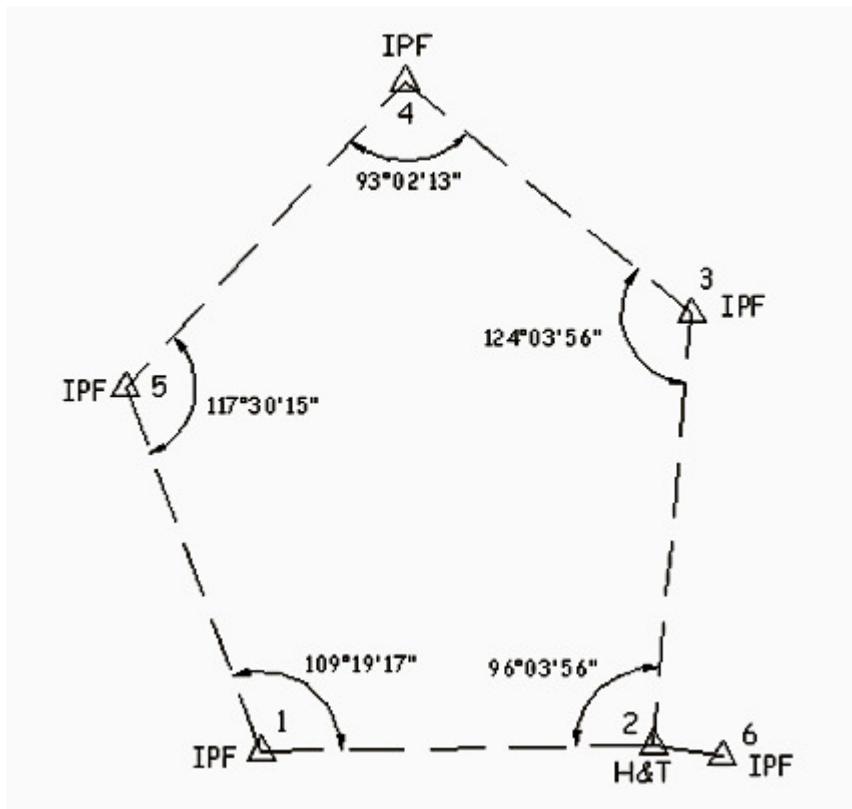


Figure 1 - Closed Loop Traverse.

SurvNET Editor - [CGSTAR.CGR]

File Edit Add Insert View Settings Tools Window Help

TYPE				Rod Height	Horz.Angle	^ Slope Dist.	^ Vert.Angle	Foresight	Code	Description
IP	1	5.32000	5		0.00000					
FS				5.00000	109.19170	292.31000	88.35000	2	TP	H&T
IP	2	5.20000	1		0.00000					
FS				5.00000	96.03560	324.26000	88.51320	3	TP	IPF
FS				5.00000	190.32100	52.39000	90.32550	6	SS	IPF
IP	3	4.90000	2		0.00000					
FS				5.00000	124.03560	275.84000	92.22400	4	TP	IPF
IP	4	5.12000	3		0.00000					
FS				5.00000	93.02130	309.68000	89.13000	5	TP	IPF
IP	5	5.15000	4		0.00000					
FS				5.00000	117.30500	290.55000	90.00000	1	TP	IPF

For Help, press F1

CAP NUM Row: 11

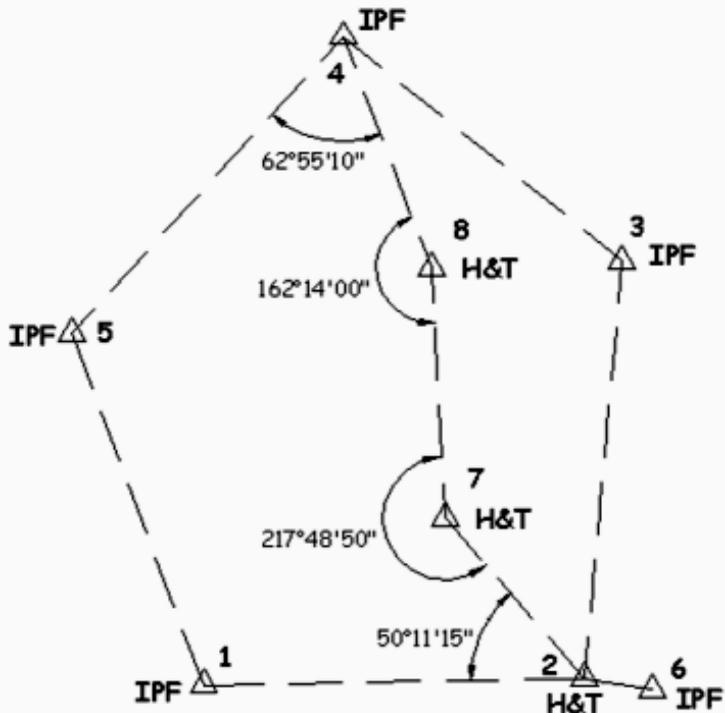


Figure 2 - Closed Traverse Beginning and Ending on Two Known Points.

Figure 2 shows a closed traverse beginning on two known points (1 and 2) and ending on two known points (4 and 5). With this type of traverse, both a linear and angular closure can be calculated.

SurvNET Editor - [CGSTAR.CGR]

File Edit Add Insert View Settings Tools Window Help

TYPE	Inst.Point	Inst.Height	Backsight	Rod Height	Horz.Angle	^ Slope Dist.	^ Vert.Angle			Time Stamp
IP	2	4.90000	1		0.00000					
FS				5.00000	50.11150	164.12000	88.51320	7	TP	H&T
IP	7	5.23000	2		0.00000					
FS				5.00000	217.48500	193.91000	92.22400	8	TP	H&T
IP	8	5.34000	7		0.00000					
FS				5.00000	162.14080	191.57000	89.13000	4	TP	IPF
IP	4	5.30000	8		0.00000					
FS				5.00000	62.55100		90.00000	5		

For Help, press F1

NUM Row: 1

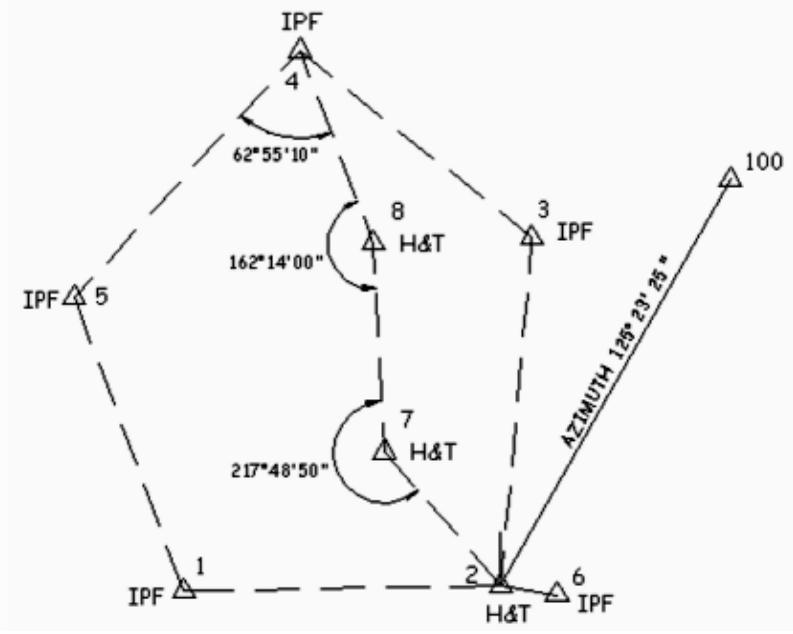


Figure 3 - Closed Loop Ending on One Known Point.

Figure 3 illustrates a traverse that begins on two known points, or a single known point and a back sight azimuth, and ends on one known point. In this case it is only possible to calculate a linear closure.

SurvNET Editor - [CGSTAR.CGR]

File Edit Add Insert View Settings Tools Window Help

TYPE	From Point	To Point	Bearing							
DR	2	100	125.23240							
IP	2	4.90000	1		0.00000					
FS				5.00000	50.11150	164.12000	88.51320	7	TP	H&T
IP	7	5.23000	2		0.00000					
FS				5.00000	217.48500	193.91000	92.22400	8	TP	H&T
IP	8	5.34000	7		0.00000					
FS				5.00000	162.14080	191.57000	89.13000	4	TP	IPF
IP	4	5.30000	8		0.00000					
FS				5.00000	87.23160			101		

For Help, press F1

NUM Row: 1

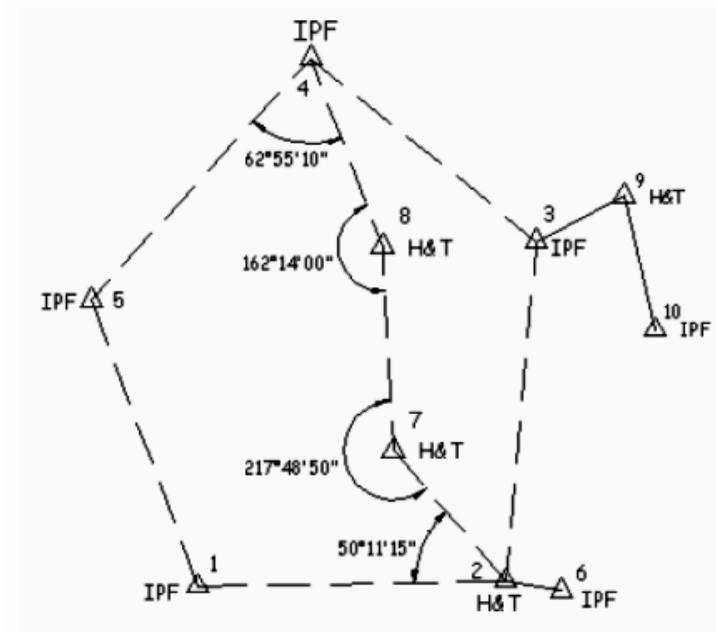


Figure 4 - Open Traverse with Side Shots

Figure 4 shows an open traverse with side shots.

TYPE				Rod Height	Horz.Angle	^ Slope Dist.	^ Vert.Angle	Foresight	Code	Description
IP	3	5.12000	4		0.00000					
FS				5.00000	113.19430	92.91000	89.15300	9	TP	H&T
IP	9	5.26000	3		0.00000					
FS				5.00000	284.01250	130.44000	91.15210	10	TP	IPF



NOTE: The data shown in the CGEditor views accompanying the four illustrations include instrument height (HI) and rod height entries. However, if you have elevations turned off, these entries are optional. Also, the examples use single distance and angle entries but multiple measurements are allowed.

In these figures each traverse has been placed in a separate raw data file. However, with the use of special codes you can combine multiple traverses in a single raw data file.

ENTERING AND EDITING TRAVERSE DATA

In the CGEditor "Raw Data" refers to unadjusted field traverse data, typically downloaded to the PC from a data collector. C&G raw data files have the extension .CGR.

Creating or Opening a Raw Data File

To create a new file or open an existing file click on the **File** menu then either click on **New** or **Open**. If you click on **Open** you will then see a file dialog. Browse to the directory where you wish to work and select an existing file having a file type of **C&G Raw Data File (*.cgr)** and click the [**Open**] button.

If you are creating a new file, an empty file will be shown in its own spreadsheet window within the editor. If you are editing an existing file, the data from the file

will appear in a similar spreadsheet window. It is possible to have multiple documents open at the same time. So you could create a new file and open an existing file in the same editing session and each would appear in its own window in the editor. You can have as many new and/or existing files open as your project demands.

A new file will be named **CGRaw#**, where **#** is an integer value that increments from 1 whenever you open a new file. For example, if you opened three new files at once, your jobs would be named: CGRaw1; CGRaw2; and CGRaw3. These job names will be used until you rename the job using the **Save** or **Save As** command from the **File** menu.

Settings

Before entering any data you should check the current settings. Click the **Settings** menu item then click **Raw Data File** to review and/or change the current settings. (See the **Settings** menu section later in this chapter.)

Traverse Data Entry

A line or row in the raw data file is referred to as a record and each item of data in a record is referred to as a field. There are several types of records that you may use in a raw data file:

- Instrument Point
- Foresight
- Foresight Tie
- Reference Bearing
- Coordinate Value
- Standard Errors
 - Control
 - Measurement
 - Setup
- Elevation
- Scale
- Loop Traverse
- Closed Traverse

- Open Traverse
- End of Traverse
- Data On/Off
- Comment

The type of data required for each of these types of records varies. Some require no data entry and are only “flags” to signify the beginning or ending of a series of records; others require only one field to be filled out; while others require several fields of data.

Adding and Inserting new records

When creating a new file, to begin entering data you must select from the **Add** or **Insert** menus to create the first blank record and begin data entry. Depending on what type of record you are editing, when you press [**Enter**] for the last field in the record, the following record will be added automatically.



NOTE: *If the **Add** and/or **Insert** toolbars are not showing, click on the **View** menu then click on the toolbar you want to turn on.*

When you click on one of the **Add** menu items or toolbar icons, an empty record is added to the end of the file. If you click on one of the Insert menu items or toolbar icons, an empty record is inserted above the currently active record or field. To make a record the currently active record, just click on one of its fields.

Moving from field to field

While entering data, to move to the next field, press the [**Enter**] or the [**Tab**] key. To move to the preceding field press the [**Esc**] key or both the [**Shift**] and [**Tab**] keys at the same time.

Instrument Points

The first record of a raw data file is often an instrument point. Add or insert a blank record using the menus or toolbars. Fill in the following fields in the new instrument point record:

- **Inst. Point:** Enter the point ID of the instrument point.
- **Inst. Height (or HI):** Enter the instrument height. This may be either the distance from the IP on the ground (“Plus-up”) or the actual elevation of the

instrument, depending on how the data is to be reduced. This field will only be active if elevations are on. (See the **Settings** section in the **Entering and Editing Traverse Data** section of this chapter)

- **Backsight:** Enter the point ID for the backsight.
- **Rod Height:** Enter the rod height. This field will only be active if elevations are on. (See the **Settings** section in the **Entering and Editing Traverse Data** section of this chapter)
- **Horz. Angle:** Enter the instrument's initial horizontal angle reading at the back-sight. When doing an azimuth traverse, no entry is required here.



NOTE ON DOUBLED ANGLES: *Doubled angles require two (2) **Instrument Point** records. Each new instrument setup requires a 0 to the back sight. The first angle to the foresight is the single angle. This angle is locked into the gun and the back sight is retaken. The second angle to the foresight is the doubled angle. You may also double angles to side shots.*

Slope Distance and Vertical Angle or Horizontal Distance and Vertical

Distance to the Back sight: Enter the appropriate distance and/or angle. A blank is assumed to be a zero.



NOTE: *When the **Slope Dist/Vert Angle** or **Horz. Dist/Vert. Dist.** column headings are preceded by a "^" it indicates that a record inserted before the current record (or added after the current record) will have the same type of distance entry mode. For example, if the heading shows **^Slope Dist** and **^Vert Angle** and you insert a record, the new record will be in the **Slope Dist/Vert Angle** distance entry mode. You can change this by clicking on one of the distance headings to remove or add the "^". If the "^" is not present it means that the inserted or added record will have the opposite distance entry mode than does the current record.*

- If, after entering the data in the last field of a given **Instrument Point** record, you press the [Enter] or [Tab] key, a **Foresight** record will automatically be created. If you want to change this newly created blank **Foresight** record into an **Instrument Point** record, press the [Esc] key. If you are at

the end of the file, pressing [**Esc**] again will delete this new **Instrument Point** record.

Foresights

After entering the data for the last field in the **Instrument Point** record, press [**Enter**]. This will cause a **Foresight** record to be created below it. This record will contain the following columns (the explanations of several of these columns are as described for Instrument Points, only differences will be noted here).

- **Rod Height:** This column is only active if elevations are on.
- **Horz Angle:** Enter the instrument's horizontal angle reading at the foresight point. Enter a positive value for a clockwise angle and a negative value for a counter-clockwise angle. This entry may be blank if you are entering only the distance readings to the foresight.
- **Slope Dist/Vert Angle** or **Horz Dist/Vert Dist:** Enter the distance data for the foresight point.
- **Foresight:** Enter the Point ID for the foresight point.
- **Code:** Enter the code for the Foresight Point. This column is only active if **Code** is on. (See **Settings** in this section.)
- **Description:** Enter the description for the Foresight Point. The number of characters you are allowed to enter is set in the **Settings** under **Description Length**.

If you enter an integer code here and the **Translate Raw Descriptions Using Description Table** is checked in the **Settings** and a matching description number is found in the description table, then the description from the table will replace the integer value you entered in the **Description** field. The integer value you entered will then be moved to the **Code** field.

- **Side Shots:** Side shots should be placed within the block of foresights immediately following the instrument point record for the instrument point from which they were shot. You may append side shots to the end of a traverse file, but they must be preceded by a begin open traverse record.

Foresight Tie

In some cases, you will need to tie to an existing traverse. You use a **Foresight Tie** record to do this. This record is used in the reduction process to determine what known point you are tying into. It is necessary if there are side shots taken at the last setup along with the tie point.

In a closed traverse, you must end a traverse by occupying a known point and turning an angle to a second known point. The second known point is the tie point.

Reference Bearing

You may **Add** or **Insert** a reference bearing or azimuth (depending on whether **Direction** is set to **Bearing** or **Azimuth** in **Settings**).

Reference bearings are entered in the following format:

<pointID><dash><pointID><space><bearing>

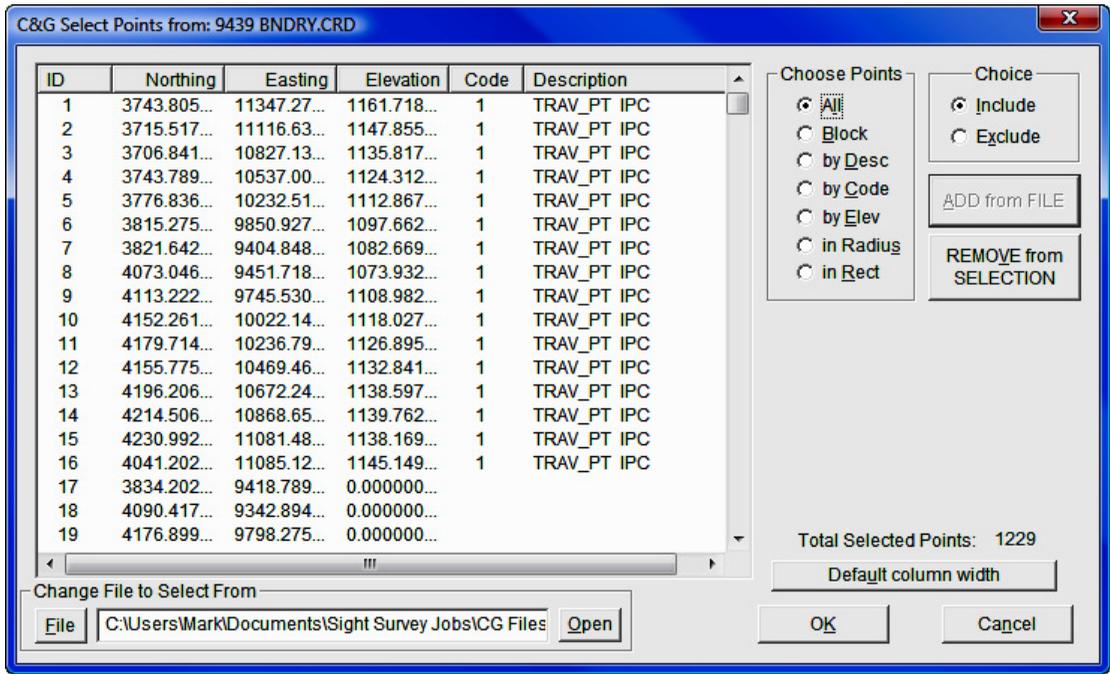
For example: **23-45 145.34568** specifies that the bearing from point **23** to point **45** is **N 45° 34' 56.8" E**.

Coordinate Value

You can use either the **Add** or **Insert** menus or toolbars to create a new coordinate record. You can then hand-enter known coordinates for a point. Coordinates can be used as a reference point during the reduction process.

Coordinates from a Coordinate File

Instead of hand entering coordinate points, you can insert coordinate records from an existing coordinate file. Click the **Insert** menu, then pick the **Coords From File** menu item.



Standard Error

You can provide standard error information for the **Network Least Squares** reduction program by inserting standard error records. Standard error records specify the standard error value for a given type of measurement. Standard errors should be in specified in units that are consistent with the units of the type of measurement to which they are being applied.

Standard Errors

Control Standard Errors

Northing (m)	<input type="text" value=".02"/>	Elevation (m)	<input type="text" value=".08"/>
Easting (m)	<input type="text" value=".04"/>	Azimuth (sec.)	<input type="text" value="3"/>

Measurement Standard Errors

Distance (m)	<input type="text" value=".006"/>	Vert. Pointing (sec.)	<input type="text" value="4"/>
Horiz. Pointing (sec.)	<input type="text" value="4"/>	Vert. Reading (sec.)	<input type="text" value="3"/>
Horiz. Reading (sec.)	<input type="text" value="3"/>	PPM	<input type="text" value="8"/>

Setup Standard Errors

Target Center (m)	<input type="text" value=".02"/>	Instrument Height (m)	<input type="text" value=".05"/>
Instrument Center (m)	<input type="text" value=".003"/>	Target Height (m)	<input type="text" value=".05"/>

When using the SurvNET program, you can enter a "*" for any entry to use the SurvNET project defaults. For information on the values allowed and the uses of standard errors, please refer to **Network Least Squares** in [Section 11.12](#).

Elevation

You can specify the elevation for a given point ID using an **Elevation** record.

Scale

You may specify a scale factor in a **Scale** record. A scale factor is a decimal number. You may enter as many scale factors as you wish. A scale factor will be

used until another is encountered. *Scale factors should be placed before an Instrument Point record.*

Multiple Traverses

If you are combining more than one traverse in a single raw data file, you must separate the traverses with special records.

After inserting or adding a begin traverse record, you may type in a comment regarding the traverse in the Comment column. You may also specify the order in which the traverses are to be processed by using the first part of the **Comment** field. Please see **Traverse Reduction Order** below for more details.

The following records can be used to indicate the beginning and ending of a given type of traverse:

Loop Traverse: Indicates the beginning of a loop traverse. A loop traverse begins and ends at the same point. If you wish to add a comment to identify the traverse in some way, just type it in the **Comment** column.

Closed Traverse: Indicates the beginning of a closed traverse. A closed traverse ties into known points at both ends. If you wish to add a comment to identify the traverse in some way, just type it in the **Comment** column.



NOTE: *If you are running a **Closed Traverse**, a reference azimuth must be placed at the last instrument point if you wish to adjust the angular error.*

Open Traverse: Indicates the beginning of an open traverse. An open traverse is a group of side shots. If you wish to add a comment to identify the traverse in some way, just type it in the **Comment** column.

End Traverse

This record signals the end of the data records for any of the traverse types.

Data On/Off

This is a C&G specific record recognized by the **Network Least Squares** program. When a **Data On/Off** record is encountered during processing, the re-

cords following it are ignored until another **Data On/Off** record is encountered. This can be very helpful in finding incorrect data or just processing a portion of the data in a file.

Comment

This record inserts a comment line above the current active line. Comment records may contain text or numbers in any combination. Comment records can be used anywhere in the raw data file and are for any notes or other data the user wants to include in the file. Comment records are ignored when processing the raw data.

Traverse Reduction Order

The order in which the traverses appear in the raw data file is typically not important. Traverses are processed in the order in which they appear in the file. Traverses may be entered in a sequential order or you may embed one traverse within another.

However, if the coordinates computed from one traverse are needed for the reduction of another traverse, then order IS important. If this condition is true for a raw data file and the traverses have NOT been placed in the raw data file in the correct order, then you need to specify a **Traverse Order Number** for each traverse in the file.



NOTE: If you specify **Traverse Order Numbers**, the traverses in the file will be reduced in the order of their **Traverse Order Numbers**.

Traverse Order Numbers: Each **Loop Traverse**, **Open Traverse** or **Closed Traverse** comment field can contain a **Traverse Order Number**.



NOTE: The **Traverse Order Number** must be an integer and must appear as the first entry in the **Comment** field separated from the remainder of the comment by a space. For example, the comment field of a **Loop Traverse** record having a **Traverse Order Number** of **3** should look like this:

3 this is a comment

All begin traverse records **MUST** have a **Traverse Order Number** if any one of them has a Traverse Order Number. However, the Traverse Order Numbers in a given file must begin with 1 and continue sequentially. **You may not duplicate a Traverse Order Number for any begin traverse record in a given file.**



IMPORTANT NOTE: Reducing a raw data file having **Traverse Order Numbers** that violate any of the above specifications will have unpredictable results. Error messages during the reduction process may not reflect the fact that improper **Traverse Order Numbering** is actually the root cause of the problem.

Data On/Off: This is a C&G specific record recognized by the Network Least Squares program and the CGSurvey traverse reduction features. When a **Data On/Off** record is encountered during processing, the records following it are ignored until another **Data On/Off** record is encountered. This can be very helpful in finding incorrect data or just processing a portion of the data in a file.

Comment: Comment records may contain text or numbers in any combination. Comment records can be used anywhere in the raw data file and are for any notes or other data the user wants to include in the file. Comment records are ignored when processing the raw data.

Editing a Raw Data File

The following sections describe the CGEditor menus and the features each offers.



File Menu

Many of the following **File** menu items will be familiar to experienced Windows users:

<u>N</u> ew	
<u>O</u> pen...	Ctrl+O
C <u>l</u> ose	Ctrl+E
<u>S</u> ave	Ctrl+S
Save <u>A</u> s...	
<hr/>	
<u>P</u> rint...	Ctrl+P
Print <u>P</u> review	Ctrl+W
Print <u>S</u> etup...	Ctrl+U
<hr/>	
<u>1</u> C:\USERS\...\CGSTAR.CGR	
<u>2</u> C:\Users\...\2160.rw5	
<hr/>	
<u>E</u> xit	Ctrl+Q

File > New

Allows you to create a new raw data file.

File > Open (Ctrl + O)

Brings up the **Open File** dialog box so you can select and edit an existing file.

File > Close (Ctrl + E)

Closes the current data file. If more than one file is open, the file that is currently being worked on will be closed.

File > Save (Ctrl + S)

Saves the current file.

File > Save As

Allows the user to save the current file to a file having a different name.

File > Print (Ctrl + P)

Allows the user to print a copy of the currently active file.

File > Print Preview (Ctrl + W)

Allows an on-screen preview of how the current file will look when printed.

File > Print Setup (Ctrl + U)

Brings up a standard Windows print preview dialog box for selecting which printer to use, what size paper to use, the page orientation, etc. The dialog layout depends to some degree on the type of printer you have.

File > Exit (Ctrl+Q)

Exits the CG Editor.

Edit Menu

As with the **File** menu, the **Edit** menu is typical of most Windows programs.

Most of the items in the **Edit** menu require that either a field within a record, or the entire record itself, be selected (highlighted) before running the command. To select a field simply click the field. To select a record (row) simply click on the first field in the record (under the **TYPE** column).

Undo	Ctrl+Z
Redo	Ctrl+Y
Cut	Ctrl+X
<u>C</u> opy	Ctrl+C
Paste	Ctrl+V
Delete	Del
Select <u>A</u> ll	Ctrl+A
C <u>l</u> ear	Ctrl+L

Edit > Undo (Ctrl + Z)

Undoes the most recent editing action.

Edit > Redo (Ctrl + Y)

Reverses the most recent undo action.

Edit > Cut (Ctrl + X)

Cuts the currently highlighted cell or an entire highlighted record. You may then use the paste command to put the cut cell or record in another location.

Edit > Copy (Ctrl + C)

Copies the currently highlighted cell or an entire highlighted record. You may then use the paste command to put the cut cell or record in another location.

Edit > Paste (Ctrl + V)

Allows you to paste any previously cut or copied cell or record to the currently highlighted location. If entire records are being pasted and only a field is currently highlighted, the pasted records will be inserted above the current record. However, if one or more entire records are currently highlighted, the pasted records will replace the highlighted records.

Edit > Delete (<Delete> key)

Deletes the currently highlighted field or record.

Edit > Select All (Ctrl + A)

Selects all the records in the raw data file.

Edit > Clear (Ctrl + L)

Empties all entries in the selected field or record.

Add Menu

The **Add** menu allows you to add a record to the current raw data file. The **Add** menu item appends the record to the end of the file. The various types of records are described in the **Data Entry** subsection of the **C&G Raw Data Files** section of this chapter.

Instrument <u>P</u> oint	Alt+P
Fo <u>r</u> esight	Alt+R
Fo <u>r</u> esight Tie	Alt+G
Reference <u>B</u> earing	Alt+B
Coordinate Val <u>u</u> e	Alt+U
Standard <u>E</u> rror	Alt+E
Elevat <u>i</u> on	Alt+I
<u>S</u> cale	Alt+C
<u>L</u> oop Traverse	Alt+L
Closed <u>T</u> raverse	Alt+D
<u>O</u> pen Traverse	Alt+O
<u>E</u> nd of Traverse	Alt+N
Data On/Off	Alt+X
<u>C</u> omment	Alt+M

(See the following section - **Insert Menu** - to insert a record above the current record.)

Insert Menu

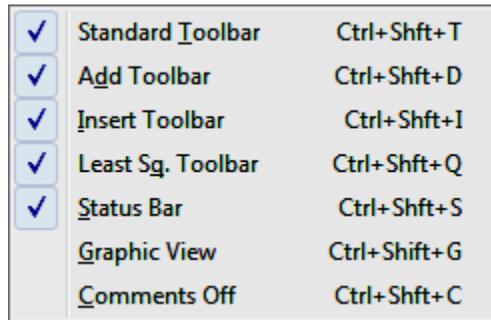
The **Insert** menu allows you to insert a record above the current record. The various types of records are described in the **Data Entry** subsection of the **C&G Raw Data Files** section of this chapter.

Instrument <u>P</u> oint	Ctrl+Alt+P
F <u>o</u> resight	Ctrl+Alt+R
F <u>o</u> resight T <u>i</u> e	Ctrl+Alt+G
Reference <u>B</u> earing	Ctrl+Alt+B
C <u>o</u> ordinate V <u>a</u> lue	Ctrl+Alt+U
C <u>o</u> ords From <u>F</u> ile	Ctrl+Alt+F
<u>S</u> tandard Error	Ctrl+Alt+S
E <u>l</u> evation	Ctrl+Alt+I
<u>S</u> cale	Ctrl+Alt+C
<u>L</u> oop Traverse	Ctrl+Alt+L
C <u>l</u> osed <u>T</u> raverse	Ctrl+Alt+D
<u>O</u> pen Traverse	Ctrl+Alt+O
<u>E</u> nd of Traverse	Ctrl+Alt+N
Data On/Off	Ctrl+Alt+X
<u>C</u> omment	Ctrl+Alt+M

(See the preceding section - **Add Menu** - to append a record to the end of the raw data file.)

View Menu

The **View** menu allows you to turn the CGEditor tool bars on or off. If you open or create a raw data file and do not see the toolbars, use this menu to turn them on again.



View > Standard Tool Bar



The above figure shows the **Standard** tool bar. To issue one of the commands listed below, click on the appropriate toolbar icon. The icons represent the following commands (listed in left to right order):

-  Create a new raw file.
-  Open a file.
-  Save the current file.
-  Cut the selected field or record.
-  Copy the selected field or record.
-  Paste copied or cut data to the currently highlighted location.

-  Undo most recent edit action.
-  Redo most recent undo action.
-  Print the currently active file.

View > Add Tool Bar



Use the **Add** tool bar to add the various types of traverse records to the end of the current file. The tool bar icons are listed below from left to right:

-  **IP** Add an **Instrument Point** record
-  **FS** Add a **Foresight** record
-  **FT** Add a **Foresight Tie** record
-  **DR** Add a **Reference Bearing** record
-  **S** Add a **Scale** record
-  **C** Add a **Coordinate Value** record
-  **E** Add an **Elevation** benchmark record
-  **LT** Add a begin **Loop Traverse** record
-  **OT** Add a begin **Open Traverse** record
-  **CT** Add a begin **Closed Traverse** record
-  **ET** Add an **End Traverse** record

-  **SE** Add **Standard Error** records for Network Least Squares Adjustment
-  **CO** Add a **Comment** record
-  **DO** Add a **Data On/Off** record

View > Insert Tool Bar



Use the **Insert** tool bar to insert the various types of traverse records to the end of the current file.

Notice that the only difference between the appearance of this toolbar and the **Add** tool bar above is the check mark in the lower right hand corner of each icon. Each icon in the **Insert** tool bar inserts the same type of record as described for the similar icon in the **Add** tool bar.

View > Least Squares Tool Bar



The **Least Squares** tool bar (or the Network Least Squares tool bar) has the following four icons:

-  **The network icon:** Selecting this icon will start the Network Least Squares program if it is not already open. If the Network Least Squares program has already been started, clicking this icon will bring it to the front so you can work with it. (See [Section 11.12](#), Network Least Squares)
-  **The “eyeball” icon:** This icon allows you to bring up a separate window displaying a scaled map of the current raw data file. (See **Graphic View** under the **View** menu section)



The "C" icon: Clicking this icon "turns off" all **Comment** records. The **Comment** records still remain in the raw file, they are just not shown on the screen. You will find that there are some actions you cannot perform when **Comments** are off.



The "No DO" icon: Clicking this icon removes all **Data On/Off** records.

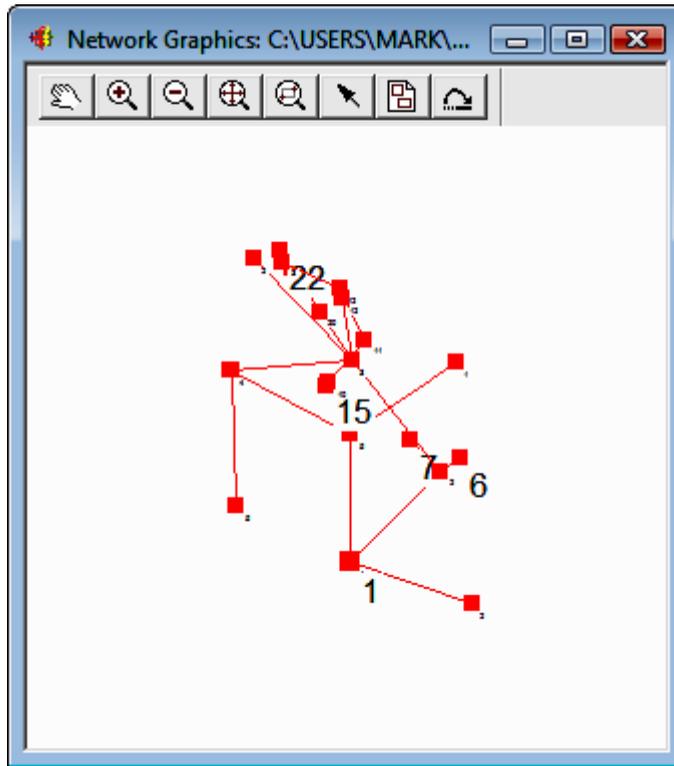
View > Status Bar

When this menu item is checked, the status bar will display. If you wish to change the setting just click on the menu item. The status bar is along the bottom border of the CGEditor window. On the left side of the status bar a brief help message is displayed when you hold the cursor over such things as menu items or toolbar icons. It also has indicators that tell you if **Caps Lock** or **Num Lock** are turned on and displays the **Row/record number** that is currently active.

View > Graphic View

Clicking on this menu item brings up a window containing a graphic representation of the traverse. The traverse lines and points are drawn to scale using the data from the current raw data file.

As noted earlier, the **Graphic View** window shows a scaled drawing of the current raw file traverse lines and points. The tool bar icons at the top of the window can be used to move around in the view and change its appearance.



The icons will be discussed as they appear from left to right:



Pan: This works very much like the AutoCAD Pan command. When you click the hand icon the cursor changes to a hand. When you click on the graphic screen the first time you are “grabbing” the graphic. You can then move it to the proper view and click a second time to “put it down”. You may repeat this as many times as you wish in order to move around the drawing. When done with the **Pan** command, click on the **Pick Point** icon (see below).



Zoom In: Clicking on this icon causes the graphic image to be enlarged a preset amount. The zoom factor cannot be configured. If you wish to see a certain area of the graphic image it is recommended that you click **Zoom Extents** then use **Zoom Window** to view the desired area.



Zoom Out: As with **Zoom In**, **Zoom Out** reduces the image size a pre set amount. The zoom factor is not configurable.



Zoom Extents: Zooms the image so all points and lines can be seen on the screen.



Zoom Window: Allows you to click on two diagonal corners of the rectangular area that you wish to see.



Pick Point: Use this icon to allow you to pick a point on the graphics screen in order to “zoom” to the first instance of the associated point ID found in the raw data editor window. This allows you to rapidly and conveniently locate a given point ID in the data file. This is especially useful in trouble shooting for errors or other problems in the data that may be more easily detected in the graphic image than when viewing the raw data.

When you pick near a plotted point on the graphics screen its point ID is noted. The raw data file is then searched for that point ID. The active field in the editor window is then set to the first instance of that point ID. You can pick the same location several times to move to the next instance of the point ID in the file.

If you have a large **Pick Radius** set (see **Graphic Settings**) or are zoomed out, picking a point may result in more than one point being found. If this occurs, a dialog box listing the nearby points will pop up. Using the list box in the dialog choose the desired point ID and press [**Enter**] or click [**OK**] to find the point in the data file.

Clicking this icon also allows you to turn off the **Pan** feature when you are done panning.



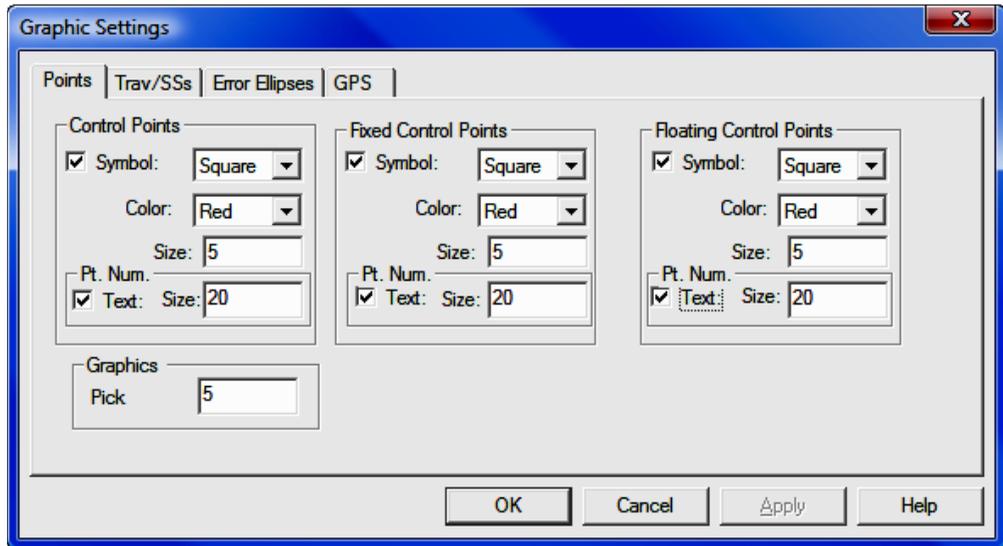
Graphic Settings: Clicking this icon brings up the **Graphic Settings** dialog. The graphic settings dialog allows you to configure the appearance of the various items that may be seen on the graphics screen.



NOTE: *The **Graphic Settings** dialog is also used for the Network Least Squares program and thus has settings that are not used by the CGEditor.*

Points Tab: Control Points, Fixed Control Points and Floating

Points



Specify whether the symbols and labels for any of these points should be shown. Also, if they are to be shown, specify symbol color, symbol type and point ID label size.

Symbol: Choose Square, Triangle or Circle from the drop down list.

Color: Choose Red, Green, Blue, Cyan, Magenta or Yellow from the drop down list.

Size: Specify the size in feet or meters.

Pt. Num:

Text: Check the check box if you want the points labeled.

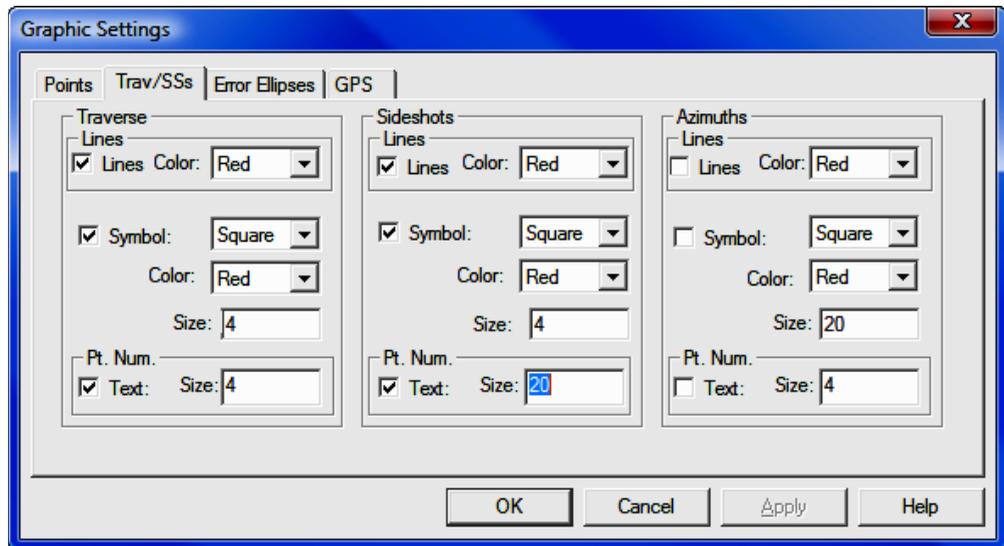
Size: If the points are to be labeled, specify the label height in feet or meters.

Graphics:

Pick Radius: When you pick near a point plotted on the graphics screen, the current field in the editor window moves to the first instance of that point in the current raw data file. Setting a pick radius allows you to specify how large an area around the pick point is to be searched for raw data points drawn in the **Graphics View** window.

Trav/SSs tab: The traverse, side shot and azimuth line colors and sym-

bol specifications can be set here. Except for lines, all the entries on this tab have been described for the **Points** tab.



Lines: Check the check box if you want lines drawn. Set the color of the line using the list box to the right of each check box.

Error Ellipses tab: These settings are not used by the CG editor.

GPS tab: These settings are not used by the CG editor.



Refresh Graphics: Allows you to refresh the graphics to view recent changes in the raw data file due to editing.



NOTE: For the **Refresh Graphics** to reflect recent changes in the raw data file, you must save the file itself prior to refreshing the graphics.

View > Comments Off (Ctrl+Shift+C)

This setting is a toggle to turn comments on or off in CGEditor.

Settings Menu

The items in the settings menu can be used to configure how the data in the raw data file will be interpreted and the appearance of that data as seen in the CGE-ditor.

<input type="checkbox"/>	<u>R</u> aw Data File	Ctrl+ Shft+R
<input type="checkbox"/>	Record Co <u>l</u> or	Ctrl+ Shft+L
<input checked="" type="checkbox"/>	Validat <u>e</u> Records	Ctrl+ Shft+O

Settings > Raw Data File

When you click on the **Raw Data File** menu item you will see a dialog box that allows you to specify many of the more important settings related to the currently open raw data files. You can also set up the defaults that will be used for newly created raw data files.

Raw Data File Settings

Current File: C:\USERS\MARK\DOCUMENTS\SIGHT SURVEY...

File Information

Job: cgdata Temperature: 98
 Operator: deg Pressure: 32
 Client: Book:
 Date: 1/20/08 Page:
 Description Length: 8
 Note:

File Measurement Info

Angular Units: Degree
 Distance Units: Foot
 Foot Definition: US
 Traverse Angles: Horiz Angles
 Direction: Bearing
 Azimuth Direction: North
 Coordinate Order: North-East
 Vertical Reference: Zenith

Edit Options

Elevation Off Distance Component Slope Dist. Vert. Angle
 Code Off Translate Raw Descriptions Using Description Table
 Description Off

Buttons: Set Defaults, Restore Values, Save As Default, OK, Cancel, Other Options, Browse...

Current File: Set the **Current File** list box to the file for which you wish to view or edit the settings. You can also view and edit the **DEFAULT** settings for newly created files.

File Information: This portion of the dialog allows the user to specify job or project specific information.

- **Job:** Enter any name you wish to identify the job or project.
- **Operator:** Enter the name of the person who led the field work.
- **Client:** The name of the person or company for whom this work was done.
- **Date:** Date in any format you wish to use.
- **Temperature:** Temperature at the time the field work was done. This is for your reference only. May be Celsius or Fahrenheit.
- **Pressure:** Atmospheric pressure at the time the field work was done. For your reference only. May be in any units.
- **Book:** Field book number for the field work.
- **Page:** Page number in the field book.
- **Description Length:** Specify the length of the description field (# of characters allowed) used in this file.
- **[Set Defaults]:** This button sets the items in the File Information portion of the dialog to the current default values.
- **[Restore Values]:** This button allows you to set the values in the **File Information** portion of the dialog back to what they were when you opened the **Raw Data File Settings** dialog.
- **[Save As Default]:** Sets the default values for the **File Information** portion of the dialog. These values are used as the default settings when a new file is created.

File Measurement Info:

- **Angular Units:** Clicking the button to the right changes the **Angular Units** from **Degrees** to **Grads** or vice versa.

- **Distance Units:** Clicking the button to the right changes the **Distance Units** from **Foot** to **Meter** or vice versa.
- **Foot Definition:** Clicking the button to the right changes the **Foot Definition** from **US** to **International** or vice versa. This button is only active when **Distance Units** are set to **Foot**.
- **Traverse Angles:** Choose one of the items in the list to specify how the traverse angles were measured: **Horiz. Angles**; **Azimuths**; or **Deflection Angles**
- **Direction:** Specify what type of angle is used to define the direction of a line. Clicking the button to the right changes the **Direction** from **Bearing** to **Azimuth** or vice versa.
- **Azimuth Direction:** Specify the reference direction for azimuths. Clicking the button to the right changes the **Azimuth Direction** from **North** to **South** or vice versa. This button is only active when **Direction** is set to **Azimuth**.
- **Coordinate Order:** Clicking the button to the right changes the **Coordinate Order** from **North-East** to **East-North** or vice versa.
- **Vertical Reference:** Pick one of the items from the list to the right to specify the reference orientation for measuring vertical angles: **Zenith**; **Nadir**; or **Horizontal**
- **[Set Defaults]:** This button sets the items in the **File Measurement Info** portion of the dialog to the current default values.
- **[Restore Values]:** This button allows you to set the values in the **File Measurement Info** portion of the dialog back to what they were when you opened the **Raw Data File Settings** dialog.
- **[Save As Default]:** Sets the default values for the **File Measurement Info** portion of the dialog. These values are used as the default settings when a new file is created.

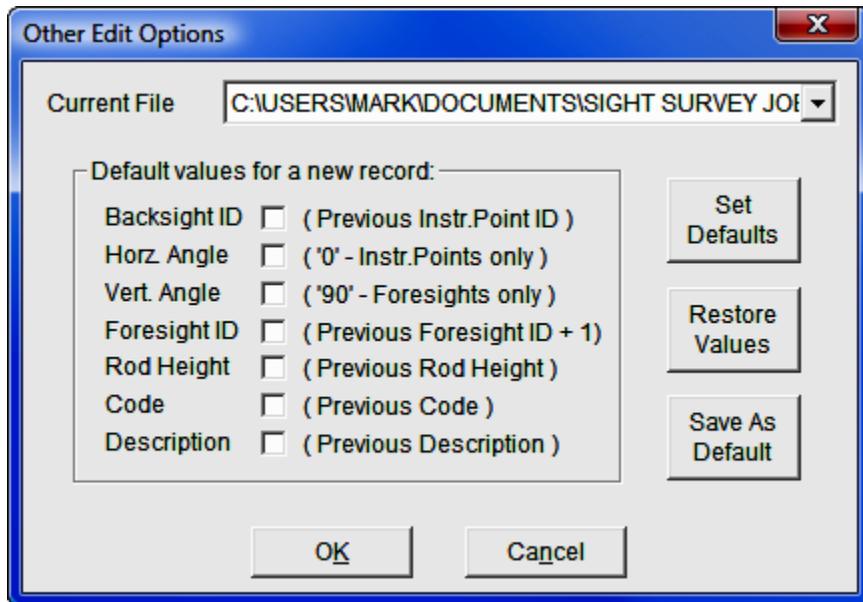
Edit Options:

- **Elevation Off:** Check this check box to turn off the **Elevation** data entry column for this file. This makes data input more convenient since you do not have to enter any data in the Elevation column, nor do you have to

tab through it. Turning off elevations does not cause any data to be deleted from the current file.

- **Code Off:** Check this check box to turn off the **Code** data entry column for this file. This makes data input more convenient since you will not have to enter any data in the **Code** column. Turning off codes does not cause any data to be deleted from the current file.
- **Description Off:** Check this check box to turn off the **Description** data entry column for this file. This makes data input more convenient since you will not have to enter any data in the **Description** column. Turning off descriptions does not cause any data to be deleted from the current file. You can turn the **Elevation**, **Code** and **Description** data entry columns on or off by clicking on the column heading.
- **Distance Component:** Specify how distances are to be entered. Clicking the button to the right changes the **Distance Component** from **Slope Dist-Vert Angle** to **Horiz. Dist-Vert. Dist.** or vice versa.
- **Translate Raw Descriptions Using Description Table:** This check box is only active if descriptions are on. If you check this check box, integer codes entered in the **Description** field will be looked up in the specified description table (see the following item). If a matching description number is found in the description table, the code will be moved to the **Code** field and the description found in the description table will be placed in the **Description** field. If no matching description number is found, the **Description** field remains as entered.
- **Desc Tbl:** Click on the **Desc Tbl** button use a file dialog to set or change the description table. The description table is used to set the **Description** field when an integer number is entered in the **Description** field (see the previous item.) If you prefer, instead of clicking on the **Desc Tbl** button you can also type in the full file path in the edit box.
- **[Set Defaults]:** This button sets the items in the **Edit Options** portion of the dialog to the current default values.
- **[Restore Values]:** This button allows you to set the values in the **Edit Options** portion of the dialog back to what they were when you opened the **Raw Data File Settings** dialog.

- **[Save As Default]:** Sets the default values for the **Edit Options** portion of the dialog. These values are used as the default settings when a new file is created.
- **[Other Options]:** Click the **[Other Options]** button to bring up the **Other Edit Options** dialog box.

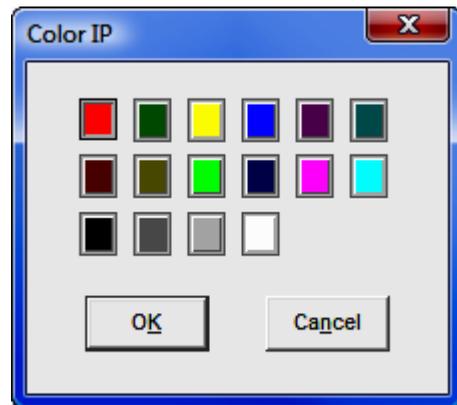
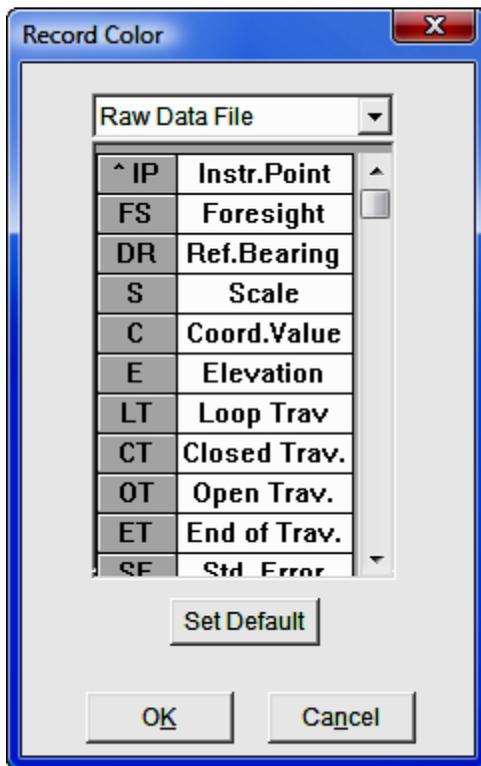


- **Current File:** Click on the name of the file in the file list for which you wish to review and/or specify the settings. You can also choose to view or edit the **DEFAULT** settings.
- **Default values for new record:** Checking the check box for the following items causes CGEditor to “remember” the most recently entered value in the respective field. Thus when you insert or add a record containing one of the checked items, it will be filled in with a “default” value. (The previously used values are not “remembered” between sessions of the editor.): **Backsight ID; Horz. Angle; Vert. Angle; Foresight ID; Rod Height; Code; and Description.**
- **[Set Defaults]:** This button sets the items in the **Other Edit Options** dialog to the current default values.

- **[Restore Values]:** This button allows you to set the values in the **Other Edit Options** dialog back to what they were when you opened the **Raw Data File Settings** dialog.
- **[Save As Default]:** Sets the default values for the items found in the **Other Edit Options** dialog. These values are used as the default settings when a new file is created.

Settings > Record Color

To set the color for a given record type, click on the record type and a color selection dialog will appear.



Click on the color you want the record type to have. Click **[OK]** button to save the color settings and close the dialog. If you click the **[Set Defaults]** button, the original program default colors are set. Click the **[Cancel]** button to close the dialog without saving the changes.

Settings > Validate Records

If this menu item is checked, all the records in the file will be validated prior to saving the file. To change the **Validate Record** setting, just click the menu item.

If an invalid record is encountered when saving a file with the **Validate Records** menu item checked, you are asked if you want to edit the invalid field, ignore the error or ignore all errors. If you decide to edit the offending field, the field will be highlighted and you can edit it and attempt to save again.

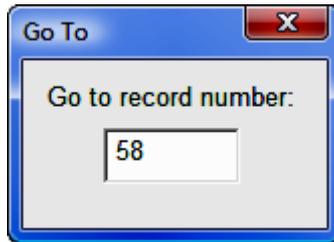
Tools Menu

The **Tools** menu has several items that can be used to find and replace specific text in specific types of fields. It even allows you to apply simple mathematical functions to allow you to edit the data in a group of fields in a single step.

Go to	Ctrl+T
Find	Ctrl+F
Find Next	F3
Find Prev	Shft+F3
Find Record Type	
Replace	Ctrl+R
Remove Data On/Off	Ctrl+D
Change	▶
Network Least Sq.	Ctrl+N

Tools > Goto (Ctrl + T)

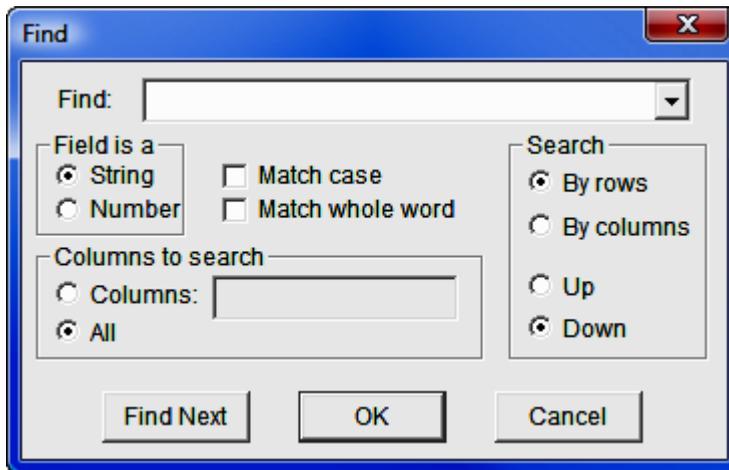
Select this item to go to a certain row (or record) number.



In the dialog box that comes up, type in the desired row number and press [**Enter**]. The editor window will zoom to that record and set the current field to the first editable field in the record.

Tools > Find (Ctrl + F)

This dialog allows you to enter a value to find and set the de-tailed search criteria. Type in the string or number you are searching for in the edit/list. You can actually type in a word or number or you can use the pull down list to pick a word or number from a previous search.



Field is a: Choose what type of data (alphanumeric **String** or **Number**) the field you are looking for contains and what kind of match (**Match Case** or **Match Whole Word**) you wish to use.

Columns to search: The default is to search **All** columns, but if you choose the **Columns** radio button, you can enter a comma separated list of column num-

bers. Column numbers begin with one. When specifying column numbers, the **TYPE** column is not counted nor can you search it.

Search: You can search **By Rows** or **By Columns** and you can choose to search **Up** from the current field or **Down**.

Once you have specified the parameters for the search, click [**Find Next**] to find the first instance of the search string. Continue to click [**Find Next**] to find the next instance of the string.

To just find the next instance of a string and close the dialog box, you can click [**OK**].

Tools > Find Next (F3)

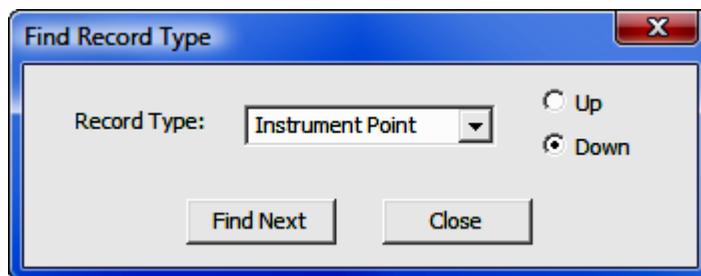
Finds to the next occurrence of the string previously specified in the **Find** dialog.

Tools > Find Prev (Shift + F3)

Moves you to the previous occurrence of the string previously specified in the **Find** dialog.

Tools > Find Record Type

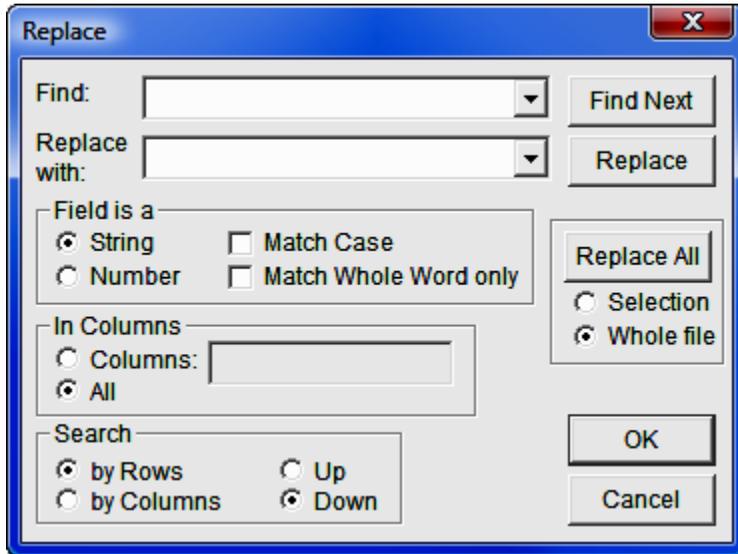
Moves you to the next or previous record of the specified record type.



Record Type: Select the record type by clicking [**▼**] next to the **Record Type** field, and select your search direction: **Up**, or **Down**. When you have made your selections, click [**Find Next**]. You may continue clicking [**Find Next**] to locate the next record of the specified type. Click [**Close**] to exit the dialog box.

Tools > Replace (Ctrl + R)

When you click on this menu item, the **Replace** dialog appears.



The **Replace** dialog allows you to specify a **Find** value and a **Replace with** value. The other fields in the **Replace** dialog are the same as the **Find** dialog.

You can view the **Find** value one instance at a time by clicking [**Find Next**], if you decide to replace a given value found just click [**Replace**]. Alternatively, you can allow the software to automatically replace all the instances of the **Find** value encountered in the specified columns in the raw data file by clicking [**Replace All**]. Before clicking [**Replace All**], be sure to specify whether you wish to replace all the values in the highlighted **Selection** or in the **Whole File**.

Tools > Remove Data On/Off (Ctrl+D)

When you click this menu item, all the **Data On** and **Data Off** records (**DO**) will be removed from the file.

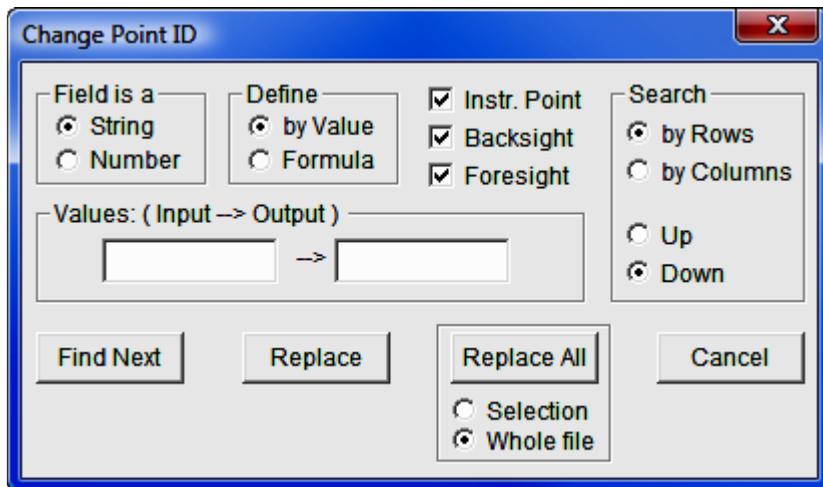
Tools > Change

The items in this submenu allow you to change specific types of fields in the raw data file.

Point ID	Ctrl+I
Height	Ctrl+H
Angle	Ctrl+G
Distance	Ctrl+D
DescLen	Ctrl+J

Tools > Change > Point ID (Ctrl + I)

This menu item allows you to change point IDs for instrument points, back sight points, or foresight points. You can change individual points one at a time or you can make a global change. You can specify a value to find and a value to replace it with. The **Change Point ID** dialog has several sections that are similar to the **Replace** dialog.



Field is a: You must specify how you want the change command to treat a point ID field by clicking on the **String** or **Number** radio buttons.

Define: You must specify whether you wish to change by **Value** or **Formula**.

Instr. Point, Backsight, and Foresight check boxes: Check the check boxes of the types of point IDs you wish to change.

Values: (Formula): It is important to note that the **Values:/Formula:** portion of the dialog changes according to whether you **Define by Value** or **Formula** and whether the **Field** is a **String** or **Number**.

Case 1: Field is a = String and Define = by Value, or

Case 2: Field is a = Number and Define = by Value

The title of this section of the dialog becomes **Values: (Input → Output)**. In this configuration the command acts exactly like the **Replace** dialog except that it only searches the point ID fields specified. Thus you merely specify the value to search for in the left hand edit box and the value to replace it with in the right hand edit box. The [**Show Next**], [**Change**] and [**Change All**] buttons act exactly the same as the [**Find Next**], [**Replace**] and [**Replace All**] buttons in the **Replace** dialog

Case 3: Field is a = String and Define = Formula

The title of this section becomes **Formula**. In this configuration the formula acts to add a prefix and/or a suffix to the existing point ID. Enter the prefix in the left hand edit box and the suffix in the right hand edit box. If you do not wish to add a prefix or you do not wish to add a suffix, you may leave either the left or right hand edit boxes empty. For example, if you entered:

[New]= a [Old] 1

It would change the point ID "456b" to "a456b1".

Case 4: Field is a = Number and Define = Formula

The title of this section becomes **Formula**. In this configuration the formula adds a specified number to a given point ID. Enter the positive or negative number to add to a given point ID in the edit box on the right. For example, if you entered:

[New]= [Old]+ 100

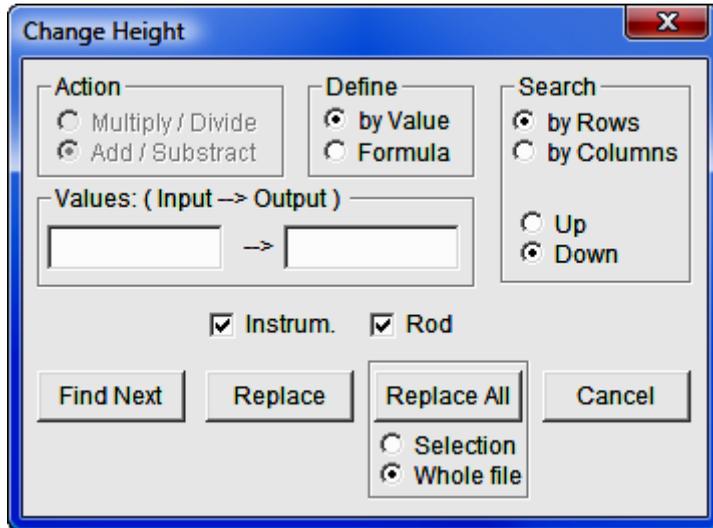
It would change the point ID "456" to "556".



NOTE: When this type of change command is specified and a point ID containing non-numeric characters is encountered, it will be skipped and no change will be made to it.

Tools > Change > Height (Ctrl + H)

Use this menu item to change the instrument height and/or rod height. Clicking this menu item brings up the **Change Height** dialog.



Action: Select the mathematical action you want to perform.

Multiply/Divide: Choose this if you wish to multiply or divide the height by a given number.

Add/Subtract: Choose this if you wish to add a specified number to the height or subtract a specified number from the height.



NOTE: This section of the dialog box is only active if the **Formula** radio button is chosen in the **Define** section.

Define: Select how you want the mathematical action to be performed.

by Value: If you choose **by Value**, this command becomes like the **Replace** command, except that it acts only on instrument heights and/or rod heights.

Formula: This allows you to add, subtract, multiply, or divide the height by a number. (See the **Action** and **Values/Formula** sections.)

Values/Formula: Depending on what you choose in the **Action** and **Define** sections there are several possibilities for this section of the dialog:

Case 1: Define = by Value (Action will be inactivated)

The title of this section becomes:

Values: (Input—>Output)

As noted above the command becomes like the Replace command, except that it acts only on instrument heights and/or rod heights.

Case 2: Define = Formula and Action = Multiply/Divide

The title of this section becomes:

Formula:

The formula will multiply or divide the instrument height or rod height by the number specified in the edit box. Whether it multiplies or divides depends on the symbol on the small button. To change from multiply to divide, or vice versa, simply click on the small button until the proper symbol ('*' or '/') appears on the button.

Case 3: Define = Formula and Action = Add/Subtract

Again, the title of this section becomes:

Formula:

The formula will add or subtract the number specified in the edit box to or from the instrument height or rod height. Whether it adds or subtracts depends on the symbol on the small button. To change from add to subtract, or vice versa, simply click on the small button until the proper symbol ('+' or '-') appears on the button.

Search: Specify the mode of searching through the file. The search begins at the currently active field.

Instrum. and Rod check boxes: Check one or both of these check boxes to specify which types of heights are to be searched/changed.

[Show Next]: Click on the **[Show Next]** button to move to the next field that matches the specifications you entered.

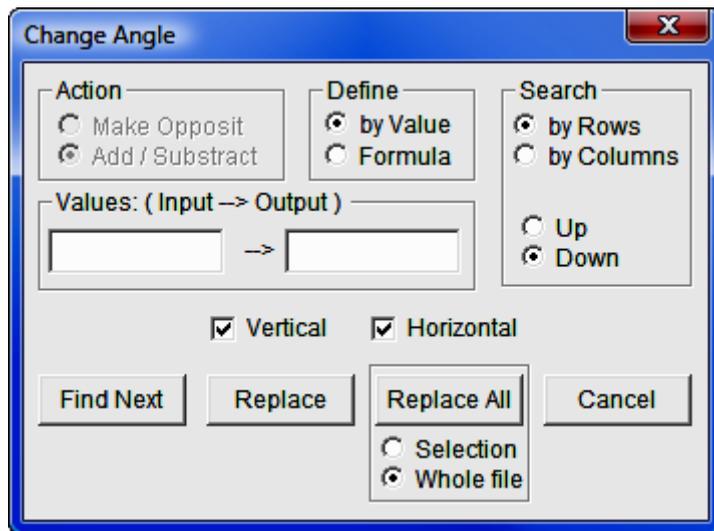
[Change]: Click on the **[Change]** button to make the changes specified in the current (highlighted) field in the raw data file.

[**Change All**]: Click the [**Change All**] button to make the changes specified to all matching fields in the file. Be sure to specify whether to apply the specified changes to the **Selection** (highlighted records and/or fields) or to the **Whole file**.

[**Cancel**]: Click the [**Cancel**] button to close the dialog.

Tools > Change > Angle (Ctrl + G)

Choose this menu item to change vertical and/or horizontal angle fields. Clicking the **Change Angle** menu item brings up the following dialog.

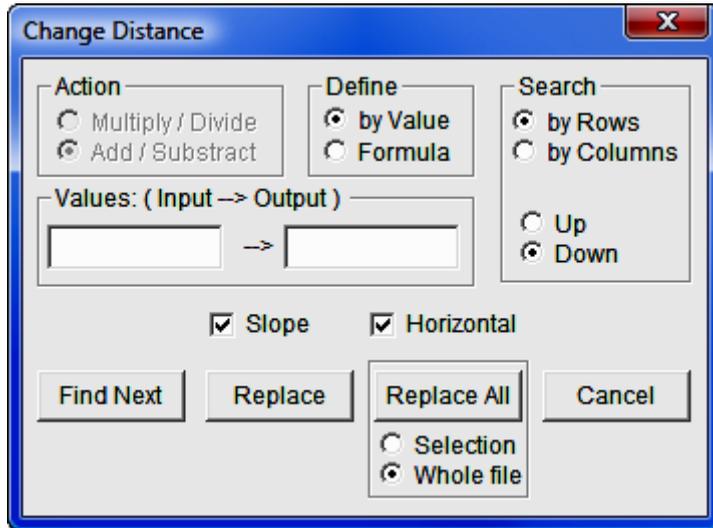


This dialog is almost identical to the **Change Height** dialog. The only differences are that the **Multiply/Divide** action is replaced by the **Make Opposite** action and you can check either the **Vertical** or **Horizontal** check boxes.

If you choose **Define = Formula** and **Action = Make Opposite**, the **Formula** section of the dialog is inactivated. This is due to the fact that the action to be taken is merely to reverse the sign of the angle.

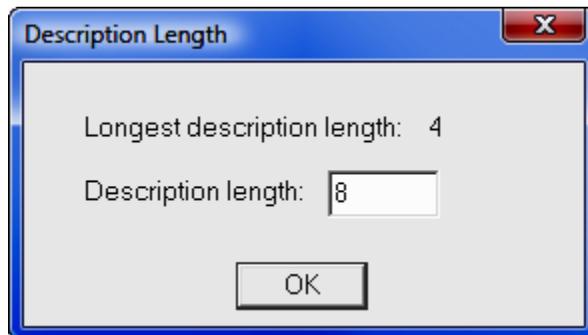
Tools > Change > Distance (Ctrl + D)

As you can see, the **Change Distance** dialog is almost identical to the **Change Height** dialog. The only difference is that you can choose to change the slope distance and/or the horizontal distance by checking the **Slope** and/or **Horizontal** check boxes.



Tools > Change > DescLen (Ctrl+J)

This command allows you to set the description length for the current raw data file.



It displays the **Longest description length** that was found in the current records in the file. It allows you to enter the new **Description length** you wish to use. If you enter a length less than the longest description, the descriptions currently in the raw data file that exceed the specified length will be truncated.

Network Least Squares

This menu item runs **SurvNET**, the **Network Least Squares Adjustment** program. Please refer to [Section 11.12](#) for a detailed description of this very powerful traverse adjustment program.

Window Menu

This menu contains many of the standard Window menu items found in other programs.



It allows you to arrange the currently open windows in several configurations. It has the added functionality of the **New Window** command which allows you to have two or more views of a single file.

11.11 Carlson Raw Editor

FUNCTION: The **Carlson Raw Editor** routine is used to edit and re-run traverse courses, compute closures, and do traverse adjustments.

Activate the **Carlson Raw Editor** by picking from the **Tools** menu; by pressing [**Alt**][**T**], [**E**], [**A**]; or by typing the two-letter command **ER** at any data entry prompt.



NOTE: By default, "Sight" Survey uses the **Carlson Raw Editor** and .RW5 files for **Traverse Closure**, **Deed Check**, and adjustments (including adjustments other than **Network Least Squares**). The **C&G Raw Editor** is available for data transfer and **Network Least Squares**. If you want to transfer a C&G raw file (.CGR) from your collector and then run a **Compass**, **Crandall**, **Transit**, or **No Adjust**, you need to download the .CGR file, then open the **Carlson Raw Editor** and import the C&G file (using **Tools > Import Raw Data > C and G**).



HINT: When called from "Sight" Survey, the **Raw Editor** window is a **Primary Focus window**. You cannot access other "Sight" Survey windows or routines while the Raw Editor is active.

In this section we cover:

- Record Types and Editing Records
- The File Menu
- The Edit Menu
- The Display Menu
- The Add Menu
- The Process (Compute Pts) Menu
- The Tools Menu
- The Format of the Raw Data RW5 File
- Alphabetical listing of Record Types
- Alphabetical listing of Field Headers
- Traverse Examples

Record Types and Editing Records

The **Carlson Raw Editor** routine 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; .cgc; .mdb; .zak) file.

The raw file can also be created or appended using the **Enter & Assign (EA - [Section 6.01](#))**, **Traverse (TR - [Section 7.09](#))**, **Sideshot (SS - [Section 7.07](#))**, and **Inverse (IN - [Section 7.01](#))** commands. To store the data inputs from these commands into a raw file, first toggle on the **Raw File Recorder ON/OFF** command (**RR - [Section 3.14](#)**) on the **File** menu.

It's also possible to enable the raw file storage automatically when you open a new job by checking the **Enable Raw Storage** option in the lower left corner of the **New "Sight" Survey Job** dialog.

The raw files created by TDS data collector programs are also compatible without conversion. Use the **C&G Data Transfer** program (see [Section 11.08](#)) to download the file. Within the Carlson raw data editor, use **Tools > Import Raw Data** for converting raw data from other formats. Available import formats include:

- C&G
- CalTrans
- Carlson
- Fieldbook
- Geodimeter
- Leica
- Nikon
- SDMS
- Sokkia/SDR
- SurvCE Archive
- TDS
- Trimble

When you select the **Carlson Raw Editor** command you will also to specify the name of the raw data (.RW5) file. The current coordinate file is automatically used. To change the current coordinate file, use the **Project File Manager** command (**FM - [Section 3.13](#)**) under the **File** menu before starting this com-

mand. If no coordinate file is current, the program will prompt you to set the current coordinate (.CRD) file.

Edit-Process Raw > Carlson Raw Editor uses a spreadsheet for editing the raw data as shown. Each row of the spreadsheet is represented by a number located at the far left side of the editor. Various messages and reports often reference possible problems with the data by this row number. 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 **Edit > Delete Row**. 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 record types from the **Add** menu.

	Type					
1		Note				
2	DS	JB,NM2160,DT10-20-2007,TM07:00:50				
3	DS	MO,AD0,UN2,SF1.00000000,EC0,E00.0,AU0				
4	DS	SurvCE Version 1.65				
5	DS	CRD: Alphanumeric				
6	DS	Equipment: Leica TPS Series				
7	DS	TS Scale: 1.00000000				
8	DS	EDM Mode: Fast				
9		PntNo	Northing	Easting	Elevation	Description
10	PT	1	50000.0000	80000.0000	500.0000	spike
11	PT	2	50000.0000	80000.0000	500.0000	spike
12		Note				
13	DS	P.C. mm Applied: 0.0000				
14	DS	OC,OP2,N 50000.00000,E 80000.00000,EL500.000,--spike				

The different record types are described below.

Code	Record Type
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 codes 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.
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.
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.
PT	Point (or 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. If the first **Occupied** point and/or the initial **Backsight** point are not defined in the coordinate file set for processing to, both points will need to be added to the RW5 file as **PT** (Store Point) records.

EL **Elevation Only:** This record sets the elevation in the CRD file for the specified point number. Often used when an existing point with good vertical control is being traversed through. Using this record type for the point would keep the elevation from changing on the existing point regardless of the measurement data. **NOTE:** This command is not on the **Type** pull down but may be manually entered into the **Type** field on a blank record. If entered manually you must type the command in upper case letters.

GPS **GPS:** This record contains the Latitude and Longitude of a point as measured by GPS surveying equipment using Carlson SurvCE data collection software. This record has additional information tied to it such as localization files, geoid files, coordinate projection systems etc. This record has its own processing routine in the **Process** pull down within the editor. Processing procedures are discussed in the **Process (Compute Pts)** pull down documentation.

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.

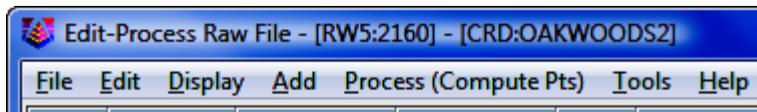
DS **Description:** The description record is an additional note that appears in the spreadsheet editor and printouts. This record can contain various information that is recorded in data collectors during field operations. This data can vary from user, temperature and general data to each line of data associated with **Set Collection**. When "Sets" of data collected using various brands of data collection software is converted/imported into the raw editor, the actual measurements made during the spinning of the angles and distances are re-

corded as DS records and the mean value of the angle and distance is recorded as a **SS** record. **DS** records are not used in processing.

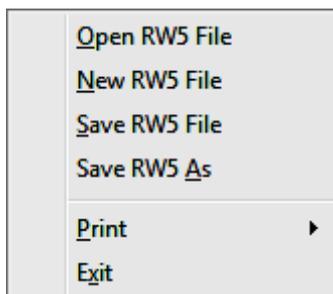
- AZ** **Azimuth Only:** Applies to **SurvNET**, the Network Least Squares analysis and adjustment routine. **NOTE:** This command is not on the **Type** pull down but may be manually entered into the **Type** field on a blank record. If entered manually you must type the command in upper case letters.
- CSE** **Control Standard Error:** Applies to **SurvNET**, the Network Least Squares analysis and adjustment routine.
- SSE** **Set-up Standard Error:** Applies to **SurvNET**, the Network Least Squares analysis and adjustment routine.
- MSE** **MSE (Measurement Standard Error:** Applies to **SurvNET**, the Network Least Squares analysis and adjustment routine.
- 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. The closing shot can also be define in the field by using special codes defined in the **Open Settings** found under the **File** pull down within the editor. Please refer to the **Open Settings** documentation for more information on these codes.
- AB** **Angle Balance:** The angle balance record is the measurement data observed that closes the angles of the traverse. Typically this record is the measurement data recorded from the closing shot to the initial backsight point. The backsight could be either external or internal to the traverse. The **Angle Balance** routine in the **Process** menu uses this record and compares 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.

Raw Data Editor Menus



File Menu



Open RW5 File

This command prompts for a RW5 file to load into the editor.

New RW5 File

This command clears the editor spreadsheet.

Save RW5 File

This saves the RW5 file. If the file hasn't been named you will be prompted for the file name and the location to save the file. After you perform the first save, this command acts as a quick save and saves the file to the name and location specified during the initial saving of the file.

Save RW5 As

This command saves the raw editor data in the spreadsheet to a RW5 file and always prompts for file name and location to save.

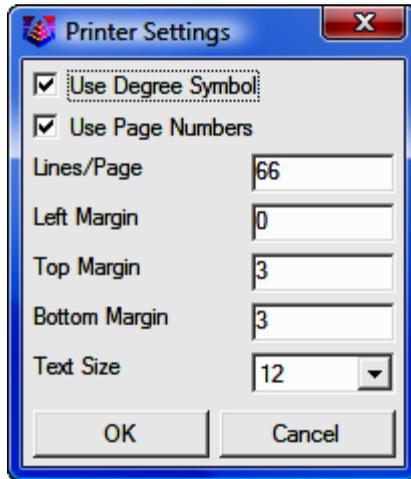
Print > Raw Data

A sample of the raw data report is shown below. This report shows the data from the raw editor spreadsheet.

```
Raw File> c:\data\survey.RW5
CRD File> c:\data\survey.crd
Note
Survey Example
PntNo  Northing Easting  Elevation Desc
1      5000      5000   100      START
OcPt   BsPt      SetAzi
1
InstHgt RodHgt
5.32    6.0
OcPt   FsPt      HorzAngle SlopeDist ZenithAng Desc
TR 1   2      AR 268.5330  711.420  89.4050  P2
InstHgt RodHgt
5.43    6.0
OcPt   FsPt      HorzAngle SlopeDist ZenithAng Desc
TR 2   3      AR 262.5448  457.760  89.3236  P3
InstHgt RodHgt
5.4      6.0
OcPt   FsPt      HorzAngle SlopeDist ZenithAng Desc
TR 3   4      AR 208.5710  201.310  89.1803  P4
TR 4   5      AR 247.1657  497.120  88.5235  P5
TR 5   6      AR 277.4835  223.980  90.2926  P6
TR 6   7      AR  92.4113  233.880  90.2746  P7
InstHgt RodHgt
5.42    6.0
OcPt   FsPt      HorzAngle SlopeDist ZenithAng Desc
TR 7   8      AR 261.2756  387.250  91.4405  CLOSE
SS 7   19     AR 289.3456  112.450  91.3423  SS1
```

Print > Print Settings

This dialog has settings for the report functions. **Left Margin** settings are in characters. **Top Margin** and **Bottom Margin** settings are in lines. At standard line spacing with a **Text Size** of 12, there are 66 **Lines/Page**.



Exit

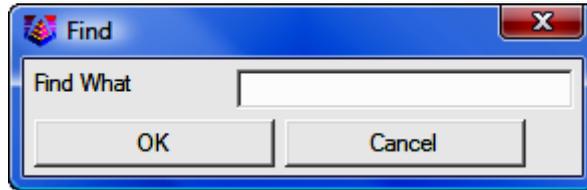
Exits the raw file editor.

Edit Menu



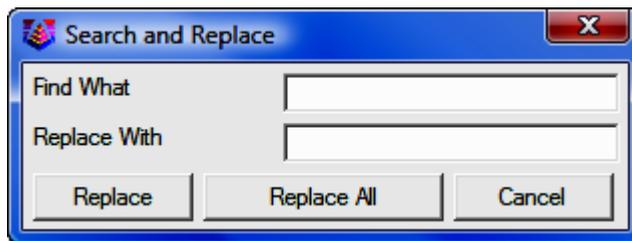
Find

This command allows you to search and find a particular word, letter, numeric value or a combination of all. Letter case does not matter.



