GOLDENSOFTWARE

MapViewer™ 8

Mapping & spatial analysis for publication-quality thematic maps.

Full User's Guide

MapViewer™ Registration Information

Your **MapViewer** serial number is located on the CD cover or in the email download instructions, depending on how you purchased MapViewer.

Register your **MapViewer** serial number online at www.goldensoftware.com. This information will not be redistributed.

Registration entitles you to free technical support, free minor updates, and upgrade pricing on future **MapViewer** releases. The serial number is required when you run **MapViewer** the first time, contact technical support, or purchase **MapViewer** upgrades.

For future reference, write your serial number on the line below.

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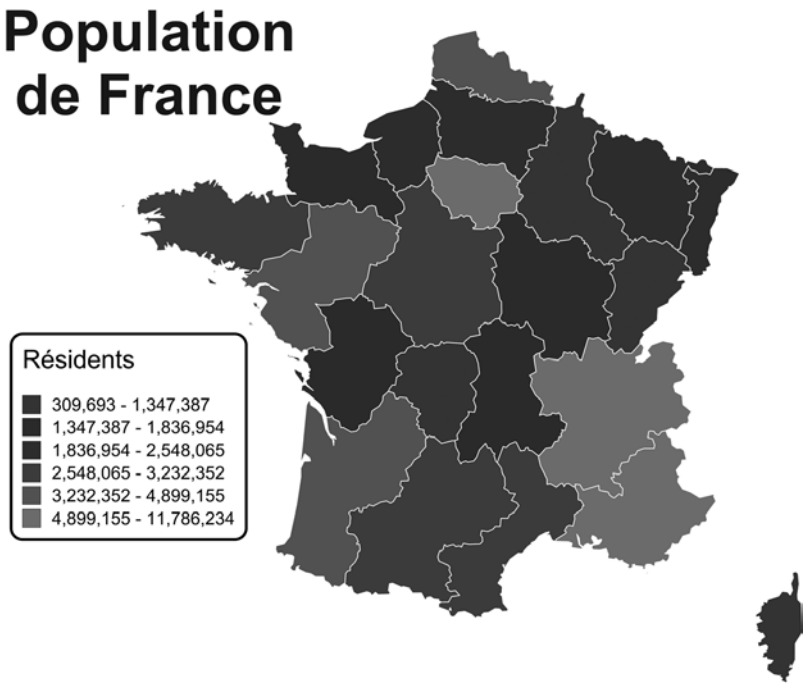
MapViewer™ 8 User's Guide

Thematic Mapping and Spatial Analysis Software for
Business, Science, and Education



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January 2015

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Chapter 1

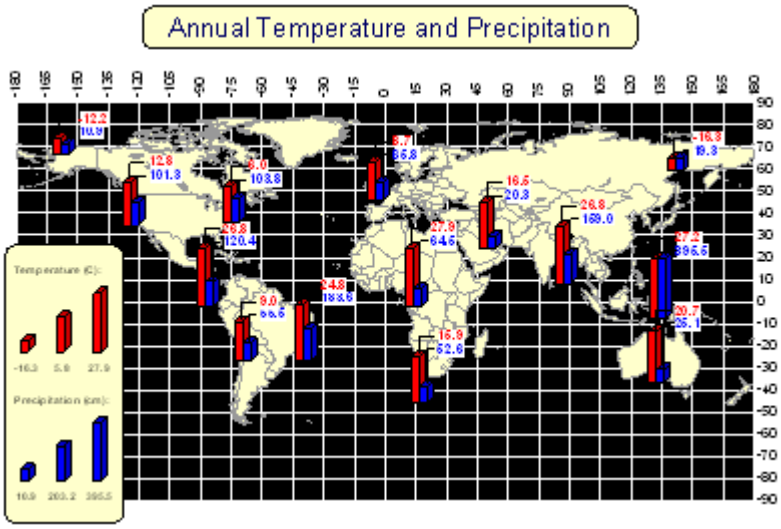
Introducing MapViewer

Introduction to MapViewer™

MapViewer is an analytical, thematic mapping program. With thematic maps, data are linked to polygons, polylines, or points on a map, making it easy for you to visualize data distribution.

With **MapViewer**, you can define sales territories, outline marketing strategies, view demographic distributions, show ecological distribution, present epidemiological studies, produce geologic maps, teach cartography, or display any geographically distributed data. **MapViewer** helps you present your data in the most informative ways.

Although **MapViewer** includes a wide variety of boundary files, it does not limit you to only working with the included boundary files. You can define your own territories by tracing existing boundaries, drawing completely new boundaries, or importing boundaries from files. Then, you can use the data included with **MapViewer** to produce various types of maps, create your own data file in **MapViewer**, or import your own data for use with the map.



Many options are available for customizing maps. This graphic shows a multivariate bar chart, legend, graticule, and text.

MapViewer can create the following map types: base, pin, hatch, contour, symbol, density, territory, vector, line graph, multi-graph, gradient, bar, flow, prism, pie, and cartogram maps. In addition, you can add map features such as data labels, graticules, legends, scale bars, and map collars. Most maps can be calibrated, scaled, limited in range, and projected. In addition, you can analyze the maps with tools such as queries.

It is recommended that all users spend a few minutes working through the tutorial. The tutorial introduces you to many of **MapViewer**'s features and helps you to understand how **MapViewer** works. The tutorial is short and easy to follow. It will be a few minutes well spent.

The **Scripter™** program, included with **MapViewer**, is useful in creating, editing, and running script files that automate **MapViewer** procedures. By writing and running script files, simple mundane tasks or complex system integration tasks can be performed precisely and repetitively without direct interaction. **MapViewer** also supports ActiveX Automation using any compatible client, such as Visual BASIC.

The new features in **MapViewer 8** are summarized:

- Online at www.goldensoftware.com/products/mapviewer#what-s-new
- In the program, click **Home | Help | Contents** and click on the New Features page in the Introduction book.

Who Uses MapViewer?

People in many different disciplines benefit from **MapViewer**. Scientists and engineers use **MapViewer** for spatial data analysis. Journalists, or anyone who creates articles, papers, or websites with maps, benefit from the visually appealing maps created with **MapViewer**. **MapViewer** maps can easily communicate complex location-based data. Educators, students, large and small businesses, government agencies, independent consultants, GIS analysts, researchers, and more consider **MapViewer** to be a valuable asset.

System Requirements

The minimum system requirements for **MapViewer** are:

- Windows XP SP2 or SP3, Vista, 7, 8 (excluding RT), and higher
- 512MB RAM minimum for simple data sets, 1GB RAM recommended
- At least 500 MB of free hard disk space
- 1024 x 768 or higher monitor resolution with a minimum 16-bit color depth

Installation Directions

Installing **MapViewer** requires logging onto the computer with an account that has Administrator rights. Golden Software does not recommend installing **MapViewer 8** over any previous versions of **MapViewer**. **MapViewer 8** can coexist with older versions (e.g. **MapViewer 7**) as long as both versions are installed in different directories. By default, the program installation directories are different.

Installing MapViewer

To install **MapViewer** from a CD:

1. Insert the **MapViewer** CD into the CD-ROM drive. The install program automatically begins on most computers. If the installation does not begin automatically, double-click on the Autorun.exe file located on the **MapViewer** CD.
2. Choose Install **MapViewer** from the **MapViewer** Auto Setup dialog to begin the installation.

To install **MapViewer** from a download:

1. Download **MapViewer** according to the emailed directions you received.
2. Double-click on the downloaded file to begin the installation process.

Updating MapViewer

To update **MapViewer**, open the program and click the **File | Online | Check for Update** command. The Internet Update program will check Golden Software's servers for any free updates.

If there is an update for your version of **MapViewer** (e.g. **MapViewer** 8.0 to **MapViewer** 8.1), you will be prompted to download the update.

Uninstalling MapViewer

Windows XP: To uninstall **MapViewer**, go to the Control Panel and double-click Add/ Remove Programs. Select **MapViewer 8** from the list of installed applications. Click the Remove button to uninstall **MapViewer 8**.

Windows Vista: To uninstall **MapViewer** when using the Regular Control Panel Home, click the Uninstall a program link. Select **MapViewer 8** from the list of installed applications. Click the Uninstall button to uninstall **MapViewer 8**.

To uninstall **MapViewer** when using the Classic View Control Panel, double-click Programs and Features. Select **MapViewer 8** from the list of installed applications. Click the Uninstall button to uninstall **MapViewer 8**.

Windows 7: To uninstall **MapViewer** go to the Windows Control Panel and click the Uninstall a program link. Select **MapViewer 8** from the list of installed applications. Click the Uninstall button to uninstall **MapViewer 8**.

Windows 8: From the Start screen, right-click the **MapViewer 8** tile and click Uninstall in the context menu. Alternatively, click the down arrow in the bottom left corner of the Start screen. Right-click the **MapViewer 8** tile and click Uninstall in the context menu.

Three-Minute Tour

We have included several example files so that you can quickly see some of **MapViewer**'s capabilities. The **MapViewer** samples folder includes an example of each map type, many boundary files, and population, demographic, or location data files. Only two example files are discussed here, and these examples do not include all of **MapViewer**'s many map types and features. The **Object Manager** is a good source of information as to what is included in each file.

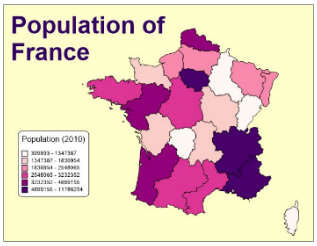
Example MapViewer Files

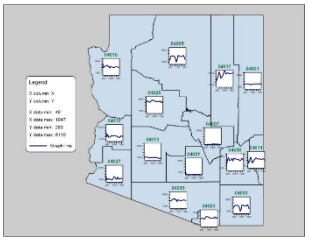
To view the example **MapViewer** files:

1. Open **MapViewer**.
2. Click the **File | Open** command.
3. Click on a .GSM file located in the Samples folder. By default, the **MapViewer** Samples folder is located in C:\Program Files\Golden Software\MapViewer 8\ Samples.
4. Click *Open* and the file opens.

<u>HatchMap.gsm</u>

The hatch map sample file contains a map with a single map layer, title, map collar, and legend. The map shows the population of France by region, where darker regions have a greater population than lighter regions.





MultiGraphMap.gsm

The multi-graph map sample file contains a map with a single map layer, map collar, and legend. The map displays unique line graphs for each county.

Using MapViewer

The general steps to progress from a data set and boundary file to a finished map are as follows:

1. Create or import the boundary file in the **MapViewer** plot window. The boundaries can be created in **MapViewer**, imported from the **MapViewer** samples folder, or imported from another source. Boundaries to be used in a map must have assigned Primary IDs.
2. Create or import the data file. The data file must consist of a Primary ID (PID) column and at least one data column. The data file can be created in the **MapViewer** worksheet window or outside of **MapViewer**, for example by using an ASCII text editor or Excel.
3. Select a map type to create a thematic map. The data file in step two is linked to the boundary file in step one in the Open Data File dialog. Boundaries are linked to their specific data values by their Primary ID.
4. Click on the map layer in the **Object Manager** to view and edit the map properties in the **Property Manager**. Add more layers and map features, such as scale bars and legends, as desired.
5. Click the **File | Save** command to save the plot as a MapViewer .GSM file, which by default contains all the information to recreate the map.

Using Scripter

Tasks can be automated in **MapViewer** using Golden Software's **Scripter** program or any ActiveX Automation-compatible client, such as Visual BASIC. A script is a text file containing a series of instructions for execution when the script is run. Scripter can be used to perform almost any task in **MapViewer**. Scripts are useful for automating repetitive tasks and consolidating a sequence of steps. Refer to the **MapViewer Automation** help book in the online help for more information about Scripter. The C:\Program Files\Golden Software\MapViewer 8\Samples\Scripts folder includes several example scripts so that you can quickly see some of **Scripter**'s capabilities.

Example Scripter Files

To run a sample script:

1. Open **Scripter** by navigating to the installation folder, C:\Program Files\Golden Software\MapViewer 8. Double-click on the Scripter.exe application file.
2. Click the **File | Open** command.
3. Select a sample script .BAS file in the C:\Program Files\Golden Software\MapViewer 8\Samples\Scripts folder.
4. Click *Open* and the script file opens.
5. Click the **Script | Run** command and the script is executed.
6. Most sample scripts will open **MapViewer** and display a map in the plot window.

How MapViewer Works

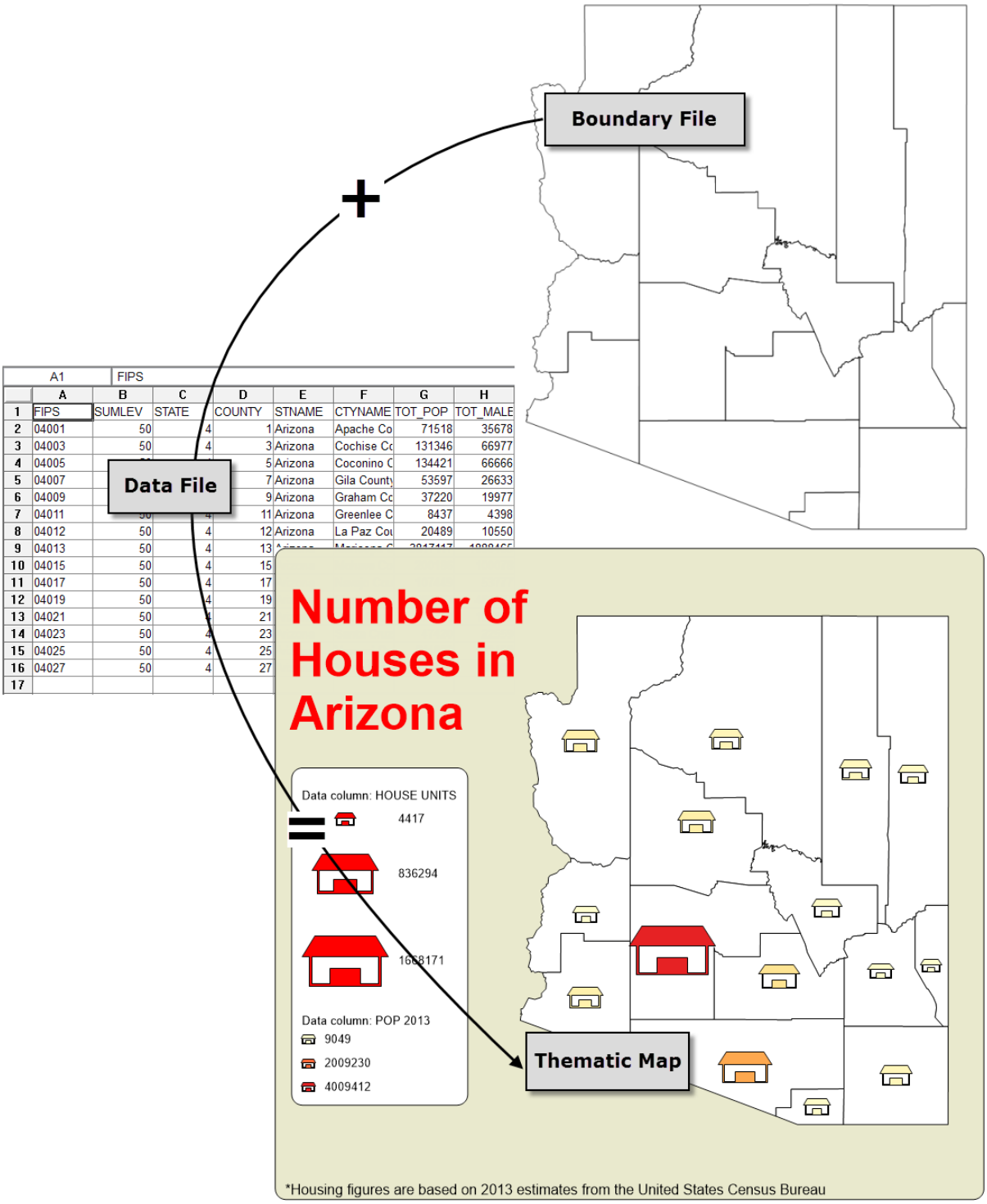
To create a thematic map in **MapViewer**, you need both a vector boundary file and a data file containing the data you want to represent on the map. With these two components, you can create any of the thematic map types. The boundary file can be imported as a base map before the data file is loaded and thematic map is created. Alternatively, the boundary file and data file can be loaded as the thematic map is created.

Boundary files may consist of polygons, polylines, and points. Polygons, polylines, and points are also called boundaries or boundary objects. Polygons are closed shapes that can display a fill property. Polylines are a connected set of XY coordinate positions forming either straight or curved lines. Points consist of a symbol marking an XY coordinate position.

MapViewer thematic maps link data to polygons, polylines, or points on maps. Boundary objects are linked to data by using Primary IDs. A Primary ID (PID) is a unique identifier associated with each polygon, polyline, or point represented on the thematic map. This Primary ID is also found in the corresponding data file.

The data contains the Primary IDs and the data for each polygon, polyline, or point you would like to represent on a map. Each row contains the Primary ID and data values for a single boundary object on the map.

The graphic on the following page illustrates the relationship between map boundaries and worksheet data. Notice that the Primary IDs are displayed for all areas on the map and are contained in column A of the worksheet portion shown.



A1	FIPS							
	A	B	C	D	E	F	G	H
1	FIPS	SUMLEV	STATE	COUNTY	STNAME	CTYNAME	TOT_POP	TOT_MALE
2	04001	50	4	1	Arizona	Apache Co	71518	35678
3	04003	50	4	3	Arizona	Cochise Co	131346	66977
4	04005			5	Arizona	Coconino C	134421	66666
5	04007			7	Arizona	Gila County	53597	26633
6	04009			9	Arizona	Graham Co	37220	19977
7	04011		4	11	Arizona	Greenlee C	8437	4398
8	04012	50	4	12	Arizona	La Paz Cou	20489	10550
9	04013	50	4	13				
10	04015	50	4	15				
11	04017	50	4	17				
12	04019	50	4	19				
13	04021	50	4	21				
14	04023	50	4	23				
15	04025	50	4	25				
16	04027	50	4	27				
17								

This graphic illustrates the relationship between the boundary file and the data when creating a thematic map in MapViewer. Each polygon (county) contains the Primary ID (FIPS CODE). The Primary IDs are also located in column A of the worksheet. The data (POP 2013 and HOUSE UNITS) are linked to the counties on the map to create the bivariate symbol map above.

File Types

MapViewer uses three basic file types: data, boundary, and **MapViewer** .GSM files.

Data Files

Data files contain the input data provided by the user, and are used to produce thematic maps or pin data points to a map. These files are generally referred to as "XYZ data files" or "data files" throughout the documentation. Data can be read from various file types, and most contain a numeric/text primary ID as well as numeric Z values or text classes. The Z values contain the variable to be modeled, such as elevation, concentration, rainfall, or similar types of values.

Boundary Files

Boundary files are vector files that contain polygons, polylines, and/or points. Boundary files are used to create a base map or boundary portion of a thematic map.

MapViewer GSM Files

MapViewer .GSM files preserve all the objects and object settings contained in a plot window. These files are called **MapViewer** .GSM files throughout the documentation. **MapViewer 8** can open .GSM files from previous versions of **MapViewer**. By default, the data files linked to the layers are embedded within a **MapViewer** .GSM file, so a **MapViewer** .GSM file contains all the components to exactly recreate the saved map.

MapViewer Files [.GSM] contain all information displayed in a plot window. This includes boundaries, drawing objects, graticules, associated data files, and window settings. All layers and thematic information are also stored. These files are binary and cannot be edited.

To load a [.GSM] file into the current document window, use the **File | Open** command. To save the current document window as a [.GSM] file, use the **File | Save** or **File | Save As** command.

Occasionally, you may want to merge two [.GSM] files together. To do so, use the **File | Import** command. When a [.GSM] file is imported, all layers of the file are inserted before the active layer in the current document. Therefore, if you want the map in the file to be placed behind the map in the current document, use the **Object Manager** and make the bottom layer active before performing the import. If you want the map in the file to be placed in front of the layer in the current map, use New Layer to create a new layer (which is placed on top of all existing layers). Then import the [.GSM] file (which is placed before this top layer), and delete the new layer.

MapViewer Documentation

The **MapViewer 8** documentation includes a quick start guide and the online help file. Basic information about each command and feature are included in the online help file. The online help file also includes advanced information such as creating multiple layer maps with multiple thematic elements. Other sources of **MapViewer** help include our support forum, FAQs, and technical support.

Various font styles are used throughout the **MapViewer** documentation. **Bold** text indicates tab or menu commands, dialog names, and page names. *Italic* text indicates items within a dialog such as group box names, options, and field names. For example, the **Import File** dialog contains a *Look in* list. Bold and italic text may occasionally be used for emphasis. Often, hyperlinks replace the **Bold** text for commands and dialogs. Click the hyperlink to see the help page for the command or dialog.

Also, menu commands appear as **Draw | Shape | Text**. This means, "Click on the **Draw** tab at the top of the ribbon bar, and then click on **Text** within the **Shape** section." The first word is always the tab name, and the second word is the ribbon section. If applicable, the next word is a command group. The final word is the command. The **Draw | Image | Filters | Spatial** command is an example of a command contained in a command group.

New Features

General

- Find commands easily with the sleek new ribbon bar user interface
- Keep your data and your map together by embedding data in GSM files
- Be able to use bigger files with the new 64-bit installation option
- Import and export data with an unlimited number of attribute fields
- Zoom easily and more precisely using mouse scroll wheel at cursor location
- Change coordinate systems easier than ever with a **Surfer**-like Coordinate System dialog
- Click Move/Size Inset command, Draw commands, and Zoom commands just once to use them multiple times consecutively
- Pin managers to easily collapse and expand them with a single click
- Move and size objects easily with the new position/size toolbar
- Find and edit object properties quickly with the **Object Manager** and **Property Manager**
- Get helpful hints with the Tip of the Day, which displays on startup

Maps

- New map type: Create a line/scatter plot for each boundary by using the new Multi-Graph map
- New map option: Display your cartogram map as contiguous to keep adjacent areas connected
- New map option: Size pin map symbols proportional to a data value in between the min and max symbol sizes
- Download raster maps from online WMS servers
- Territory map: Create territory from text column in worksheet
- Hatch map: Bin classes from text column in worksheet
- Pie map: Remove 100% line
- Pin map: Save classes based on string values
- Allow scaling of plot containing prism map

Other

- Query across multiple layers
- Set scale bar title offset
- Use new Collect Colors command to quickly add custom colors to the color list with a click

Labels / Text

- Unicode support
- Use the new text editor to have more control over your text properties
- Control label opacity
- Customize your plot by moving/editing/hiding individual data labels

- Display graticule labels in Degree Minute Second (DMS) format
- Move posted label and have leader line point back to centroid

Objects

- Set partial transparency/opacity
- Create an immovable title block by locking objects (or layers)
- Draw text that follows a curve
- Reverse any color spectrum
- Utilize additional line styles
- Fill objects with linear or radial gradient fills

Legend

- Edit legend entry formatting and font properties
- Support label frequency for map types with numeric legend entries
- Pie map: Specify 1 or 0 Samples in legend
- Symbol map: Choose symbol levels

Worksheet

- Custom and locale-based date/time formats
- Allow commas as decimal delimiters
- Percentage format support
- Transpose rows to columns and vice versa
- Transform: PI() and ROUND() added to Formulas list
- New "Mode" statistics calculation
- Ignore blanking value when calculating statistics

Automation

- Support for /x flag when running via command line
- Pass command line arguments to a script
- TXT import: Use comma as decimal symbol option
- Updated MVProjection Type values to include new projections
- Allow Inset to list all layers it contains
- Ignore blanking value when calculating Statistics

Import/Export

<u>General</u>

- Tiff Import: Support YCbCr Color Format
- PDF Import: Increase DPI
- PDF Export: Support compression, page size option
- PDF Vector Export: Support partial transparency for image fill patterns
- Import bitmap at original DPI
- GSI Export: save symbol properties, save coordinate system info internally
- BLN Export: Blanking Flag option in BLN Export Options dialog
- KML Export: Option to export text as 'label' placemarks instead of icons or areas/curves
- Improved export of stock fill patterns
- Remember last export file type

New Import and Export Formats

- Google Earth KML/KMZ
- Excel XLSX
- JPEG2000 (JP2)
- SEG SP1

New Import Formats

- Excel XLSM
- Access 2007
- MrSID
- GPX
- Zipped Shapefiles
- LASer LiDAR data
- PDF (as raster)
- TerraGo GeoPDF
- ECW ER Mapper
- Tiled TIF (import all tiles at once)
- 56-bpp Landsat based GeoTIFF

New Export Formats

- SVG Scalable Vector Graphics
- HTML Image Map
- GeoPDF
- Transparent TIF/PNG/GIF/PDF/GSI
- Vector PDF with layers

More Coordinate Systems

General

- Save custom projection and datum information
- Search for Coordinate System/EPSG code in Assign Projection dialog
- Set Datum to Popular Visualization when ellipsoid same as Popular Visualization
- WGS84: change spheroid definition to be compatible with ArcMap

New Coordinate Systems

- New Zealand Transverse Mercator 2000
- Hungarian National Grid EOV
- Russia Pulkovo
- Posgar94
- Sweref99
- British National Grid & Ordnance Survey (OSGB36)
- WGS84 Web Mercator
- Japan Plane Rect.
- Swiss LV95 and LV03
- Bursa-Wolf (7-parameter) Transformation Version of the CH1903 Coordinate System
- South African Grid

- Taiwan TWD67 and TWD97
- Irish National Grid
- Portuguese National Grid
- Australian GDA94 with GDA94 datum
- Michigan GeoRef (1point+azimuth)
- Kentucky Single Zone
- ISG
- Europe UTM zone 29N using European 1950 - Port./Spain datum
- ITM: Irish Transverse Mercator
- SVY21
- More Australian grid coordinate systems
- WGS84 Web Mercator (900913) and WGS84 Web Mercator (EPSG 3857)
- France: RGF93 / CC (zones 42-50)

New Projections

- New Zealand Map Grid
- Hotine Oblique Mercator 2-Point
- Gauss-Boaga
- Mount Eden Circuit 2000
- Support Ordnance Survey
- SCOPQ (MTM)

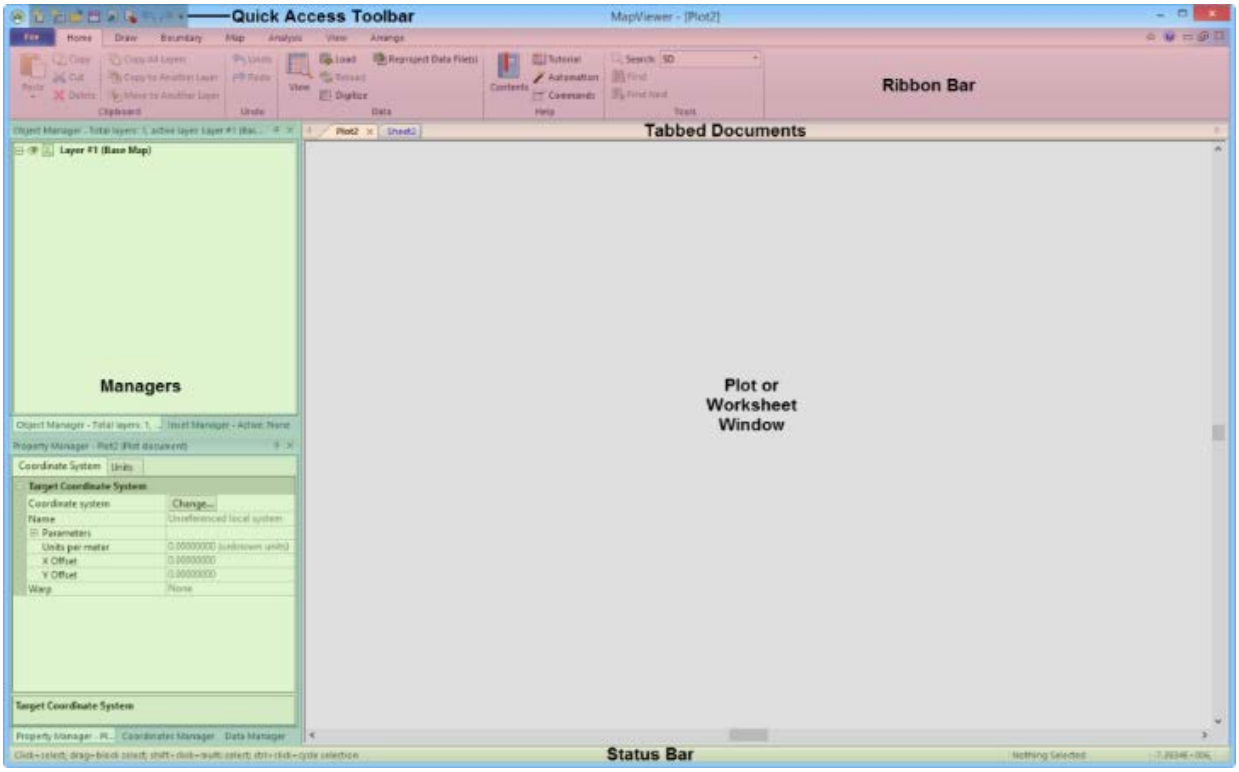
New Datums

- D_Hartebeesthoek_1994
- Potsdam 1983 (PD83)
- NGO 1948
- NWS-84
- Japanese Geodetic Datum 2000
- ITRF94

Chapter 2

MapViewer User Interface

The default **MapViewer 8** application window is made up of six main parts. The Quick Access Toolbar, ribbon bar, plot window or worksheet window, tabbed documents, and mangers. The areas for each are shaded and labeled in the image below.



*The **MapViewer** application window. Above, a plot document is active, so the window is a plot window. When a worksheet document is active, the window is a worksheet window.*

Below is some general information about the **MapViewer** user interface. Please click the following hyperlinks for detailed information on each topic:

- The Quick Access Toolbar provides easy access to frequently-used commands. The Quick Access Toolbar can be customized.
- The ribbon bar contains all of **MapViewer**'s commands. The ribbon bar can also be customized.
- Open plot and worksheet documents are displayed in the tabbed documents area by default. Click on the tap to activate the document. The tabbed document style can be changed, or turned off, in the Options dialog User Interface page.
- By default, the managers are docked to the left side of the application window. The **Object Manager** and Inset Manager are tabbed together, and the **Property Manager**, Coordinates Manager, and Data Manager are tabbed together. The managers can be split apart, moved, and docked elsewhere. See the Manager Layout help page for more

information. The managers can also be hidden or shown with the **View | Managers** commands on the ribbon bar.

- The plot or worksheet window displays the active document. See the plot window and worksheet window help pages for more information on each.
- The status bar displays information about the current activity, command, and selected object. Turn the status bar on or off in the Options dialog User Interface page.

Plot Window

Plot windows are the workspaces for creating and modifying maps or other types of drawings. When you first start **MapViewer,** you are presented with an empty plot window. During a **MapViewer** session, new empty plot windows are created with the **File | New | Plot** command.

Ribbon Bar Menu/Tabs

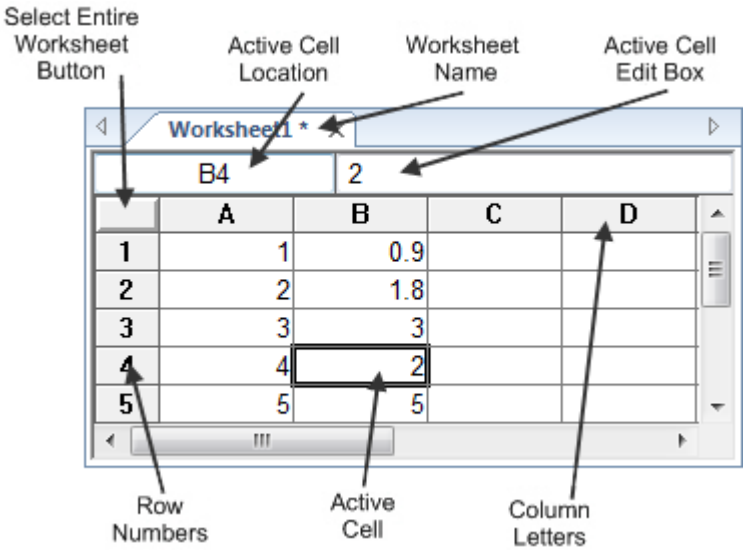
File	Opens, closes, saves, and prints files
Home	Contains undo, cut, copy, paste, delete, and insert
Draw	Draws objects
Boundary	Commands to edit and convert boundaries
Map	Creates maps and controls map features
Analysis	Contains tools to analyze the map
View	Controls zoom and redraw as well as the display of toolbars, objects, status bar, and rulers.
Arrange	Arranges objects

The Application/Document Control menu commands control the size and position of the application window or the document window.

New Plot

You can create a new plot window with the **File | New | Plot** command or the  button on the Quick Access Toolbar. You can create maps in a plot window and use the worksheet to manage data. Existing maps or worksheets are not altered by this command because the new window is independent of all other document windows. A new map may be created or an existing map may be loaded into a new plot window. The opened window is empty when created. A worksheet window may also be created with the **File | New | Worksheet** command.

Worksheet Window User Interface



To enter data in a worksheet, use the **File | Open** command to open an existing data file or choose the **File | New | Worksheet** command to create a blank worksheet. Data already used to create plots can be opened in the worksheet window with the **Home | Data | View** command. If data is currently loaded for an active layer, that data is displayed in the worksheet. If data is not loaded and there is a base map in the plot window, the base map primary IDs are automatically loaded into column A of the worksheet. If the base map contains secondary IDs, the secondary IDs are entered into column B. The title of the worksheet window is the name of the loaded data file. If base map is displayed (without data), the worksheet name is Sheet #. When the worksheet window is active the menu bar changes to show the worksheet commands.

The components of the worksheet window are discussed below.