Replace

This command allows you to search and replace a particular word, letter, numeric value, or a combination of all. Letter case does not matter. It also provides further options to **Replace** individual items one at a time or to **Replace All**.



Cut

This is a standard windows cut command. It removes data from editor and places it in the windows clipboard.

Copy

This is a standard windows copy command. It copies selected data to windows clipboard.

Paste

This is a standard windows copy command. It inserts cut or copied data from the windows clipboard.

Delete Row

This command deletes the row containing the active cursor or cell. You can delete a row by placing the cursor in any of the cells in the row you wish to delete, or by picking on the row number at the far left of the editor.



WARNING! You may also delete a row by placing the cursor in the row and pressing [**Delete**]. **Use caution!** There is no **Undo** command. To delete the contents of a single cell, select the contents before pressing [**Delete**].

Modify Measurements

This option allows for a change in distance, horizontal angle or vertical angle by a specified amount for the entire file or for a specified point number or line number range. To modify a measurement, choose which field to modify and 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 **Start** and **End** line.

Modify Measurements

Field To Modify

Distance Horizontal Angle Vertical Angle

Change To Distance:

Apply To ...

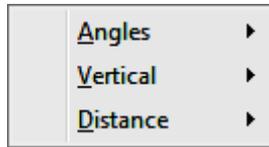
All By Point Number By Line Number

Range of Points:

Start Line: End Line:

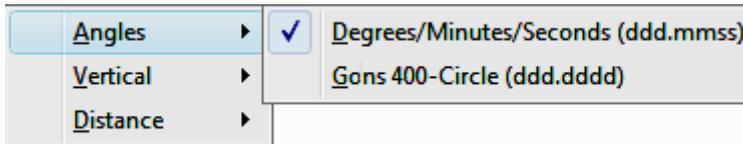
OK Cancel

Display Menu



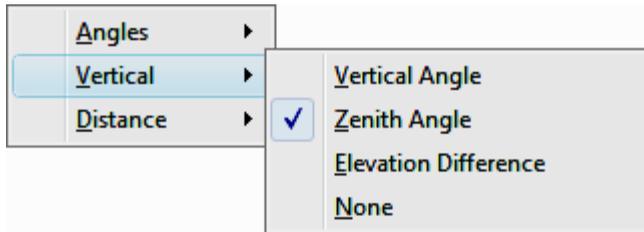
Angles

This option chooses the angle format between **Degrees/Minutes/Seconds (ddd.mmss)** and **Gons-400 Circle (ddd.dddd)**. This setting applies to the angles in the spreadsheet editor as well as the angle format for reports.



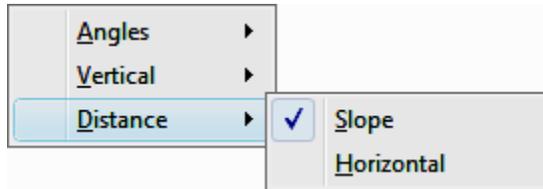
Vertical

The options contained in this menu allow for specifying the type of vertical measurement information you will input or is contained in the RW5 file. The **Vertical Angle** selection assumes the barrel or scope of the instrument is level when reading 0 (zero). With this setting, the vertical component of a measurement record will have a header of **VertAng**. The **Zenith Angle** selection, most commonly used, assumes the barrel/scope to be level when reading 90. Using this setting results in a header of **ZenithAng**. Elevation difference displays the elevation difference between the occupied and foresight points. If the **Distance** option is specified as **Slope**, this elevation difference will be used to calculate the horizontal distance of the measurement. The header for this record is **ElevDiff**. The **None** selection assumes all distances are horizontal distances and removes the vertical component for a measurement from the editor. Switching modes can be performed at any time.

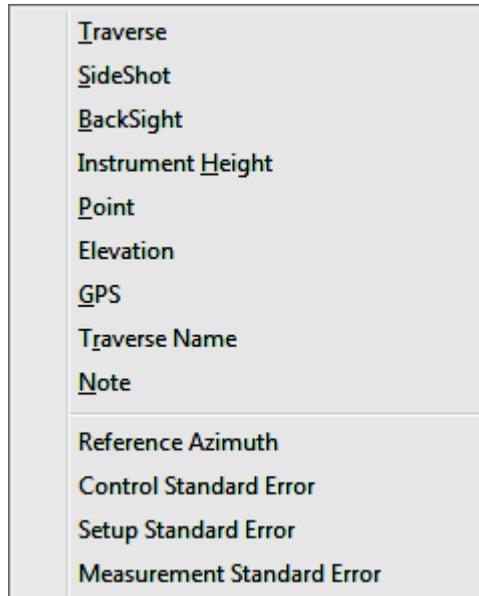


Distance

This option controls the display of either **Slope** or **Horizontal Distances**. Changing the display results in the distance data adjusting to reflect the correct value for the selection made. The vertical data: **VertAng**; **ZenithAng**; or **Vert-Diff** is used to convert the distance value when changing this display option.



Add Menu



Traverse

Adds a traverse record (**TR**) to the spreadsheet editor. The new record will be insert above the row that contains the active cell unless this row is the last row in the file. If so, you will be prompted to insert above or below the current row.

SideShot

Adds a sideshot record (**SS**) to the spreadsheet editor. The new record will be inserted above the row that contains the active cell unless this row is the last row in the file. If so, you will be prompted to insert above or below the current row.

Backsight

Adds a backsight (**BK**) to the spreadsheet editor. The new record will be inserted above the row that contains the active cell unless this row is the last row in the file. If so, you will be prompted to insert above or below the current row.

Instrument Height

Adds an instrument height (**HI**) record to the editor. This record contains both the instrument and rod height setting. The new record will be inserted above the

row that contains the active cell unless this row is the last row in the file. If so, you will be prompted to insert above or below the current row.

Point

Adds a point (**PT**) record to the editor. Inserting a blank record allows manual input to define the coordinates for the point. The new record will be inserted above the row that contains the active cell unless this row is the last row in the file. If so, you will be prompted to insert above or below the current row.

Elevation

Adds an elevation (**EL**) record to the editor. The new record will be insert above the row that contains the active cell unless this row is the last row in the file. If so, you will be prompted to insert above or below the current row.

GPS

Adds a **GPS** record to the editor. The new record will be insert above the row that contains the active cell unless this row is the last row in the file. If so, you will be prompted to insert above or below the current row.

Traverse Name

Adds a traverse name (**Name**) to the editor. The new record will be insert above the row that contains the active cell unless this row is the last row in the file. If so, you will be prompted to insert above or below the current row.

Note

Adds a note (**DS**) record to the editor. Note records are for information display and do not effect processing except for two special notes which are:

Elevation: 2D

Elevation: 3D

These special notes set the elevation mode for processing for the records that follow the note. The raw editor starts in 3D mode. The **Elevation: 2D** note will switch processing to 2D mode and the **Elevation: 3D** note will switch the mode back to 3D. In 2D mode, the processing will not set the elevations in the coordinate file.

Reference Azimuth

This record applies to **SurvNET**, the optional Network Least Squares analysis and adjustment routine.

Control Standard Error

This record applies to **SurvNET**, the optional Network Least Squares analysis and adjustment routine.

Setup Standard Error

This record applies to **SurvNET**, the optional Network Least Squares analysis and adjustment routine.

Measurement Standard Error

This record applies to **SurvNET**, the optional Network Least Squares analysis and adjustment routine.

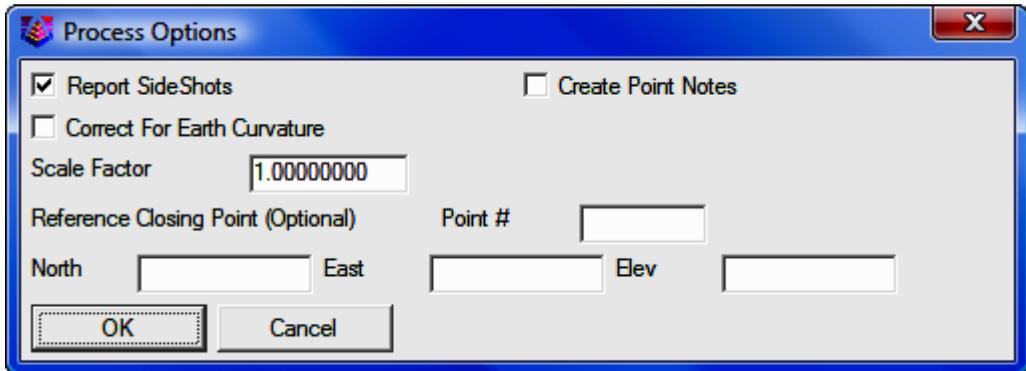
Process (Compute Pts) Menu

This menu contains tools to process raw data by various methods. The calculated coordinates are stored to the active specified coordinate file. The options for processing are specified within either the **Process Options** dialog box or the **Closure Options** dialog box. This dialog box is displayed before processing data, using any of the available methods, with the exception being the **Least Squares** method.

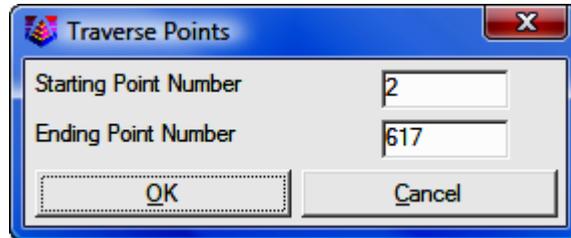


No Adjust

No Adjust means that no angle balance or traverse adjustment will be applied. Options are specified in the **Process Options** dialog.



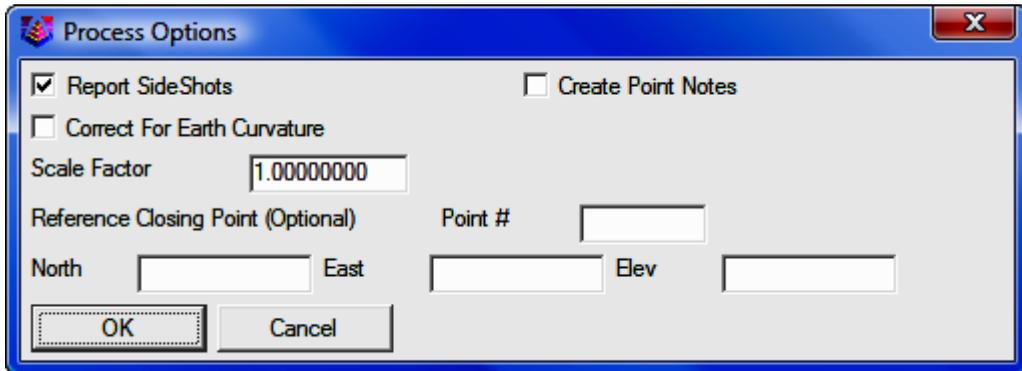
After picking [OK] on the process options dialog a **Traverse Points** dialog appears for entering the starting and ending point numbers.



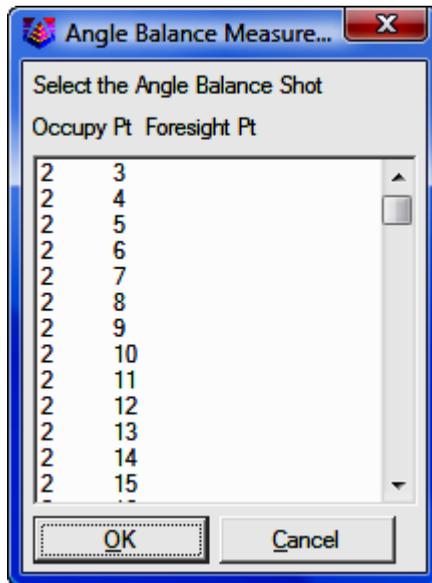
The program reads the raw file to set the defaults for these point numbers which are used to calculate the closure. The difference between the ending point and the reference closing point is the closure error and the sum of the traverse distances from the starting to the ending point is used as the total distance traversed. After picking [OK] for the second dialog, the program starts processing the raw file from the top record down. The result is displayed in the **Standard Report Viewer** which can save, print or draw the report.

Angle Balance

This process method applies an angle balance to the traverse lines when calculating the coordinates. Options are specified in the **Process Options** dialog.



The angle balance takes the angular error divided by the number of traverse lines and adjusts the angle of each traverse line by this 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 program will prompt 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, azimuth or by two point numbers in the dialog shown.

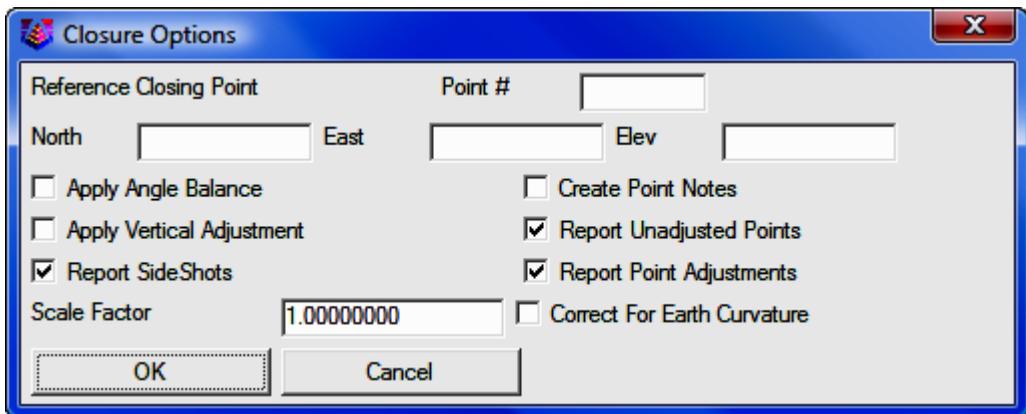


The angle balance report shows the unadjusted points, the unadjusted closure, the angular error, the adjusted points and then the adjusted closure. Typically but not always, applying the angle balance correction will improve the traverse closure.

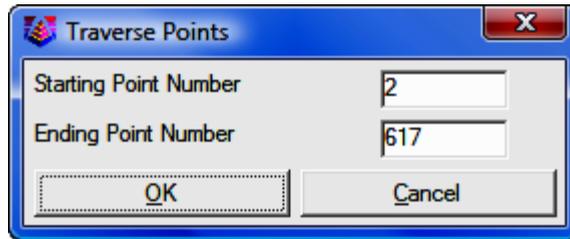
Compass, Crandall, Transit

These process methods apply the selected rule to the traverse lines when calculating the coordinates. After adjusting the traverse, the sideshots are also recalculated. 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 program will prompt 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 point.

Options are specified in the **Closure Options** dialog.



Specify the closing **Point #** or enter **North, East**, and (optional) **Elevation** coordinates. After picking [**OK**] on the process options dialog, a **Traverse Points** dialog appears for entering the starting and ending point numbers.



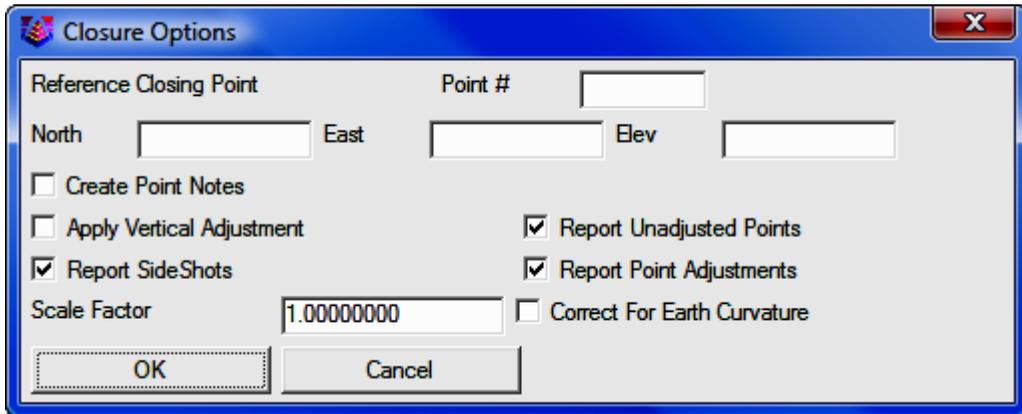
The program reads the raw file to set the defaults for these point numbers which are used to calculate the closure. The difference between the ending point and the reference closing point is the closure error and the sum of the traverse distances from the starting to the ending point is used as the total distance traversed. After picking [OK] for the second dialog, the program starts processing the raw file from the top record down. The result is displayed in the **Standard Report Viewer** which can save, print or draw the report.

Least Squares

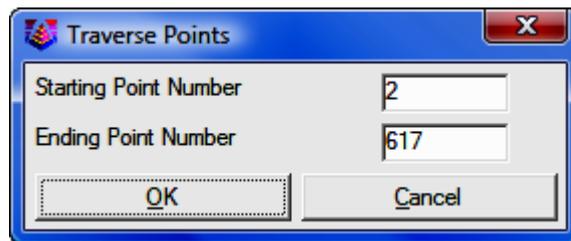
This **Least Squares** routine is simpler least squares adjustment, not **SurvNET** which is a robust network least squares adjustment routine. If you want to use the features from SurvNET, close the editor and select **Tools > Network Least Squares** from the "Sight" Survey menus, then load your RW5 file into SurvNET. See [Section 11.12](#) for **SurvNET** instructions.

From the raw file data, this routine makes initial calculations for the coordinate points in the traverse. The constraints of the routine are: **all angle readings must be in angle right mode**; and **the coordinates of the starting and the ending points must be known**.

The routine begins with a dialog for specifying 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.



Specify the closing **Point #** or enter **North**, **East**, and (optional) **Elevation** coordinates. After picking [OK] on the process options dialog, a **Traverse Points** dialog appears for entering the starting and ending point numbers.

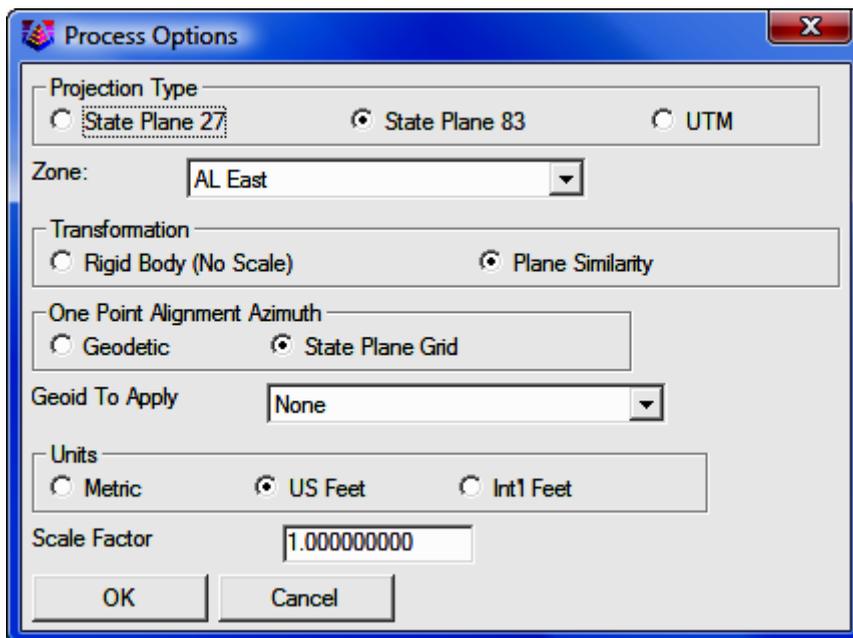


This routine applies a least-squares adjustment to the data stored in the .RW5 file. The closing errors are distributed among the other points, using the "Method of Least Squares" (Ref : Wolf, P.R. and Ghilani, C.D., 1996, "Adjustment Computations", John Wiley and Sons, NY, Third Edition). After the adjustment, the rest of the raw file is processed to recalculate the sideshots.

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.

GPS

The process **GPS** routine allows for reduction of GPS records that reside in a raw (*.RW5) file from latitude, longitude and WGS84 Ellipsoid Height to State Plane or local coordinates. When selected, the **GPS Settings** dialog will appear as shown below.



Projection Type

This setting defines the datum coordinate system to be used for converting the Latitude, Longitude and WGS84 Ellipsoid height collected from the GPS receiver into Cartesian coordinates. The supported projection types are: **State Plane 83**; **State Plane 27**; and **UTM**.

Zone

For State Plane projections, you must select the correct state zone that you are working in. For UTM, the Automatic Zone option will have the program automatically use the program automatically use the correct UTM zone for your location. Otherwise for UTM, you can manually set a specific UTM zone. This manual option applies to working on the border between zones and you want to force the program to always use one of those zones.

Transformation

The transformation in SurvCE's Align Local Coordinates command can either be by plane similarity or rigid body methods. The difference is that the rigid body method does a transformation with a translation and rotation and without a scale. The plane similarity does a rotation, translation and scale. This option only applies when two or more points are used in Align Local Coordinates or the Localization routine in SurvCE.

One Point Alignment Azimuth

This option applies to the rotation when using one point in Align Local Coordinates or the Localization routine in SurvCE. For this alignment method, the state plane coordinate is translated to the local coordinate. Then the rotation can use either the state plane grid or the geodetic as North. No scale is applied in this transformation. The state plane and geodetic true north diverge slightly in the east and west edges of the state plane zone. This option allows you to choose which north to use: **Geodetic**; or **State Plane Grid**.

Geoid to Apply

The supported geoids include:

- Geoid99 (USA)
- Geoid03 (USA)
- World (EGM96)
- (World (OSU91A)
- Australia (AUSGeiod98)
- Belgium (BG03)
- Canada (CGG2000)
- Canada (HT 2.0)
- Canada (HT 1.01)
- Canada (GSD95)
- Caribbean (CARIB97)
- Finland (2000)
- France(RAF-98)
- Great Britain (OSGM02)
- Ireland (OSGM02_ROI)
- N. Ireland (OSGM02_NI)

This option will account for the geoid undulation in determining the orthometric elevation of the measurement. The definition of the geoid model as currently adopted by the national Geodetic survey is the equipotential surface of the Earth's gravity field which best fits, in a least squares sense, global mean sea

level. Orthometric elevation measurements are used in survey calculations. In order to convert ellipsoid heights (H_e) as measured by GPS into orthometric elevations (E_0), you must provide for a correction between the GPS-measured ellipsoid (reference ellipsoid) and a constant level gravitational surface, the geoid. This correction is the geoid undulation (U_g). The formula is $H_e = E_0 + U_g$.

Carlson applies the Geoid model by subtracting the Geoid undulation from the GPS elevation. The resulting elevation is then used and displayed. In practice, the Geoid model is most applicable to two types of alignment scenarios. One of these types is when setting up the base over a known point and having no alignment control points. The other is when there is one alignment control point. When using multiple alignment control points, the Geoid model is not as important because Carlson can model the elevation difference which can generally pick up the local Geoid undulation.

Units

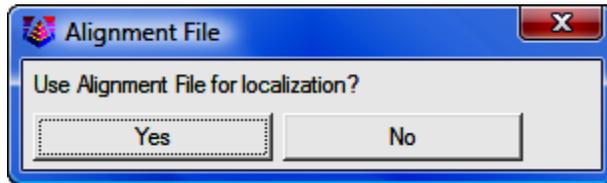
Coordinates can be reduced into one of three available units: **Metric**; **US Feet**; or **International Feet**.

Scale Factor

For most applications, the **Scale Factor** should be set to 1.0. The scale factor represents the "combined" grid/elevation factor that reduces ground distances to grid. After converting the LAT/LONG from the GPS records to state plane coordinates and applying the coordinate alignment (Localization) file, the **Scale Factor** is applied as the final adjustment to the coordinates. This adjustment is used on the X, Y, and not the Z. The **Scale Factor** is applied by dividing the distance between the coordinate and a base point by the **Scale Factor**. The coordinate is then set by starting from the base point and moving in the direction to the coordinate for the adjusted distance. The base point is the first point in the alignment (Localization) file. If there are no points specified in the alignment file, then 0,0 is used as the base point. If using an alignment file (Localization File) this value will be automatically calculated and displayed. Manual entry of a scale factor is also permitted.

Use Alignment File For Localization

After selecting **[OK]** in the **Process Options** dialog, the **Alignment File** dialog is displayed.

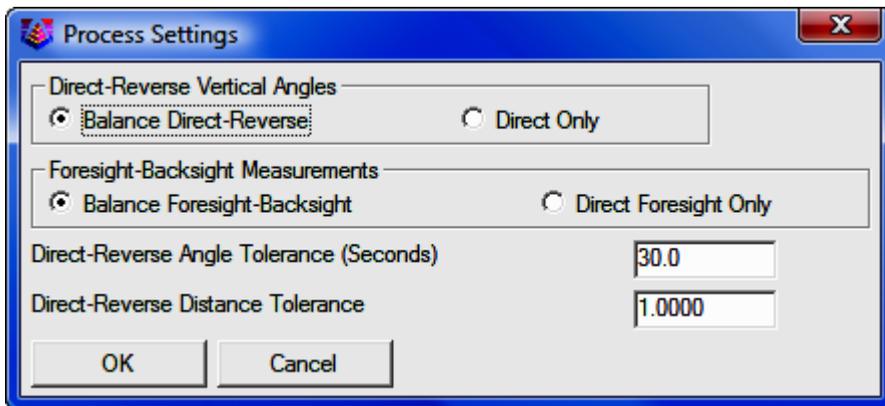


This file is typically created by SurvCE (Carlson's Data Collection System) using the Localization routine or by Carlson Field Using the Align to Local Coordinates routine. This file (*.DAT) contains the parameters to transform the derived State Plane coordinates to the defined local coordinates. If you select [**Yes**] you will be asked to select the alignment file using a standard Windows file selection dialog.

At the end of the process, the coordinates will be written to the current coordinate file and a report will be presented in the Carlson editor for saving or printing purposes.

Process Settings

This option allows for the setting of user preferences and tolerances to be used during processing and generation of reports.



Direct-Reverse Vertical Angles

This option determines how to handle direct-reverse vertical angle measurements when processing. **Balance Direct-Reverse** will take the mean of the direct-reverse measurements and use this value when processing the file. **Direct Only** will only use the direct measurement to the point for processing.

Foresight-Backsight Measurements

Balance Foresight-Backsight allows for averaging in the foresight and backsight measurements when using direct-reverse sets. The **Direct Foresight Only** option will average the foresight measurements only of a direct-reverse set.

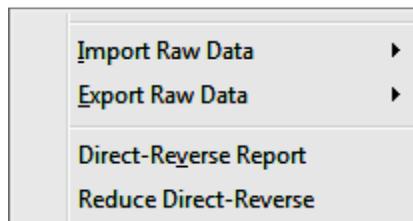
Direct-Reverse Angle Tolerance (Seconds)

This is the tolerance that the angle measured by the direct measurements and the angle measured by the reverse measurements in a direct-reverse set must fall within.

Direct-Reverse Distance Tolerance

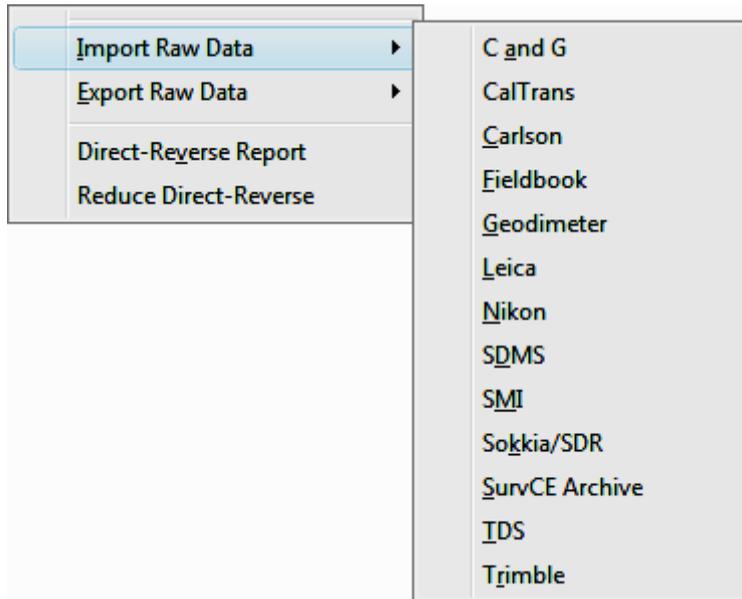
This setting allows for user input of desired tolerance values for multiple measurements. Exceeded tolerances will be displayed on the process results report. The residual values of the measurements will be shown on the process results report. The data to be averaged can be either the **Distance Measurements** or the **Coordinates**.

Tools Menu



Import

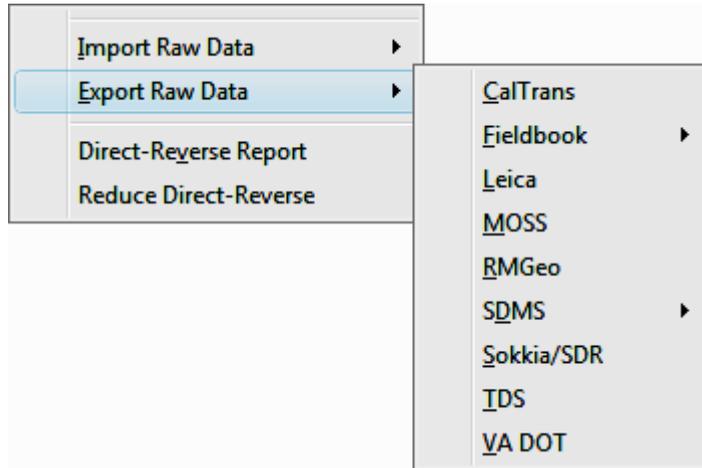
These routines convert raw data from other formats into the current Carlson RW5 format. The converted raw data will be added to the end of any existing data in the editor. In many cases, the raw data file to import can be downloaded directly from the data collector or instrument using the *Data Collectors* command. The following supported formats (along with their standard file extension) are listed here.



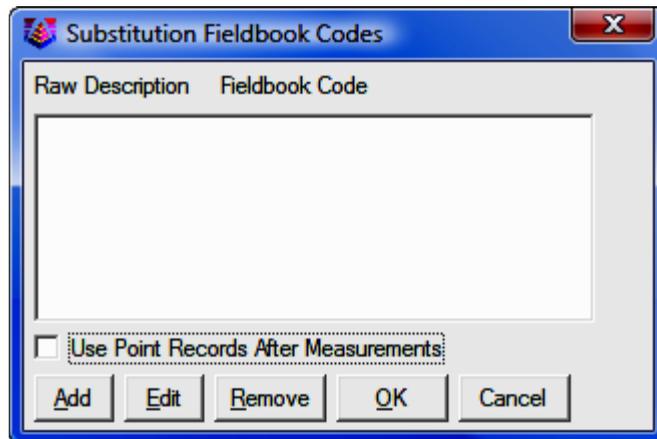
- **C&G (.CGR, .RAW, .TXT, *)**
- **CalTrans (.DMP)**
- **Carlson (.RW5)**
- **Fieldbook (.FBK)** - from Softdesk, Land Development Desktop or Civil 3D.
- **Geodimeter (.OBS, .RAW, JOB, *)**
- **Leica (.GSI, .RAW, GRE):** This reads the Leica raw file in Wildsoft, Liscad, 10-20-30-40, C&G, or GeoComp format. There are options to specify direct-reverse shot order if any and to convert from International Feet to Leica US Feet.
- **Nikon (.TRN, .RAW)**
- **SDMS (.PRJ, *)**
- **SMI (.RAW)**
- **Sokkia SDR (.SDR, .RAW, *)**
- **SurvCOGO (.RAW or .TXT)**
- **SurvCE Archive (.SC5)** - When downloading an RW5 file from SurvCE using SurvCOM, there's an option to copy the RW5 file to a SC5 file as a read-only backup
- **TDS (.RW5, .RAW)**
- **Trimble (.DC)**

Export

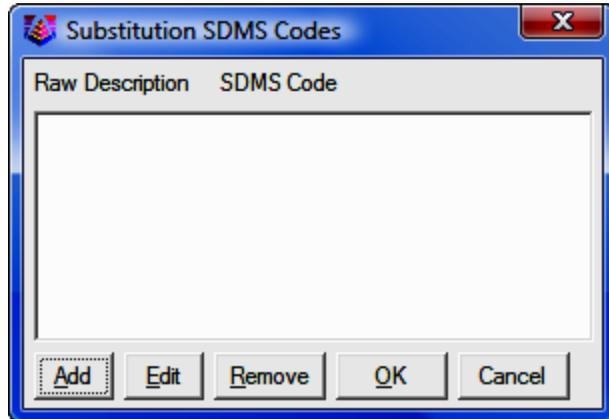
These routines convert the Carlson raw data (.RW5) file to other formats. The following file formats are supported.



- **CalTrans (.DMP)**
- **Fieldbook (.FBK)** - This export routine provides an option to setup **Substitution Fieldbook Codes**. This allows the user to substitute the raw description contained in the RW5 file with the fieldbook code used in AutoDesk Land Desktop or Civil 3D.



- **Leica (.GSI)**
- **MOSS (.MOS)**
- **RMGeo (.TXT)**
- **SDMS (.PRJ)** - This export routine provides an option to "Setup SDMS Codes". This allows the user to substitute the raw description contained in the RW5 file with the SDMS codes used in SDMS program.



- **Sokkia (.SDR)**
- **TDS (.RW5, .RAW)**
- **VA Dot (.TOP)**

Direct-Reverse Report

This routine creates a report of direct and reverse shots along with the resulting averaged shots. Any tolerance specified in the **Process Settings>Direct-Reverse Settings** section, that is exceeded will be displayed in this report. The residuals are the difference between the measurement and the final average.

Reduce Direct-Reverse

This routine 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.

Format of the raw data (.RW5) file

The Carlson raw data format is a comma delimited ASCII file containing record types, headers, recorded data and comments. The format is based on the RW5 raw data specification, with the exception of angle sets. Angle sets are recorded as BD, BR, FD and FR records to allow reduction of all possible combinations. Essentially, these records are identical to a sideshot record.

Backsight Record

Record type: BK

Field headers:

OP Occupy Point

BP Back Point

BS Backsight

BC Back Circle

Sample(s):

BK,OP1,BP2,BS315.0000,BC0.0044

Line of Sight Record

Record type: LS

Field headers:

HI Height of Instrument

HR Height of Rod*

*GPS heights may be recorded to phase center or ARP depending on GPS make.

Sample(s):

LS,HI5.000000,HR6.000000

LS,HR4.000000

Occupy Record

Record type: OC

Field headers:

OP Point Name

N Northing (the header is N space)

E Easting (the header is E space)

EL Elevation

-- Note

Sample(s):

OC,OP1,N 5000.00000,E 5000.00000,EL100.000,--CP

Store Point Record

Record type: SP

Field headers:

PN Point Name

N Northing

E Easting

EL Elevation

-- Note

Sample(s):

SP,PN100,N 5002.0000,E 5000.0000,EL100.0000,--PP

Traverse / Sideshot Record / Backsight Direct / Backsight Reverse / Foresight Direct / Foresight Reverse

Record type: TR / SS / BD / BR / FD / FR

Field headers:

OP Occupy Point

FP Foresight Point

(one of the following)

AZ Azimuth

BR Bearing

AR Angle-Right

AL Angle-Left

DR Deflection-Right

DL Deflection-Left

(one of the following)

ZE Zenith

VA Vertical angle

CE Change Elevation

(one of the following)

SD Slope Distance

HD Horizontal Distance

--, Note

Sample(s):

TR,OP1,FP4,AR90.3333,ZE90.3333,SD25.550000,--CP

SS,OP1,FP2,AR0.0044,ZE86.0133,SD10.313750,--CP

BD,OP1,FP2,AR0.0055,ZE86.0126,SD10.320000,--CP

BR,OP1,FP2,AR180.0037,ZE273.5826,SD10.315000,--CP
FD,OP1,FP3,AR57.1630,ZE89.4305,SD7.393000,--CP
FR,OP1,FP3,AR237.1612,ZE270.1548,SD7.395000,--CP

GPS

Record type: GPS

Field headers:

PN Point Name
LA Latitude (WGS84)
LN Longitude (WGS84,negative for West)
EL Ellipsoid elevation in meters*
-- Note

*GPS heights may be recorded to phase center or ARP depending on GPS make.

Sample(s):

GPS,PN701,LA42.214630920,LN-71.081409184,EL-21.8459,--C
P /Brass Disk

Alphabetical listing of Record Types

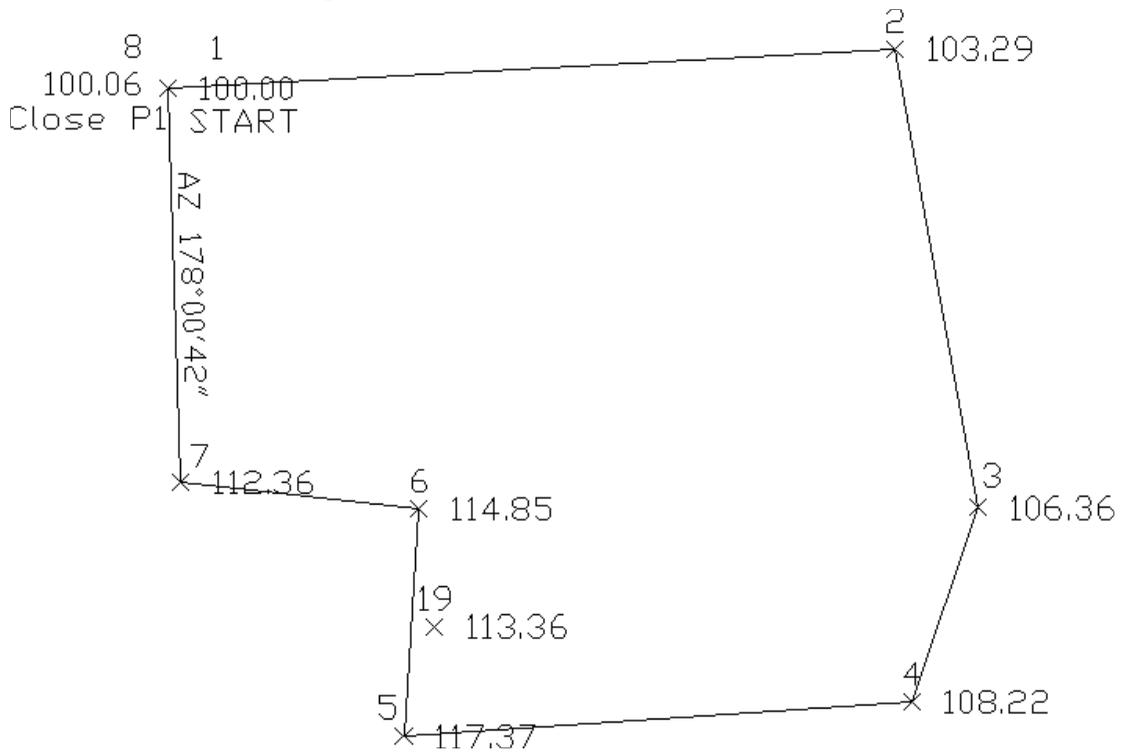
BD Backsight Direct
BK Backsight
BR Backsight Reverse
FD Foresight Direct
FR Foresight Reverse
GPS GPS Position in Lat (dd.mmss) Lon (dd.mmss - Negative for West) and WGS84 Ellipsoid Elevation in meters

Alphabetical listing of Field Headers

AD Azimuth Direction (0 for North,1 for South)
AL Angle-Left
AR Angle-Right
AZ Azimuth
BC Back Circle

BP	Back Point
BR	Bearing (this field will be recorded as N123.4500W)
BS	Backsight (when back point is not defined)
CE	Change Elevation
DL	Deflection-Left
DR	Deflection-Right
DT	Local Date (MM-DD-YYYY)
E	Easting (the header is E space)
EC	Earth Curvature (0 for off, 1 for on)
EL	Elevation (GPS value is ellipsoid elevation in meters)
EO	EDM Offset
FE	Foresight Elevation
FP	Foresight Point
HD	Horizontal Distance
HI	Height of Instrument
HR	Height of Rod
LA	Latitude
LN	Longitude
N	Northing (the header is N space)
OC	Occupy Point Coordinates
OP	Occupy Point
PN	Point Name
SD	Slope Distance
SF	Scale Factor
TM	Local Time (HH:MM:SS)
UN	Distance Unit (0 for feet, 1 for meter, 2 for US feet)
VA	Vertical Angle
ZE	Zenith
--	Note

Traverse Examples



This first example is a closed traverse with an internal backsight of azimuth $178^{\circ} 00' 42''$

Use the functions under the **Add** menu to create and fill out the raw file as shown here.

Edit-Process Raw File - [RW5:NONE] - [CRD:LANDPOINT]							
File Edit Display Add Process (Compute Pts) Tools Help							
		PntNo	Northing	Easting	Elevation	Desc	
1	PT	1	5000.0000	5000.0000	100.0000	START	
2		OcPt	BsPt	Azi	SetAzi		
3	BK	1		178.0042	0.0000		
4		InstHt	RodHt				
5	HI	5.320	6.000				
6		OcPt	FsPt	Code	HorzAngle	SlopeDist	ZenithAng Desc
7	TR	1	2	AR	268.5330	711.320	89.4050 P2
8		InstHt	RodHt				
9	HI	5.430	6.000				
10		OcPt	FsPt	Code	HorzAngle	SlopeDist	ZenithAng Desc
11	TR	2	3	AR	262.5448	457.760	89.3236 P3
12		InstHt	RodHt				
13	HI	5.400	6.000				
14		OcPt	FsPt	Code	HorzAngle	SlopeDist	ZenithAng Desc
15	TR	3	4	AR	208.5710	201.310	89.1803 P4
16	TR	4	5	AR	247.1657	497.120	88.5235 P5
17	SS	5	19	AR	289.3456	112.450	91.4405 SS1
18	TR	5	6	AR	277.4835	223.980	90.2926 P6
19	TR	6	7	AR	92.4143	233.880	90.2746 P7
20		InstHt	RodHt				
21	HI	5.420	6.000				
22		OcPt	FsPt	Code	HorzAngle	SlopeDist	ZenithAng Desc
23	CL+AB	7	8	AR	261.2756	387.250	91.4405 CLOSE

Notice that the record from point 7 to 8 is set as a **CL+AB** record. This tells the program that point 8 is the closing point and that the angle from 7 to 8 is the closing angle. For traverse adjustment, the closing reference point is 1 and the closure error is the difference between point 1 and point 8. For angle balance, the reference closing angle is $358^{\circ} 00' 42''$ ($178^{\circ} 0' 42'' + 180^{\circ}$). The angle balance error is the difference between this reference angle and the angle from points 7 to 8.

Now let's process using **Compass** adjustment with **Angle Balance**. Choose **Compass** under the **Process** menu and fill out the dialogs as shown.

Closure Options

Reference Closing Point Point # 1

North 5000.0000 East 5000.0000 Elev 100.000

Apply Angle Balance Create Point Notes

Apply Vertical Adjustment Report Unadjusted Points

Report SideShots Report Point Adjustments

Scale Factor 1.00000000 Correct For Earth Curvature

OK Cancel

Traverse Points

Starting Point Number 1

Ending Point Number 8

OK Cancel

Reference Closing Angle

Measured Closing Points: 7 to 8

Measured Closing Bearing: N 01°58'39" W

Measured Closing Azimuth: 358°01'21"

Angular Error: 0°00'39.00000"

From Pt# To Pt#

Reference Closing Angle (dd.mmss) 358.0042

Angle Format

NE SE SW NW AZ

OK Cancel

Process report:

Process Results 05/23/2002 10:06

Raw file>

CRD file> C:/Program Files/Simplicity Sight Survey 2009/xporttmp.crd

Scale Factor: 1.00000000

Correct for Earth Curvature: OFF

Starting Point 1: N 5000.00 E 5000.00 Z 100.00

BackSight Azimuth: 178°00'42"

Point No.	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
2	AR268.5330	89.4050	711.32	5.32	6.00	5038.43	5710.27	103.29
P2								
3	AR262.5448	89.3236	457.76	5.43	6.00	4587.89	5791.20	106.36
P3								
4	AR208.5710	89.1803	201.31	5.40	6.00	4397.30	5726.43	108.22
P4								
5	AR247.1657	88.5235	497.12	5.40	6.00	4363.08	5230.59	117.37
P5								
19	AR289.3456	91.4405	112.45	5.40	6.00	4471.32	5260.88	113.36
SS1								
6	AR277.4835	90.2926	223.98	5.40	6.00	4586.54	5245.67	114.85
P6								
7	AR92.4143	90.2746	233.88	5.40	6.00	4613.25	5013.33	112.36
P7								
8	AR261.2756	91.4405	387.25	5.42	6.00	5000.09	4999.97	100.06

CLOSE

Closure Results (Before Angle Balance)

Starting Point 1: N 5000.00 E 5000.00 Z 100.00

Closing Reference Point 1: N 5000.00 E 5000.00 Z 100.00

Ending Point 8: N 5000.09 E 4999.97 Z 100.06

Azimuth Error : 341°38'22"

North Error : 0.09061

East Error : -0.03007

Vertical Error: 0.05953

Hz Dist Error : 0.09547

S1 Dist Error : 0.11251

Traverse Lines> 7

SideShots> 1

Horiz Dist Traversed: 2712.29

Slope Dist Traversed: 2712.62

Closure Precision: 1 in 28409

Compass Closure

Adjusted Point Comparison

Point#	Original		Adjusted		Dist	Bearing
	Northing	Easting	Northing	Easting		
2	5038.445	5710.269	5038.440	5710.294	0.025	S 79°46'08" E

```

3      4587.914  5791.222  4587.907  5791.263  0.042 S 79°46'08" E
4      4397.319  5726.469  4397.310  5726.517  0.049 S 79°46'08" E
5      4363.044  5230.628  4363.032  5230.693  0.067 S 79°46'08" E
6      4586.509  5245.681  4586.496  5245.755  0.075 S 79°46'08" E
7      4613.178  5013.335  4613.163  5013.416  0.083 S 79°46'08" E
8      5000.017  4999.905  5000.000  5000.000  0.097 S 79°46'08" E

```

Max adjustment: 0.097

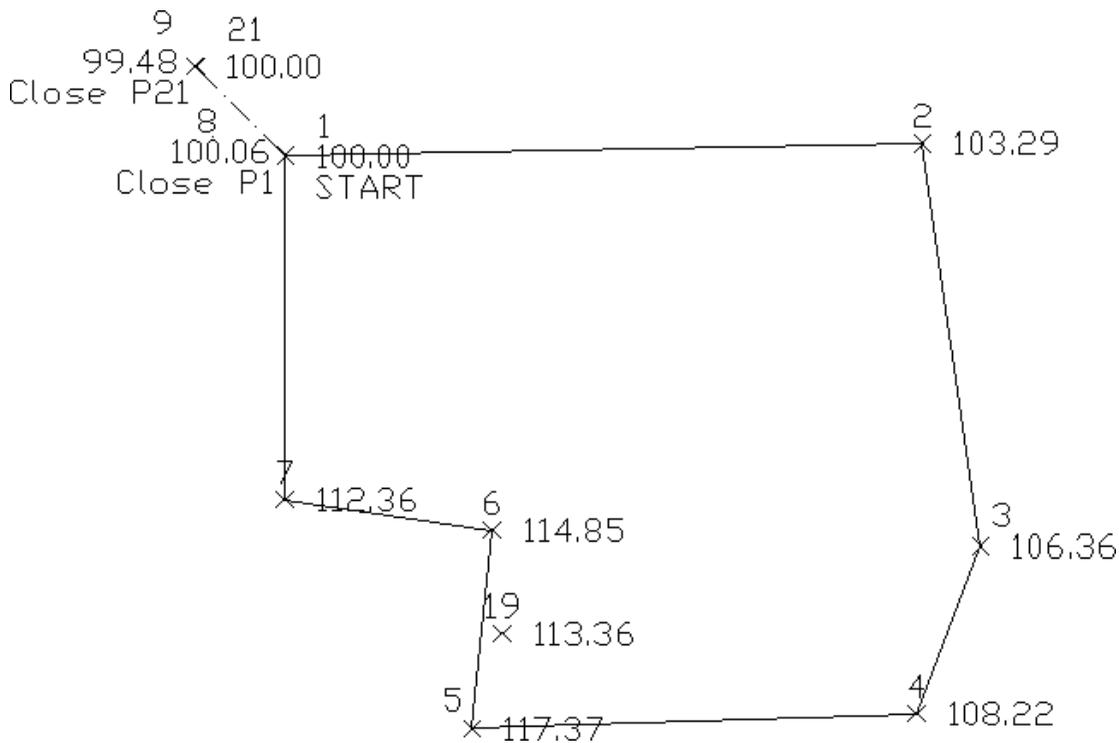
Starting Point 1: N 5000.00 E 5000.00 Z 100.00

BackSight Azimuth: 178°00'42"

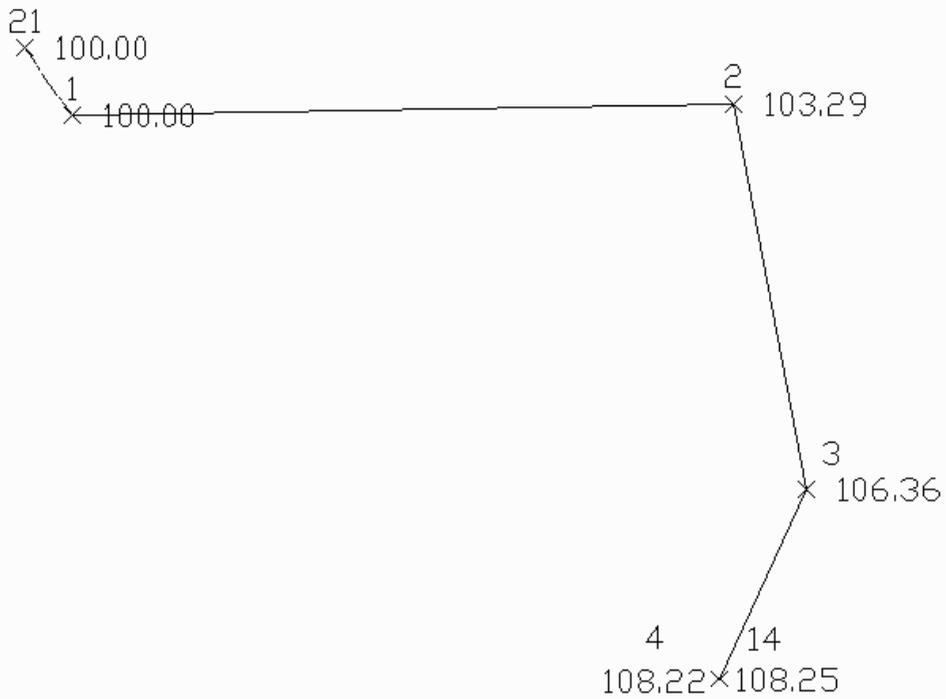
Point No.	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
2	AR268.5326	89.4050	711.34	5.32	6.00	5038.44	5710.29	103.29
P2								
3	AR262.5434	89.3236	457.76	5.43	6.00	4587.91	5791.26	106.36
P3								
4	AR208.5704	89.1803	201.30	5.40	6.00	4397.31	5726.52	108.22
P4								
5	AR247.1657	88.5235	497.09	5.40	6.00	4363.03	5230.69	117.37
P5								
19	AR289.3456	91.4405	112.47	5.40	6.00	4471.28	5260.97	113.36
SS1								
6	AR277.4839	90.2926	223.99	5.40	6.00	4586.50	5245.75	114.85
P6								
7	AR92.4130	90.2746	233.88	5.40	6.00	4613.16	5013.42	112.36
P7								
8	AR261.2758	91.4405	387.27	5.42	6.00	5000.00	5000.00	100.06
CLOSE								

Shown above is the resulting process report. The angle balance had an error of 39 seconds which was divided among the 7 traverse sides. The Compass Closure shows how each traverse point was adjusted and then the resulting adjusted angles and distances.

Here is another layout of the last example that shows an external backsight setup. In this case there are two known points. Point 1 is the starting point and point 21 is the initial backsight. The setup could also use a backsight azimuth (ie north azimuth for example) instead of a backsight point number.



The closing record setup has changed from the last example. In this example, the shot from 7 to 8 is the closing shot with point 8 as the closing point. The closing reference point is still point 1. The angle balance shot is from 8 to 9 and the reference angle is from 1 to 21.



Example of an open traverse

The traverse starts from the known point 1 and ends at the known point 14. In this case there is no angle balance shot. The closing shot is from 3 to 4 with point 4 being the closing point. Point 14 is the closing reference point.

		InstHt	RodHt	Code	HorzAngle	SlopeDist	ZenithAng	
1		PntNo	Northing		Easting	Elevation	Desc	
2	PT	1	5000.0000		5000.0000	100.0000	START	
3	PT	21	5100		4900	100		
4		OcPt	BsPt		Azi	SetAzi		
5	BK	1	21			0.0000		
6		InstHt	RodHt					
7	HI	5.320	6.000					
8		OcPt	FsPt	Code	HorzAngle	SlopeDist	ZenithAng	Desc
9	TR	1	2	AR	268.5330	711.320	89.4050	P2
10		InstHt	RodHt					
11	HI	5.430	6.000					
12		OcPt	FsPt	Code	HorzAngle	SlopeDist	ZenithAng	Desc
13	TR	2	3	AR	262.5448	457.760	89.3236	P3
14		InstHt	RodHt					
15	HI	5.400	6.000					
16		OcPt	FsPt	Code	HorzAngle	SlopeDist	ZenithAng	Desc
17	TR	3	4	AR	208.5710	201.310	89.1803	P4

The closing record setup has changed from the last example. In this example, the shot from 7 to 8 is the closing shot with point 8 as the closing point. The closing reference point is still point 1. The angle balance shot is from 8 to 9 and the reference angle is from 1 to 21.

Here is an example of an open traverse.

Compass Report from Open Traverse example:

```

Process Results
Raw file> d:/scdev/data/tsurvey.RW5
CRD file> d:/scdev/data/tsurvey.crd
Compass Closure
Adjusted Point Comparison
      Original      Adjusted
Point# Northing Easting Northing Easting Distance Bearing
2      5013.76  5711.18  5013.78  5711.13  0.047    N 63d21'19" W
3      4560.69  5776.42  4560.72  5776.35  0.078    N 63d21'19" W
4      4372.46  5705.08  4372.50  5705.00  0.091    N 63d21'19" W
Point Horizontal Vertical Slope  Inst Rod Northing Easting Elev

```

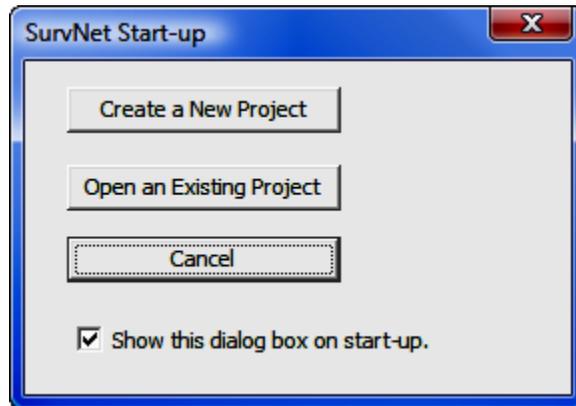
No.	Angle	Angle	Dist	HT	HT			
Description								
2	AR133.5324	89.4050	711.27	5.32	6.00	5013.78	5711.13	103.29
3	AR262.5506	89.3236	457.74	5.43	6.00	4560.72	5776.35	106.36
4	AR208.5712	89.1803	201.30	5.40	6.00	4372.50	5705.00	108.22

The traverse starts from the known point 1 and ends at the known point 14. In this case there is no angle balance shot. The closing shot is from 3 to 4 with point 4 being the closing point. Point 14 is the closing reference point.

11.12 Network Least Squares: SurvNET

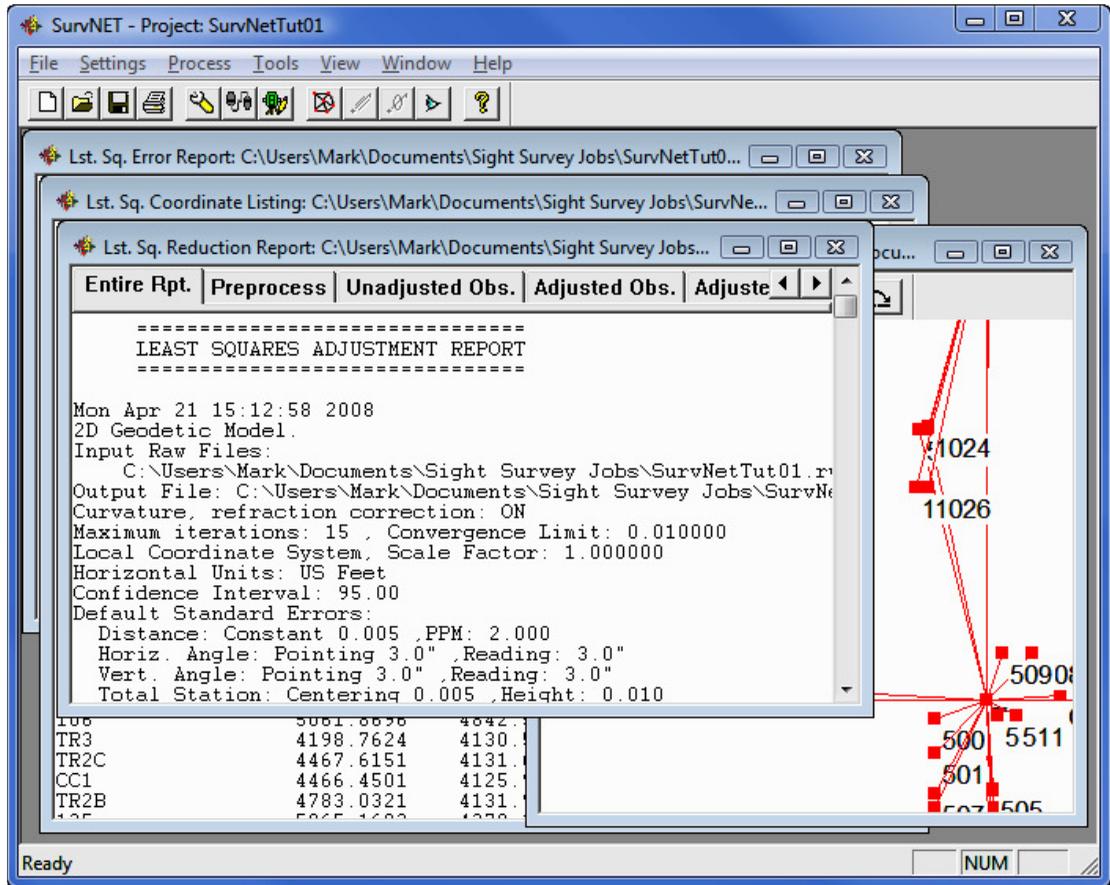
FUNCTION: **SurvNET** performs a least squares adjustment and statistical analysis on a network of raw survey field data, including both total station measurements and GPS vectors. **SurvNET** simultaneously adjusts a network of interconnected traverses with any amount of redundancy. The raw data can contain any combination of traverse (angle and distance), triangulation (angle only) and trilateration (distance only) measurements, as well as GPS vectors. The raw data does not need to be in any specified order, and individual traverses do not have to be defined using any special codes. All measurements are used in the adjustment.

Activate **SurvNET** routine by picking from the **Tools** menu; or by pressing **[Alt][T]**, **[N]**. **SurvNET** may also be activated from the **Edit Process Raw File** routines: under the **Carlson Raw Editor** (see [Section 11.11](#)) by pressing **[Alt][T]**, **[E]**, **[A]** then select **Process > Least Squares**; and under the **C&G Raw Editor** (see [Section 11.10](#)) by pressing **[Alt][T]**, **[E]**, **[C]** then select **Tools > Network Least Squares**.



SurvNET is a project based program. Before performing a least squares adjustment an existing project must be opened or a new project needs to be created. The opening dialog box (shown above) allows the user to open or create a project on start-up. You also can create or open a project from the **Files** menu. Since all project management functions can be performed from the **Files** menu this start-up dialog box is a convenience and you may elect to turn it off by unchecking **Show this dialog box on start-up**.

Shown below is the SurvNET main window with an existing project opened.



Key Features of SurvNET

- SurvNET reduces survey field measurements to grid coordinates in assumed, UTM, SPC83 SPC27, and a variety of other 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 there is sufficient elevation data. 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.

- SurvNET supports a variety of map projections and coordinate systems including the New Brunswick Survey Control coordinate system, UTM, and user defined systems consisting of either a predefined ellipsoid or a user defined ellipsoid and one of the following projections, Transverse Mercator, 1 Standard Parallel Lambert Conformal, 2 Standard Parallel Lambert Conformal, Oblique Mercator, and the Double Stereographic projection.
- A full statistical report containing the results of the least squares adjustment is produced and written to the report file (.RPT). An error report file (.ERR) is created and contains any error messages that are generated during the adjustment.
- Coordinates can be stored in a Carlson file (.CRD), C&G file (.CRD), Simplicity file (.ZAK) or an LDD file (.MDB). An ASCII coordinate file (.NEZ) is always created that can be imported into most any mapping/surveying/GIS program. The user has the option to compute unadjusted preliminary coordinates.
- There is an option to compute traverse closures during the preprocessing of the raw data. Closures can be computed for both GPS loops and total station traverses. Closure for multiple traverse loops in the same raw file can be computed.
- SurvNET can combine GPS vectors and total station data in a single adjustment. GPS Vector files from Leica, Thales, Topcon and Trimble can be input, as well as GPS files in the StarNet format. Additionally GPS vectors can be read from NGS G-files. There is also an option to read the G-file section of an Opus report.
- SurvNET includes a variety of blunder detection routines. One blunder detection method is effective in detecting if the same point number has been used for two different points. Additionally this blunder detection method is effective in detecting if two different point numbers have been used for the same physical position. This method also flags other raw data problems. Another blunder detection method included in SurvNET is 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, distances or angles 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 include: Differential and Trig level networks and loops can be adjusted using the network least squares program. Geoid modeling is used in SurvNET, allowing the users to choose between the Geoid99

and the Geoid03 model. The user can alternately enter the project geoid separation. There are description codes to identify duplicate points with different point numbers. The user can specify the confidence interval from 50 to 99 percent.

Network Least Squares Reduction

SurvNET performs a least squares adjustment and statistical analysis of a network of raw survey field data, including both total station measurements, differential level data and GPS vectors. SurvNET simultaneously adjusts a network of interconnected traverses with any amount of redundancy. The raw data can contain any combination of angle and distance measurements, and GPS vectors. SurvNET can adjust any combination of trilaterations, traverses, triangulations, networks and resections. 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.**

General Rules for Collecting Data for Use in Least Squares Adjustments

The least squares method is very flexible in terms of how the survey data needs to be collected. Generally speaking, any combination of angles, and distances combined with a minimal amount of control points and azimuths are needed. This data can be collected in any order. There needs to be at least some redundancy in the measurements. Redundant measurements are measurements that are in excess of the minimum number of measurements needed to determine the unknown coordinates. Redundancy can be created by including multiple GPS and other control points within a network or traverse. Measuring angles and distances to points in the network that have been located from another point in the survey creates redundancy. Running additional cut-off traverses or additional traverses to existing control points creates redundancy. Following are some general rules and tips in collecting data for least squares reduction.

- Backsights should be to point numbers. Some data collectors allow the user to backsight an azimuth not associated with a point number. SurvNET requires that all backsights be associated with a point number.
- There has to be at least a minimum amount of control. There has to be at least one control point. Additionally there needs to be either one additional control point or a reference azimuth. Control points can be entered in either the raw data file or there can be a supplemental control point file

containing the control point. Reference azimuths are entered in the raw data file. The control points and reference azimuths do not need to be for the first points in the raw file. The control points and azimuths can be associated with any point in the network or traverse. The control does not need to be adjacent to each other. It is permissible, though unusual, to have one control point on one side of the project and a reference azimuth on the other side of the project.

- Some data collectors do not allow the surveyor to shoot the same point twice using the same point number. SurvNET requires that all measurements to the same point use a single point number. The raw data may need to be edited after it has been downloaded to the office computer to insure that points are numbered correctly. An alternative to renumbering the points in the raw data file is to use the 'Pt Number substitution string' feature in the project 'Settings' screen. See the 'Redundant Measurement' section for more details on this feature.
- The majority of all problems in processing raw data are related to point numbering problems. Using the same point number twice to different points, not using the same point number when shooting the same point, misnumbering backsights or foresights, and misnumbering control points are all common problems.
- A big source of problems with new users is a misunderstanding in defining their control for a project. It is always best to explicitly define the control for the project. A good method is to put all the control for a project into a separate raw file.
- Some raw data collector files may have preliminary unadjusted coordinates included with the raw data. These coordinate records should be removed from the raw file. The only coordinate values that should be in the raw file are the control points. Since there is no concept of 'starting coordinates' in least squares there is no way for SurvNET to determine which points are considered control and which points are preliminary unadjusted points. So all coordinates found in a raw data file will be considered control points.
- When a large project is not processing correctly, it is often useful to divide the project into several raw data files and debug and process each file separately as it is easier to debug small projects. Once the smaller projects are processing separately they can be combined for a final combined adjustment.

Two Mathematical Models, 2D/1D and 3D

SurvNET gives the user the option to choose one of two mathematical model options when adjusting raw data, the 3D model and the 2D/1D model.

In the process of developing SurvNET, numerous projects have been adjusted using both the 2D/1D model and the 3D model. There are slight differences in final adjusted coordinates when comparing the results from the same network using the two models. But in all cases the differences in the results are typically less than the accuracy of measurements used in the project. The main difference in terms of collecting raw data for the two different models is that the 3D model requires that rod heights and instrument heights need to be measured, and there needs to be sufficient elevation control to compute elevations for all points in the survey. When collecting data for the 2D/1D model the field crews do not need to collect rod heights and instrument heights.

In the 2D/1D model raw distance measurements are first reduced to horizontal distances and then optionally to grid distances. Then a two dimensional horizontal least squares adjustment is performed on these reduced horizontal distance measurements and horizontal angles. After the horizontal adjustment is performed an optional one-dimensional vertical least squares adjustment is performed in order to adjust the elevations if there is sufficient data to compute elevations. The 2D/1D model is the model that has been traditionally been used in the past by non-geodetic surveyors in the reduction of field data. There are several advantages of SurvNET's implementation of the 2D/1D model. One advantage is that an assumed coordinate system can be used. It is not necessary to know geodetic positions for control points. Another advantage is that 3D raw data is not required. It is not necessary to record rod heights and heights of instruments. Elevations are not required for the control points. The primary disadvantage of SurvNET's implementation of the 2D/1D model is that GPS vector data cannot be used in 2D/1D projects.

In the 3D model raw data is not reduced to a horizontal plane prior to the least squares adjustment. The 3 dimensional data is adjusted in a single least squares process. In SurvNET's implementation of the 3D model XYZ geodetic positions are required for control. The raw data must contain full 3D data including rod heights and measured heights of instrument. The user must designate a supported geodetic coordinate system. The main advantage of using the 3D model is that GPS vectors can be incorporated into the adjustment. Another advantage of the 3D model is the ability to compute and adjust 3D points that only have horizontal and vertical angles measured to the point. This feature can be used in

the collection of points where a prism cannot be used, such as a power line survey.

When using the 2D/1D model 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 an elevation for the point the instrument record must have a HI, and the foresight record must have a rod height, slope distance and vertical angle. If working with .CGR raw data a 0.0 (zero) HI or rod height is valid. It is only when the field is blank that the record will be considered a 2D measurement. Carlson SurvCE 2.0 or higher allows you to mix 2D and 3D data by inserting a 2D or 3D comment record into the .RW5 file. A 3D traverse must also have adequate elevation control in order to process the elevations. Elevation control can be obtained from the supplemental control file, coordinate records in the raw data file, or elevation records in the raw data file.

SurvNET can also automatically reduce field measurements to state plane coordinates in either the NAD 83 or NAD 27 or other supported geodetic 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 there is sufficient elevation data. 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 file (.RPT). An error report file (.ERR) is created and contains any error messages that are generated during the adjustment. Coordinates can be stored in the following formats:

- C&G numeric (*.crd)
- C&G alphanumeric (*.cgc)
- Carlson numeric (*.crd)
- Carlson alphanumeric (*.crd)
- Autodesk Land Desktop (*.mdb)
- Simplicity (*.zak)
- ASCII P,N,E,Z,D,C (*.nez)

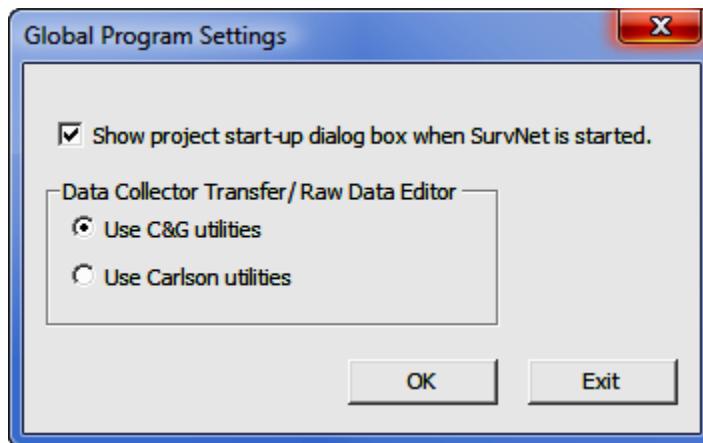
A file with the extension .OUT is always created and contains an ASCII formatted coordinate list of the final adjusted coordinates formatted suitable for printing. Additionally an ASCII file with an extension of .NEZ containing the final adjusted

coordinates in a format suitable for input into 3rd party software that is capable of inputting an ASCII coordinate file.

SurvNET produces a wealth of statistical information that allows an effective way to evaluate the quality of survey measurements. In addition to the least squares statistical information 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. This option 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.

Raw Data Files and Raw Data Editor Functions

SurvNET works equally well for raw file formats from both Carlson and C&G. The primary difference between the two is that a Carlson user will typically be using an .RW5 file for his raw data and a C&G user will typically be using a .CGR as the source of his raw data.



SurvNET is capable of processing either C&G raw data files (.CGR) or Carlson raw data files (.RW5). Measurement, coordinate, elevation and direction (Brg/Az) records are all recognized. Scale factor records in the .CGR file are not processed since SurvNET calculates the state plane scale factors automatically. The menu option **Global Settings** displays the following dialog box. If **Use Carlson Utilities** is chosen then the **Carlson Editor** (.RW5) will be the default raw editor

and **Carlson SurvCom** will be the default data collection transfer program. If **Use C&G Utilities** is chosen then the **C&G Editor** (.CGR) will be the default raw editor and **C&G's Transfer** program will be the default data collection transfer program.

Standard Error Records in the Raw Data File

Standard errors are estimated errors that are assigned to measurements or coordinates. A standard error is an estimate of the standard deviation of a sample. A higher standard error indicates a less accurate measurement. The higher the standard error of a measurement, the less weight it will have in the adjustment process.

Although you can set default standard errors for the various types of measurements in the project settings of SurvNET, standard errors can also be placed directly into the raw data file. A standard error record inserted into a raw data file controls all the measurements following the SE record. The standard error does not change until another SE record is inserted that either changes the specific standard error, or sets the standard errors back to the project defaults. The advantage of entering standard errors into the raw file is that you can have different standard errors for the same type measurement in the same job. For example, if you used a one second total station with fixed backsights and foresights for a portion of a traverse and a 10 second total station with backsights and foresights to hand held prisms on the other portion of the traverse, you would want to assign different standard errors to reflect the different methods used to collect the data.

Make sure the SE record is placed before the measurements for which it applies.

If you do not have standard errors defined in the raw data file, the default standard errors in the project settings will be applied to the entire file.

Carlson Raw Data Editor

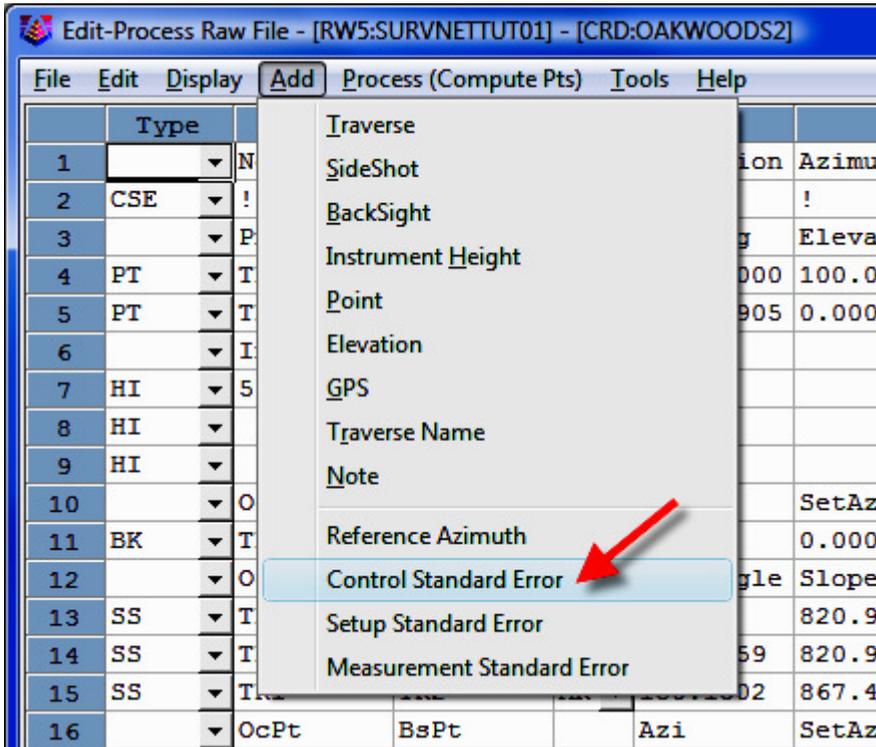
The raw data editor can be accessed from the tool bar icon. Following is an image of the .RW5 editor. Refer to the Carlson raw editor documentation for guidance in the basic operation of the editor. The following documentation only deals with topics that are specific to the .RW5 editor and SurvNET.

Edit-Process Raw File - [RW5:SURVNETTUT01] - [CRD-OAKWOODS2]

File Edit Display Add Process (Compute Pts) Tools Help

	Type						
1		Northing	Easting	Elevation	Azimuth(sec)		
2	CSE	!	!	!	!		
3		PntNo	Northing	Easting	Elevation	Description	
4	PT	TR1	5000.0000	5000.0000	100.0000	230	
5	PT	TR100	5000.0000	5820.9905	0.0000	230	
6		InstHt	RodHt				
7	HI	5.000					
8	HI		6.000				
9	HI		5.500				
10		OcPt	BsPt	Azi	SetAzi		
11	BK	TR1	TR100		0.0000		
12		OcPt	FsPt	Code	HorzAngle	SlopeDist	ZenithAng
13	SS	TR1	TR100	AR	0.0001	820.991	90.0555
14	SS	TR1	TR100	AR	359.5959	820.991	90.0555
15	SS	TR1	TR2	AR	180.1302	867.492	90.0747
16		OcPt	BsPt	Azi	SetAzi		
17	BK	TR1	TR100		0.0000		

You can insert or add standard error records into the raw data file. Use the **INSERT** or **ADD** menu option and select **Standard Errors**, or pick the SE buttons on the tool bar. Use the **Add** menu option to insert standard error records into the raw files.



SEC - Control Standard Errors

You can set standard errors for Northing, Easting, Elevation, and Azimuth using the **Control Standard Error** menu option. Azimuth standard errors are entered in seconds. The North, East and Elevation standard errors affect the PT (coordinate) and EL (elevation) records.

You can hold or **FIX** the North, East and Elevation fixed by entering a "!" symbol. You can allow the North, East and Elevation to **FLOAT** by entering a "#" symbol. You can also assign the North, East and Elevation actual values. If you use an "*" symbol, the current standard error values will revert to the project default values.

North	East	Elevation	Azim	
!	!	!		(Fix all values)
#	#	#	30.0	(Allow the N., E. & Elevation to Float)
0.01	0.01	0.03	5.0	(assign values)
*	*	*	*	(return the standard errors back to project defaults)

When you fix a measurement, the original value does not change during the adjustment and all other measurements will be adjusted to fit the fixed measurements. If you allow a value to float, it will not be used in the actual adjustment, it will just be used to help calculate the initial coordinate values required for the adjustment process. Placing a very high or low standard error on a measurement accomplishes almost the same thing as setting a standard error as fixed or float. The primary purpose of using a float point is if SurvNET cannot compute preliminary values, a preliminary float value can be computed and entered for the point.

Direction records cannot be **FIXED** or **FLOAT**. You can assign a low standard error (or zero to fix) if you want to weight it heavily, or a high standard error to allow it to float.

Example:

	North	East	Elev	Azim
CSE	!	!	!	
PT 103	1123233.23491	238477.28654	923.456	
PT 204	1124789.84638	239234.56946	859.275	
PT 306	1122934.25974	237258.65248	904.957	
CSE	*	*	*	
PT 478	1122784.26874	237300.75248	945.840	

The first **SEC** record containing the "!" character and sets points 103, 204, and 306 to be fixed. The last **SEC** record contains the "*" character. It sets the standard errors for point 478 and any other points that follow to the project settings. The Azimuth standard error was left blank.

MSE - Measurement Standard Errors

You can set the standard errors for distances, horizontal angle pointing, horizontal angle reading, vertical angle pointing, vertical angle reading, and distance constant and PPM.

Distance - distance constant and measurement error, can be obtained from EDM specs, or from performing an EDM calibration on an EDM baseline, or from other testing done by the user.

PPM - Parts per Million, obtain from EDM specs, or from performing an EDM calibration on an EDM baseline, or from other testing done by the user.

Pointing - total station horizontal angular pointing error in seconds. This value is an indication of how accurately the instrument man can point to the target. For example, you may set it higher in the summer because of the heat waves; or you may set it higher for total stations running in Robotic Mode because they cannot point as well as a manual sighted total station.

Reading - total station horizontal angular reading error in seconds. If you have a 10 second theodolite, enter a reading error of 10 seconds.

V.Pointing - total station vertical angular pointing error in seconds. This value is an indication of how accurately the instrument man can point to the target. For example, you may set it higher in the summer because of the heat waves.

V.Reading - total station vertical angular reading error in seconds. If you have a 10 second theodolite, enter a reading error of 10 seconds.

Example:

	Distance	Point	Read	V.Point	V.Read	PPM
MSE	0.01	3	3	3	3	5

You can enter any combination of the above values. If you do not want to change the standard error for a particular measurement type, leave it blank.

If you use an "*" symbol, the standard error for that measurement type will return to the project default values.

SSE - Setup Standard Errors

These standard errors are a measure of how accurately the instrument and target can be setup over the points.

Rod Ctr is the Target Centering error. This value reflects how accurately the target prism can be set up over the point.

Inst Ctr is the Instrument Centering error. This value reflects how accurately the instrument can be set up over the point.

Ints Hgt is the Instrument Height error. This value reflects how accurately the height of the instrument above the mark can be measured.

Rod Hgt is the Target Height error. This value reflects how accurately the height of the prism above the mark can be measured.

Example:

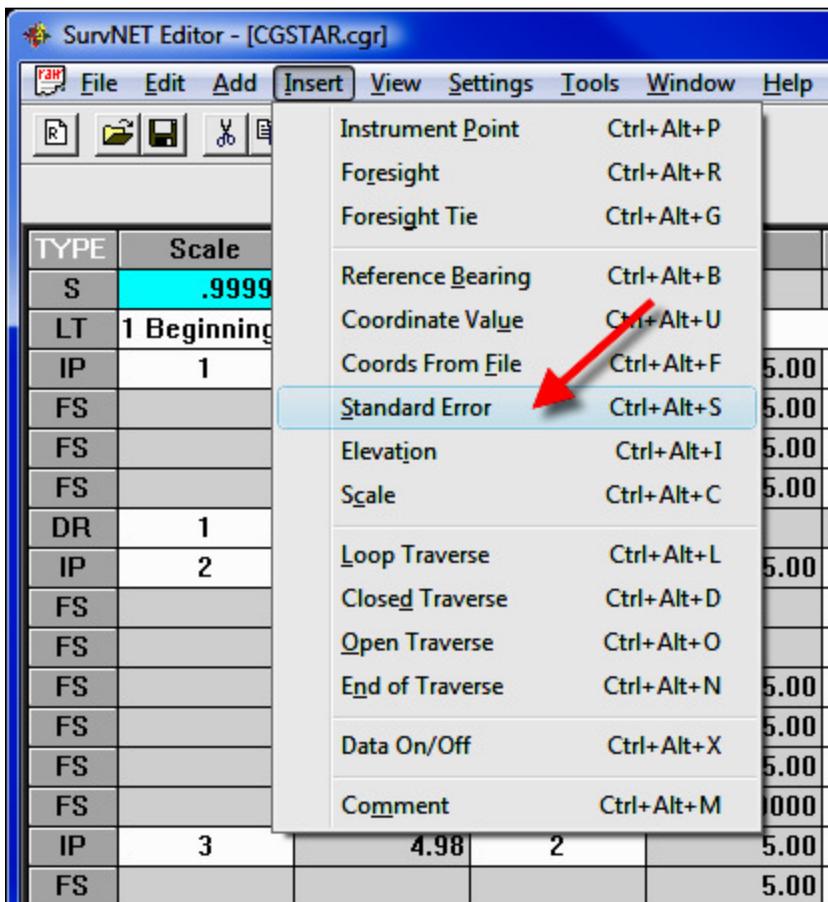
	TargCtr	InstCtr	HI	TargHgt
SSE	0.005	0.005	0.01	0.01

You can enter any combination of the above values. If you do not want to change the standard error for a particular measurement type, leave it blank.

If you use an "*" symbol, it will return the standard error to the project default values.

C&G Raw Data Editor

You can set standard errors for control, measurements and instrument setup using the **Insert > Standard Error** menu option:



This will open a **Standard Errors** dialog box:

The image shows a dialog box titled "Standard Errors" with a blue title bar and a close button (X) in the top right corner. The dialog is divided into three main sections, each with a "Set Project Defaults (*)" button at the bottom.

Control Standard Errors:

- Northing (m):
- Elevation (m):
- Easting (m):
- Azimuth (sec.):
- Buttons: "Set Fixed Point (!)" and "Set Project Defaults (*)"

Measurement Standard Errors:

- Distance (m):
- Vert. Pointing (sec.):
- Horiz. Pointing (sec.):
- Vert. Reading (sec.):
- Horiz. Reading (sec.):
- PPM:
- Button: "Set Project Defaults (*)"

Setup Standard Errors:

- Target Center (m):
- Instrument Height (m):
- Instrument Center (m):
- Target Height (m):
- Button: "Set Project Defaults (*)"

At the bottom of the dialog are "OK" and "Cancel" buttons.

This dialog allows you to create three types of standard error records: **Control**, **Measurement**, and **Setup**. You need only enter the values for the standard errors you wish to set. If a field is left blank no standard error for that value will be inserted into the raw data file.

You can **FIX** the North, East and Elevation by entering a "!" symbol (as shown above). You can allow the North, East and Elevation to **FLOAT** by entering a "#" symbol. You can also assign the North, East and Elevation actual values. (In the 2D/1D model elevation control is ALWAYS fixed.) If you use an "*" symbol (or press the **[Set Project Defaults]** button), the current standard error value will return to the project default values.

In the above example, a **Control Standard Error** record (**SEc**) will be created:

TYPE	Northing	Easting	Elevation	Azim [sec]
SEc	!	!	!	
S	.99996			
LT	1 Beginning of Loop Traverse			
IP	1	5.32	5	5.00
FS				5.00
FS				5.00
FS				5.00

Below are some sample values for control standard errors:

North	East	Elevation	Azim	
!	!	!		(Fix all values)
#	#	#	30.0	(Allow the N., E. & Elevation to Float)
0.01	0.01	0.03	5.0	(assign values)
*	*	*	*	(return the standard errors back to project defaults)

When you fix a measurement, the original value does not change during the adjustment and all other measurements will be adjusted to fit the fixed measurements. If you allow a value to float, it will not be used in the actual adjustment, it will just be used to help calculate the initial coordinate values required for the adjustment process. Placing a very high or low standard error on a measurement accomplishes almost the same thing as setting a standard error as float or fixed. The primary purpose of using a float point is if SurvNET cannot compute preliminary values, a preliminary float value can be computed and entered for the point.

Direction records cannot be **FIXED** or **FLOAT**. You can assign a low standard error (or zero to fix) if you want to weight it heavily, or a high standard error to allow it to float.

MSE - Measurement Standard Errors

You can set the standard errors for distances, horizontal angle pointing, horizontal angle reading, vertical angle pointing, vertical angle reading, and distance constant and PPM.

Distance - distance constant and measurement error, can be obtained from EDM specs, or from performing an EDM calibration on an EDM baseline, or from other testing done by the user.

PPM - Parts per Million, obtain from EDM specs, or from performing an EDM calibration on an EDM baseline, or from other testing done by the user.

Pointing - total station horizontal angular pointing error in seconds. This value is an indication of how accurately the instrument man can point to the target. For example, you may set it higher in the summer because of the heat waves; or you may set it higher for total stations running in Robotic Mode because they cannot point as well as a manual sighted total station.

Reading - total station horizontal angular reading error in seconds. If you have a 10 second theodolite, enter a reading error of 10 seconds.

V. Pointing - total station vertical angular pointing error in seconds. This value is an indication of how accurately the instrument man can point to the target. For example, you may set it higher in the summer because of the heat waves.

V. Reading - total station vertical angular reading error in seconds. If you have a 10 second theodolite, enter a reading error of 10 seconds.

Example:

Standard Errors [X]

Control Standard Errors

Northing (m)	<input type="text"/>	Elevation (m)	<input type="text"/>
Easting (m)	<input type="text"/>	Azimuth (sec.)	<input type="text"/>

Measurement Standard Errors

Distance (m)	<input type="text" value="0.01"/>	Vert. Pointing (sec.)	<input type="text" value="3"/>
Horiz. Pointing (sec.)	<input type="text" value="3"/>	Vert. Reading (sec.)	<input type="text" value="3"/>
Horiz. Reading (sec.)	<input type="text" value="3"/>	PPM	<input type="text" value="5"/>

Setup Standard Errors

Target Center (m)	<input type="text"/>	Instrument Height (m)	<input type="text"/>
Instrument Center (m)	<input type="text"/>	Target Height (m)	<input type="text"/>

You can enter any combination of the above values. If you do not want to change the standard error for a particular measurement type, leave it blank. If you use an "*" symbol, the standard error for that measurement type will return to the project default values.

The following **SEm** record will be created:

SurvNET Editor - [CGSTAR.cgr]

File Edit Add Insert View Settings Tools Window Help

TYPE	Distance	Point (sec)	Read (sec)	V Point (sec)	V Read (sec)	PPM
SEc	!	!	!			
C	43	40952.01400	22184.22540	948.17100		
C	104	41717.10000	22442.26220	976.97000		
SEm	.01	3	3	3	3	5
S	.99996					
LT	1 Beginning of Loop Traverse					
IP	1	5.32	5	5.00	0.00000	290.540
FS				5.00	109.19170	292.310

SSE - Setup Standard Errors

These standard errors are a measure of how accurately the instrument and target can be setup over the points.

Targ Ctr is the Target Centering error. This value reflects how accurately the target prism can be set up over the point.

Inst Ctr is the Instrument Centering error. This value reflects how accurately the instrument can be set up over the point.

HI is the Instrument Height error. This value reflects how accurately the height of the instrument above the mark can be measured.

Targ Hgt is the Target Height error. This value reflects how accurately the height of the prism above the mark can be measured.

Example:

The image shows a 'Standard Errors' dialog box with three main sections:

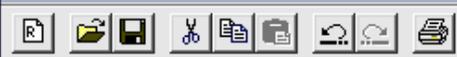
- Control Standard Errors:** Contains input fields for Northing (m), Easting (m), Elevation (m), and Azimuth (sec.). Below these are buttons for 'Set Fixed Point (!)' and 'Set Project Defaults (*)'.
- Measurement Standard Errors:** Contains input fields for Distance (m), Horiz. Pointing (sec.), Horiz. Reading (sec.), Vert. Pointing (sec.), Vert. Reading (sec.), and PPM. Below these is a 'Set Project Defaults (*)' button.
- Setup Standard Errors:** Contains input fields for Target Center (m), Instrument Center (m), Instrument Height (m), and Target Height (m). Below these is a 'Set Project Defaults (*)' button.

At the bottom of the dialog are 'OK' and 'Cancel' buttons.

You can enter any combination of the above values. If you do not want to change the standard error for a particular measurement type, leave it blank.

If you use an "*" symbol, it will return the standard error to the project default values.

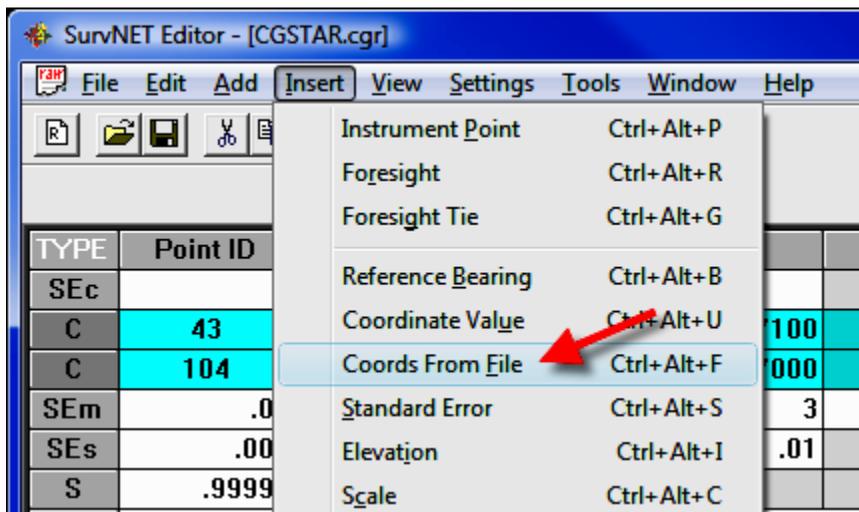
The following **SEs** record will be created:

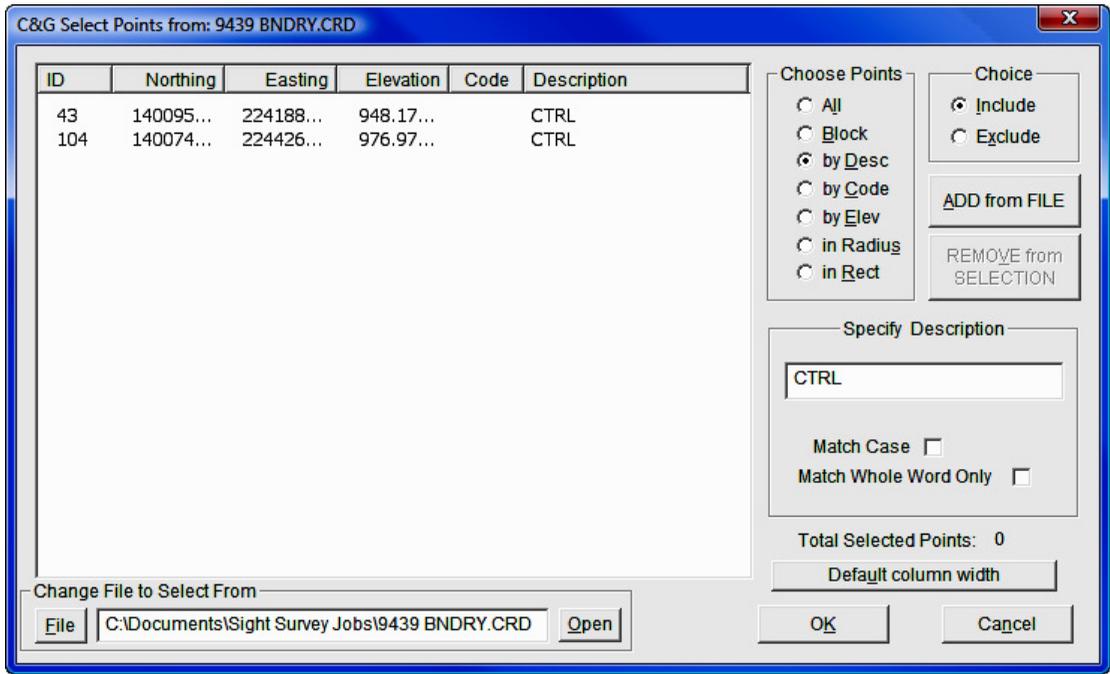
SurvNET Editor - [CGSTAR.cgr]							
File Edit Add Insert View Settings Tools Window Help							
							
TYPE	Targ Ctr	Inst Ctr	HI	Targ Hgt			
SEc	!	!	!				
C	43	40952.01400	22184.22540	948.17100			
C	104	41717.10000	22442.26220	976.97000			
SEm	.01	3	3	3	3	5	
SEs	.005	.005	.01	.01			
S	.99996						
LT	1 Beginning of Loop Traverse						
IP	1	5.32	5	5.00	0.00000	290.540	
FS				5.00	109.19170	292.310	

Other Important Raw Data Editing Features:

There are several other features available in both the Carlson and C&G editors that are useful to SurvNET.

- **Insert Coordinate records from file** - when inputting control into a raw data file, it is more convenient to read the control point directly from a coordinate file than it is to manually key them in. The **Insert Coordinates** function allows you to select points in a variety of manner making it easy to select just control points. For example, you can select points by description, code, point blocks, point number, etc.





- Data ON/OFF records** - when trying track down problems, sometimes it is convenient to remove certain sections of raw data prior to processing. The editors have a special record (**DO** record) that will turn **OFF** or **ON** certain areas of data. For example, when you insert a **DO** record all data following that record will be turned **OFF** (it will be shown in a different color). When you insert another **DO** record further down, the data following it will be turn back **ON**. It is simply a toggle. In the example below, the instrument setup at point 2 back sighting 1 was turned **OFF**.

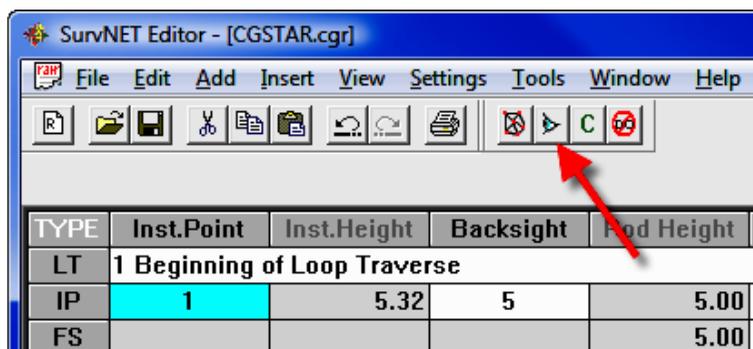
SurvNET Editor - [CGSTAR.cgr]

File Edit Add Insert View Settings Tools Window Help

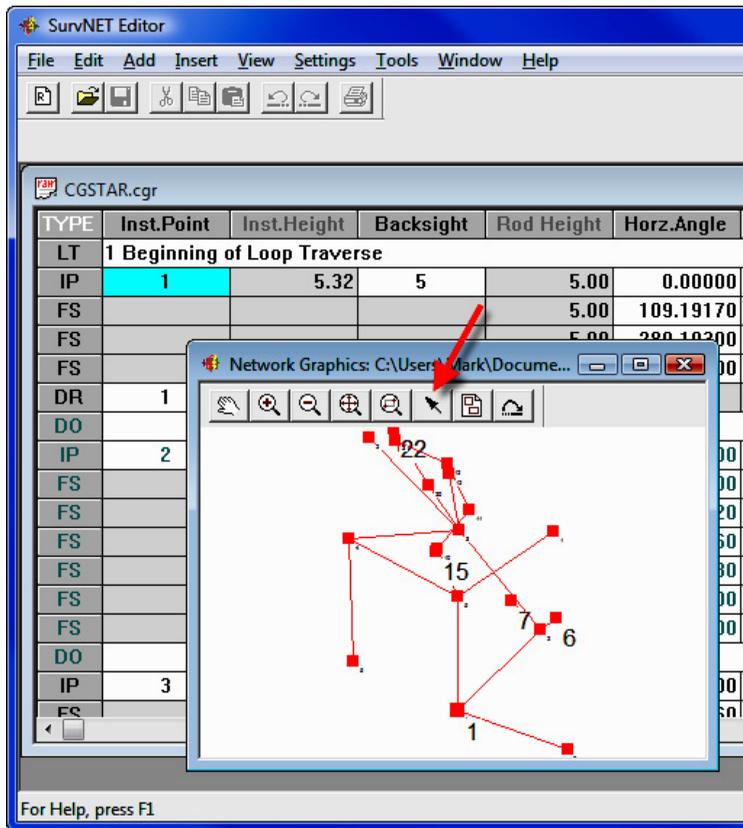
IP FS FT DR S C E LT OT CT ET SE Co DO IP FS FT DR S C E LT OT CT ET SE Co DO

TYPE	Inst.Point	Inst.Height	Backsight	Rod Height	Horz.Angle	Slope Dist.
LT	1 Beginning of Loop Traverse					
IP	1	5.32	5	5.00	0.00000	290.540
FS				5.00	109.19170	292.310
FS				5.00	289.19300	292.310
FS				5.00	180.00200	290.540
DR	1	2	145.00000			
DO						
IP	2	5.20	1	5.00	0.00000	292.310
FS					190.32100	52.390
FS					10.32120	52.390
FS				5.00	96.03560	324.260
FS				5.00	276.03580	324.260
FS				5.00	180.00100	292.310
FS				5.00000	90.00000	100.00000
DO						
IP	3	4.98	2	5.00	0.00000	324.260
FS				5.00	124.03560	275.840

Graphics and the C&G Editor - When using the C&G editor the graphics window can be used to navigate within the raw data. To use this feature initiate the graphics window from the C&G Editor.



Click the graphic **Pick Point** button then pick the desired point in the graphic window. The text editor cursor should move to the next record that contains that point number.

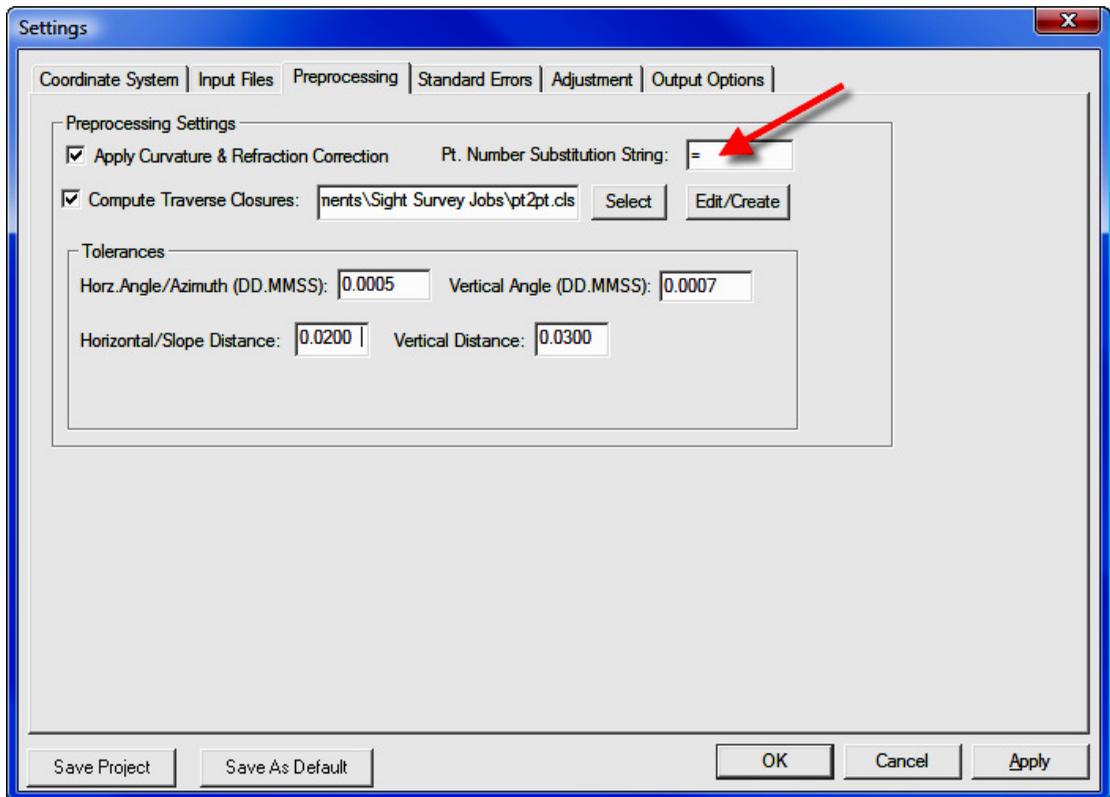


If there is more than one point number within the search radius a dialog box is displayed so that the desired point can be chosen.

Redundant Measurements

One of the benefits of least squares is the ability to process redundant measurements. In terms of total station data, redundant measurement is defined as measuring angles and/or distances to the same point from two or more different setups.

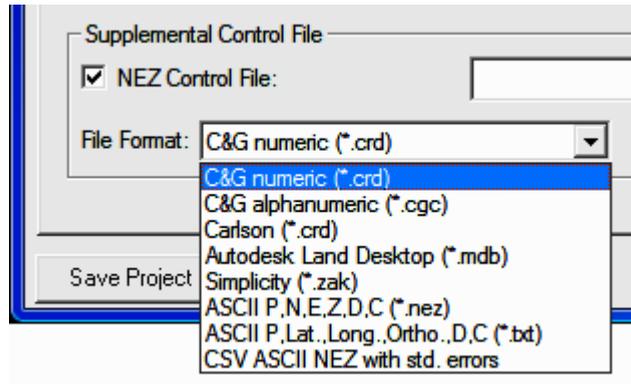
It is required that the same point number be used when locating a point that was previously recorded. However, since some data collectors will not allow you to use the same point number if the point already exists, the following convention for collecting redundant points while collecting the data in the field is used. If you begin the point description with a user defined string, for example a "=" (equal sign) followed by the original point number, that measurement will be treated as a redundant measurement to the point defined in the description field. The user defined character or string is set in the project settings dialog. For example, if point number 56 has the description "=12", we will treat point number 56 as a shot to point number 12, not point 56. Make sure the **Settings > Project Settings > Preprocessing Settings** dialog box has the **Pt. Number Substitution String** set to the appropriate value.



Alternately, the point numbers can be edited after the raw data has been downloaded from the data collector.

Supplemental Control Files

Select **Settings > Project Settings > Input Files** to set **Supplemental Control Files**.



In order to process a raw data file, you must have as a minimum a control point and a control azimuth, or two control points. Control points can be inserted into the raw data file or alternately control points can be read from coordinate files. Control points can be read from a variety of coordinate file types:

- C&G or Carlson numeric (.CRD) files
- C&G Alphanumeric coordinate files (*.cgc)
- Carlson Alphanumeric coordinate files (*.crd)
- Autodesk Land Desktop (*.mdb)
- Simplicity coordinate files (*.zak)
- ASCII (.NEZ) file
- ASCII latitude and longitude (3D model only)
- CSV ASCII NEZ with std. errors

ASCII file (.NEZ)

Typically the standard errors for the control points from a supplemental control file will be assigned from the NORTH, and EAST standard errors from the project settings dialog box. The option **CSV ASCII NEZ with std.** is the exception. With this option the standard errors are field within the file.

In the ASCII .NEZ file, the coordinate records need to be in the following format:

```
Pt. No., Northing, Easting, Elevation, Description<cr><lf>  
103, 123233.23491, 238477.28654, 923.456, Mon 56-7B<CR><LF>
```

Each line is terminated with carriage-return **<CR>** and line-feed **<LF>** characters.

ASCII latitude and longitude (3D model only)

In the ASCII latitude and longitude file, the records need to be in the following format:

```
Pt.No., Lat.(NDDD.mmssssss),  
Lon.(WDDD.mmssssss),Elev.(Orthometric), Desc.<cr><lf>  
FRKN, N35.113068642, W083.234174724, 649.27<CR><LF>
```

Each line is terminated with carriage-return **<CR>** and line-feed **<LF>** characters.

CSV ASCII NEZ with std. errors

In the CVS ASCII .NEZ with std. errors file, the coordinate records need to be in the following format: This format is typically created as an output NEZ option. The typical use of this format is if the control for a project was initially created as a project. Then the points from that projects can be used as supplemental control for subsequent projects and the actual standard errors of the control will be used.

```
Pt.No., Northing, Easting, Elevation, Std.Err.N, Std.Err.E,  
Std.Err.Z, Description<cr><lf>  
504, 204015.23528803, 786760.95695104, 876.15662064, 0.002,  
0.003, 0.004, , 1<CR><LF>
```

Each line is terminated with carriage-return **<CR>** and line-feed **<LF>** characters.

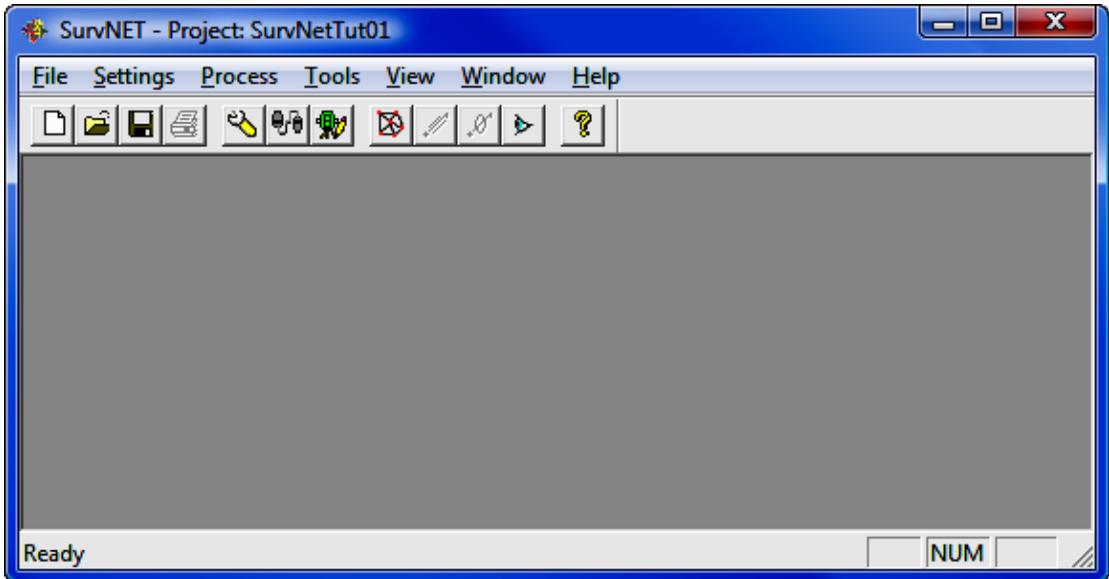
The major advantage of putting coordinate control points in the actual raw data file is that specific standard errors can be assigned to each control point (as described in the RAW DATA section above). If you do not include an SE record the standard error will be assigned from the NORTH, EAST, and ELEVATION standard errors from the project settings dialog box.



WARNING: *The supplemental control file and the final output file should never be the same. Since least squares considers all points to be control points only control points should be in a supplemental control file. If the supplemental control file has coordinate values for points that are not control points then these coordinate values will still be treated as control.*

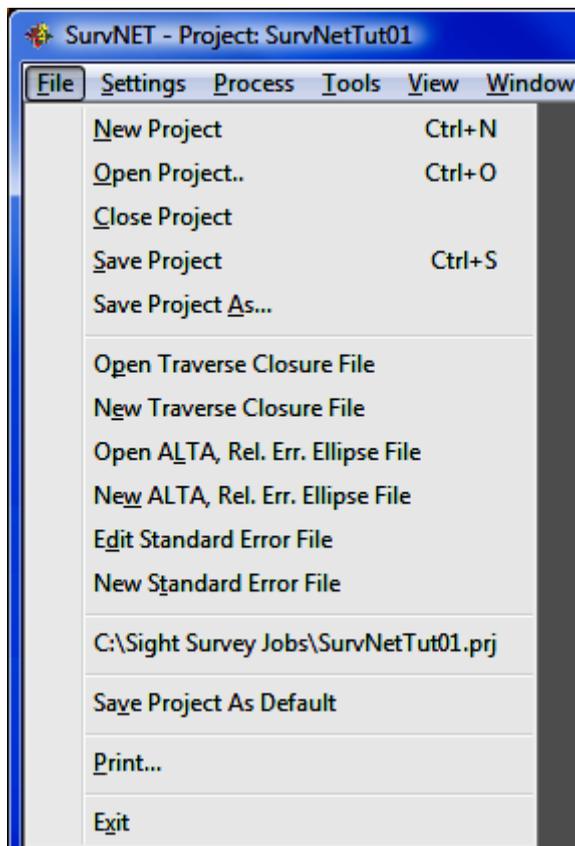
Menus

Most least squares operations are initiated from the main network least squares window.



File

Selecting the **FILE** menu option opens the following menu:

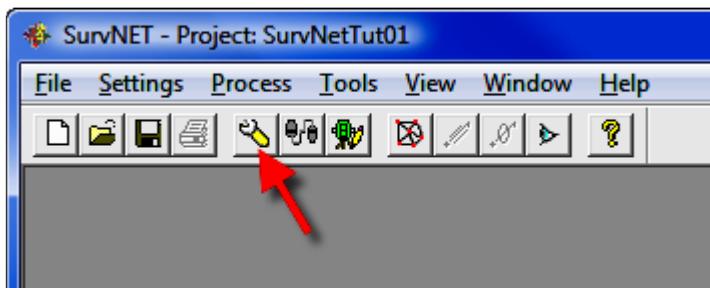


A **Project File (.PRJ)** is created in order to store all the settings and files necessary to reprocess the data making up the project. You can create a **NEW** project, or **OPEN** an existing project. It is necessary to have a project open in order to process the data.

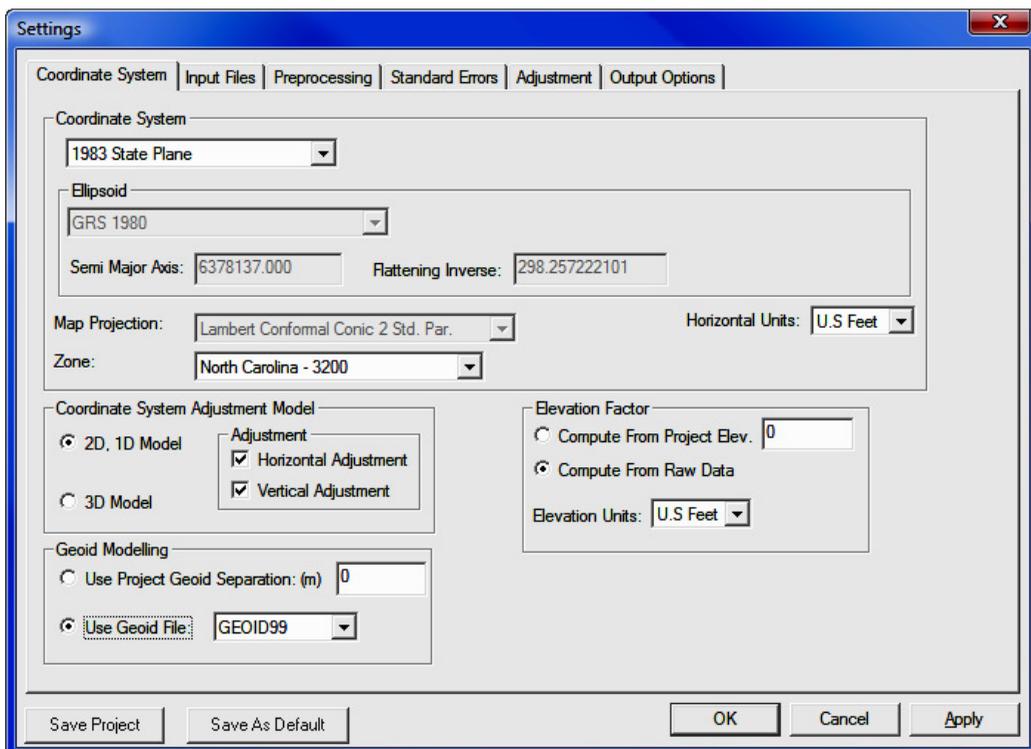
Save Project As Default can be used to create default project settings to be used when creating a new project. The current project settings are saved and will be used as the default settings when any new project is created.

Project Settings

The project settings are set by selecting **Settings > Project Settings** from the menu, or pressing the **SE** icon on the tool bar.



The project settings dialog box has six tabbed windows, **Coordinate System**, **Input Files**, **Preprocessing**, **Adjustment**, **Standard Errors**, and **Output Options**.



Notice that there are two buttons at the lower left of the dialog box. The [**Save Project**] button can be used to store the current settings to the active project. If there is no active project then the user will be prompted for a new project file name. Projects can also be saved using the **File > Save Project** menu option from the main menu. The [**Save as Default**] button can be used to save the current project settings as the default settings whenever a new project is created. Default project settings can also be defined using the **File > Save Project as default** menu option from the main menu.

Coordinate System

The **Coordinate System** tab contains settings that relate to the project coordinate system, output units, the adjustment model and other geodetic settings.

You can select either the 3D model or the 2D/1D mathematical model. If you choose 2D/1D mathematical model you can choose to only perform a horizontal adjustment, a vertical adjustment or both. In the 3D model both horizontal and vertical are adjusted simultaneously. The 3D model requires that you choose a geodetic coordinate system. Local, assumed coordinate systems cannot be used with the 3D model. GPS vectors can only be used when using the 3D model.

If using the 2D/1D mathematical model you can select Local (assumed coordinate system), or a geodetic coordinate system such State Plane NAD83, State Plane NAD27, UTM, or a user-defined coordinate system as the coordinate system. When using the 3D model you cannot use a local system.

Select the **Horizontal Units** for output of coordinate values (Meters, US Feet, or International Feet). In the 3D model both horizontal and vertical units are assumed to be the same. In the 2D/1D model horizontal and vertical units can differ. The **Horizontal Units** setting in this screen refers to the output units. It is permissible to have input units in feet and output units in meters. Input units are set in the **Input Files** tabbed screen.

If you choose SPC 1983, SPC 1927, or UTM, the appropriate zone will need to be chosen. 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.

If using the 2D/1D model and you select a geodetic coordinate system, you have a choice as to how the elevation factor is computed. You can choose to either

enter a project elevation or you can choose to have elevations factors computed for each distance based on computed elevations. In order to use the **Elevation Factor: Compute from Raw Data** all HI's and foresight rod heights must be collected for all points.

If you choose a geodetic coordinate system and are using the 2D/1D model you will want to select **Compute from Project Elevation** if any of your raw data measurements are missing any rod heights or instrument heights. There must be enough information to compute elevations for all points in order to compute elevation factors. For most survey projects it is sufficient to use an approximate elevation, such as can be obtained from a Quad Sheet for the project elevation.

Geoid Modeling

If you are using either the 3D or the 2D/1D adjustment model using SPC 1983 or UTM reduction you must choose a geoid modeling method. A project geoid separation can be entered or the GEOID99 or GEOID03 grid models can be used. The project must fall within the geographic range of the geoid grid files in order to use GEOID99 or GEOID03 models.

Geoid modeling is used as follows. Entering a 0.0 value for the separation is the method to use if you wish to ignore the geoid separation. In the 2D, 1D model it is assumed that elevations entered as control are entered as orthometric heights. Since grid reduction requires the data be reduced to the ellipsoid, the geoid separation is used to compute ellipsoid elevations. The difference between using geoid modeling and not using geoid modeling or using a project geoid separation is insignificant for most surveys of limited extents. In the 3D model it is also assumed that elevations entered as control are orthometric heights. Since the adjustment is performed on the ellipsoid, the geoid separation is used to compute ellipsoid elevations prior to adjustment. After the adjustment is completed the adjusted orthometric elevations will be computed from the adjusted ellipsoid elevations and the computed geoid separation for each point.

Geoid modeling is especially important for projects covering large extents. If you incorporate GPS vector data from an OPUS solution into your project it will be necessary to use geoid modeling, otherwise your results will be poor.

If you choose the GEOID99 or GEOID03 modeling option, geoid separations are computed by interpolation with data points retrieved from geoid separation files. The geoid separation files should be found in the primary the installation directory. Grid files have an extension of .GRD. These files should have been

installed during the installation of SurvNET. These files can be downloaded from the Carlson/C&G website, www.carlsonsw.com, if needed. The geoid files used by SurvNET are not in the same format as the geoid files available from NGS. The geoid files used by SurvNET must come from Carlson/C&G, either installed during installation or downloaded from the Carlson website.

If you choose to enter a project geoid separation the best way to determine a project geoid separation is by using the GEOID03 option of the NGS on-line Geodetic Toolkit. Enter a latitude and longitude of the project midpoint and the program will output a project separation.

Working with User-defined Coordinate Systems

SurvNET allows the creation of user-defined geodetic coordinate systems (UDP). The ability to create user-defined coordinate system allows the user to create geodetic coordinate systems based on projections that are not explicitly supported by SurvNET. A SurvNET user-defined coordinate system consists of an ellipsoid, and a map projection. The ellipsoid can be one of the explicitly supported ellipsoids or a user-defined ellipsoid. The supported map projections are **Transverse Mercator, Lambert Conformal Conic with 1 standard parallel, Lambert Conformal Conic with 2 standard parallels, Oblique Mercator (NGS), and Double Stereographic projection**. User-defined coordinate systems are created, edited, and attached to a project from the **Project Settings: Coordinate System** dialog box. To attach an existing UDP file (.UDP) to a project use the [**Select**] button. To edit an existing .UDP file or create a new .UDP file use the [**Edit**] button.

The User-defined **Oblique Mercator** projection used by SurvNET uses the Oblique Mercator projection formulas published in the NGS document "State Plane Coordinate System of 1983" by James Stem. This implementation of the Oblique Mercator projection uses the convention of the False North and East being the natural origin, as opposed to the origin being the center of the projection.

The following dialog box is used to create the user-defined coordinate system. The ellipsoid needs to be defined and the appropriate map projection and projection parameters need to be entered. The appropriate parameter fields will be displayed depending on the projection type chosen.

User Defined Coordinate System

System Name:

Ellipsoid Settings

Name: a: 1/f:

Projection Settings

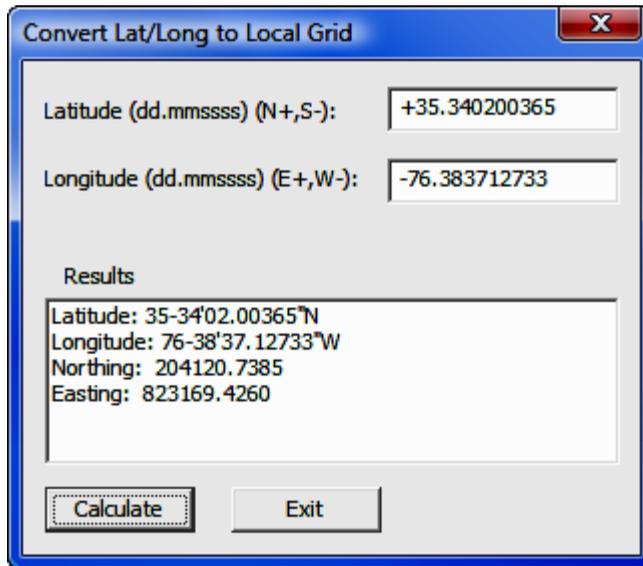
Map Projections:

Grid Origin N.: Grid Origin Latitude (dd.mmss)(N+,S-):

Grid Origin E.: Grid Origin Longitude (dd.mmss)(E+,W-):

North Parallel (dd.mmss)(N+,S-): South Parallel (dd.mmss)(N+,S-):

Test - Use the [**Test**] button to enter a known latitude and longitude position to check that the UDP is computing correct grid coordinates. Following is the test UDP dialog box. Enter the known lat/long in the top portion of the dialog box then press [**Calculate**] and the computed grid coordinates will be displayed in the **Results** list box.



Load -Use the [**Load**] to load the coordinate system parameters from an existing UDP.

Save - Use the [**Save**] button to save the displayed UDP. The [**Save**] button prompts the user to enter the UDP file name.

OK - Use the [**OK**] button to save the UDP using the existing file name and return to the **Coordinate System** dialog box.

Cancel - Use the [**Cancel**] button to return to the **Coordinate System** dialog box without saving any changes to the UDP file.

Ellipsoid Settings: User-Defined Ellipsoid - If you need to define an ellipsoid chose the **User-Defined ellipsoid** option. With the user-defined ellipsoid you will then have the option to enter two of the ellipsoid parameter.

User Defined Coordinate System

System Name:

Ellipsoid Settings

Name: a: 1/f:

Semimajor axis, a: Semiminor axis, b:

Projection Settings

Map Projections:

Grid Origin N.: Grid Origin Latitude (dd.mmss)(N+,S-):

Grid Origin E.: Grid Origin Longitude (dd.mmss)(E+,W-):

North Parallel (dd.mmss)(N+,S-): South Parallel (dd.mmss)(N+,S-):

Raw Data Files: Use the **[Add]** button to insert raw total station files into the list. Use the **[Remove]** button to remove raw files from the list. All the files in this list are included in the least squares adjustments. Having the ability to choose multiple files allows you to keep control in one file and measurements in another file, or different files collected at different times can be processed all at one time. If you have multiple crews working on the same project using different equipment, you can have "crew-specific" raw data files with standard error settings for their particular equipment. Having separate data files is also a convenient method of working with large projects. It is often easier to debug and process individual raw files. Once the individual files are processing correctly all the files can be included for a final adjustment. You can either enter C&G raw files (.CGR) or Carlson files (.RW5) into the list for processing. You cannot have both .CGR and .RW5 files in the same project to be processed at the same time. Notice that you have the ability to highlight multiple files when removing or adding files.

Level Raw Files: Differential and Trig level files can be entered and processed. Differential level raw files have an .LVL extension and are created using the Carlson/C&G level editor. Carlson SurvCE 2.0 or higher allows you to store differential or trig levels in a .TLV file which can also be processed by SurvNET.

GPS Vector Files: GPS vector files can be entered and processed. Both GPS vector files and total station raw files can be combined and processed together. You must have chosen the **3D Mathematical Model** in the **Coordinate System** tab in order to include GPS vectors in the adjustment.

Currently, the following GPS vector file formats are supported.

- Thales: Thales files typically have .obn extensions and are binary files.
- Leica: Leica files are ASCII files.
- StarNet ASCII GPS: See below for more information on StarNet format. These files typically have .GPS extensions.
- Topcon (.tvf): Topcon .tvf files are ASCII files.
- Topcon (.xml): Topcon also can output their GPS vectors in XML format which is in ASCII format.
- Trimble Data Exchange Format (.asc): These files are in ASCII format.
- Trimble data collection (.dc): These files are ASCII.
- LandXML, (*.xml)
- NGS G-File
- NGS G-File from an OPUS report.

The following is a typical vector record in the StarNet ASCII format. GPS vectors typically consist of the "from" and "to" point number, the delta X, delta Y, delta Z values from the "from" and "to" point, with the XYZ deltas being in the geocentric coordinate system. Additionally the variance/covariance values of the delta XYZ's are included in the vector file.

```
G0 'V3 00:34 00130015.SSF
G1 400-401 4725.684625 -1175.976652 1127.564218
G2 1.02174748583350E-007 2.19210810829205E-
007 1.23924502584092E-007
G3 6.06552466633441E-008 -5.58807795027874E-008 -
9.11050726758263E-008
```

The G0 record is a comment. The G1 record includes the "from" and "to" point and the delta X, delta Y, and delta Z in the geocentric coordinate system. The G2 record is the variance of X,Y, and Z. The G3 record contains the covariance of XY, the covariance ZX, and the covariance ZY. Most all GPS vector files contain the same data fields in varying formats.

Use the [**Add**] button to insert GPS vector files into the list. Use the [**Delete**] button to remove GPS vector files from the list. All the files in this list will be used in the least squares adjustments. All the GPS files in the list must be in the same format. If the GPS file format is ASCII you have the option to edit the GPS vector files. The **Edit** option allows the editing of any of the ASCII GPS files using Notepad. Typically, only point numbers would be the fields in a GPS vector file that a user would have need to edit. The variance/covariance values are used to determine the weights that the GPS vectors will receive during the adjustment and are not typically edited.

For a variety of reasons it is common for GPS vector data collected with GPS equipment to have point names that do not match the point names used in the total station data. Generally the easiest way to handle this situation is to first convert the GPS data into the StarNet ASCII format using the **Tools/Convert GPS file to ASCII** menu option. Once the file has been converted to ASCII it is straightforward to change the G1 records using any text editor to reflect the correct point numbers.

Supplemental Control File: The supplemental control file option allows the user to designate an additional coordinate file to be used as control. The supplemental control files can be from a variety of different file types.

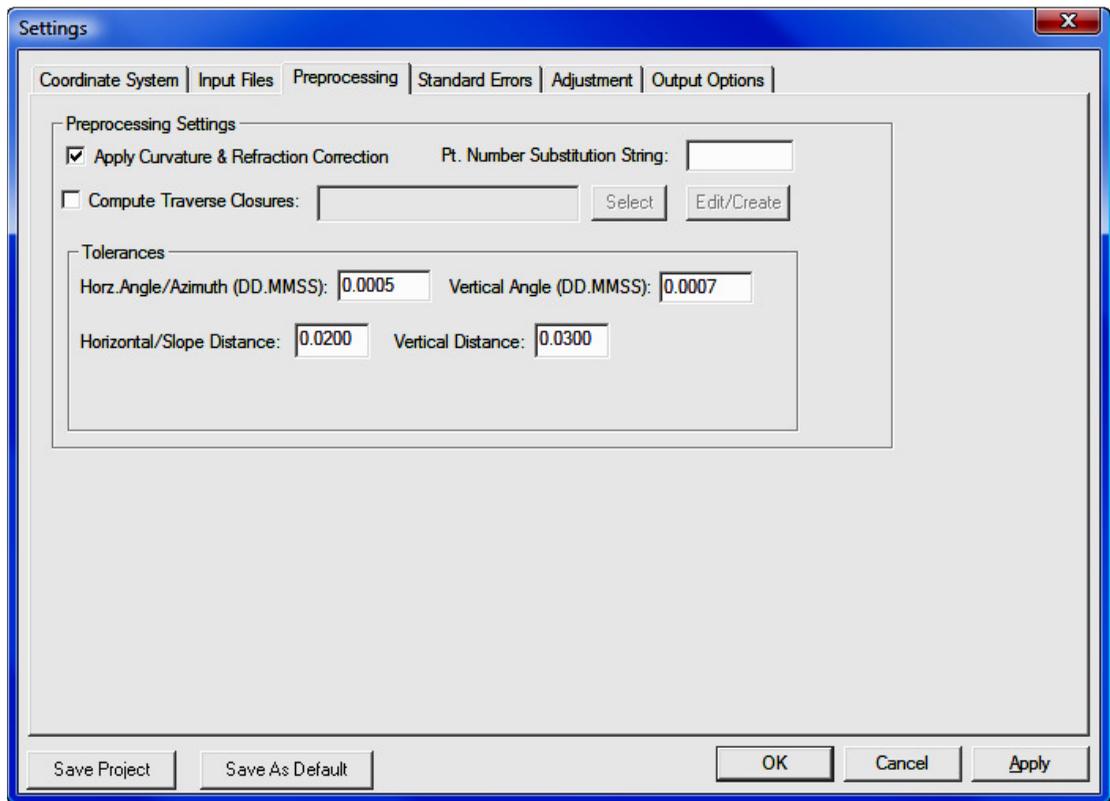
- C&G numeric (*.crd)
- C&G alphanumeric (*.cgc)
- Carlson numeric (*.crd)
- Carlson alphanumeric (*.crd)
- Autodesk Land Desktop (*.mdb)
- Simplicity (*.zak)
- ASCII P,N,E,Z,D,C (*.nez)
- ASCII P,Lat,Long,Ortho,D,C (*.txt)
- CSV ASCII NEZ with std. errors

Note: You should never use the same file for supplemental control points and for final output. Least squares considers all points to be measurements. If the

output file is also used as a supplemental control file then after the project has been processed, all the points in the project would now be in the control file and all the points in the file would now be considered control points if the project was processed again. The simplest and most straight-forward method to define control for a project is to include the control coordinates in a raw data file.

Preprocessing

The **Preprocessing** tab contains settings that are used in the preprocessing of the raw data.



Apply Curvature and Refraction Corrections: Set this toggle if you wish to have the curvature refraction correction applied in the 2D/1D model when reducing the slope distance/vertical angle to horizontal distance and vertical distance. Curvature and refraction primarily impacts vertical distances.

Tolerances: When sets of angles and/or distances are measured to a point, a single averaged value is calculated for use in the least squares adjustment. You may set the tolerances so that a warning is generated if any differences between the angle sets or distances exceed these tolerances. Tolerance warnings will be shown in the report (.RPT) and the (.ERR) file after processing the data.

Horz./Slope Dist Tolerance: This value sets the tolerance threshold for the display of warnings if the difference between highest and lowest horizontal distance exceeds this value. In the 2D model it is the horizontal distances that are being compared. In the 3D model it is the slope distances that are being compared.

Vert. Dist Tolerance: This value sets the tolerance threshold for the display of a warning if the difference between highest and lowest vertical difference component exceeds this value (used in 2D model only).

Horz. Angle Tolerance: This value sets the tolerance threshold for the display of a warning if the difference between the highest and lowest horizontal angle exceeds this value.

Vert. Angle Tolerance: This value sets the tolerance threshold for the display a warning if the difference between the highest and lowest vertical angle exceeds this value (used in 3D model only).

Compute Traverse Closures: Traditional 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. This option is useful for surveyors who due to statutory requirements are still required to compute traditional traverse closures and for those surveyors who still like to view traverse closures prior to the least squares adjustment. This option is used to specify a previously created closure file.

To use this option the user has to first create a traverse closure file. The file contains a .CLS extension. The traverse closure file is a file containing an ordered list of the point numbers comprising the traverse. Since the raw data for SurvNET is not expected to be in any particular order it is required that the user must specify the points and the correct order of the points in the traverse loop. Both GPS loops and angle/distance traverses can be defined in a single traverse closure file. More details on creating the traverse closure files follow in a later section of this manual.

Pt. Number Substitution String: This option is used to automatically renumber point names based on this string. Some data collectors do not allow the user to use the same point number twice during data collection. In least squares it is common to collect measurements to the same point from different locations. If the data collector does not allow the collection of data from different points using the same point number this option can be used to automatically renumber these points during processing. For example you could enter "=" in the **Pt. Number Substitution String**. Then if you shot point 1 but had to call it something else such as 101 you could enter "=1" in the description field and during preprocessing point 101 would be renumbered as point 1. With small projects it may be just as easy to edit the raw data.

Adjustment

Settings

Coordinate System | Input Files | Preprocessing | Standard Errors | **Adjustment** | Output Options

Least Squares Adjustment Options

Maximum Iterations: Convergence Threshold:

Confidence Interval: % (50 <= CI <= 99.99)

Relative Error Ellipses

Enable sideshots for relative error ellipses

Rel. Err. Points File:

Include ALTA tolerance report

Allowable Tolerance: PPM:

Save Project | Save As Default |

Maximum Iterations: Non-linear least squares is an iterative process. The user must define the maximum number of iterations to make before the program quits trying to find a converging solution. Typically if there are no blunders in the data the solution will converge in 2-5 iterations.

Convergence Threshold: During each iteration corrections are computed. When the corrections are less than the threshold value the solution has converged. This value should be somewhat less than the accuracy of the measurements. For example, if you can only measure distances to the nearest .01' then a reasonable convergence threshold value would be .005'.

Confidence Interval: This setting is used when calculating the size of error ellipses, and in the chi-square testing. For example, a 95% confidence interval means that there is a 95% chance that the error is within the tolerances shown.

Enable sideshots for relative error ellipses: Check this box if you want to see the error ellipses and relative error ellipses of sideshots. This checkbox must be set if you want to use the **relative error ellipse inverse** function with sideshots. When turned off this toggle filters out sideshots during the least squares processing. Since the sideshots are excluded from the least squares processing error ellipses cannot be computed for these points. When this toggle is off, the sideshots are computed after the network has been adjusted. The final coordinate values of the sideshots will be the same regardless of this setting.

Large numbers of sideshots slow down least squares processing. It is best to uncheck this box while debugging your project to avoid having to wait for the computer to finish processing. After the project processes correctly you may turn on the option for the final processing.

Relative Err. Points File: The new ALTA standards require that surveyors certify to the relative positional error between points. Relative error ellipses are an accepted method of determining the relative positional error required by ALTA standards. The points that are to be included in the relative error checking are specified by the user. These points are defined in an ASCII file with an extension of .ALT. To select an .alt file for relative error checking use the [**Select**] button and then browse to the file's location.

Include ALTA tolerance report: Turn this toggle on if you wish to include the ALTA tolerance section of the report.

Allowable Tolerance, PPM: These fields allow the user to set the allowable error for computations. Typically the user would enter the current ALTA error standards, i.e. 0.07' & 50 PPM.

See the **ALTA** section later in this manual for more detailed information on creating and interpreting the ALTA section of the report.

Standard Errors

Standard errors are the expected measurement errors based on the type equipment and field procedures being used. For example, if you are using a 5 second total station, you would expect the angles to be measured within +/- 5 seconds (Reading error).

Settings

Coordinate System | Input Files | Preprocessing | Standard Errors | Adjustment | Output Options

Distance Standard Error
Constant: 0.005
ppm: 2

Angle Standard Error (Secs.)
Horiz. Pointing: 3 Reading: 3
Vertical Pointing: 3 Reading: 3

Std. Err. Definition File
Load
Save As..

Total Station and Total Station Target Standard Errors
Target Centering: 0.005 Instr. Centering: 0.005 Target Hght.: 0.01 Instr. Hght.: 0.01

Control Standard Errors
Direction (Azimuth) Standard Error
Direction (Secs.): 5
Coordinate Standard Errors
North: 0.001 East: 0.001 Elev.: 0.02

Differential Leveling Standard Errors
Avg. Dist. to BS/FS: 100 Rod Reading Error per 100 ft./m.: 0.001 Collimation Error (sec.): 3

GPS Standard Errors
Instrument Centering: 0 Vector Std. Err. Factor: 1

Save Project Save As Default OK Cancel Apply

The **Distance Constant**, **PPM** settings, and **Angle Reading** should be based on the equipment and field procedures being used. These values can be obtained

from the published specifications for the total station, or the distance PPM and constant can be computed for a specific EDM by performing an EDM calibration using an EDM calibration baseline.

Survey methods should also be taken into account when setting standard errors. For example, 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.

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 section on raw data files).

If the report generated when you process the data 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). Failing the chi-square test consistently is also an indication that the selected standard errors are not consistent with the field measurements.

You can set the standard errors for the following:

Distance and Angle Standard Errors

Distance Constant: Constant portion of the distance error. This value can be obtained from published EDM specifications, or from an EDM calibration.

Distance PPM: Parts per million component of the distance error. This value can be obtained from published EDM specification, or from an EDM calibration.

Horizontal Angle Pointing: The horizontal angle pointing error is influenced by atmospheric conditions, optics, experience and care taken by instrument operator.

Horizontal Angle Reading: Precision of horizontal angle measurements, obtain from theodolite specs.

Vertical Angle Pointing: The vertical angle pointing error is influenced by atmospheric conditions, optics, experience and care taken by instrument operator.

Vertical Angle Reading: Precision of vertical angle measurements, obtain from theodolite specs.

Instrument and Target Standard Errors

Target Centering: This value is the expected amount of error in setting the target or prism over the point.

Instrument Centering: The expected amount of error in setting the total station over the point.

Target Height: The expected amount of error in measuring the height of the target.

Instrument Height: The expected amount of error in measuring the height of the total station.

Control Standard Errors

Direction (Bearing / Azimuth): The estimated amount of error in the bearing/azimuth (direction) found in the azimuth records of the raw data.

North, East, Elev: The estimated amount of error in the control north, east and elev. You may want to have different coordinate standard errors for different methods of obtaining control. Control derived from RTK GPS would be higher than control derived from GPS static measurements.

GPS Standard Errors

Instrument Centering: This option is used to specify the error associated with centering a GPS receiver over a point.

Vector Standard Error Factor: This option is used as a factor to increase GPS vector standard errors as found in the input GPS vector file. Some people think that the GPS vector variances/covariances as found in GPS vector files tend to be overly optimistic. This factor allows the user to globally increase the GPS vector standard errors without having to edit the GPS vector file. A factor of 0 should be the default value and results in no change to the GPS vector standard errors as found in the GPS vector file. The maximum value allowed is 10.

Differential Leveling Standard Errors

These settings only effect level data and are not used when processing total station or GPS vector files.

Avg, Dist. To BS/FS: This option is used to define the average distance to the backsight and foresight during leveling.

Rod Reading Error per 100 ft./m: This option is used to define the expected level reading error.

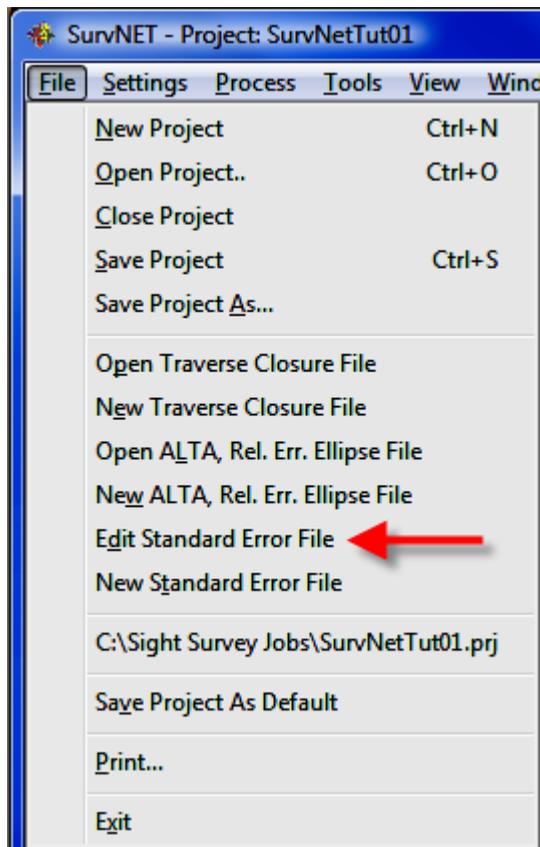
Collimation Error: This is the expected differential leveling collimation error in seconds.

Standard Error Definition Files

The **Standard Error** settings can be saved and then later reloaded into an existing or new project. Creating libraries of standard errors for different types of survey equipment or survey procedures is a convenient method of creating standards within a survey department using a variety of equipment and performing different types of surveys. Standard error library files, *.SEF files, can be created two ways. From the **Settings/Standard Errors** dialog box the [**Load**] button can be used to import an existing .SEF file into the current project. A .SEF file can also be created from the existing project standard errors by using the [**Save As**] button.

Standard Errors			
Angle Standard Error (Secs.)			
Horiz. Pointing:	<input type="text" value="10"/>	Reading:	<input type="text" value="3"/>
Vertical Pointing:	<input type="text" value="3"/>	Reading:	<input type="text" value="3"/>
Std. Err. Definition File		Load	
		Save As..	

Standard error files (.SEF) can also be managed from the main **Files** menu. Use the **Edit Standard Error File** menu option to edit an existing standard error file. Use the **New Standard Error File** option to create a new standard error file.



After choosing one of the menu options and choosing the file to edit or create, the following dialog box will be shown. Set the desired standard errors and press the **[OK]** button to save the standard error file.

Standard Errors: C:\Users\Mark\Documents\Sight Survey Jobs\sn1.sef

Distance Standard Error
Constant: 0.005
ppm: 2

Angle Standard Error (seconds)
Horiz. Pointing: 10 Reading: 3
Vertical Pointing: 3 Reading: 3

Total Station and Total Station Target Standard Errors
Target Centering: 0.01 Instr. Centering: 0.005 Target Hght.: 0.01 Instr. Hght: 0.005

Control Standard Errors
Direction (Azimuth) Standard Error
Direction (sec.): 5

Coordinate Standard Errors
North: 0.001 East: 0.001 Elev.: 0.02

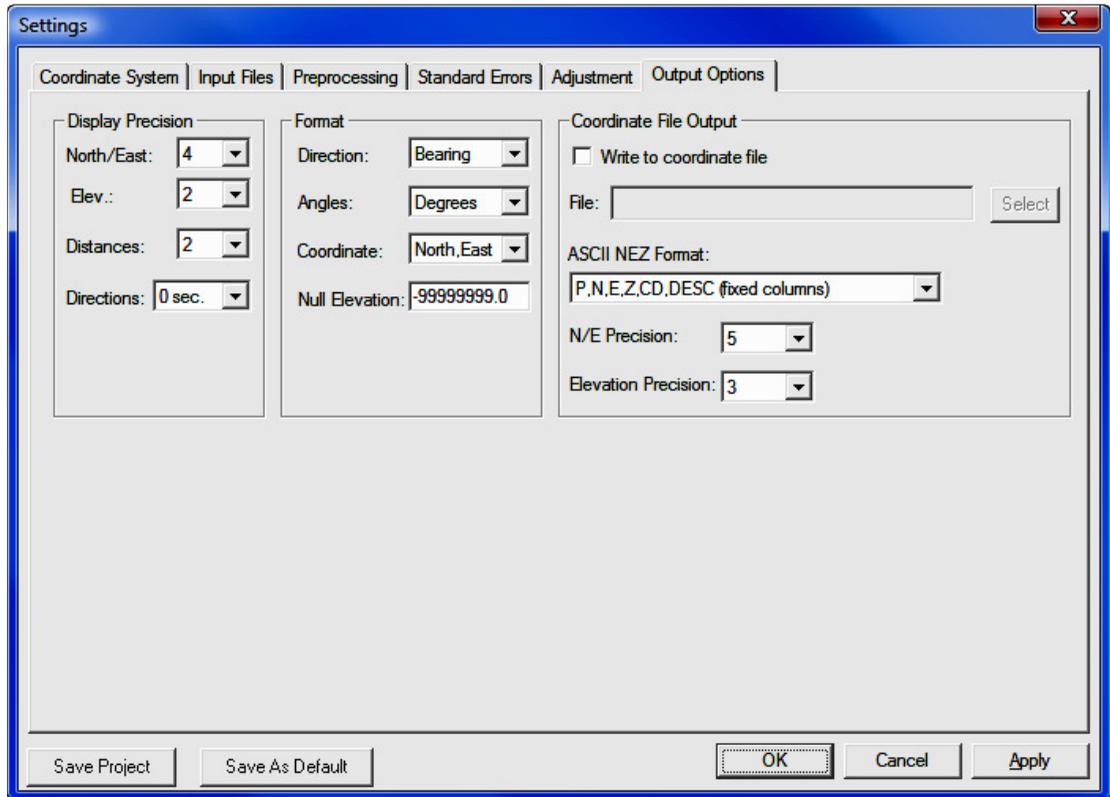
Differential Leveling Standard Errors
Avg. Dist. to BS/FS: 100 Rod Reading Error per 100 ft./m.: 0.001 Collimation Error (sec.): 3

GPS Standard Errors
Instrument Centering: 0 Vector Std. Err. Factor: 1

OK Cancel

Output Options

These settings apply to the output of data to the report and coordinate files.



Display Precision

These settings determine the number of decimal places to display in the reports for the following types of data. The display precision has no effect on any computations, only the display of the reports.

Coordinates (North, East, Elevation) - Chose 0-4 decimal places.

Distances - Chose 0-4 decimal places

Directions (Azimuths or Bearings) - nearest second, tenth of second, or hundredth of second.

Format

These settings determine the format for the following types of data.

Direction - Choose either bearings or azimuth for direction display. If the angle units are degrees, bearings are entered as **QDD.MMSSss** and azimuths are entered as **DDD.MMSSss**. If the angle units are grads, bearings are input as **QGGG.ggggg** and azimuths are input as **GGG.ggggg**.

Coordinate Display - Choose the order of coordinate display, either north-east or east-north.

Null Elevation - Choose the value for null elevations in the output ASCII coordinate NEZ file. The Null Elevation field defaults to SurvNET's value for **NO ELEVATION**, of -999999999.0 .

Angle Display - Choose the units you are working it: **degrees**; or **gradians**.

Coordinate File Output

These settings determine the type and format of the output NEZ file. An ASCII .NEZ and .OUT files are always created after processing the raw data. The .OUT file will be a nicely formatted version of the .NEZ file suitable for printing. The .NEZ file will be an ASCII file suitable to be input into other programs. There are a variety of options for the format of the .NEZ file. Following are the different ASCII file output options.

- P,N,E,Z,CD,DESC (fixed columns); - Point,north,east,elev.,code,desc in fixed columns separated by commas.
- P,N,E,Z,CD,DESC; Point,north,east,elev.,code,desc separated by commas.
- P N E Z CD DESC (fixed columns); Point,north,east,elev.,code,desc in fixed columns with no commas.
- P N E Z CD DESC; Point,north,east,elev.,code,desc in fixed columns with no commas.
- P,N,E,Z,DESC (fixed columns); Point,north,east,elev., desc in fixed columns separated by commas.
- P,N,E,Z,DESC; Point,north,east,elev., desc separated by commas.

- P N E Z DESC (fixed columns); Point,north,east,elev., desc in fixed columns with no commas.
- P N E Z DESC; Point,north,east,elev.,code,desc separated by spaces.
- P,E,N,Z,CD,DESC (fixed columns); - Point,east,north,elev.,code,desc in fixed columns separated by commas.
- P,E,N,Z,CD,DESC; Point,east,north,elev.,code,desc separated by commas.
- P E N Z CD DESC (fixed columns); Point,east,north,elev.,code,desc in fixed columns with no commas.
- P E N Z CD DESC; Point,east,north,elev.,code,desc in fixed columns with no commas.
- P,E,N,Z,DESC (fixed columns); Point,east,north,elev., desc in fixed columns separated by commas.
- P,E,N,Z,DESC; Point,east,north,elev., desc separated by commas.
- P E N Z DESC (fixed columns); Point,east,,northelev., desc in fixed columns with no commas.
- P E N Z DESC; Point,east,north,elev.,code,desc separated by spaces.
- CSV ASCII with std. errors (This format is useful as it can be used as a supplemental control input file type option, where the coordinate standard errors output for one project can be used as input for another project.)

You can also set the output precision of the coordinates for the ASCII output file. This setting only applies to ASCII files, not to the C&G or Carlson binary coordinate files which are stored to full double precision.

N/E Precision: number of places after the decimal to use for North and East values (0 -> 8) in the output NEZ ASCII file.

Elevation Precision: number of places after the decimal to use for Elevation values (0 -> 8) in the output NEZ ASCII file.

If you want to write the calculated coordinates directly to a coordinate file, check the **Write to Carlson/C&G .CRD file** box and select the file. You can choose the type of Carlson/C&G file to be created when you select the file to be created. You may wish to leave this box unchecked until you are satisfied with the adjustment. Following are the different available coordinate output file options.

- C&G Numeric (.crd)
- C&G Alphanumeric (.cgc)
- Carlson Numeric (.crd)
- Carlson Alphanumeric (.crd)
- Autodesk Land Desktop (.mdb)
- Simplicity (.zak)

NOTE: If coordinate points already exist in the CRD file, before a point is written, you will be shown the NEW value, the OLD value, and given the following option:

WARNING: POINT WILL BE OVERWRITTEN !

Point ID

	Current Values	New Values	Delta Values
Northing	<input type="text" value="7036366.97"/>	<input type="text" value="7036366.97"/>	<input type="text" value="0.00"/>
Easting	<input type="text" value="3547556.76"/>	<input type="text" value="3547556.76"/>	<input type="text" value="0.00"/>
Elevation	<input type="text" value="100.00"/>	<input type="text" value="100.00"/>	<input type="text" value="0.00"/>
Code	<input type="text"/>	<input type="text"/>	
Description	<input type="text" value="pk nail"/>	<input type="text" value="pk nail"/>	

Do Not Ask Again
(During Current Operation)

Cancel: Cancel the present operation. No more points will be written to the Carson/C&G file.

Overwrite: Overwrite the existing point. Notice that if you check the **Do Not Ask Again** box all further duplicate points will be overwritten without prompting.

Do not Overwrite: The existing point will not be overwritten. Notice that if you check the **Do Not Ask Again** box all further duplicate points will automatically not be overwritten and only new points will be written.

Process

When you select **Process > Network Adjustment** from the menu, or select the **NETWORK** icon on the tool bar, the raw data will be processed and adjusted using least squares based on the project settings. If there is a problem with the reduction, you will be shown error messages that will help you track down the problem. Additionally an .err file is created that will log and display error and warning messages.

The data is first preprocessed to calculate averaged angles and distances for sets of angles and multiple distances. 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.

Non-linear network least squares solutions require that initial approximations of all the coordinates be known before the least squares processing can be performed. During the preprocessing approximate coordinate values for each point are calculated using basic coordinate geometry functions. If there is inadequate control or odd geometric situations SurvNET may generate a message indicating that the initial coordinate approximations could not be computed. The most common cause of this problem is that control has not been adequately defined or there are point number problems.

Side Shots are separated from the raw data and computed after the adjustment (unless the **Enable sideshots for relative error ellipses** toggle is checked in the adjustment dialog box). If side shots are filtered out of the least squares process and processed after the network is adjusted, processing is greatly speeded up, especially for a large project with a lot of side shots.

If the raw data processes completely, a report file, .RPT, a .NEZ file, an .OUT file, and an .ERR file will be created in the project directory. The file names will consist of the project name plus the above file extensions. These different files are

shown in separate windows after processing. Additionally a graphic window of the network is displayed.

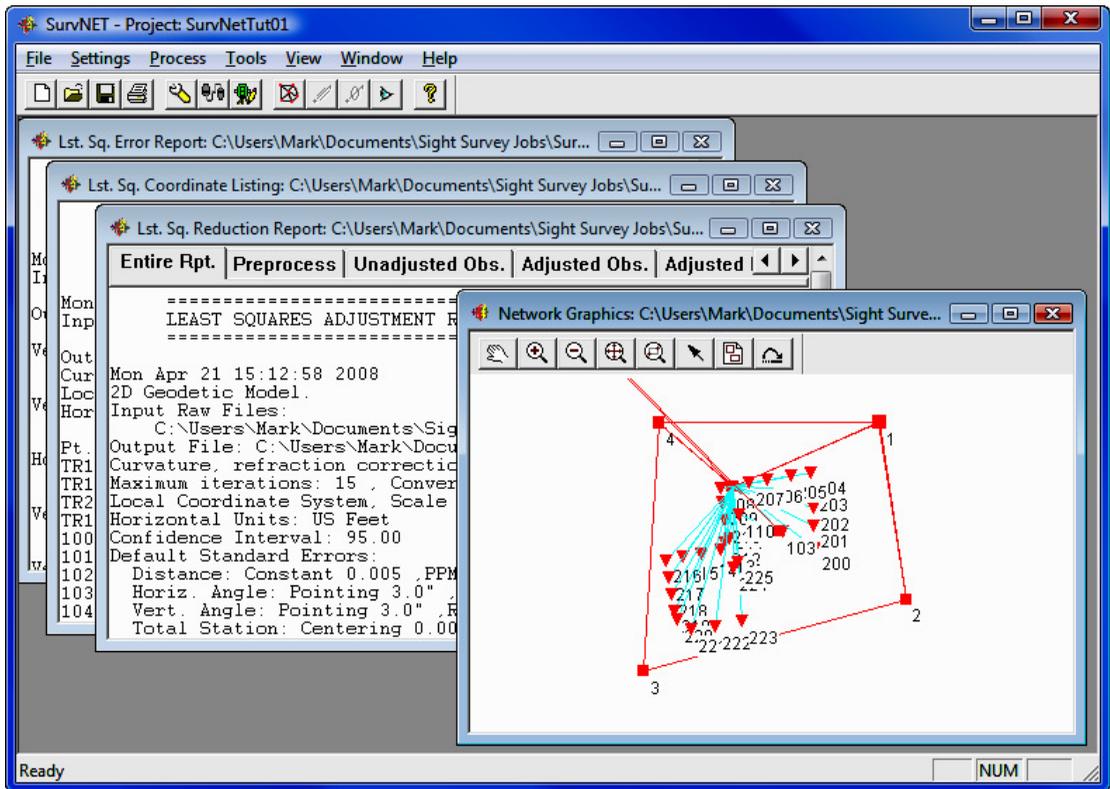
.RPT file: This is an ASCII file that contains the statistical and computational results of the least squares processing.

.NEZ file: This file is an ASCII file containing the final adjusted coordinates. This file can be imported into any program that can read ASCII coordinate files. The format of the file is determined by the setting in the project settings dialog box.

.OUT file: The .OUT file is a formatted ASCII file of the final adjusted coordinates suitable for display or printing

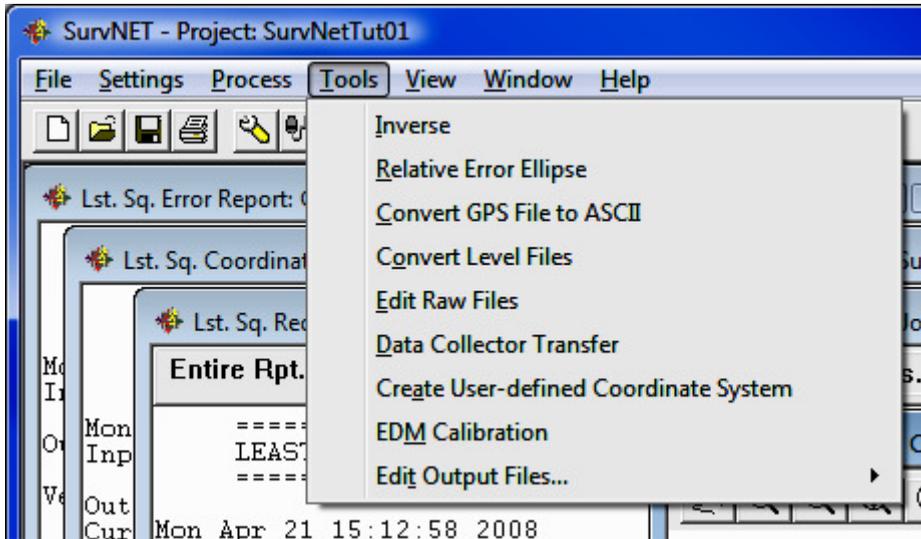
.ERR file: The .ERR file contains any warning or error messages that were generated during processing. Though some warning messages may be innocuous it is always prudent to review and understand the meaning of the messages.

The following is a graphic of the different windows displayed after processing. Notice that with the report file you can navigate to different sections of the report using the tabs at the top of the window.



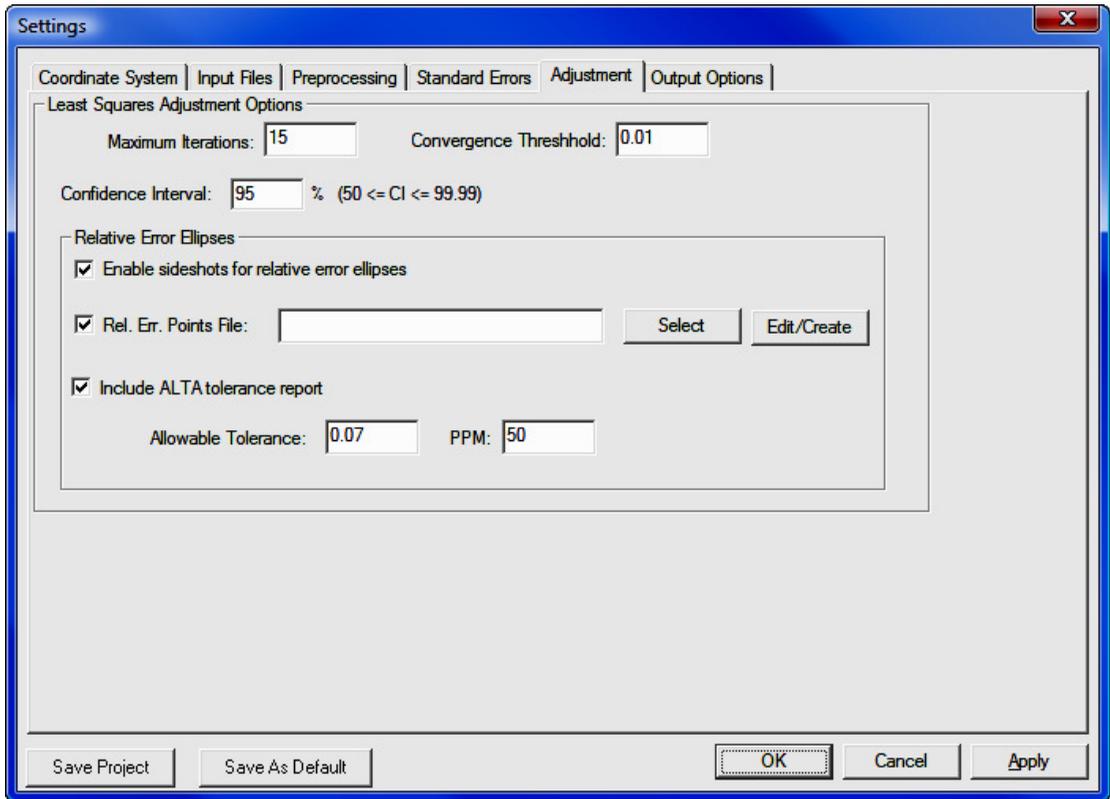
If you have **Write to Carlson/C&G.CRD** checked in the output options dialog, the coordinates will also be written to a .CRD file.

Analysis Tools



Inverse Button - The **Inverse** button is found on the main window (the button with the icon that shows a line with points at each end). You can also select the **Tools > Inverse** menu option. This feature is only active after a network has been processed successfully. This option 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.

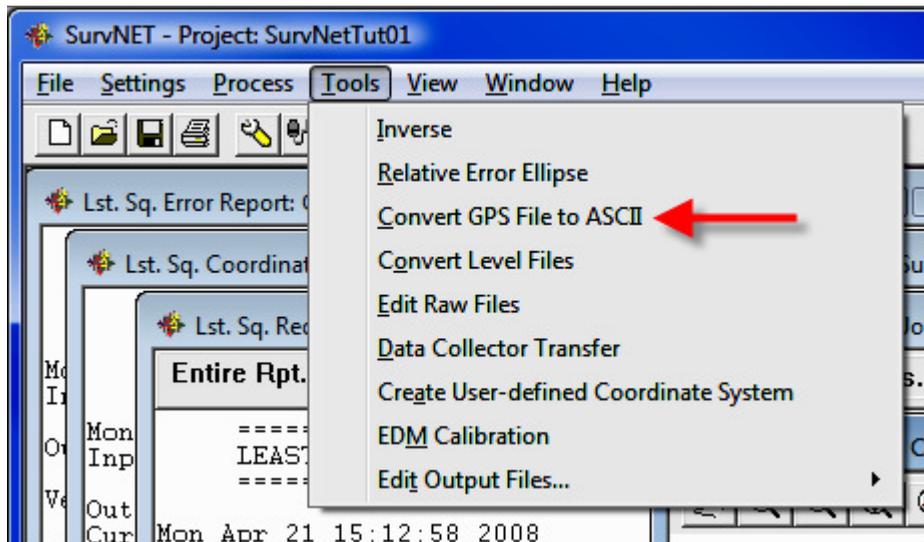
The **Relative Error Ellipse Inverse** button is found on the main window (the button with the icon that shows a line with an ellipse in the middle). You can also select the **Tools > Relative Error Ellipse** menu option. This feature is only active after a network has been processed successfully. This option can be used to obtain the relative error ellipse between two points. It shows the semi-major and semi-minor axis and the azimuth of the error ellipse, computed to a user-defined confidence interval. This information can also be used to determine the relative precision between any two points in the network. It is the relative error ellipse calculation that is the basis for the ALTA tolerance reporting. If the **Enable sideshots for relative error ellipses** toggle is checked, all points in the project can be used to compute relative error ellipses. The trade-off is that processing time will be increased with large projects.



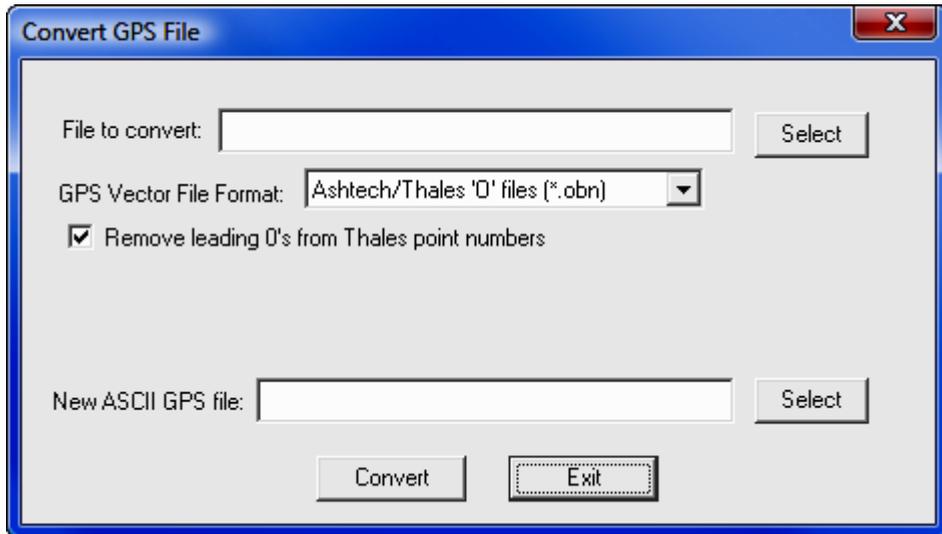
If you need to certify as to the **Positional Tolerances** of your monuments as per the ALTA Standards, use the **Relative Error Ellipse Inverse** routine to determine these values, or use the specific ALTA tolerance reporting function as explained later in the manual.

For example, suppose you must certify that all monuments have a positional tolerance of no more than 0.07 feet with 50 PPM at a 95 percent confidence interval. First set the confidence interval to 95 percent in the **Settings/ Adjustment** screen, then process the raw data. Now you may inverse between points in as many combinations as you deem necessary and make note of the semi-major axis error values. If none of them are larger than 0.07 feet + (50PPM*distance), you have met the standards. It is however more convenient to create a **Relative Error Points File** containing the points you wish to check and include the ALTA tolerance report. This report takes into account the PPM and directly tells you if the positional tolerance between the selected points meets the ALTA standards.

Convert GPS File to ASCII



The purpose of this option is to convert GPS vector files that are in the manufacturers' binary or ASCII format into the StarNet ASCII file format. The advantage of creating an ASCII file is that the ASCII file can be edited using a standard text editor. Being able to edit the vector file may be necessary in order to edit point numbers so that the point numbers in the GPS file match the point numbers in the total station file. The following dialog box is displayed after choosing this option.