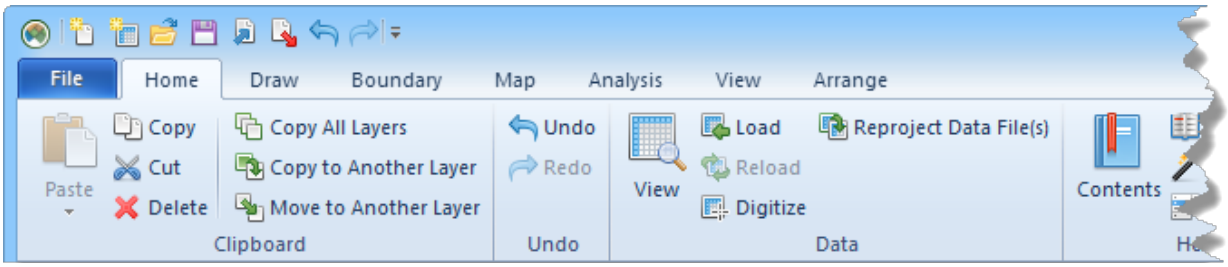
The components of a worksheet window shown above are described in the following table.

Column Letters	The column letters identify a column in the worksheet.
Row Numbers	The row numbers identify a row in the worksheet.
Active Cell	The active cell is highlighted with a bold outline. The active cell receives data input (numeric values or text strings) from the keyboard. Only one cell is active at a time.
Active Cell Location	The active cell location is specified by column letter and row number.
Active Cell Edit Box	The active cell edit box displays the contents of the active cell. Data typed into an empty cell appears in both the edit box and the active cell.
Worksheet Name	The worksheet name displays the data file name or the worksheet number if the data file has not been saved.
Select Entire Worksheet Button	The select entire worksheet button is used to select all cells in the worksheet.

Ribbon

The Ribbon is the strip of buttons and icons located above the plot, worksheet, and grid windows. The Ribbon replaces the menus and toolbars found in earlier versions of **MapViewer**. The ribbon is designed to help you quickly find the commands that you need to complete a task.

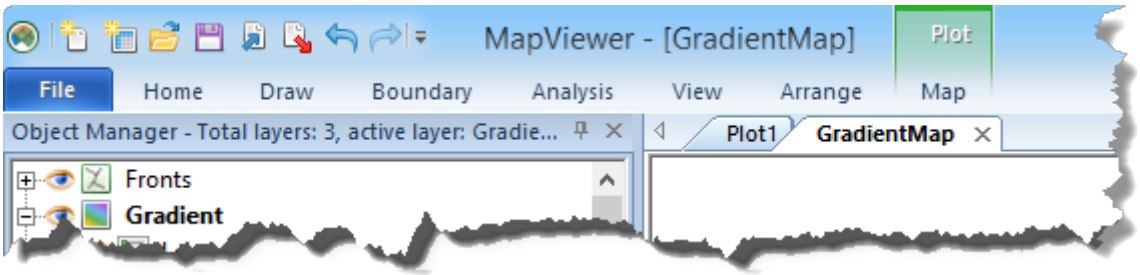
Above the Ribbon are a number of tabs, such as **Home**, **Map**, and **Analysis**. Clicking or scrolling to a tab displays the options located in this section of the ribbon. The tabs have commands that are organized into a group. For instance, all the boundary editing related commands are on the **Boundary** tab.



*The Ribbon is displayed with the **Home** tab selected.*

Minimizing the Ribbon

The ribbon can be minimized to take up less space on the screen. To minimize the ribbon, right-click on the ribbon and select *Minimize the Ribbon*,click the button in the top right portion of the **MapViewer** window, or press CTRL+F1. When displayed in a minimized mode, only the tabs at the top of the screen are visible. To see the commands on each tab, click the tab name. After selecting a command, the ribbon automatically minimizes again.



The Ribbon displayed with the Minimize the Ribbon *option selected. Clicking any tab name displays the ribbon.*

Customizing the Ribbon

The ribbon is customizable in **MapViewer**. To customize the commands in the ribbon, right-click on the ribbon and select *Customize the Ribbon*.

In the **Customize Ribbon** dialog, you can add new tabs, add groups, hide existing tabs or custom groups, and add commands to any custom group. You can also rearrange the tabs into an order that fits your needs better.

To customize the commands in the **Customize Ribbon** dialog, right-click on the ribbon and select *Customize the Ribbon*. In the **Customize Ribbon** dialog, use the following options.

<u>Tab options:</u>

1. To add a custom tab, set the *Customize the Ribbon* section to *All Tabs*. Click in the list on the right side of the dialog where the custom tab should be located and click the *New Tab* button.

2. To delete custom tab, right-click on the tab name in the list on the right side of the dialog and select *Delete*.
3. To rename a default or custom tab, click on the tab name in the list on the right side of the dialog. Click the *Rename* button. Type the new name and press OK to make the change.
4. To hide a default or custom tab, uncheck the box next to the tab name on the right side of the dialog. Only checked tabs will be displayed.
5. To change the order of default or custom tabs, click on the tab name that should be moved in the list on the right side of the dialog. Click the up and down arrow buttons on the far right side of the dialog to move the selected tab up or down. Default tabs must remain in their major group.

Group options:

1. To add a custom group to a default or custom tab, click on the + next to the tab name. Click in the list of group names where the new group should be located and click the *New Group* button.
2. To delete a default or custom group on any tab, right-click on the group name in the list on the right side of the dialog and select *Delete*.
3. To rename a default or custom group on any tab, click on the group name in the list on the right side of the dialog. Click the *Rename* button. Type the new name and click OK to make the change.
4. To change the order of default or custom groups on any tab, click on the group name that should be moved in the list on the right side of the dialog. Click the up and down arrow buttons on the far right side of the dialog to move the selected group up or down in the list.
5. To replace a default group with a custom group, right-click on the default group name and select *Delete*. Click the *New Group* button. Add the desired commands to the new group that you want displayed. Rename the new group, if desired.

Command options:

Commands can only be added to or deleted from custom groups. Commands can only be rearranged or renamed in custom groups. If commands in default groups are desired to be edited, the default group should be deleted and a new custom group should be created with the same commands.

1. To add a command to a custom group, set the *choose commands from* list to *All Tabs* so that all commands are listed on the left side of the dialog. Select the desired command that should be added. On the right side of the dialog, click the + next to the custom group name. Click on the desired position in the list of commands. If no commands exist in the group yet, click on the group name. Click the *Add>>* button and the command is added to the custom group.
2. To delete a command from a custom group, right-click on the command name in the list on the right side of the dialog and select *Delete*. Only commands from custom groups can be deleted.
3. To rename a command in a custom group, click on the command name in the list on the right side of the dialog. Click the *Rename* button. Type the new name and click OK to make the change. Only commands in custom groups can be renamed.
4. To change the order of commands in a custom group, click on the command name that should be moved in the list on the right side of the dialog. Click the up and down arrow buttons on the far right side of the dialog to move the selected command up or down in the list.

Reset the Ribbon

To reset all customizations on the ribbon, click the *Reset* button at the bottom of the **Customize Ribbon** dialog.

Quick Access Toolbar Commands

The Quick Access Toolbar is at the top of the **MapViewer** window. This toolbar has frequently used commands and can be customized by the user. The commands in the Quick Access Toolbar are the same regardless of the type of window displayed in **MapViewer**.

*The **Quick Access Toolbar** is displayed at the top of the **MapViewer** window.*

Customizing the Quick Access Toolbar

The Quick Access Toolbar is a customizable toolbar. One method that can be used to add commands to the Quick Access Toolbar is to right-click on the command in the ribbon and choose *Add to Quick Access Toolbar*. The command is automatically added to the end of the toolbar.

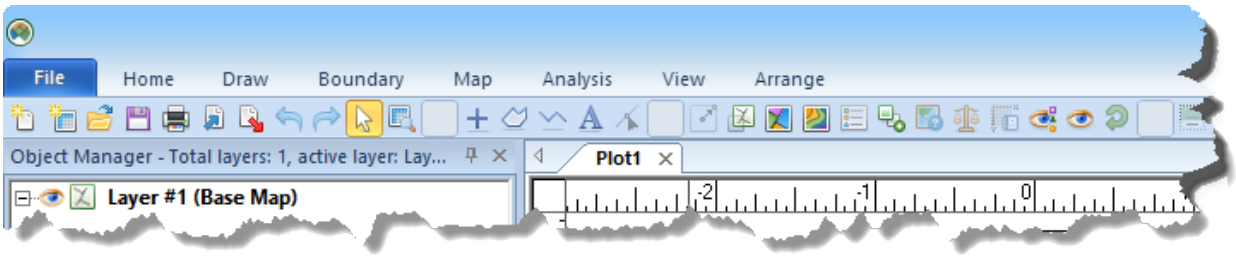
To customize the commands in the **Quick Access Toolbar** dialog, right-click on the ribbon and select *Customize Quick Access Toolbar*. In the **Quick Access Toolbar** dialog,

1. To add a command, select the command from the list on the left that you want to add. Click the *Add>>* button and the command is added to the list on the right.
2. To add a separator between commands, set the *Choose commands from* to Main on the left side of the dialog. Select *<Separator>* and click *Add>>*. Move the separator to the desired position.
3. To delete a command, select the command from the list on the right. Click the *<<Remove* button and the command is removed from the list on the right.
4. To rearrange commands or move separators, click on the command or separator name from the list on the right that you want to move. Click the up and down arrow buttons on the far right to move the command up or down the list. Commands are shown in the exact order that they are displayed in the Quick Access Toolbar.
5. To reset the Quick Access Toolbar to the default display, click the *Reset* button below the list on the right side of the dialog.
6. Click OK and all changes are made.

Note: to add individual plot types as buttons to the Quick Access Toolbar, set the *Choose commands from* to *Plot | Plot Menu*. Then on the left side of the dialog, select the appropriate plot type, such as *3D Bar Chart. Click Add>>* and the plot type is added with an icon to the right side. Click *OK* and the plot type is displayed in the Quick Access Toolbar.

Displaying the Quick Access Toolbar Below the Ribbon

To display the Quick Access Toolbar below the ribbon, right-click on the ribbon and select *Show Quick Access Toolbar Below the Ribbon*. This setting is useful if you have added many commands to the Quick Access Toolbar. More commands display, by default, when the Quick Access Toolbar is below the ribbon. When combined with the minimized ribbon appearance, this can give single click access to all your most used commands and maximize the viewing area for the plot.



Customize the Quick Access Toolbar to display all the commands you frequently use. Then, display the Quick Access Toolbar below the ribbon bar. When the ribbon bar is minimized, it appears that all of your commands are in a single toolbar, ready to create exactly what you want with a single click.

Tabbed Documents

The plot and worksheet windows are displayed as tabbed documents. When more than one window is open, tabs appear at the top of the screen, allowing you to click on a tab to switch to that window.

Selecting and Closing Windows

To select a tab to view, click the tab name. To close a tab, right-click and select *Close* or click the X next to the tab name. If unsaved changes are present in the document, you will be prompted to save the changes before the file is closed.

Change Order of Tabs

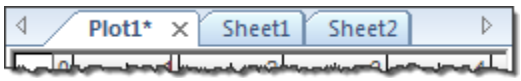
When viewing in tabbed document mode, the tabs may be dragged to reorder them. Left-click on a tab, hold the left mouse button, drag to a new location, and release the mouse button to move the tab to a new location.

To move to the next tab, you can use the Next command. Alternatively, press CTRL + F6 to move to the next tab.

The  and  buttons on the sides of the tabs are used to scroll the tabs should there be more tabs than can fit along the top of the window.

Unsaved Changes

When a document contains unsaved changes, an asterisk (*) appears next to its tabbed name. The asterisk disappears once the unsaved changes have been saved.



The Plot1 *tab has unsaved changes, indicated by the (*) asterisk. The* Sheet1 *and* Sheet2 *tabs do not have saved changes.*

Tab Style

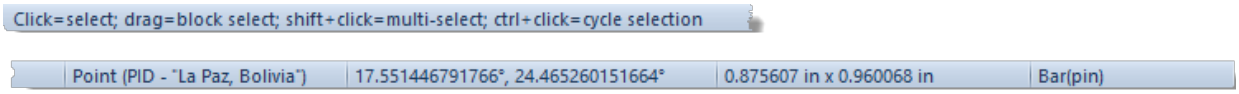
The style of the tab can be changed in **File | Options | User Interface**. Select a new tab style from the *MDI tab style* list.

No Tabs

Tabs can be turned off in **File | Options | User Interface**. Select a *None* from the *MDI tab style* list.

Status Bar

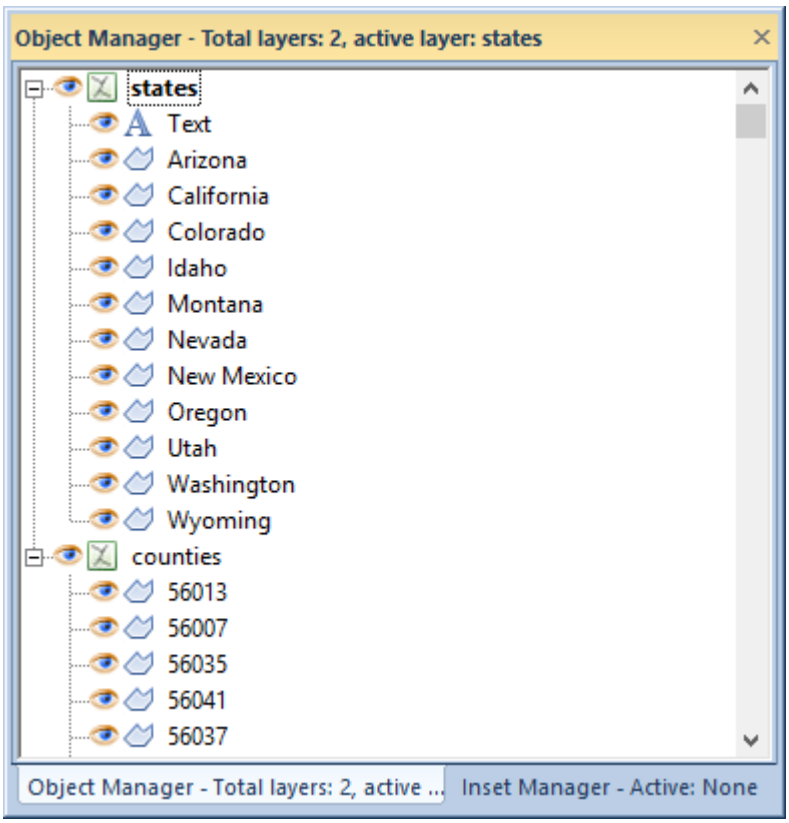
Click **View | Display | Status Bar** to show or hide the status bar. The status bar displays information about the current command or activity in **MapViewer**. A check mark next to **Status Bar** indicates that the status bar is displayed. The status bar is divided into four sections. Click on each section in the graphic to display more information about each pane. In the worksheet, the status bar displays ToolTips.



Managers

Object Manager

The **Object Manager** contains a list of the objects and layers in the map. The objects can be selected and arranged in the **Object Manager**. Changes made in the **Object Manager** are reflected in the plot window and vice versa.



Object Manager Contents

Column	Contents
Layer	Displays the layer name, map type, layer visibility, graticule, and locked state.
Object	Displays the object type, such as polygons, polylines, and rectangles. This field also shows whether or not an object is visible. See *Object Visibility* below.

Opening and Closing the **Object Manager**

The **Object Manager** is opened and closed with the **View | Managers | Object Manager** check box ☑ Object. The **Object Manager** can be opened or closed by right-clicking in the **Object Manager** or plot window and selecting *Managers* | *Object Manager* in the context menu. Click the ☒ button in the title bar of the **Object Manager** to close the window.

Changing the **Object Manager** Location

The **Object Manager** can be docked on the edge of the **MapViewer** window or floated as a pop-up window. To change the position of the **Object Manager**, click on the title bar and drag it to a new location. While dragging the manager to a new location, the docking interface is shown on the screen. You can double-click on the title bar to toggle between floating and docked modes. You can drag the sides of the **Object Manager** to change the size of the window.

Selecting Objects

Click on the ⊞ button next to a layer name to expand the layer. When a layer is expanded the objects on the layer are shown in the **Object Manager**. Click the ⊟ button next to a layer name to collapse the layer. Use the Expand All Layers and Collapse All Layers to expand or collapse all layers in the **Object Manager** at once. Click on an object to select it in the **Object Manager** and in the plot window. If you select an object in the plot window it is also selected in the **Object Manager**. Use CTRL+click to select multiple objects. Use SHIFT+click to select multiple contiguous objects. The arrow keys can also be used to select objects in the **Object Manager**. The LEFT ARROW and RIGHT ARROW keys collapse and expand the current layer, respectively. Press the UP ARROW and DOWN ARROW to move up and down in the **Object Manager**. SHIFT+ PAGE UP selects everything from the current item to the beginning of the list. SHIFT + PAGE DOWN selects everything from the current item to the bottom of the list. Hold SHIFT and press the UP ARROW to select the item above the current selection, and hold SHIFT and press the DOWN ARROW to select the object below the current selection. Hold CTRL and press the UP or DOWN ARROW to select multiple objects.