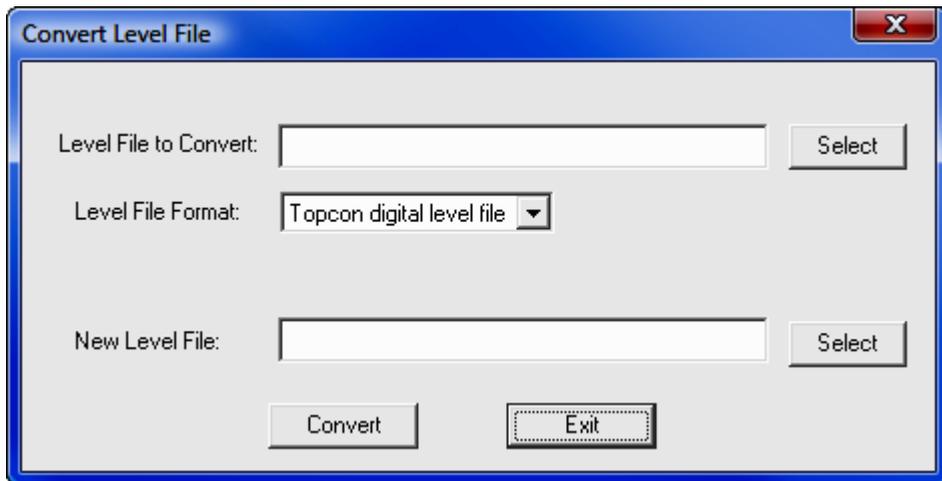
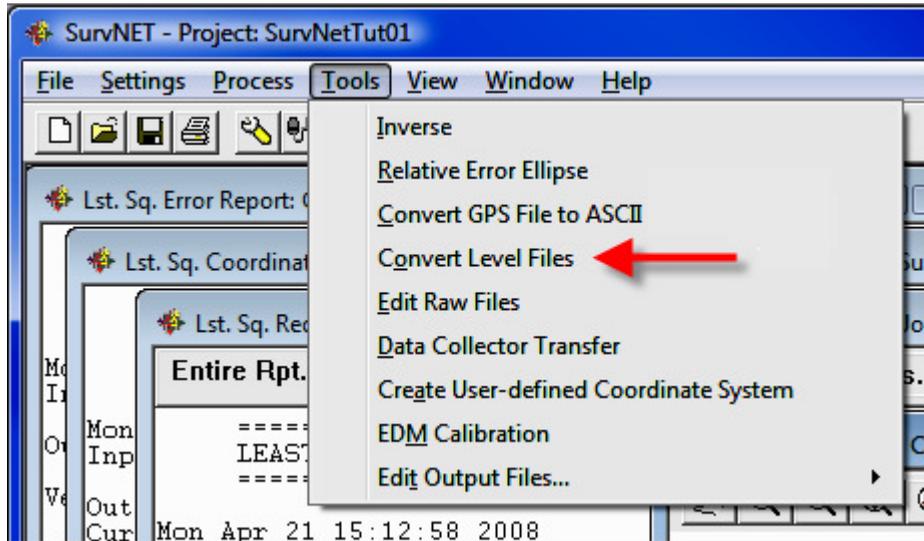
First choose the file format of the GPS vector file to be converted. Next use the [**Select**] button to navigate to the vector file to be converted. If you are converting a Thales file you have the option to remove the leading 0's from Thales point numbers. Next, use the second [**Select**] button to select the name of the new ASCII GPS vector file to be created. Choose the [**Convert**] button to initiate the file conversion. Press the [**Cancel**] button when you have completed the conversions. The file created will have an extension of .GPS. Following are the different GPS formats that can be converted to ASCII.

- **Thales:** The Thales GPS vector file is a binary file and is sometimes referred to as an 'O' file. Notice that you have the option to remove the leading 0's from Thales point numbers, by checking the **Remove leading 0's from Thales point numbers** check box.
- **Leica:** The Leica vector file is an ASCII format typically created with the Leica SKI software. This format is created by Leica when baseline vectors are required for input into 3rd party adjustment software such as SurvNET. The SKI ASCII Baseline Vector format is an extension of the SKI ASCII Point Coordinate format.
- **Topcon (.TVF):** The Topcon Vector File is in ASCII format and typically has an extension of .TVF

- **Topcon (.XML):** The Topcon XML file is an ASCII file that contains the GPS vectors in an XML format. This format is not equivalent to LandXML format.
- **Trimble Data Exchange Format (.ASC):** The Trimble TDEF format is an ASCII file typically output by Trimble's office software as a means to output GPS vectors for use by 3rd party software.
- **Trimble Data Collection (.dc):** The Trimble .dc format is an ASCII file typically output by Trimble's data collector. It contains a variety of measurements including GPS vectors. This option only converts GPS vectors found in the .DC file.
- **LandXML (.XML):** The landXML format is an industry standard format. Currently SurvNET will only import LandXML survey point records. The conversion does not currently import LandXML vectors.
- **NGS G-File:** The NGS G-File is the format used National Geodetic Survey in their processing software.
- **NGS G-File from an OPUS report:** Every OPUS report contains a G-File section. The vectors making up this G-file are the vectors from the control points to the computed point making up the OPUS solution. These OPUS vectors can be extracted and then combined with other GPS or total station data to create a larger SurvNET project. If the OPUS vector data is used in a SurvNET project it is important to use Geoid modeling since the control points making up the OPUS solution typically cover a large extent.

Convert Level Files

The purpose of this option is to convert differential level files from digital levels into C&G/Carlson differential level file format. At present the only level file format that can be converted are the level files downloaded from the Topcon digital levels.



Edit Raw Files

Select **Edit Raw Files** to open a raw file editor. If you are using a C&G raw file (.CGR), the **C&G Raw Editor** will open. Please refer to see [Section 11.10](#) for instructions on the C&G Raw Editor. If you are using a Carlson raw file (.RW5), the **Carlson Raw Editor** will open. Please refer to see [Section 11.11](#) for instructions on the Carlson Raw Editor.

Data Collector Transfer

Select **Data Collector Transfer** to open a data transfer program. If you are using C&G data files, the **C&G Transfer** program will open. Please refer to see [Section 11.08](#) for instructions on using C&G Transfer. If you are using Carlson data files, the **Carlson SurvCom** program will open. Please refer to see [Section 11.09](#) for instructions on using SurvCom.

Create User Defined Coordinate System

SurvNET allows you to create a user-defined coordinate systems. For a discussion of this option, see the sub-section entitled **Working with User-defined Coordinate Systems** earlier in this section.

EDM Calibration

The **EDM Calibration** program allows a surveyor to enter and process the raw data collected on an EDM calibration baseline. The purpose of an EDM calibration is to determine if the EDM is measuring within standards. The program performs a statistical analysis of that data as outlined in "Use of Calibration Base Lines", by Charles J. Fronczek, NOAA Technical Memorandum NOS NGS-10. The NGS document can be downloaded from the NGS website. NGS maintains a webpage on EDM Calibration Base Lines. The manual and other information on EDM calibrations can be found at <http://geodesy.noaa.gov/CBLINES/calibration.shtm>. Following is the main **EDM Calibration** dialog box. NGS publishes the EDM calibration data in metric units. SurvNET's EDM calibration program currently expects the data to be collected in meters.

EDM Calibration

File Edit

REC + REC

	From Sta.	From HI	From El...	To Sta.	To HI	To Elev.	Observed S...	Published ...
1	STA_0	1.576	47.494	STA_150	1.552	44.631	150.0326	150.0008
2	STA_0	1.576	47.494	STA_400	1.537	41.497	400.0229	399.9772
3	STA_0	1.576	47.494	STA_1100	1.519	41.431	1100.0203	1100.0001
4	STA_150	1.570	44.631	STA_1100	1.519	41.431	950.0081	949.9991
5	STA_400	1.583	41.497	STA_1100	1.519	41.431	700.0265	700.0226
6	STA_400	1.580	41.497	STA_150	1.480	44.631	249.9946	249.9764
7	STA_400	1.580	41.497	STA_0	1.526	47.494	400.0260	399.9722

Date: Time:

EDM Description:

Reflector Description:

Weather:

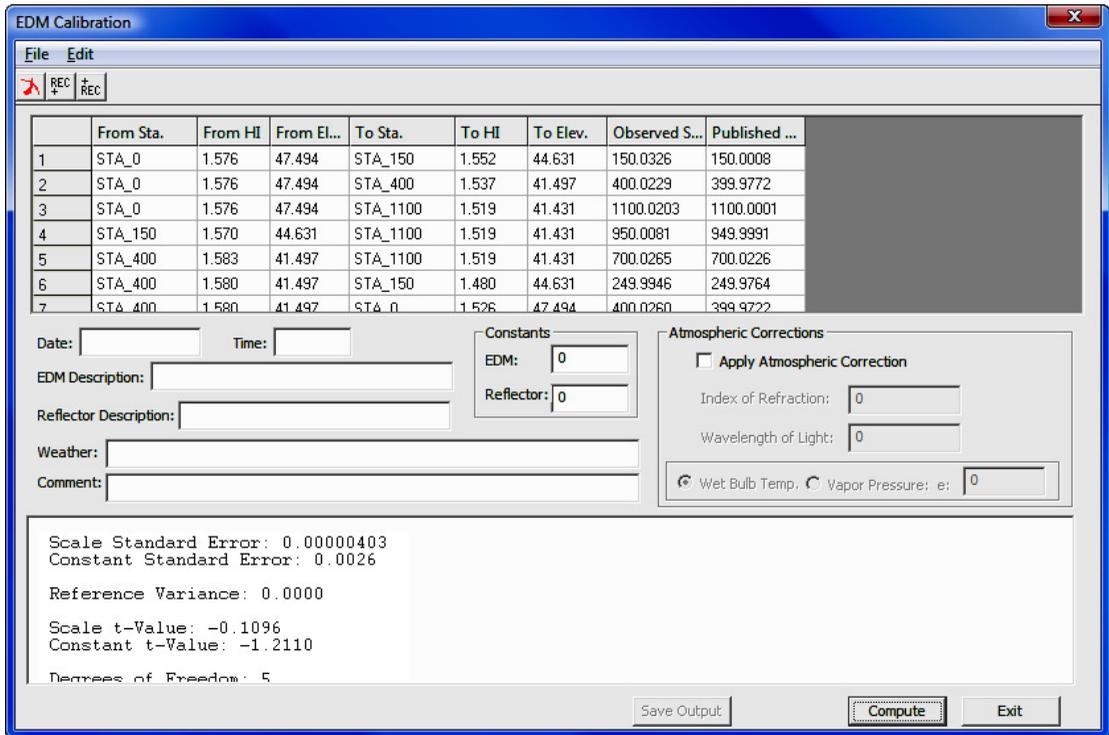
Comment:

Constants
EDM:
Reflector:

Atmospheric Corrections
 Apply Atmospheric Correction
Index of Refraction:
Wavelength of Light:
Wet Bulb Temp. Vapor Pressure: e:

Save Output Compute Exit

The basic flow of this program is to first fill out the lower portion of the dialog box which contains different text fields, **EDM constant** values, and the optional **Atmospheric Corrections** settings. Next, fill out the grid in the upper portion of the dialog box. This grid contains the field data collected and also the published distances between monuments of the baseline. After this information has been filled out use the [**Compute**] button. The program will then display the result of the calibration in the window in the lower portion of the dialog box as follows.



After the file is processed the results can be stored as an ASCII text file. Use the [**Save Output**] button or the menu option **File > Save Results File As** to save the results. First, you will be prompted for an output file name. The input data can also be stored. Once stored it can be opened and processed again.

Following is the entire output with a brief explanation of the results. Comments about the results are inserted between report sections.

EDM Calibration Report

Observed Data

EDM Type:

Date: Time:

Prism description:

Weather description:

Comment:

Atmosphere Correction: OFF
 Constants: Refractor: 0.000 EDM: 0.000

From Sta.	From Observed Elev.	From Published HI	To Sta.	To Elev.	To HI	Temp.
STA_0	47.494	1.576	STA_150	44.631	1.552	0.0
0.0	150.0326	150.0008				
STA_0	47.494	1.576	STA_400	41.497	1.537	0.0
0.0	400.0229	399.9772				
STA_0	47.494	1.576	STA_1100	41.431	1.519	0.0
0.0	1100.0203	1100.0001				
STA_150	44.631	1.570	STA_1100	41.431	1.519	0.0
0.0	950.0081	949.9991				
STA_400	41.497	1.583	STA_1100	41.431	1.519	0.0
0.0	700.0265	700.0226				
STA_400	41.497	1.580	STA_150	44.631	1.480	0.0
0.0	249.9946	249.9764				
STA_400	41.497	1.580	STA_0	47.494	1.526	0.0
0.0	400.0260	399.9722				

The above section shows the inputs, which consists of the observed slope distances and the measured HI's. The **From** and **To** elevations are published data from the NGS data sheet on the particular baseline being observed. The published distances are also published NGS data sheet. In this example, the atmospheric pressure was turned OFF so the **Temperature** and **Pressure** fields are irrelevant.

Results

Null Hypothesis, HO: EDM scale error and EDM constant error = 0.0

If the scale error and the EDM constant are 0.0 then the EDM is without error. So the purpose of the statistical test is to test how close the results are to 0.0.

Scale Error (ppm): -0.00000044
 Constant Error: -0.0032

The two above lines show the values for the computed scale error and constant error.

```
Scale Standard Error: 0.00000403  
Constant Standard Error: 0.0026
```

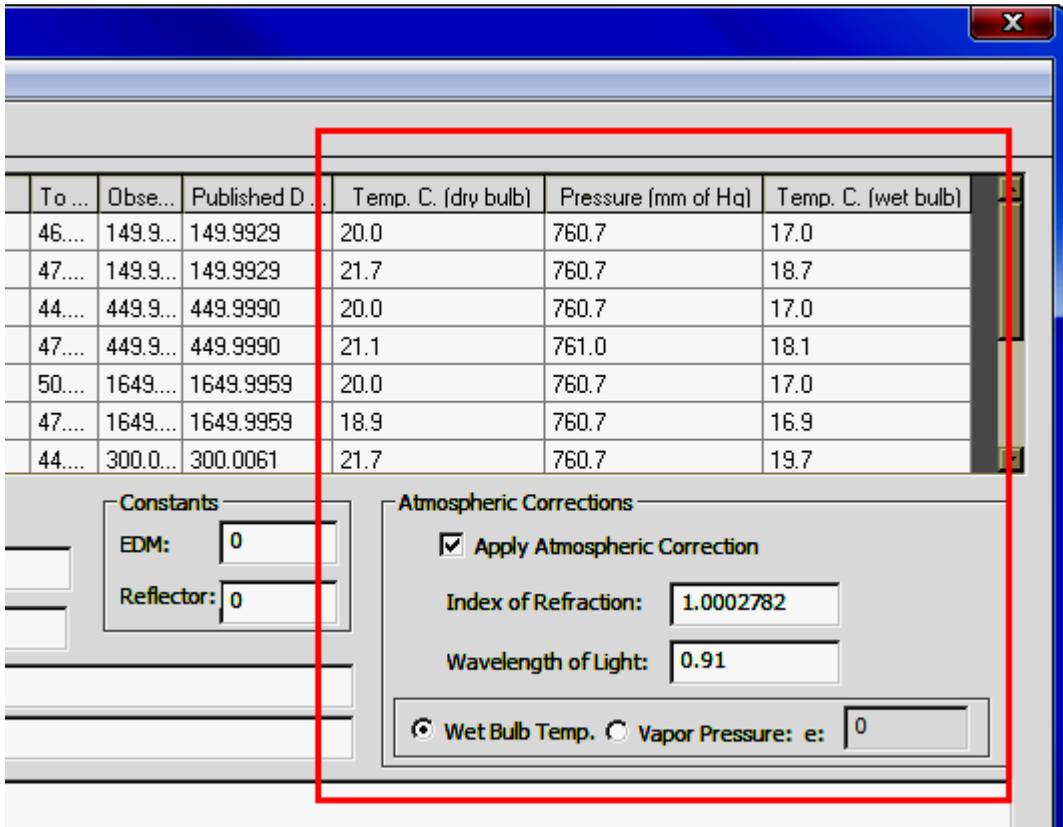
The two above lines show the values for the computed standard errors of the scale error and constant error.

```
Reference Variance: 0.0000126  
  
Scale t-Value: -0.1096  
Constant t-Value: -1.2110  
  
Degrees of Freedom: 5  
Critical t-Value at the 1 percent confidence level: 4.0320  
Cannot reject the H0 for the scale error. (The scale factor is  
0.0)  
Cannot reject the H0 for the constant error. (The constant is  
0.0)
```

The above lines show the final results of the statistical test. Since the test determined that we cannot reject the null hypothesis, this EDM is in good working order.

EDM Calibrations and Atmospheric Corrections

The atmospheric correction algorithms used in the EDM calibration are from the NGS manual. To use this method both dry-bulb and wet-bulb temperature needs to be measured; or the vapor pressure, e , and the dry bulb temperature needs to be measured. Refer to the NGS documentation for a detailed explanation of the atmospheric corrections that they use.



It is probably most common to turn atmospheric correction **OFF** in the calibration program, and turn atmospheric correction **ON** on the EDM (total station). When atmospheric correction is turned off in the calibration program the user does not need to enter the temperature into the grid or any of the other atmospheric values. If atmospheric corrections are turned **OFF** then the grid input columns **Temp. (dry bulb)**, **Pressure, (mm of Hg)**, and **Temp. (wet bulb)** will not be displayed since they are not needed.

Constants can be entered for both the EDM and the reflector. These values are added to the observed distances during processing. Typically they are set to 0.0.

0.145	47....	1649....	1649.9959	18.9
1.560	44....	300.0....	300.0061	21.7

Constants

EDM:

Reflector:

The following text fields have no effect on any computations and are simply comments that can be used to document the calibration.

4	STA300	1.580	44.210	STA600	1.560	44....	300.0....	300.0061	21.7
5	STA150	0.200	47.440	STA1800	3.230	50....	1649....	1649.9959	20.0
6	STA1...	3.240	50.540	STA150	0.145	47....	1649....	1649.9959	18.9
7	STA300	1.580	46.210	STA600	1.560	44....	300.0....	300.0061	21.7

Date: Time:

EDM Description:

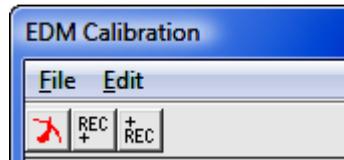
Reflector Description:

Weather:

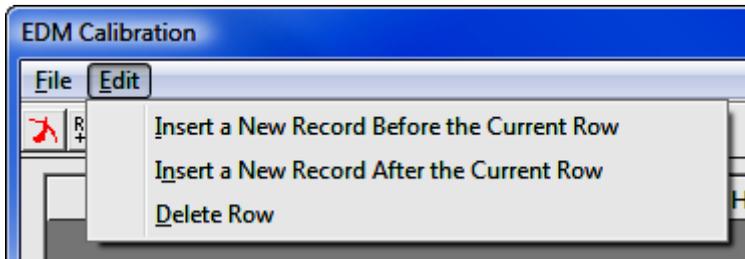
Comment:

Entering Data Into the EDM Calibration Grid

Blank data records are inserted into or deleted from the grid using the following tool bar.



The first button deletes the current highlighted record. The second button inserts a new blank record before the current highlighted record. The third button inserts a new blank record after the current highlighted record. Alternately the **Edit** menu options could be used to delete and insert new data records.



Following is a brief explanation of the fields that make up the grid.

	From ...	From HI	From Elev.	To Sta.	To HI	To ...	Obse...	Published D ...	Temp. C. (dry bulb)	Pressure (mm of Hg)	Temp. C. (wet bulb)
1	STA150	0.200	47.440	STA300	1.530	46....	149.9...	149.9929	20.0	760.7	17.0
2	STA300	1.580	46.210	STA150	0.145	47....	149.9...	149.9929	21.7	760.7	18.7
3	STA150	0.200	47.440	STA600	1.560	44....	449.9...	449.9990	20.0	760.7	17.0
4	STA600	1.610	44.380	STA150	0.145	47....	449.9...	449.9990	21.1	761.0	18.1
5	STA150	0.200	47.440	STA1800	3.230	50....	1649....	1649.9959	20.0	760.7	17.0
6	STA1...	3.240	50.540	STA150	0.145	47....	1649....	1649.9959	18.9	760.7	16.9
7	STA300	1.580	46.210	STA600	1.560	44....	300.0...	300.0061	21.7	760.7	19.7

From Sta. - This field represents the station name where the EDM is located. Any name can be used, but you must be consistent and used the same name whenever you occupy or measure a distance to the station.

From HI. - This field represents the height of instrument of the from station. It should be in the same units as the measurements. If horizontal distances are

being entered into the grid then all the HI fields should be set to a constant value such as 0.0.

From Elev. - This field represents the elevation of the station. This value is published as part of the baseline calibration sheets obtained from NGS. If horizontal distances are used then all the Elevation fields should be set to a constant.

To Sta. - This field represents the station name where the prism is located. Any name can be used but you must be consistent and use the same name whenever you occupy or measure a distance to the station.

To HI. - This field represents the height of instrument of the to station. It should be in the same units as the distance measurements. If horizontal distances are being entered into the grid then all the HI fields can be set to a constant value such as 0.0.

To Elev. - This field represents the elevation of the station where the prism is located. This value is published as part of the baseline calibration sheets obtained from NGS. If horizontal distances are used then all the Elevation fields should be set to a constant.

Observed S. Dist. - This is the measured slope distance or it can be a measured horizontal distance. If it is a horizontal distance then all the HI's and elevations should be set to a constant value.

Published Dist. - This field represents the published distance between the **From** and **To** station. This value is published as part of the baseline calibration data obtained from NGS for the particular baseline being observed.

Temp. (dry bulb) - This field is only present if atmospheric corrections are turned on.

Temp. (wet bulb) - This field is only present if atmospheric corrections are turned on.

Pressure. (mm of Hg) - This field is only present if atmospheric corrections are turned on.

Edit Output Files...

Toolbars

Many of the most commonly used functions can be accessed using the toolbar. Following is an explanation of the buttons found in the toolbar.



-  **Create New Project** - New project icon.
-  **Open an Existing Project** - Open file icon.
-  **Save the Current Project** - Disk icon.
-  **Print One of the Reports** - Printer icon.
-  **Settings** - Wrench icon. This icon initiates the **Settings > Standard Errors** tab.
-  **Data Collector Transfer Program** - This icon will initiate either the **C&G Data Transfer** program or the **Carlson SurvCom** program. The C&G program allows you to transfer data from the data collector, or convert the data collector file to a .CGR file format. It supports all major data collectors. The Carlson program connects specifically to the Carlson SurvCE data collector.
-  **Edit Raw Data** - This icon can be used to start either the .RW5 raw data editor or the .CGR raw data editor. If your project has multiple raw data files, you will be shown a list and asked to select the file you wish to edit. The appropriate editor will be called depending on what type raw files are defined in the project settings. If no raw file or project has been specified the default raw editor as defined in the **Settings** menu will be executed. Any changes you make in the editor need to be saved before returning to SurvNET for processing.
-  **Process Network** - Icon that looks like a traverse network.



Inverse - Icon has a line with points on each end.



Relative Error Ellipses - Icon has a line with points on each end and an ellipse in the middle



Graphics - Icon that looks like an eye. This icon is active once a project has been opened.



Help - Question mark icon.

Results from Network Processing

Report File: A report file consisting of the project name with an .RPT extension is generated after successfully processing the raw data. The report file will be shown in a text window so you can analyze the data. You can pick the **Printer** icon if you wish to produce a hardcopy. Following is an example of the results from a relatively simple network adjustment using a local coordinate system.

Sample 2D/1D, Local Coordinate System Report File

```

=====
LEAST SQUARES ADJUSTMENT REPORT
=====

Mon May 08 10:16:16 2006

2D Geodetic Model.

Input Raw Files:
  C:\data\lsdata\cgstar\CGSTAR.CGR
Output File: C:\data\lsdata\cgstar\cgstar.RPT

Curvature, refraction correction: ON

Maximum iterations: 10 , Convergence Limit: 0.002000
Local Coordinate System, Scale Factor: 1.000000
Horizontal Units: US Feet
Confidence Interval: 95.00

Default Standard Errors:
Distance: Constant 0.010 ,PPM: 5.000
Horiz. Angle: Pointing 3.0" ,Reading: 3.0"
Vert. Angle: Pointing 3.0" ,Reading: 3.0"

```

Total Station: Centering 0.005 ,Height: 0.010
Target: Centering 0.005 ,Height: 0.010
Azimuth: 5"

Coordinate Control: N:0.010, E:0.010, Z:0.030,

Horizontal Angle spread exceeds tolerance:

IP: 1, BS: 5, FS: 2

Low: 109-19'10.0" , High: 109-19'17.0" , Diff: 000-00'07.0"

Horizontal Angle spread exceeds tolerance:

IP: 2, BS: 1, FS: 6

Low: 190-32'02.0" , High: 190-32'10.0" , Diff: 000-00'08.0"

Horizontal Angle spread exceeds tolerance:

IP: 2, BS: 1, FS: 3

Low: 096-03'48.0" , High: 096-03'56.0" , Diff: 000-00'08.0"

Horizontal Angle spread exceeds tolerance:

IP: 3, BS: 2, FS: 4

Low: 124-03'50.0" , High: 124-03'56.0" , Diff: 000-00'06.0"

Horizontal Angle spread exceeds tolerance:

IP: 5, BS: 4, FS: 10

Low: 039-26'35.0" , High: 039-26'45.0" , Diff: 000-00'10.0"

Horizontal Angle spread exceeds tolerance:

IP: 10, BS: 5, FS: 11

Low: 241-56'23.0" , High: 241-56'35.0" , Diff: 000-00'12.0"

Horizontal Angle spread exceeds tolerance:

IP: 11, BS: 10, FS: 12

Low: 114-56'20.0" , High: 114-56'34.0" , Diff: 000-00'14.0"

Horizontal Angle spread exceeds tolerance:

IP: 12, BS: 11, FS: 3

Low: 140-39'18.0" , High: 140-39'31.0" , Diff: 000-00'13.0"

Horizontal Angle spread exceeds tolerance:

IP: 5, BS: 4, FS: 1

Low: 117-30'35.0" , High: 117-30'50.0" , Diff: 000-00'15.0"

Horizontal Distance from 2 to 3 exceeds tolerance:

Low: 324.15, High: 324.20, Diff: 0.04

Vertical Distance from 2 to 3 exceeds tolerance:

Low: 6.62, High: 8.36, Diff: 1.74

Vertical Distance from 3 to 4 exceeds tolerance:

Low: 11.46, High: 11.51, Diff: 0.05

Horizontal Distance from 12 to 3 exceeds tolerance:

Low: 144.64, High: 144.66, Diff: 0.02

HORIZONTAL ADJUSTMENT REPORT

=====

Unadjusted Observations

=====

Control Coordinates: 1 Observed Points, 0 Fixed Points, 0 Approx. Points

Sta.	N:	E:	StErr N:	StErr E:
1	658428.26	2150182.70	0.01	0.01

Distances: 14 Observations

From Sta.	To Sta.	Dist.	StErr
1	5	290.45	0.01
1	2	292.21	0.01
2	6	52.39	0.01
2	3	324.19	0.01
3	4	275.60	0.01
3	20	134.66	0.01
20	21	116.07	0.01
21	22	50.12	0.01
4	5	309.65	0.01
5	10	129.99	0.01
10	11	126.01	0.01
10	15	10.00	0.01
11	12	129.43	0.01
12	3	144.65	0.01

Angles: 15 Observations

BS Sta.	Occ. Sta.	FS Sta.	Angle	StErr (Sec.)
5	1	2	109-19'13.5"	7.7
1	2	6	190-32'06.0"	26.2
1	2	3	096-03'52.0"	7.3
2	3	4	124-03'53.0"	7.8
2	3	20	185-23'56.0"	12.8
3	20	21	180-15'26.0"	17.6
20	21	22	183-26'45.0"	31.2
3	4	5	093-02'11.5"	7.5
4	5	10	039-26'40.0"	10.4
5	10	11	241-56'29.0"	15.6
5	10	15	056-23'10.0"	125.0
10	11	12	114-56'27.0"	15.5
11	12	3	140-39'24.5"	15.3
12	3	2	325-54'30.0"	9.5
4	5	1	117-30'42.5"	7.7

Azimuths: 1 Observations

Occ. Sta.	FS Sta.	Bearing	StErr (Sec.)
1	2	N 45-00'00.0"E	5.0

Adjusted Coordinates

=====

Adjusted Local Coordinates

Sta.	N:	E:	StErr N:	StErr E:
1	658428.26	2150182.70	0.02	0.02
2	658634.88	2150389.32	0.02	0.02
5	658554.12	2149920.92	0.03	0.02
3	658887.03	2150185.59	0.02	0.03
4	658863.61	2149910.99	0.03	0.03
20	658999.28	2150111.19	0.03	0.04
21	659096.31	2150047.49	0.04	0.05
10	658657.11	2150000.25	0.03	0.03
11	658636.21	2150124.52	0.03	0.03
12	658742.89	2150197.81	0.03	0.03

Adjusted Coordinates Error Ellipses, 95% CI

Sta.	Semi Major Axis	Semi Minor Axis	Max. Error Az.
1	0.05	0.05	S 29-26'39.4"E
2	0.07	0.07	N 45-00'00.0"E
5	0.08	0.07	N 10-58'28.2"E
3	0.10	0.07	N 84-37'31.0"E
4	0.11	0.07	N 51-23'12.0"E
20	0.13	0.10	N 84-24'17.5"E
21	0.17	0.12	N 72-01'17.5"E
10	0.09	0.07	N 43-35'54.5"E
11	0.09	0.08	N 54-43'51.1"E
12	0.08	0.08	N 79-48'07.2"E

Adjusted Observations

=====

Adjusted Distances

From Sta.	To Sta.	Distance	Residual	StdRes.	StdDev
1	5	290.46	0.01	1.42	0.01
1	2	292.21	-0.00	0.40	0.01
2	3	324.17	-0.01	1.62	0.01
3	4	275.59	-0.01	1.11	0.01
3	20	134.66	-0.00	0.00	0.02
20	21	116.07	-0.00	0.00	0.02
4	5	309.65	0.01	0.64	0.01
5	10	130.00	0.01	0.97	0.01
10	11	126.01	0.00	0.16	0.01
11	12	129.44	0.01	0.98	0.02
12	3	144.66	0.01	0.94	0.02
Root Mean Square (RMS)			0.01		

Adjusted Angles

BS Sta.	Occ. Sta.	FS Sta.	Angle	Residual	StdRes	StdDev(Sec.)
5	1	2	109-19'19.2"	5.7	0.7	9.9
1	2	3	096-03'43.4"	-8.6	1.2	9.2
2	3	4	124-03'48.1"	-4.9	0.6	10.1
2	3	20	185-23'56.0"	-0.0	0.0	21.5
3	20	21	180-15'26.0"	0.0	0.0	29.7
3	4	5	093-02'12.8"	1.3	0.2	9.3
4	5	10	039-26'37.1"	-2.9	0.3	14.4
5	10	11	241-56'27.5"	-1.5	0.1	21.2
10	11	12	114-56'39.8"	12.8	0.8	21.8
11	12	3	140-39'40.8"	16.3	1.1	20.3
12	3	2	325-54'33.8"	3.8	0.4	13.2
4	5	1	117-30'56.6"	14.1	1.8	9.9
Root Mean Square (RMS)				8.1		

Adjusted Azimuths

Occ. Sta.	FS Sta.	Bearing	Residual	StdRes	StdDev(Sec.)
1	2	N 45-00'00.0"E	0.0	0.0	8.4
Root Mean Square (RMS)			0.0		

Statistics

=====

Solution converged in 2 iterations
Degrees of freedom:6
Reference variance:2.84
Standard error unit Weight: +/-1.68
Failed the Chi-Square test at the 95.00 significance level
1.237 <= 17.023 <= 14.449

Sideshots

=====

From	To	Bearing	Dist.	N	E	StDev. N	StDev. E
2	6	N 55-32'06.0"E	52.39	658664.53	2150432.52	0.02	0.02
21	22	N 29-50'09.6"W	50.12	659139.78	2150022.56	0.04	0.05
10	15	N 86-00'28.6"W	10.00	658657.80	2149990.27	0.03	0.03

LEAST SQUARES VERTICAL ADJUSTMENT REPORT

Mon May 08 10:16:16 2006

2D Geodetic Model.

Input Raw Files:

C:\data\lsdata\cgstar\CGSTAR.CGR

Output File: C:\data\lsdata\cgstar\cgstar.RPT

Curvature, refraction correction: ON

FIXED VERTICAL BENCHMARKS

Station	Elevation
1	569.8500

POINTS TO BE ADJUSTED

Station
2,5,3,4,10,11,12

MEASUREMENT SUMMARY

From	To	Elev. Diff. (unadjusted)	StdErr
1	5	7.5040	0.0145
1	2	7.5659	0.0145
2	3	6.9843	0.0145
3	4	-11.4907	0.0146
4	5	4.3557	0.0145
5	10	2.2639	0.0143
10	11	1.0931	0.0143
11	12	0.3828	0.0143
12	3	3.3590	0.0144

ADJUSTED ELEVATIONS

Station	Adjusted Elev	Standard Dev.
1	569.8500	0.00000
2	577.4336	0.02465
5	577.3363	0.02465
3	584.4355	0.02915
4	572.9628	0.03070
10	579.6003	0.03341
11	580.6935	0.03641
12	581.0764	0.03519

ADJUSTED MEASUREMENT SUMMARY

From	To	Elev. Diff. (adjusted)	Residuals
1	5	7.4863	-0.0177
1	2	7.5836	0.0177
2	3	7.0019	0.0177
3	4	-11.4728	0.0179
4	5	4.3735	0.0178
5	10	2.2641	0.0001
10	11	1.0932	0.0001
11	12	0.3829	0.0001
12	3	3.3591	0.0001

Vertical Sideshots

Station	Elevation
20	571.77
21	581.25
22	580.14
15	579.60

Project Settings

The first section of the report displays the project settings at the time the project was processed.

Tolerances

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. It is prudent to pay attention to any messages generated in this section of the report. Some warnings may be innocuous but it is good practice to check and understand all warning messages.

Unadjusted Observations

The next four sections of the report list the reduced and averaged, but unadjusted measurements that make up the network. Multiple measurements of the same angle or distance are averaged to a single measurement. The standard error of multiple averaged measurements is less than the standard error of a single measurement. When multiple measurements are used, the standard error for the averaged measurement will be computed using the average of the mean formula.

The first of the four sections is a list of the control coordinates used in the network adjustment. These coordinates could have been read from the .CGR raw data file, or from the .CRD or .NEZ supplemental coordinate file. Notice that the standard errors for the control points are displayed.

The second of the four measurement sections shows the distances and distance standard errors used in the adjustment. These distances are horizontal distances computed from all slope distance and vertical angles for that distance, 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.

The third of the four measurement sections shows 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. The techniques and formulas used to calculate the final angle standard error are found in Section 6.2 of the textbook "Adjustment Computations, Statistics and Least Squares in Surveying and GIS", by Paul Wolf and Charles Ghilani.

The fourth of the four measurement sections shows the azimuths and azimuth standard errors used in the adjustment. Azimuths can only be defined as a direction record in the .CGR raw data file.

Adjusted Coordinates

If the adjustment of the network converges the next section of the report displays a list of the final adjusted coordinates and the computed standard X, Y standard error. An interpretation of the meaning of the X, Y standard error, is 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.

The next section of the report 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 the confidence interval as defined in the settings screen. In this report the error ellipse axis is larger than the X, Y standard errors since the error ellipses in this report are calculated at a 95% probability level as set in the **Settings** screens. 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 most likely see that the error ellipse will approach a circle, which is the strongest geometric shape.

Adjusted Observations

The next three sections of the report list the adjusted horizontal distance, horizontal angle, and azimuth measurements. In addition to the adjusted measurement the residual, the standard residual, and the standard deviation of the adjusted measurement is 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 residual of a measurement. The a priori standard errors are the standard errors of the measurements as displayed in the unadjusted measurement section. A standard residual of 1 indicates that the adjustment applied to the measurement is consistent with the expected adjustment to 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 a blunder in the survey. When all standard residuals are consistently large there is likely an inconsistency in the a priori standard errors and the adjustments being made to the measurements. 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 means that there is a 68% probability that the adjusted measurement is within plus or minus the standard deviation of the measurement's true value.

Additionally, the root mean square of each measurement type is displayed. The root mean square is defined as the square root of the average of the squares of a set of numbers. Loosely defined, it is as an average residual for that measurement type.

Statistics

The next section of the report 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 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 (.CGR) file are used to determine the weights of the measurements. These standard errors can also be looked at as an estimate of how accurately the

measurements were made. The chi-square test merely tests whether the results of the adjusted measurements are consistent with the a priori standard errors. Notice that if you change the project standard errors and then reprocess the survey, the results of the chi-square test change even though the final adjusted coordinates may change very little.

Sideshots

The next section of the report displays the computed sideshots of the network. Sideshots are filtered out of the network adjustment as part of the preprocessing process if the **Enable Sideshots for Error Ellipses** toggle is **off**. 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 side shot computations are the same whether they are reduced as part of the least squares adjustment or from the final adjusted coordinates.

LEAST SQUARES VERTICAL ADJUSTMENT REPORT

The next part of the report displays the results of the vertical adjustment. In the 2D/1D model 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 also be reduced and adjusted using least squares.

The first section displays the vertical benchmarks used in the vertical adjustment. Next, is listed the points that will be adjusted as part of the vertical adjustment. The following section displays the measurements used in the adjustment. 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.

The next section displays the adjusted elevations and the computed standard deviations of the computed elevations. Following the adjusted elevation section is a section displaying the final adjusted elevation difference measurements and their residuals. Finally, the computed side shot elevations are displayed.

State Plane Reduction Report file:

When reducing to a state plane coordinate system, there is additional information displayed in the report file. First, notice the heading of the report. The heading indicates that the project is being reduced into the North Carolina zone of the

1983 State Plane Coordinate System. The heading shows that the elevation factor is computed based on a project elevation of 250 feet.

Sample 2D/1D, State Plane Coordinate System Report File

```
=====
LEAST SQUARES ADJUSTMENT REPORT
=====
```

Tue Mar 21 17:37:27 2006

2D Geodetic Model.

Input Raw Files:

C:\data\lsdata\cgstar\CGSTAR.CGR

Output File: C:\data\lsdata\cgstar\cgstar.RPT

Curvature, refraction correction: ON

Maximum iterations: 10 , Convergence Limit: 0.002000

1983 State Plane Coordinates, zone:3200 North Carolina

Elevation factor computed from project elevation,250.000000.

Elevation Units: US Feet

Horizontal Units: US Feet

Confidence Interval: 95.00

Project Geoid Height: 0.00

Default Standard Errors:

Distance: Constant 0.010 ,PPM: 5.000

Horiz. Angle: Pointing 3.0" ,Reading: 3.0"

Vert. Angle: Pointing 3.0" ,Reading: 3.0"

Total Station: Centering 0.005 ,Height: 0.010

Target: Centering 0.005 ,Height: 0.010

Azimuth: 5"

Coordinate Control: N:0.010, E:0.010, Z:0.030,

Horizontal Angle spread exceeds tolerance:

IP: 1, BS: 5, FS: 2

Low: 109-19'10.0" , High: 109-19'17.0" , Diff: 000-00'07.0"

Horizontal Angle spread exceeds tolerance:

IP: 2, BS: 1, FS: 6

Low: 190-32'02.0" , High: 190-32'10.0" , Diff: 000-00'08.0"

Horizontal Angle spread exceeds tolerance:
IP: 2, BS: 1, FS: 3
Low: 096-03'48.0" , High: 096-03'56.0" , Diff: 000-00'08.0"

Horizontal Angle spread exceeds tolerance:
IP: 3, BS: 2, FS: 4
Low: 124-03'50.0" , High: 124-03'56.0" , Diff: 000-00'06.0"

Horizontal Angle spread exceeds tolerance:
IP: 5, BS: 4, FS: 10
Low: 039-26'35.0" , High: 039-26'45.0" , Diff: 000-00'10.0"

Horizontal Angle spread exceeds tolerance:
IP: 10, BS: 5, FS: 11
Low: 241-56'23.0" , High: 241-56'35.0" , Diff: 000-00'12.0"

Horizontal Angle spread exceeds tolerance:
IP: 11, BS: 10, FS: 12
Low: 114-56'20.0" , High: 114-56'34.0" , Diff: 000-00'14.0"

Horizontal Angle spread exceeds tolerance:
IP: 12, BS: 11, FS: 3
Low: 140-39'18.0" , High: 140-39'31.0" , Diff: 000-00'13.0"

Horizontal Angle spread exceeds tolerance:
IP: 5, BS: 4, FS: 1
Low: 117-30'35.0" , High: 117-30'50.0" , Diff: 000-00'15.0"

Horizontal Distance from 2 to 3 exceeds tolerance:
Low: 324.15, High: 324.20, Diff: 0.04

Vertical Distance from 2 to 3 exceeds tolerance:
Low: 6.62, High: 8.36, Diff: 1.74

Vertical Distance from 3 to 4 exceeds tolerance:
Low: 11.46, High: 11.51, Diff: 0.05

Horizontal Distance from 12 to 3 exceeds tolerance:
Low: 144.64, High: 144.66, Diff: 0.02

HORIZONTAL ADJUSTMENT REPORT

=====

Unadjusted Observations

=====

Control Coordinates: 1 Observed Points, 0 Fixed Points, 0 Approx. Points

Sta.	N:	E:	StErr N:	StErr E:
1	658428.26	2150182.70	0.01	0.01

The first distance listing in the **Unadjusted Observation** section of the report shows the unadjusted horizontal ground distances.

Distances: 14 Observations

From Sta.	To Sta.	Ground Dist.	StErr
1	5	290.45	0.01
1	2	292.21	0.01
2	6	52.39	0.01
2	3	324.19	0.01
3	4	275.60	0.01
3	20	134.66	0.01
20	21	116.07	0.01
21	22	50.12	0.01
4	5	309.65	0.01
5	10	129.99	0.01
10	11	126.01	0.01
10	15	10.00	0.01
11	12	129.43	0.01
12	3	144.65	0.01

Angles: 15 Observations

BS Sta.	Occ. Sta.	FS Sta.	Angle	StErr (Sec.)
5	1	2	109-19'13.5"	7.7
1	2	6	190-32'06.0"	26.2
1	2	3	096-03'52.0"	7.3
2	3	4	124-03'53.0"	7.8
2	3	20	185-23'56.0"	12.8
3	20	21	180-15'26.0"	17.6
20	21	22	183-26'45.0"	31.2
3	4	5	093-02'11.5"	7.5
4	5	10	039-26'40.0"	10.4

5	10	11	241-56'29.0"	15.6
5	10	15	056-23'10.0"	125.0
10	11	12	114-56'27.0"	15.5
11	12	3	140-39'24.5"	15.3
12	3	2	325-54'30.0"	9.5
4	5	1	117-30'42.5"	7.7

Grid Azimuths: 1 Observations

Occ. Sta.	FS Sta.	Bearing	StErr (Sec.)
1	2	N 45-00'00.0"E	5.0

There is a new section displaying the reduced unadjusted grid distances. The grid factor, the elevation factor, and the combined factor used to reduce the ground distance to a grid distance are included in the listing:

Grid Distances: 14 Observations

From Sta.	To Sta.	Grid Dist.	Grid Factor	Z Factor	Combined Factor
1	5	290.41	0.99988685	0.99998804	0.99987490
1	2	292.18	0.99988686	0.99998804	0.99987491
2	6	52.38	0.99988689	0.99998804	0.99987494
2	3	324.15	0.99988692	0.99998804	0.99987497
3	4	275.57	0.99988695	0.99998804	0.99987500
3	20	134.65	0.99988697	0.99998804	0.99987501
20	21	116.06	0.99988700	0.99998804	0.99987504
21	22	50.11	0.99988701	0.99998804	0.99987506
4	5	309.61	0.99988691	0.99998804	0.99987495
5	10	129.97	0.99988688	0.99998804	0.99987493
10	11	125.99	0.99988689	0.99998804	0.99987494
10	15	10.00	0.99988690	0.99998804	0.99987494
11	12	129.41	0.99988690	0.99998804	0.99987495
12	3	144.63	0.99988694	0.99998804	0.99987498

There is a new section displaying the reduced unadjusted horizontal angles with the t-T correction applied. The t-T correction is generally a small correction. For most surveys of limited size the correction is negligible. The t-T correction is displayed in seconds.

Grid Horizontal Angles: 15 Observations

BS Sta.	Occ. Sta.	FS Sta.	Angle	StErr (Sec.)	t-T
5	1	2	109-19'13.5"	7.7	0.0
1	2	6	190-32'06.0"	26.2	0.0
1	2	3	096-03'52.0"	7.3	0.0
2	3	4	124-03'53.0"	7.8	-0.0
2	3	20	185-23'56.0"	12.8	-0.0
3	20	21	180-15'26.0"	17.6	-0.0
20	21	22	183-26'45.0"	31.2	-0.0
3	4	5	093-02'11.5"	7.5	-0.0
4	5	10	039-26'40.0"	10.4	0.0
5	10	11	241-56'29.0"	15.6	0.0
5	10	15	056-23'10.0"	125.0	0.0
10	11	12	114-56'27.0"	15.5	0.0
11	12	3	140-39'24.5"	15.3	0.0
12	3	2	325-54'30.0"	9.5	0.0
4	5	1	117-30'42.5"	7.7	0.0

Adjusted Coordinates

=====

Adjusted Grid Coordinates

Sta.	N:	E:	StErr N:	StErr E:
1	658428.26	2150182.70	0.02	0.02
2	658634.86	2150389.30	0.02	0.02
5	658554.11	2149920.95	0.03	0.02
3	658886.98	2150185.59	0.02	0.03
4	658863.56	2149911.03	0.03	0.03
20	658999.20	2150111.20	0.03	0.04
21	659096.23	2150047.51	0.04	0.05
10	658657.08	2150000.27	0.03	0.03
11	658636.18	2150124.52	0.03	0.03
12	658742.85	2150197.81	0.03	0.03

In the **Adjusted Coordinates** section of the report there is a new section displaying the latitude and longitude of the final adjusted points. Additionally the convergence angle, the grid factor, the elevation factor, and the combined factor are displayed for each point:

Adjusted Geographic Coordinates

=====

Sta.	Latitude	Longitude	Conv. Ang.	Grid Factor	Z Factor
1	35-33'29.13143"N	78-29'42.16576"E	000-17'29.2"	0.99988684	0.99998804
0.99987488					
2	35-33'31.16445"N	78-29'39.65237"E	000-17'30.7"	0.99988689	0.99998804
0.99987493					
5	35-33'30.38930"N	78-29'45.32617"E	000-17'27.4"	0.99988687	0.99998804
0.99987491					
3	35-33'33.66835"N	78-29'42.10255"E	000-17'29.2"	0.99988695	0.99998804
0.99987500					
4	35-33'33.45055"N	78-29'45.42733"E	000-17'27.3"	0.99988695	0.99998804
0.99987499					
20	35-33'34.78212"N	78-29'42.99610"E	000-17'28.7"	0.99988698	0.99998804
0.99987503					
21	35-33'35.74495"N	78-29'43.76102"E	000-17'28.3"	0.99988701	0.99998804
0.99987505					
10	35-33'31.40380"N	78-29'44.35979"E	000-17'27.9"	0.99988690	0.99998804
0.99987494					
11	35-33'31.19087"N	78-29'42.85714"E	000-17'28.8"	0.99988689	0.99998804
0.99987493					
12	35-33'32.24222"N	78-29'41.96349"E	000-17'29.3"	0.99988692	0.99998804
0.99987496					

Adjusted Coordinates Error Ellipses, 95% CI

Sta.	Semi Major Axis	Semi Minor Axis	Max. Error Az.
1	0.05	0.05	N 17-17'30.9"E
2	0.07	0.07	N 45-00'00.0"E
5	0.08	0.07	N 10-58'14.5"E
3	0.10	0.07	N 84-37'33.3"E
4	0.11	0.07	N 51-23'11.9"E
20	0.13	0.10	N 84-24'34.6"E
21	0.17	0.12	N 72-01'28.4"E
10	0.09	0.07	N 43-35'55.4"E
11	0.09	0.08	N 54-43'48.7"E
12	0.08	0.08	N 79-47'56.6"E

Adjusted Observations

=====

Adjusted Distances

From Sta.	To Sta.	Distance	Residual	StdRes.	StdDev
1	5	290.43	0.01	1.42	0.01
1	2	292.17	-0.00	0.40	0.01
2	3	324.13	-0.01	1.62	0.01

3	4	275.56	-0.01	1.11	0.01
3	20	134.65	0.00	0.00	0.02
20	21	116.06	0.00	0.00	0.02
4	5	309.61	0.01	0.64	0.01
5	10	129.98	0.01	0.97	0.01
10	11	126.00	0.00	0.16	0.01
11	12	129.42	0.01	0.98	0.02
12	3	144.64	0.01	0.94	0.02

Root Mean Square (RMS) 0.01

Adjusted Angles

BS Sta.	Occ. Sta.	FS Sta.	Angle	Residual	StdRes	StdDev(Sec.)
5	1	2	109-19'19.2"	5.7	0.7	9.9
1	2	3	096-03'43.4"	-8.6	1.2	9.2
2	3	4	124-03'48.1"	-4.9	0.6	10.1
2	3	20	185-23'56.0"	-0.0	0.0	21.5
3	20	21	180-15'26.0"	-0.0	0.0	29.7
3	4	5	093-02'12.8"	1.2	0.2	9.3
4	5	10	039-26'37.2"	-2.8	0.3	14.4
5	10	11	241-56'27.5"	-1.5	0.1	21.2
10	11	12	114-56'39.8"	12.9	0.8	21.8
11	12	3	140-39'40.8"	16.3	1.1	20.3
12	3	2	325-54'33.8"	3.8	0.4	13.2
4	5	1	117-30'56.6"	14.1	1.8	9.9

Root Mean Square (RMS) 8.1

Adjusted Azimuths

Occ. Sta.	FS Sta.	Bearing	Residual	StdRes	StdDev(Sec.)
1	2	N 45-00'00.0"E	-0.0	0.0	8.4

Root Mean Square (RMS) 0.0

Statistics

=====

Solution converged in 2 iterations
Degrees of freedom:6
Reference variance:2.84
Standard error unit Weight: +/-1.69
Failed the Chi-Square test at the 95.00 significance level
1.237 <= 17.037 <= 14.449

Sideshots

=====

From	To	Bearing	Dist.	N	E	StDev. N	StDev. E
2	6	N 55-32'06.0"E	52.38	658664.50	2150432.48	0.02	0.02
21	22	N 29-50'09.6"W	50.11	659139.69	2150022.58	0.04	0.05
10	15	N 86-00'28.6"W	10.00	658657.77	2149990.30	0.03	0.03

LEAST SQUARES VERTICAL ADJUSTMENT REPORT

Tue Mar 21 17:37:27 2006

2D Geodetic Model.

Input Raw Files:

C:\data\lsdata\cgstar\CGSTAR.CGR

Output File: C:\data\lsdata\cgstar\cgstar.RPT

Curvature, refraction correction: ON

FIXED VERTICAL BENCHMARKS

Station	Elevation
1	569.8500

POINTS TO BE ADJUSTED

Station
2,5,3,4,10,11,12

MEASUREMENT SUMMARY

From	To	Elev. Diff. (unadjusted)	StdErr
1	5	7.5040	0.0145
1	2	7.5659	0.0145
2	3	6.9843	0.0145
3	4	-11.4907	0.0146
4	5	4.3557	0.0145
5	10	2.2639	0.0143
10	11	1.0931	0.0143
11	12	0.3828	0.0143
12	3	3.3590	0.0144

ADJUSTED ELEVATIONS

Station	Adjusted Elev	Standard Dev.
1	569.8500	0.00000
2	577.4336	0.02465
5	577.3363	0.02465
3	584.4355	0.02915
4	572.9628	0.03070
10	579.6003	0.03341
11	580.6935	0.03641
12	581.0764	0.03519

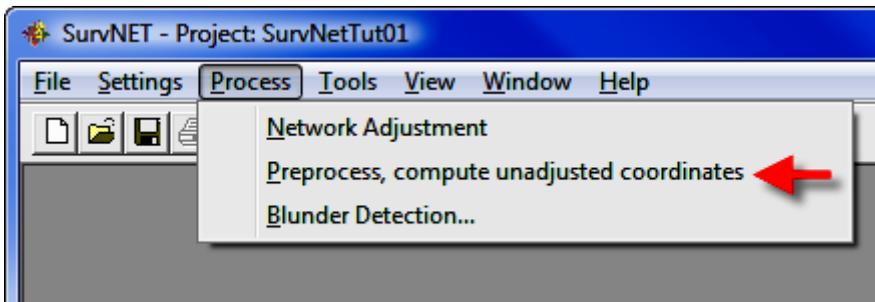
ADJUSTED MEASUREMENT SUMMARY

From	To	Elev. Diff. (adjusted)	Residuals
1	5	7.4863	-0.0177
1	2	7.5836	0.0177
2	3	7.0019	0.0177
3	4	-11.4728	0.0179
4	5	4.3735	0.0178
5	10	2.2641	0.0001
10	11	1.0932	0.0001
11	12	0.3829	0.0001
12	3	3.3591	0.0001

Vertical Sideshots

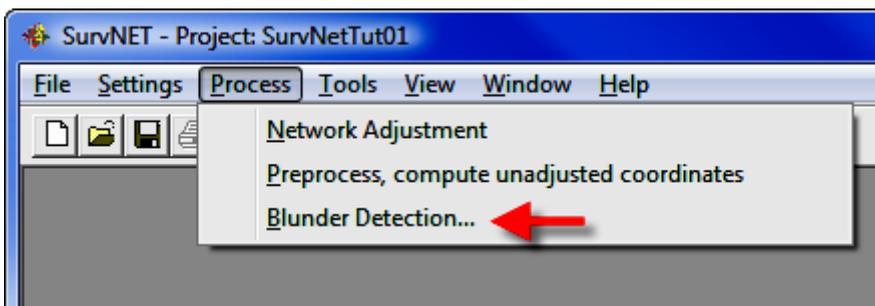
Station	Elevation
20	571.77
21	581.25
22	580.14
15	579.60

Preprocess, compute unadjusted coordinates



The **Preprocess, compute unadjusted coordinates** option allows the computation of unadjusted coordinates. If there are redundant measurements in the raw data, the first angle and distance found in the raw data is used to compute the coordinates. If a state plane grid system has been designated the measurements are reduced to grid prior to the computation of unadjusted coordinates. If the point is located from two different points the initial computation of the point will be the value stored.

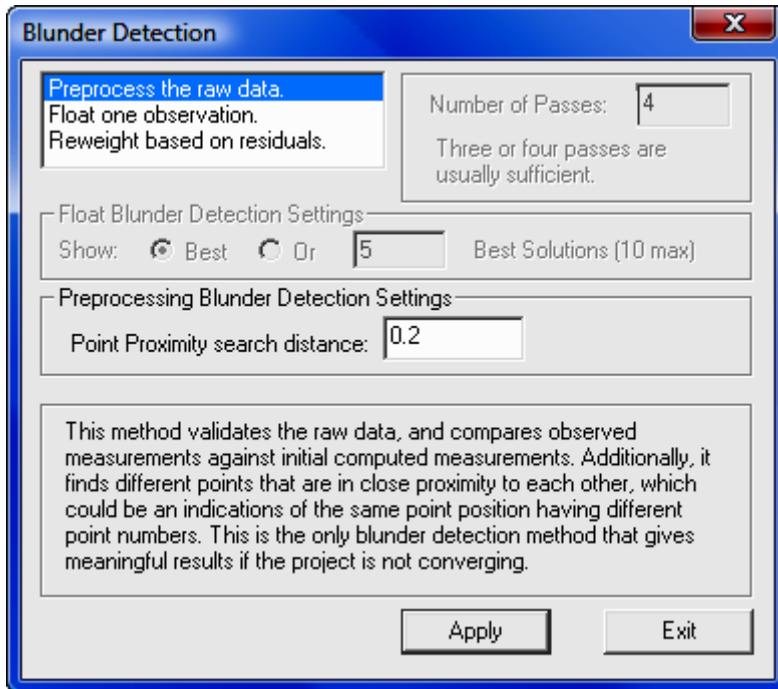
Blunder Detection



A variety of blunder detection tools are available that gives the user additional tools in analyzing his survey data, and detecting blunders. The standard least squares adjustment processing and its resulting report can often be used to determine blunders. No blunder detection method can be guaranteed to find all blunders. So much depends on the nature of the network geometry, the nature of the measurements, and the intuition of the analyst. Generally, the more redundancy there is in a network the easier it is to detect blunders.

There are three different methods that can be used to track down blunders in a network or traverse.

Option 1) Preprocess the raw data:



The **Preprocess the raw data** option validates the raw data. It displays angle and distance spreads as well as checks the validity of the raw data. Traverse closures are computed if specified. It also performs a **K-Matrix** analysis. The **K-Matrix** analysis compares the unadjusted, averaged measurements with the computed preliminary measurements (measurements calculated from the preliminary computed coordinates). This method will catch blunders such as using the same point number twice for two different points. The report will be sent to the .ERR file. The .ERR file will contain the tolerance checks, closures and the **K-Matrix** analysis. Following is an example of the report created using the **Preprocess the raw data** option. Notice that the first section of the report shows

the angle and distance spreads from the multiple angle and distance measurements. The second part of the report shows the **K-Matrix** analyses.

Additionally there is a **Point Proximity Report** section that reports pairs of different points that are in close proximity to each other which may indicate where the same point was collected multiple times using different point numbers.

The **Preprocess the raw data** option is one of the simplest and effective tools in finding blunders. Time spent learning how this function works will be well spent. If the project is not converging due to an unknown blunder in the raw data this tool is one of the most effective tools in finding the blunder. Many blunders are due to point numbering errors during data collections, and the **K-Matrix** analysis and **Point Proximity** search are great tools for finding this type blunders.

```
=====
LEAST SQUARES ADJUSTMENT ERROR REPORT
=====

Tue Mar 21 16:04:32 2006

Input Raw Files:
  C:\data\lsdata\cgstar\CGSTAR.CGR
Output File: C:\data\lsdata\cgstar\cgstar.RPT
Checking raw data syntax and angle & distance spreads.

Warning: Missing Vert. Angle. Assumption made as to whether it is direct or re-
verse.
  1                5.00  180.00050
  4

Warning: Missing Vert. Angle. Assumption made as to whether it is direct or re-
verse.
  1                5.00  180.00070
  5

Warning: Missing Vert. Angle. Assumption made as to whether it is direct or re-
verse.
  1                5.00  180.00100
 10

Warning: Missing Vert. Angle. Assumption made as to whether it is direct or re-
verse.
  1                5.00  180.00020
 11
```

Warning: Missing Vert. Angle. Assumption made as to whether it is direct or reverse.

1 5.00 325.54320
2 H&T

Warning: Missing Vert. Angle. Assumption made as to whether it is direct or reverse.

1 5.01 145.54300
2 H&T

Warning: Missing Vert. Angle. Assumption made as to whether it is direct or reverse.

1 5.01 180.00020
12

Horizontal Angle spread exceeds tolerance:

IP: 1, BS: 5, FS: 2
Low: 109-19'10.0" , High: 109-19'17.0" , Diff: 000-00'07.0"

Horizontal Angle spread exceeds tolerance:

IP: 2, BS: 1, FS: 6
Low: 190-32'02.0" , High: 190-32'10.0" , Diff: 000-00'08.0"

Horizontal Angle spread exceeds tolerance:

IP: 2, BS: 1, FS: 3
Low: 096-03'48.0" , High: 096-03'56.0" , Diff: 000-00'08.0"

Horizontal Angle spread exceeds tolerance:

IP: 3, BS: 2, FS: 4
Low: 124-03'50.0" , High: 124-03'56.0" , Diff: 000-00'06.0"

Horizontal Angle spread exceeds tolerance:

IP: 5, BS: 4, FS: 10
Low: 039-26'35.0" , High: 039-26'45.0" , Diff: 000-00'10.0"

Horizontal Angle spread exceeds tolerance:

IP: 10, BS: 5, FS: 11
Low: 241-56'23.0" , High: 241-56'35.0" , Diff: 000-00'12.0"

Horizontal Angle spread exceeds tolerance:

IP: 11, BS: 10, FS: 12
Low: 114-56'20.0" , High: 114-56'34.0" , Diff: 000-00'14.0"

Horizontal Angle spread exceeds tolerance:

IP: 12, BS: 11, FS: 3
Low: 140-39'18.0" , High: 140-39'31.0" , Diff: 000-00'13.0"

Horizontal Angle spread exceeds tolerance:
IP: 5, BS: 4, FS: 1
Low: 117-30'35.0" , High: 117-30'50.0" , Diff: 000-00'15.0"

Horizontal Distance from 2 to 3 exceeds tolerance:
Low: 324.15, High: 324.20, Diff: 0.04

Vertical Distance from 2 to 3 exceeds tolerance:
Low: 6.62, High: 8.36, Diff: 1.74

Vertical Distance from 3 to 4 exceeds tolerance:
Low: 11.46, High: 11.51, Diff: 0.05

Horizontal Distance from 12 to 3 exceeds tolerance:
Low: 144.64, High: 144.66, Diff: 0.02

K-Matrix Analysis.

Distance: From pt.: 4 To pt.: 5
Measured distance: 309.61 Initial computed distance: 309.65
Difference: -0.04

Distance: From pt.: 12 To pt.: 3
Measured distance: 144.63 Initial computed distance: 144.66
Difference: -0.03

Distance: From pt.: 5 To pt.: 6
Measured distance: 348.51 Initial computed distance: 523.29
Difference: -174.79

Angle: IP: 4 BS: 3 FS: 5
Measured angle: 093-02'11.5"
Initial computed angle: 093-01'45.1"
Difference: 000-00'26.4"

Angle: IP: 12 BS: 11 FS: 3
Measured angle: 140-39'24.5"
Initial computed angle: 140-40'32.6"
Difference: -000-01'08.1"

Angle: IP: 5 BS: 4 FS: 1
Measured angle: 117-30'42.5"

```
Initial computed angle: 117-31'16.4"
Difference: -000-00'33.9"

Angle: IP: 5 BS: 4 FS: 6
Measured angle: 145-30'34.0"
Initial computed angle: 079-39'46.4"
Difference: 065-50'47.6"

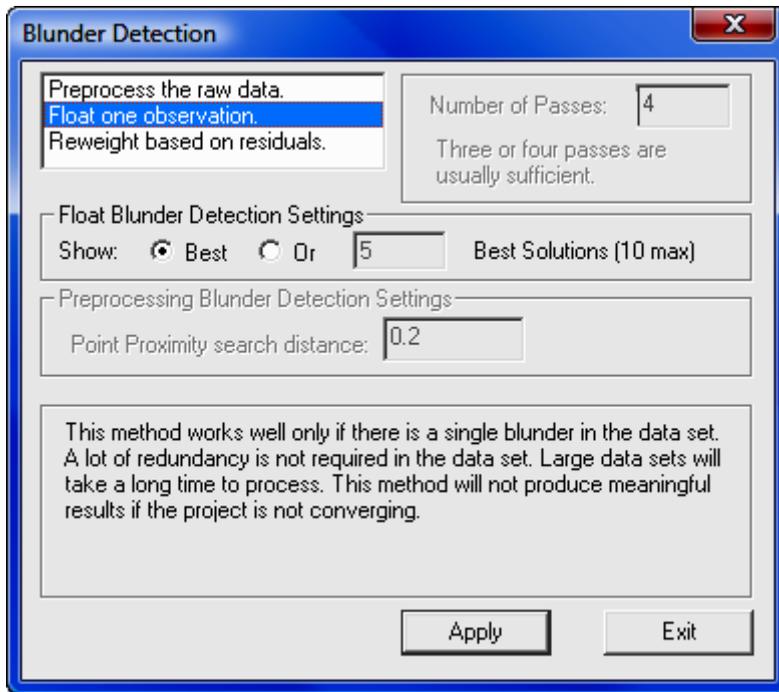
Point Proximity Report:
Points 3 and 30 are within 0.05 of each other.
```

The problem with the above project was that point 6 was accidentally used twice for two separate side shots. Because of the point numbering problem the project would not converge using the regular least squares processing. The **Preprocess the raw data** option was then used. Notice in the K-matrix section the distance from 5 to 6 shows a difference of 174.79' and the angle 4-5-6 shows a difference of 065-50'47.6". Then notice that the other listed differences are in the range of .02' for the distances and less than a minute for the angles. This report is clearly pointing out a problem to point 6.

Note the point proximity report section. During data collection point number 30 was used as the point number when the point was previously collected as point 3.

In the first section of the report notice that there are several warnings concerning whether a horizontal angle reading was collected in direct or reverse reading. The preprocessing software uses the vertical angle reading to determine the angle face of the horizontal angle reading. If the vertical angle is missing the program makes its best guess as to whether the angle was collected in direct or reverse face. Since all horizontal angle spreads in the report are reasonable, the preprocessing software must have made the correct determination.

Option 2) Float one observation:



This option is useful in finding a single blunder, either an angle or distance, within a network or traverse. If there is more than a single blunder in the network then it is less likely that this method will be able to isolate the blunders. If the standard least squares processing results in a network that will not converge then this blunder detection method might not work. Use the **Preprocess the raw data** blunder detection method if the solution is not converging. Also this method will only work on small and moderately sized networks. This method performs a least squares adjustment once for every non-trivial measurement in the network. So for large networks this method may take so long to process that it is not feasible to use this method.

With this method an adjustment is computed for each non-trivial individual angle and distance measurement. Consecutively, a single angle or distance is allowed to float during each adjustment. The selected floated angle or distance does not "constrain" the adjustment in any way. If there is a single bad angle or distance, one of the adjustment possibilities will place most of the error in the "float"

measurement, and the other measurements should have small residuals. The potentially bad angle or distance is flagged with a double asterisk (**). Since an adjustment is computed for each measurement this method may take a long time when analyzing large data files.

The adjustments with the lowest reference variances are selected as the most likely adjustments that have isolated the blunder. You have the choice to view the best adjustment, or the top adjustments with a maximum of ten. In the above example we asked to see the top five choices for potential blunders. The results are shown in the .ERR file. Following is a section of the report generated where an angular blunder was introduced into a small traverse. Notice the '**' characters beside the angle measurements. In this report the two most likely adjustments were displayed. The blunder was introduced to angle 101-2-3. Angle 101-2-3 was chosen as the 2nd most likely source of the blunder, showing that these blunder detection methods though not perfect, can be a useful tool in the analysis of survey measurements. Notice how much higher the standard residuals are on the suspected blunders than the standard residuals of the other measurements.

```
Adjusted Observations
=====
```

Adjusted Distances

From Sta.	To Sta.	Distance	Residual	StdRes.	StdDev
101	2	68.780	-0.006	0.608	0.008
2	3	22.592	-0.006	0.573	0.008
3	4	47.694	-0.002	0.213	0.008
4	5	44.954	-0.001	0.069	0.008
5	6	62.604	0.005	0.472	0.009
6	7	35.512	0.006	0.539	0.008
7	101	61.704	0.003	0.314	0.009
Root Mean Square (RMS)			0.005		

Adjusted Angles

BS Sta.	Occ. Sta.	FS Sta.	Angle	Residual	StdRes	StdDev (Sec.)
7	101	2	048-05'06"	-5	0	21
101	2	3	172-14'33"	-2	0	27
2	3	4	129-27'44"	-222 *	7	56 **
3	4	5	166-09'59"	11	0	25
4	5	6	043-12'26"	22	1	21
5	6	7	192-11'52"	12	0	25
6	7	101	148-38'19"	8	0	25

Root Mean Square (RMS) 85

Adjusted Azimuths

Occ. Sta.	FS Sta.	Bearing	Residual	StdRes	StdDev(Sec.)
101	7	N 00-00'00"E	0	0	4
Root Mean Square (RMS)			0		

Statistics

=====

Solution converged in 2 iterations
Degrees of freedom:3
Reference variance:0.78
Standard error unit Weight: +/-0.88
Passed the Chi-Square test at the 95.00 significance level
0.216 <= 2.347 <= 9.348

Adjusted Observations

=====

Adjusted Distances

From Sta.	To Sta.	Distance	Residual	StdRes.	StdDev
101	2	68.781	-0.005	0.473	0.009
2	3	22.592	-0.005	0.512	0.009
3	4	47.690	-0.006	0.586	0.009
4	5	44.950	-0.005	0.523	0.009
5	6	62.605	0.006	0.607	0.009
6	7	35.512	0.006	0.560	0.009
7	101	61.708	0.006	0.614	0.009
Root Mean Square (RMS)			0.006		

Adjusted Angles

BS Sta.	Occ. Sta.	FS Sta.	Angle	Residual	StdRes	StdDev(Sec.)
7	101	2	048-05'22"	11	0	24
101	2	3	172-11'03"	-213	*	58 **
2	3	4	129-31'23"	-3	0	29
3	4	5	166-09'48"	1	0	26
4	5	6	043-12'11"	6	0	21
5	6	7	192-11'50"	10	0	27
6	7	101	148-38'24"	13	0	27
Root Mean Square (RMS)			81			

Adjusted Azimuths

Occ. Sta.	FS Sta.	Bearing	Residual	StdRes	StdDev (Sec.)
101	7	N-00-00'00"E	-0	0	5
Root Mean Square (RMS)			0		

Statistics

=====

Solution converged in 2 iterations

Degrees of freedom:3

Reference variance:0.89

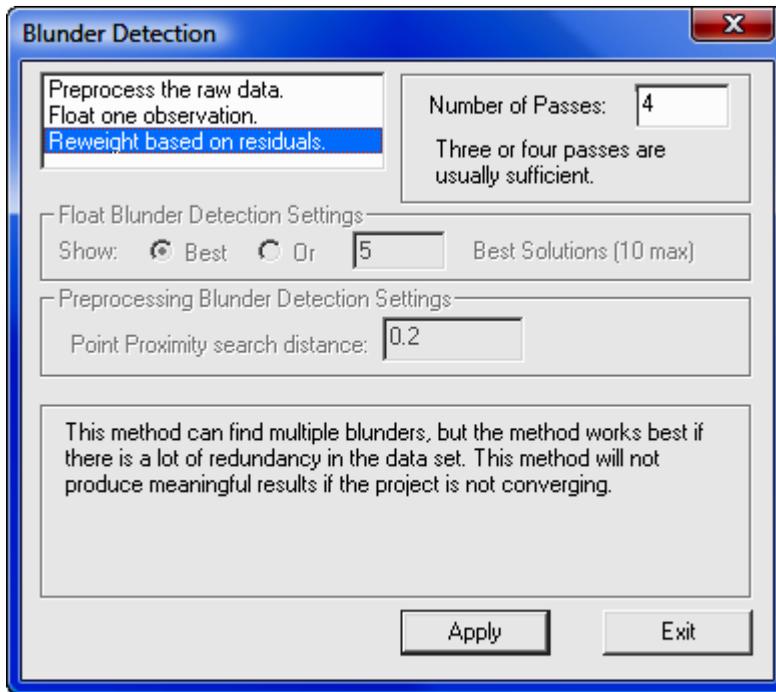
Standard error unit Weight: +/-0.94

Passed the Chi-Square test at the 95.00 significance level

0.216 <= 2.675 <= 9.348

The blunder is most likely in the measurement containing the largest residual and standard residual. The observation marked with ** is the observation that floated. It is also most likely the measurement containing the blunder.

Option 3) Re-weight by residuals & std err:



This method is capable of detecting multiple blunders but one is more likely to find the blunders if there is a high degree of redundancy (network of interconnected traverses). The higher the degree of freedom the more likely this method will find the blunders. This method will not work if the standard least squares processing will not converge. Use the **Preprocess the raw data** blunder detection method if the network is not converging.

First, select the number of adjustments or passes you wish to make. Each time an adjustment is completed, the measurements will be re-weighted based on the residuals and standard errors. Hopefully after three or four passes the blunders will become obvious. The results are shown in the .ERR file, look for the measurements with the highest standard residuals. These measurements are more likely to contain blunders.

The theory behind this method is that after processing, the measurements with blunders are more likely to have higher residuals and computed standard er-

rors. So, in the next pass the measurements are re-weighted based on the computed residuals, with less weight being assigned to the measurements with high residuals. After several passes it is likely that the measurements with the blunders have been reweighted such that they have little effect on the network.

As a rule of thumb three or four passes are usually sufficient. Following is a section of the report showing the results of the **Reweight by residuals & std. err.** The report was generated using the same data used in the earlier example. Notice that it has flagged the same two angle measurements.

The **Reweight by residuals & std. err.** method performs a new adjustment for each pass; so this method will take longer than the standard least squares adjustment, but does not take near as long to complete processing as the **Float one Observation** method for larger networks.

```

=====
Adjusted Observations
=====

Adjusted Distances

From Sta.  To Sta.      Distance   Residual   StdRes.   StdDev
101         2             68.778    -0.009     0.827     0.014
2           3             22.588    -0.010     0.942     0.015
3           4             47.694    -0.002     0.208     0.009
4           5             44.954    -0.001     0.077     0.006
5           6             62.608     0.010     0.919     0.016
6           7             35.517     0.011     1.040     0.016
7          101             61.705     0.004     0.398     0.011

                Root Mean Square (RMS)      0.008

Adjusted Angles

BS Sta.   Occ. Sta.   FS Sta.   Angle           Residual   StdRes   StdDev(Sec.)
7         101         2         048-05'07"      -4          0        21
101       2           3         172-13'19"     -77         *        65
2         3           4         129-29'56"     -91         *        64
3         4           5         166-09'44"      -3          0        24
4         5           6         043-12'05"      0           0         9
5         6           7         192-11'40"      -0          0        19
6         7          101       148-38'10"     -1          0        20

                Root Mean Square (RMS)      45

```

Adjusted Azimuths

Occ. Sta.	FS Sta.	Bearing	Residual	StdRes	StdDev (Sec.)
101	7	N 00-00'00"E	0	0	2
Root Mean Square (RMS)			0		

Statistics

=====

Solution converged in 1 iterations
Degrees of freedom:3
Reference variance:1.77
Standard error unit Weight: +/-1.33
Passed the Chi-Square test at the 95.00 significance level
0.216 <= 5.322 <= 9.348

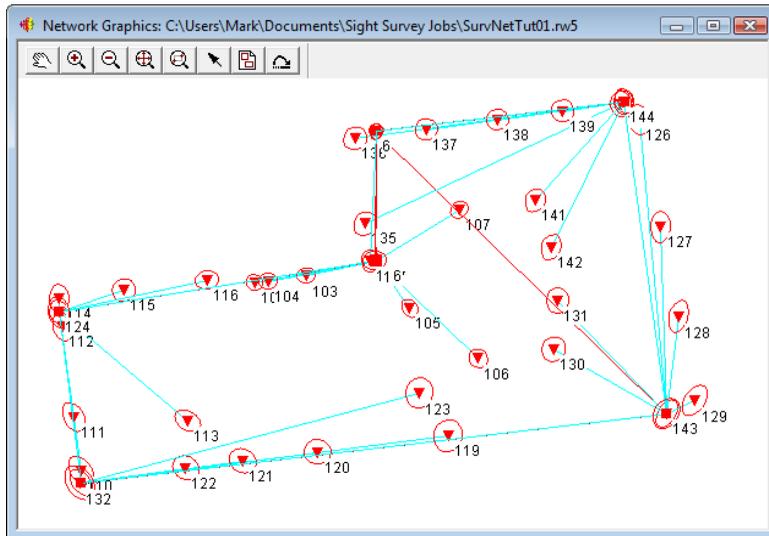
The blunder is most likely in the measurement containing the largest residual and standard residual.

Graphics

SurvNET provides a window that graphically displays the survey network. Additionally the user is able to display error ellipses, and GPS vectors. The user has much control over how the network is displayed. The graphic tool is a useful tool in debugging networks since the raw data can be displayed prior to adjustment. If there are problems with the raw data the graphics often reflect the problem. The actual graphics cannot be output or saved. The graphics can be shown independent of whether the project has been processed.

The following illustration shows a view of the graphic window, which can be accessed using the eye icon on the main tool bar. A project must be opened before the graphic window can be displayed. The graphics window will only display error ellipses after the project has been processed.

The tool bar in the graphics window contains buttons that allow the user to pan, zoom in, zoom out, zoom extents, and zoom to a window. Additionally there is a button that allows the user to navigate to points in the .CGR raw data editor. Also, there are buttons that will refresh the graphic, and change the graphic settings.



Pan: Use this button to pan the graphics.



Zoom In: Use this button to zoom in on the graphics.



Zoom Out: Use this button to zoom out on the graphics.



Zoom Extents: Use this button to zoom to the extents of the graphics.



Zoom to Wwindow: Use this button to zoom to the extents of a user picked window.



Pick Point: This button allows the user to navigate within the .CGR raw editor from the graphics window. Currently this button serves no purpose when working with .RW5 data.



Settings: This buttons is used to change the graphic display settings.



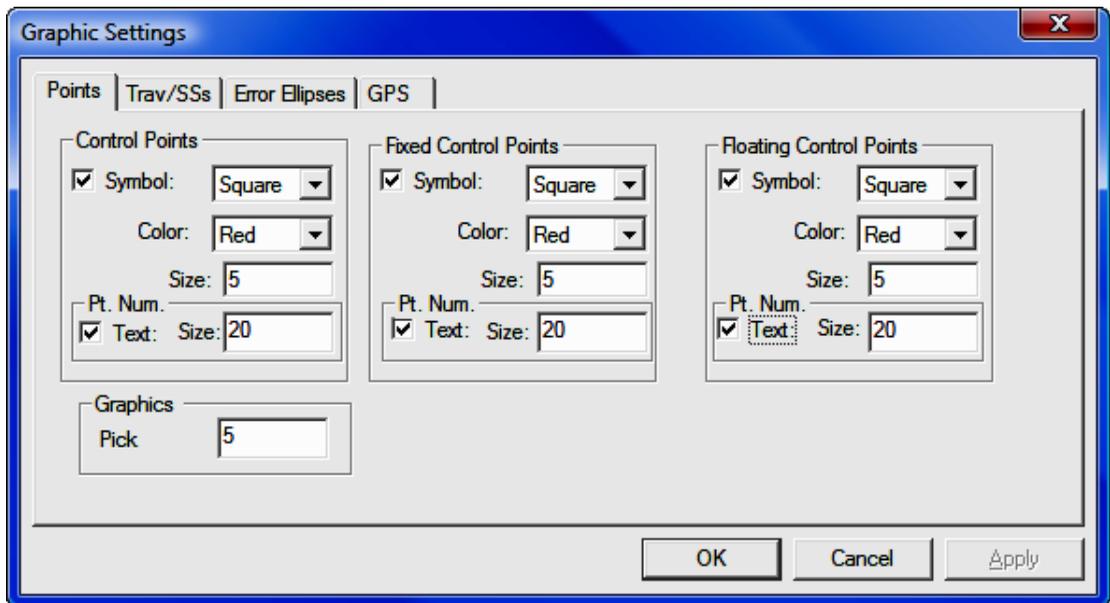
Refresh: This button will refresh the graphic view. Graphics are generated from the saved raw data file. If you make changes to the raw file in the raw editor you must save the file before the changes will be reflected in the refreshed graphic screen.

Following is a description of the options in the graphics setting dialog box, which is accessed using the **Settings** tool bar button.

Points Options

These settings determine how the different type control points are displayed in the graphics window. Different graphic settings can be applied to standard control points, fixed control points and floating control points. The symbol node display can be controlled as to symbol type, symbol color, symbol size. The control point name can be displayed and its size set from this setting dialog box.

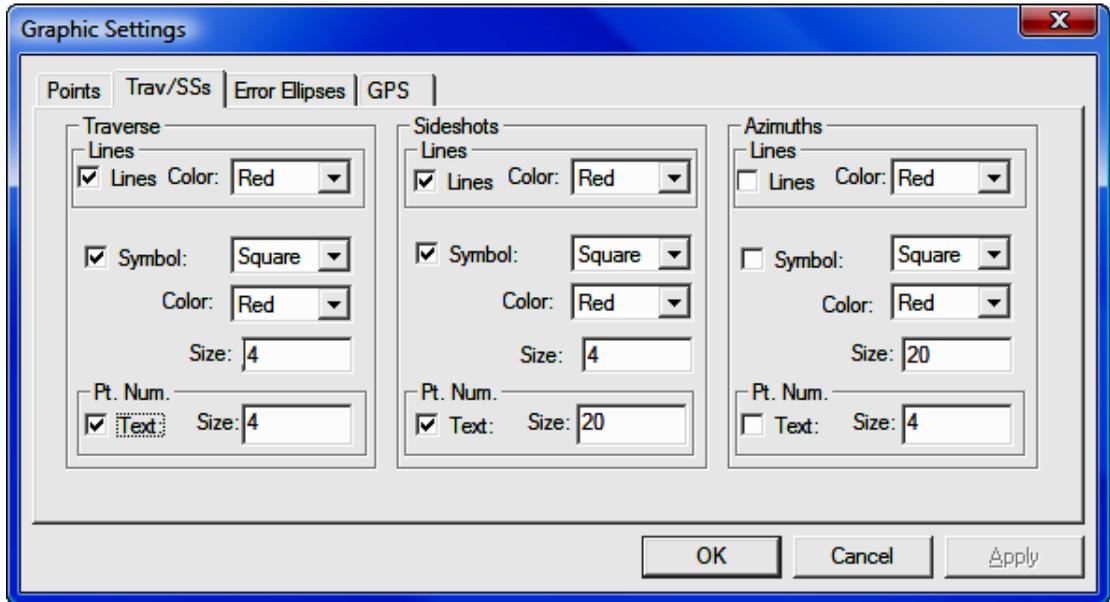
The graphic pick radius defines a search radius. This radius is used when navigating the .CGR editor using the graphic window. You can pick a point graphically and the cursor in the editor will go to the next field containing that point number. The radius is defined in terms of the distance units of the raw data file.



Trav/SS's Options

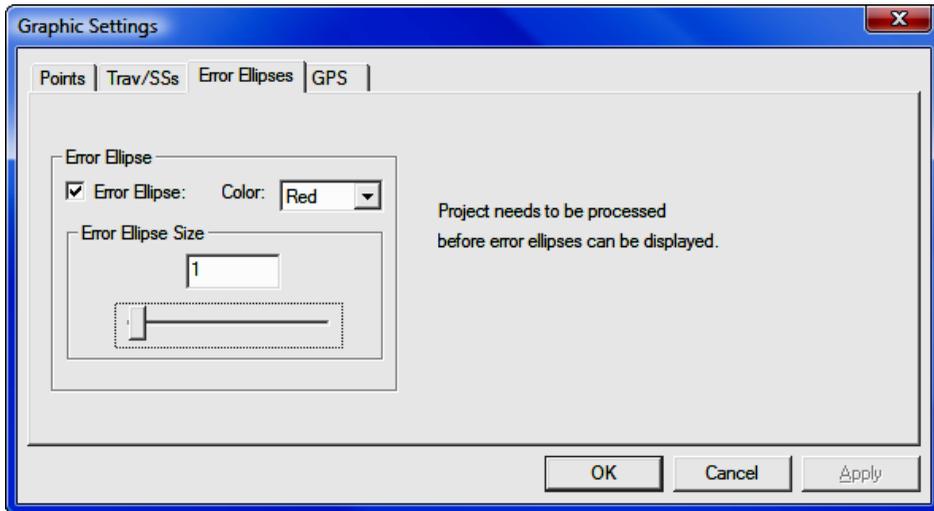
These settings determine how the network line work will be displayed for total station raw data. There are settings for traverse data, side shot data, and azimuth control. The program considers any point that has only a single angle and

distance to it a side shot. The user can control the color of the traverse lines. The symbol node display can be controlled as to symbol type, symbol color, symbol size. The point name can be displayed and its size set from this setting dialog box.



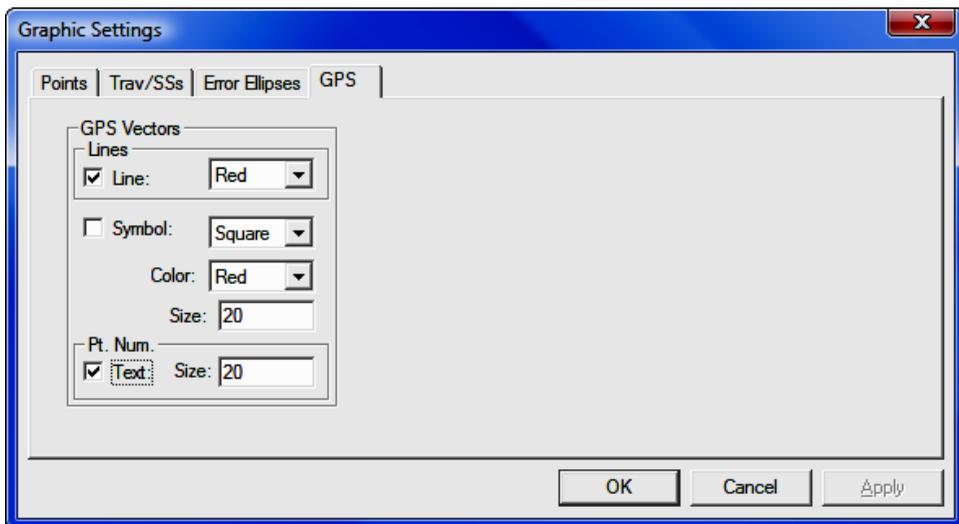
Error Ellipses Options

These settings determine how the error ellipses will be displayed in the graphic window. Error ellipses will only be displayed if there is a successful least squares adjustment. The display of the error ellipses is relative, and the program automatically determines a default relative error ellipse size. The user can modify the visual size of the error ellipses using the track bar in the following dialog box. The user can also control the color of the error ellipse from the following dialog box.



GPS Options

The settings in the following dialog box determine how GPS vectors will be displayed in the graphic window. The user can control the color of the GPS vector lines. The symbol node display can be controlled as to symbol type, symbol color, symbol size. The GPS point names can be displayed and their size set from this setting dialog box.

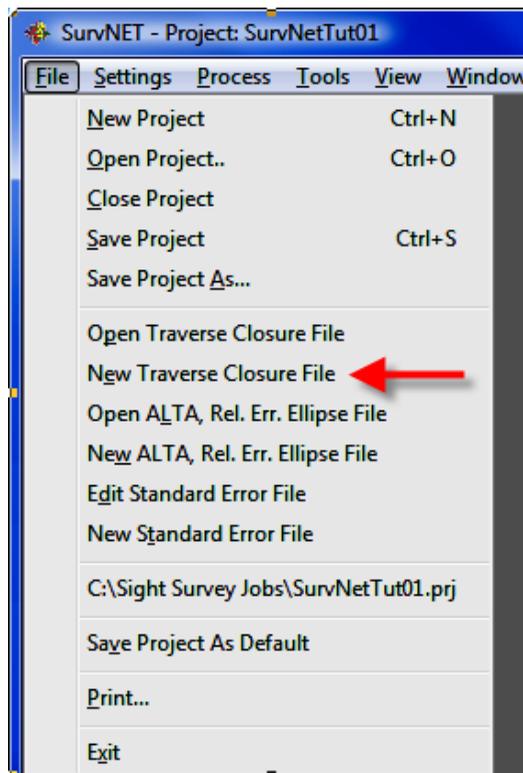


Traverse Closures

Some statutes and jurisdictions still require the computation of traditional traverse closures. SurvNET gives the surveyor the ability to compute the closures of multiple traverses within a project as part of the preprocessing of the project raw data. Closures for single or multiple traverses can be computed for a single project. Additionally, GPS closures can be computed for GPS loops. To compute closures you must first create a **Closure file** (.CLS). Closure files define the type of traverse loops that are to be computed and the point numbers that make up the traverse.

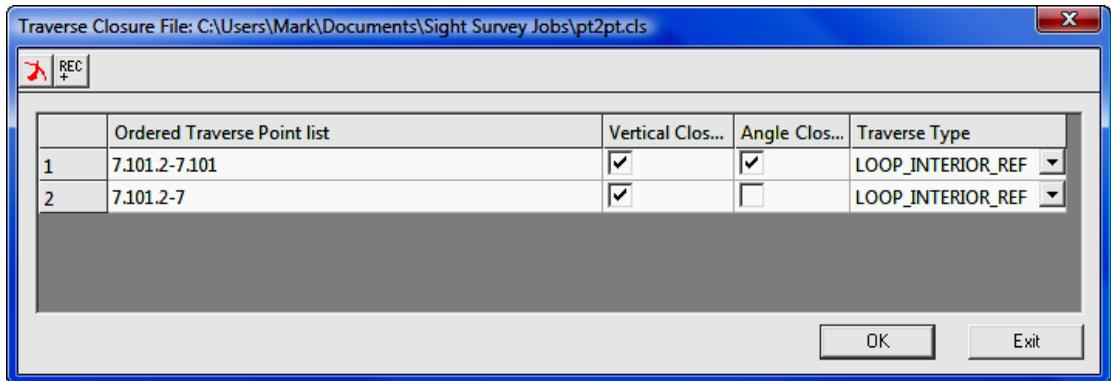
There are two options in the **FILE** menu that are used to create and edit the closure files (.cls):

- Open Traverse Closure File
- New Traverse Closure File



After choosing the **New Traverse Closure File** you will be prompted for a new file name. After choosing a file name the following dialog box is displayed.

First enter the point sequence which defines the traverse in the **Ordered Traverse Point List** grid field. Set the check boxes to set whether vertical closure and angle closures are to be computed, then choose what type traverse is being entered.



Enter the points that define the traverse. Points can be entered in the form:
1,23,30-35,45,23,1

A comma separates the point numbers. You can select a range (30-35) when the points are sequential. You must start with the first backsight point number and end with the last foresight point number. For example, if you have a simple loop traverse with angle closure using points 1, 2, 3 and 4, it will be entered as:
4,1,2,3,4,1 where **1** is the first occupied point and **4** is the initial backsight.

You can set the **Angle Closure** as **ON** or **OFF**. If the angle closure is **ON**, you will be shown the total angular error and error per angle point. If the final closing angle was not collected you can set **Angle Closure** to **OFF** and only the linear closure will be computed.

You can set the **Vertical Closure** as **ON** or **OFF**. If the vertical closure is **ON**, you will be shown the total vertical distance closure.

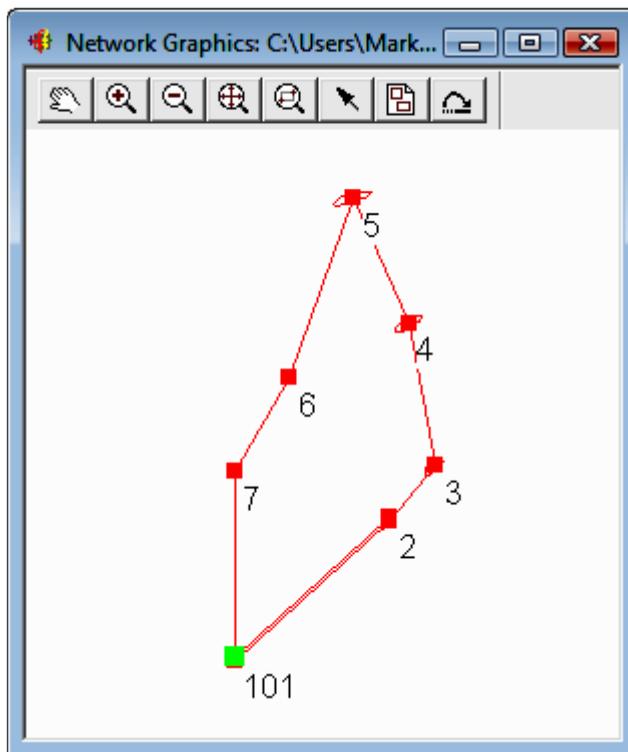
In order to calculate the traverse closure, you must select the **TRAVERSE TYPE**. It can be:

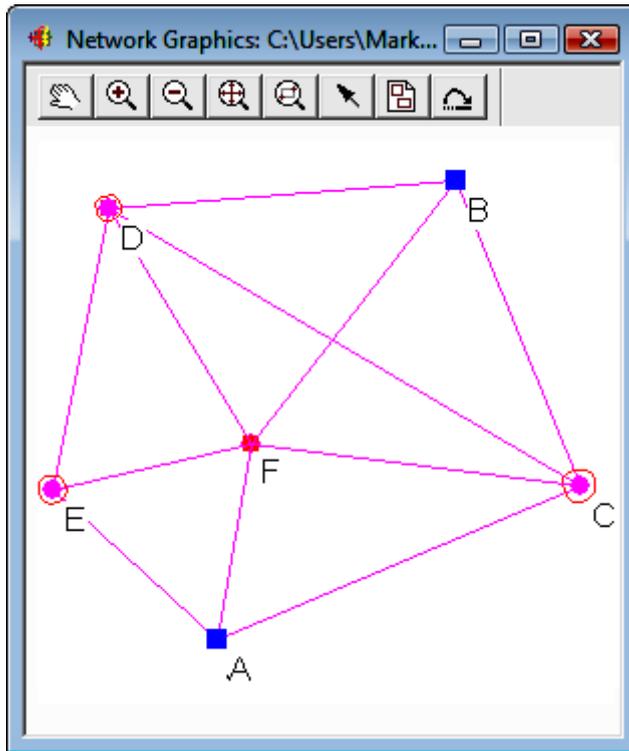
Pt. to Pt. Trav. - A point to point traverse is a traverse that starts at a set of known coordinates and ends at another known coordinate. This option assumes you start from two control points and tie into two control points if an angle closure is desired and one control point if only a linear closure is desired. The first backsight distance and last foresight distance if angle closure is **ON** are not used in computing the linear closure. Following is an example of a pt. to pt. traverse with angle closure.

100,101,2-5

In the above pt. to pt. list Pt 100 is the starting backsight point, Pt. 101 is the starting instrument point. Pt. 4 is the ending instrument point and the foresight to the angle closure point is point 5. If a closing angle was not collected the list would look as follows: **100,101,2-4**

Loop Trav., Int. Az. Ref. - A closed loop traverse that begins by back sighting the last interior point on the traverse. Following is an example.

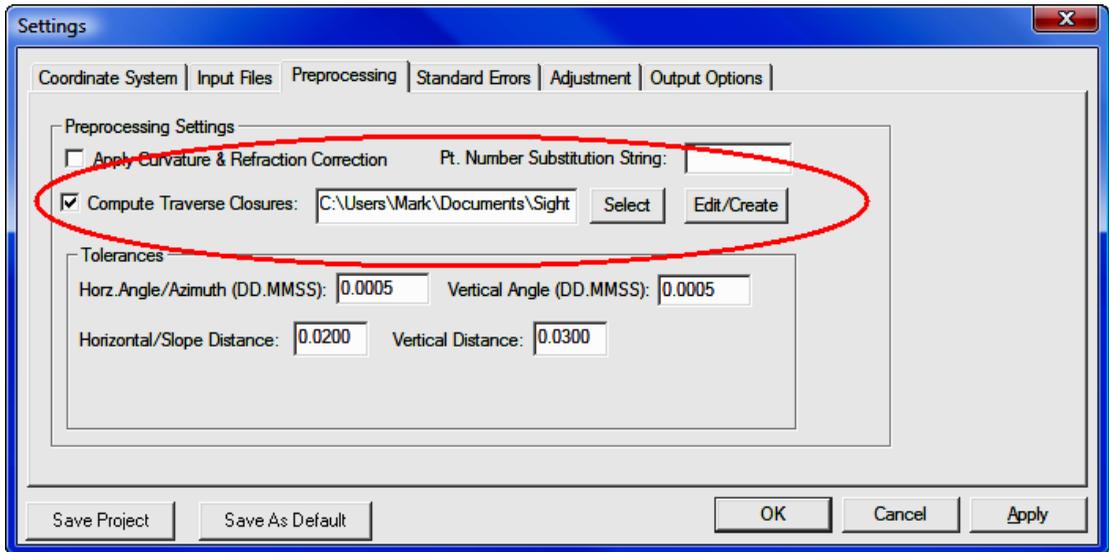




A,E,F,A

In the above example GPS loop, closure will be computed from the GPS loop going from A-E-F-A.

After the closure file (.cls) has been created the preprocessing project settings need to be updated to include the closure file in the project. Following is a view of the settings screen that defines a closure file to be used in preprocessing. Notice that the check box **Compute Traverse Closure** is checked and a closure file has been entered in the edit box field. Notice that the **[Edit/Create]** button can be used to edit an existing closure file or create a new closure file.



When the data is processed, the closure reports will appear in the RPT and ERR files. Following is an example of a closed loop traverse report:

```

Traverse Closures
=====

Traverse points:
7,101,2-7,101

Loop Traverse; Interior direction reference;
Compute angle closure.
Do not compute vertical closure.

Total angular error: 000-04'16"
Angular error per point: 000-00'37"

Correct Ending Coordinates, North: 249369.069 East: 642232.387
Ending Coordinates, North: 249369.156 East: 642232.360
Error, N: 0.087 E: -0.026 Total: 0.091 Brg: S 16-46'01"E
Distance Traversed: 344.651 Closure: 3776.794

```

Following is an example of a GPS loop closure report.

```
Traverse Closures
=====

GPS Loop Points:
A,E,F,A

GPS Loop Closure;
Misclosure, X: -0.0323   Y: -0.0162   Z: -0.0105
Closure error:  0.0376   Perimeter: 20229.3858
Precision: 1:537594

GPS Loop Points:
C,F,D,B,C

GPS Loop Closure;
Misclosure, X: -0.0121   Y: -0.0101   Z:  0.0002
Closure error:  0.0158   Perimeter: 41332.9807
Precision: 1:2622216

GPS Loop Points:
F,D,B,F

GPS Loop Closure;
Misclosure, X: -0.0022   Y: -0.0044   Z:  0.0097
Closure error:  0.0109   Perimeter: 30814.5047
Precision: 1:2833226
```

Following is a view of the closure file that created the above GPS closure report. The **Vert. Closure** and **Angle Closure** toggles serve no purpose with GPS loop closures.

Traverse Closure File: C:\Users\Mark\Documents\Sight Survey Jobs\pt2pt.cls

REC +

	Ordered Traverse Point list	Vertical Clos...	Angle Clos...	Traverse Type
1	A,E,F,A	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	LOOP_INTERIOR_REF ▾
2	C,F,D,B,C	<input type="checkbox"/>	<input type="checkbox"/>	LOOP_INTERIOR_REF ▾
3	F,D,B,F	<input type="checkbox"/>	<input type="checkbox"/>	LOOP_INTERIOR_REF ▾

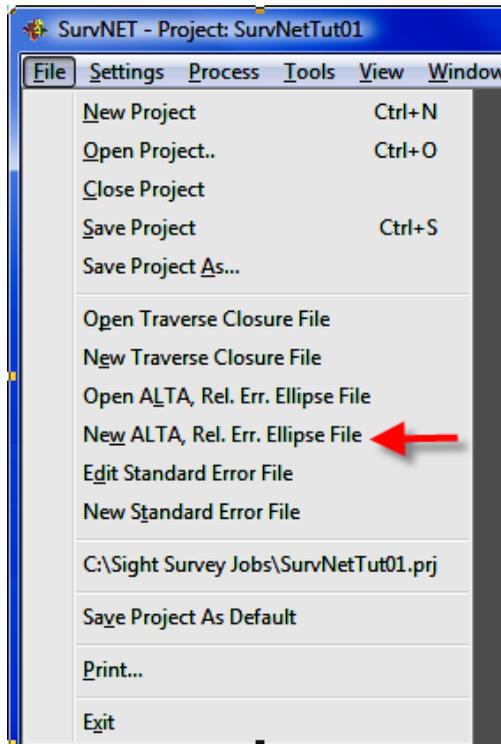
OK Exit

Creating ALTA Tolerance Reports

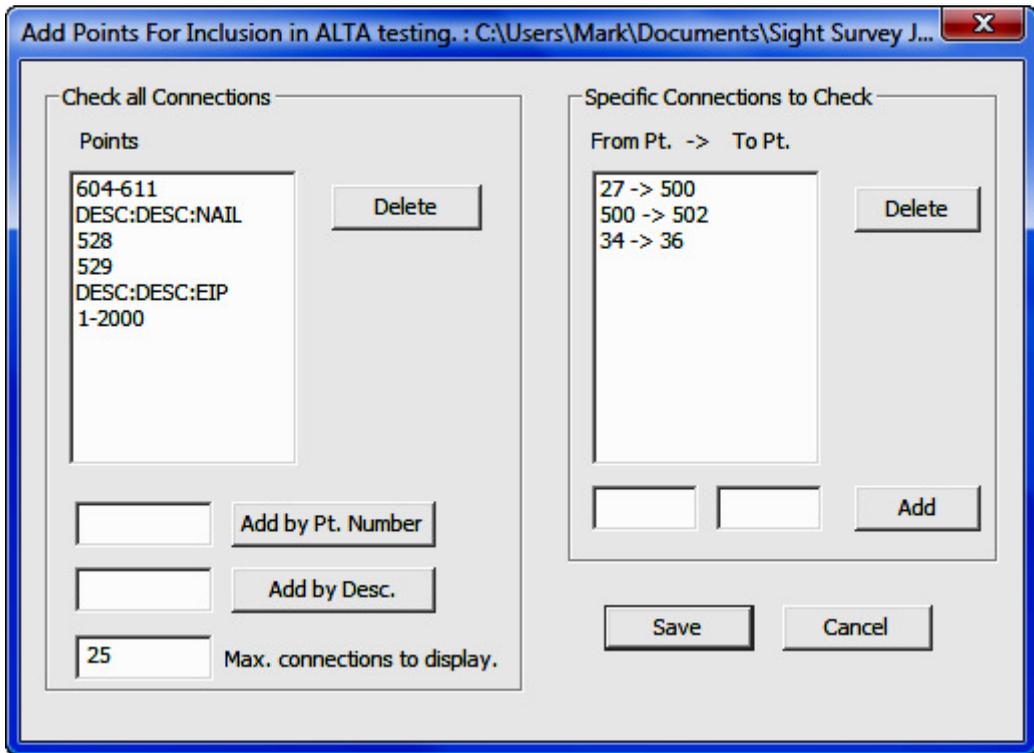
SurvNET provides the ability to generate reports that give the surveyor the information needed to determine if his survey is within ALTA positional tolerances. It is required that the user define which points are to be included in the ALTA testing. The points to be included for ALTA testing are defined in an .Alt file.

There are two options in the FILE menu that are used to create and edit the ALTA files (.alt):

- **Open ALTA, Rel. Err. Ellipse File**
- **New ALTA, Rel. Err. Ellipse File**



After choosing the ALTA file to be created or edited the following dialog box is displayed.



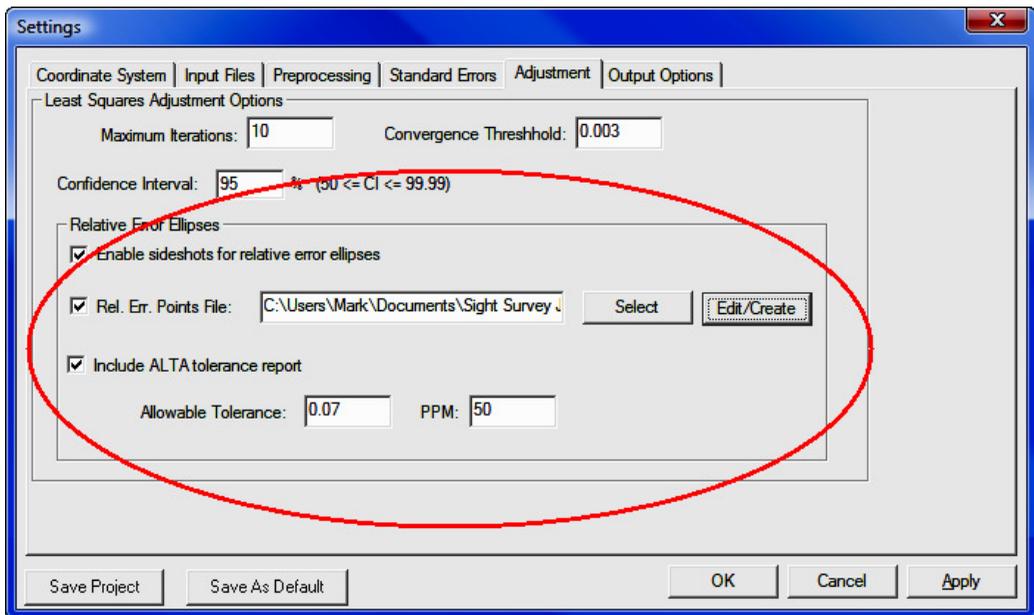
The above dialog box allows the user to define the points to be included in the ALTA report processing. There are two sections in the .RPT file created through the ALTA reporting. The following report shows the sections of the ALTA report generated by the data in the dialog box. The first section of the report displays only the relative error ellipses between points. The point sequences used in this section come from the list on the right hand side of the above dialog box. The second section of the report performs an ALTA tolerance test and displays only those connections that fall outside of the ALTA tolerances (as set in the **ADJUSTMENT** tab of the **SETTINGS** dialog box). The program first checks the specific point sequences defined by the list on the right side of the dialog box. The program then checks all the connections between all the points listed on the left hand side of the dialog box.

There can be many connections to check if the point list on the left hand side of the dialog box has a lot of points. The user can limit the number of sequences to be displayed that fail the ALTA test by entering a number in the **Max. Connections to display** field.

Notice that you can enter points based on descriptions in the left hand list box. If you wished to check connections between all points with TP, EIP, MON descriptions, enter the descriptions in the edit field and press the **[Add]** button. If TP, EIP, and MON represented traverse points, existing iron pipes and monuments then ALTA testing would be performed on those point types.

After you have created the .ALT point file you need to set a few project settings. These settings define the ALTA tolerances, specify the .ALT file to be used, and define the type of reporting to be generated. The **Adjustment** tab sheet within the **Project Settings**, has a relative error ellipse section where the ALTA report settings are located.

All the ALTA reporting settings reside within the **Relative Error Ellipse** box. If there are any side shots that need to be included in the ALTA testing, the **Enable side shots for relative error ellipses** check box must be checked.



The **Rel. Err. Points File** check box must be checked, and an .ALT file must be chosen to get an ALTA report. The .ALT file defines which points will be included in the ALTA reporting. See the previous discussion on the creation of the .ALT file if you are unsure of how to create an .ALT file.

Check the **Include ALTA tolerance report** check box to create the ALTA tolerance checking report section. If an .ALT file has been chosen then the relative error section of the report will always be generated.

Next make sure the appropriate tolerance and PPM has been defined. The ALTA standards define their positional standard as .07 plus 50 PPM. Additionally, the ALTA standards require that the computations be performed to a 95% confidence. The confidence interval is set in the **Confidence Interval** edit field.

After the project has been processed the **ALTA/Relative Error** portion of the report is displayed in the report window under the **ALTA/Relative Err.** tab.

The following is a sample ALTA report:

```

Relative Error and ALTA Tolerances
=====

Alta Tolerance Report ,Specific Connections, 95% Confidence Interval

Sta.   Sta.   Dist.   Actual   Allowable   Ratio
nor    Max. Err. Az.   Semi Major   Semi Major   Actual/Allow.   Semi Mi-
27     500    204.5030  0.0793   0.0802     0.9890       0.0588   S
85-06'32.2"E
500    502    66.8572  0.1132   0.0733     1.5432       0.0842   S
86-05'06.7"E
34     36     237.9748  0.0731   0.0819     0.8920       0.0731   N
00-00'00.0"E

Alta Tolerance Report ,All Connections, 95% Confidence Interval

Sta.   Sta.   Dist.   Actual   Allowable   Ratio
nor    Max. Err. Az.   Semi Major   Semi Major   Actual/Allow.   Semi Mi-
506    556    806.5402  1.0818   0.1103     9.8054       0.2586   S
86-37'40.4"E
507    556    827.2364  1.0832   0.1114     9.7268       0.2446   S
86-37'05.9"E
505    556    818.7994  1.0779   0.1109     9.7158       0.2386   S
86-48'24.5"E
508    556    854.9436  1.0836   0.1127     9.6108       0.2477   S
86-38'39.4"E
509    556    880.6338  1.0848   0.1140     9.5129       0.2489   S
86-45'39.4"E
521    556    798.2729  1.0387   0.1099     9.4500       0.2318   S
87-22'50.2"E
512    556    793.0518  1.0334   0.1097     9.4245       0.2127   S
87-21'38.9"E

```

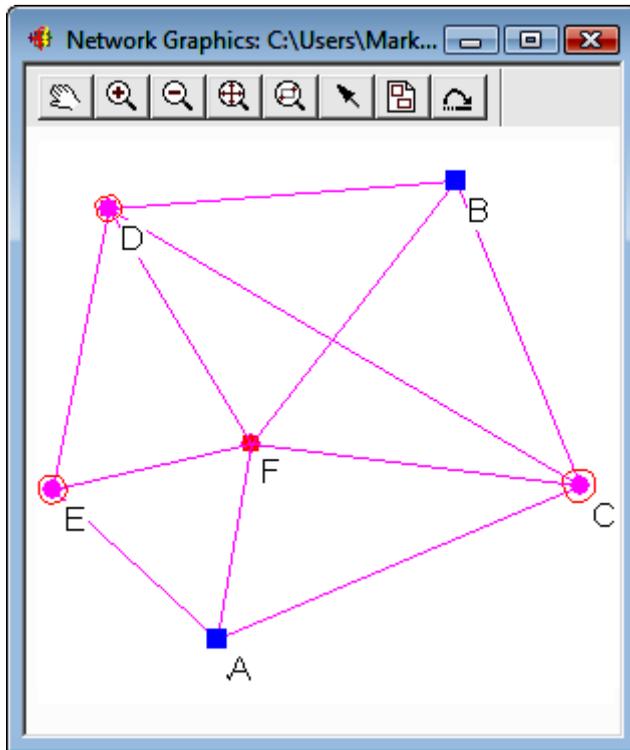
517	556	907.2084	1.0856	0.1154	9.4106	0.2379	S
87-07'38.4"E							
510	556	918.6572	1.0861	0.1159	9.3682	0.2525	S
86-52'46.5"E							
516	556	935.1194	1.0885	0.1168	9.3228	0.2426	S
87-22'21.7"E							
511	556	941.3134	1.0830	0.1171	9.2516	0.2283	S
87-33'40.2"E							
518	556	962.0899	1.0893	0.1181	9.2231	0.2345	S
87-36'45.6"E							
550	556	656.1441	0.9453	0.1028	9.1946	0.1952	S
87-09'41.3"E							
515	556	978.6797	1.0882	0.1189	9.1495	0.2484	S
87-34'16.6"E							
513	556	981.5606	1.0893	0.1191	9.1477	0.2452	S
87-42'02.1"E							
514	556	985.2691	1.0895	0.1193	9.1349	0.2454	S
87-41'57.3"E							
519	556	993.3973	1.0904	0.1197	9.1116	0.2388	S
87-32'58.7"E							
504	556	1004.0126	1.0838	0.1202	9.0163	0.2643	S
86-11'23.8"E							
520	556	1132.1493	1.0918	0.1266	8.6234	0.2423	S
87-17'23.7"E							
524	556	1152.1979	1.0948	0.1276	8.5796	0.2993	S
86-39'15.0"E							
551	556	530.9691	0.8252	0.0965	8.5471	0.1766	S
87-17'08.2"E							
506	555	695.5978	0.8953	0.1048	8.5450	0.2389	S
86-24'27.4"E							
556	800	1161.6986	1.0945	0.1281	8.5449	0.2766	S
86-03'20.2"E							
503	556	1172.1735	1.0945	0.1286	8.5101	0.2767	S
86-03'36.5"E							
522	556	1164.2729	1.0911	0.1282	8.5100	0.2546	S
86-47'21.4"E							

If the **Ratio Actual/Allowable** is 1.0 or less, the positional tolerance of the two points have passed the ALTA standards. The first part of the report labeled **Specific Connections** will show all selected connections whether they passed or failed. The second part of the report, labeled **All Connections** will only show the connections that "failed" (we chose to see the worst 25).

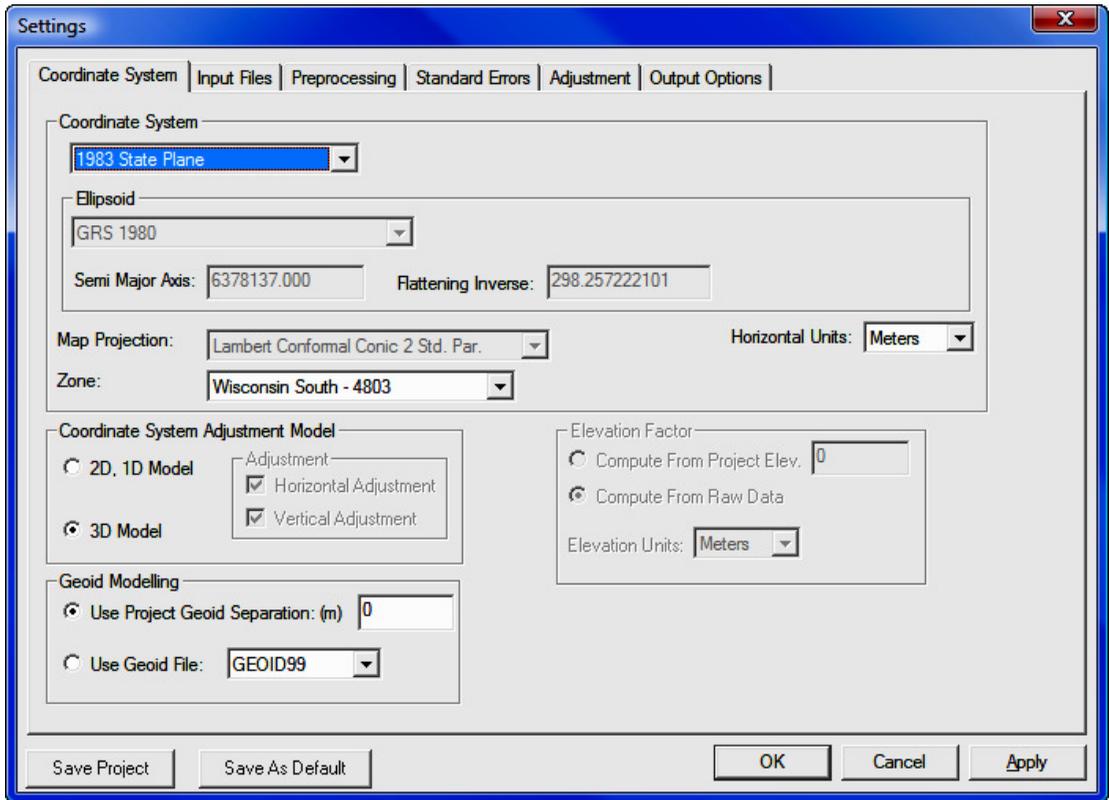
Processing a GPS Vector Network

GPS vector networks can be adjusted with the current version of SurvNET. This section will describe the processing of a simple GPS network. Following is a graphic view of the GPS network that is to be adjusted. Points A and B are control points. The red lines represent measured GPS vectors. Most GPS vendor's

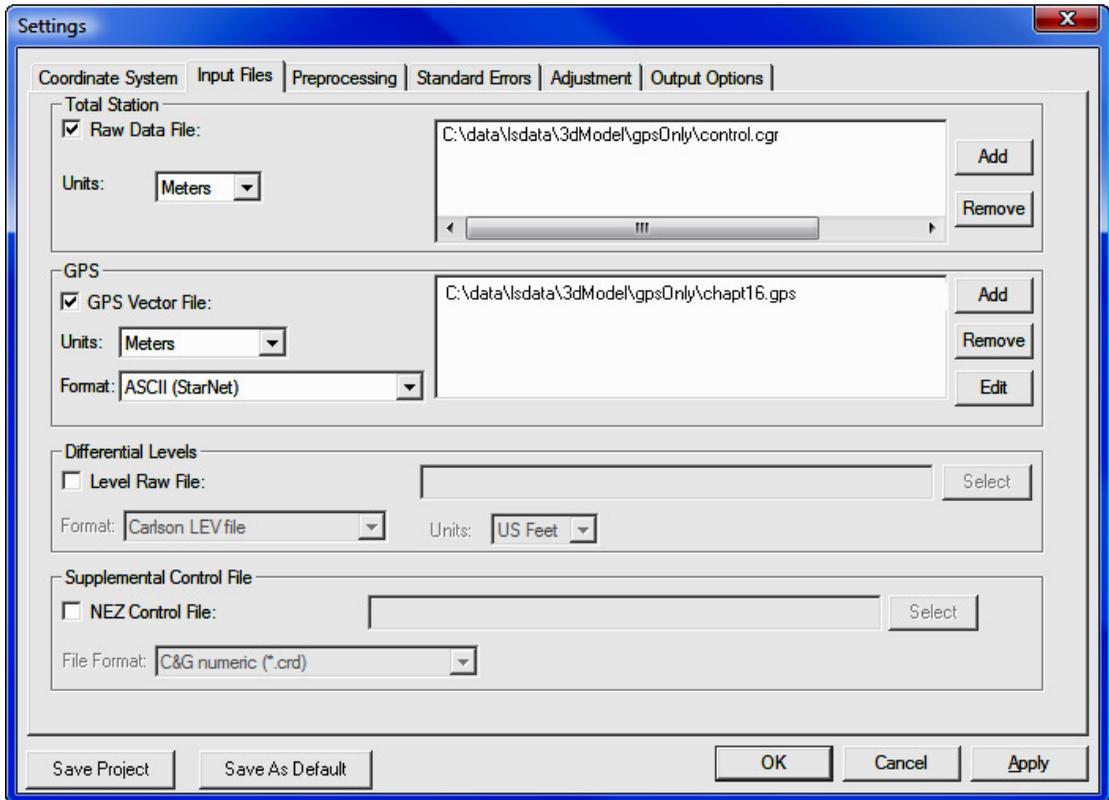
software can output GPS vectors to a file as part of the post processing of GPS data.



When processing GPS vectors certain project settings are important. In the following settings dialog box notice that the 3D-model has been chosen, and SPC 1983 with an appropriate zone has been chosen. The 3-D model and a geodetic coordinate are required when processing GPS vectors. Though it is not require for GPS processing it is in most cases appropriate to chose to do geoid modeling, especially if the project covers a large extents. The following settings dialog box shows the raw files used in processing GPS files. A GPS vector file must be chosen.



GPS vector files from various GPS vendors are currently supported. Following are the formats currently supported.

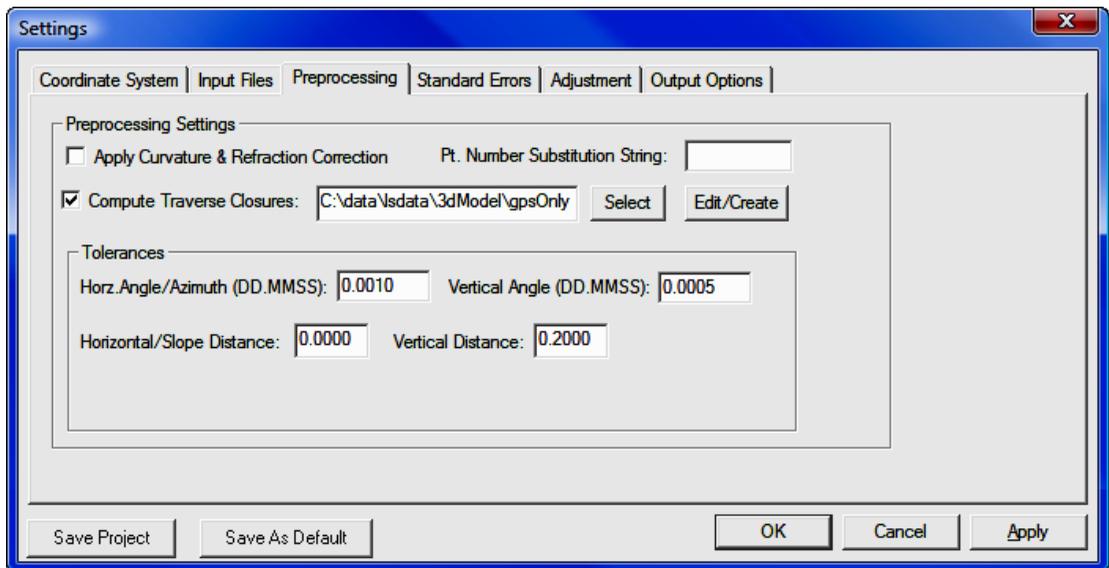


Coordinate control for the network can be in one of several files. The control can be located in the GPS vector file itself. More typically, the control points can be regular coordinate records in the .RW5 or the .CGR file. The also can be entered as **Supplemental Control** in one of the available formats. When the control coordinates are in the raw data file or supplemental coordinate file, the coordinates are expected to be grid coordinates. If the control coordinates are found in the GPS vector file, they are assumed to be Earth centered XYZ.

Very often the point numbering convention used in the GPS data collection is different than the point number convention used when collecting total station data. If the point numbers in the GPS file differ from the total station point number it is easy to first convert the native GPS format file to a ASCII .GPS using the **Tools/ Convert GPS file to ASCII** menu option. The .GPS ASCII files can easily be edited to ensure point numbers are consistent between GPS and total station data.

It is not unusual to have different distance units for GPS, total station data, and control data. Often the GPS vector data is in metric units but the total station raw file is in US Feet, so the distance units must be specified for the different raw data types.

In the **Preprocessing Settings** dialog box the only important setting is the **Compute Traverse Closures** options. If GPS loop closures need to be computed, the loop point numbers need to be entered into a closure file. See the section on traverse closures to see how to create closure files.



There are two **GPS Standard Errors** fields in the **Standard Errors** dialog box. The GPS vector XYZ standard errors and covariances do not need to be defined as project settings since they are typically found in the GPS vector data files. The Instrument centering standard error is the estimated error in centering the GPS unit over the survey point. The **Vector Std. Err. Factor** can be used to globally increase the variance/covariances found in the GPS files without having to edit the GPS file itself.

Settings

Coordinate System | Input Files | Preprocessing | Standard Errors | Adjustment | Output Options

Distance Standard Error
 Constant: 0.01
 ppm: 5

Angle Standard Error (Secs.)
 Horiz. Pointing: 10 Reading: 3
 Vertical Pointing: 3 Reading: 3

Std. Err. Definition File
 Load
 Save As..

Total Station and Total Station Target Standard Errors
 Target Centering: 0.01 Instr. Centering: 0.005 Target Hght.: 0.01 Instr. Hght.: 0.01

Control Standard Errors
 Direction (Azimuth) Standard Error
 Direction (Secs.): 5

Coordinate Standard Errors
 North: 0.001 East: 0.001 Elev.: 0.03

Differential Leveling Standard Errors
 Avg. Dist. to BS/FS: 50 Rod Reading Error per 100 ft./m.: 0.0001 Collimation Error (sec.): 3

GPS Standard Errors
 Instrument Centering: 0.002 Vector Std. Err. Factor: 0

Save Project Save As Default OK Cancel Apply

The following section shows the report generated by the least squares adjustment of the GPS network. Explanations of the report are included following each report section.

```

=====
LEAST SQUARES ADJUSTMENT REPORT
=====

Mon May 08 13:03:02 2006

3D Geodetic Model.

Input Raw Files:
  C:\data\lsdata\3dModel\gpsOnly\control.cgr
GPS File: C:\data\lsdata\3dModel\gpsOnly\chapt16.gps
Output File: C:\data\lsdata\3dModel\gpsOnly\gpsOnly1.RPT
Traverse File: C:\data\lsdata\3dModel\gpsOnly\gpsLoops.cls

Curvature, refraction correction: OFF

```

```

Maximum iterations: 10 , Convergence Limit: 0.002000
1983 State Plane Coordinates, zone:4803 Wisconsin South
Horizontal Units: Meters
Confidence Interval: 95.00
Project Geoid Height:    0.0000

```

```

Default Standard Errors:
Distance: Constant 0.010 ,PPM: 5.000
Horiz. Angle: Pointing 10.0" ,Reading: 3.0"
Vert. Angle: Pointing 3.0" ,Reading: 3.0"
Total Station: Centering 0.005 ,Height: 0.010
Target: Centering 0.010 ,Height: 0.010
Azimuth: 5"

```

```

Coordinate Control: N:0.001, E:0.001, Z:0.030,
GPS: Centering:0.000, Vector Err. Factor:1.0

```

The following section shows the unadjusted measurements that make up the network. The control coordinates are displayed first followed by the GPS vectors. The control coordinates are displayed as latitude/longitude, SPC Grid XYZ, and geocentric XYZ. If geoid modeling is set both ellipsoid and orthometric elevations are displayed, ellipsoid elevation in the latitude/longitude section and orthometric elevation in the SPC section. The GPS vector section shows the unadjusted delta XYZ, variances and covariances of the vectors.

Unadjusted Observations

=====

Control Coordinates: 0 Observed Points, 2 Fixed Points, 0 Approx. Points

Sta.	Latitude	Longitude	Z (Ellip.)	StErr N:	StErr E:	StErr Z:
A	43-15'46.28901"N	89-59'42.16399"W	1382.62	FIXED	FIXED	FIXED
B	43-23'46.36261"N	89-54'00.75701"W	1235.46	FIXED	FIXED	FIXED

Grid XYZ

Sta.	N:	E:	Z (Geoid):	StErr N:	StErr E:	StErr Z:
------	----	----	------------	----------	----------	----------

A	140291.2060	600402.2380	1382.62	FIXED	FIXED	FIXED
B	155110.5390	608083.9250	1235.46	FIXED	FIXED	FIXED
Geocentric XYZ						
Sta.	X:	Y:	Z:	StErr X:	StErr Y:	StErr Z:
A	402.3510	-4652995.3008	4349760.78	FIXED	FIXED	FIXED
B	8086.0316	-4642712.8473	4360439.08	FIXED	FIXED	FIXED
GPS Vectors: 13 Observations						
From Sta.	Delta X	Variance	Delta X	Covariance	XY	
To Sta.	Delta Y	Variance	Delta Y	Covariance	XZ	
	Delta Z	Variance	Delta Z	Covariance	YZ	
A	11644.223	0.001969		-1.916E-005		
C	3601.217	0.001875		1.904E-005		
	3399.255	0.001965		-1.904E-005		
A	-5321.716	0.0004316		-4.2E-006		
E	3634.075	0.0003838		4.32E-006		
	3173.665	0.000401		-4.2E-006		
B	3960.544	0.000461		-4.46E-006		
C	-6681.247	0.0005092		4.14E-006		
	-7279.015	0.0004504		-4.46E-006		
B	-11167.608	0.00054		-5.5E-006		
D	-394.520	0.0005442		5.7E-006		
	-907.959	0.000534		-5.44E-006		
D	15128.165	0.0002922		-2.86E-006		
C	-6286.705	0.0003228		2.68E-006		
	-6371.058	0.0002616		-2.88E-006		
D	-1837.746	0.0002462		-2.38E-006		
E	-6253.853	0.0002554		2.44E-006		
	-6596.670	0.0002566		-2.42E-006		
F	-1116.452	0.0001495		-1.58E-006		
A	-4596.161	0.0001319		1.76E-006		
	-4355.906	0.0001523		-1.62E-006		
F	10527.785	0.0005134		-4.5E-006		
C	-994.938	0.0004326		4.8E-006		
	-956.625	0.0004794		-4.54E-006		
F	-6438.136	0.0001889		-1.84E-006		
E	-962.069	0.0001992		2.08E-006		
	-1182.230	0.0001765		-1.78E-006		

F	-4600.379	0.0001866	-1.98E-006
D	5291.779	0.0001975	1.8E-006
	5414.431	0.0002408	-1.98E-006
F	6567.231	0.0001329	-1.3E-006
B	5686.293	0.0001493	1.38E-006
	6322.392	0.000121	-1.28E-006
B	-6567.231	0.0001103	-1.26E-006
F	-5686.303	0.0001495	1.22E-006
	-6322.381	0.0001326	-1.26E-006
A	1116.458	0.0001324	-1.6E-006
F	4596.155	0.0001622	1.8E-006
	4355.914	0.0001875	-1.64E-006

The optional **Traverse Closure** section shows the GPS loop closures for the GPS loops defined in the closure file (.CLS).

```

Traverse Closures
=====

GPS Loop Points:
A,E,F,A

GPS Loop Closure;
Misclosure, X: -0.0323   Y: -0.0162   Z: -0.0105
Closure error:  0.0376   Perimeter: 20229.3858
Precision: 1:537594

GPS Loop Points:
C,F,D,B,C

GPS Loop Closure;
Misclosure, X: -0.0121   Y: -0.0101   Z:  0.0002
Closure error:  0.0158   Perimeter: 41332.9807
Precision: 1:2622216

GPS Loop Points:
F,D,B,F

GPS Loop Closure;
Misclosure, X: -0.0022   Y: -0.0044   Z:  0.0097
Closure error:  0.0109   Perimeter: 30814.5047
Precision: 1:2833226

```

Following are the final adjusted coordinates. Included in the report are point grid factor, elev. factor and the combined factor. Following the adjusted coordinates are the error ellipses, followed by the adjusted measurements section.

Adjusted Geographic Coordinates

Adjusted Grid Coordinates, (Meters)

Sta.	N:	E:	Z (Geoid):	StErr N:	StErr E:	StErr Z:
C	145233.5553	612043.7117	1103.10	0.0062	0.0062	0.0060
E	145091.9380	595081.6888	914.98	0.0053	0.0053	0.0052
D	154179.9383	596919.0552	894.01	0.0051	0.0050	0.0052
F	146611.7860	601518.4564	1024.24	0.0029	0.0027	0.0028

Adjusted Geocentric Coordinates, (Metric)

Sta.	X:	Y:	Z:	StErr X:	StErr Y:	StErr Z:
C	12046.5807	-4649394.0824	4353160.06	0.0062	0.0062	0.0060
E	-4919.3403	-4649361.2195	4352934.45	0.0053	0.0053	0.0052
D	-3081.5836	-4643107.3693	4359531.12	0.0050	0.0051	0.0052
F	1518.8008	-4648399.1451	4354116.69	0.0027	0.0029	0.0028

Adjusted XYZ Coordinates Error Ellipses, 95% CI

Sta.	Semi Major Axis	Semi Minor Axis	Max. Error Az.	Elev.
C	0.0161	0.0159	S 25-49'31.6"E	0.0157
E	0.0138	0.0137	S 29-24'51.2"E	0.0136
D	0.0133	0.0130	S 11-30'48.4"E	0.0135
F	0.0074	0.0070	S 05-18'52.7"E	0.0073

Adjusted Observations

=====

GPS Vectors: 13 Observations

From Sta.	Delta X	Residual	StdRes	StdDev
To Sta.	Delta Y	Residual	StdRes	StdDev
	Delta Z	Residual	StdRes	StdDev
A	11644.2435	0.0203	0.4581	0.0062
C	3601.2230	0.0065	0.1502	0.0062
	3399.2795	0.0245	0.5521	0.0060

A	-5321.7125	0.0039	0.1894	0.0053
E	3634.1005	0.0251	1.2810	0.0053
	3173.6781	0.0129	0.6429	0.0052
B	3960.5330	-0.0112	0.5219	0.0062
C	-6681.2418	0.0049	0.2181	0.0062
	-7279.0098	0.0050	0.2378	0.0060
B	-11167.6067	0.0009	0.0406	0.0050
D	-394.5281	-0.0077	0.3288	0.0051
	-907.9606	-0.0013	0.0568	0.0052
D	15128.1644	-0.0003	0.0194	0.0063
C	-6286.7131	-0.0077	0.4275	0.0064
	-6371.0592	-0.0009	0.0573	0.0061
D	-1837.7566	-0.0107	0.6844	0.0056
E	-6253.8502	0.0032	0.2006	0.0057
	-6596.6687	0.0010	0.0619	0.0057
F	-1116.4498	0.0025	0.2079	0.0027
A	-4596.1557	0.0053	0.4606	0.0029
	-4355.9139	-0.0077	0.6259	0.0028
F	10527.7799	-0.0053	0.2318	0.0061
C	-994.9372	0.0005	0.0223	0.0061
	-956.6272	-0.0026	0.1175	0.0060
F	-6438.1411	-0.0047	0.3391	0.0050
E	-962.0744	-0.0050	0.3507	0.0051
	-1182.2367	-0.0062	0.4631	0.0050
F	-4600.3844	-0.0057	0.4188	0.0047
D	5291.7758	-0.0027	0.1889	0.0048
	5414.4321	0.0010	0.0615	0.0050
F	6567.2308	-0.0003	0.0220	0.0027
B	5686.2978	0.0052	0.4292	0.0029
	6322.3917	-0.0000	0.0037	0.0028
B	-6567.2308	0.0003	0.0248	0.0027
F	-5686.2978	0.0055	0.4474	0.0029
	-6322.3917	-0.0110	0.9511	0.0028
A	1116.4498	-0.0079	0.6903	0.0027
F	4596.1557	0.0004	0.0321	0.0029
	4355.9139	-0.0002	0.0128	0.0028

The final section displays a variety statistical measures, followed by side shots if there are any. Side shots would be a point that has only a single GPS vector going to or from the point.

Statistics

=====

Solution converged in 2 iterations

Degrees of freedom:27

Reference variance:0.26

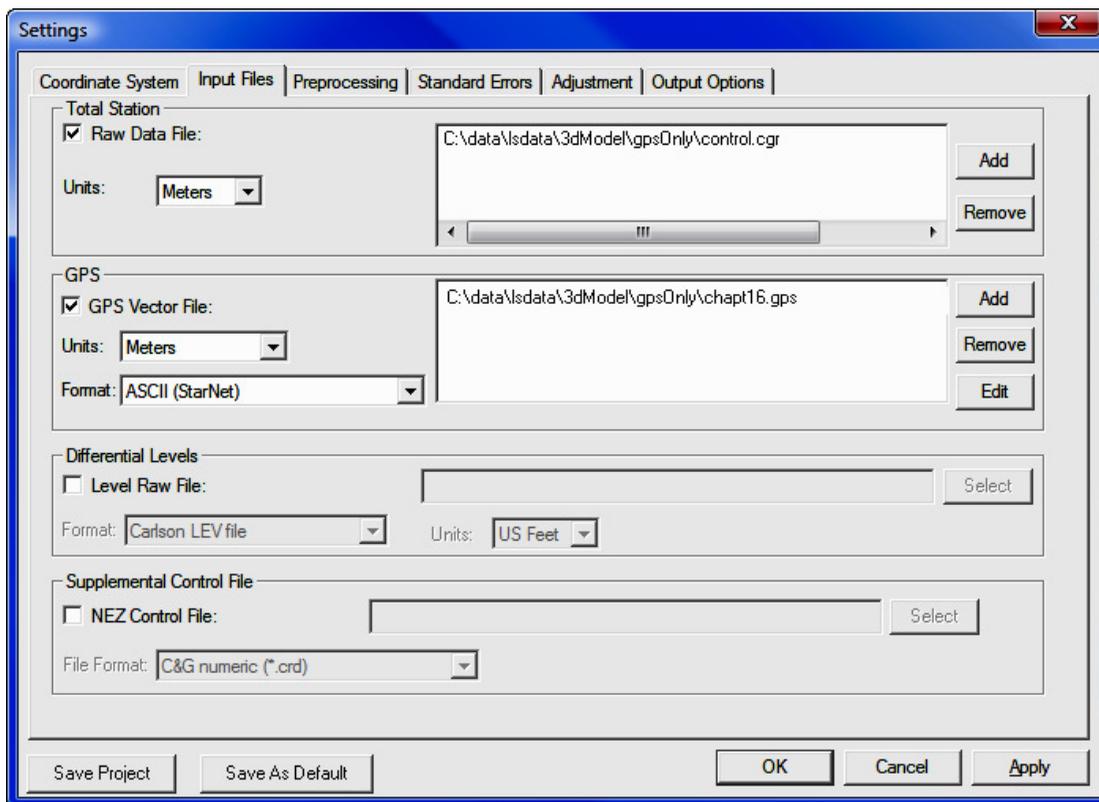
Standard error unit Weight: +/-0.51

Failed the Chi-Square test at the 95.00 significance level

14.573 <= 6.927 <= 43.195

Processing a Total Station and a GPS Vector Network

Processing a GPS vector network together with conventional total station data is similar to processing a GPS network by itself. The only difference in regards to project settings is that a raw data file containing the total station data needs to be chosen as well as a GPS vector file. The project must be set up for the 3D model and a geodetic coordinate system needs to be chosen. The total station must contain full 3D data, including all rod heights and instrument heights measured. Following is a view of the **Input Files Settings** dialog box showing both a GPS vector file and a total station raw data file chosen in a single project. It is not uncommon to have different distance units for GPS data and total station data, so make sure the correct units are set for data types.



One of the most common problems for new users in combining GPS and total station data is not collecting HI's and rod heights when collecting the total station data. Since the 3D model is being used complete 3D data needs to be collected.

Following is a report generated from a project that combined GPS vectors and total station data. Notice that the report is very similar to the GPS vector only project report. Explanations of the report are included in the report and are in bold, normal text.

```
=====
LEAST SQUARES ADJUSTMENT REPORT
=====

Mon May 08 15:08:39 2006

3D Geodetic Model.

Input Raw Files:
  C:\data\lsdata\3dModel\GPSCombined\ravCombined.cgr
GPS File:  C:\data\lsdata\3dModel\GPSCombined\VectorJob.gps
Output File: C:\data\lsdata\3dModel\GPSCombined\gpsCombined2D.RPT

Curvature, refraction correction: OFF
Maximum iterations: 10 , Convergence Limit: 0.000200
1983 State Plane Coordinates, zone:0202 Arizona Central
Horizontal Units: Meters
Confidence Interval: 95.00
Project Geoid Height:  -30.000

Default Standard Errors:

  Distance: Constant 0.002 ,PPM: 5.000

  Horiz. Angle: Pointing 0.6" ,Reading: 0.0"

  Vert. Angle: Pointing 2.0" ,Reading: 3.0"

  Total Station: Centering 0.001 ,Height: 0.002

  Target: Centering 0.001 ,Height: 0.002

  Azimuth: 5"

  Coordinate Control: N:0.010, E:0.010, Z:0.030,

  GPS: Centering:0.001, Vector Err. Factor:10.0
```

Notice that in this example geoid modeling was used. Notice that the ellipsoid elevation is displayed with the latitudes and longitudes. Orthometric elevations are displayed with the SPC83 grid coordinates.

Unadjusted Observations
 =====

Control Coordinates: 0 Observed Points, 2 Fixed Points, 0 Approx. Points
 Sta. Latitude Longitude Z (Ellip.) StErr N: StErr E: StErr Z:
 17 32-58'09.73116"N 112-47'13.55718"W 179.384 FIXED FIXED FIXED
 12 33-04'44.24403"N 112-54'36.04569"W 194.299 FIXED FIXED FIXED

Grid XYZ

Sta.	N:	E:	Z (Geoid):	StErr N:	StErr E:	StErr Z:
17	218691.215	131994.035	209.384	FIXED	FIXED	FIXED
12	230946.179	120618.775	224.299	FIXED	FIXED	FIXED

Geocentric XYZ

Sta.	X:	Y:	Z:	StErr X:	StErr Y:	StErr Z:
17	-2074605.540	-4938403.868	3451206.784	FIXED	FIXED	FIXED
12	-2082621.133	-4927852.115	3461405.389	FIXED	FIXED	FIXED

Notice that in the 3-D model distances are not reduced to horizontal or grid. Slope distances are reduced to mark to mark distances. A Mark to mark distance is the computed slope distance from the monument to monument.

Mark to Mark Slope Distances: 8 Observations

From Sta.	To Sta.	Dist.	StErr
13	51	4013.947	0.022
51	52	2208.268	0.013
52	53	2202.068	0.013
53	18	2714.298	0.016
51	15	1601.219	0.010
52	15	2499.608	0.015
52	16	2639.678	0.015
53	16	2859.648	0.016

Notice that in the 3-D model distances vertical angles are considered as separate measurements. Vertical angles have also been converted to mark to mark vertical angles.

Mark to Mark Vertical Angles: 8 Observations

From Sta.	To Sta.	Vertical Ang.	StErr (Sec.)
13	51	090-04'46.6"	3.6
51	52	090-14'33.0"	3.6
52	53	089-43'23.7"	3.6
53	18	089-58'21.3"	3.6
51	15	090-27'52.0"	3.6
52	15	090-05'53.1"	3.6
52	16	090-07'37.0"	3.6
53	16	090-20'24.0"	3.6

Horizontal Angles: 8 Observations

BS Sta.	Occ. Sta.	FS Sta.	Angle	StErr (Sec.)
12	13	51	067-58'23.5"	0.8
13	51	52	160-18'01.7"	0.9
51	52	53	213-47'22.1"	0.9
52	53	18	198-52'17.3"	0.9
13	51	15	240-35'47.0"	0.9
51	52	15	320-50'46.2"	0.9
51	52	16	142-02'01.5"	0.9
52	53	16	061-14'43.7"	0.9

GPS Vectors: 8 Observations

From Sta.	Delta X	Variance Delta X	Covariance XY
To Sta.	Delta Y	Variance Delta Y	Covariance XZ
	Delta Z	Variance Delta Z	Covariance YZ
12	-507.728	6.64E-005	7.231E-005
13	-5749.936	0.0002136	-1.914E-005
	-8484.249	7.969E-005	-6.468E-005
12	5291.644	4.281E-005	4.478E-005
16	-4337.804	0.0001497	-1.252E-005
	-3048.755	5.397E-005	-4.592E-005
13	4725.685	0.0001066	6.211E-005
15	-1175.977	0.0002265	-5.722E-005
	1127.564	0.0001289	-9.329E-005
13	5799.369	5.779E-005	5.987E-005
16	1412.130	0.0001984	-1.63E-005
	5435.492	7.569E-005	-6.123E-005
15	3797.625	0.0001611	0.0001685
17	-3625.824	0.001025	-8.94E-005
	-2841.898	0.0003411	-0.000365

16	2723.952	6.601E-005	6.098E-005
17	-6213.925	0.0001595	-3.951E-005
	-7149.837	0.0001187	-8.61E-005
16	3983.996	4.166E-005	3.668E-005
18	-2884.461	9.022E-005	-2.464E-005
	-1679.646	6.868E-005	-4.835E-005
17	1260.043	3.331E-005	2.912E-005
18	3329.461	7.695E-005	-1.931E-005
	5470.192	6.021E-005	-4.279E-005

Adjusted Geographic Coordinates

Adjusted Grid Coordinates, (Meters)

Sta.	N:	E:	Z (Geoid):	StErr N:	StErr E:	StErr Z:
13	220822.407	122293.821	205.469	0.011	0.006	0.007
51	222914.991	125719.002	200.982	0.013	0.008	0.028
52	224634.004	127105.001	191.980	0.011	0.009	0.028
53	225289.986	129206.984	202.983	0.011	0.008	0.032
18	225217.062	131920.203	204.850	0.008	0.005	0.007
15	222134.510	127117.007	188.195	0.013	0.008	0.011
16	227273.259	127147.034	186.643	0.007	0.004	0.006

Adjusted Geocentric Coordinates, (Metric)

Sta.	X:	Y:	Z:	StErr X:	StErr Y:	StErr Z:
13	-2083128.851	-4933602.055	3452921.136	0.006	0.011	0.007
51	-2079539.552	-4933856.880	3454699.821	0.008	0.013	0.028
52	-2077907.135	-4933512.881	3456146.639	0.009	0.011	0.028
53	-2075836.064	-4933996.021	3456717.919	0.008	0.011	0.032
18	-2073345.496	-4935074.401	3456676.978	0.005	0.008	0.007
15	-2078403.158	-4934778.040	3454048.691	0.008	0.013	0.011
16	-2077329.484	-4932189.930	3458356.627	0.004	0.007	0.006

Adjusted XYZ Coordinates Error Ellipses, 95% CI

Sta.	Semi Major Axis	Semi Minor Axis	Max. Error Az.	Elev.
13	0.030	0.013	N 20-10'14.1"E	0.019
51	0.036	0.019	N 21-18'08.4"E	0.071
52	0.029	0.020	N 29-51'55.4"E	0.072
53	0.030	0.021	N 19-08'38.0"E	0.083
18	0.022	0.010	N 26-26'36.4"E	0.018
15	0.034	0.020	N 17-51'28.5"E	0.028
16	0.021	0.009	N 22-55'33.0"E	0.014

Adjusted Observations

=====

Adjusted Mark to Mark Distances

From Sta.	To Sta.	Distance	Residual	StdRes.	StdDev
13	51	4013.941	-0.005	0.244	0.013
51	52	2208.258	-0.011	0.803	0.010
52	53	2202.072	0.004	0.281	0.011
53	18	2714.316	0.018	1.146	0.011
51	15	1601.218	-0.001	0.072	0.008
52	15	2499.610	0.002	0.145	0.008
52	16	2639.683	0.005	0.357	0.008
53	16	2859.656	0.008	0.469	0.008
Root Mean Square (RMS)			0.008		

Adjusted Angles

BS Sta.	Occ. Sta.	FS Sta.	Angle	Residual	StdRes	StdDev(Sec.)
12	13	51	067-58'22.4"	-1.1	1.3	0.4
13	51	52	160-18'02.3"	0.6	0.7	0.7
51	52	53	213-47'22.2"	0.1	0.1	0.7
52	53	18	198-52'17.5"	0.2	0.2	0.9
13	51	15	240-35'46.5"	-0.5	0.5	0.9
51	52	15	320-50'47.2"	1.0	1.2	0.7
51	52	16	142-02'01.5"	-0.0	0.0	0.8
52	53	16	061-14'43.4"	-0.3	0.4	0.7
Root Mean Square (RMS)				0.6		

Adjusted vertical angles

From Sta.	To Sta.	Vertical Ang.	Residual	StdRes	StdDev(Sec.)
13	51	090-04'55.5"	-9.0	* 2.5	1.4
51	52	090-14'36.5"	-3.5	1.0	2.9
52	53	089-43'25.0"	-1.2	0.3	3.1
53	18	089-58'22.0"	-0.7	0.2	2.4
51	15	090-27'53.0"	-1.0	0.3	3.4
52	15	090-05'52.9"	0.2	0.1	2.3
52	16	090-07'39.9"	-2.9	0.8	2.1
53	16	090-20'24.9"	-0.9	0.2	2.3
Root Mean Square (RMS)			3.6		

GPS Vectors: 8 Observations

From Sta.	Delta X	Residual	StdRes	StdDev
To Sta.	Delta Y	Residual	StdRes	StdDev
	Delta Z	Residual	StdRes	StdDev

12	-507.7297	-0.0022	0.267	0.0061
13	-5749.9259	0.0102	0.699	0.0109
	-8484.2524	-0.0037	0.409	0.0072
12	5291.6464	0.0028	0.430	0.0045
16	-4337.7947	0.0096	0.785	0.0074
	-3048.7649	-0.0095	1.298	0.0055
13	4725.6931	0.0085	0.818	0.0080
15	-1175.9849	-0.0083	0.549	0.0115
	1127.5557	-0.0086	0.754	0.0100
13	5799.3676	-0.0014	0.185	0.0060
16	1412.1252	-0.0048	0.339	0.0107
	5435.4912	-0.0010	0.116	0.0073
15	3797.6184	-0.0067	0.524	0.0083
17	-3625.8277	-0.0034	0.107	0.0128
	-2841.9072	-0.0093	0.505	0.0109
16	2723.9438	-0.0081	0.999	0.0045
17	-6213.9378	-0.0129	1.022	0.0074
	-7149.8428	-0.0061	0.562	0.0055
16	3983.9875	-0.0082	1.268	0.0054
18	-2884.4705	-0.0092	0.965	0.0079
	-1679.6485	-0.0024	0.290	0.0069
17	1260.0437	0.0003	0.049	0.0052
18	3329.4673	0.0063	0.719	0.0079
	5470.1943	0.0021	0.276	0.0069

Statistics

=====

Solution converged in 3 iterations

Degrees of freedom:27

Reference variance:1.32

Standard error unit Weight: +/-1.15

Passed the Chi-Square test at the 95.00 significance level

14.573 <= 35.620 <= 43.195

Example Projects

On the installation disk there are a variety of different least squares projects one can use to become familiar with least squares and SurvNET. These projects are located in the `\Data\SurvNET\` subdirectory.

When you open a project for review, you will need to check the project settings, input data files to see if the data files show up. If they do not, you will need to re-select them.

Simple Traverse with Traverse Closure

This project is located in `\Data\SurvNET\2DTraverse`. The name of the project is **Traverse**. This project illustrates a basic loop traverse with two control points and a known azimuth for control. This project also illustrates how to obtain traditional closure information as part of the least squares report. The program uses the 2D/1D model and uses a local coordinate system.

Traverse using State Plane Coordinates

This project is located in `\Data\SurvNET\SPCTraverse`. The name of the project is **TravSPCUSFt**. This project illustrates a basic network with three GPS control points for control. This project is computed using the SPC83 NC Grid coordinate system. The project is set up to generate traditional loop closure data. The program uses the 2D/1D model. No elevations are computed or adjusted as there were no HI's or rod readings collected. Notice, that the project uses two raw data files. One file contains the raw angle & distance data while the other raw data file contains the control for the project.

Network with ALTA Reporting

The ALTA reporting project is located in `\Data\SurvNET\ALTARpt`. The name of the project is **ALTARpt**. This project illustrates how to perform ALTA tolerance testing on points within a network.

GPS Network with GPS Loop Closures

The GPS network project is located in `\Data\SurvNET\GPSNetwork`. The name of the project is **GPSOnly**. This project is a simple GPS network. In addi-

tion to the least squares computation and report, GPS loop closures were generated for various GPS loops for this project.

Level Network

The differential leveling project is located in `\Data\SurvNET\LevelNetwork`. The name of the project is **network1**. This project is a simple differential leveling network.

Basic 3D Project

The basic 3D adjustment project is located in `\Data\SurvNET\3DNetwork`. The name of the project is **pg08**. This project is a simple four point example network. Notice in the raw data that all set up records have an HI and all FS readings have valid rod heights. Also note that there are valid vertical angles for every slope distance. Since the 3D model is a true one process 3 dimensional adjustment, you must enter all valid slope distances and vertical angles. Be aware that you cannot just enter a horizontal distance and a vertical angle of 90 from reduced field notes when adjusting using the 3D model.

3D Project Combining Total Station and GPS Vectors

The total station raw data combined with GPS vectors example is located in `\Data\SurvNET\GPSandTtlSta`. The name of the project is **GPSandTtlSta**. This project illustrates a 3D model adjustment that combines both GPS vectors and data from a total station. Since there is GPS data the 3D model must be used. Notice that the GPS vectors are in meters but the total station data is in US feet and the output coordinates are in US feet. Always make sure your units are correct for each data type especially when using the 3D model.

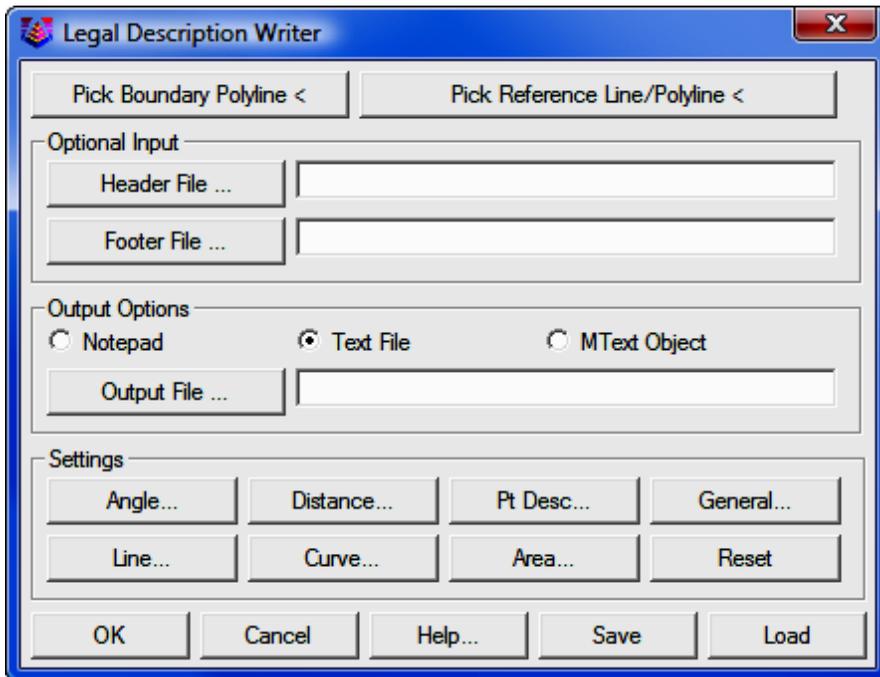
Resection

The total station raw data combined with GPS vectors example is located in `\Data\SurvNET\Resection`. The name of the project is **Resect**. This project illustrates an angle and distance resection. There is no real difference in a resection project than any other angle and distance network in terms of how the data is collected or how the project is set up.

11.13 Write a Legal Description (LD or LF)

FUNCTION: The **Write a Legal Description** routine is used to create a legal description by entering courses defined by point numbers. If necessary, polylines may be created by entering courses defined by point numbers.

Activate **Write a Legal Description** routine by picking from the **Tools** menu, by pressing [Alt][T], [L], or by entering the two-letter command **LD** or **LF** at any data entry prompt.



[**Pick Boundary Polyline**]: This button is used to designate the polyline boundary used. The boundary should be a closed polyline. Use the **Report Sequence** setting in the **General Settings** menu if you need to reverse the polyline. If you want to construct a polyline by entering point numbers, use the **Draw Polyline** routine (**PL** - [Section 12.32](#)).



AutoCAD/IntelliCAD users: After selecting the polyline in your drawing, press the [**Space Bar**] to accept the polyline selection and return to the legal writer dialog.

MicroStation users: After selecting the polyline in your drawing, move your mouse away from the polyline and double-right-click to accept the polyline selection and return to the legal writer dialog.

[Pick Reference Lines]: Use this button to select lines that tie into the polyline boundary used for the legal description. These should be LINE objects that have one endpoint exactly the same as the beginning point of the boundary polyline. If a Simplicity point exists at the end of the line away from the boundary, the routine will pick up its description, otherwise you will be prompted for the description. You can choose any number of reference lines; simply press [**Enter**] to conclude the selection of reference lines.



AutoCAD/IntelliCAD users: After selecting the reference line(s) in your drawing, press the [**Space Bar**] to accept the selection and return to the legal writer dialog.

MicroStation users: After selecting the reference line(s) in your drawing, move your mouse away from the polyline and double-right-click to accept the selection and return to the legal writer dialog.

[Header File]: This button and edit field are used to designate the optional header text file. If a valid file is selected it will be written into the top of the description. Enter a file name or select a file using the Windows File Selection dialog.

[Footer File]: This button and edit field are used to designate the optional footer text file. If a file is selected it will be written at the end of the description. Enter a file name or select a file using the Windows File Selection dialog.

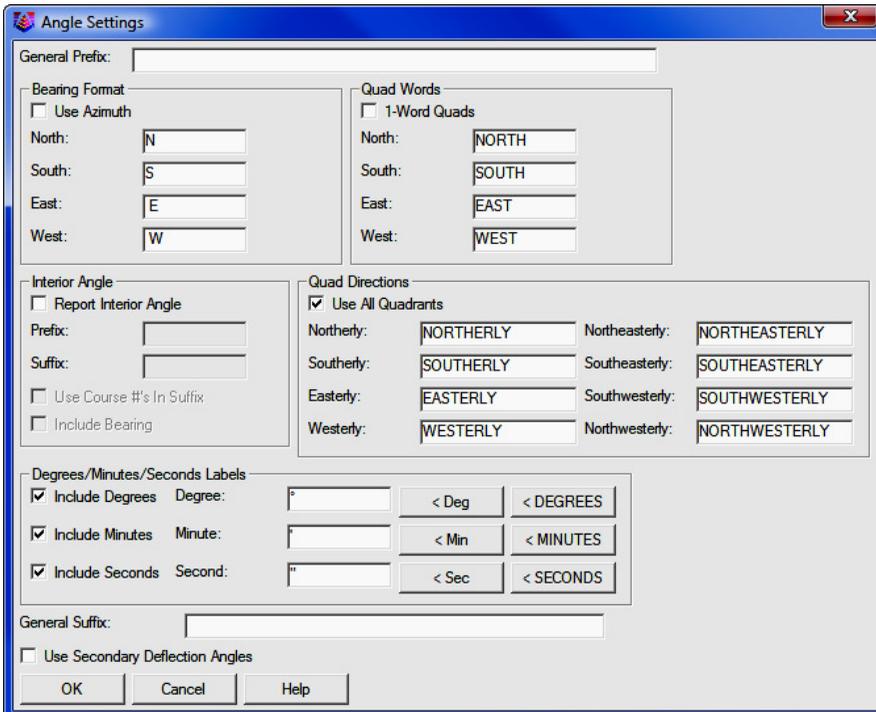
[Output Options]: These options allow you to select where the **Legal Description Writer** should send the output.

- Ⓒ **Notepad:** The output is sent to Windows Notepad.
- Ⓒ **Text File:** The output is sent to an external text file as designated in the output file section described below.

[Output File]: This button and edit field are used to designate the output text file if that is your chosen output option. This file can then be brought into your word processor and finalized. Enter a file name or select a file using the Windows File Selection dialog. Note that the appearance of the output file can be affected by the status of the **Report Style Option: Append Lines Output Format** toggle under the Legal Description's **[General]** settings button.

- ⊙ **Mtext Object:** This creates an mtext object in the current drawing. Upon clicking **[OK]** to write the descriptions, you will be presented with the **Draw Text Line** dialog, from which you may select the **Justification**, and text properties (via the **[Drawing Properties]** button). Click **[Draw]** to insert the text into the drawing.

[Angle] Settings: This dialog is used to establish the appearance of the bearings that are output with the description, and allows detailed control over each aspect.



General Prefix: If desired, enter a prefix to be used prior to any angle call.

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 are literal, meaning that if you don't have a literal space after N/S, and before E/W, a space will not be formatted into the bearing. To use azimuths, select the **Use Azimuth** option and the **General Prefix** will be set to **AZ**.

1-Word Quads: For example bearings that are **due NORTH**, the default is to generate **N 00° 00' 00" E**. If the **1-Word Quads** option is selected, the program will substitute the word or phrase (user definable) for the direction, these usually being (for example) **NORTH**, or **DUE NORTH**.

Interior Angle: Select this option to include interior angles in your directional calls. You have the option of assigning a prefix and/or suffix to these angle calls.

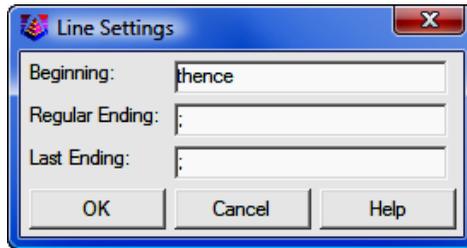
Quad Direction: Enter the words to be used to describe general directions.

Degrees/Minutes/Seconds Labels: This section 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.

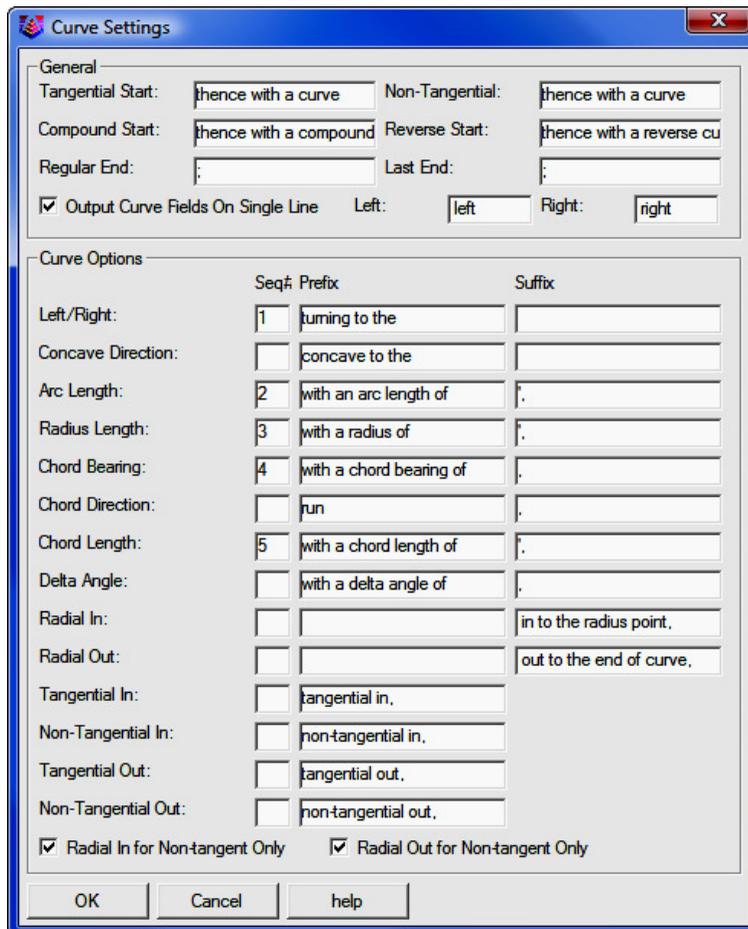
General Suffix: If desired, enter a suffix to be used subsequent to any angle call.

Use Secondary Deflection Angles: Select this option to include secondary deflection angles in your directional calls.

[Line] Settings: This section 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.

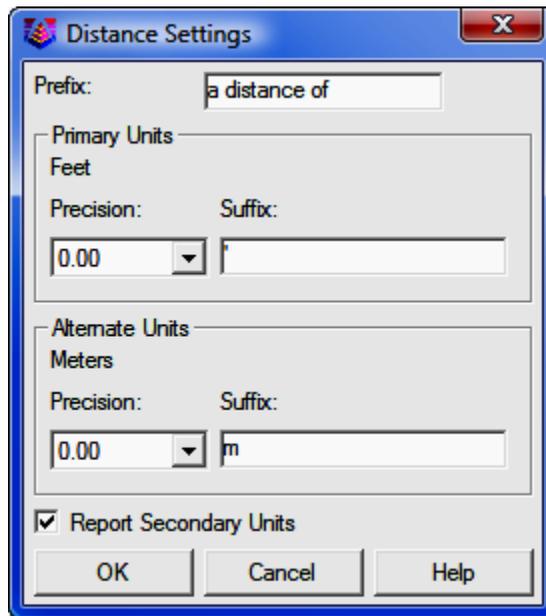


[Curve] Settings: This dialog is used to establish the terms and options used when creating the course of a curve. Basic options include beginning and ending terms, as well as the words for left and right if chosen.



In the large table of curve options, you may choose the items you wish to report, in the order you want them to appear. Simply place a number in the sequence field indicating the items you wish to report, making sure that there are no duplicate numbers. In the dialog screen shown above, the program would output the curve direction, arc length, radius length, chord bearing, and chord length, radius length, chord bearing, and chord length, and in that order. Each field can also have a unique **prefix/suffix**. There are four different possible phrases for the start of the curve description for whether the curve is tangential, non-tangential, compound or reverse. The **Radial In/Out** for **Non-tangential Only** option applies to the **Radial In/Out** fields and tells the program to only use these fields when the curve is non-tangential. Otherwise, these fields are always used when the **Radial In/Out** fields are in the sequence.

[Distance] Settings: This dialog is used to establish the terms and precision used when creating a distance for the course of a call.

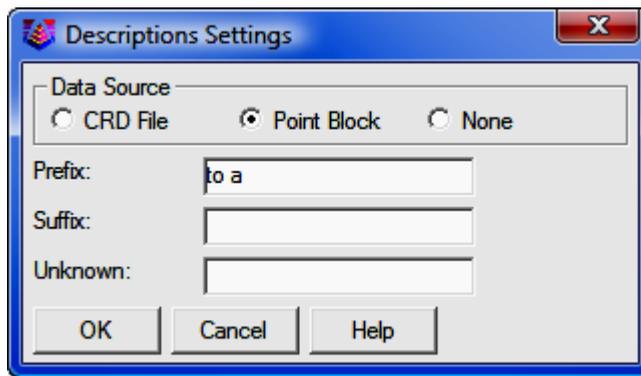


Primary Units: The precision and suffix apply to curves as well. Simply choose the desired distance precision from the pull-down menu, and supply the beginning and ending terms for the line calls.

Alternate Units: The precision and suffix apply to curves as well. Simply choose the desired distance precision from the pull-down menu, and supply the beginning and ending terms for the line calls.