Naming Objects

Objects and layers are named in the **Object Manager** by clicking once on the selected the object or layer. Layers do not have PIDs and are only named in the **Object Manager**. The name in the **Object Manager** is the object type when objects are created with a draw command or imported without PIDs. When a PID is assigned to the object in the **Property Manager** Info page, with the MultiAssign command, or with the Redefine command, the name in the **Object Manager** is updated to the new PID.

Editing Properties

After selecting an object or layer in the **Object Manager**, object or layer properties are edited in the **Property Manager**.

Object Visibility

Each row in the list consists of an icon indicating the type of object or layer and a text label for the object or layer. All objects and layers also have an eye icon that indicates if the object is visible. A fully colored eye indicates that the object is visible and a partially transparent eye indicates that the object is not visible. To change the visible status of an object, click on the eye to the left of the object icon. Invisible objects do not appear in the plot window and do not appear on printed output. Invisible objects can be selected in the **Object Manager** but they cannot be selected in the plot window.

Map and Object Type

The images immediately left of the layer and object names indicate the map type for layers or object type for objects. The map layer images are small versions of the **Map | Create Map** command buttons. The object type images are the same image as in the **Draw | Shape** command buttons.

Graticule Placement and Lock State

The layer containing the graticules is indicated by a graticule symbol in the upper right corner of the visibility eye . Locked layers and objects are indicated with a lock in the lower right corner of the eye .

Arranging Objects

To change the display order of the objects with the mouse, select an object and drag it to a new position in the list above or below an object. The pointer changes to a black right arrow ➡ if the object can be moved to the pointer location or a black circle with a diagonal line ⃠ if the object cannot be moved to the indicated location. The objects can also be moved with **Arrange | Move |** To Front, To Back, Forward, and Backward options.

Sorting the **Object Manager**

Objects can be sorted in each layer with the Sort Objects command. Objects can be sorted by *Object type*, *PID*, *SID*, *Vertex count*, *Length*, *Area*, *Polygon directions*, *Number of subpolygons*, *Hyperlink*, or *Attribute*.

Creating Reports

See Object Property Report for more information on creating a report of the **Object Manager** information.

Property Manager

The **Property Manager** edits object, layer, or plot properties. The **Property Manager** contains a list of properties of the selected object. If an object or layer is not selected, the **Property Manager** shows the properties for the current plot.

Properties and Thematic Maps

Thematic map properties are displayed in the **Property Manager**. Click on the thematic map layer in the object manager or the **Map | Layer | Layer Properties** command Layer Properties.

Property Manager Pages

The **Property Manager** has tabs relating to property types for the selected object, layer, or plot.

Plot Properties	Scale, Units, Limits, Coordinate System, Graticules, Graticule Ticks, Collar, and Collar Ticks
Shared Map Properties[1,2]	**General**, Info, and Data Labels
Thematic Map Specific Properties[2]	**Map**, **Gridding**, **Symbol**, **Territory**, **Graph**, **Axes**, **Labels**, **Bars**, **3D Settings**, **Pies**, **Font**, **Layer**, **Frame**, and **Method**
Object Properties	Info, Symbol, Font, Line, and Fill

1. Base Maps and layers without a thematic map or linked data file only have an **Info** page. Linking a data file to objects on the layer adds the **Data Labels** page to the **Property Manager**.

2. See each map type for a list of applicable **Property Manager** pages.

Changing Properties

The **Property Manager** displays the properties for selected objects. For example, a selected polygon has line and fill properties. To change a property, click on the property's value and select a new property from the popup box, scroll to a new number using the buttons, or type new numbers or text and press ENTER on your keyboard. The property access depends on the property type. In the area example, changing the color requires clicking on the current color and selecting a new color from the color palette, and changing a vector pattern's scale requires typing a new number or scrolling to a new number. When you type the new number, press ENTER on your keyboard or click somewhere in the **Property Manager** to make the change permanent.

Occasionally, some properties are dependent on your other selections. For example, in the fill properties there is a *Scale* option. This option is disabled (grayed out) unless you have selected a vector fill type as the *Pattern*.

Applying Property Changes

MapViewer makes changes to the object properties as you edit them in the **Property Manager**. Numeric fields require pressing ENTER on your keyboard or clicking somewhere else in the **Property Inspector**. Click the ESC key while a field is still active to cancel a change.

Opening and Closing the **Property Manager**

The **Property Manager** is opened and closed with the **View | Managers | Property** command. You can also open or close the **Property Manager** by right-clicking and selecting **Managers | Property Manager** in the context menu. You can click on the button in the title bar of the **Property Manager** to close it.

Changing the **Property Manager** Location

The **Property Manager** can be docked on the edge of the **MapViewer** window or floated as a pop-up window. To change the position of a docked **Property Manager**, click on the title bar of the **Property Manager** and drag it to a new location. A thin solid black rectangle indicates the new location is docked. A thick light gray rectangle indicates that the new location is floating. Double-click on the title bar to toggle between floating and docked modes. You can also display the property, coordinates, and data managers in one tabbed view.

Resizing the **Property Manager**

You can drag the sides of the **Property Manager** to change the size of the window. If the **Property Manager** is docked, the upper and lower bounds of the window are indicated by a cursor. Move the cursor to change the size.

Keyboard Commands

When working with the **Property Manager**, the up and down arrow keys move up and down in the **Property Manager** list. The ENTER key activates the highlighted property. The right arrow key expands collapsed sections (i.e. *Object Descriptions*) and the left arrow collapses the section.

Property Defaults

To change the default line, fill, symbol, or text properties use the Options dialog Default Properties page.

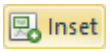
Property Manager Tips

To add an information area about each option in the **Property Manager**, check the *Show Property Manager info area* box in the Options dialog User Interface page.

Inset Manager

An inset is a display frame that is positioned on a portion of the page. One or more layers can be assigned to be displayed within an inset. Objects within an inset retain their original coordinates even as the inset frame is moved on the page. The display within the inset frame can be zoomed and panned. You can access the Inset Manager by clicking **View | Managers | Inset**.

Creating an Inset

Click the **Map | Add | Inset** command 

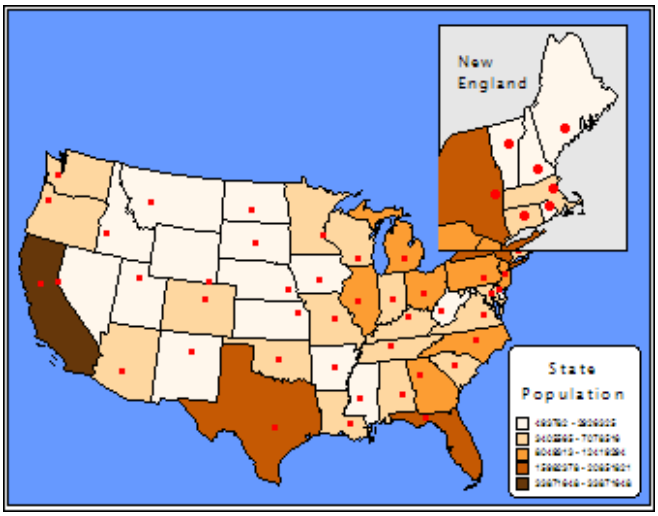
to add an inset to the map.

Editing an Inset

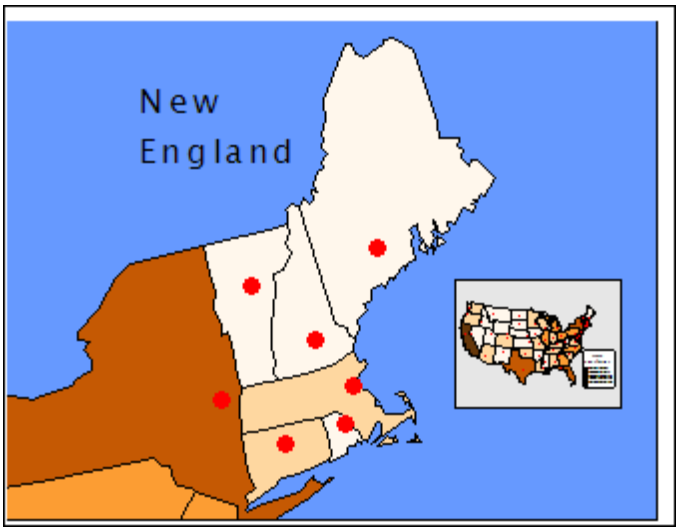
Use the toolbar at the top of the **Inset Manager**, the Inset page of the **Property Manager**, and the zoom **In**, **Out**, **Rectangle**, and **Pan** commands to edit inset properties and views.

Inset Examples

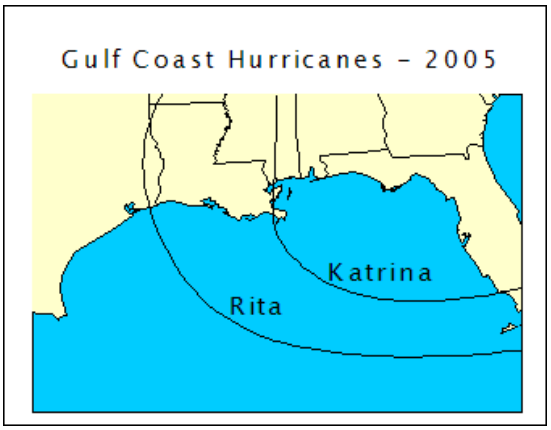
Enlarge a portion of a map to show more detail:



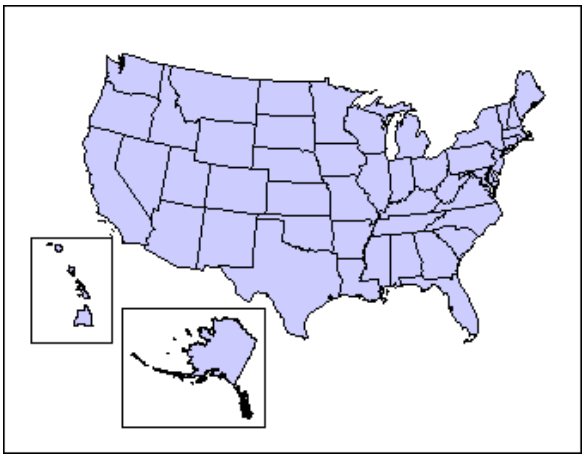
While a portion of the map is enlarged, have a small inset to show the whole map:



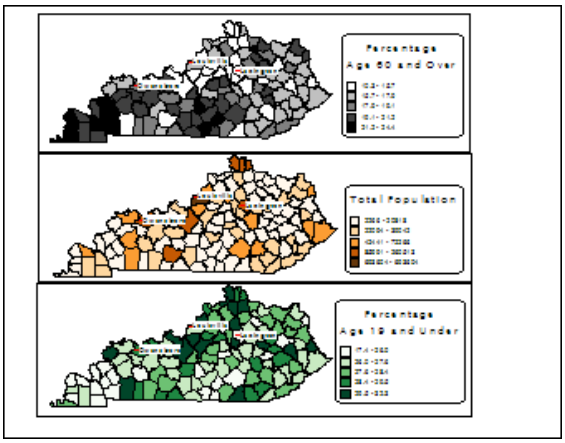
Apply limits to one or more layers while still allowing things to be displayed outside those limits:



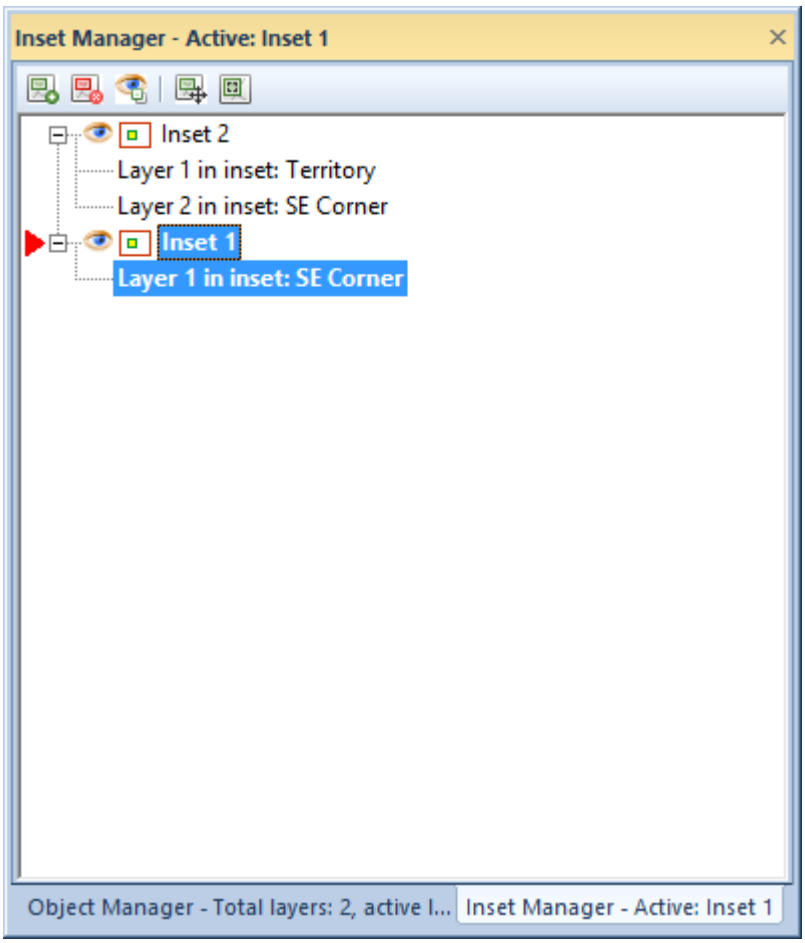
Move/resize Alaska and Hawaii in a 50-state map without changing their coordinates:



Show multiple thematic maps on a page while maintaining the original coordinates:



Using the Inset Manager



A toolbar appears at the top of the Inset Manager. Use these tools to manipulate the insets in the plot window. These commands, in addition to a few others, also appear when you right-click within the Inset Manger.

Name	Button	Function
New Inset		Create a new inset
Delete Inset		Delete the selected inset
Manage Layers		Assign or remove layers from the selected inset
Show Inset		Display the selected inset in the plot window
Hide Inset		Hide the selected inset
Move/Size Inset		Move or resize the selected inset
Fit to Inset		Zoom the selected inset so that the entire contents can be seen
Activate/Deactivate Inset	N/A	Double-click an inset to activate and deactivate it in the Inset Manager
Inset Properties	N/A	Set inset line and fill properties in the Inset page of the **Property Manager**

Remember, when an inset is active some other controls in MapViewer such as Zoom, Pan, and Selection apply to the active inset, rather than to the map as a whole.

Coordinates Manager

The **Coordinates Manager** displays the vertex coordinates for a selected object in a map document with a known projection.

Coordinates Manager - Polygon of 315 subpolygons (PID - "United States")

Editable Vertex	X Coordinate	Y Coordinate	Subpolygon Vertex
Center of 3314 vertices	-127.27	45.171	
0	-154.79	19.543	s0:v0
1	-155.67	18.93	s0:v1
2	-156.05	19.759	s0:v2
3	-155.86	20.279	s0:v3
4	-155.59	20.139	s0:v4
5	-154.79	19.543	s0:v5
6	-156.55	20.529	s1:v0
7	-156.58	20.525	s1:v1
8	-156.54	20.541	s1:v2
9	-156.55	20.529	s1:v3
10	-156.88	20.753	s2:v0
11	-156.92	20.74	s2:v1
12	-156.84	20.778	s2:v2
13	-156.88	20.753	s2:v3
14	-156.03	20.695	s3:v0
15	-156.41	20.589	s3:v1
16	-156.58	21.04	s3:v2
17	-156.03	20.695	s3:v3

Property Manager - Unit... Data Manager - Polygon ... Coordinates Manager - P...

*View and edit object vertex coordinates in the **Coordinates Manager**.*

The *Editable Vertex* column shows the vertex number. The *X Coordinate* and *Y Coordinate* columns display the X and Y coordinates for each vertex. If you are obtaining coordinates for a complex polygon, the additional area vertices are listed in the *Subpolygon Vertex* column.

The first row lists the total number of vertices for the selected object and the object primary ID. The second row identifies the coordinates for the center of the object. To move the entire object in a given direction, redefine the X and Y coordinates for the object center. The coordinates for all the vertices can be modified in the **Coordinates Manager** by double-clicking in the appropriate cell and typing in a new value.

Coordinate Units

The *X Coordinate* and *Y Coordinate* units are determined by the *Coordinate display units* property in the Units page of the plot properties.

Opening and Closing the Coordinates Manager

The **Coordinates Manager** is opened and closed with the **View | Managers | Coordinates Manager** check box ☑ Coordinate. The **Coordinates Manager** can be opened or closed by right-clicking in the **Object Manager** or plot window and selecting *Managers* | *Coordinates Manager* in the context menu. Click the button in the title bar of the **Coordinates Manager** to close the window.

Changing the Coordinates Manager Location

The **Coordinates Manager** can be docked on the edge of the **MapViewer** window or floated as a pop-up window. To change the position of the **Coordinates Manager**, click on the title bar and drag it to a new location. While dragging the manager to a new location, the docking interface is shown on the screen. You can double-click on the title bar to toggle between floating and docked modes. You can drag the sides of the **Coordinates Manager** to change the size of the window.