Report Secondary Units: Note the availability of dual distance reporting. If you would like to report dual distances such as feet/metric, turn on the toggle in the lower left corner of the dialog.

[Descriptions] Settings: This dialog is used to establish the data source and general terms to apply to point descriptions as a prefix and/or suffix.



Data Source: 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 (.CRD) file, meaning the points do not have to be plotted on the screen. A second option is point block, in which the program will read the information from the drawing, and not require the presence of a coordinate (.CRD) file.

Prefix: General term applied before the actual description.

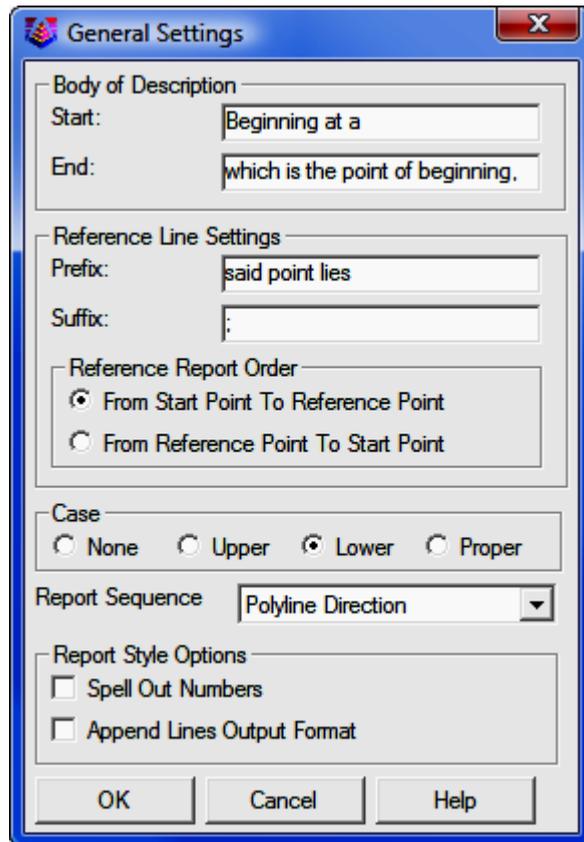
Suffix: General term applied after the actual description.

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.

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.

[General] Settings: This dialog controls general specifications which can affect the entire description. Each group of items are explained in detail below.



Body of Description: Enter the beginning and ending terms for the description.

Reference Line Settings: Enter the **Prefix** and **Suffix** to be used when inserting the call to the reference line.

Reference Report Order: Choose to describe the reference line from the **Start Point to the Reference Point**, or from the **Reference Point to the Start Point**.

String Case: Choose the button corresponding to the string case conversion desired. If you want no changes made, choose **None**. Choosing **Upper**, **Lower**, or **Proper** case conversion will affect the case of all text throughout the description, except bearing letters.

Report Sequence: This option controls the sequence to report the boundary segments either in the direction of the polyline; clockwise, or counter-clockwise.

Spell Out Numbers: This **Report Style Option** writes numbers as words instead of digits. For example, a distance of **123** would be written as **one hundred twenty three**.

Append Lines Output Format: If this **Report Style Option** 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.

[Area] Settings: The legal description writer can report several types of area summaries.

Area Reporting

General Prefix:

	Seq#	Prefix	Suffix	Precision
Sq. Feet:	<input type="text" value="1"/>	<input type="text"/>	Square Feet.	<input type="text" value="0.00"/>
Sq. Yards:	<input type="text"/>	<input type="text"/>	Square Yards	<input type="text" value="0.00"/>
Sq. Miles	<input type="text"/>	<input type="text"/>	Square Miles	<input type="text" value="0.000"/>
Acres:	<input type="text" value="2"/>	<input type="text"/>	Acres	<input type="text" value="0.000"/>
Sq. Meters:	<input type="text"/>	<input type="text"/>	Square s	<input type="text" value="0.00"/>
Sq. Kilo:	<input type="text"/>	<input type="text"/>	Square Kilos	<input type="text" value="0.00"/>
Cuerdas:	<input type="text"/>	<input type="text"/>	Cuerdas	<input type="text" value="0.00"/>
Hectares:	<input type="text"/>	<input type="text"/>	Hectares	<input type="text" value="0.00"/>

General Suffix:

OK Cancel Help

General Prefix: Specify a general prefix for the area output line.

Area Selections: In the table of area options, you may choose the items you wish to report, in the order you want them to appear. Simply place a number in the sequence field indicating the items to be reported, making sure that there are no duplicate numbers. You may also edit the **Prefix** and **Suffix** for each area call, and control decimal **Precision** of each field output.

General Suffix: Specify a general suffix for the area output line.

[Reset]: Click **[Reset]** to reset all settings to their original default values. You will be asked to confirm your intentions.

[**OK**]: Once you have selected the polylines to be used and you have established your description settings, click [**OK**] to write the description.

[**Save**]: Click [**Save**] to save the legal description to a file. The file will be saved with an extension of (LGL).

[**Load**]: Click [**Load**] to load a previously saved legal description (*.LGL) files.

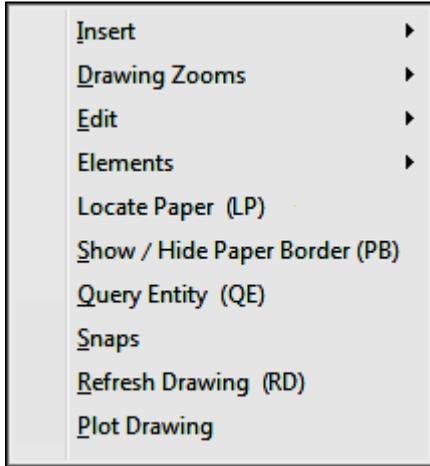


LGL Files: *LGL files from "Sight" Survey 2 or 3, or LegalEase are not compatible with this version of the Legal Description Writer.*

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Section 12

The Draw Menu



The **Draw** menu contains commands related to CAD operations.



NO CAD: *If you are using the non-CAD interface, these options are not available to you.*

In this menu you will find commands for inserting various elements into drawings, including: North arrows; scale bars; line and curve tables; symbols; raster images; and text. This menu also contains several commands that affect CAD usability, such as: various zoom settings; paper location; and drawing erasure.

Several of the two-letter command codes in this section represent legacy commands for users of earlier "Sight" Survey versions.

Many of the CAD commands are not functions programmed into "Sight" Survey, but instead call actual routines in your CAD application. Where applicable, the manual will indicate the application specific CAD command activated by the "Sight" Survey command. This manual is not a substitute for your CAD application's documentation. It will refer you to the command, but for actual instruction for the use of that command please refer to your CAD application manuals.



NOTE: *When "Sight" Survey activates a CAD command, there is no prompting for user action in the program. Refer to the command lines and dialog boxes in your CAD application.*

Because of the number of commands covered in this section the fly-out menus are not shown above, but are listed in the table below.

Insert ▶

North Arrow (NA)
Scale Bar (SB)
Curve Table (CL)
Reset Curve Table (VX)
Short Line Table (SL)
Reset Line Table (LX)
ASCII Text File (TF)
Text Line (TL)
Title Block (TB)
Raster Image (IM)
Component Place (CP or PS)

Drawing Zooms ▶

Auto Zoom Extents (AZ)
Magnify (MG)
Demagnify (DM)
Zoom All (or Extents) (AZ or ZE)
Zoom Window (ZW)
Zoom Sheet (ZS)
Zoom Last (ZL)
Zoom to Point (ZP)

Edit ▶

Drawing Erase (DX)
Layer Erase
Break Line (BL)
Extend Line (EX)
Trim
Move Selected to New Layer (XY)
Default Line Properties (XL)
Default Text Properties (XT)
Default Arrow Properties (XA)
Group into Object
Create Block
Explode Block (XB)
Explode Group
Selection Filter (SF or FI)

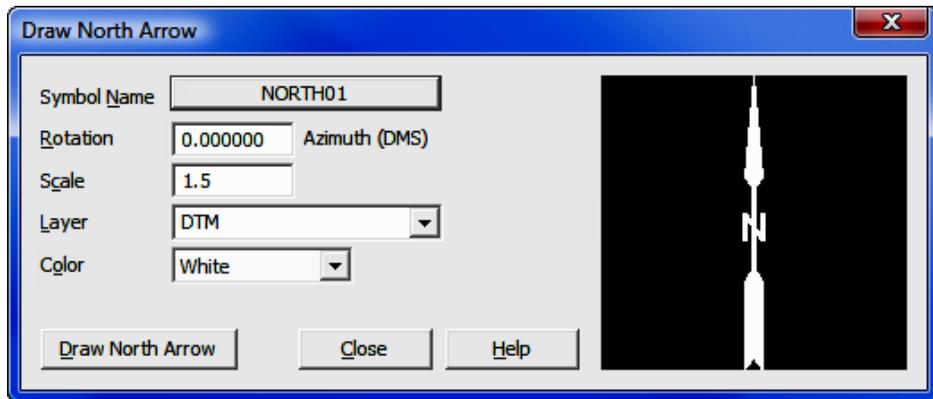
Elements ▶

Draw Polyline (PL)
Draw B-Spline (RC)
Draw Circle (DC)
Draw Rectangle (DR)
Draw Line (LI)
Draw Parallel Line (DP)
Draw Three Point Arc (AC)
Draw Ellipse (EL)
Draw Fillet
Draw Chamfer
Draw Leader Line (LE)
Hatch or Fill
Measure (Label) an Angle (MA)

12.01 North Arrow (NA)

FUNCTION: The **North Arrow** routine allows you to insert a North arrow into your drawing at a specified location.

Activate the **North Arrow** routine by picking from the **Draw > Insert** menu; by pressing [**Alt**][**D**], [**I**], [**N**]; or by typing the two-letter command **NA** at any data entry prompt.



Symbol Name: Click the button to select the North arrow from a graphically displayed array.

Rotation: Enter the angle of rotation as an azimuth in the format shown.

Scale: Enter the scale factor. This is a relative factor; a factor of 2 is twice the size as a factor of 1. You do not have to enter whole numbers. A size of 1 corresponds to an arrow height of 1" when plotted at the scale indicated by the **CAD Configuration** menu (**CM** - [Section 5.03](#)).

Layer: Click [**▼**] to choose the layer upon which to plot the North arrow, or type in the name of a new layer.

Color: Click [**▼**] to select a color in which the North arrow will be drawn.

[Draw North Arrow]: Clicking this button transfers control to your CAD application which will prompt you to click the location for insertion of the North arrow. After placing the North arrow, focus returns to "Sight" Survey.



Can't see Filled Arrows? Several North arrows contain fills. If you place a filled North arrow in the drawing but can't see the fills, make sure the **Fill** attribute is "On." **AutoCAD/IntelliCAD users:** Enter **FILL ON**, then issue a **REGEN** command to refresh the drawing. **MicroStation users:** Select **Settings > View Attributes** and select the **FILL** option. You may apply the option to the open view or all views.



Drawing your own North Arrow: "Sight" Survey includes several North arrows. You can edit any existing arrow, or draw your own. If you create your own arrow, start with an existing **NorthXX.DWG** file and edit it, then be sure to name it as **NORTHXX** where the **XX** can be any number. North arrows must be saved as AutoCAD drawing files (.dwg). You must also save it in the folder:
C:\Program Files\Simplicity Sight Survey 2009\Symbols.

12.02 Scale Bar (SC)

FUNCTION: The **Scale Bar** routine allows you to insert a scale bar into your drawing at a specified location.

Activate the **Scale Bar** routine by picking from the **Draw > Insert** menu; by pressing [**Alt**][**D**], [**I**], [**S**]; or by typing the two-letter command **SC** at any data entry prompt.



Layer: Click [**▼**] to choose the layer upon which to place the component, or type in the name of a new layer.

Precision: Enter the number of decimal places to which you would like the scale divisions carried out.

Color: Click [▼] to select a color for the component to be drawn.

[**Draw**]: Once all the component parameters are set, click [**Draw**] which changes focus to your CAD application. In CAD, you are being prompted for the scale bar location. Left-click your mouse wherever you want the scale bar to be placed, after which focus is returned to "Sight" Surveyy.



12.03 Curve Table (CL)

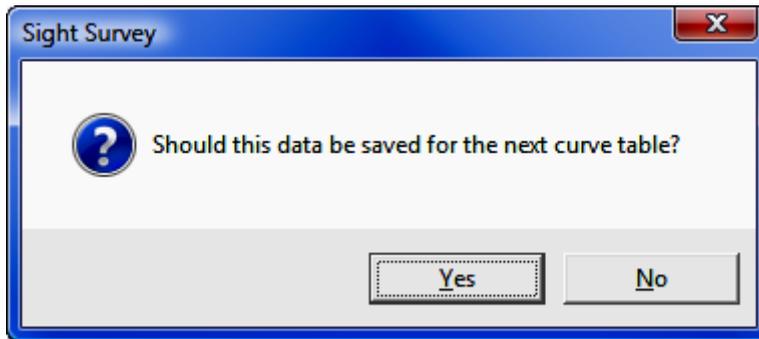
FUNCTION: The **Curve Table** routine allows you to insert a table of curve data into your drawing at a specified location.

Activate the **Curve Table** routine by picking from the **Draw > Insert** menu; by pressing [**Alt**][**D**], [**I**], [**C**]; or by typing the two-letter command **CL** at any data entry prompt.

When activated, focus shifts to your CAD application where you are prompted to select a location for the curve table. The location selected is the upper left corner of the table. The table is constructed on the **Supplemental Table Layer** using the **Text Font**, **Text Size**, and **Text Color** properties as set on the **Drawing Properties** menu (**PR** - [Section 5.10](#)).

The data is placed in the table as individual elements, and it is not grouped. If you want to move the table to another location after you have placed it in the drawing, be sure to select all the elements in the table.

After the table is placed "Sight" Surveyy prompts:



Select [**Yes**] to continue enumerating curves from the last used curve ID number, or select [**No**] to reset the curve counter to 1.

Resetting the Curve Counter: At any time you may reset the curve counter to 1 by selecting **Draw > Insert > Reset Curve Table** or entering the two-letter command **VX**. You will be asked to confirm your decision.

12.04 Line Table (SL)

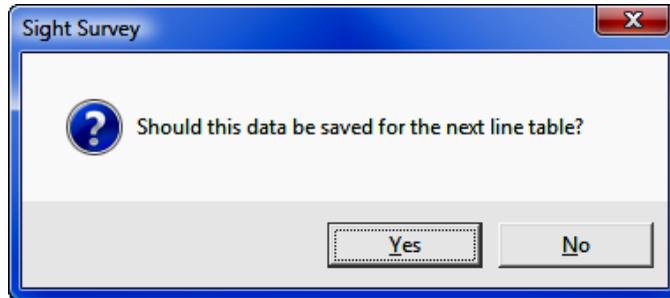
FUNCTION: The **Line Table** routine allows you to insert a table of line data into your drawing at a specified location. Typically this is data pertaining to lines which were too short to support normal annotation.

Activate the **Line Table** routine by picking from the **Draw > Insert** menu; by pressing [**Alt**][**D**], [**I**], [**L**]; or by typing the two-letter command **SL** at any data entry prompt.

When activated, focus shifts to your CAD application where you are prompted to select a location for the line table. The location selected is the upper left corner of the table. The table is constructed on the **Supplemental Table Layer** using the **Text Font**, **Text Size**, and **Text Color** properties as set on the **Drawing Properties** menu (**PR** - [Section 5.10](#)).

The data is placed in the table as individual elements, and it is not grouped. If you want to move the table to another location after you have placed it in the drawing, be sure to select all the elements in the table.

After the table is placed "Sight" Survey prompts:



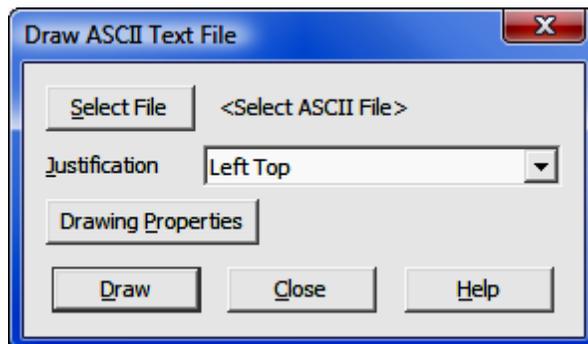
Select [**Yes**] to continue numbering lines from the last used line ID number, or select [**No**] to reset the line counter to 1.

Resetting the Line Counter: At any time you may reset the line counter to 1 by selecting **Draw > Insert > Reset Line Table** or entering the two-letter command **LX**. You will be asked to confirm your decision.

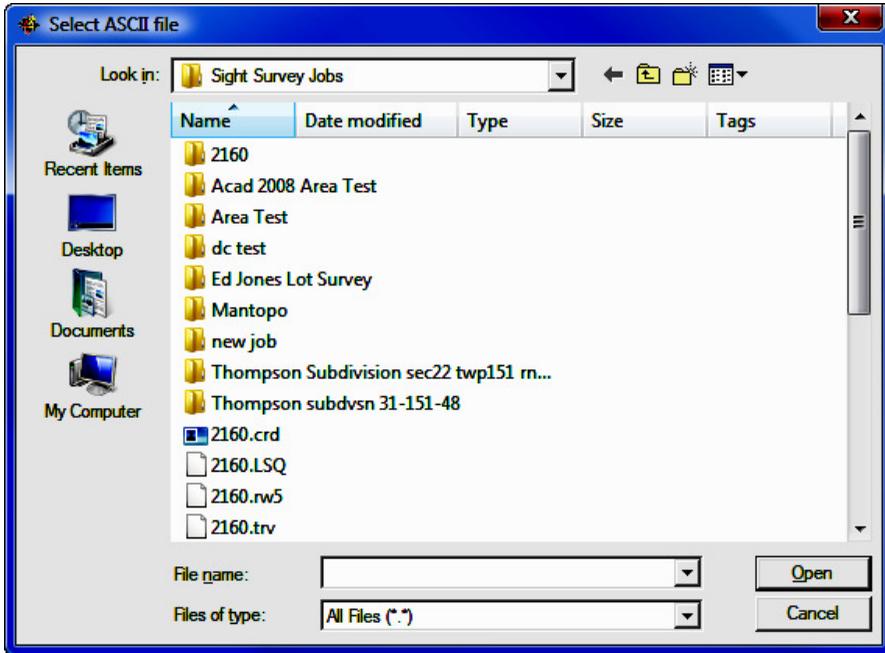
12.05 ASCII Text File (TF)

FUNCTION: The **ASCII Text File** routine allows you to insert the contents of an ASCII formatted text file into your drawing at a specified location.

Activate the **ASCII Text File** routine by picking from the **Draw > Insert** menu; by pressing [**Alt**][**D**], [**I**], [**A**]; or by typing the two-letter command **TF** at any data entry prompt.



[**Select File**]: Begin by selecting the ASCII file from the file selection dialog.



Justification: Choose the justification style for the text to be placed. You have these choices: Left Top; Left Center; Left Bottom; Right Top; Right Center; Right Bottom; Center Top; Center; or Center Bottom. The first term refers to the justification (left, right, or center justified) and the second term refers to the overall position of the relative to the insertion point.

[**Drawing Properties**]: Select this button to set the **ASCII File Layer**, **Text Font**, **Text Size**, and **Text Color** properties to be applied to the text (see [Section 5.10](#)).

[**Draw**]: With all text parameters now set, click [**Draw**] and focus shifts to your CAD application where you are prompted to select a location for text file. The file is placed in the drawing as MText and is treated as a single element.

[**Close**]: After placing the text, focus returns to the **Draw ASCII Text File** dialog box so you may insert additional files. Click [**Close**] to terminate this routine.

12.06 Text Line (TL)

FUNCTION: The **Text Line** routine allows you to insert lines of text into your drawing at a specified location.

Activate the **Text Line** routine by picking from the **Draw > Insert** menu; by pressing [**Alt**][**D**], [**I**], [**T**]; or by typing the two-letter command **TL** at any data entry prompt.



Type the text to be inserted into the drawing in the text entry field. Pressing [**Enter**] inserts a line break. When you have finished entering text, set your **Justification** and **Drawing Properties**, then click [**Draw**] to place the text into the drawing.

Justification: Choose the justification style for the text to be placed. You have these choices: Left Top; Left Center; Left Bottom; Right Top; Right Center; Right Bottom; Center Top; Center; or Center Bottom. The first term refers to the justification (left, right, or center justified) and the second term refers to the overall position of the relative to the insertion point.

[**Drawing Properties**]: Select this button to set the **ASCII File Layer**, **Text Font**, **Text Size**, and **Text Color** properties to be applied to the text (see [Section 5.10](#)).

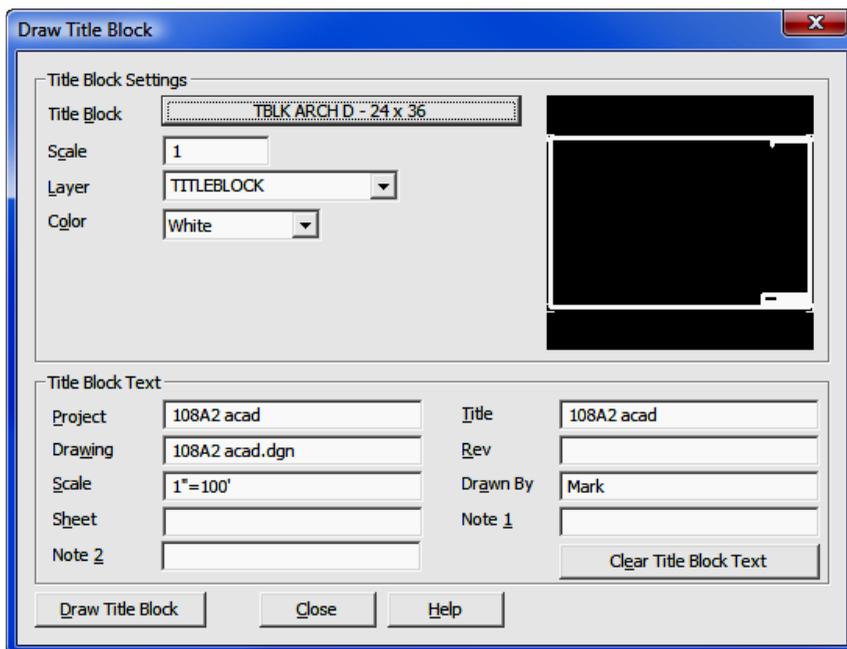
[**Draw**]: With all text parameters now set, click [**Draw**] and focus shifts to your CAD application where you are prompted to select a location for the text. Text is placed in the drawing as MText and is treated as a single element.

[**Close**]: After placing the text, focus returns to the **Draw ASCII Text File** dialog box so you may insert additional files. Click [**Close**] to terminate the routine.

12.07 Title Block (TB)

FUNCTION: The **Title Block** routine allows you to insert a pre-defined border and title block.

Activate the **Title Block** routine by picking from the **Draw > Insert** menu; by pressing [**Alt**][**D**], [**I**], [**B**]; or by typing the two-letter command **TB** at any data entry prompt.



Title Block: Click the button to select the title block from a graphically displayed array.

Scale: Enter the scale factor. This is a relative scale factor and should be left at 1. The title blocks supplied with "Sight" Survey have been created at the actual size indicated in each name. A scale factor of 1 will insert the title block at the correct size for the scale indicated by the **CAD Configuration** menu (**CM - Section 5.03**).

Layer: Click [▼] to choose the layer upon which to plot the title block, or type in the name of a new layer. The default layer is **TITLEBLOCK**, which will be created when the title block is inserted into the drawing.

Color: Click [▼] to select a color in which the title block will be drawn.

Title Block Text: The title blocks supplied with "Sight" Survey contain attribute fields which will be completed using the text from these text fields. If you do not want any text automatically inserted into the title block, click [**Clear Title Block Text**]. More information on these attribute fields may be found in the **Creating Custom Title Blocks** section below.

[Draw Title Block]: Clicking this button transfers control to your CAD application which will prompt you to click the location for insertion of the title block. After placing the title block arrow, focus returns to "Sight" Survey.

Creating Custom Title Blocks

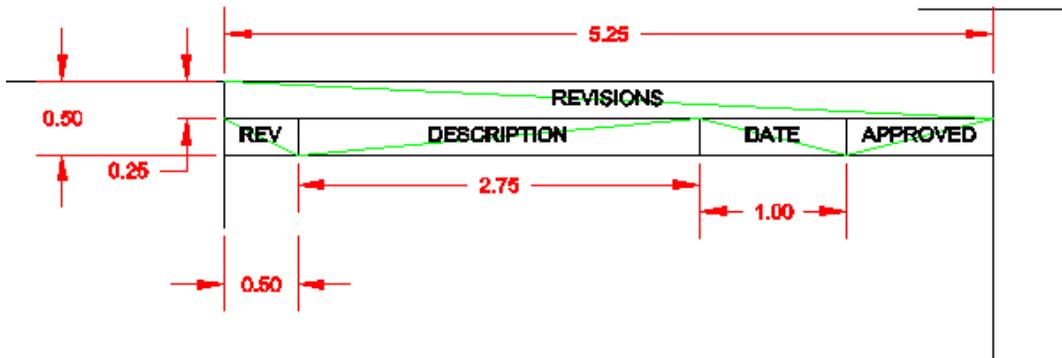
"Sight" Survey includes several title blocks. You can edit any existing title block, or draw your own. Instructions shown below are for IntelliCAD, but AutoCAD instructions are similar.

The title block for this exercise will be designed for an 11 "x 17" sheet. Adjust as needed to make it larger or smaller.

We will start by drawing a rectangle 16" wide x 10" high which will give us a ½" border on all four sides.

<i>Command line prompt</i>	<i>Response</i>
Command:	rectang [Enter]
Select first corner of rectangle:	.5, .5 [Enter]
Other corner of rectangle:	16.5,10.5 [Enter]

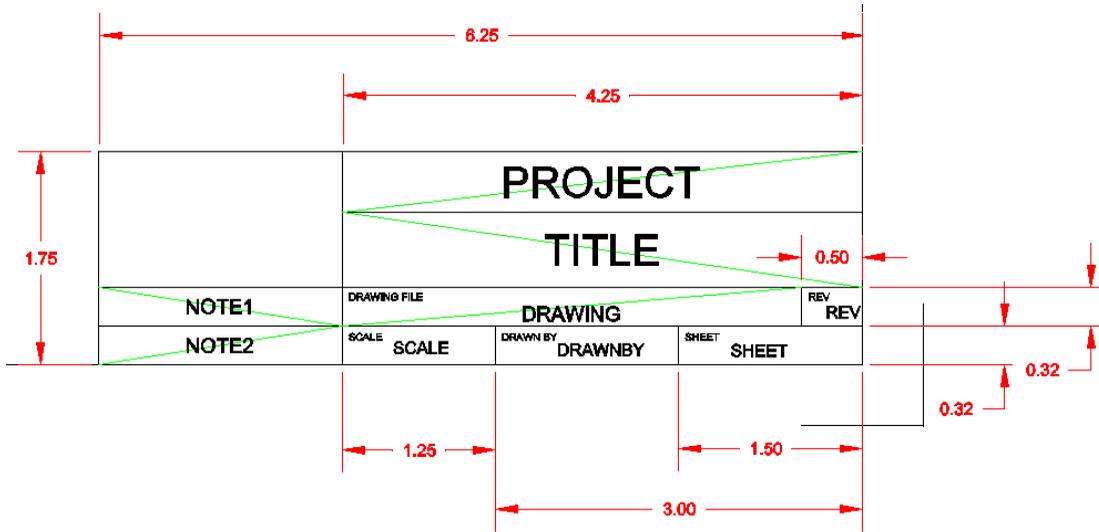
Now we'll draw the area for tracking revisions in the upper-right corner. Select the line tool or type **line** at the command line. We will draw the line using X & Y coordinates. Remember that the upper right corner has been established at **16.5 X** and **10.5 Y**. First we'll draw the horizontal lines, then the vertical lines, then add text as we reproduce this layout:



<i>Command line prompt</i>	<i>Response</i>
Command:	line [Enter]
Start of line:	16.5, 10.25 [Enter]
Angle/Length/End Point:	11.25, 10.25 [Enter] [Enter]
Command:	line [Enter]
Start of line:	16.5, 10 [Enter]
Angle/Length/End Point:	11.25, 10 [Enter] [Enter]
Command:	line [Enter]
Start of line:	11.25, 10.5 [Enter]
Angle/Length/End Point:	11.25, 9.5 [Enter] [Enter]
Command:	line [Enter]
Start of line:	11.75, 10.25 [Enter]
Angle/Length/End Point:	11.75, 10 [Enter] [Enter]
Command:	line [Enter]
Start of line:	14.5, 10.25 [Enter]
Angle/Length/End Point:	14.5, 10 [Enter] [Enter]

Command:	line [Enter]
Start of line:	15.5, 10.25 [Enter]
Angle/Length/End Point:	15.5, 10 [Enter] [Enter]

This completes the lines for the revision tracking area. Now we'll draw the bottom section of the title block.



<i>Command line prompt</i>	<i>Response</i>
Command:	line [Enter]
Start of line:	16.5, 2.25 [Enter]
Angle/Length/End Point:	10.25, 2.25 [Enter]
Angle/Length/End Point:	10.25, .5 [Enter] [Enter]
Command:	line [Enter]
Start of line:	12.25, 2.25 [Enter]
Angle/Length/End Point:	12.25, .5 [Enter] [Enter]
Command:	line [Enter]
Start of line:	12.25, 1.75 [Enter]
Angle/Length/End Point:	16.5, 1.75 [Enter] [Enter]

Command:	line [Enter]
Start of line:	10.25, 1.14 [Enter]
Angle/Length/End Point:	12.25, 1.14 [Enter]
Angle/Length/End Point:	16.5, 1.14 [Enter] [Enter]
Command:	line [Enter]
Start of line:	10.25, .82 [Enter]
Angle/Length/End Point:	12.25, .82 [Enter]
Angle/Length/End Point:	16.5, .82 [Enter] [Enter]
Command:	line [Enter]
Start of line:	16, 1.14 [Enter]
Angle/Length/End Point:	16, .82 [Enter] [Enter]
Command:	line [Enter]
Start of line:	13.5, .82 [Enter]
Angle/Length/End Point:	13.5, .5 [Enter] [Enter]
Command:	line [Enter]
Start of line:	15, .82 [Enter]
Angle/Length/End Point:	15, .5 [Enter] [Enter]

This completes the lines for the lower title block. At this point let's set our border lines to a bolder stroke. Select **Edit > Select All** or simply press **[Ctrl][A]** to select everything in the drawing. Now double-click your mouse on one of the selected lines, or type **entprop [Enter]** on the command line (AutoCAD users type **properties [Enter]**). When the **Properties** dialog appears, set your **Line Thickness** to **2** and click **[OK]**. Now we'll add the actual corners of the paper which will prove to be useful when plotting your drawing. Using these corners, you will be able to plot the contents bounded by a window which is selectable by clicking on the opposite corners of the paper corner indicators. We will use two - 1" line segments at each corner.

<i>Command line prompt</i>	<i>Response</i>
Command:	line [Enter]
Start of line:	0, 1 [Enter]
Angle/Length/End Point:	0, 0 [Enter]

Angle/Length/End Point:	1, 0 [Enter] [Enter]
Command:	line [Enter]
Start of line:	0, 10 [Enter]
Angle/Length/End Point:	0, 11 [Enter]
Angle/Length/End Point:	1, 11 [Enter] [Enter]
Command:	line [Enter]
Start of line:	16, 11 [Enter]
Angle/Length/End Point:	17, 11 [Enter]
Angle/Length/End Point:	17, 10 [Enter] [Enter]
Command:	line [Enter]
Start of line:	16, 0 [Enter]
Angle/Length/End Point:	17, 0 [Enter]
Angle/Length/End Point:	17, 1 [Enter] [Enter]

Before we start adding text, let's set our text font and size. At the command line, type style [Enter]. In the **Text Style** dialog, select the desired **Text Font**. We'll select **Arial** for this example. Click [OK]. Now we'll place some text headings in the lower title block. For these heading we will just select our text entry points by entering coordinates that are just a few hundredths inside and below the border lines of the cells we are labeling. We could also just "eyeball" in the location by clicking on the drawing, then move the text around later to fine-tune our spacing.

<i>Command line prompt</i>	<i>Response</i>
Command:	dtext [Enter]
Start point:	12.3, 1.03 [Enter]
Height of text <0.2000>:	0.06 [Enter]
Rotation angle of text <0>	[Enter]
Text:	DRAWING FILE [Enter] [Enter]
Command:	dtext [Enter]
Start point:	16.06, 1.03 [Enter]
Height of text <0.0600>:	[Enter]
Rotation angle of text <0>	[Enter]

Text:	REV [Enter] [Enter]
Command:	dtext [Enter]
Start point:	12.3, .70 [Enter]
Height of text <0.0600>:	[Enter]
Rotation angle of text <0>:	[Enter]
Text:	SCALE [Enter] [Enter]
Command:	dtext [Enter]
Start point:	13.55, .70 [Enter]
Height of text <0.0600>:	[Enter]
Rotation angle of text <0>:	[Enter]
Text:	DRAWN BY [Enter] [Enter]
Command:	dtext [Enter]
Start point:	15.05, .70 [Enter]
Height of text <0.0600>:	[Enter]
Rotation angle of text <0>:	[Enter]
Text:	SHEET [Enter] [Enter]

Now continue with text in the top title block. We will locate these headings, as well as the rest of our text, directly in the middle of each respective cell. To help us locate the middle, we will begin by drawing some lines diagonally across each cell. To locate the text, we will snap to the mid-point of the polyline segment. We will remove the polylines after we insert text. For illustration, the polylines are shown in green, although setting a different color for the temporary polylines is not necessary. Start by typing **osnap [Enter]** at the command line, then type **end [Enter]**. This will allow us to snap to the exact corners of each cell.

<i>Command line prompt</i>	<i>Response</i>
Command:	Polyline [Enter]
Start of polyline	Click at the top left corner of the top cell in the top title block
<Next point>:	Click at the lower right corner of the top cell in the top title block
<Next point>:	In a similar manner, click at diagonal corners in the remainder of the cells. When you have

clicked on the last point, press [Esc].

In the same manner, draw diagonals in the lower title block as shown by the green polylines in the example drawing.

Now we will place text in the upper title block. The text will be inserted at the mid point of each segment of the polyline as it crosses the cell. This will insure us of perfectly centered text. We will set up our snaps to pick the mid-point of the line. At the command line type: **osnap [Enter] mid [Enter]**.

<i>Command line prompt</i>	<i>Response</i>
Command:	dtext [Enter]
Start point:	M [Enter] (to middle-justify text)
Center point of text:	Click near the midpoint of the diagonal in the top cell. You will automatically snap to the mid-point of the line.
Height of text <0.0600>:	.1 [Enter]
Rotation angle of text <0>	[Enter]
Text:	REVISIONS [Enter] [Enter]

In a similar manner, enter the rest of the text for the second line.

“Sight” Survey allows for the use of attributes when placing text. This means that as the title block is place, certain attributes (or information) may be automatically placed into the title block. The **Title Block Text** portion of the **Title Block** dialog (as shown below) contains several fields into which you can place information about your project. This information is used to populate attribute fields in the title block. You may also use these fields to place information into your custom title blocks as long as you insert the properly named attribute fields. The titles (or tags) for each field indicate the attribute name recognized by “Sight” Survey for that piece of information.

Title Block Text

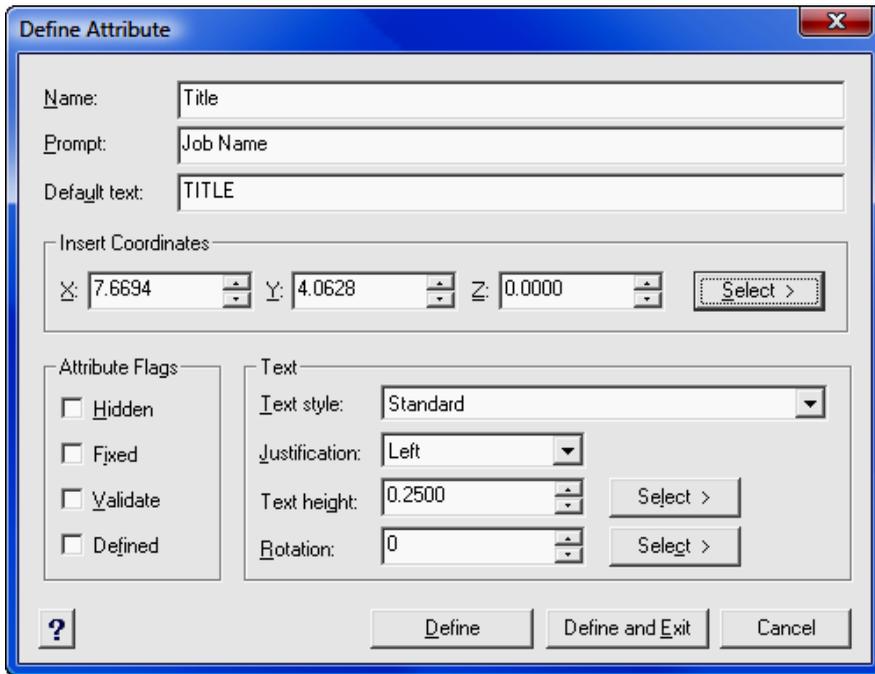
Project	108A2 acad	Title	108A2 acad
Drawing	108A2 acad.dgn	Rev	
Scale	1"=100'	Drawn By	MDF
Sheet	1/4	Note 2	
Note 1			

The table below shows the attribute name (tag), the default value, the font, size, and justification. The font and size may be adjusted as desired.

TAG	DEFAULT VALUE	FONT	HEIGHT	JUSTIFICATION
Project	Your Job Name	Arial	0.25	Center-Middle
Title	Your Job Name	Arial	0.25	Center-Middle
Drawing	Your Drawing Name	Arial	0.12	Center-Top
Rev		Arial	0.12	Left-Middle*
Scale	As set on Config>CAD	Arial	0.12	Left-Middle*
Drawn By		Arial	0.12	Left-Middle*
Sheet		Arial	0.12	Left-Middle*
Note1		Arial	0.18	Center-Middle
Note2		Arial	0.18	Center-Middle

No polyline was drawn to snap to this location. Simply click your mouse at the desired text location. After placing the tag text you may use your mouse to adjust the positioning. Since you will not be using snaps to locate this text, draw this text last and turn off **osnaps prior to selecting these insertion points. At the command line type: **osnap** [Enter] **off** [Enter].*

Defining the Attributes: Select **Tools > Define Attributes**, or type **DDATTDEF** [Enter] on the command line.



Name: Enter the attribute TAG name here.

Prompt: Enter a prompt that will appear on the command line if you manually insert the title block into your drawing (not using the **Title Block** routine).

Default Text: Enter the attribute TAG name here. This is the text that will appear on the drawing prior to the insertion of the attribute text.

Insert Coordinates: Click [**Select**] to set the insertion point. With **osnaps** set to **MID**, click on the middle of the polyline that crosses the cell. With **osnaps** set to **OFF**, simply click on an insertion location.

Text Style: Select a text style or leave it set to **Standard**.

Justification: Click [**▼**] to select the justification.

Text Height: Click [**▼**] to select the text height.

Rotation: Click [**▼**] to select the rotation angle.

[**Define**]: Click [**Define**] to insert the attribute into the drawing, then continue with additional attributes. When you are finished, click [**Define and Exit**].

Use these basic instructions and the data in the attribute table above to define all your title block attributes.

All that remains is to clean up and save the drawing. To delete the polylines that were used to center the text, simply click on each polyline and press [**Delete**].

If we set the color attribute to **BY BLOCK**, "Sight" Survey will insert the title block using the color selected on the **Title Block** dialog box. Select **Edit > Select All** or simply press [**Ctrl**][**A**] to select everything in the drawing. Type **entprop** [**Enter**] on the command line (AutoCAD users type **properties** [**Enter**]). When the **Properties** dialog appears, click [**Select Color**] to launch the **Color** dialog. Set the color to **BY BLOCK** and click [**OK**]. Click [**OK**] on the **Properties** dialog to close it.

Finally, we need to save our title block. Click **File > Save** and save your work as an AutoCAD drawing (*.dwg). There are two requirements you must follow or you will not be able to access your title block from within "Sight" Survey:

1. You must start your file name with **TBLK** followed by a space, such as **TBLK 17 x 22.dwg**. The "TBLK" indicates to "Sight" Survey that this file should appear on the title block list.
2. You must save your file in "Sight" Survey's Symbols file folder. This location is: **C:\Program Files\Simplicity Sight Survey 2009\Symbols**

12.08 Raster Image (IM)

FUNCTION: The **Raster Image** routine instructs CAD to insert a raster image (bitmap) at a user selected location.

Activate the **Raster Image** routine by picking from the **Draw > Insert** menu; by pressing [**Alt**][**D**], [**I**], [**R**]; or by typing the two-letter command **IM** at any data entry prompt.

This routine transfers control to your CAD application and activates one of the following CAD functions which will prompt you for the image file and the location.

AutoCAD: **IMAGEATTACH**

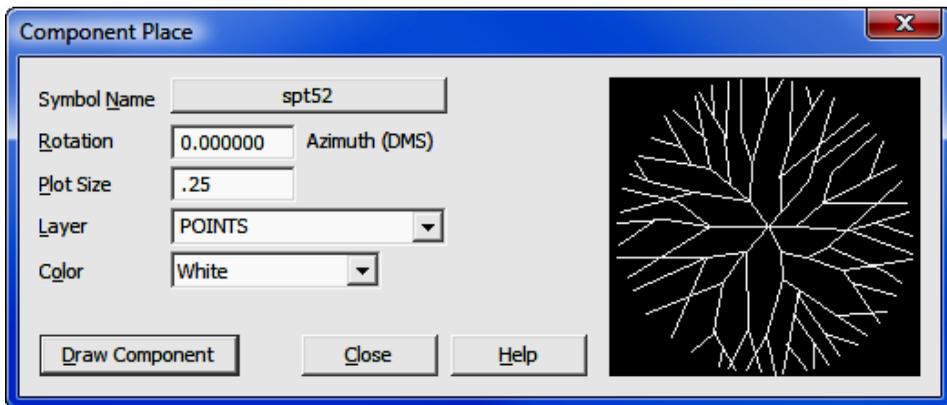
IntelliCAD: **IMAGEATTACH**

MicroStation: **RASTER ATTACH INTERACTIVE** (Key-In Command)

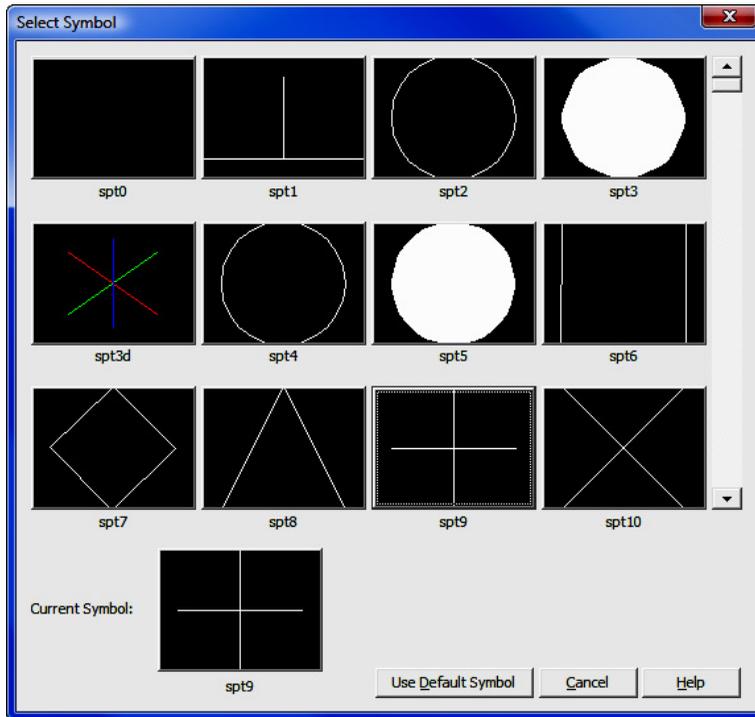
12.09 Component Place (CP)

FUNCTION: The **Component Place** routine inserts a user specified symbol into the drawing at a user selected location.

Activate the **Component Place** routine by picking from the **Draw > Insert** menu; by pressing [**Alt**][**D**], [**I**], [**P**]; or by typing the two-letter command **CP** at any data entry prompt.



Symbol Name: Click the button to select a symbol to be placed in your drawing. To select a symbol, use the slider bar on the right side of the **Select Symbol** dialog until the desired symbol is visible, then left-click on the symbol.



Rotation: Enter the angle of rotation as an azimuth in the format shown.

Plot Size: Enter the size for plotted symbols. This size is relative to the selected drawing scale set in **CAD Configuration (CM - [Section 5.03](#))**. For example, if you have set your drawing scale to 1" = 100' and your symbol plot size to be 0.10", that is the size symbols will appear on your plotted drawing. If you should change your drawing scale to 1"=50', those same symbols would double in size and be plotted to 0.20".

Layer: Click [**▼**] to choose the layer upon which to place the component, or type in the name of a new layer.

Color: Click [**▼**] to select a color for the component to be drawn.

[**Draw Component**]: Once all the component parameters are set, click [**Draw Component**] which changes focus to your CAD application. In CAD, you are being prompted for component locations. Left-click your mouse wherever you want

a component to be placed. When you are done placing components, press [**Esc**] or right-click your mouse to return focus to "Sight" Survey.



Can't see Filled Symbols? Several symbols contain fills. If you place these symbols in the drawing but can't see the fills, make sure the **Fill** attribute is "**On**." **AutoCAD/IntelliCAD users:** Enter **FILL ON**, then issue a **REGEN** command to refresh the drawing. **MicroStation users:** Select **Settings > View Attributes** and select the **FILL** option. You may apply the option to the open view or all views.



Drawing your own Symbols: "Sight" Survey includes several symbols. You can edit any existing symbol, or draw your own. If you create your own symbol, start with an existing **sptXX.DWG** file and edit it, then be sure to name it as **sptXX** where the **XX** can be any number. Symbols must be saved as AutoCAD drawings (.DWG). You must also save it in the folder **C:\Program Files\Simplicity Sight Survey 2009\Symbols**.

12.10 Auto Zoom Extents (AZ)

FUNCTION: The **Auto Zoom Extents** routine is a toggle that controls automatic zooming of the entire drawing.

Activate the **Auto Zoom Extents** routine by picking from the **Draw > Drawing Zooms** menu; by pressing [**Alt**][**D**], [**D**], [**A**]; or by typing the two-letter command **AZ** at any data entry prompt. You may also click the [**Toggle Auto Zoom Extents**] button at the bottom of the "Sight" Survey screen, or check the **Auto Zoom Extents** setting on the **CAD Configuration** menu (**CM** - [Section 5.03](#)).

This is a CAD command that requires no additional user input. When "**on**," "Sight" Survey will automatically zoom the entire drawing after each drawing operation. When "**off**," the drawing zoom level remains unchanged as elements are added to the drawing.

12.11 **Magnify (MG)**

FUNCTION: The **Magnify** routine is used to zoom in incrementally. The center of the drawing window does not change.

Activate the **Magnify** routine by picking from the **Draw > Drawing ZOOMS** menu; by pressing **[Alt][D]**, **[D]**, **[M]**; or by typing the two-letter command **MG** at any data entry prompt.

This is a CAD command that requires no additional user input. When run, "Sight" Survey instructs your CAD application to zoom in about 10%.

12.12 **Demagnify (DM)**

FUNCTION: The **Demagnify** routine is used to zoom out incrementally. The center of the drawing window does not change.

Activate the **Demagnify** routine by picking from the **Draw > Drawing ZOOMS** menu; by pressing **[Alt][D]**, **[D]**, **[D]**; or by typing the two-letter command **DM** at any data entry prompt.

This is a CAD command that requires no additional user input. When run, "Sight" Survey instructs your CAD application to zoom out about and increase the extents of the visible area by 10%.

12.13 **Zoom All (or Extents) (ZA or ZE)**

FUNCTION: The **Zoom All (or Extents)** routine is used to display a zoom level encompassing all of the drawing elements.

Activate the **Zoom All (or Extents)** routine by picking from the **Draw > Drawing ZOOMS** menu; by pressing **[Alt][D]**, **[D]**, **[Z]**; or by typing the two-letter command **ZA** or **ZE** at any data entry prompt.

This is a CAD command that requires no additional user input. When run, "Sight" Survey instructs your CAD application to issue a **Zoom Extents** operation.

12.14 Zoom Window (ZW)

FUNCTION: The **Zoom Window** routine is used to display a zoom level encompassing a user defined window.

Activate the **Zoom Window** routine by picking from the **Draw > Drawing Zooms** menu; by pressing [**Alt**][**D**], [**D**], [**W**]; or by typing the two-letter command **ZW** at any data entry prompt.

When run, this command instructs your CAD application to zoom to a user defined window. Prompts inside your CAD application will instruct you to define the window.

Basic Operation:

- Issue the **Zoom Window** command (**ZW**).
- Left-click on one corner of the window.
- Move the mouse to the opposite corner of the area to be zoomed.
- Left-click to set the opposite corner.



MICROSTATION USERS: When you set the second corner, you need to double-left-click your mouse.

12.15 Zoom Sheet (ZS)

FUNCTION: The **Zoom Sheet** routine is used to display a zoom level encompassing the depicted outline of the paper which has been placed and recorded by the **Locate Paper** routine (**LP** – [Section 12.45](#)).

Activate the **Zoom Sheet** routine by picking from the **Draw > Drawing Zooms** menu; by pressing [**Alt**][**D**], [**D**], [**S**]; or by typing the two-letter command **ZS** at any data entry prompt.

This is a CAD command that requires no additional user input. When run, "Sight" Survey instructs your CAD application to zoom to level encompassing the depicted outline of the paper.

Show or Hide Paper Borders by using the two-letter toggle **PB** ([Section 12.46](#)).

12.16 Zoom Last (ZL)

FUNCTION: The **Zoom Last** routine is used to return to the previous zoom level.

Activate the **Zoom Last** routine by picking from the **Draw > Drawing Zooms** menu; by pressing [**Alt**][**D**], [**D**], [**L**]; or by typing the two-letter command **ZL** at any data entry prompt.

This is a CAD command that requires no additional user input. When run, "Sight" Survey instructs your CAD application to zoom to its previous level.

12.17 Zoom to Point (ZP)

FUNCTION: The **Zoom to Point** routine is used to zoom in to area centered on an identified point.

Activate the **Zoom to Point** routine by picking from the **Draw > Drawing Zooms** menu; by pressing [**Alt**][**D**], [**D**], [**P**]; or by typing the two-letter command **ZP** at any data entry prompt.



Type the point number around which the zoom should be centered and press [**Enter**] or click [**Accept**]. "Sight" Survey will zoom in to the specified point.

12.18 Drawing Erase (DX)

FUNCTION: The **Drawing Erase** routine is used to select all the elements in a drawing and erase them.

Activate the **Drawing Erase** routine by picking from the **Draw > Edit** menu; by pressing [**Alt**][**D**], [**E**], [**E**]; or by typing the two-letter command **DX** at any data entry prompt.

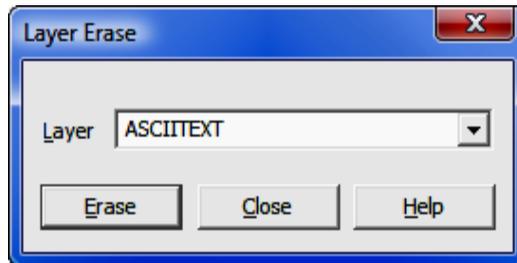
You will be asked to confirm your intention to erase the entire drawing.

In all CAD versions supported by "Sight" Survey, the equivalent CAD keyboard commands is [**Ctrl**][**A**], [**Delete**].

12.19 Layer Erase (RX)

FUNCTION: The **Layer Erase** routine is used to select all the elements in a drawing and erase them.

Activate the **Layer Erase** routine by picking from the **Draw > Edit** menu; by pressing [**Alt**][**D**], [**E**], [**R**]; or by typing the two-letter command **RX** at any data entry prompt.



Layer: Click [**▼**] to choose the layer you want to delete and then click [**Erase**]. You will be asked to confirm your decision. The contents of the layer will be deleted from the drawing. The layer may also be removed, but if you are removing more than one layer you will notice that deleted layer names remain on the selection list until this routine is closed.

When you are finished deleting layers, click [**Cancel**]. "Sight" Survey will refresh the layer list and erase the deleted layer names before continuing.



LAYER STILL THERE?

MicroStation users: *This routine will clear the contents of the layer, but the layer itself will remain in the drawing.*

AutoCAD/IntelliCAD users: *This routine will clear the contents of the layer, but the selected layer cannot be deleted from the drawing if: it is the current layer; it is layer 0; it is an xref-dependent layer; or if the layer contains "objects." Layers referenced by block definitions, along with a special layer named DEFPOINTS, cannot be deleted even if they do not contain visible objects.*

12.20 Break Line (BL)

FUNCTION: The **Break Line** routine is used to break a line and delete the remaining portion of the line from the break to the end point.

Activate the **Break Line** routine by picking from the **Draw > Edit** menu; by pressing [**Alt**][**D**], [**E**], [**B**]; or by typing the two-letter command **BL** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: **BREAK**

IntelliCAD: **BREAK**

MicroStation: **DELETE PARTIAL** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.21 Extend Line (EX)

FUNCTION: The **Extend Line** routine is used to extend a line from its current end point to another point or to a point of intersection with another line.

Activate the **Extend Line** routine by picking from the **Draw > Edit** menu, by pressing [**Alt**][**D**], [**E**], [**N**], or by typing command **EX** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: **EXTEND**

IntelliCAD: **EXTEND**

MicroStation: **EXTEND** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.22 Trim Line

FUNCTION: The **Trim** routine is used to tidy the intersections of lines by erasing any line segments that overlap or extend beyond the intersection point.

Activate the **Trim** routine by picking from the **Draw > Edit** menu; or by pressing [**Alt**][**D**], [**E**], [**T**].

This routine activates one of the following CAD functions:

AutoCAD: **TRIM**

IntelliCAD: **TRIM**

MicroStation: **TRIM MULTI** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.23 **M**ove Selected to New Layer (XY)

FUNCTION: The **Move Selected to New Layer** routine is used to move all selected elements from one layer to another.

Activate the **Move Selected to New Layer** routine by picking from the **Draw > Edit** menu; by pressing [**Alt**][**D**], [**E**], [**M**]; or by typing the two-letter command **XY** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: **PROPERTIES**

IntelliCAD: **CHPROP**

MicroStation: **CHANGE ICON** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. The basic operation of this command requires you to:

1. Issue the command.
2. Select an object or objects to be moved.
3. Manually change the layer in your CAD's properties dialog.

Please refer to your CAD documentation for specific instructions on changing the layer property.

12.24 **D**efault **L**ine Properties (XL)

FUNCTION: The **Default Line Properties** routine is used to set the line style properties to be used by default when drawing in CAD. These properties are not

used when drawing elements are placed by "Sight" Survey, but they are used when you are adding drawing elements solely through CAD commands and menus.

Activate the **Default Line Properties** routine by picking from the **Draw > Edit** menu; by pressing [**Alt**][**D**], [**E**], [**L**]; or by typing the two-letter command **XL** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: PROPERTIES

IntelliCAD: ENTPROP

MicroStation: CHANGE ICON (Key-In Command)

Prompts and dialog boxes will appear in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.25 Default Text Properties (XT)

FUNCTION: The **Default Text Properties** routine is used to set the text style properties to be used by default when drawing in CAD. These properties are not used when text is placed by "Sight" Survey, but they are used when you are adding text solely through CAD commands and menus.

Activate the **Default Text Properties** routine by picking from the **Draw > Edit** menu; by pressing [**Alt**][**D**], [**E**], [**D**]; or by typing the two-letter command **XT** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: STYLE

IntelliCAD: STYLE

MicroStation: TEXT DIALOG OPEN (Key-In Command)

Prompts and dialog boxes will appear in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.26 **Default Arrow Properties (XA)**

FUNCTION: The **Default Arrow Properties** routine is used to set the arrow-head style to be used by default when drawing leader lines and dimensions in CAD. These properties are not used when dimensions are placed by "Sight" Survey, but they are used when you are adding dimensions and leader lines solely through CAD commands and menus.

Activate the **Default Arrow Properties** routine by picking from the **Draw > Edit** menu; by pressing [**Alt**][**D**], [**E**], [**W**]; or by typing the two-letter command **XA** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: **DIMSTYLE**

IntelliCAD: **SETDIM**

MicroStation: **DIALOG DIMSETTINGS OPEN** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.27 **Group into Object**

FUNCTION: The **Group into Object** routine is used to create a single object grouped together from several individual drawing entities.

Activate the **Group into Object** routine by picking from the **Draw > Edit** menu; or by pressing [**Alt**][**D**], [**E**], [**O**].

This routine activates one of the following CAD functions:

AutoCAD: **GROUP**

IntelliCAD: **GROUP**

MicroStation: **GROUP ADD** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.28 Create Block

FUNCTION: The **Create Block** routine is used to create a block from several individual drawing entities.

Activate the **Create Block** routine by picking from the **Draw > Edit** menu; or by pressing [**Alt**][**D**], [**E**], [**K**].

This routine activates one of the following CAD functions:

AutoCAD: **BLOCK**

IntelliCAD: **BLOCK**

MicroStation: **GROUP ADD** (Key-In Command) In MicroStation, a cell is the equivalent of an AutoCAD block. Cells are generally named and kept in cell libraries. To group together individual drawing entities into an unnamed cell is the same as creating a group.

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

See then info box, "**Drawing your own Symbols,**" under **Component Place** (**CP** – [Section 12.09](#)) for info on using your blocks in "Sight" Survey.

12.29 Explode Block (XB)

FUNCTION: The **Explode Block** routine is used to separate the collective elements of a block into individual entities.

Activate the **Explode Block** routine by picking from the **Draw > Edit** menu; or by pressing [**Alt**][**D**], [**E**], [**X**], or by typing command **XB** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: **EXPLODE**

IntelliCAD: **EXPLODE**

MicroStation: **DROP ELEMENT** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.30 Explode Group

FUNCTION: The **Explode Group** routine is used to separate the collective elements of a group into individual entities.

Activate the **Explode Group** routine by picking from the **Draw > Edit** menu; or by pressing [**Alt**][**D**], [**E**], [**G**].

This routine activates one of the following CAD functions:

AutoCAD: **GROUP** - Select the group, then pick [**Explode**].

IntelliCAD: **GROUP** - Select the group, then pick [**Ungroup Entities**].

MicroStation: **DROP ELEMENT** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.31 Selection Filter (SF or FI)

FUNCTION: The **Selection Filter** is used to selectively pick elements in CAD that share common properties or attributes, such as: layers (levels), colors, text, line types, and so on.

Activate the **Selection Filter** routine by picking from the **Draw > Edit** menu; by pressing [**Alt**][**D**], [**E**], [**F**]; or by typing the two-letter command **SF** or **FI** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: **QSELECT**

IntelliCAD: **SELECT**

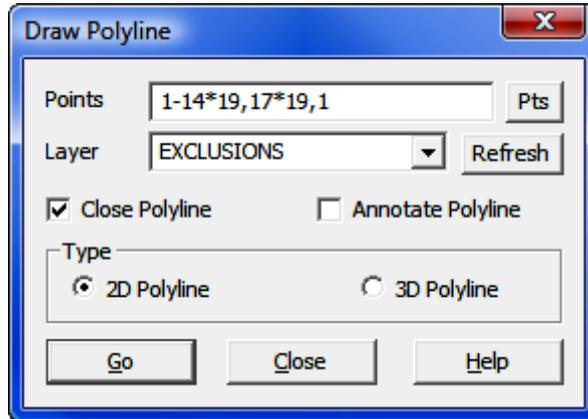
MicroStation: **Edit > Select By Attributes** (Menu Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.32 Draw Polyline (PL)

FUNCTION: The **Draw Polyline** routine is used to create a continuous polyline (AutoCAD/IntelliCAD) or line string (MicroStation). Curves may be contained in 2D-Polylines (AutoCAD/IntelliCAD) and also in MicroStation. Annotation may also be included. Polylines may be used to indicate breaklines, and closed polylines may be used to designate inclusion and exclusion perimeters (see **Contour** - [Section 11.02](#)).

Activate the **Draw Polyline** routine by picking from the **Draw > Elements** menu; by pressing **[Alt][D]**, **[M]**, **[P]**; or by typing the two-letter command **PL** at any data entry prompt. This routine may also be activated from within the **Contour** routine (**CI** - [Section 11.02](#)) by clicking on any of the three **[Draw]** buttons adjacent to the layer settings for **Breaklines**, **Inclusion**, and **Exclusion** perimeters.



Points: Enter a point string in accordance with the rules listed below. You must enter a point string; this routine does not accept individual points. You may enter **DF** to use a figure from your list of **Defined Figures** ([Section 6.20](#)). You



TIP: Left-click the **[Pts]** button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the **[Pts]** button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)). Points selected from the CAD window will be added to the point string in the **Points** field.

Layer: Enter the name of the layer upon which the polyline will be placed, or click **[▼]** to select from a list of available layers. If you enter the name of a layer that is not currently in the drawing, it will be created.

[Refresh]: Click **[Refresh]** to refresh the layer list from the drawing. If you have manually added layers to your drawing using only CAD commands (commands not initiated from within "Sight" Survey), you should issue the **[Refresh]** command to incorporate those layers into "Sight" Survey.

Close Polyline: If you are constructing an **Inclusion** perimeter or **Exclusion** perimeter for use in contouring, you must select the **Close Polyline** option. Open polylines used for inclusion or exclusion perimeters will result in incorrect contouring. In the figure shown above, selecting the **Close Polyline** option will automatically close the polyline from point 11 back to point 1.

Annotate Polyline: Choose this option if you wish to have bearing and/or distance annotation placed on your polyline. The annotation is placed on the layer selected to contain the polyline using the **Text Font, Text Size, Text Placement,** and **Text Color** properties as set on the **Drawing Properties** menu (**PR** - [Section 5.10](#)).

Type: Select the type of polyline to be drawn; either a 2D Polyline, or a 3D Polyline. Either type is sufficient for breaklines, inclusion perimeters, and exclusion perimeters. 2D Polylines may contain curves, while 3D polylines may not.

[**Go**]: Click [**Go**] to draw the polyline on the specified layer using the **Object (Line) Color, Line Type, Line Weight,** and **Line Type Scale** as set on the **Drawing Properties** menu (**PR** - [Section 5.10](#)). The **Draw Polyline** routine remains available to draw additional polylines. Click [**Close**] to exit the routine.



RULES FOR POINT STRINGS:

1. Separate single points by a comma, for example: **1,3,5,7**
2. Separate a consecutive range of **numeric** point numbers by a dash, for example: **1-7**
3. Enter all **alphanumeric** point numbers individually and separate them by a comma, for example: **PT1,PT3,PC8,NCorL1**
4. Preface any radius points with an asterisk (*****) or less than sign (**<**) for acute curves or a greater than sign (**>**) for obtuse curves, and use only the *****, **<**, or **>** to separate the PC and the radius point of a curve; for example **5*10,8** sets the acute curve from 5 through center point 10 to end point 8; and **5>10,8** sets the obtuse curve from 5 through center point 10 to end point 8. Don't place a comma after the 5.
5. Curve points may be entered within point ranges, if desired. For example: **1-7*8,10*8,15*8-17,1** is the same as entering points **1-7*8-10*8,15*8,16*8,17,1**.

6. **DO NOT** start your point string with a radius point (*****, **>**, or **<**) designation.
7. Use care when entering your point string since the program will not attempt to screen your entry for illegal characters or unassigned points.

12.33 Draw B-Spline (RC)

FUNCTION: The **Draw B-Spline** routine is used to construct a spline.

Activate the **Draw B-Spline** routine by picking from the **Draw > Elements** menu; by pressing [**Alt**][**D**], [**M**], [**B**]; or by typing the two-letter command **RC** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: **SPLINE**

IntelliCAD: **SPLINE**

MicroStation: **PLACE BSPLINE CURVE** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.34 Draw Circle (DC)

FUNCTION: The **Draw Circle** routine is used to create a circle by placing a center point and indicating a radius or diameter.

Activate the **Draw Circle** routine by picking from the **Draw > Elements** menu; by pressing [**Alt**][**D**], [**M**], [**C**]; or by typing the two-letter command **DC** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: **CIRCLE**

IntelliCAD: **CIRCLE**

MicroStation: **PLACE CIRCLE ICON** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.35 Draw Rectangle (DR)

FUNCTION: The **Draw Rectangle** routine is used to place a rectangle in the drawing.

Activate the **Draw Rectangle** routine by picking from the **Draw > Elements** menu; by pressing [**Alt**][**D**], [**M**], [**R**]; or by typing the two-letter command **DR** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: **RECTANG**

IntelliCAD: **RECTANG**

MicroStation: **PLACE BLOCK ICON** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.36 Draw Line (LI)

FUNCTION: The **Draw Line** routine is used to place lines into the drawing.

Activate the **Draw Line** routine by picking from the **Draw > Elements** menu; by pressing [**Alt**][**D**], [**M**], [**D**]; or by typing the two-letter command **LI** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: **LINE**

IntelliCAD: **LINE**

MicroStation: **PLACE LINE CONSTRAINED** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.37 Draw Parallel Line (DP)

FUNCTION: The **Draw Parallel Line** routine is used to create a line or curve parallel to another line or curve.

Activate the **Draw Parallel Line** routine by picking from the **Draw > Elements** menu; by pressing [**Alt**][**D**], [**M**], [**L**]; or by typing the two-letter command **DP** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: **OFFSET**

IntelliCAD: **OFFSET**

MicroStation: **MOVE PARALLEL OFFSET** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.38 Draw Three Point Arc (AC)

FUNCTION: The **Draw Three Point Arc** routine is used to place an arc that passes through three given points into the drawing.

Activate the **Draw Three Point Arc** routine by picking from the **Draw > Elements** menu; by pressing [**Alt**][**D**], [**M**], [**T**]; or by typing the two-letter command **AC** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: **ARC**

IntelliCAD: **ARC**

MicroStation: **PLACE ARC ICON** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.39 Draw Ellipse (EL)

FUNCTION: The **Draw Ellipse** routine is used to place an ellipse into the drawing.

Activate the **Draw Ellipse** routine by picking from the **Draw > Elements** menu; or by pressing [**Alt**][**D**], [**M**], [**E**], or by typing command **EL** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: **ELLIPSE**

IntelliCAD: **ELLIPSE**

MicroStation: **PLACE ELLIPSE ICON** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.40 Draw Fillet

FUNCTION: The **Draw Fillet** routine is used to place a fillet (arc) between two intersecting lines.

Activate the **Draw Fillet** routine by picking from the **Draw > Elements** menu; or by pressing [**Alt**][**D**], [**M**], [**F**].

This routine activates one of the following CAD functions:

AutoCAD: **FILLET**

IntelliCAD: **FILLET**

MicroStation: **FILLET ICON** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.41 Draw Chamfer

FUNCTION: The **Draw Chamfer** routine is used to place a chamfer at the intersection of two lines.

Activate the **Draw Chamfer** routine by picking from the **Draw > Elements** menu; or by pressing [**Alt**][**D**], [**M**], [**M**].

This routine activates one of the following CAD functions:

AutoCAD: CHAMFER

IntelliCAD: CHAMFER

MicroStation: CHAMFER (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.42 Draw Leader Line (LE)

FUNCTION: The **Draw Leader Line** routine is used to place a leader line with arrowhead into the drawing. The routine also allows for the placement of a note.

Activate the **Draw Leader Line** routine by picking from the **Draw > Elements** menu; by pressing [**Alt**][**D**], [**M**], [**W**]; or by typing the two-letter command **LE** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: LEADER

IntelliCAD: LEADER

MicroStation: PLACE NOTE MULTI (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.43 Hatch or Fill

FUNCTION: The **Hatch or Fill** routine is used to crosshatch or fill an element in the drawing.

Activate the **Hatch or Fill** routine by picking from the **Draw > Elements** menu; or by pressing [**Alt**][**D**], [**M**], [**H**].

This routine activates one of the following CAD functions:

AutoCAD: **HATCH**

IntelliCAD: **HATCH**

MicroStation: **DIALOG TOOLBOX PATTERNS** (Key-In Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

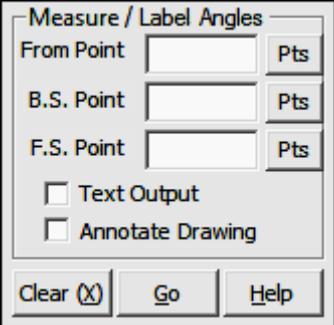


Can't see Fills? If you fill an object in the drawing but can't see the fills, make sure the **Fill** attribute is "**On**." **AutoCAD/IntelliCAD users:** Enter **FILL ON**, then issue a **REGEN** command to refresh the drawing. **MicroStation users:** Select **Settings > View Attributes** and select the **FILL** option. You may apply the option to the open view or all views.

12.44 Measure (Label) an Angle (MA or AL)

FUNCTION: The **Measure (Label) an Angle** routine is used to label angles in the drawing.

Activate the **Measure (Label) an Angle** routine by picking from the **Draw > Elements** menu; by pressing [**Alt**][**D**], [**M**], [**G**]; or by typing the two-letter command **MA** or **AL** at any data entry prompt.



Measure / Label Angles

From Point Pts

B.S. Point Pts

F.S. Point Pts

Text Output

Annotate Drawing

Clear (X) Go Help

From Point: When you enter the **Measure (Label) an Angle** routine, the **From Point** is the currently occupied point. If you have already established an occupied point this box will automatically be filled for you. Changing the **From Point** is equivalent to running the **Go To** routine (**GT** - [Section 6.06](#)).



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

BS Point: Enter or select the backsight point.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

FS Point: Enter or select the foresight point.



TIP: Left-click the [**Pts**] button to select a point from the **Point Manager** (see [Section 6.09](#)). Right-click the [**Pts**] button to select a point from the drawing (see **Picking Points in CAD** in [Section 2.03](#)).

Text Output: Select this option to have the measured angle(s) reported in the **Text Output** window.

Annotate Drawing: Select this option to have measured angle(s) annotated in the drawing using the text properties as set on the **Drawing Properties** menu (**PR** - [Section 5.10](#)).

12.45 Locate Paper (LP)

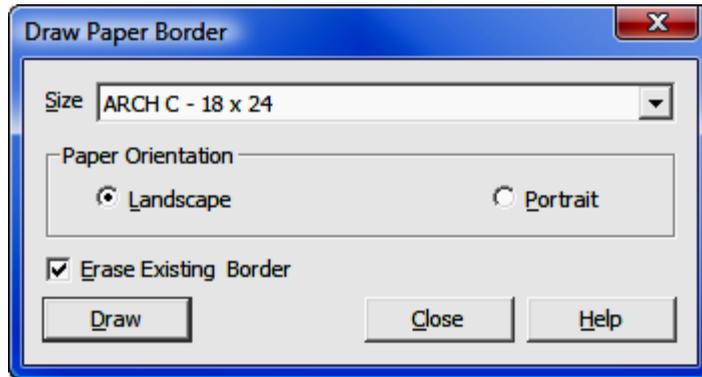
FUNCTION: The **L**ocate Paper routine is used to place a border depicting the edge of your paper and/or record the actual border location into "Sight" Survey.

Activate the **L**ocate Paper routine by picking from the **D**raw menu; by pressing [**Alt**][**D**], [**L**]; or by typing the two-letter command **LP** at any data entry prompt.



TIPS:

1. If you are currently zoomed to extents, you may want to **Demagnify** (**DM** - [Section 12.12](#)) a few levels before running this routine.
2. If a paper border already exists but has been relocated, you may use this routine to record the actual corners of the paper border by simply clicking [**Record**]. In that case, you do not need to insert a new border.



Paper Size: Click [▼] to select from a list of available sizes. You may create custom sizes by following the procedure outlined below.

Paper Orientation: Select the correct orientation. Landscape orientations have a horizontal dimension that is greater than the vertical dimension. Portrait orientations have a horizontal dimension that is less than the vertical dimension.

Erase Previous Paper Border: Select this option to delete any existing paper border before placing a new one.

[**Draw**]: Click [**Draw**] to place the paper border into your drawing. You will be prompted to click in your CAD window to locate the paper. The paper border is contained on the **PAPER_BORDER** layer.

After initially inserting the paper border, you will probably want to reposition it using CAD tools. Generally speaking, you can select the object by clicking it, then drag it to a new position. Once the final position is established, you need to tell "Sight" Survey where it is by using the [**Record**] button. Only after the position has been recorded can you use the **Zoom Sheet** function (**ZS** - [Section 12.15](#)).



CUSTOM PAPER SIZES: You may create your own custom paper sizes.

1. Open a new blank drawing.
2. Use the rectangle command to draw a rectangle at the desired size.

In **AutoCAD** and **IntelliCAD**, select **Draw Rectangle** from the menu or toolbar, or type the command **RECTANG**. When you are prompted for the first corner, type **0,0** [Enter]. When you are prompted for the other corner, type in the dimensions of the sheet in X,Y format (such as **34,22**) and press [Enter]. To edit the linetype and color, click the rectangle to select it and change the properties (In **AutoCAD** type **PROPERTIES**. In **IntelliCAD** type **CHPROP**.)

In **MicroStation**, select the **Polygons: Place Block Icon**, or key-in the command **PLACE BLOCK ICON**. When you are prompted to select the first point, just click in the drawing. When you are prompted for the second point, you may enter the dimension values in the **X** and **Y** fields. Select the rectangle and use the **Attributes** toolbar or key-in **CHANGE ICON** to edit the linetype and color.

4. Select **File > Save As** and select the file type as **AutoCAD Drawing File (*.dwg)**. Give the border a descriptive name starting with the word **PAPER**, such as **PAPER 34 x 22.dwg**. (Only files starting with the word **PAPER** will be used in the drop down list of available paper templates.) Save the file in the folder:

C:\Program Files\Simplicity Sight Survey 2009\Symbols

12.46 Show/Hide Paper Border (PB)

FUNCTION: The **Show/Hide Paper** command is a toggle used to display or hide the display of a border depicting the edge of your paper.

Activate the **Show/Hide Paper** routine by picking from the **Draw** menu; by pressing [**Alt**][**D**], [**S**]; or by typing the two-letter command **PB** at any data entry prompt.

This command functions by toggling the visibility of the **PAPER_BORDER** layer. If the layer does not exist, you will be sent to the **Locate Paper** routine (**LP** – [Section 12.45](#)).

12.47 Query Entity (QE)

FUNCTION: The **Query Entity** routine is used to view the properties of a drawing entity.

Activate the **Query Entity** routine by picking from the **Draw** menu; by pressing [Alt][D], [Q]; or by typing the two-letter command **QE** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: **PROPERTIES**

IntelliCAD: **ENTPROP**

MicroStation: **CHANGE ICON** (Key-In Command)

You may select the entity to be queried either before or after issuing the command. The entity's properties appear in the **Property** dialog in CAD.

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.48 Snaps

FUNCTION: The **Snaps** routine is used to choose snap parameters.

Activate the **Snaps** routine by picking from the **Draw** menu; or by pressing [Alt][D], [N].

This routine activates one of the following CAD functions:

AutoCAD: **OSNAP** - Select snap parameters from the menu that appears. You may select more than one parameter. In CAD, toggle snaps on/off using [F3].

IntelliCAD: **OSNAP** - Select a single snap parameter from the menu that appears. In CAD, toggle snaps on/off using [F3].

MicroStation: **Settings > Snaps** (Menu Command)

Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

12.49 Refresh Drawing (RD)

FUNCTION: The **Refresh Drawing** routine is used to refresh the drawing screen.

Activate the **Refresh Drawing** routine by picking from the **Draw** menu; by pressing [**Alt**][**D**], [**R**]; or by typing the two-letter command **RD** at any data entry prompt.

This routine activates one of the following CAD functions:

AutoCAD: **REGEN**

IntelliCAD: **REGEN**

MicroStation: **UPDATE VIEW EXTENDED** (Key-In Command)

This function simply refreshes the drawing screen. There is no other user action required.

12.50 Plot Drawing

FUNCTION: The **Plot Drawing** routine is used to output your drawing on a printer or plotter.

Activate the **Plot Drawing** routine by picking from the **D**raw menu; or by pressing **[Alt][D]**, **[P]**.

This routine activates one of the following CAD functions:

AutoCAD: **PLOT**

IntelliCAD: **PLOT**

MicroStation: **DIALOG PLOT** (Key-In Command)

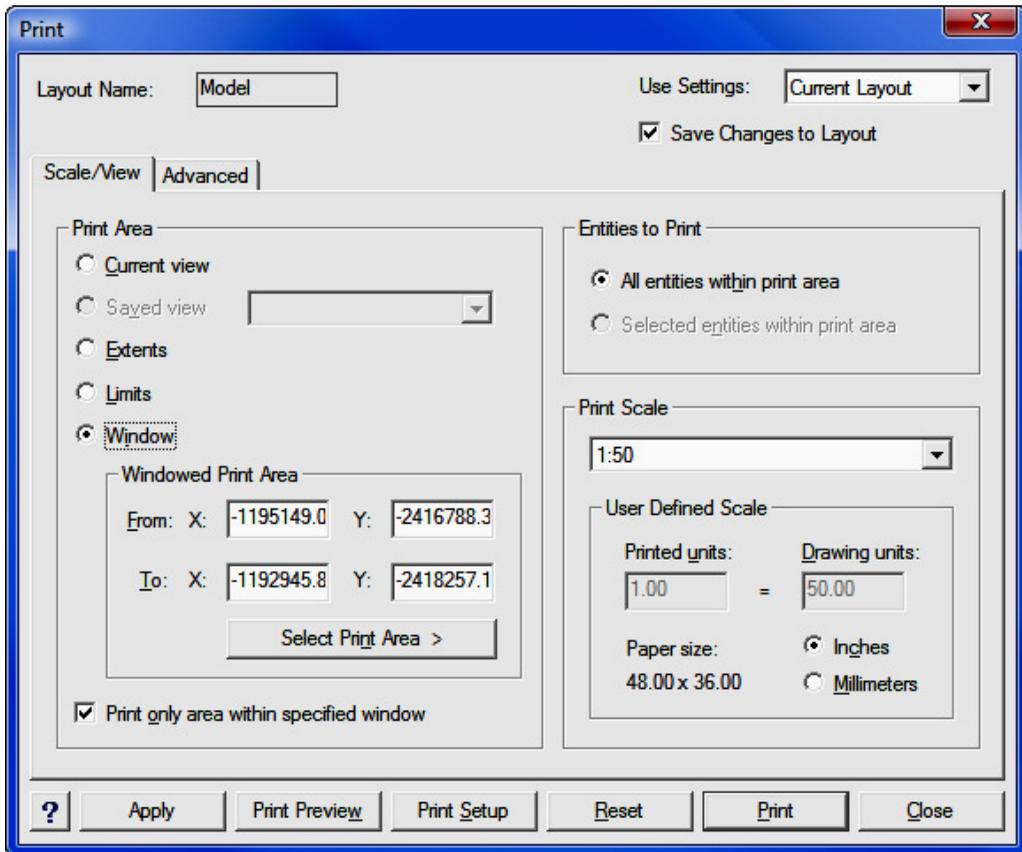
Prompts will appear on the command or status line in your CAD application. Please refer to your CAD documentation for specific instructions on the use of this function.

Plotting from Model Space in IntelliCAD

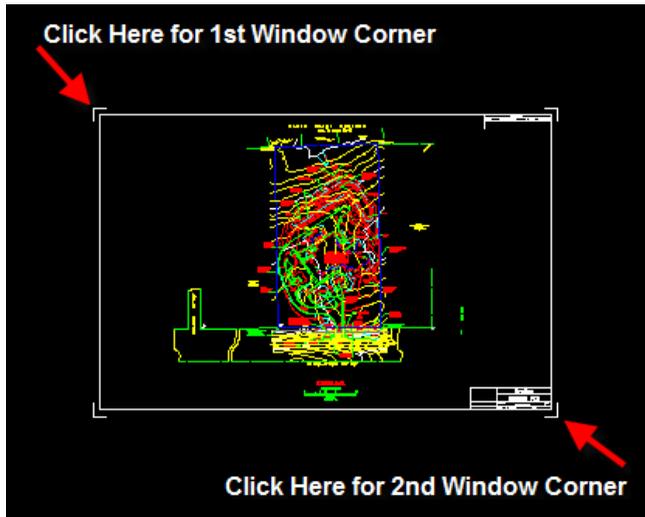
This example assumes you have placed a **Title Block** (**TB** - [Section 12.07](#)) or used **Locate Paper** (**LP** - [Section 12.45](#)) to place a paper border and you are ready to plot. The example below shows such a drawing.

For this example, we will plot directly from model space and will not utilize a paper space viewport.

Select **File > Print**.



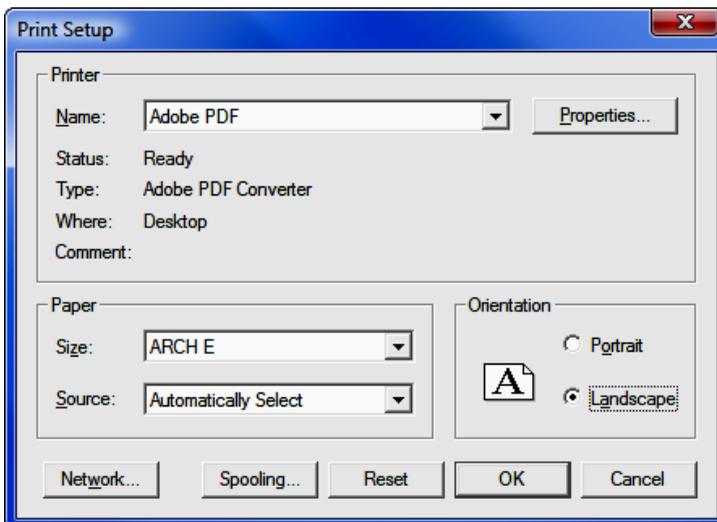
Print Area: Select **Window**. Click [**Select Print Area**] and when prompted for the window locations, click on the page markers on the two opposite corners of the plot area. Select the option to **Print only area within the specified window**.



Entities to Print: Select **All Entities** to print everything in the windowed area, or **Selected Entities** to print only selected items within the print area.

Print Scale: Select your print scale from the drop-down selection list, or enter a custom scale.

Click [**Print Setup**].

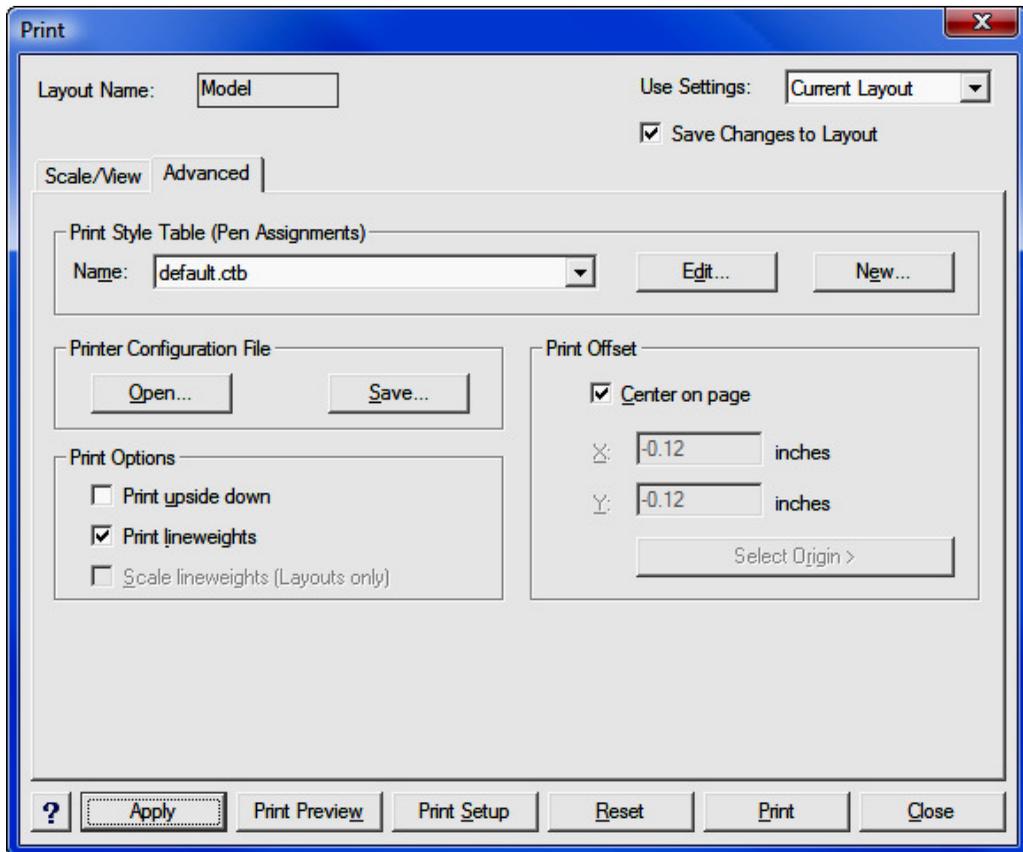


Printer: Select the printer to be used.

Paper: Select the paper size and source.

Orientation: Select **Landscape** or **Portrait** orientation.

Click [**OK**] to return to the **Print** dialog. Select the **Advanced** tab and under **Print Offset**, select the option to **Center on page**.



Click [**Apply**], then click [**Print Preview**]. When you are satisfied with your setup, click [**Print**].

Section 13

Examples

This section contains a number of examples, including:

- [Importing an old "Sight" Survey 2 or 3 Job](#) - Illustrates the steps necessary to use a job from an older version of Simplicity "Sight" Survey.
- [Importing an old DOS Survey 3 or Survey 4 Job](#) - Illustrates the steps necessary to use a job from an older DOS version of Simplicity Survey.
- [Starting a New Job from a Data Collector](#) - Illustrates the creation of a new "Sight" Survey job from a data collector file.
- [Field to Finish](#) - Illustrates the usefulness of Field-to-Finish coding and processing to start a new job.
- [Contours, Surfaces and Volumes](#) - Illustrates the creation of contours and surfaces, and also the computation of a volume between surfaces.
- [A Small Subdivision](#) - Illustrates the COGO steps needed to lay out a small subdivision.
- [Traverse Closure, Correction, and Adjustment](#) - Illustrates the steps involved in entering a traverse, correcting an entry error, and processing by Crandall Rule. (Examples for network least squares adjustments are contained in [Section 11.12.](#))

Any sample files used for these examples have been installed in the folder:

C:\Program Files\Simplicity Sight Survey 2009\Extras.

13.01 Importing an old "Sight" Survey 2 or 3 Job

Files used: Oakwoods.ZAK, Oakwoods.DRG

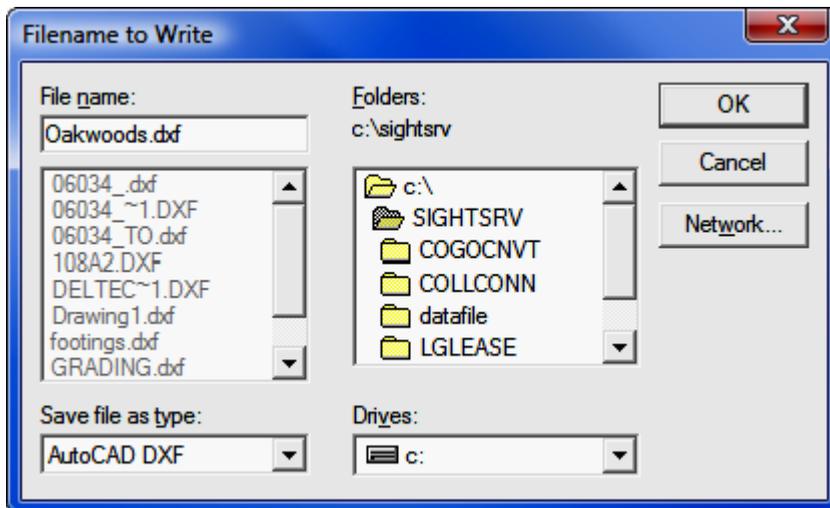
In this example we will:

- Export the "Sight" Survey 3 DRG file to DXF
- Open a New Blank Job with AutoCAD
- Import the .ZAK file
- Import the Drawing
- Save the New Drawing

Step 1:

Export the DRG file to a DXF: Open "Sight" Survey 3 (or 2) and load your job as you always have. Once it has loaded:

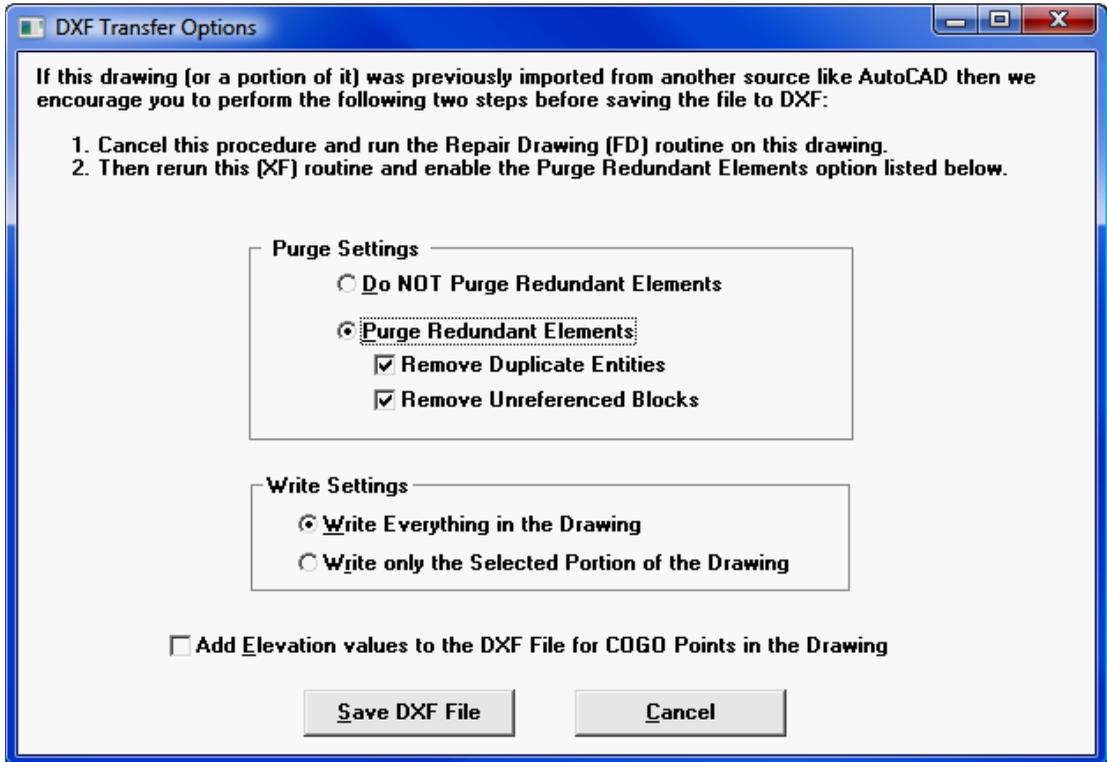
- "Sight" Survey 2 users select **File > Export > Drawing**.
- "Sight" Survey 3 users type **XF** to save the drawing as a DXF file.



Enter the **File Name** as **Oakwoods.DXF** and make sure the **Save file as type** setting is **AutoCAD DXF**. Click [**OK**].

"Sight" Survey 2 Users: You will be prompted at the top of the drawing screen: **Write everything? (else just selected)**. Click [**Yes**] and proceed to Step 2.

"Sight" Survey 3 Users: You will be presented with a **DXF Transfer Options** dialog.

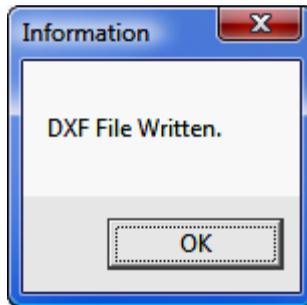


Select to **Purge Redundant Elements** and leave the two checkboxes checked. Also select **Write Everything in the Drawing**.

Click [**Save DXF File**].

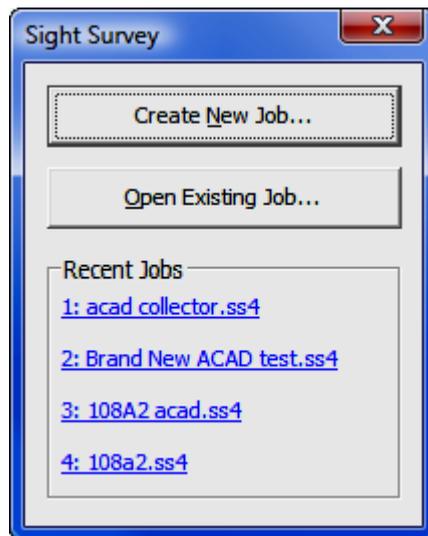
Step 2:

Once you have confirmation that the DXF file has been saved, click [**OK**] and then close your old "Sight" Survey.

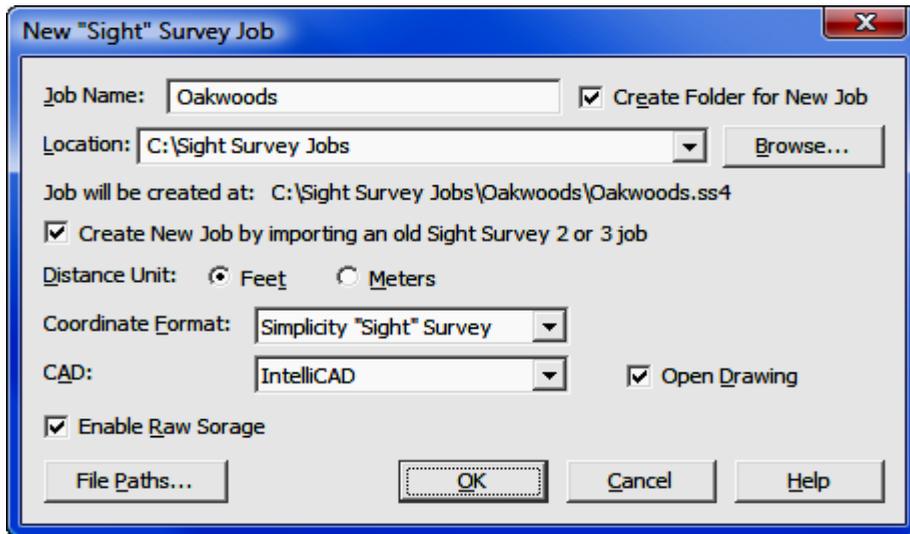


Use **Windows Explorer** (or **My Computer**) to copy the files **Oakwoods.DXF** and **Oakwoods.ZAK** to the **Sight Survey Jobs** folder on your desktop or under your **Documents** folder.

Start "Sight" Survey 2009 by double-clicking the **SS2009 External** icon on your desktop.



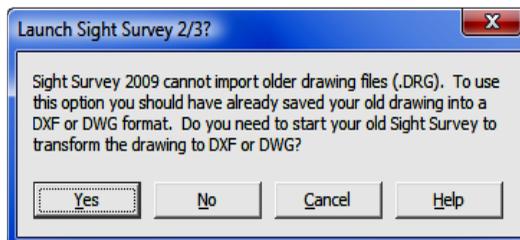
Left-click on the [**Create New Job**] button.



In the **New Job** window, set the **Job name** to **Oakwoods**. Set everything else as shown on the dialog above, with two exceptions:

- The **Location** (the path to the job) – leave it as it appears when the dialog opens. Do not change this setting.
- **CAD** – select the CAD version you want to use.

Click [**OK**]. "Sight" Survey will now initialize a data file and open the CAD window. At this point, you might want rearrange your display to allow for "Sight" Survey and the CAD program to coexist. If this is the first time you have started "Sight" Survey, it is probably lurking behind the CAD window on the left side of your screen. If your CAD screen is maximized, click the restore down button, and then use your mouse to resize and reposition the CAD display so you have something like what is shown below. (Note: If you have a dual monitor setup, you can drag the "Sight" Survey window to the other monitor.)

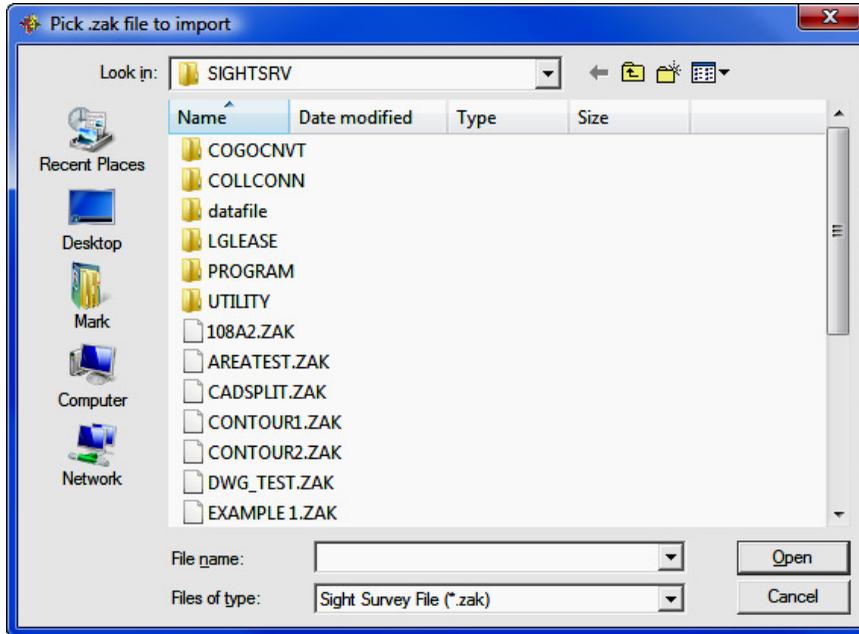


Just in case you have not yet converted your old drawing file, this dialog will allow you to launch your old "Sight" Survey and make the conversion.

[Yes]: Clicking **[Yes]** will launch "Sight" Survey 2/3 provided that your old "Sight" Survey is in the default location. If you installed it to another location, DO NOT click any buttons on this dialog, but use your normal "Sight" Survey 2/3 startup procedures to launch the old program. After you have converted the drawing and closed "Sight" Survey 2/3, click **[No]** on this dialog.

[Cancel]: Click **[Cancel]** to return to the **New Job** dialog to change your settings.

[No]: Click **[No]** to continue importing your job.



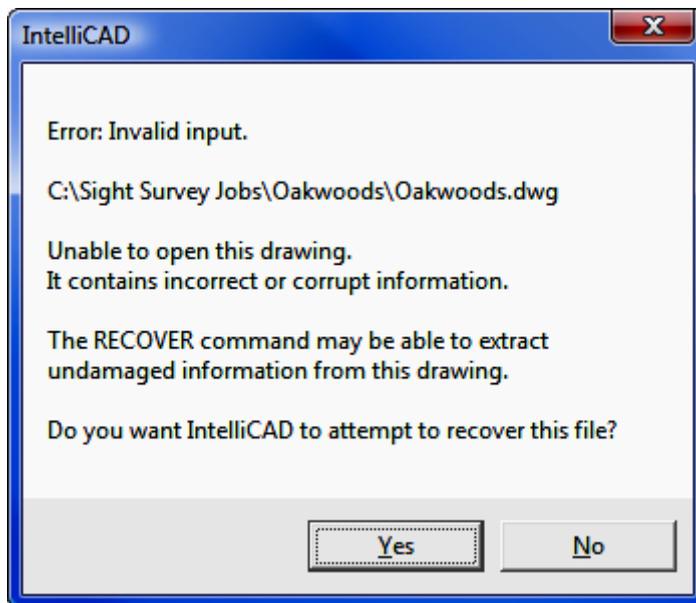
Pick .zak file to import: "Sight" Survey 2009 will display a **Windows File Selection** dialog box pointing to a folder location of **C:\SightSrv**. This is the default location for "Sight" Survey 2/3 files. If you are saving data files to a different location, you will need to navigate to your data folder.

Select the old **.ZAK** file you want to import and click [**Open**]. You do not need to import a drawing file, only the **.ZAK** file. The drawing file will be automatically included.

"Sight" Survey 2009 will open the imported job. If you do not see the drawing, issue a **Zoom All** command in "Sight" Survey by typing the two-letter command **ZA**. Before continuing, it is a good idea to save your job. Select **File > Save** or left-click the save icon in the "Sight" Survey toolbar.

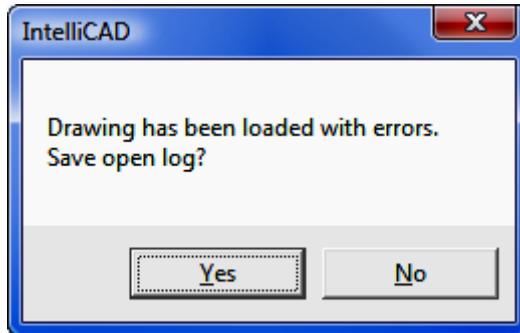
Note to IntelliCAD Users:

If you have imported a DWG file, when the drawing first opens you will likely see this error message.

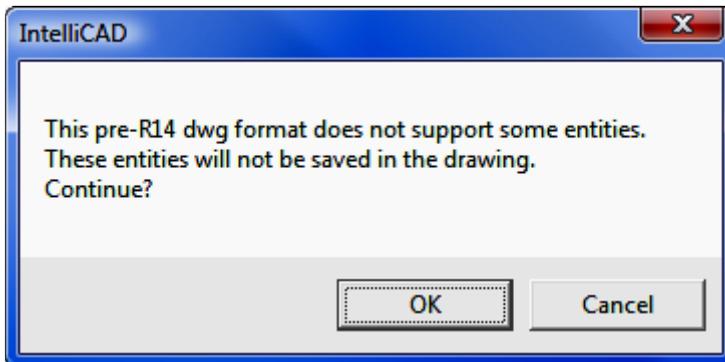


The error message is caused by settings in the release 12 formatted drawing file that are not recognized by IntelliCAD. These are general settings and there is nothing wrong with your drawing. Click [**Yes**] to continue loading the drawing.

A log file is created as the drawing is recovered, resulting in another message. You do not need to save the log file. Click [**No**].



When you attempt to save the imported drawing for the first time, you will also see this dialog:



Again, there is nothing wrong with the drawing, and nothing will be left out of the drawing when you save it. Click [**OK**] to complete the initial save process. Your drawing is saved in the most current IntelliCAD/AutoCAD drawing format and you will not see this message again.

13.02 Importing an old DOS Survey 3 or 4 Job

Files used: None

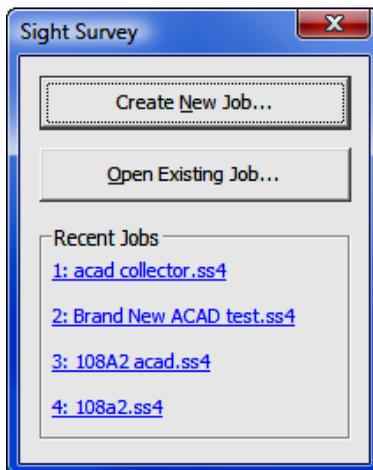
In this example we will:

- Open a New Blank Job with AutoCAD
- Import an old DOS file to Sight Survey
- Import a drawing file (if one is available)

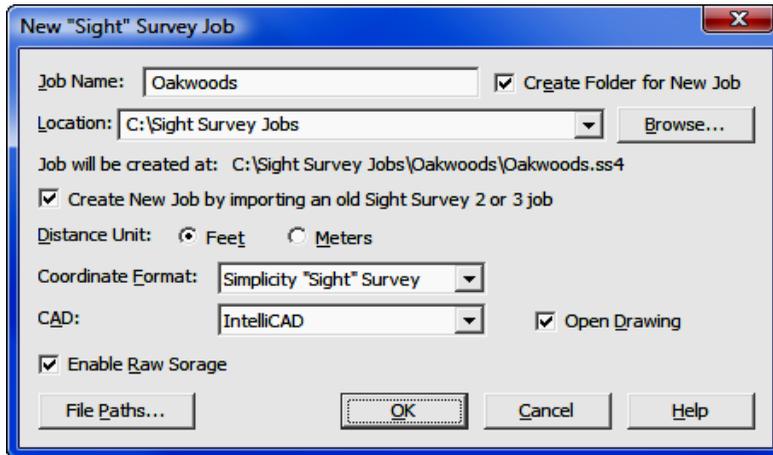
Step 1:

Start a New Job: Start "Sight" Survey 2009 by double-clicking the **SS2009 External** icon on your desktop. (Note: Since you do not have any drawing file associated with your job, you may wish to start the **No-CAD** version instead. In that case, you would not specify a CAD version.)

Generic CADD / Draftsman Users: If you have used The Draftsman to create a Generic CADD drawing (.GCD), you need to use Generic CADD to convert your drawing to an AutoCAD .DXF file if you intend to use it with "Sight" Survey.



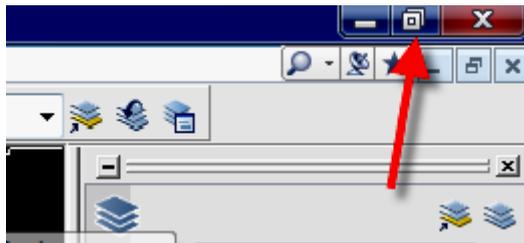
Left-click on the [**Create New Job**] Button.

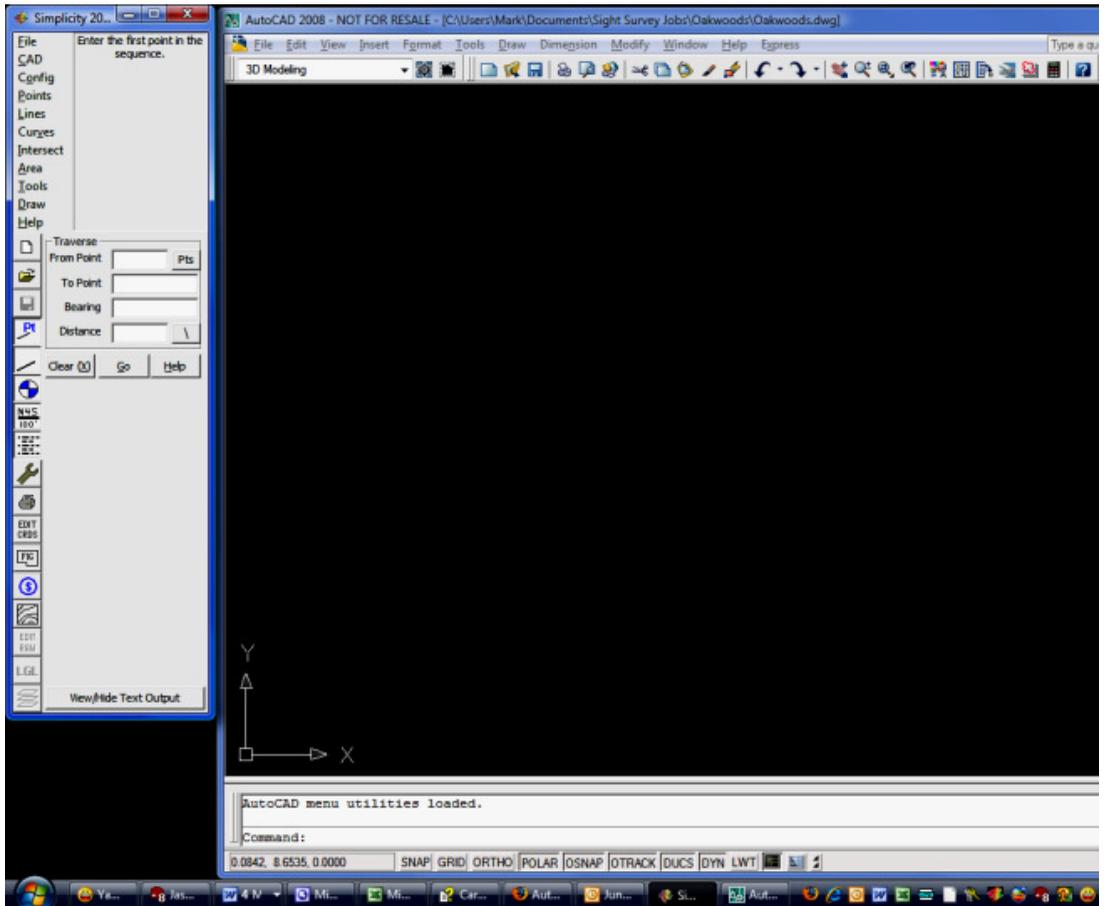


In the **New Job** window, establish the **Job name**. Set everything else as shown on the dialog to the right, with two exceptions:

- The **Location** (the path to the job) – leave it as it appears when the dialog opens. Do not change this setting.
- **CAD** – select the CAD version you want to use.

Click [OK]. "Sight" Survey will now initialize a data file and open the CAD window. At this point, you might want rearrange your display to allow for "Sight" Survey and the CAD program to coexist. If this is the first time you have started "Sight" Survey, it is probably lurking behind the CAD window on the left side of your screen. If your CAD screen is maximized, click the restore down button, and then use your mouse to resize and reposition the CAD display so you have something like what is shown below. (Note: If you have a dual monitor setup, you can drag the "Sight" Survey window to the other monitor.)





Step 2:

Import the Coordinate File: In "Sight" Survey, select the menu item **File > Import > Coordinates**. (See [Section 3.09](#))

Import Point Parameters [X]

Point Overwrite Protection

- No Point Overwrite Protection
- Renumber Duplicates & Place at end of File
- Prompt for instruction at each duplicate point

Tolerances

Positional: 0.000010

Elevation: 0.000010

Import Points

- All points in File
- All Points Except Numbers []
- Only Point Numbers []

Renumber Imported Points

- DO NOT Renumber Imported Points
- Renumber Imported Points starting at Point Number []

Prefix / Suffix

Prefix [] Suffix []

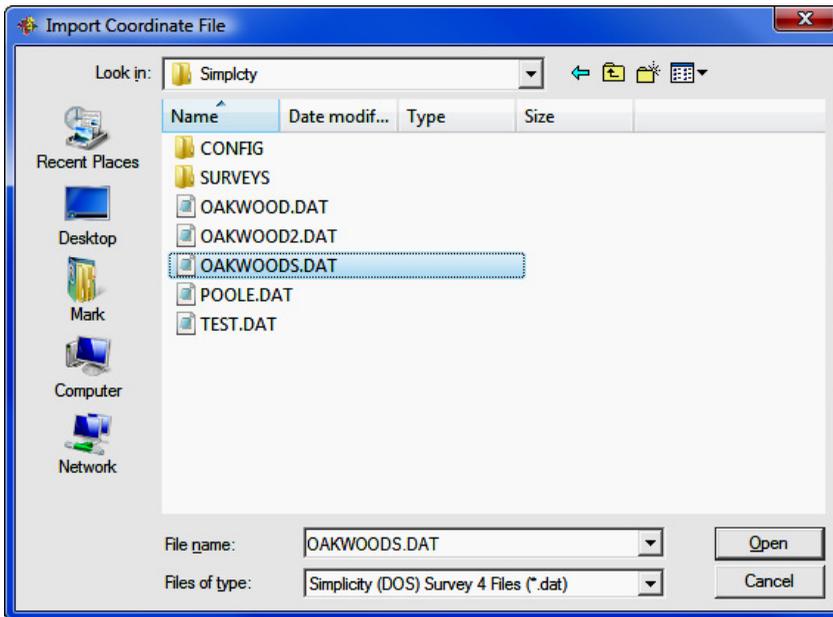
Assign Points to Layer

- Default
- By Description
- Enter Layer: WASTEWATER [v]

Draw Points

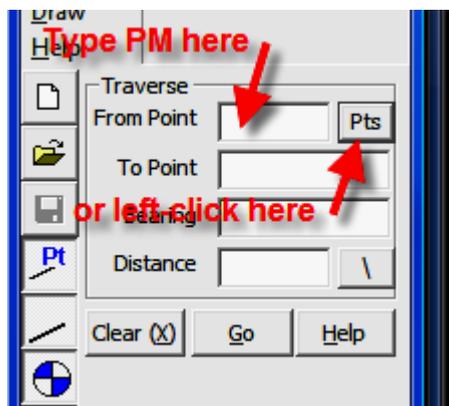
[Import Points] [Cancel] [Help]

Since you are importing into a blank file, you do not need to set up any **Import Point Parameters**. Click [**Import Points**] to select the data file.



Set the **Files of Type** to **Simplicity (DOS) Survey 4 Files (*.DAT)** or **Simplicity (DOS) Survey 3 Files (*.DAT)**.

Find the data file to be imported and click [**Open**]. Your coordinates have now been loaded. Type **PM** or left-clicking on the [**Pts**] button to the right of the **From Point** field, you can call up the **Point Manager (PM - [Section 6.09](#))** to view your coordinates.



After viewing your coordinates, left-click [**Close/Cancel**] to close the **Point Manager** window and continue working.

Don't forget to **Save the New Job**: Select **File > Save**.

13.03 Starting a New Job from a Data Collector Raw File

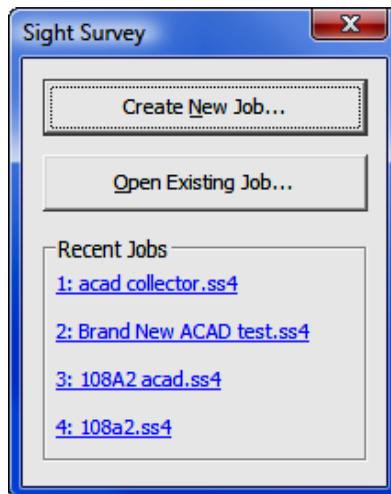
Files used: 2160.rw5, carlson.fld

In this example we will:

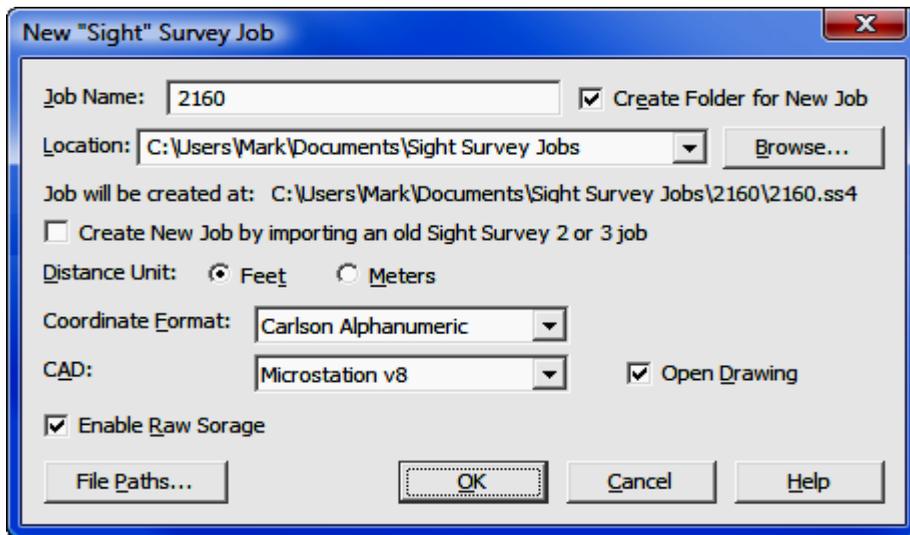
- [Open a New Blank Job with MicroStation](#)
- [Transfer the Raw Data file from the Data Collector](#)
- [Convert the Raw Data file to Coordinates](#)
- [Run Field-to-Finish](#)
- [Construct and Label Contours](#)

Open a New Job with MicroStation:

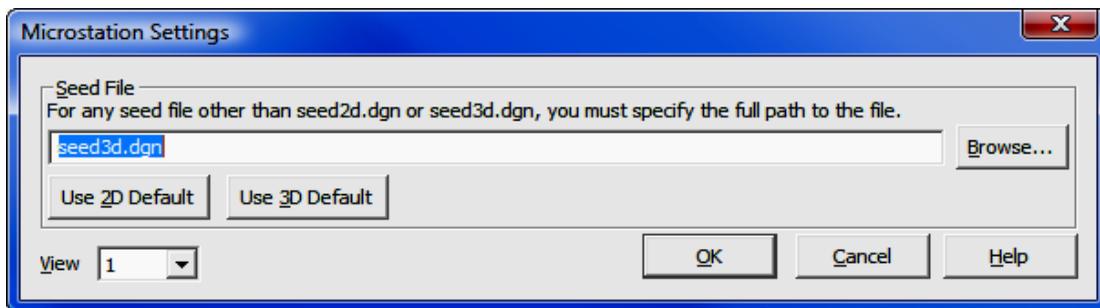
Start "Sight" Survey 2009 by double-clicking the **SS2009 External** icon on your desktop.



Left-click on the [**Create New Job**] button.



In the **Job Name** field, enter the name of your job, **2160**, in this example. Leave the default **Location** as is, but set the **Coordinate Format** to **Carlson Alphanumeric** and select **MicroStation V8** as the **CAD** version. The **Open Drawing** box should be checked, and the **Raw Format** should be set to **RW5**. Click [**OK**] to bring up the **MicroStation Settings** dialog window.

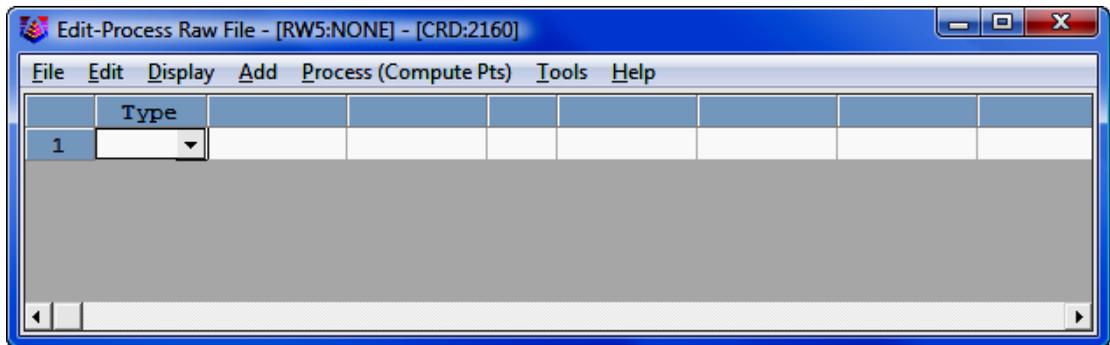


The **Seed File** should be set to **seed3d.dgn**. You must use a 3d seed file if you are going to generate contours. If this is not set to **seed3d.dgn**, click the [**Use 3D Default**] button. The **View** setting identifies the window in MicroStation that will be active when MicroStation is launched. You can specify 1-8, but view **1** (a

2D top view) is best to start with. Click [**OK**] and "Sight" Survey will open a MicroStation drawing (2160.dgn).

Transfer the Raw Data file from the Data Collector:

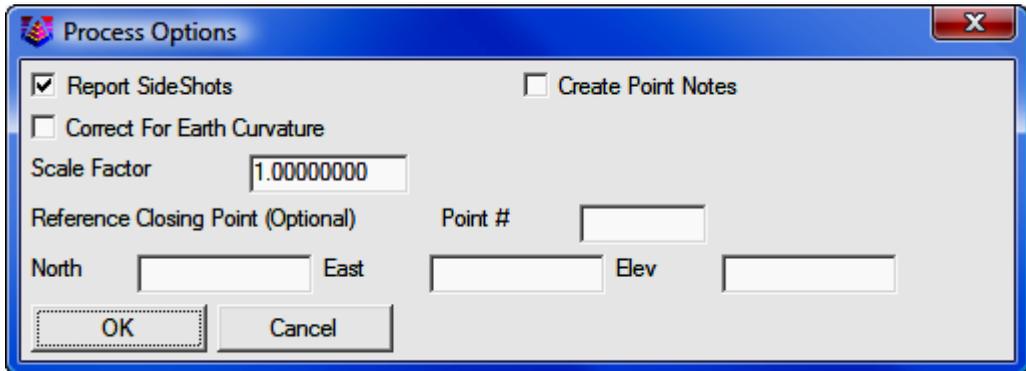
We are now ready to import points. You can import **crd** files or **ASCII** files from a data collector or from files on your computer. If you were going to import from a Carlson data collector, you would select **Tools > Data Transfer > SurvCom Transfer**. (In your demo, don't select this item unless you actually have a data collector connector to the computer or you will generate an error.) To import a file, you would select **File > Import > Coordinate Files** (or ASCII Files). For demo purposes though, you might want to use a third alternative, one that will also show the **SurvNet Least Squares** program. Select **Tools > Edit Process Raw Files > Carlson Raw Editor**.



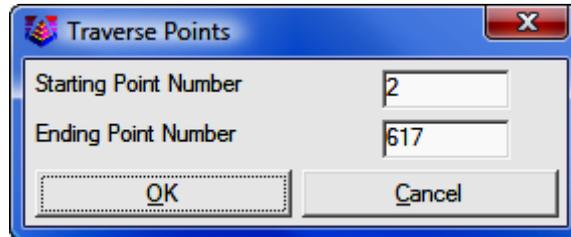
In this editor window, we will now load the RW5 raw file. Select **File > Open RW5 File** and select the **2160.rw5** file. This will populate the **Edit-Process Raw File** window. You can review the contents using the scroll bar on the right side of the window.

Convert the Raw Data file to Coordinates:

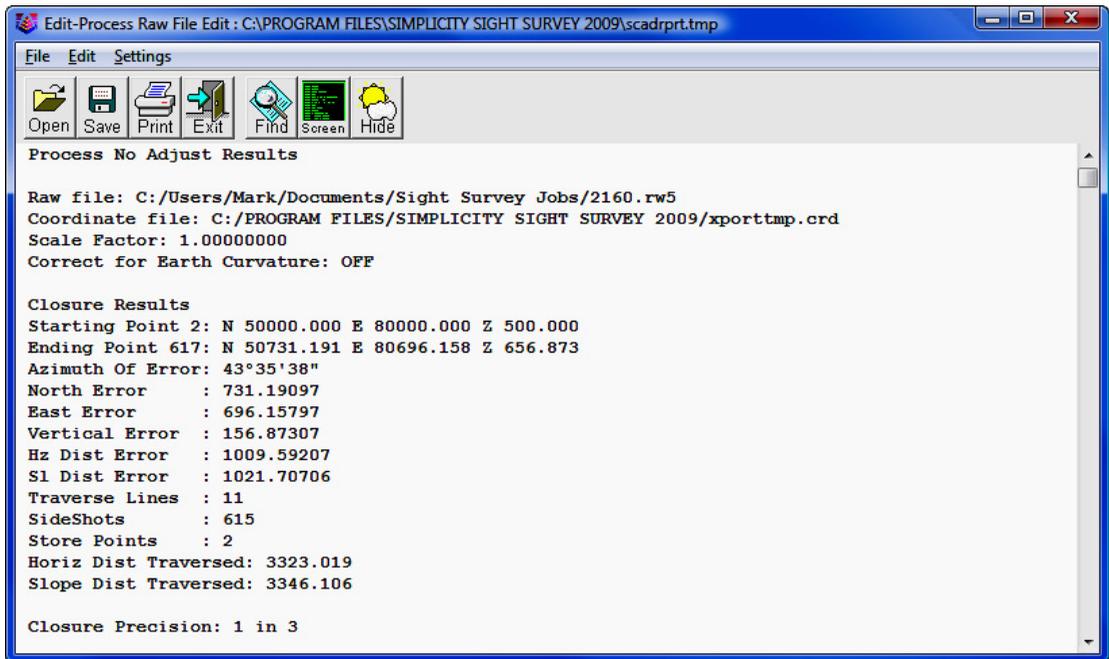
Now select **Process (Compute Pts) > No Adjust**. We will simply process the raw file without any traverse adjustment.



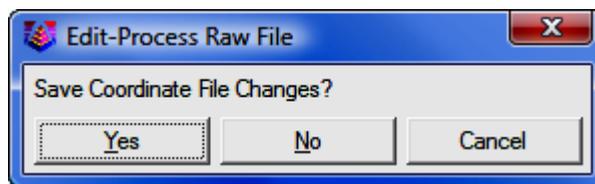
Click [OK]. The **Traverse Points** dialog opens and the starting and ending point numbers are automatically populated from the RW5 file.



Click [OK] and you'll get the results report. (**Note:** No attempt is made here to correct the traverse before running the **No Adjust** option. We simply want to compute coordinates to show importation into "Sight" Survey. Traverse correction and adjustment is shown in [Section 13.07](#).)

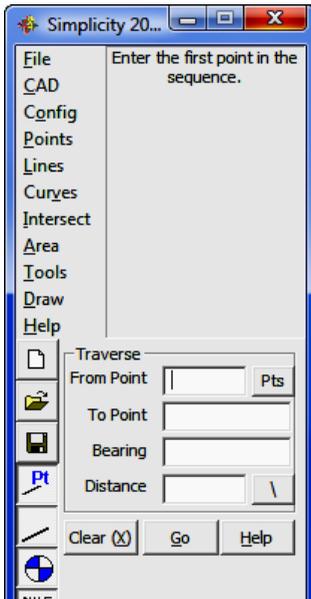


At this point you can save or print the report, or simply review it and select [**Exit**] to take you back to the raw editor window, where you should select **File > Exit** and then **Save the Coordinate File Changes**.



The editor window will close.

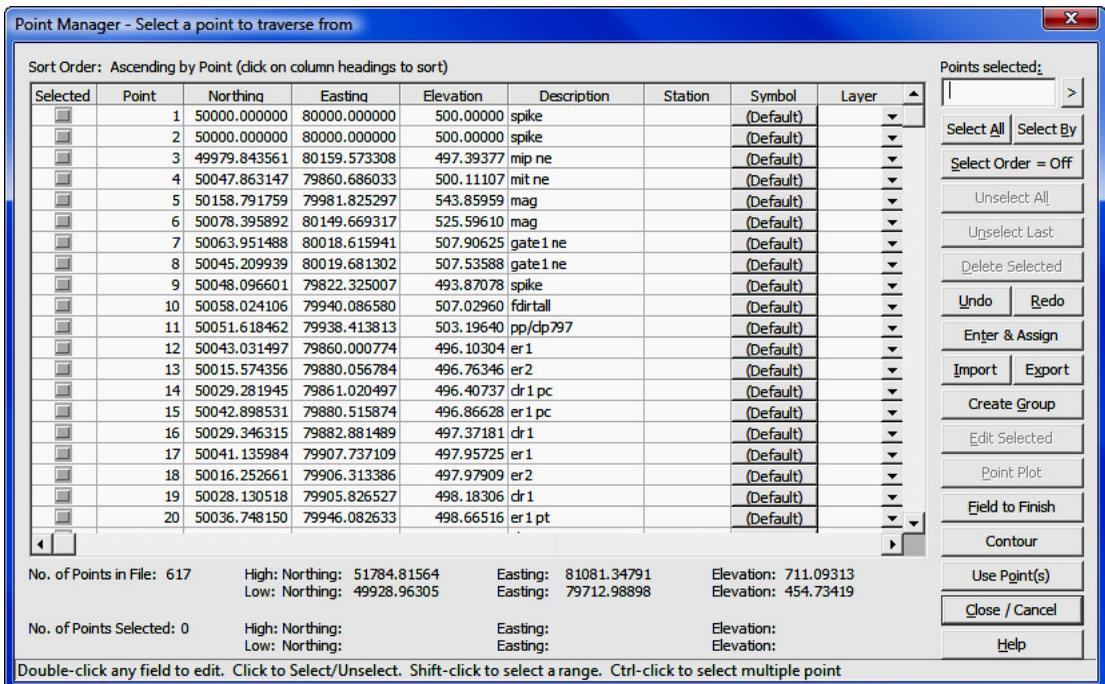
"Sight" Survey uses 2-letter commands as shortcuts to change routines. (TR = Traverse, IN = Inverse, SS = Side Shot, etc.) The commands are shown beside the menu items for each routine. These 2-letter commands can be entered into virtually any data entry field, and case does not matter. At this point, your "Sight" Survey window looks like this (only the top half is shown here):



In the middle of the window you have a **Traverse Box**. You can see the points (in text mode) that have just been imported in any one of three ways:

1. Click the [**Pts**] button to the right of the **From Point** field.
2. Simply type **PM** to call up the **Points Manager**. (You will not see the letters as you type them.)
3. Select **Points > Point Manager**.

Use one of these options to call up the **Point Manager** to show the imported points.



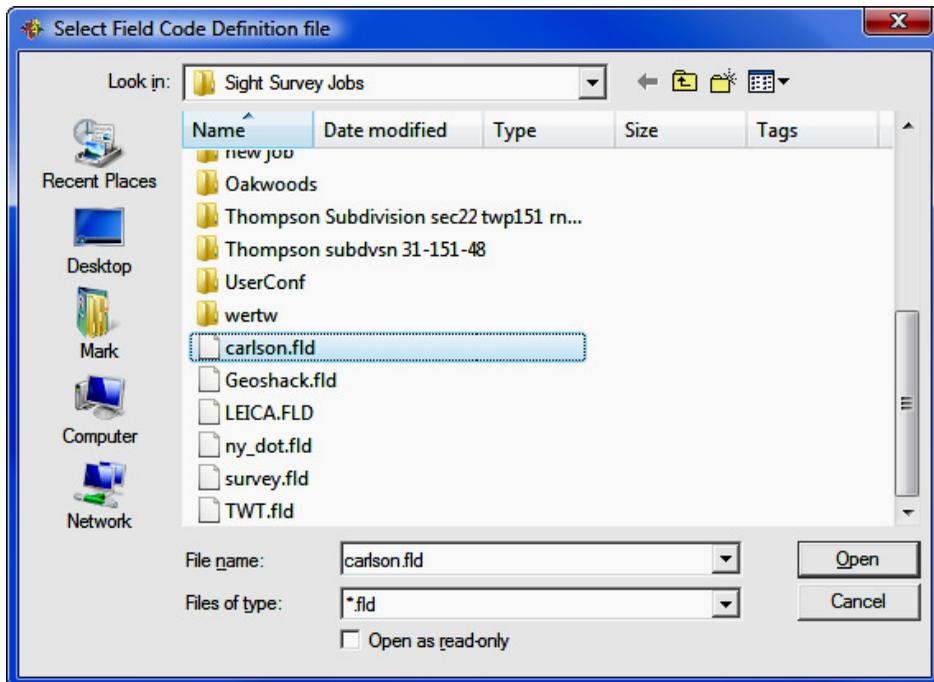
From the **Point Manager** window you can plot all the points by clicking [**Select All**], and then [**Point Plot**]. You can also enter **Field-to-Finish** by clicking [**Select All**] and then clicking [**Field to Finish**]. However for now, just click [**Close/Cancel**] to close the **Point Manager**.

Run Field-to-Finish:

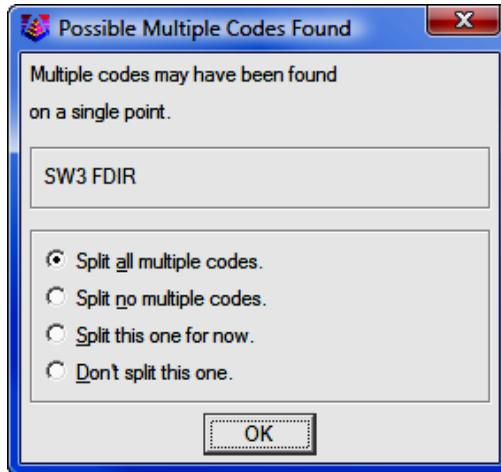
Type **FF** to enter the **Field-to-Finish** routine (or select **Points > Draw Field to Finish**).



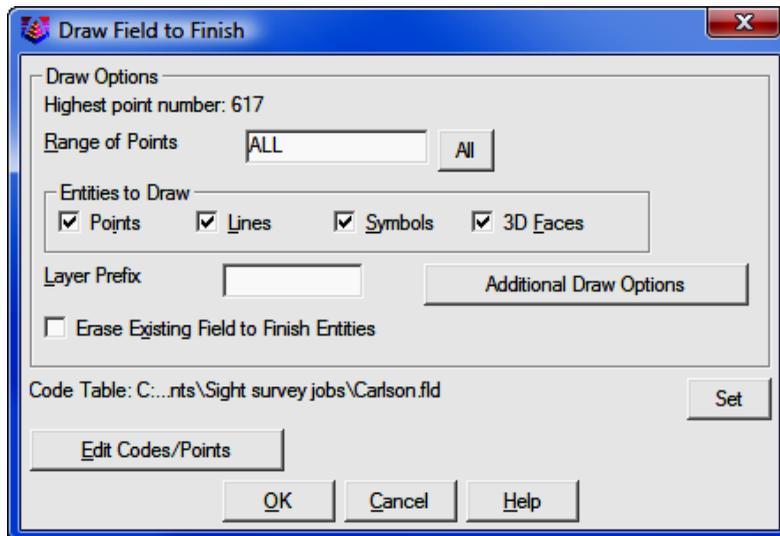
IMPORTANT: Remember that "Sight" Survey is not running inside MicroStation, but rather it is running along side it. This means that if you click in the MicroStation drawing, you have to click back into the "Sight" Survey window before entering data or routine codes from the keyboard. Likewise, you need to click into the MicroStation window before issuing keyboard commands such as Ctrl-A to select all entities. This is true also for AutoCAD usage.



Select the **carlson.fld** file as the **Field Code Definition File** and click [**Open**].

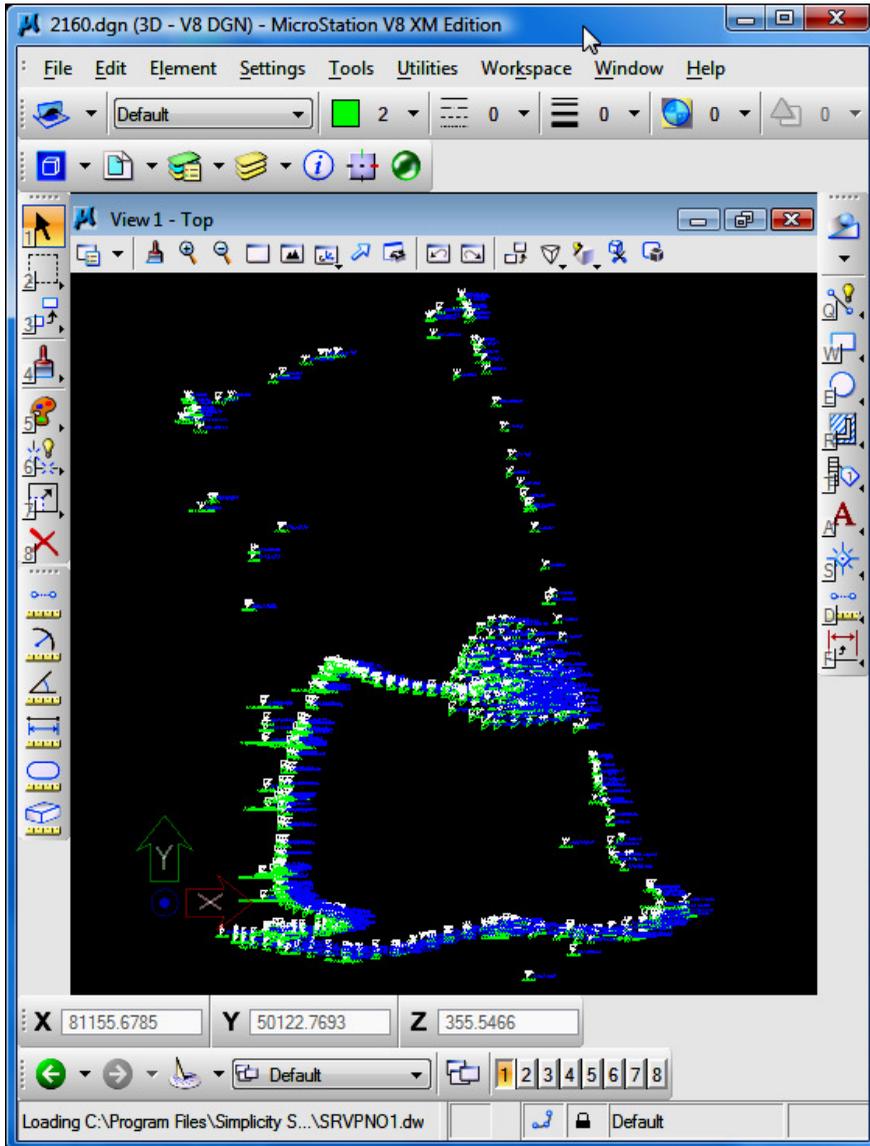


Some point descriptions contain multiple codes. Select [**OK**].



Use the default settings as provided in the dialog box. If you are running F2F multiple times, you can check the **Erase Existing Field to Finish Entities** box to delete previous entities in favor of newer ones. Deleting any old existing entries will increase drawing time slightly. Click [**OK**].

There are 1270+ entities so it takes a few moments to plot all the points. For this example there is no linework in the file to show so only points will be plotted. After a few moments your MicroStation window should be showing all of the points.



Construct and Label Contours

Now plot some contours. At this point we may not want the F2F entities on the drawing so delete them using the **Delete Field-to-Finish (XF)** routine. Unless you have clicked into the CAD window, "Sight" Survey is still the active program so just type **XF**. Otherwise, click into "Sight" Survey first and then type **XF**. Click **Yes** to confirm that you want to erase the entities.

Now select **Tools > Surface > Contour** or click the little toolbar icon that looks like a contour map.

Contour

Contour By Points Contour By Surface

Points: All Select Points

Breakline Layer(s): BREAKLINES Layers Draw Pick (0)

Inclusion Layer(s): Layers Draw Pick (0)

Exclusion Layer(s): Layers Draw Pick (0)

Contour Lines

Contour Layer: CONTOUR Select Layer

Contour Color: Blue Linetype: *ByLayer

Interval: 5 Line Weight: 0

Draw Index Contours Ignore Zero Elevations

Index Layer: CNTRINDEX Select Layer

Index Color: Red Linetype: *ByLayer

Index Interval: 20 Line Weight: 1

Bezier Smoothing Factor = 0 (off)

Erase Previous Contours/Labels Contour

Surface

Show Triangles Erase Previous Triangles

Triangle Layer: DTM Select Layer

Triangle Color: Blue

Create Surface File: Surface Name

Surface Path

Labels

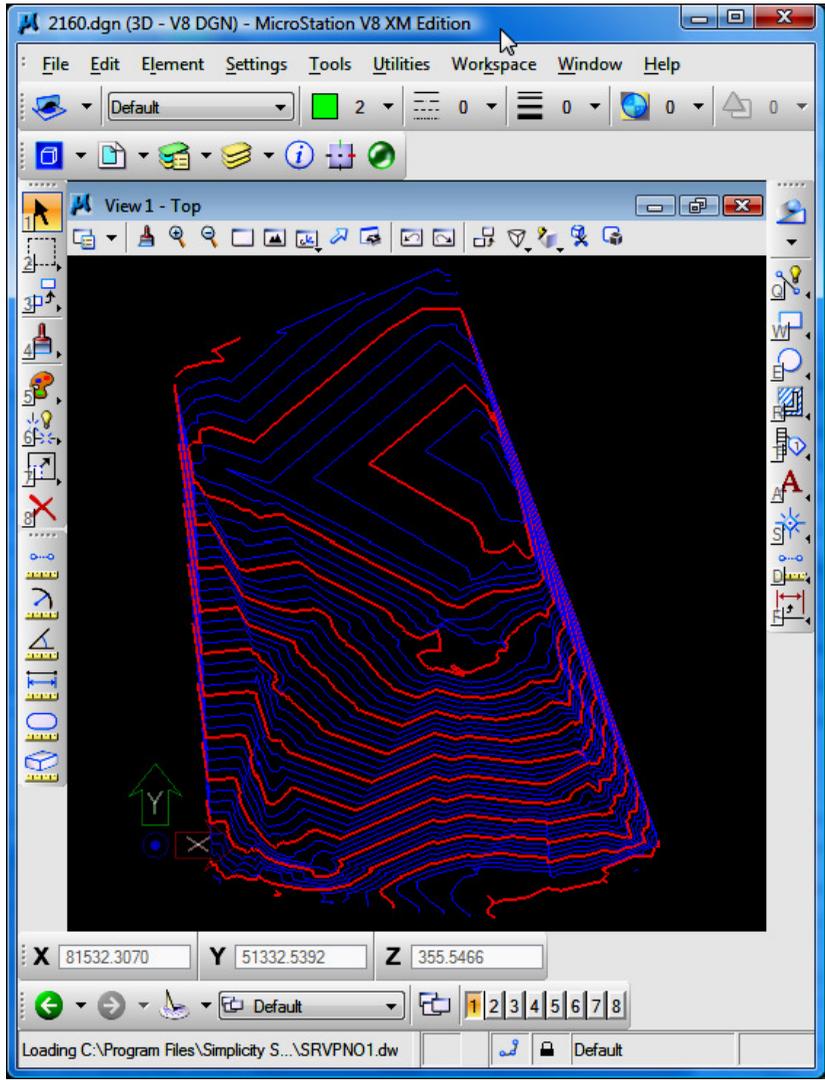
Label Layer: CNTRLABEL Select Layer

Label Color: Yellow Label Font: Arial

Label Precision: 0 Label Size: 06

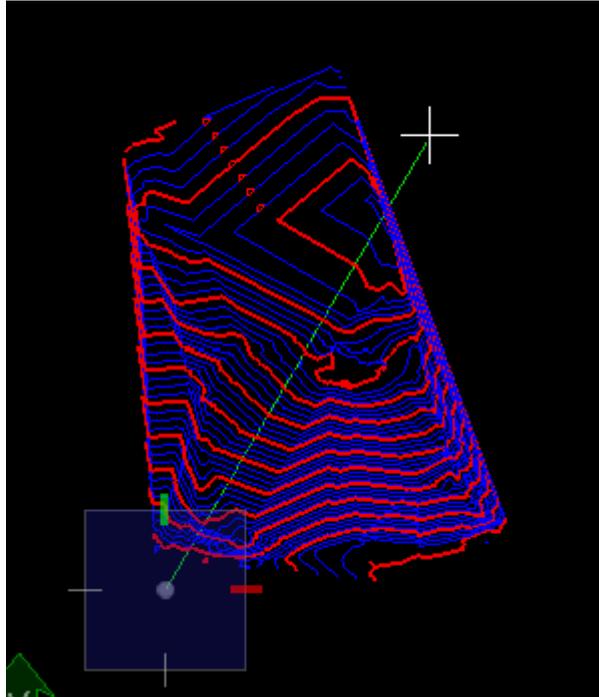
Label Contour Lines Volumes Cancel Help

On the **Contour** dialog, Set your contour interval to **5** with color **Blue**. Check the **Draw Index Contours** box and set the **Index Interval** to **20**. Click [**Contour**]. (If you are re-running the routine after changing intervals, check the **Erase Previous Contours/Labels** box.)



To label contour lines, click the [**Label Contour Lines**] button after setting preferences for font, size, color and layer. Click the CAD title bar, and note that the

command line is prompting you **Contour label line > Place Starting Point**. Left-click and hold the mouse button while you drag a line across the drawing to an ending point, then release the mouse button. Labels will be placed where this line intersects a contour line.



You can repeat this labeling process as many times as you wish. After you finish, select the **Contour** dialog box and click **Cancel**.



Using MicroStation Cell Files: "Sight" Survey can access your MicroStation cell files to use your custom symbols when importing Field-to-Finish. These cell files can be accessed in either of two ways, **before** you run Field-to-Finish:

- In MicroStation, select **Element > Cells**. Click **File > Attach** and browse to your cell library. Select the library and click [**Attach**].
- Set up your **MicroStation User Config** file to include and automatically load your cell library on startup.

13.04 Field to Finish

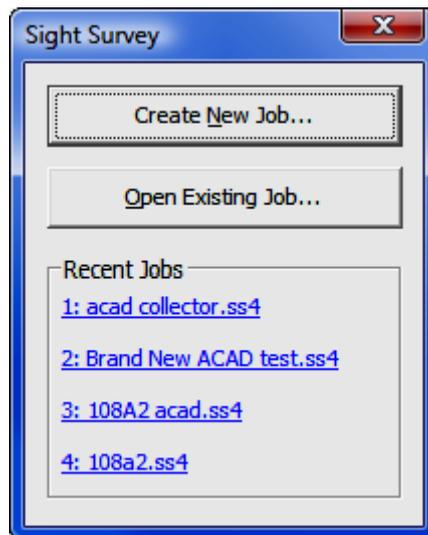
Files used: plat.txt, carlson.fld

In this example we will:

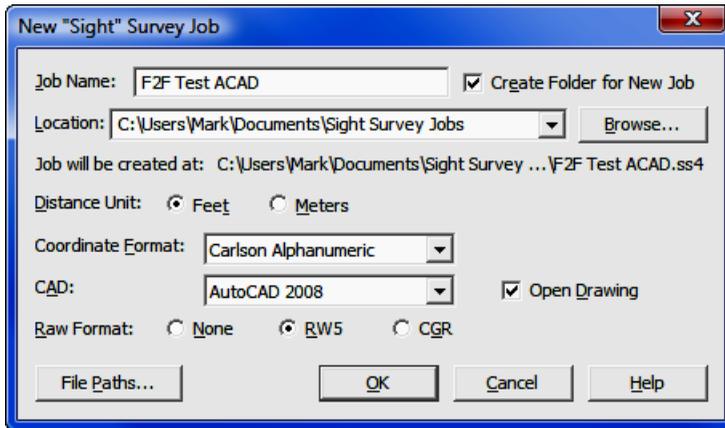
- [Open a New Blank Job with AutoCAD](#)
- [Import a Data File](#)
- [Configure Point Output](#)
- [Draw-Locate Points](#)
- [Erase the Drawing](#)
- [Run Field-to-Finish](#)

Open a New Blank Job with AutoCAD:

Start "Sight" Survey 2009 by double-clicking the **SS2009 External** icon on your desktop.



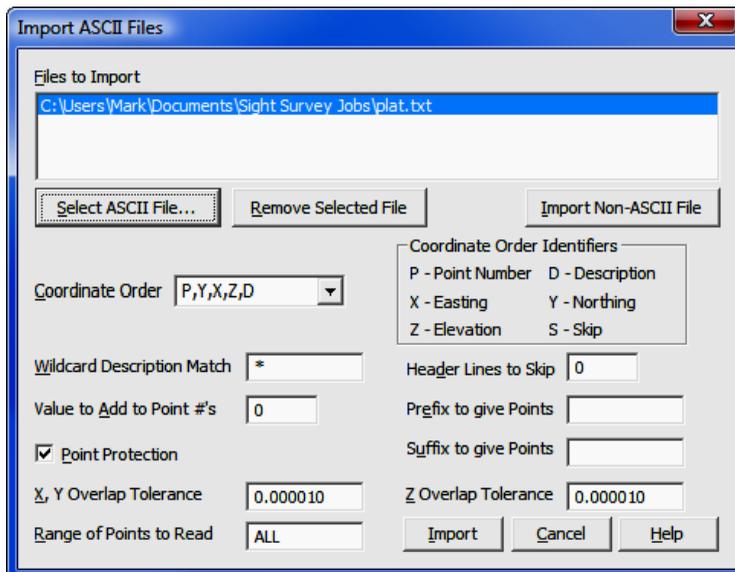
Left-click on the [**Create New Job**] button.



In the **Job Name** field, enter the name of your job, **F2F Test ACAD**, in this example. Leave the default **Location** as is, but set the **Coordinate Format** to **Carlson Alphanumeric** and select your **AutoCAD** version. The **Open Drawing** box should be checked. Click [OK] to initialize the new job and start AutoCAD.

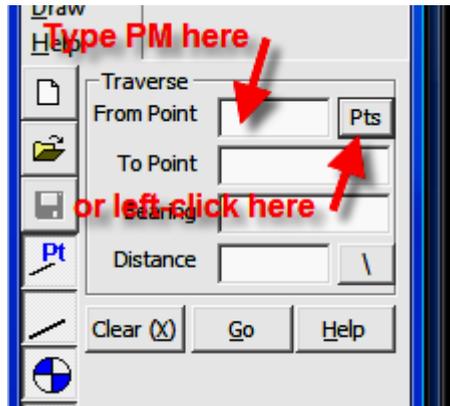
Import a Data File:

We are now ready to import points. Select **File > Import > ASCII Files**.



Click the [**Select ASCII File**] button and select the file **Plat.TXT** from the "Sight" Survey Jobs folder. Click [**Import**].

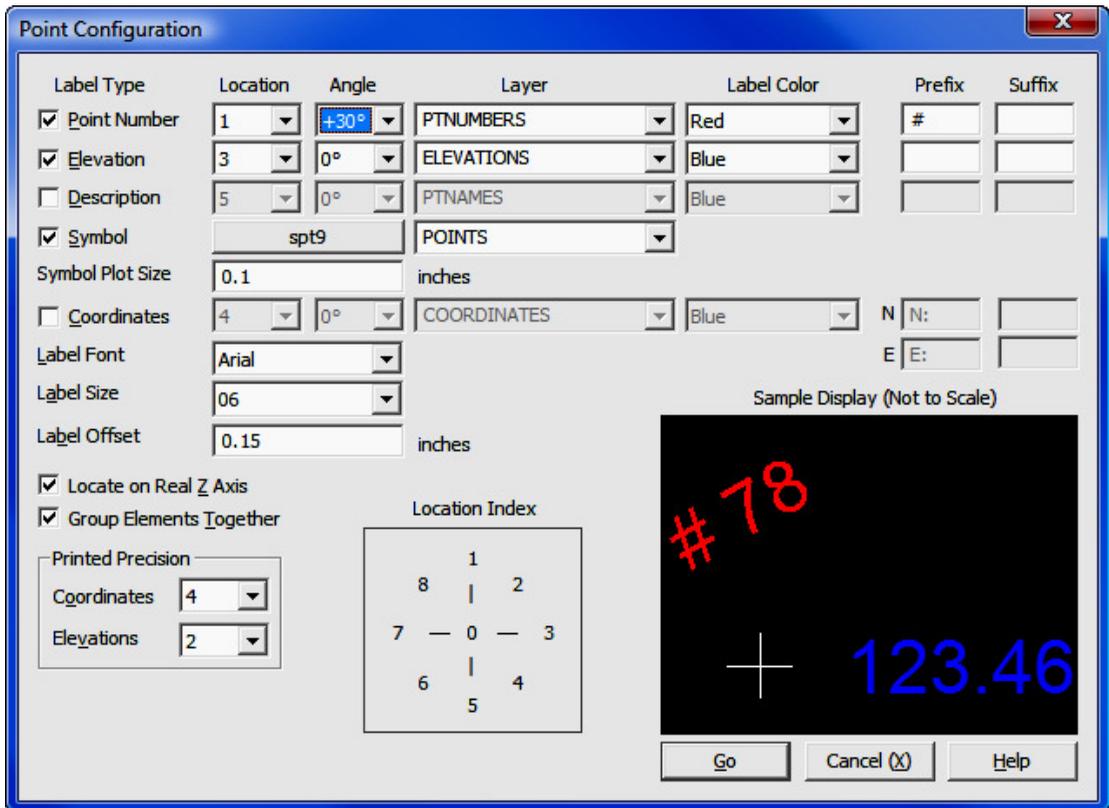
Your coordinates have now been loaded. By typing **PM** or left-clicking on the [**Pts**] button to the right of the **From Point** field, you can call up the **Point Manager** to view your coordinates.



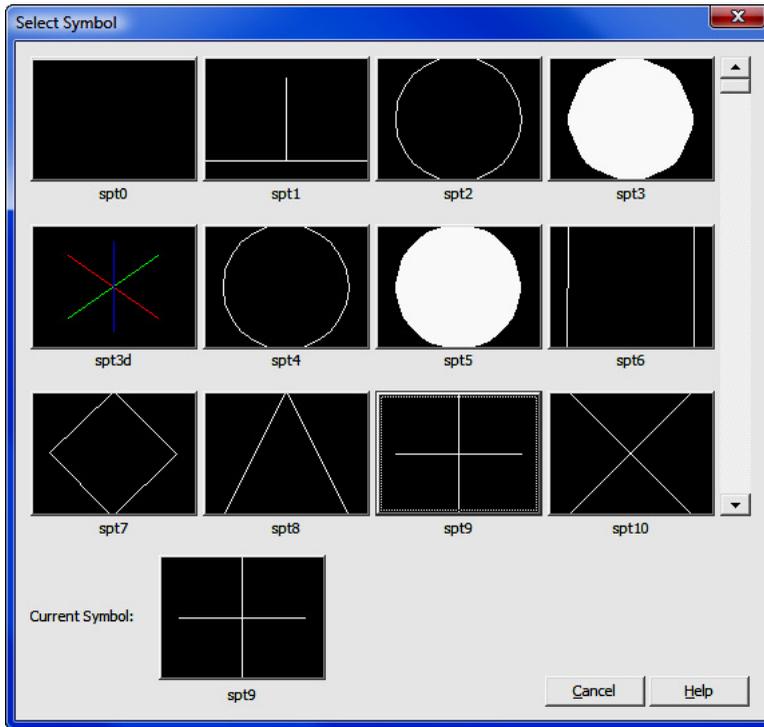
After viewing your coordinates, left-click [**Close/Cancel**] to close the **Point Manager** window.

Configure Point Output:

"Sight" Survey 2009 contains a visual point configuration routine to set up how your points are displayed in CAD. Access the routine by selecting **Config > Point Configuration**, or by typing the two-letter command **PC**.



Check the boxes next to the **Point Number**, **Elevation** and **Symbol Label Types**. In the **Location** column, set the point number location to **1**, and the elevation location to **3**. A location index is shown next to the sample display to assist you in selecting locations. Under the **Angle** column, set your point number angle to **+30°**. Set your point number color to **Red**, and your elevation color to **Blue**. Now click the button to the right of the **Symbol Label Type** checkbox to select a symbol.



Click on symbol **spt9** to select it and the Select Symbol dialog will close. The **Sample Display** window in the **Point Configuration** dialog box reflects your settings. Click [**Go**].

Draw-Locate Points:

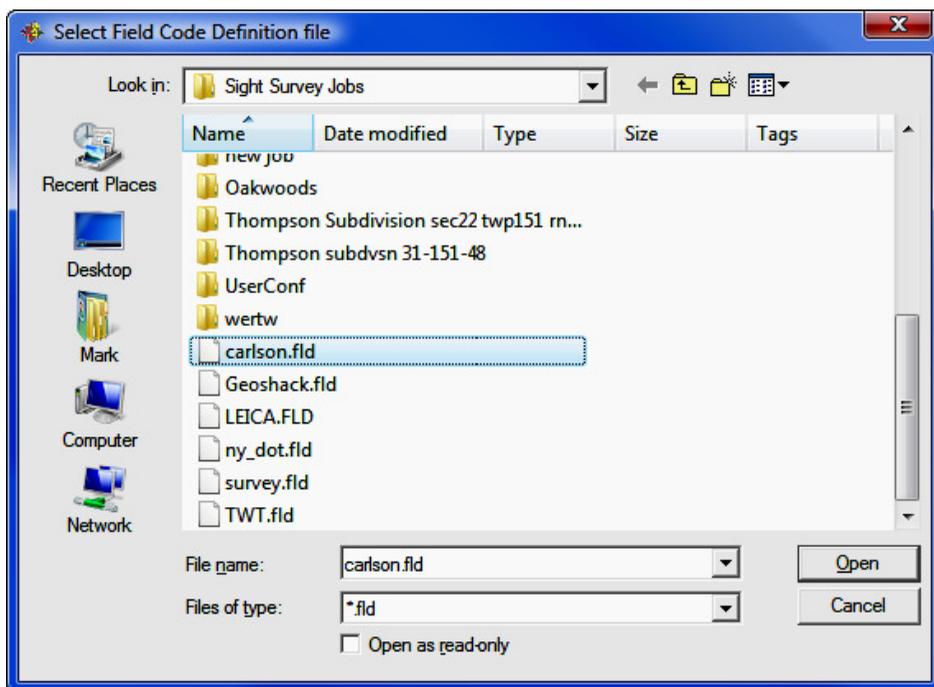
Other than using **Field-to-Finish**, there are two other ways to draw points in "Sight" Survey: by the **Point Plot** routine; or by the **Draw All Points** routine. If you intend to plot only certain the points in the file, **Point Plot** will let you define a selection set. In this example, we want to plot all the points in the file so we will use **Draw All Points**. Select **Points > Draw All Points** or type the two-letter command **DL**. The points will immediately be drawn in CAD using the configuration as set up under the **Point Configuration** routine.

Erase the Drawing:

To erase the current open drawing associated with your job, use the **Drawing Erase** routine by typing the two-letter command **DX**. You will be asked to confirm your intentions. Erase the current drawing before running **Field-to-Finish**.

Run Field-to-Finish:

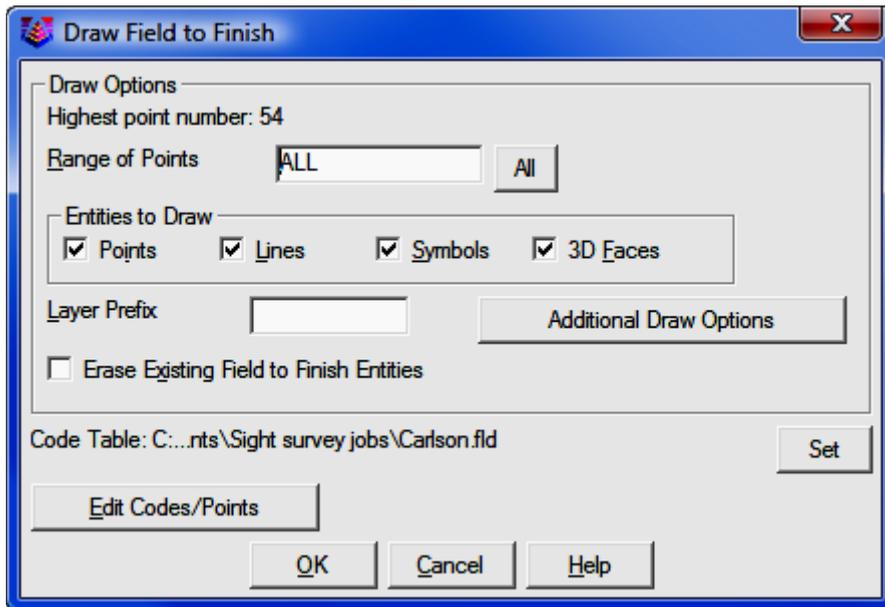
The Plat.txt file was field-coded for use in Field-to-Finish. The file includes line-work. Type **FF** to enter the routine (or select **Points > Draw Field to Finish**).



Select the **carlson.fld** file as the **Field Code Definition File** and click [**Open**].



Some point descriptions contain multiple codes. Select [OK].





WHY DID THE SYMBOLS CHANGE? *If you have coded symbol information in the field, the **Draw Field to Finish** (**FF** - [Section 6.33](#)) routine will use your field-coded symbols during field-to-finish processing. Field-to-finish processing overrides any symbol setting on the **Point Configuration** dialog. Once **Draw Field to Finish** has been run, these symbols are assigned to their respective points. You may change the association by using the **Point Manager**, but running **Draw Field to Finish** again will reset it to the field-coded symbol.*

13.05 Example 5: Contours, Surfaces, and Volumes

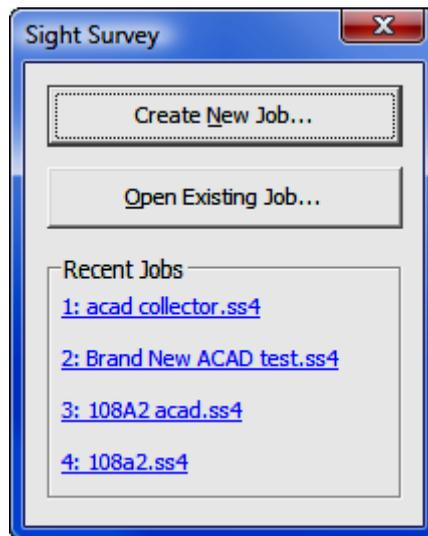
File used: Mantopo2.crd

In this example we will:

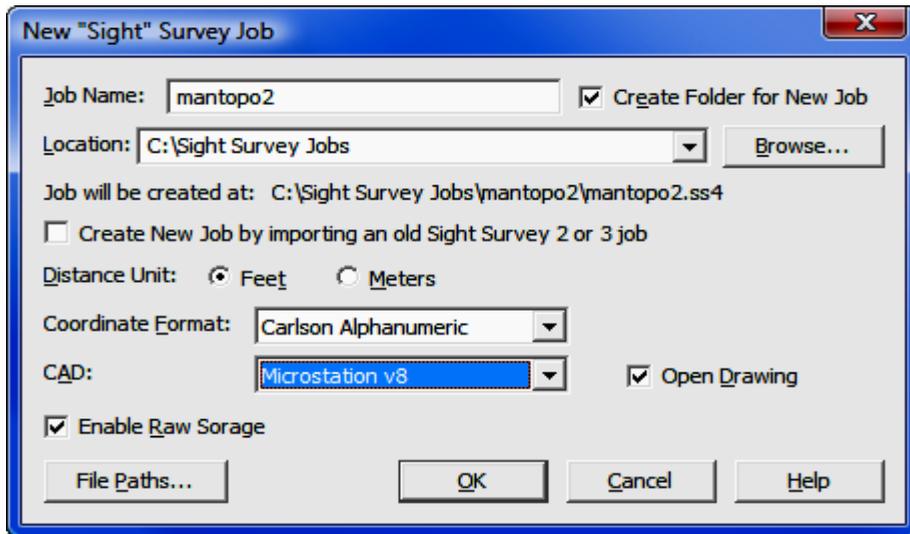
- [Open a New Job with MicroStation](#)
- [Import a Coordinate File](#)
- [Draw Contours and Build Surfaces](#)
- [Compute the Volume between the Surfaces](#)

Open a New Job with MicroStation:

Start "Sight" Survey 2009 by double-clicking the **SS2009 External** icon on your desktop.



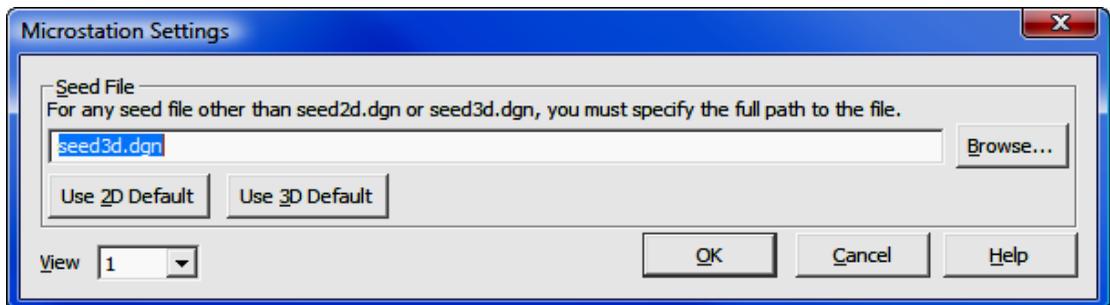
Left-click on the [**Create New Job**] button.



In the **New Job** window, set the **Job Name** to **mantopo2**. Set everything else as shown above, with two exceptions:

- The **Location** (the path to the job) – leave it as it appears when the dialog opens. Do not change this setting.
- **CAD** – We're using MicroStation, but select what you have as a CAD application.

Click [**OK**] to bring up the **MicroStation Settings** dialog window.