Data Manager

The **Data Manager** displays data or statistics associated with a selected object. If multiple objects are selected, data for only one of the objects is displayed. Use Boundary Records if you wish to view data for multiple selected objects. You can create a report or edit the data for an object in the **Data Manager**.

To display the **Data Manager**, click **View | Managers | Data Manager**. A check mark indicates that the **Data Manager** is visible. The **Data Manager** contains a **Data** view and a **Stats** view. To select or change the view, click the *Data* or *Stats* button.

Opening and Closing the Data Manager

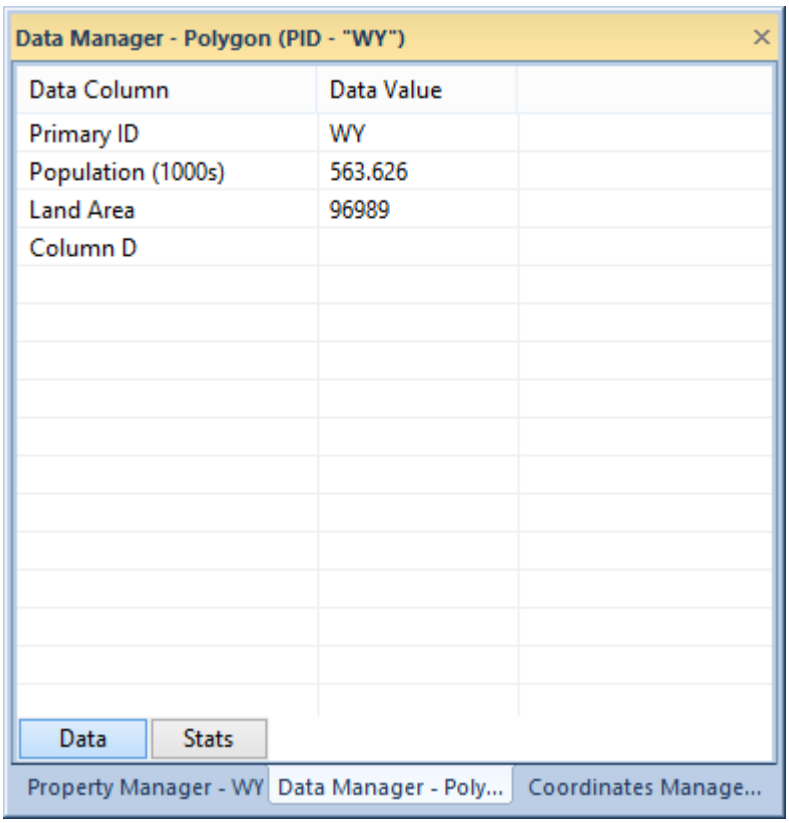
The **Data Manager** is opened and closed with the **View | Managers | Object Manager** check box ☑ Data. The **Data Manager** can be opened or closed by right-clicking in the **Object Manager** or plot window and selecting **Managers | Data Manager** in the context menu. Click the button in the title bar of the **Data Manager** to close the window.

Changing the **Object Manager** Location

The **Data Manager** can be docked on the edge of the **MapViewer** window or floated as a pop-up window. To change the position of the **Data Manager**, click on the title bar and drag it to a new location. While dragging the manager to a new location, the docking interface is shown on the screen. You can double-click on the title bar to toggle between floating and docked modes. You can drag the sides of the **Data Manager** to change the size of the window.

The Data View

Click the *Data* button in the **Data Manager** to show the **Data** view. The **Data** view shows the data columns and data values for the object in the linked worksheet. The object type and PID are showed in the title bar.

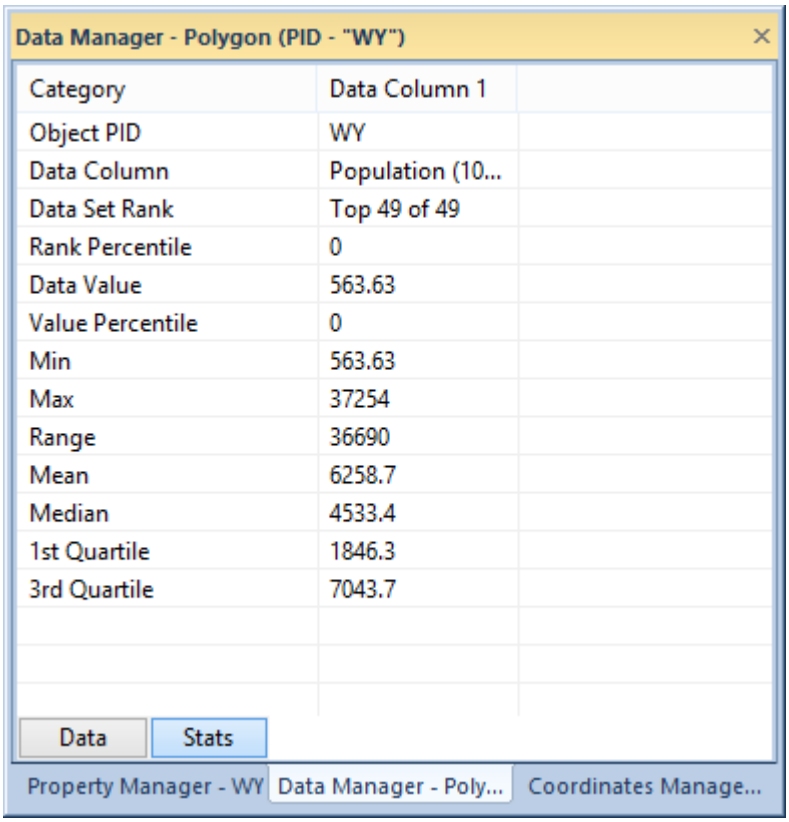


Edit data values and create new data columns in the Data *view of the* ***Data Manager****.*

The *Data Column* section displays the column headers used in the map's data. If you do not have column headers in your data file, the column letter is displayed instead. This column is not editable. The *Data Value* column displays all of the data associated with the selected object. You can edit the data values by double-clicking on a data value. If you add an apostrophe (') before a number, the number is read as text as in the worksheet. Hold down the CTRL key and click in the **Data Manager** to add a new column of data to the worksheet. You must have an object selected to add a column.

The Stats View

The **Stats** view contains statistics on the selected object.



Category	Data Column 1
Object PID	WY
Data Column	Population (10...
Data Set Rank	Top 49 of 49
Rank Percentile	0
Data Value	563.63
Value Percentile	0
Min	563.63
Max	37254
Range	36690
Mean	6258.7
Median	4533.4
1st Quartile	1846.3
3rd Quartile	7043.7

View object data statistics in the Stats *view of the* ***Data Manager****.*

The *Category* column lists all of the statistical categories available. *Data Column 1* contains statistics on the first data variable. If you have a map with multiple variables, such as a pie map or bar map, the other map variables appear in the subsequent columns (*Data Column 2*, *Data Column 3*, etc). If you are obtaining statistics on a prism map object, *Data Column 1* contains the height variable and *Data Column 2* contains the color class variable.

<u>Reports</u>

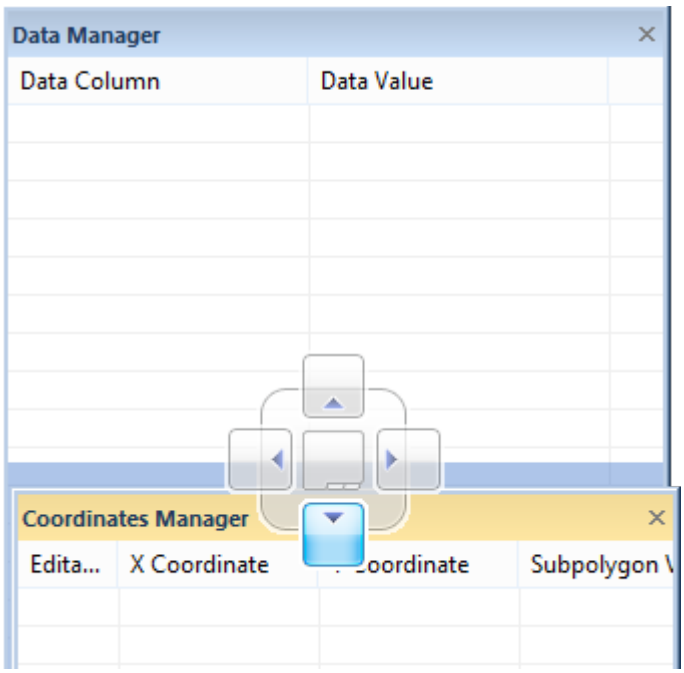
To create a report of the selected object's data, right-click in the **Data** view to generate an Object Data Report. Right-click in the **Stats** view to generate an Object Statistics Report. Alternatively, the report can be generated with the Object Data Report command.

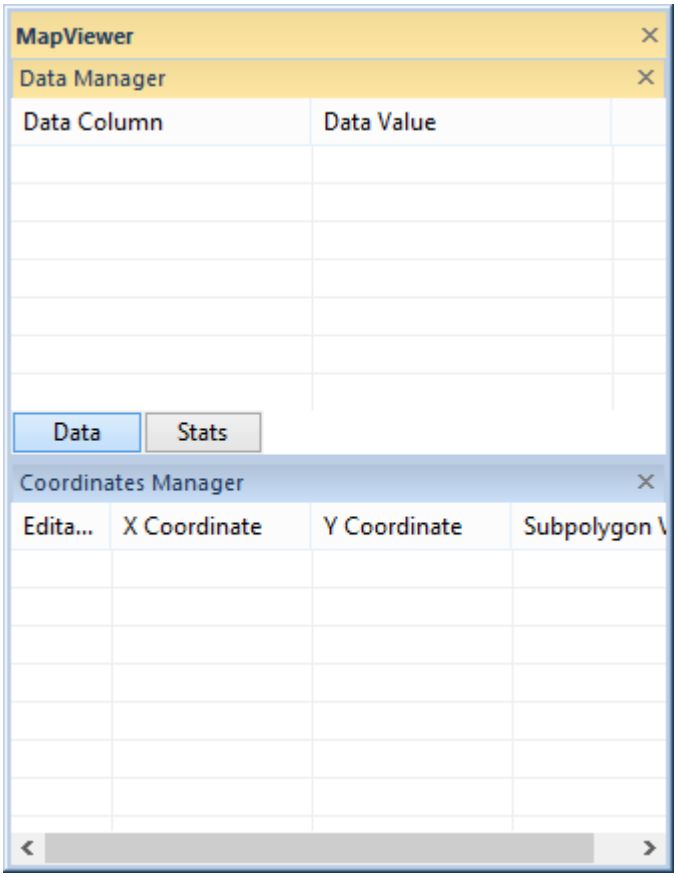
Manager Layout

The managers can be displayed as individual windows or as a tabbed window.

If you want to "stack" the managers:

1. Drag one manager on top of another manager.
2. Position the cursor in one of the four outside squares in the docking user interface. A blue rectangle will indicate the stacked area.

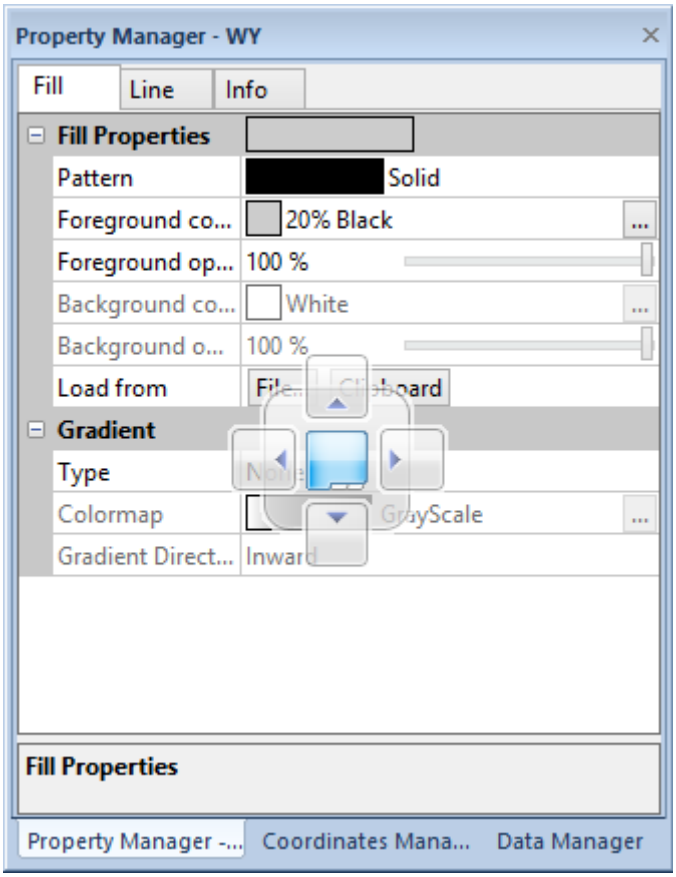




Position the cursor in the bottom square (top graphic) to "stack" one manager on top of the other (bottom graphic).

To create a tabbed view:

1. Drag one manager on top of another manager.
2. Position the cursor within the middle square in the docking user interface. You will see an outline of the manager with a tab at the bottom if you have positioned the cursor correctly.



Position the cursor in the middle square to create tabbed managers. Notice the tab outline near Auto Update.

To return to individual managers from tabbed view:

1. Click on the manager's name on the tab.
2. Drag the tab to a new position.

Click on the manager's tab and drag the cursor to a new position to separate the managers.

Application / Document Control Menu Commands

To display the application control menu click the application control button in the top left corner of the **MapViewer** application window, or press ALT+SPACEBAR, or right-click the application window title bar. To display the document control menu click the document control button in the top left corner of a document window, or press ALT+HYPHEN, or right-click the document window title bar.

Restore	Returns the active window to its previous size.
Move	Repositions the active window.
Size	Changes the size of the active window.
Minimize	Shrinks the active window to an icon.
Maximize	Expands the active window to the full size of the screen.
Close	Closes the active window.

Application / Document Control Close

Application or document control **Close** closes the active application window.

To close the application or document:

- Click the button in the upper right corner of the title bar
- Or click the application/document control button in the left corner of the title bar and select **Close**
- Or right-click the title bar and then click **Close**
- Or press ALT+SPACEBAR+C (application) / ALT+HYPHEN+C (document)
- Or press ALT+F4 (application) / CTRL+F4 (document)

Application / Document Control Maximize

Application Control **Maximize** expands the active application window to the full size of the screen. Document Control **Maximize** expands the active document window to the full size of the application window. To restore a maximized window to its former size, use the Restore command.

To maximize the window:

- Click the icon in the upper left corner of the title bar and select **Maximize**
- Or right-click the title bar and then click **Maximize**
- Or click
- Or right-click the window title bar and then click **Maximize**
- Or press ALT+SPACEBAR+X (application) or ALT+HYPHEN+X (document)

Application / Document Control Minimize

Minimize reduces the application window or document window to a small icon at the bottom of the screen. To restore the window to its previous size, use the Restore command or double-click the icon.

To minimize the window:

- Click the button
- Or click the button in the upper left corner of the title bar and select **Minimize**
- Or right-click the window title bar and then click **Minimize**

- Or press ALT+SPACEBAR+N (application) / ALT+HYPHEN+N (document)

Application / Document Control Move

Move repositions an application window or document window.

To reposition the window:

- Click the button in the upper left corner of the title bar and select **Move**
- Or right-click the title bar, then click **Move**
- Or press ALT+SPACEBAR+M (application) / ALT+HYPHEN+M (document)

Tips:

- Press the ENTER key to anchor the window in its new position.
- The CTRL key + ARROW keys moves the window slowly.
- This command is unavailable if the window is expanded to maximum size.
- The active window can be repositioned by dragging the title bar with the mouse.

Document Control Next

Next activates the next document window and moves it to the top of all other document windows.

To go to the next document window:

- Click the button in the upper left corner of the title bar and select **Next**
- Or press ALT+HYPHEN+T
- Or press CTRL+F6

Application / Document Control Restore

Restore restores the active application window or document window to the size and location before the Maximize or the Minimize command was used.

To restore the window:

- Click the button in the upper left corner of the title bar and select **Restore**
- Or click the  button
- Or right-click the window title bar and then click **Restore**
- Or press ALT+SPACEBAR+R (application) / ALT+HYPHEN+R (document)

Application / Document Control Size

Size changes the size of the active application window or document window.

To size the window:

- Click the button in the upper left corner of the title bar and select **Size**
- Or right-click the application window title bar and then click **Size**
- Or press ALT+SPACEBAR+S (application) / ALT+HYPHEN+S (document)

Tips:

- Press ARROW keys after choosing the command.
- Press the ENTER key when the window is the appropriate size.
- The CTRL key + ARROW keys sizes the window slowly.
- The active window can be resized by dragging the gray window border with the mouse.

Chapter 3

Tutorial

Tutorial Introduction

The tutorial is designed to introduce you to some of **MapViewer's** basic features. After you have completed the tutorial, you should be able to begin creating your own maps. We strongly encourage completing the tutorial before proceeding with **MapViewer 8**, even if you have used previous versions of the program.