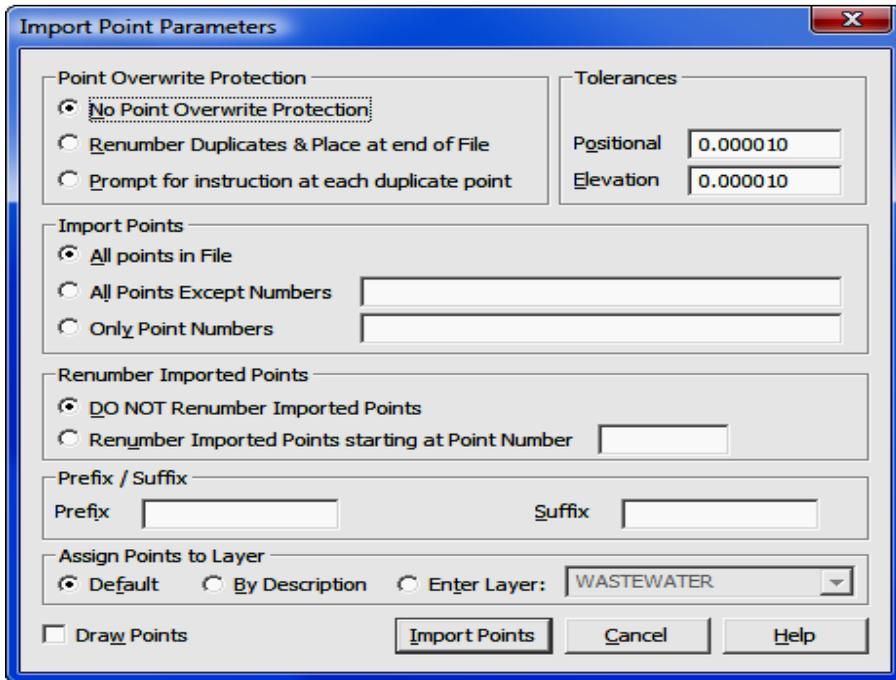


The **Seed File** should be set to **seed3d.dgn**. You must use a 3d seed file if you are going to generate contours. If this is not set to seed3d.dgn, click the [**Use 3D Default**] button. The **View** setting identifies the window in MicroStation that

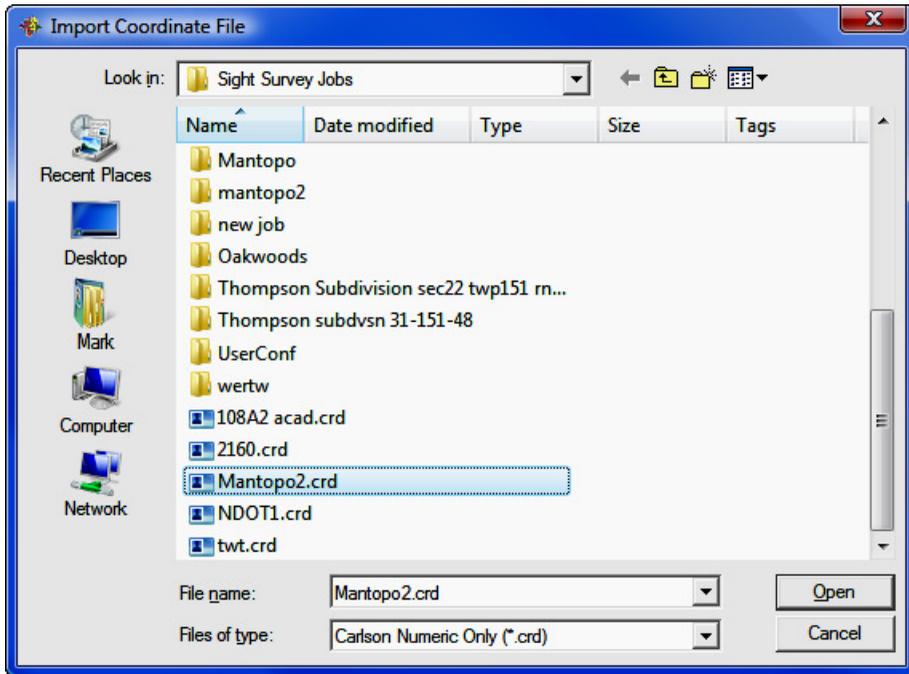
will be active when MicroStation is launched. You can specify 1-8, but view **1** (a 2D top view) is best to start with. Click [**OK**] and "Sight" Survey will open a MicroStation drawing (mantopo2.dgn).

Import a Coordinate File:

We are now ready to import points. Select **File > Import > Coordinate File**.

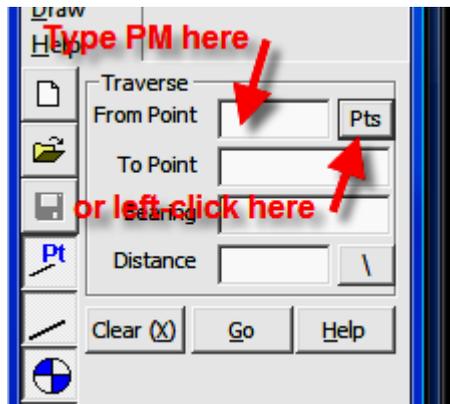


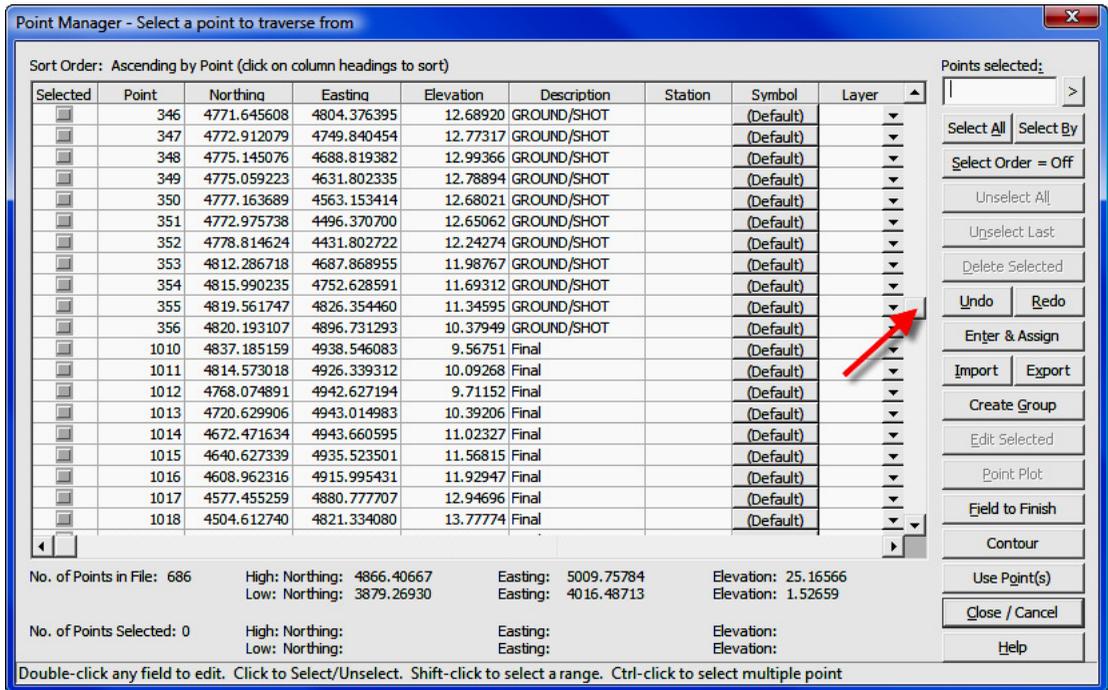
Leave the **Import Point Parameters** set as shown, and click the [**Import Points**] button.



Click the file **Mantopo2.crd** from the "Sight" Survey Jobs folder. Click [**Open**].

Your coordinates have now been loaded. By typing **PM** or left-clicking on the [**Pts**] button to the right of the **From Point** field, you can call up the **Point Manager** to view your coordinates.





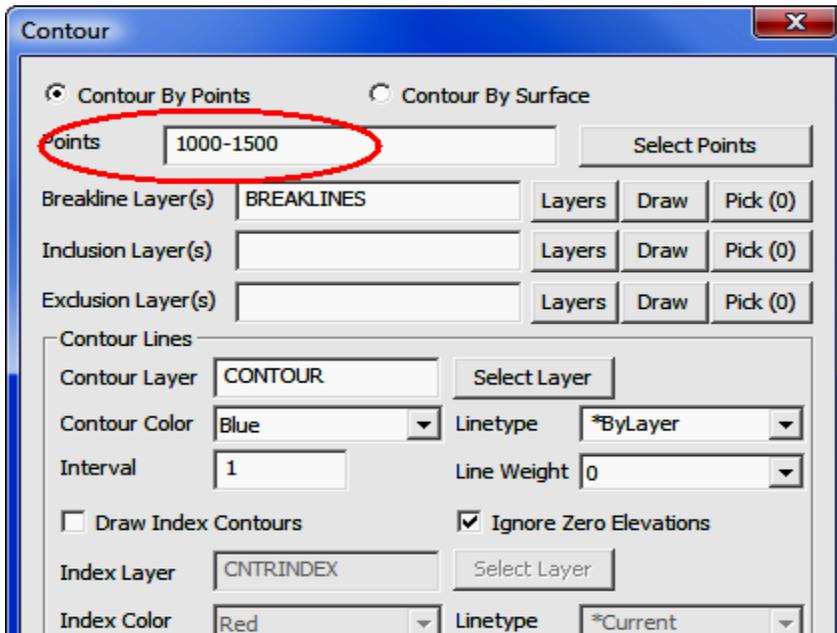
Notice that you have 686 points in the file. The file contains data sets for both the initial and final ground shots which have been grouped into two coordinate sets: original ground shots are points 10 through 356, and final ground shot are points 1010 through 1356. Use the scroll button to scroll through the file.

After viewing your coordinates, left-click [**Close/Cancel**] to close the **Point Manager** window.

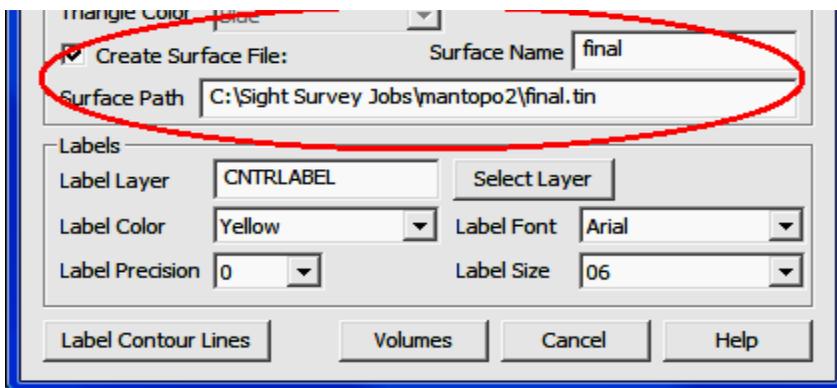
Draw Contours and Build Surfaces:

In "Sight" Survey it is not necessary to plot points or construct contours before building any surfaces, although you certainly may do so. Building surfaces is very similar to contouring. In fact, you may even use the contouring dialog box to build a surface and contour at the same time.

To illustrate both interfaces available for building surfaces, we will build one surface using each method. Select **Tools > Surface > Contour** or click the little toolbar icon that looks like a contour map.



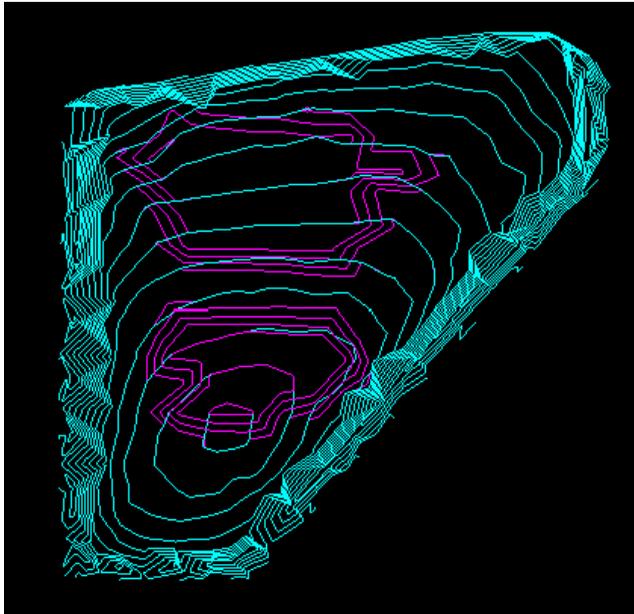
We'll use the Contour window to build our final surface and view the contour map. Enter **1000-1500** in the points field. Our actual range is 1010-1356 but knowing we don't have any other points in that range, we can easily approximate the points we want to use and "Sight" Survey will use only valid points from within that range.



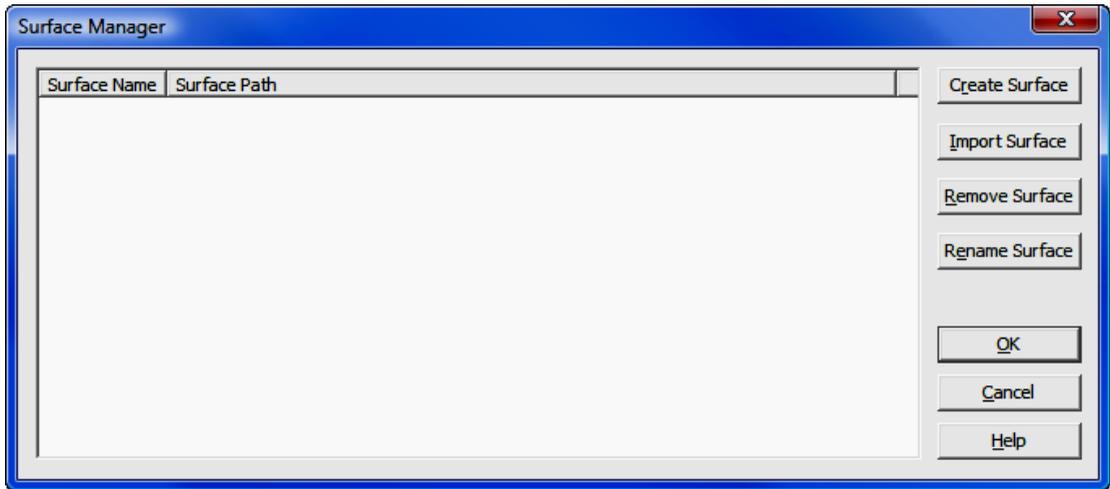
In the **Surface** dialog, check **Create Surface File** and give the file the name of **final.tin**. Click [**Contour**].

Now, just to illustrate the differences in the contours, set your point range to **1-500**, and change the **Contour Color** and click [**Contour**].

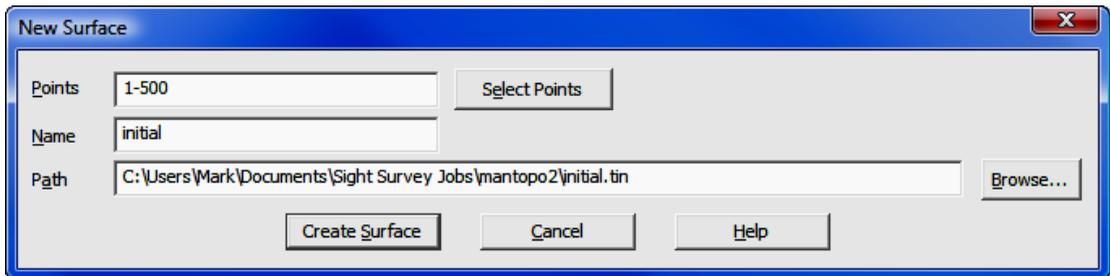
You should now see the existing ground contours plotted over the top of the final contours. Your contour map should look something like the image shown below.



The other method of creating a surface is to call the **Surface Manager**. Select **Tools > Surface > Surface Manager** or type the two-letter command **SM**. We'll use this method to create the initial surface so we can compute a volume.



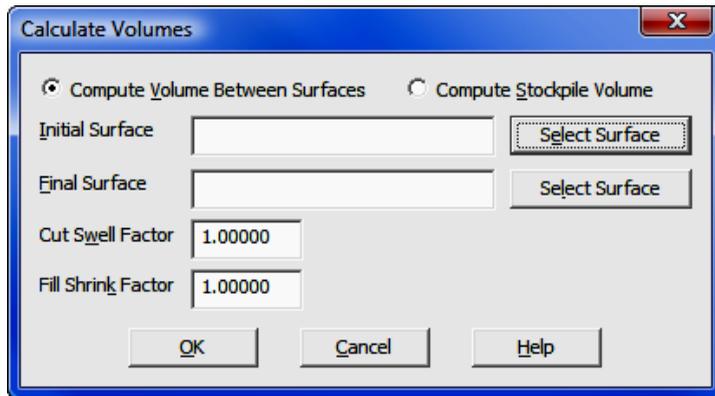
Click [**Create Surface**].



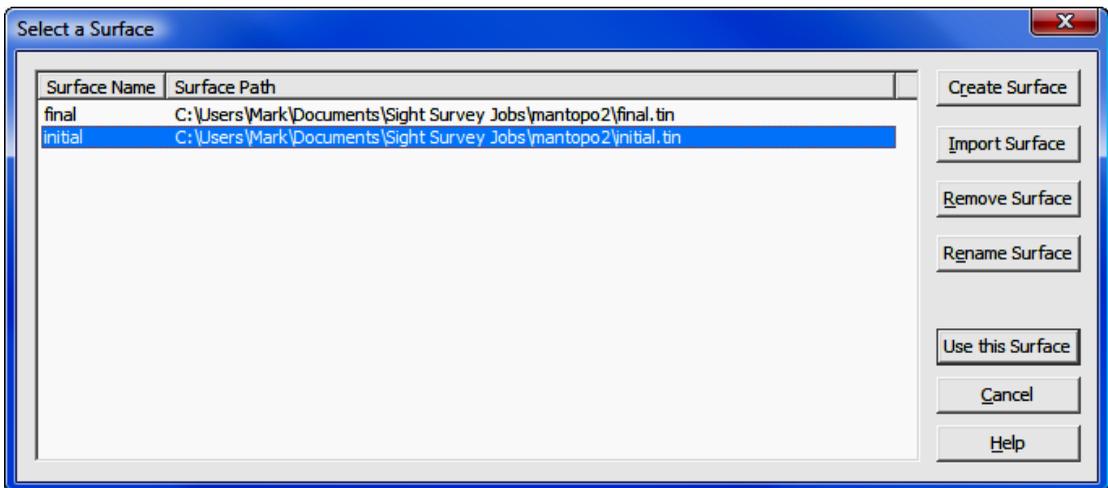
Enter **1-500** into the Points field (clicking [**Select Points**] would take you to the **Point Manager** for point selection.) In the Name field, type **initial**. Click [**Create Surface**]. The click [**OK**] to close the **Surface Manager** window.

Compute the Volume between the Surfaces:

Select **Tools > Surface > Calculate Volume** or type the two-letter command **CV**.



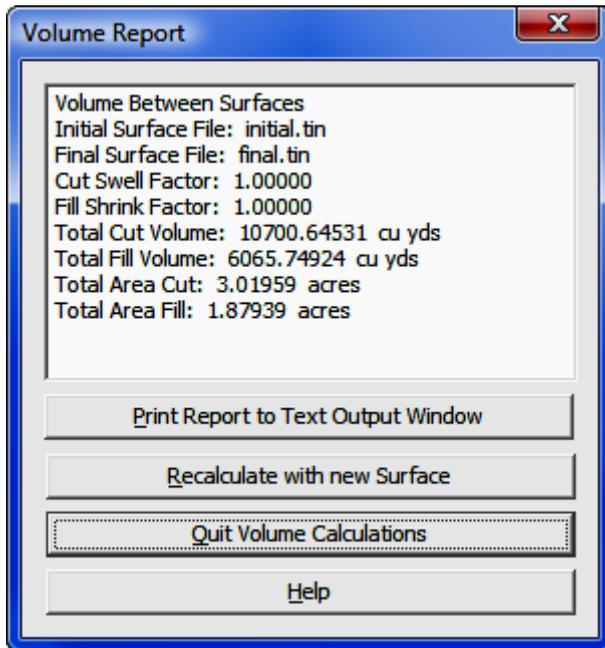
We will compute the volume between the two surfaces. To select the Initial Surface, click the [**Select Surface**] button to the right of the field.



Select the **Surface Name initial** and click [**Use this Surface**].

In a similar manner, select the **Final Surface** by clicking the [**Select Surface**] button to the right of the field. Select the **Surface Name final** and click [**Use this Surface**].

Leaving the **Shrink** and **Swell Factors** each set to **1**, click [**OK**] to generate the volume report.

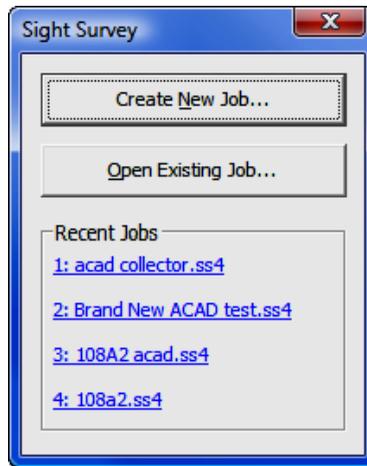


13.06 A Small Subdivision

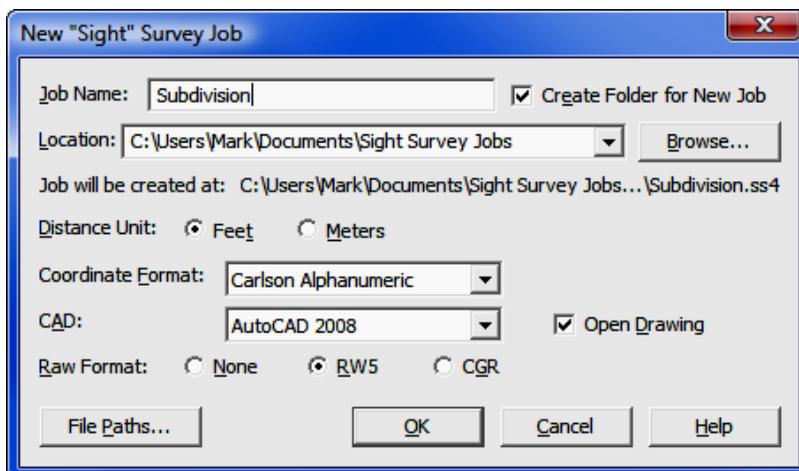
File used: none

In this example we will construct a small seven lot subdivision using a variety of COGO commands.

Start "Sight" Survey 2009 by double-clicking the **SS2009 External** icon on your desktop.



Left-click on the [**Create New Job**] button.



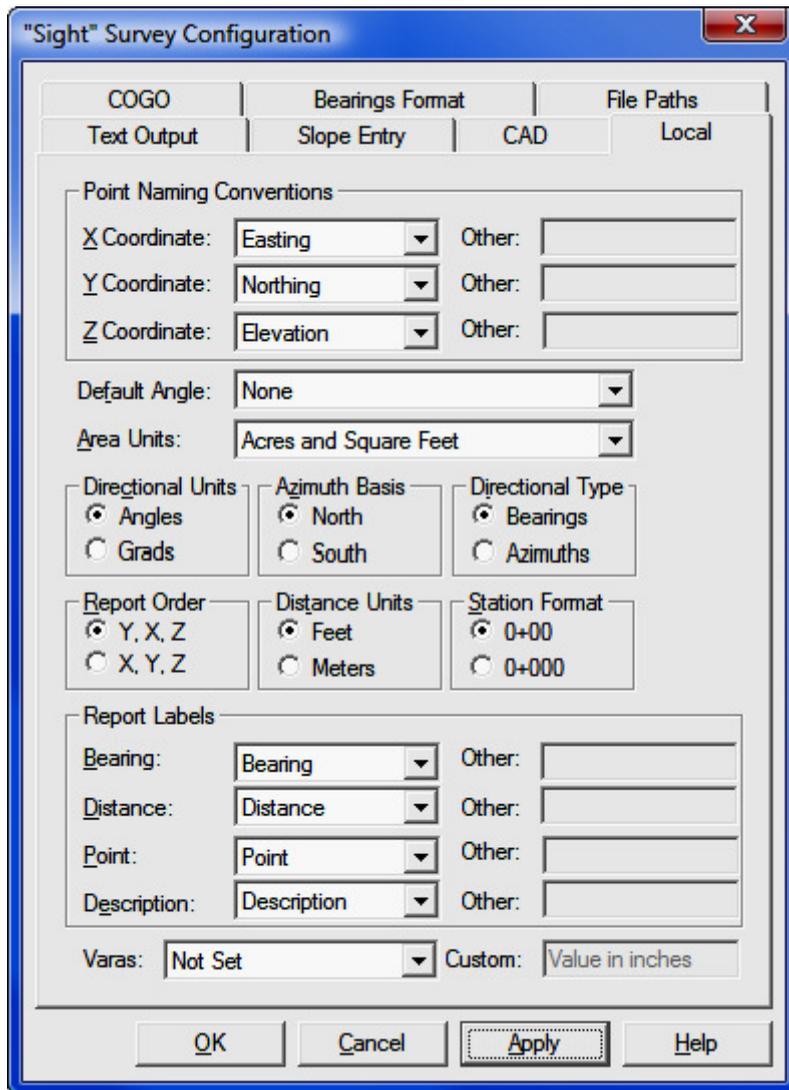
In the **New Job** window, set the **Job name** to **Subdivision**. Set everything else as shown on the dialog above, with two exceptions:

- The **Location** (the path to the job) – leave it as it appears when the dialog opens. Do not change this setting.
- **CAD** – select the CAD version you want to use.

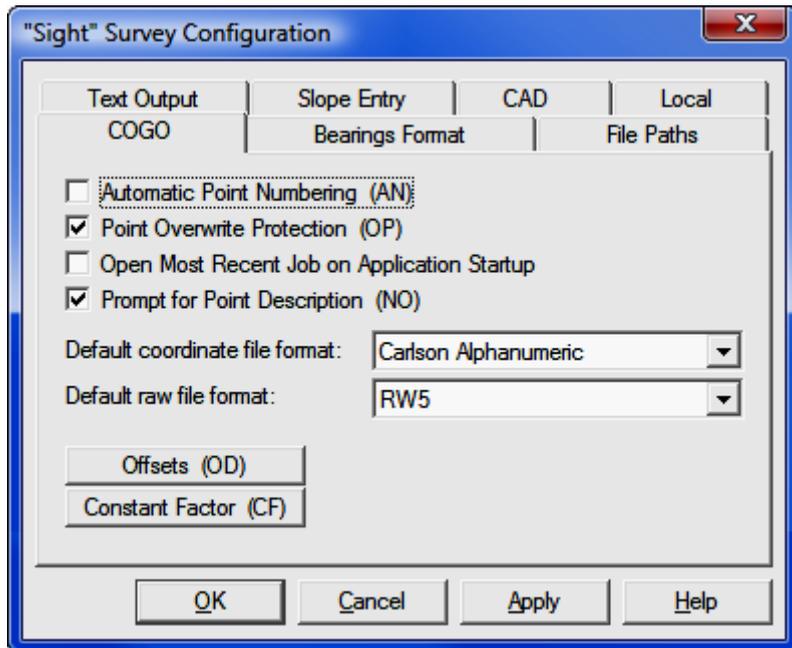
Click [**OK**]. "Sight" Survey will now initialize a data file and open the CAD window.

Configuration:

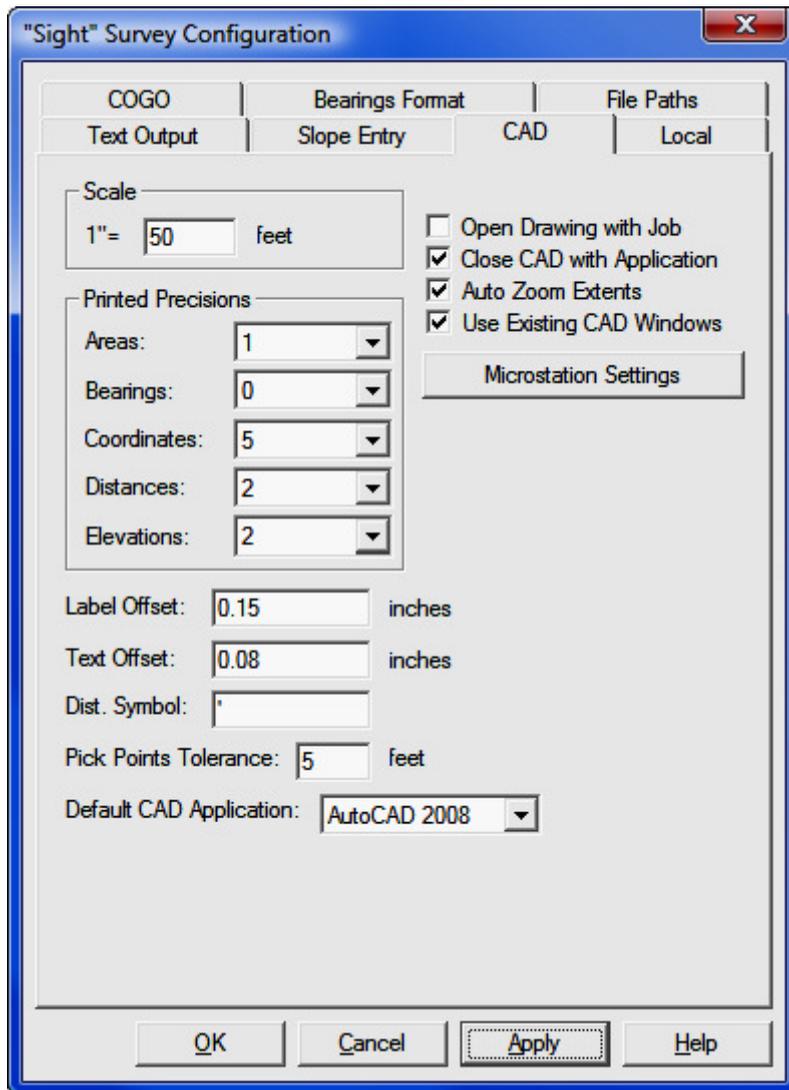
We will begin by setting some configuration parameters. Select **Config >Local Configuration**, or type the two-letter command **LA**. Match these **Local** settings and click [**Apply**].



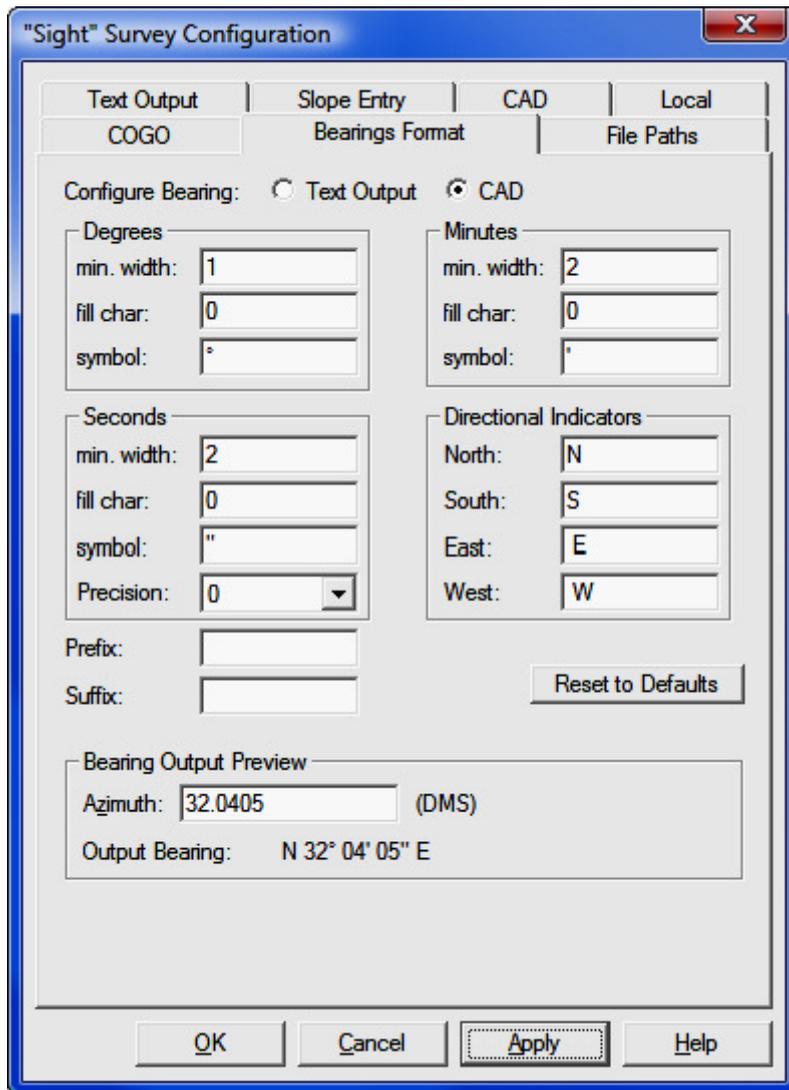
Click the **COGO** tab, match these settings and click [**Apply**].



Click the **CAD** tab, match these settings and click [**Apply**].

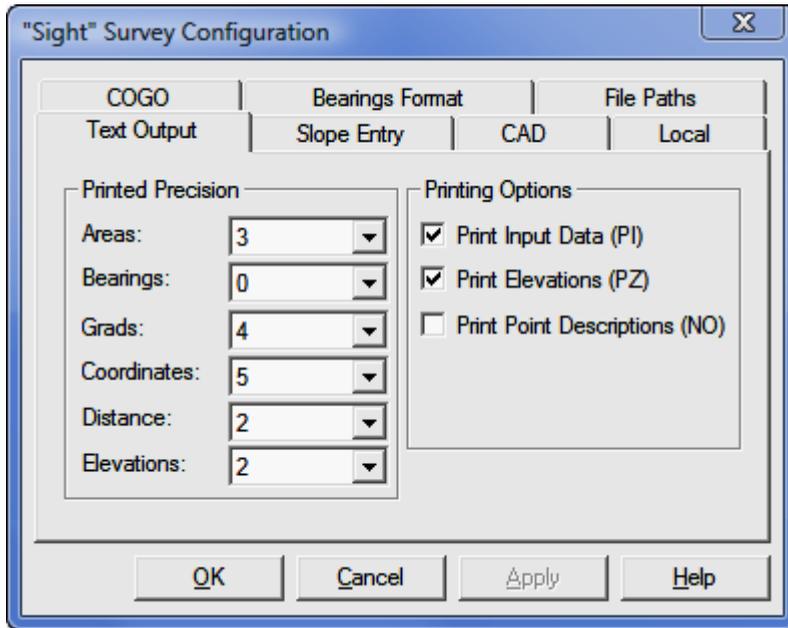


Click the **Bearings Format** tab, and match these settings and click [**Apply**].

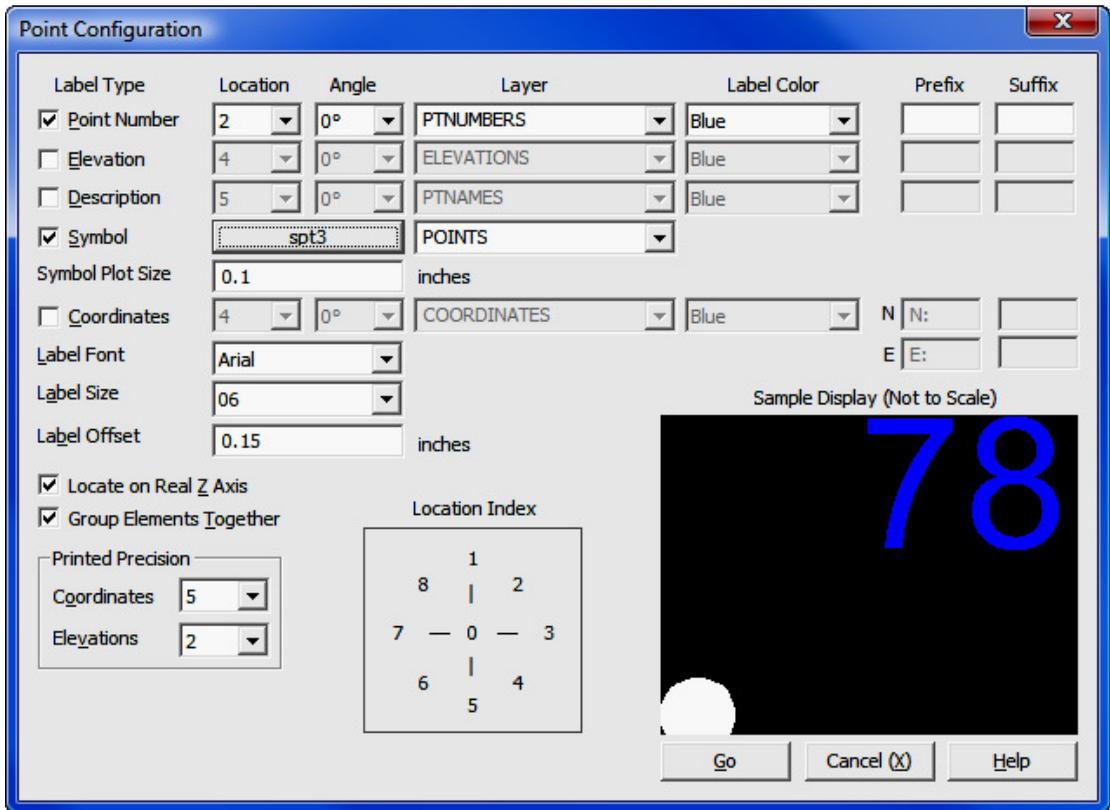


Finally, click the **Text Output** tab, match these settings and click [**OK**] to close the configuration menus.

Note: For this example, we will forego entering point descriptions. The unchecked **Print Point Descriptions** box will suppress the prompting for point descriptions.

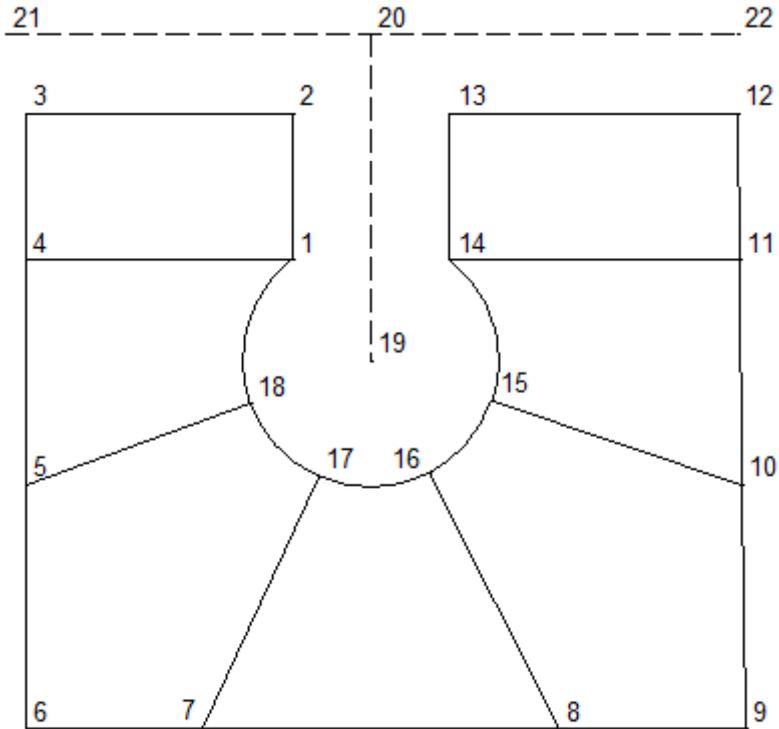


Now we will set up our **Point Configuration**, how we want our plotted points to appear. Type **PC** or select **Config > Point Configuration**. Match the settings shown below, including selecting symbol **spt3**, and click [**OK**].



Getting Started:

In this example, we know the coordinates of three of the block corners; points 3, 9 and 12. We will create these points using the **Enter and Assign** routine. A sketch showing the point locations is shown below. Just type **EA** to start the routine (or select **Points > Enter and Assign** from the menu.)



Enter and Assign

Point

Northing

Easting

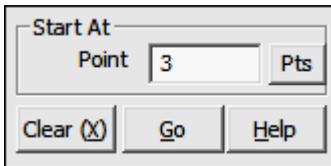
Elevation

For each point, type the point number **[Enter]**, the Northing **[Enter]**, and the Easting **[Enter]**. Since we are not using any elevations, just press **[Enter]** once more to accept the point. Repeat for points 9 and 12 using this data:

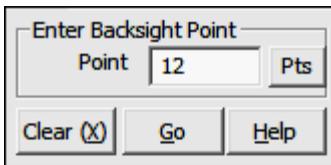
Pt.	Northing	Easting
9	9811.7544	20190.0472
12	10126.2344	20186.4565

Type **PR** to set the **Drawing Properties**. Set your **Object** color to **White**, **Text Place** to **Dist/**, **Text Size** to **8** and **Text Color** to **Red**. Click [**Close**].

To begin, we will set the points on either end of the centerline of a road r/w that travels East-West along the North side of the property as defined by the line from point 3 to point 12.



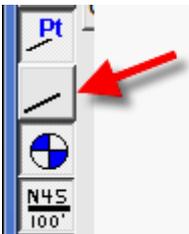
Type **ST** to select a starting point and type **3** [**Enter**]. A **Traverse** dialog box appears with the focus on the **To Point** field.



The Type **EP** to **Enter a Backsight Point**.

Enter the backsight point of **12** [**Enter**].

Once again, a **Traverse** dialog box appears with the focus on the **To Point** field.



This is a good point to introduce the drawing control buttons on "Sight" Survey's toolbar. These four buttons act as toggle switches to control what goes into the drawing. From top to bottom, they control: **Point Numbers**; **Line Drawing**; **Symbol Placement**; and **Line Annotation**. When these buttons appear depressed, they are "on" and the selected elements will be drawn in CAD as "Sight" Survey computes. When

the buttons are not depressed, such as the **Line Drawing** button highlighted, then that particular object is not placed into the drawing. In the next step, we will be placing a point, but we do not want to connect it to the previous point with a line. Click the **Line Drawing** button to turn off line drawing.

Traverse	
From Point	3 Pts
To Point	21
Bearing	90a
Distance	30 \
Clear (X) Go Help	

Enter the data as shown and press [Enter] after each entry.

To Point 21
Bearing 90a (or press function key [F9])
Distance 30

Point 21 will be computed and drawn. The **Traverse** dialog remains open with focus in the **To Point** field. We will now set point 22 using a **Bearing-**

Distance Intersection.

Type the command **BD**.

Bearing-Distance Intersection	
Type	Bng-Dist
From Pt	21 Pts
Bearing	*3,12
Inter. Pt	22
Close Dist	30
Close Pt	12 Pts
Clear (X) Go Help	

Enter the data as shown and press [Enter] after each entry.

Bearing 3,12 (recall bearing from pt 3 to 12)
Inter. Pt 22
Close Dist 30
Close Pt 12

Point 22 will be computed and drawn. The **Traverse** dialog opens with focus in the **To Point** field. We will now set point 21 using a **Side Shot** routine. Point 21 is the point of intersection of the centerline 21-22, with the roan leading into our subdivision. Type the

command **SS**.

Side Shots	
From Point	21 Pts
To Point	20 Pts
Bearing	*3,12
Distance	180 \
<input type="checkbox"/> Draw Line	
<input type="checkbox"/> Annotate Line	
Clear (X) Go Help	

We have made an arbitrary decision that we want incoming r/w to be 80 feet wide, and the lot in the NW corner to be 140 feet deep. Therefore we want to set point 20 a distance of 180' from point 21.

Click in the **From Point** field and set the point to **21**. Enter the rest of the data as shown and press [Enter] after each entry.

To Point 20
Bearing 21,22 (recall bearing from pt 21 to 22)
Distance 180

We do not want to draw or annotate the side shot so leave both boxes unchecked. Point 20 is set.

Point 3 is the NW corner of Lot 1. Point 2 is the NE corner. There are a few ways we could set point 2: **Traverse** from 3; **Side Shot** from 3; or **Offset Intersection** from pt 20. **Offset Intersection** is the least likely to be used for this, but since this subdivision affords few opportunities to demonstrate the routine we will do so now. Type the command **OI**.

Click in the **From Point** field and set the point to **20**. Enter the rest of the data as shown and press [**Enter**] after each entry.

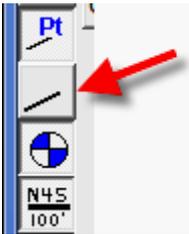
Inter Pt **2**
1st Bng **21,3** (recall bearing from pt 21 to 3)
1st Dist **40** (a positive distance offsets to the right of a line of bearing 21,3 extending from point 20. This is the centerline of the road going into the subdivision.)
2nd Bng **20,21** (recall bearing from pt 20 to 21)
2nd Dist **-30** (a negative distance offsets to the left of a line of bearing 20,21 extending from point

20. This is the centerline of the East-West road along the North side of the subdivision.) Pt 2 is computed and drawn in CAD.

In a similar manner we will set point 13, the NW corner of Lot 7. Type the command **OI**. Enter the data as shown and press [**Enter**] after each entry.

Inter Pt **13**
1st Bng **20,22** (recall bearing from pt 20 to 22)
1st Dist **30** (a positive distance offsets to the right of a line of bearing 20,22 extending from point 20. This is the centerline of the East-West road.)
2nd Bng **21,3** (recall bearing from pt 21 to pt 3)
2nd Dist **-30** (a negative distance offsets to the left of a line of bearing 21,3 extending from point 20. This is the centerline of the road going into the subdivision.)

Point 13 is computed and drawn in CAD.



Now we will draw and annotate the line from 3 to 2, then **Traverse** to pt. 1, the SE corner of Lot 1. First, let's turn line drawing back on by clicking the Line button on the drawing controls. The button should be in the depressed position.

Now, type the command **PR** to set the drawing properties. Set **Text Place** to **Bng / Dist**. Click [**Close**].

Inverse	
From Point	3 Pts
To Point	2 Pts
Clear (X)	Go Help

Type the command **IN** to start the **Inverse** routine which is used to measure and report the bearing and distance between two points. It will also draw a line between the points. Click in the **From Point** field and set the point to **3**. Type **2** into the **To Point** field and press [**Enter**].

Traverse	
From Point	2 Pts
To Point	1
Bearing	90al
Distance	75 \
Clear (X)	Go Help

Now type **TR** to enter the **Traverse** routine to set point 1 a distance of 75' south of point 2. Complete the fields as shown.

To Point **1**
Bearing **90al** (90° angle left)
Distance **75**

Point 1 is computed and drawn.

Side Shots	
From Point	1 Pts
To Point	14 Pts
Bearing	90AR
Distance	80 \
<input type="checkbox"/> Draw Line	
<input type="checkbox"/> Annotate Line	
Clear (X)	Go Help

Now type **SS** to use the **Side Shot** routine to set pt. 14, 80' east of pt. 1. Complete the fields as shown.

To Point **14**
Bearing **90ar** (90° angle right)
Distance **80**

Leave **Draw Line** and **Annotate Line** unchecked.

Point 14 is computed and drawn.

Bearing-Bearing Intersection

Type: Bng-Bng

From Pt: 1 Pts

Bearing: 90nw

Inter. Pt: 4

Close Bng: 0ne

Close Pt: 3 Pts

Clear (X) Go Help

Now type **BB** use the **Bearing-Bearing Intersection** routine to set pt. 4, the SW corner of Lot 1. Complete the fields as shown.

Bearing 90nw
Inter Pt. 4
Close Bng 0ne
Close Pt. 3

Point 4 is computed and placed and the lot lines are drawn and annotated.

Inverse

From Point: 14 Pts

To Point: -12 Pts

Clear (X) Go Help

Now we'll complete lot 7, first by **Inversing** from 14 to 13 to 12, then setting pt 11 by **Bearing-Bearing Intersection**. Type **IN** to start the Inverse routine. Enter **14** in the **From Point** field and enter **-12** in the **To Point** field. This will inverse from 14 to 13 to 12.

Bearing-Bearing Intersection

Type: Bng-Bng

From Pt: 12 Pts

Bearing: *12,9

Inter. Pt: 11

Close Bng: 90nw

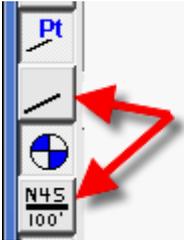
Close Pt: 14 Pts

Clear (X) Go Help

Now type **BB** to use the **Bearing-Bearing Intersection** and complete the fields as shown.

Bearing 12,9 (recall bearing from pt 12 to 9)
Inter Pt 11
Close Bng 90nw
Close Pt 14

Point 11 is computed and placed and the lot lines are drawn and annotated



Now we will set pt 19 (which is the center of a cul-de-sac) using a **Distance-Distance Intersection** from pt. 14 to pt. 1. The cul-de-sac radius is 65'. Since we do not want to draw or annotate the lines to/from pt. 19, click on both the **Line Drawing** and **Text Annotation** buttons on the toolbar. After running the routine, click them again to reactivate them.

Dist-Dist Intersection

Type: Dist-Dist

From Pt: 14 Pts

Distance: 65

Inter. Pt: 19

Close Dist: 65

Close Pt: 1 Pts

Clear (X) Go Help

Type **DD** to activate the **Distance-Distance Intersection** routine and complete the fields as shown.

Distance **65**
Inter Pt **19**
Close Dist **65**
Close Pt **1**

Two solutions for point 19 is computed and displayed.

Choose Intersection Point

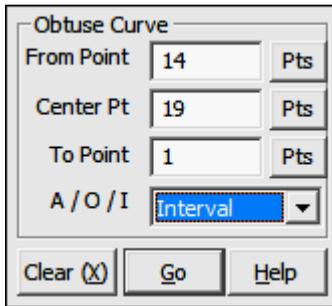
Select intersection point A or B

	Point A	Point B
North:	10102.46950	10000.00000
East:	20000.00000	20000.00000
Bearing:	N 37° 58' 48" W	S 37° 58' 48" W
Distance:	65.00	65.00

A (0) B (1) Cancel (Esc or 2)

In this case we will select solution B, which shows pt. 19 as being located S37°58'48"W of pt 14. Press [**1**] or [**B**] to select this solution and the point will be computed and plotted.

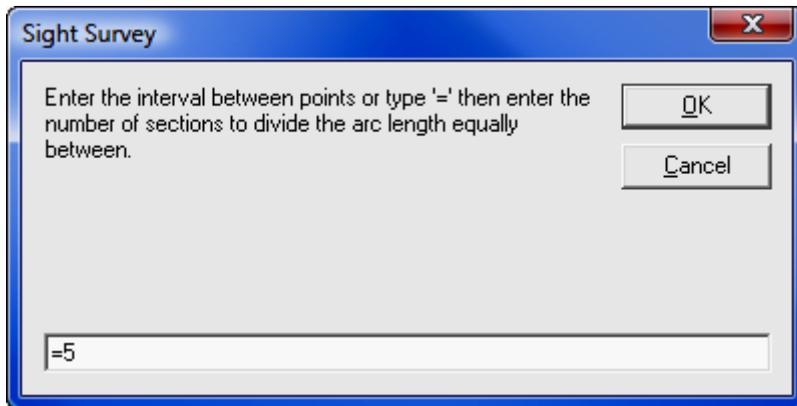
We will now use the **Inverse Obtuse Curve** routine to set 5 points on the obtuse arc defining the cul-de-sac. Type **OC** to access the routine and complete the prompts as shown.



Obtuse Curve		
From Point	14	Pts
Center Pt	19	Pts
To Point	1	Pts
A / O / I	Interval	
Clear (X)	Go	Help

From Point 14
Center Pt 19
To Point 1
A/O/I Interval

After entering this data "Sight" Survey asks for the number of intervals or the arc length of each interval. In this case we need 5 arcs so we enter **=5**.



Sight Survey

Enter the interval between points or type '=' then enter the number of sections to divide the arc length equally between.

OK

Cancel

=5

The points 15, 16, 17, and 18 are computed and plotted.

Now we will complete the lots using a series of **Bearing-Bearing Intersections**.

Bearing-Bearing Intersection

Type: Bng-Bng

From Pt: 15 Pts

Bearing: *19,15

Inter. Pt: 10

Close Bng: *9,12

Close Pt: 11 Pts

Clear (X) Go Help

To set point 10, type **BB** to access the routine and complete the prompts as shown.

From Pt 15
Bearing 19,15 (recall bearing from pt 19 to 15)
Inter Pt. 10
Close Bng 9,12 (recall bearing from pt 9 to 12)
Close Pt. 11

Point 10 will be computed and lines from 15 to 10 to 11 will be drawn and annotated.

Bearing-Bearing Intersection

Type: Bng-Bng

From Pt: 16 Pts

Bearing: *19,16

Inter. Pt: 8

Close Bng: 90ne

Close Pt: 9 Pts

Clear (X) Go Help

To set point 8, type **BB** to access the routine and complete the prompts as shown.

From Pt 16
Bearing 19,16 (recall bearing from pt 19 to 16)
Inter Pt. 8
Close Bng 90ne
Close Pt. 9

Point 8 will be computed and lines from 16 to 8 to 9 will be drawn and annotated.

Bearing-Bearing Intersection

Type: Bng-Bng

From Pt: 17 Pts

Bearing: *19,17

Inter. Pt: 7

Close Bng: 90ne

Close Pt: 8 Pts

Clear (X) Go Help

To set point 7, type **BB** to access the routine and complete the prompts as shown.

From Pt 17
Bearing 19,17 (recall bearing from pt 19 to 17)
Inter Pt. 10
Close Bng 90ne
Close Pt. 8

Point 7 will be computed and lines from 17 to 7 to 8 will be drawn and annotated.

Bearing-Bearing Intersection

Type: Bng-Bng

From Pt: 18 Pts

Bearing: *19,18

Inter. Pt: 5

Close Bng: One

Close Pt: 4 Pts

Clear (X) Go Help

To set point 5, type **BB** to access the routine and complete the prompts as shown.

From Pt 18
Bearing 19,18 (recall bearing from pt 19 to 18)
Inter Pt. 5
Close Bng One
Close Pt. 4

Point 7 will be computed and lines from 15 to 10 to 11 will be drawn and annotated.

Bearing-Bearing Intersection

Type: Bng-Bng

From Pt: 5 Pts

Bearing: *4,5

Inter. Pt: 6

Close Bng: *7,9

Close Pt: 7 Pts

Clear (X) Go Help

To set point 6, type **BB** to access the routine and complete the prompts as shown.

From Pt 5
Bearing 4,5 (recall bearing from pt 4 to 5)
Inter Pt. 6
Close Bng 7,9 (recall bearing from pt 7 to 9)
Close Pt. 7

Point 6 will be computed and lines from 5 to 6 to 7 will be drawn and annotated.

All the points have now been set and all that remains is to inverse the line from 9 to 10, and inverse the cul-de-sac frontages.

Type **IN** to access the **Inverse** routine and complete the prompts as shown.

Inverse

From Point: 9 Pts

To Point: 10 Pts

Clear (X) Go Help

From Point 9
To Point 10

The line from 9 to 10 will be drawn and annotated.

Inverse Curve		
From Point	14	Pts
Center Pt	19	Pts
To Point	-18	Pts
A / O / I	Acute	
Clear (X)	Go	Help

Type **IC** to access the **Inverse Curve** routine and complete the prompts as shown.

From Point 14
Center Pt 19
To Point -18

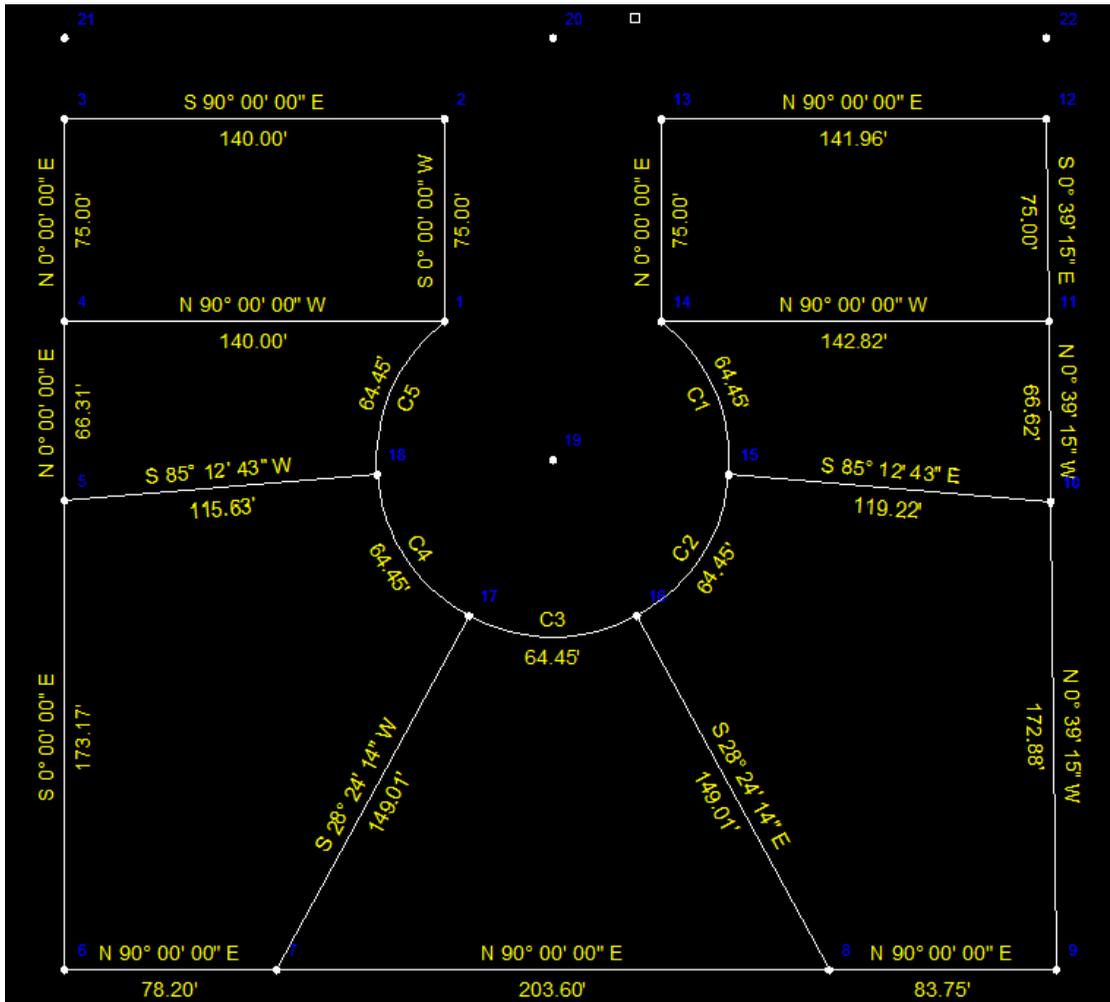
The arc from 14 to 15 to 16 to 17 to 18 will be drawn and annotated.

Inverse Curve		
From Point	18	Pts
Center Pt	19	Pts
To Point	1	Pts
A / O / I	Acute	
Clear (X)	Go	Help

Type **IC** to access the **Inverse Curve** routine and complete the prompts as shown.

From Point 18
Center Pt 19
To Point 1

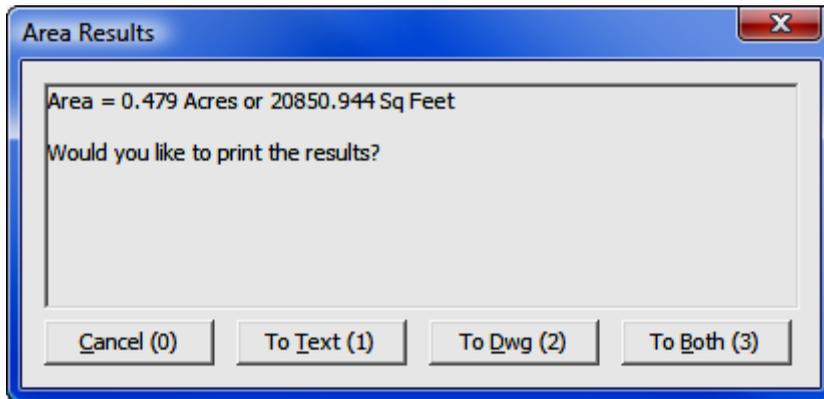
The arc from 18 to 1 is drawn and our subdivision is complete.



Before we quit, let's calculate the area of Lot 3, in the southwest corner of the subdivision. Type **PA** to start the **Point to Point Area** routine.

In the **Points** field type: **18,5-7,17*19,18**

This will measure the area of a tract bounded by point 18, to points 5, 6, and 7, to 17, and then along an arc having a radius point at 19 to point 18.



You may send the results to the text window, the drawing, or to both locations. If you send the results to the drawing you are asked to pick a location for the text. The printed text will be centered on the location you select.

13.07 Traverse Closure and Adjustment

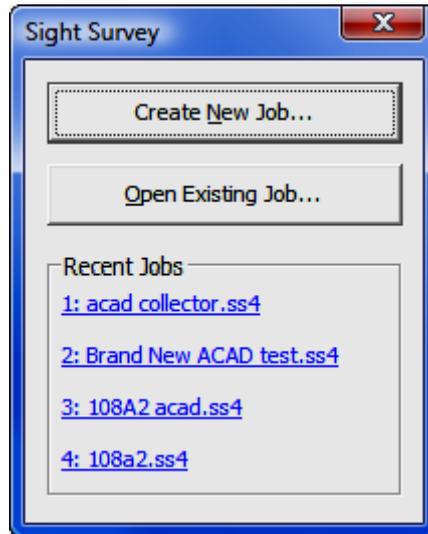
Files used: None

In this example we will:

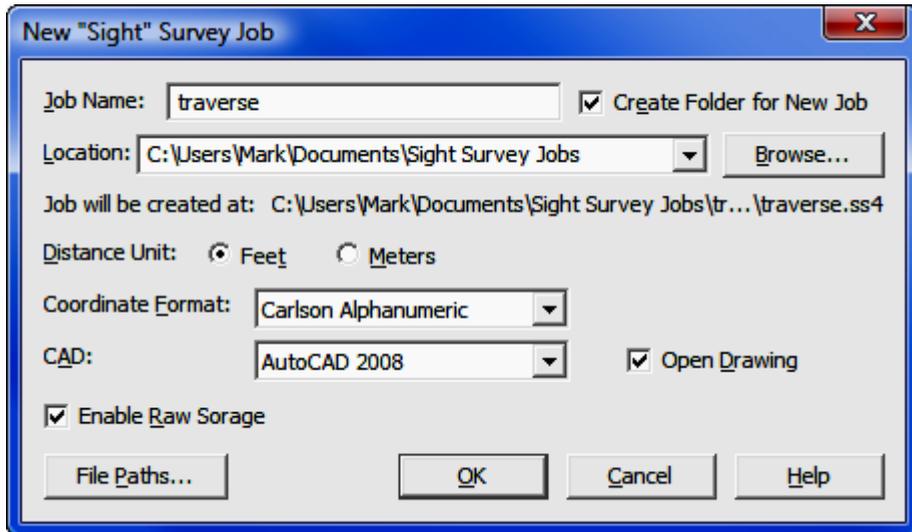
- [Start a New Job with AutoCAD](#)
- [Enter a Small Traverse](#)
- [Generate an Initial Closure](#)
- [Correct an Entry using Edit/Process Raw File](#)
- [Balance the Traverse by Crandall Rule](#)

Start a New Job with AutoCAD:

Start "Sight" Survey 2009 by double-clicking the **SS2009 External** icon on your desktop.



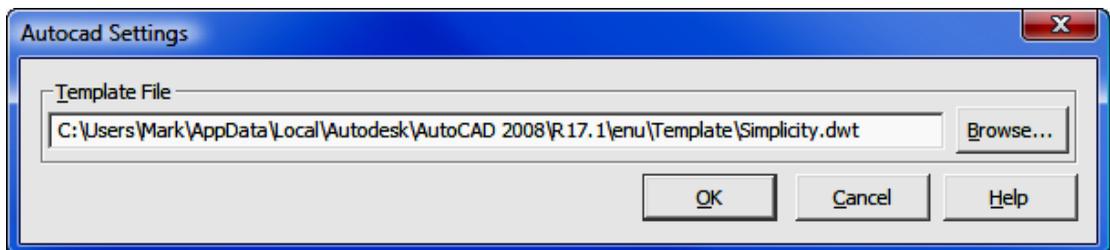
Left-click on the [**Create New Job**] button.



In the **New Job** window, set the **Job Name** to **traverse**. Set everything else as shown above, with two exceptions:

- The **Location** (the path to the job) – leave it as it appears when the dialog opens. Do not change this setting.
- **CAD** – We're using AutoCAD, but select what you have as a CAD application.

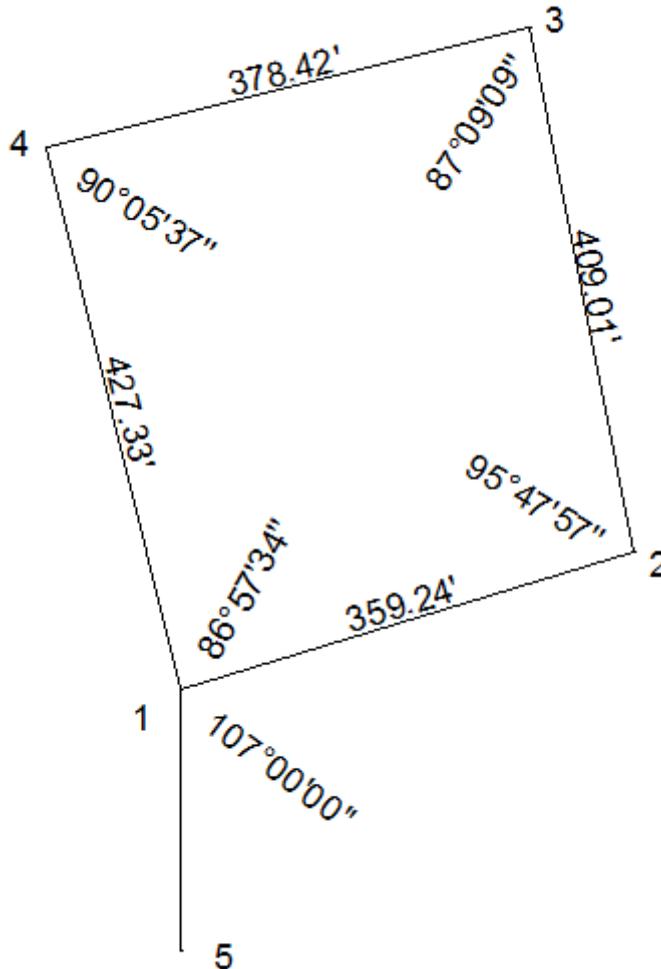
Click [**OK**] to bring up the **AutoCAD Settings** dialog window.



AutoCAD can use a template file to place preconfigured linetypes and layers into a blank drawing. You can build your own template file using the instructions in [Section 3.01](#). For this example we are not concerned with using a template, so no entry is needed here, simply click [**OK**]. "Sight" Survey will initialize a new blank data file and open a drawing (traverse.dwg).

Enter a Small Traverse:

Our traverse will consist of a four-sided figure with an external initial backsight as shown below in the sketch of our field data.



We know the coordinates for two points: point 5 is our initial backsight; and point 1 is our initial occupied point. type **EA** to use the **Enter and Assign** routine to enter points 1 and 5. For each point, type the point number [**Enter**], the Northing [**Enter**], and the Easting [**Enter**]. Since we are not using any elevations,

just press [**Enter**] once more to accept the point. Enter points 1 and 5 using this data:

Pt.	Northing	Easting
1	10000.0000	10000.0000
5	9800.0002	9999.7574

Type **ST** or select Points > Start At to start at point **1**.

Type **EP** and enter point **5** as the **Backsight Point**.

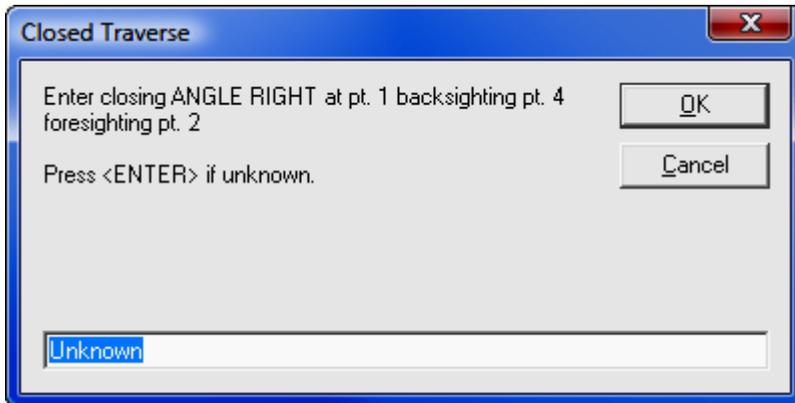
Type **TR** to start traversing from point **1** to point **2**. Our initial angle at point 1 and backsighting point 5 is **107AL**, and our distance is **359.24**.

Continue traversing from point **2** to point **3** using an angle of **95.4757AR** and a distance of **409.01**.

Continue traversing from point **3** to point **4** using an angle of **87.0909AR** and a distance of **378.42**.

Generate an Initial Closure:

Type **TC** to use the traverse close routine to traverse from point **4** to close at point **1** using an angle of **90.0537AR** and a distance of **472.33**. (**Note:** The distance measured in the field was actually **427.33** but we are transposing the **2** and **7** to illustrate corrections using **Edit Process Raw File**.)



Type this angle of **86.5734** and press [**Enter**]. If you do not know the angle, just click [**OK**].

Open the **Text Output Window** to see the results:

Precision Ratio = 1:37

Length Traversed = 1664.33

Length to Close = 45.33

Error in Latitude = -44.01

Error in Departure = 10.84

Area = 3.533 Acres or 153892.116 Sq Feet

Total Angular Error = 0° 00' 17"

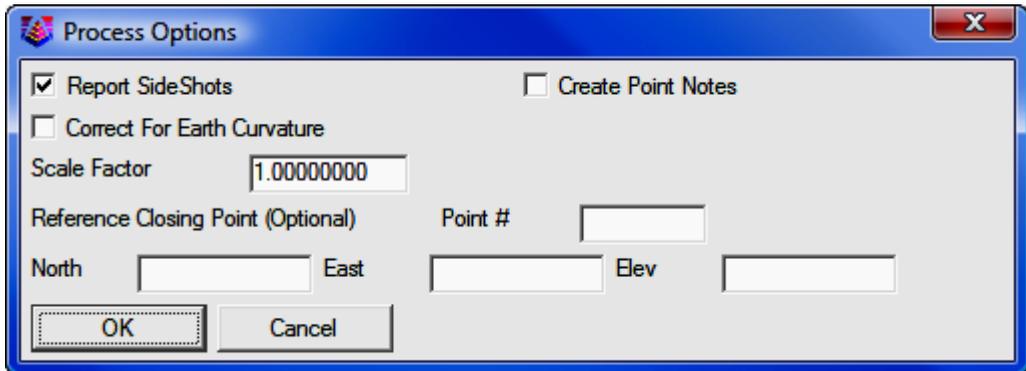
Error per Station = 0° 00' 04.3"

Correct an Entry using Edit/Process Raw File :

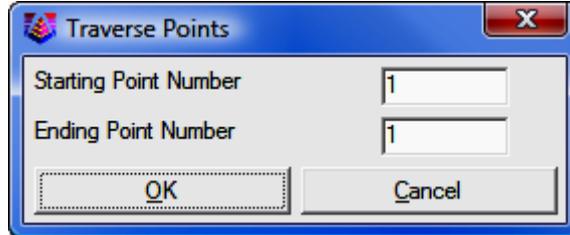
Type **ER** or select **Tools > Edit Process Raw File > Carlson Raw Editor**. The editor appears containing our traverse data.

		OcPt	FsPt	Code	HorzAngle	SlopeDist	ElevDiff
1		PntNo	Northing		Easting	Elevation	Description
2	PT	1	10000.0000		10000.0000	0.0000	
3	PT	5	9800.0002		9999.7574	0.0000	
4		OcPt	BsPt		Azi	SetAzi	
5	BK	1	5			0.0000	
6		OcPt	FsPt	Code	HorzAngle	SlopeDist	ElevDiff
7	TR	1	2	AL	107.0000	359.240	0.0000
8		OcPt	BsPt		Azi	SetAzi	
9	BK	2	1			0.0000	
10		OcPt	FsPt	Code	HorzAngle	SlopeDist	ElevDiff
11	TR	2	3	AR	95.4757	409.010	0.0000
12		OcPt	BsPt		Azi	SetAzi	
13	BK	3	2			0.0000	
14		OcPt	FsPt	Code	HorzAngle	SlopeDist	ElevDiff
15	TR	3	4	AR	87.0909	378.420	0.0000
16		OcPt	BsPt		Azi	SetAzi	
17	BK	4	3			0.0000	
18		OcPt	FsPt	Code	HorzAngle	SlopeDist	ElevDiff
19	TR	4	1	AR	90.0537	472.330	0.0000

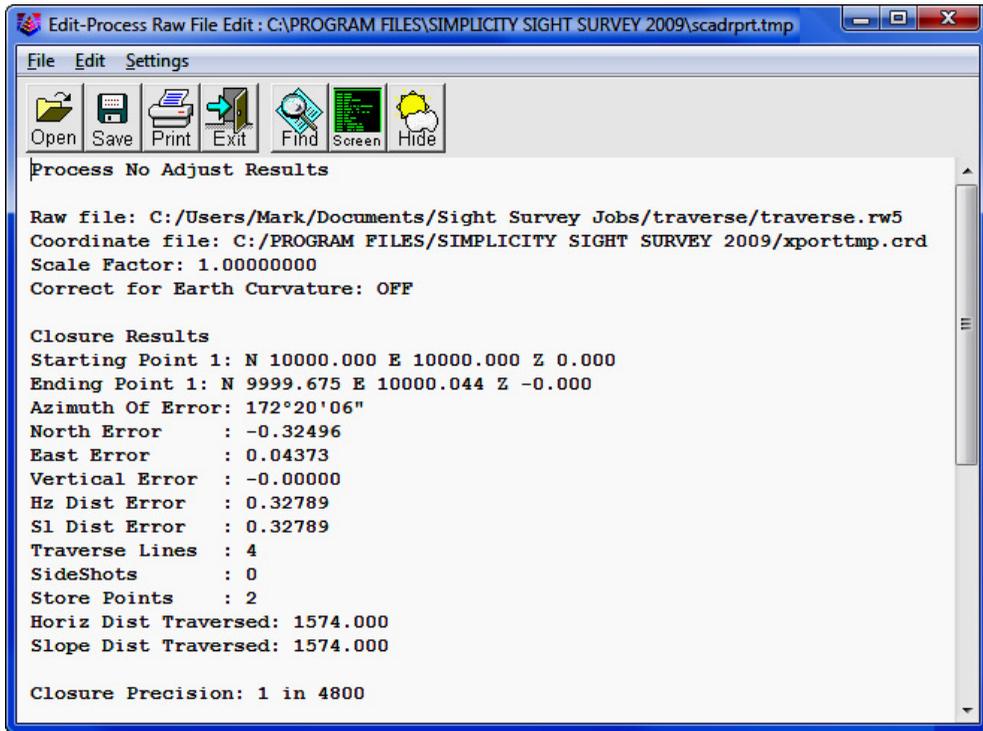
The first thing we need to do is correct the bad distance on line 19. Double-click in the field and type in the correct data of **427.33**. Now select **Process > No Adjust** to see the new results.



For a "No Adjust" process we will not use any **Process Options**. Click [**OK**].

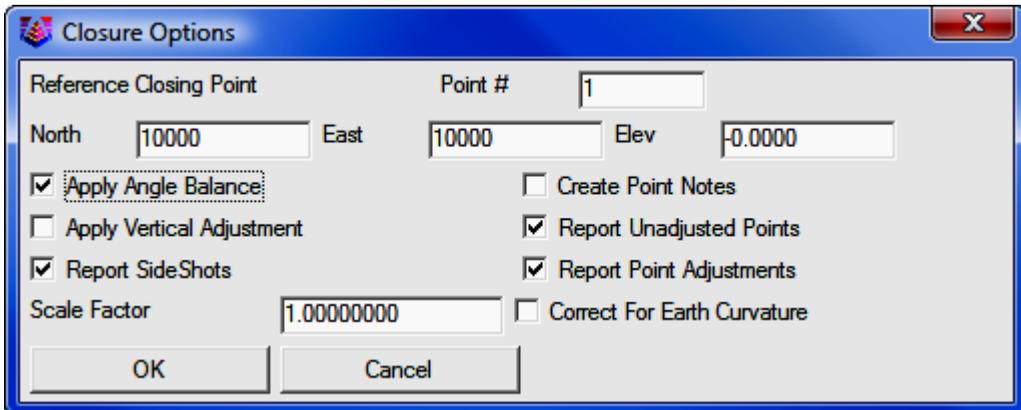


Enter or verify the **Starting Point Number (1)** and **Ending Point Number (also 1)**, then click [**OK**] to see the results which now reflect the corrected distance.

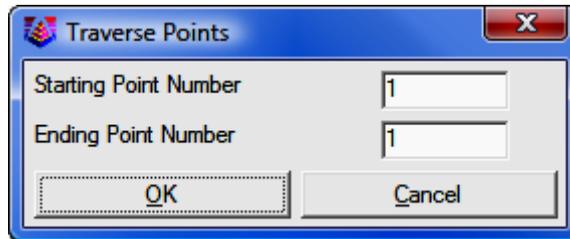


Balance the Traverse by Crandall Rule:

Select **Process > Crandall Rule**.



Enter the reference closing point or the coordinates and select any other desired closing options, then click [OK].



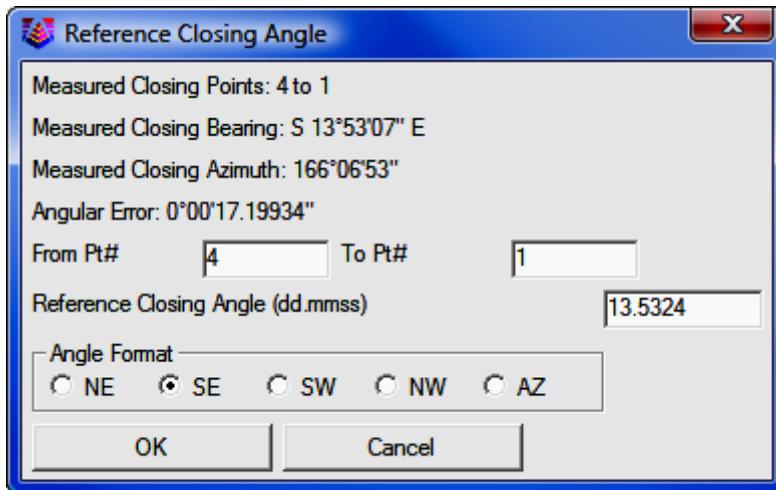
Traverse Points

Starting Point Number: 1

Ending Point Number: 1

OK Cancel

Enter or verify the **Starting Point Number (1)** and **Ending Point Number (also 1)**, then click [OK].



Reference Closing Angle

Measured Closing Points: 4 to 1

Measured Closing Bearing: S 13°53'07" E

Measured Closing Azimuth: 166°06'53"

Angular Error: 0°00'17.19934"

From Pt# 4 To Pt# 1

Reference Closing Angle (dd.mmss) 13.5324

Angle Format

NE SE SW NW AZ

OK Cancel

Enter the **From Pt# (4)** and **To Pt# (1)**. The **Reference Closing Angle** and **Angle Format** (Quad Code) are shown. Click [OK] to balance the traverse and give you the final report.

Edit-Process Raw File Edit : C:\PROGRAM FILES\SIMPLICITY SIGHT SURVEY 2009\scadrprt.tmp

File Edit Settings

Open Save Print Exit Find Screen Hide

Angle Balance
 Angular Error: 0°00'17.20" for 4 traverse sides
 Adjusting Each Angle: 0°00'04.30"

Closure Results (After Angle Balance)
 Starting Coordinates : N 10000.000 E 10000.000 Z 0.000
 Closing Reference Point : N 10000.000 E 10000.000 Z 0.000
 Ending Coordinates : N 9999.664 E 10000.065 Z 0.000
 Azimuth Of Error: 169°00'50"
 North Error : -0.33550
 East Error : 0.06513
 Vertical Error : 0.00000
 Hz Dist Error : 0.34177
 Sl Dist Error : 0.34177
 Traverse Lines : 4
 SideShots : 0
 Total Hz Dist Traversed: 1574.00000
 Total Sl Dist Traversed: 1574.00000

Closure Precision: 1 in 4605

Point No.	Horizontal Angle	Elev Diff	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
2	AL107.0004	0.0000	359.240	0.000	0.000	10104.622	10343.668	0.000
3	AR95.4753	0.0000	409.010	0.000	0.000	10505.934	10264.688	0.000
4	AR87.0905	0.0000	378.420	0.000	0.000	10414.499	9897.481	0.000
1	AR90.0533	0.0000	427.330	0.000	0.000	9999.664	10000.065	0.000

Description

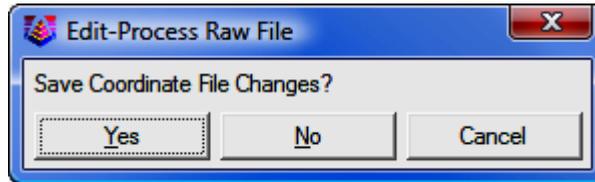
Sideshots

Crandall Closure
 Adjusted Point Comparison

Point#	Original Northing	Original Easting	Adjusted Northing	Adjusted Easting	Dist	Bearing
2	10104.622	10343.668	10104.624	10343.676	0.008	N 73°00'51" E
3	10505.934	10264.688	10506.100	10264.664	0.168	N 08°15'15" W
4	10414.499	9897.481	10414.665	9897.458	0.168	N 07°58'13" W
1	9999.664	10000.065	10000.000	10000.000	0.342	N 10°59'10" W

[**Print**] and/or [**Save**] the report if desired, then click the [**Exit**] button to close the report.

Back in the **Edit Process Raw File** window select **File > Exit**.



If you want to bring the adjusted coordinates back into "Sight" Survey, click [**Yes**]. Otherwise, click [**No**] to return to "Sight" Survey without adjusting the coordinates or click [**Cancel**] to close this dialog and continue working in the raw editor.

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