If you find you still have questions after you have completed the tutorial, you should consider reviewing the material in **MapViewer's** extensive online help file. However, if you still have questions, do not hesitate to contact Golden Software's technical support. We are happy to answer your questions before they become problems.

Tutorial Lessons

The following is an overview of lessons included in the tutorial.

Lesson 1 - Data Files shows you how to create and format a data file to use in mapping.

Lesson 2 - Boundary Files explains boundary files used to create a map.

Lesson 3 - Creating a Thematic Map shows you how to create a thematic map.

Lesson 4 - Editing Map Properties shows you how to change thematic map properties.

Lesson 5 - Adding Map Accessories describes some of the **MapViewer** features such as legends.

Lesson 6 - Using Layers to Create Two Thematic Maps in One Map Window shows you how to add another thematic map layer to a single map.

Lesson 7 - Changing the Projection shows you how to change the map projection.

Lesson 8 - Saving and Exporting the Map explains how to save and export maps.

Advanced Tutorial Lesson 1 - Boundary Editing

Advanced Tutorial Lesson 2 - Querying

Advanced Tutorial Lesson 3 - Downloading Online Maps

The lessons should be completed in order; however, they do not need to be completed in one session.

Note about the Documentation

The **MapViewer 8** documentation includes a getting started guide and this online help file. Basic information about each command and feature are included in the online help file. The online help file also includes advanced information such as creating multiple layer maps with multiple thematic elements. Other sources of **MapViewer** information include our support forum, FAQs, and technical support.

If you prefer printed documentation, you can purchase the full PDF user's guide that includes all documentation for the program. The PDF guide can be printed by the user, if desired. The guide can be purchased at www.goldensoftware.com. You can also print pages and books from the online help. See Printing the Online Help topic for more information

Various font styles are used throughout the **MapViewer** documentation. **Bold** text indicates tab or menu commands, dialog names, and page names. *Italic* text indicates items within a dialog such as group box names, options, and field names. For example, the **Import File** dialog contains a *Look in* list. Bold and italic text may occasionally be used for emphasis. Often, hyperlinks replace the **Bold** text for commands and dialogs. Click the hyperlink to see the help page for the command or dialog.

Also, menu commands appear as **Draw | Shape | Text**. This means, "Click on the **Draw** tab at the top of the ribbon bar, and then click on **Text** within the **Shape** section." The first word is always the tab name, and the second word is the ribbon section. If applicable, the next word is a command group. The final word is the command. The **Draw | Image | Filters | Spatial** is an example of a command contained in a command group.

Using the Tutorial with the Demo Version

If you are using the demo version of **MapViewer**, you will not be able to complete some of the steps due to disabled features. When this is a factor it is noted in the text and you are directed to proceed to the next step that can be accomplished with the demo.

Lesson 1 - Data Files

Lesson 1.0 - Data Files

A **MapViewer** data file must contain a primary ID (PID) and at least one variable. Each row contains a PID that is linked to an object on the map and that object's associated data values.

If the data are already in a file, note that you do not need to display the data in a worksheet window. However, if the data are not in a file, you must first create a data file before you create a map. See Worksheet Document for additional information on data files, worksheet windows, and how to manipulate data in the worksheet.

Lesson 1.1 - Opening a Data File

To look at an example of a data file, please open TUTORIAL.XLS into a worksheet window. Click the

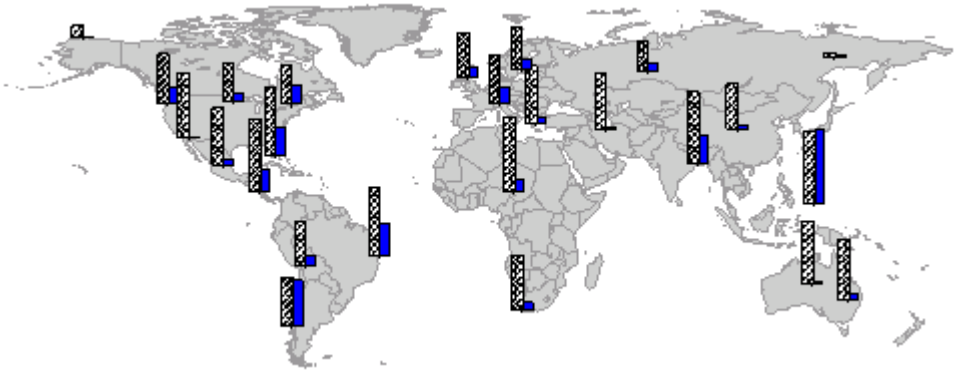
1. Click the **File | Open** command or click the button on the Quick Access Toolbar.
2. In the **Open** dialog, click the down arrow in the *File type* field and select *XLS Excel Spreadsheet (*. xls).*
3. In **MapViewer's** Samples folder, click TUTORIAL.XLS and then click the *Open* button.

Although it is not required, the header text (the text in row 1) is helpful to identify the type of data in the column, and this information is used in dialog boxes when selecting data columns. You do not need to open the data file before creating a map, although it is useful to view the data to be sure the correct data are contained in the file.

Lesson 2 - Boundary Files

Lesson 2.0 - Boundary Files

MapViewer contains boundary files in the Samples folder. In addition to these boundary files, you can create your own boundaries or import them from another source. All maps must have primary IDs assigned to the boundary objects (polygons, polylines, and points). If you are importing boundaries from an outside source, keep in mind that Atlas Boundary [.BNA], ESRI ArcInfo Export Format [.E00], MapInfo Interchange [.MIF], and ESRI Shapefiles [.SHP] files can carry primary IDs.



Boundary files can be used for map reference. In the map above, the bar map was created from a pin map, and the map of the world is used for reference.

Import a Boundary File:

1. Select the **File | New | Plot** command or click the button on the Quick Access Toolbar. This creates a new plot document for displaying a map.

   Note: Opening a new plot automatically switches to the new plot document in the **MapViewer** window. You can click the tabs at the top of the window to switch between plot and worksheet documents. If you opened **MapViewer** and directly started the tutorial, you should have Plot1, TUTORIAL, and Plot2 document tabs at the top of the window.

2. Click the **Map | Create Map | Base** command to display the **Import** dialog. The boundary file to display in the plot window is selected in the **Import** dialog. Alternatively, you can select the **File | Import** command or click the button on the Quick Access Toolbar to open the **Import** dialog.

3. In the **Import** dialog, browse to the **MapViewer 8** Samples folder. Next, click the down arrow in the *File type* field, and then choose *Common Graphic Files (*...)*. In the list of files, click TUTORIAL.GSB and the name appears in the *File name* box. Check the *Append image*, *Show options if they are available*, and *Scale map if it's too big* boxes if they are not already checked. Next, click the *Open* button.

4. In the **Import Options** dialog, you can define the ID columns for the primary ID, secondary ID, attributes, and hyperlink. For this example, the default import options are acceptable. Click the *OK* button and the boundary map is displayed in the plot window. **Note:** The default properties are as follows: *Create PID* is set to Primary and *Create SID* is set to Secondary. The *Create Hyperlink* box is not checked. All available attributes and *Import objects to their specified layers if multi-layers exist* are selected. The *Import attributes list to linked worksheet* and *Import objects that are (partially) within the limits of the existing map* options are unchecked.

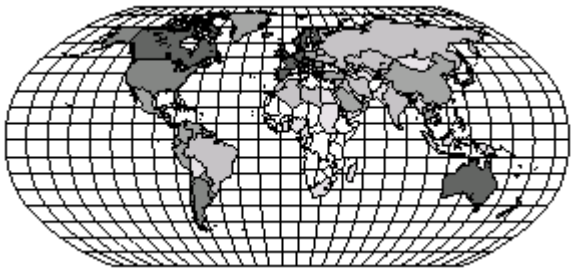
If the file you are importing does not contain IDs, for example, AutoCAD Drawing [.DXF] files, you can assign IDs to objects in the map by selecting the boundary object (for example, click on a polygon) and typing the ID into the *PID* field of the Info page in the **Property Manager**.

When you are creating a thematic map, you are prompted for a boundary file automatically unless a boundary file is already opened. See Lesson 3 - Creating a Thematic Map for information on this procedure.

Lesson 3 - Creating a Thematic Map

Lesson 3.0 - Creating a Thematic Map

For the first mapping example, we will create a hatch map. A hatch map uses colors or patterns to represent data ranges. It is one of the most common ways to display information on a map because it provides an easy-to-understand visual representation of the data. On a hatch map, all the data values are assigned to a particular class or range of data. In this example, each class is assigned a different fill color that is gradational between two or more colors. Intermediate classes are assigned gradational colors depending on where they fall in the data range.



Hatch maps use colors or patterns to represent data ranges.

As mentioned previously, thematic maps require both a base map and a data file. When you choose a thematic map command, you are required to select a boundary file and data file you would like to use. To begin creating a thematic map, simply choose the map command you want to use from the **Map** menu.

Creating a Thematic Map

The following steps are for continuing the tutorial from Lesson 2.0. If you have not completed the preceding lessons, see the "Open a New Map Window," "Selecting a Map Type," and "Import a Boundary File" sections below.

1. Click the **Map | Create Map | Hatch** command 

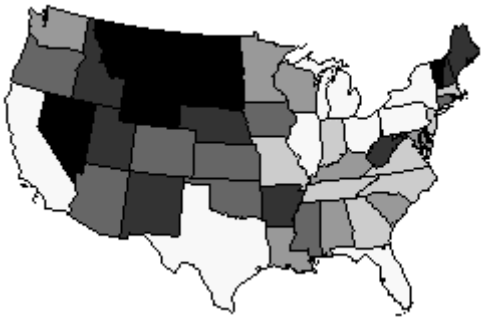
to convert the base map on Layer #1 to a hatch map. The TUTORIAL.xls file we opened in Lesson 1.1 needs to be linked to the layer to create the thematic map. Clicking the **Map | Create Map | Hatch** command opens the Open Data File dialog.

2. Click the TUTORIAL.xls file in the **Open Data File** dialog. Notice the *File name* changes to TUTORIAL. Since we opened TUTORIAL.xls earlier, we can alternatively select TUTORIAL in the *Use loaded worksheet:* list. Click the *Open* button.

3. The TUTORIAL.xls data file is now linked to Layer #1 and a hatch map is displayed in the plot window.

4. It is good practice to name layers when using multiple layers and map types in a plot document. Rename Layer #1 by clicking on it in the **Object Manager**, wait a moment, then click again to enable editing. Type "Hatch Map" and press ENTER to name the layer.

Your tutorial hatch map should look similar to this map. The colors may vary depending on your settings. Changing the colors is discussed as part of Lesson 4.



If you have not completed Lessons 1 and 2, you can quickly generate a similar hatch map with the processes below.

Open a New Map Window

First, open a new plot window by selecting the **File | New | Plot** command or clicking the  button on the Quick Access Toolbar.

Selecting the Map Type

To begin creating a hatch map, click the **Map | Create Map | Hatch** command to display the **Import** dialog.

Import a Boundary File

Select the TUTORIAL.gsb file in the Samples folder in the **Import** dialog. Next click the *Open* button. Click the *OK* button in the **Import Options** dialog. See Lesson 2 for more information on importing a boundary file and the associated dialog options.

Opening a Data File

Next, the Open Data File dialog is displayed, prompting you for the data file to use. Click the TUTORIAL.xls file in the Samples folder in the **Open Data File** dialog. Next click the *OK* button. See Lesson 1 for more information on opening a data file.

There is now a hatch map displayed in the plot window.

Lesson 3.1 - Zooming In to Get a Better View

The View tab contains a number of helpful commands that control the level of detail shown for your map. For example, the plot window might be quite large, and the map itself relatively small so there is a lot of empty space surrounding the map. Conversely, portions of the map might extend

outside the plot window limits, so only a portion of the map is displayed. In these cases, a quick way to adjust your view of the map is to use the **View | Zoom | Fit to Window** command. This makes the map as large as possible in the plot window while still allowing the entire map to be seen. You might try using this command if you need it again while proceeding through the rest of the tutorial. You can also use the other View tab commands to change the view level of your map.

If your mouse is equipped with a wheel, you can zoom in and zoom out by rolling the mouse wheel forward and backward. You can also click and hold the mouse wheel to pan the window.

Lesson 3.2 - Viewing the Hatch Map Data

When a thematic map is created, you are required to open a data file for the map. The data file does not need to displayed in a worksheet window to be used in a thematic map. However, if you want to view or edit the data associated with a map, you may open the worksheet window as follows.

1. Click the **Home | Data | View** command. A worksheet window is opened displaying the data for the thematic map. Notice for this tutorial, TUTORIAL.xls contains Primary IDs in column A, Population (1000's) in column B, and Land Area in column C.

2. To return to the map, click the **Plot2** tab above the worksheet window.

Lesson 3.3 - Changing the Map Type

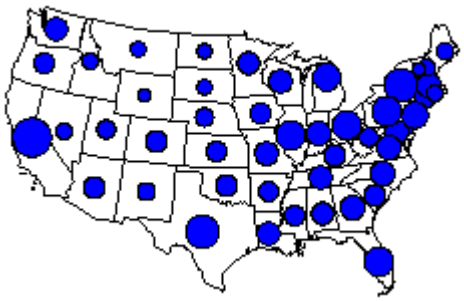
Although hatch maps are very effective for displaying data distribution, you might consider some of **MapViewer's** other thematic map types to display the same data. **MapViewer** can easily change between map types to show the same data on the map. In most cases, changing map type is as simple as selecting the type in the **Map** tab. For example, consider this brief exercise in which you can create a symbol map and density map with the same data.

<u>Changing the Hatch Map into a Symbol Map</u>

To change the hatch map into a symbol map:

1. Click the **Map | Create Map | Symbol** command 

.



Symbol maps display variables according to symbol size.

Changing the Symbol Map into a Density Map

To change the symbol map into a density map:

1. Click the **Map | Create Map | Density** command 

.

Density maps display a greater number of symbols in areas with higher data values.

You can experiment with any of the map parameters for any of the map types you create. The most important point to keep in mind is that the location of the PID (primary ID) column in the data is the only parameter you should not change on an existing map. If you change this, the link between the map boundaries and the data is broken until you change back to the correct data column.

Often, **MapViewer's** default data column selections make a seamless transition between map types. However, some map types can present more than one data column, and multi-graph maps require a unique data column arrangement. You can change the data column selections in the *General* page of the **Property Manager**. Occasionally other layer properties need to be edited after changing map type to better display the map.

Lesson 4 - Editing Map Properties

Lesson 4.0 - Editing Map Properties

MapViewer maps are highly customizable. Properties for plots, layers, and objects are located in the **Property Manager**. Select an object by clicking on it in the plot window or **Object Manager** to view its properties in the **Property Manager**. We will continue the tutorial by changing our hatch map colors and classes. We will also display the Primary IDs for the states on the map.

Viewing Map Layer Properties

To continue the tutorial, we need to display the hatch map properties in the **Property Manager**. Click the layer name in the **Object Manager** to select the hatch map layer. If you changed the layer name in Lesson 3.0, click "Hatch Map." Otherwise, click "Layer #1." Alternatively, click the **Map | Layer | Layer Properties** command and **MapViewer** will select the active layer and show its properties in the **Property Manager**. The **Layer Properties** command is useful for quickly selecting the map layer for editing when the plot contains many layers and objects.

If you changed the map type in the previous lesson, click the **Map | Create Map | Hatch** command to change the map back to a hatch map.

Lesson 4.1 - Changing the Hatch Map Colors

After creating a map, you can change how the map is displayed. Most of the time, the **MapViewer** defaults create a visually appealing hatch map, but there are times when you might want to customize the map. For example, you might want to change the colors used for the hatch map fill. This is accomplished by opening the hatch map properties.

Click on the map layer name in the **Object Manager** or click the **Map | Layer | Layer Properties** command to select the hatch map layer. See the "Viewing Map Layer Properties" section in the Editing Map Properties lesson for more information on selecting objects in the **Object Manager** and the **Layer Properties** command.

Changing Hatch Map Colors

To change the fill colors:

1. Open the hatch map properties by using one of the methods listed above.
2. In the **Property Manager**, click on the *Map* tab to view the Map page.
3. Click the Edit... button in the *Classes* field to open the Data Classes dialog.
4. Click the *Fill* column title to open the Color Spectrum dialog.
5. Click the *Foreground colors* spectrum and select *Sunrise* in the color spectrum list for the hatch map. *Sunrise* is about halfway down the color spectrum list.
6. Click *OK* in the **Color Spectrum** and **Data Classes** dialogs to apply the new color spectrum to the map.

Also, you can change the individual colors in a hatch map by double-clicking on the class color in the *Fill* column in the **Data Classes** dialog.

Lesson 4.2 - Changing the Number of Classes

You can also change the number of classes on the hatch map. In this example, we will change the number of classes and classification method so the hatch map displays eight classes of equal size.

Click on the map layer name in the **Object Manager** or click the **Map | Layer | Layer Properties** command to select the hatch map layer. See the "Viewing Map Layer Properties" section in the Editing Map Properties lesson for more information on selecting objects in the **Object Manager** and the **Layer Properties** command.

To change the number of classes and classification method:

1. Open the hatch map properties with one of the methods described above.
2. In the **Property Manager**, click on the *General* tab to view the General page.
3. Click the *Use user-defined limits* check box to enable editing in the *Min limits* and *Max limits* fields.
4. Type "0" into the *Min limits* field then press ENTER. Type "40000" into the *Max limits* field and press ENTER.
5. In the **Property Manager**, click on the *Map* tab to view the Map page.
6. Click the Edit... button in the *Classes* field to open the Data Classes dialog.
7. Type "8" into the *Number of classes* input box or click the button until the *Number of classes* value is "8."

8. Click the *Classification method:* and select *Equal intervals* from the list. Notice the *Increment* field displays 5000. Also look at the *Count* column of the *Objects in classes* list. Notice there are no states in classes 5 or 7.
9. Click the *OK* button.

The hatch map now has 8 classes, each with a range of 5000. Because the population data is in thousands, each class size corresponds to 5 million people. Changing the number of classes, classification method, and hatch map colors lets you control the way your data is displayed.

Lesson 4.3 - Displaying the Primary IDs

As mentioned previously, the primary ID is the link between the map boundaries and the data. But you might have noticed that the primary IDs are not displayed on the map. By default, the display of primary IDs is turned off. There are two methods for displaying Primary IDs on the map.

Displaying PIDs as Data Labels

To display PIDs on the map as data labels:

1. Click on the hatch map layer in the **Object Manager** or click **Map | Layer | Layer Properties**
2. In the **Property Manager**, click on the *Data Labels* tab to view the Data Labels page.
3. Click the *Show data labels* check box. Notice the *Label set* is *Column A: Primary ID*. The *Label Sets* section is used for selecting the data column that is displayed, and multiple labels can be added to each object. For the purpose of this tutorial, we will display only the PIDs.
4. Scroll down on the *Data Labels* page of the **Property Manager** and enter "14" in to the *Size (points)* field of the *Font Properties* section.

The PID data labels are now shown on the map. Any combination of data from the worksheet can be added to the map.

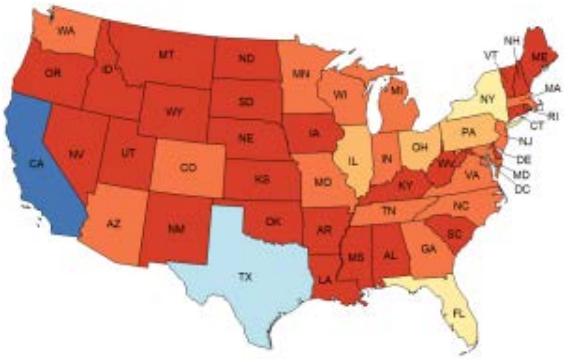
Data labels can also be moved individually. We will now move some of the PIDs and add leader lines to increase our map's readability.

Moving Data Labels and Adding Leader Lines

To move data labels:

1. Click the *Start* button in the *Move/edit labels* field to begin moving labels. The *Move/edit labels* field is located at the top of the *Data Labels* page in the *General* section.
2. Click and drag labels to move them. Move the northeastern states' data labels so they can be easily read. For example, move DC, MD, DE, NJ, CT, RI, and MA east off of the map. Also you can move VT and NH north.
3. Click the *Finish* button in the *Move/edit labels* field to stop moving labels. **Note:** You can click the *Clear* button next to *Clear custom labels* to revert the labels back to their default locations.
4. In the *Leader Line - Column A: Primary ID* section of the *Data Labels* page, click the *Show* check box.

Now the hatch map has readable PIDs and lead lines have been added to the data labels. The lead lines are not visible for PIDs that have not been moved. If you have followed the tutorial up to now, your map should look similar to this:



The primary IDs can be displayed on all the map boundaries. On the tutorial map, the states use the two-letter designations as primary IDs.

Displaying PIDs with the Show Objects Command

The PIDs can be quickly displayed and moved with the **View | Display | Show Objects** command, but the font properties cannot be edited. Leader lines cannot be added automatically to PIDs showed with the **Show Objects** command. For customizing PID labels, use the *Data Labels* page in the **Property Manager**. When customization is not needed, use the **Show Objects** command for quickly adding PIDs.

Lesson 5 - Adding Map Accessories

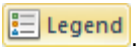
Lesson 5.0 - Adding Map Accessories

MapViewer has many mapping and drawing utilities that enhance your maps. Many of these accessories are located in the Draw and Map tabs. For example, you can add text to the map with **Draw | Shape | Text**, add a scale bar to the map with **Map | Add | Scale Bar**, etc. A few of these features are discussed in this lesson.

Lesson 5.1 - Adding a Legend

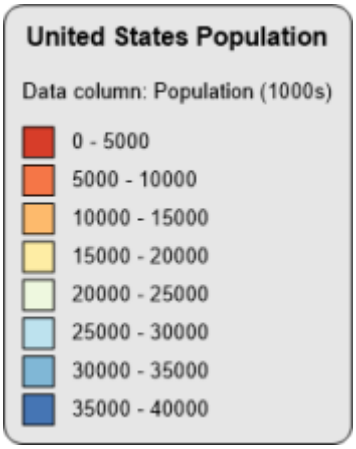
When you make a thematic map, it is helpful to provide some explanation of the way in which data is represented on the map. You can easily add legends to any type of thematic map. **MapViewer** legends show quantitative information about the thematic map.

To add a legend:

1. Click the **Map | Add | Legend** command 

. Then, click the newly created legend and move it off of the map. When you click the legend in the plot window it is also selected in the **Object Manager**, and its properties are shown in the **Property Manager**.
2. Now add a title. In the **Property Manager**, click the *Layer* tab to view the Layer page.
3. Replace the "Legend of Hatch Map" ("Legend of Layer #1") text with "United States Population" in the *Text* row in the *Title* section. Press ENTER to change the legend title.
4. Next add a fill to the legend. In the **Property Manager**, click the *Legend* tab to view the Legend page.

5. Click the *Pattern* selection (currently *None*) and select *Solid* from the pattern palette.
6. Click the *Foreground color* selection (currently *Black*) and select *10% Black* in the color palette.



Legends display information about the map.

Lesson 5.2 - Drawing Objects on the Plot

Next, we will add a title for the map by drawing rounded rectangle and text objects.

Drawing a Rounded Rectangle

First we will draw a rounded rectangle to surround the text.

1. Click the **Draw | Shape | Rounded Rectangle** command. The cursor changes to a crosshair in the plot window to indicate draw mode is enabled.
2. Click and drag in the plot window to create the rounded rectangle.
3. Press ESC or click the **Draw | Tools | Select** command to end draw mode.
4. Click the Rounded Rectangle in the **Object Manager** if it isn't already selected. Next, click the *Fill* tab in the **Property Manager** to view the Fill page.
5. Select *Solid* in the *Pattern* palette and select *10% Black* in the *Foreground color* palette.

Drawing Text

Next we will draw a text object for the map title.

1. Click the **Draw | Shape | Text** command. The cursor changes to a crosshair to indicate draw mode is enabled.
2. Click the plot window where you want the text to be drawn. The point you click is a reference point for drawing the text. Later, you can edit the text location in relation to the reference point in the font properties page.
3. Clicking in the plot window opens the Text Editor. Change the font size to about *40 pts* and type a title into the **Text Editor**. Click *OK* when you are finished adding text.

Aligning the Rounded Rectangle and Text

The rounded rectangle can be moved and resized by clicking and dragging on the object or its selection handles. The text box can be moved and sized in this manner, or by changing the font size in the **Property Manager** or **Text Editor**. Below is one method for aligning the objects to make a visually appealing title.

1. First, be sure that the "Text" object is above the "Rounded Rectangle" in the **Object Manager**. If the draw order is reversed, the rounded rectangle fill will cover the text, so it is not visible. Change object order in the **Object Manager** by clicking and dragging the object name, or using the **Arrange | Move** commands.
2. Next, hold CTRL and click the "Text" object and "Rounded Rectangle" object in the **Object Manager**. Or, hold SHIFT and click the text and rounded rectangle objects in the plot window.
3. Click the **Arrange | Align | Center** and **Arrange | Align | Middle** commands to have **MapViewer** align the objects.
4. While both objects are selected, click and drag them to your desired location.

You can experiment with the Align Objects commands, **Arrange | Size and Postition** fields, **Text Editor**, and Font Properties to further refine object placement in relation to the map or relation to the page.

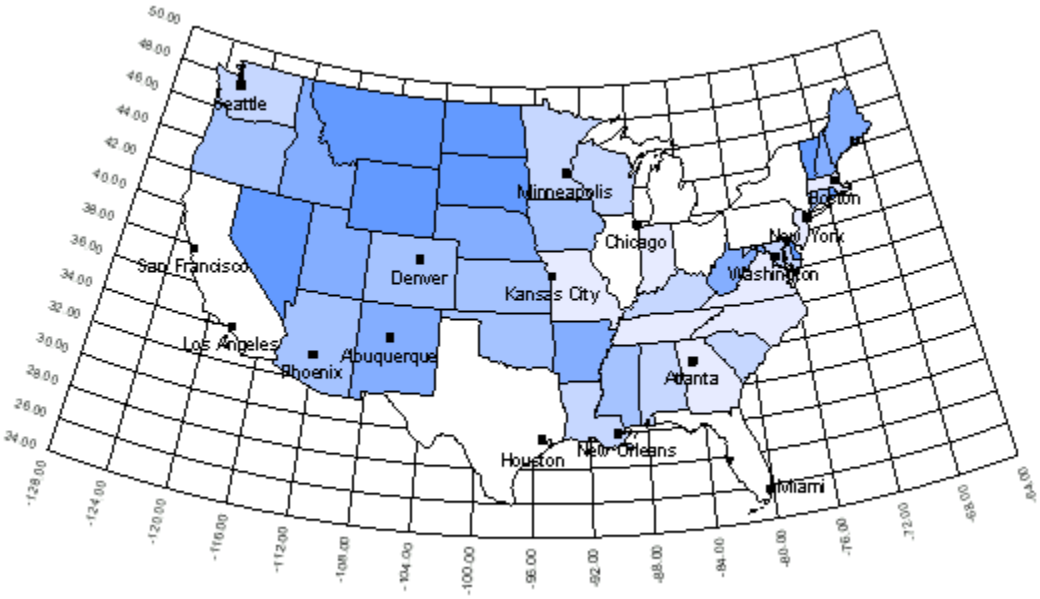
Lesson 5.3 - Adding Graticule Lines to Show the Map Coordinate System

The graticule consists of grid lines that indicate the map coordinate system. The graticule lines are commonly based on latitude/longitude coordinates (as in this example), but they can also indicate any type of map coordinate system. In this example, we will add a graticule, add graticule lables, and change the graticule limits.

To add a graticule:

1. Click the **Map | Add | Graticule** command.
2. Click the **Map | Plot | Plot Properties** command to show the plot properties in the **Property Manager**. You can also show the plot properties by clicking empty space in the **Object Manager** or plot window.
3. In the **Property Manager**, click the *Graticules* tab to view the Graticules page.
4. In the General section of the *Graticules* page, if there is not a check mark next to *Draw graticules under map* check box, click the box to enable this option. *Draw graticules under map* is used to move the graticule behind the boundaries and other objects on the map layer. Otherwise, the graticule is drawn over the top of all boundary objects on the layer.
5. In the *Y Graticules* section, change the *Graticule end* to 50 and press ENTER.
6. In the **Property Manager**, click the *Graticules Ticks* tab to open the Graticule Ticks page. This page contains options for displaying labels and ticks on the graticule lines.
7. In both the *X Graticules* and *Y Graticules* sections, click the *Show start labels* check boxes.

Notice that the graticule lines are curved on the map. This reflects the map projection. This map uses an Albers Equal Area projection.



Graticule lines show the map coordinate system for the map.

Lesson 6 - Using Layers to Create Two Thematic Maps in One Plot Window

Lesson 6.0 - Using Layers to Create Two Thematic Maps in One Plot Window

One of **MapViewer's** strengths is the ability to add layers to your maps. Each time you open a new plot window, *Layer #1* is automatically created and it is the active layer, ready to receive any type of input such as imported boundary files, drawing objects, and so on. Layers are like transparencies in that you can see through each layer to the underlying layers. An important characteristic of layers is that each layer can have only one thematic map and can have only one data file associated with it.

Active Layer

The active layer is indicated on the right end of the status bar at the bottom of the **MapViewer** window. If you cannot see the entire status bar, click the button in the upper right corner of the main **MapViewer** window. The **MapViewer** window fills the screen, and the entire status bar is displayed.

Object Manager

The **Object Manager** also displays the layer information in **MapViewer**. You can rename layers, change the order of layers, make a layer active, and remove layers in the **Object Manager**. The active layer name is indicated with **Bold** text.

Creating a Second Thematic Map on a New Layer

In this example, we add a second thematic map to our hatch map, creating a pin map over the top of the hatch map. Pin maps show point locations by drawing a symbol at each point to be shown on the map.

To create a new layer:

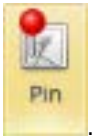
1. Choose the **Map | Layer | New Layer** command 

. A new layer is created in the **Object Manager**.
2. Rename the new layer by clicking once, waiting a moment, and clicking again on the new layer's name in the **Object Manager**. Type "Pin Map" and press ENTER.

Clicking on a layer name in the **Object Manager** makes the layer the active layer. You do not need to move the layer to the front to make it active. You can only select objects on the active layer when clicking in the plot window. Click "Pin Map" in the **Object Manager** to make it the active layer, and then click on objects in the plot window. Notice that because all of the objects are on the "Hatch Map" layer, none are selected.

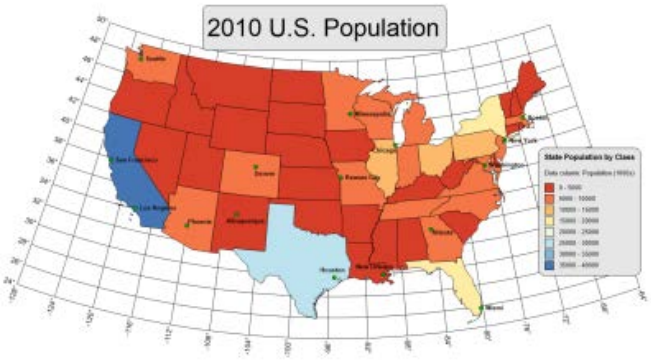
Lesson 6.1 - Creating a Pin Map

Now you are ready to create the pin map on the new layer:

1. Click the **Map | Create Map | Pin** command 

. The **Open Data File** dialog opens and you must select a data file. In the **MapViewer** Samples folder, double-click the file USCITY.XLS.
2. In the **Property Manager**, click the *General* tab to open the General page. Make sure the *Locating method* is set to *Coordinate.*
3. Verify the following settings: In the *PID Column* field, *Column A: Cities* is selected. *Column B: Longitude* for the *X coordinate* and *Column C: Latitude* for the *Y coordinate* should be selected.
4. In the **Property Manager**, click the *Map* tab to open the Map page. Click the *Method* selection and select *Uniform symbol* from the list if it is not the current *Method*.
6. In the **Property Manager**, click the *Symbol* tab to view the Symbol page. Select a symbol in the *Symbol* list
7. **MapViewer** includes many symbol sets. You can browse the *Symbol* options for each *Symbol Set* and select a symbol for your pin map.
8. In the **Property Manager**, click the *Pin Labels* tab to open the Pin Labels page. Click the *Show label* box and choose *Column A: Cities* from the *Label source column* list. This adds the city names next to the points on the map. Click and drag the labels to move them. You can also delete individual labels by clicking them and pressing DELETE on your keyboard.

At this point, you may wish to remove the data labels from the Hatch Map layer. Select the Hatch Map in the **Object Manager** and uncheck the *Show data labels* option in the *Data Labels* **Property Manager** page. Your data label settings will be saved. So, if you decide to show the state PIDs again, they will be unchanged from before.



Pin maps draw point locations on a map, and can show optional labels. This pin map is on a layer on top of an existing hatch map.

Lesson 7 - Changing the Projection

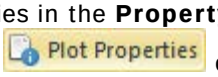
Lesson 7.0 - Changing the Projection

Maps are usually seen in a flat, two-dimensional medium such as a drawing on paper or an image on a computer screen. Since the surface of the Earth is curved, or three-dimensional, the visual elements on the surface must be transformed from three dimensions to two in order to display a map of the Earth's surface. Projections are a mathematical process by which the visual elements are transformed from three dimensions to two. The Introduction to Map Projections help page discusses map projections in detail.

You can select the target coordinate system from your map in the Coordinate System page in the **Property Manager** for the plot properties. Data and boundary files may have different, or even undefined, projections. **MapViewer** converts the information for the map layers from their source coordinate system to the target coordinate system.

<u>Changing the Map Projection</u>

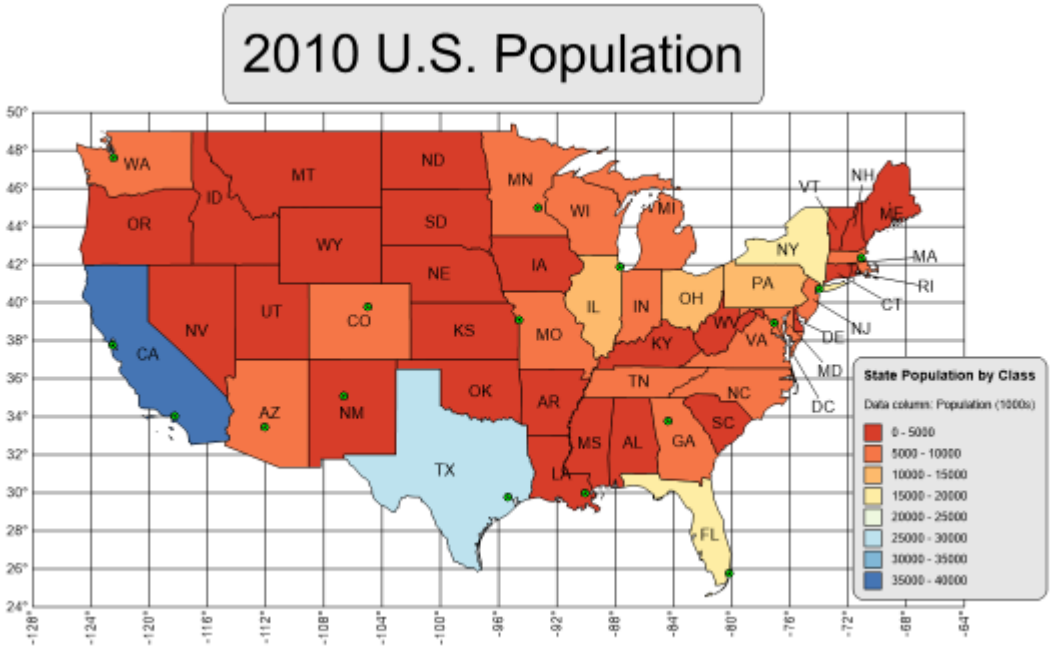
To change the map projection:

1. View the plot properties in the **Property Manager** by clicking the **Map | Plot | Plot Properties** command  or clicking empty space in the **Object Manager** or plot window.
2. In the **Property Manager**, click the *Coordinate System* tab to view the Coordinate System page.
3. Click the *Change...* button in the *Coordinate system* field to open the Assign Coordinate System dialog.
4. Navigate to the *Templates* section by clicking the expand ⊞ buttons next to *Predefined* and *Templates*. Select *Template - Equidistant Cylindrical Projection* in the projection list.
5. Click the *OK* button.

Notice the title text, title rectangle, and edited data labels have appeared to move or rotate. Actually their locations relative to the map coordinates has not changed. Use the *Move/edit data labels* mode in the Hatch Map **Property Manager** Data Labels page to reposition the state PIDs for the northeastern states. Use the **Arrange | Rotate | Rotate** and/or the **Arrange| Rotate | Free Rotate** commands to rotate the map title text and rectangle. Notice that the graticule limits have also changed. You can change the graticule limits in the Graticules page of the plot properties.

Alternatively, you can press CTRL + Z or click **Home | Undo | Undo** to revert back to the map's original projection.

Map projections can be modified, saved, and managed in the **Assign Coordinate System** and **Define Coordinate System** dialogs.



Your finished map should look similar to the above map. Notice in this map, the pin labels were forgone for hatch map data labels showing the state PIDs. Also, the map title and state PIDs were repositioned after the projection was changed.

Lesson 8 - Saving and Exporting the Map

Lesson 8.0 - Saving and Exporting the Map

You can save the map so you can access it at a later time to make changes or to use it in other applications.

Maps are saved in **MapViewer** in the [.GSM] format. The [.GSM] format is only recognized by **MapViewer**, and this format preserves the map exactly as it exists on the screen. To save in the [.GSM] format:

- Use the **File | Save As** command. This allows you to save the map to a new name or to specify a file name for an entirely new map. Simply type a name into the *File name* box and click the *OK* button. The map is saved with a [.GSM] extension.
- When you open a [.GSM] file and make changes, you can save the map to the same file name by choosing the **File | Save** command. In this case, no dialog is displayed, and the map is saved to the same file name used when you opened the file. Again, this saves the map in [.GSM] format.

For this tutorial:

1. Select the **File | Save As** command.
2. Select a location to save your file in the left window pane of the **Save As** dialog.
2. Type the name "My Map" into the *File name* box.
3. Click the *OK* button and the file "My Map.gsm" is saved in the current folder. The [.GSM] extension is automatically added for you.

If you are using the demo version of **MapViewer** you cannot save the map.

Lesson 8.1 - Using the Map in Other Applications - Tutorial

When you have a completed map, you might want to use the map to another application. For example, you might want to incorporate the map in a report in a word processing program. When this is the case, you should consider using the Windows clipboard commands to copy the map and then paste it into the other application. To do this, it is easiest and best to choose the **Home | Clipboard | Copy All Layers** command. This copies all boundary objects from all layers, including graticule lines, to the Windows clipboard. In your word processor, you can use the **Paste** command to paste the copy of the map into your document. This is very quick and easy.

Alternatively, there are a number of export file formats available by using the **File | Export** command. When you need the map to be saved in a file that can be read by other applications, you should consider one of the many export formats.

If you are using the demo version of **MapViewer** you are not able to copy or export the map.

Lesson 8.2 - Opening an Existing Map File - Tutorial

When you have a completed map, it can be saved to a **MapViewer** [. GSM] file. [.GSM] files preserve the entire map with all the map features. Then, when you want to retrieve the file, you can use the **File | Open** command.

To open a [.GSM] file:

1. Choose the **File | Open** command.
2. In the **Open** dialog, switch to the **MapViewer** Samples folder. Click on HatchMap.gsm.
3. Click the *Open* button and HatchMap.gsm is opened in another plot window. This is a hatch map of France showing population by region, similar to the map you created earlier in this tutorial.

Advanced Tutorial

Lesson 1 - Boundary Editing - Advanced Tutorial

There are many useful **MapViewer** sample boundary and data files. One boundary file that is not included with **MapViewer** is a single map that includes the states or provinces of the United States, Canada, and Mexico. In the first Advanced Tutorial lesson, we will use a few of the boundary editing tools in **MapViewer** to generate a useful template file.

1. Click **File | New | Plot** or the  button on the Quick Access Toolbar.
2. Create three additional layers by clicking the **Map | Layer | New Layer** command.
3. Name the layers by clicking once on the layer in the **Object Manager**, waiting a moment, and clicking again. Name Layers #2-4 "United States" "Canada" and "Mexico" by

typing in the name and pressing ENTER. Layer #1 will eventually be deleted and does not need to be renamed.

4. Click on *Layer #1* in the **Object Manager** to make it the active layer.

Part 1 - Alaska and Hawaii

The US50LL.gsb and US50Alb.gsb sample files have Alaska and Hawaii moved from their actual location for more convenient presentation in a map of the United States. This will not suffice for our map. So we have to import Alaska and Hawaii and make them each single objects.

1. Verify that *Layer #1* is the active layer in the **Object Manager**. If it is not, click on *Layer #1*.

2. Select **File | Import** or click the  button on the Quick Access Toolbar. Select the AK2010.GSB sample file in the **Import** dialog and click *Open*. The default import options are sufficient for this tutorial, so click *OK* in the **Import Options** dialog.

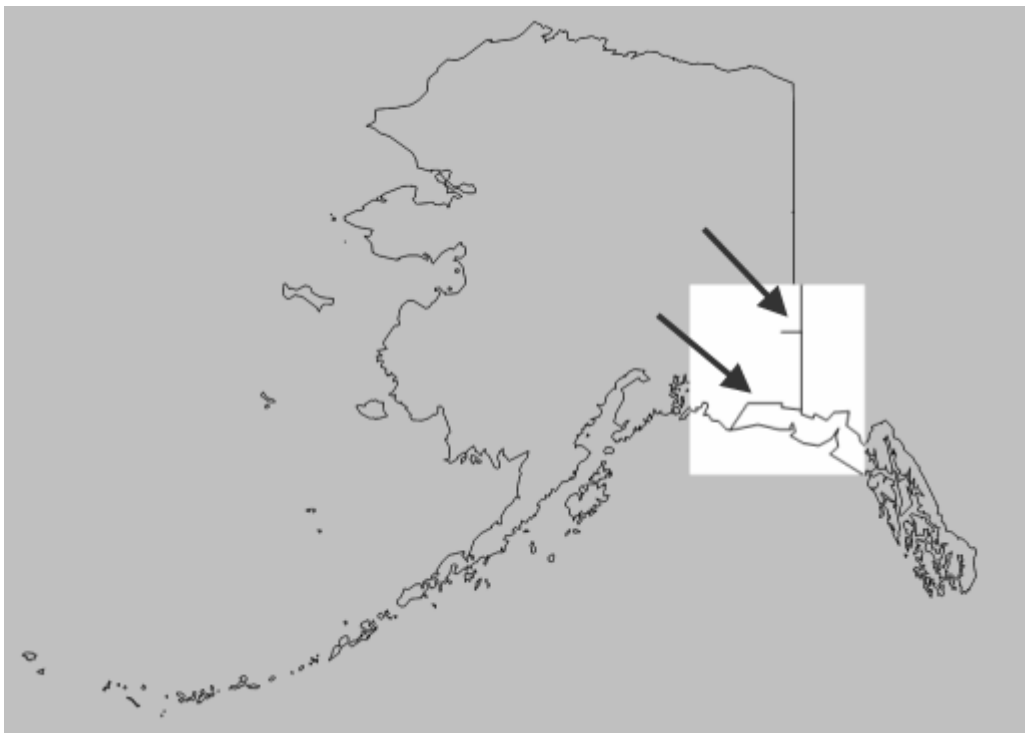
3. In the **Object Manager** click the first object *02240*, hold the SHIFT key, and click the last object *02013*. Click the **Arrange | Selection | Select All** command. You can also select all the objects in the **Object Manager** or select all the objects by clicking and dragging around the objects in the plot window.

4. Click the **Boundary | New Boundaries | Union of Polygons** command. Uncheck *Keep original areas* and *Keep inner lakes* if their boxes are checked in the **Union of Areas** dialog, and then click *OK*.

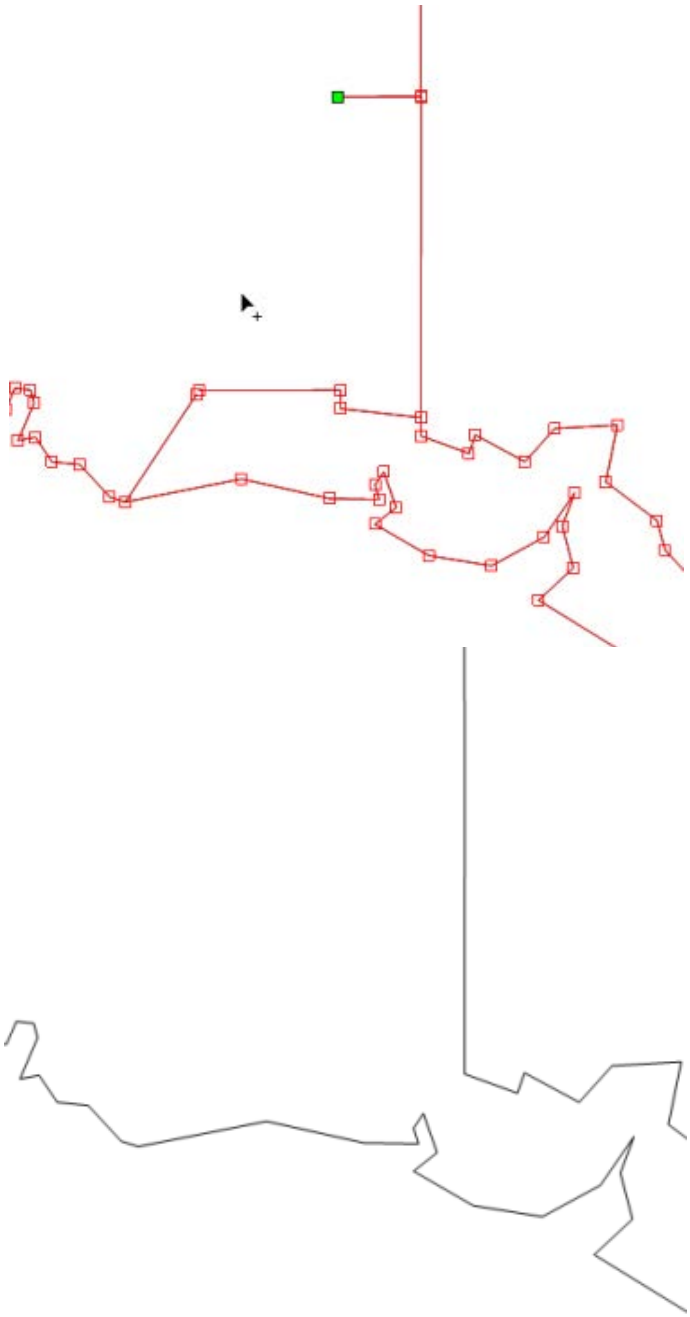
5. Again, click the Select All command. Next, click the **Boundary | Islands/Lakes | Combine** command.

6. Next click on the *Info* tab in the **Property Manager** to view the Info page. Change the *PID* to "AK" and the *SID* to "Alaska."

7. Notice there are two interior boundaries still visible in Alaska. The extra lines are highlighted in the image below.



Click the **Boundary | Edit Boundaries | Reshape** command to enable boundary editing mode. The polygon line color changes to red and vertices are indicated by red squares. Click on a vertex to select it. The selected vertex is indicated by green fill. Click on an interior vertex and the press the DELETE key to remove the vertex. Continue removing vertices until the interior lines are removed. Click the **Boundary | Edit Boundaries | Reshape** command again, or press the ESC key, to stop editing boundaries with the **Reshape** command.



*The top image shows the area in **Reshape** mode with one vertex selected. The lower image shows the area after interior vertices have been deleted.*

8. With *AK* selected in the **Object Manager** or plot window, click the **Home | Clipboard | Move to Another Layer** command. Select *United States* in the **Move to Layer** dialog and click *OK*.

9. Verify that *Layer #1* is still the active layer in the **Object Manager**, then **Import** HI2010.gsb from the **MapViewer** samples file folder.

10. Click **Arrange | Selection | Select All** and then **Boundary | Island/Lakes | Combine**.

11. In the **Property Manager** *Info* page, change the *PID* to "HI" and *SID* to "Hawaii."

12. Select *HI* in the **Object Manager** or plot window and click the **Home | Clipboard | Move to Another Layer** command. Select *United States* in the **Move to Layer** dialog and click *OK*.

13. Click on *Layer #1* in the **Object Manager** and press the DELETE key.

Part 2 - Importing the U.S., Canada, and Mexico

Next we will import the rest of the boundaries to complete the map.

1. Click *Mexico* in the **Object Manager**, and then click **File | Import**.

2. Select MEXICO.GSB in the **Import** dialog and click *Open*. Next, click *OK* in the **Import Options** dialog.

3. Import US48LL.gsb to the *United States* layer and Canada.gsb to the *Canada* layer in the same method.

4. MEXICO.GSB includes an object encompassing all of Mexico. You may wish to delete the *Mexico* polygon object in the *Mexico* layer.

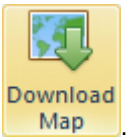
Congratulations, you have a single boundary file with all of the American and Mexican states and Canadian provinces. If you wish to save this boundary file for later use, click the **File | Save As** command.

Lesson 2 - Downloading Online Maps - Advanced Tutorial

One of **MapViewer 8**'s new features is the ability to download online maps from WMS (Web Map Service) Servers. In this tutorial, we will add a new server to the data source list, add a map to the Favorites group, and download the map.

Adding a Server to the Data Source List

The **Download Online Maps** dialog contains a few servers and multiple maps already, but many other free and "paid-for" WMS servers exist. Many of the free or public WMS servers require only that the user cites the maps creator when publishing or presenting the map.

1. In a new plot, click the **Map | Add | Download Map** command 

. The **Download Online Maps** dialog opens.

2. Right-click in the *Select Data Source (right click for options)* list at the top of the dialog, and select *Add New Category*. In the **Create Category** dialog, type "NOAA nowCOAST" and click *OK*. The map we will use for the tutorial is provided by the NOAA nowCOAST service.

3. Right-click on the new category *NOAA nowCOAST* and select *Add Map Source*. This opens the **Add Data Source** dialog. Type "Forecast" into the *Name* field, and type: "http://nowcoast.noaa.gov/wms/com.esri.wms.Esrimap/forecasts?service=wms&version=1.1.1&request=GetCapabilities"

   into the *URL* field. This, and other NOAA available WMS servers, can be found by navigating to nowcoast.noaa.gov in your web browser and clicking on the *Map Services* link in the top right corner of the web page.

4. After you have entered the *Name* and *URL*, click the *Next* > button. The next page shows you if the server connection succeeded or failed, and also shows general

information about the server. Click the *Finish* button when you are finished looking at the server information.

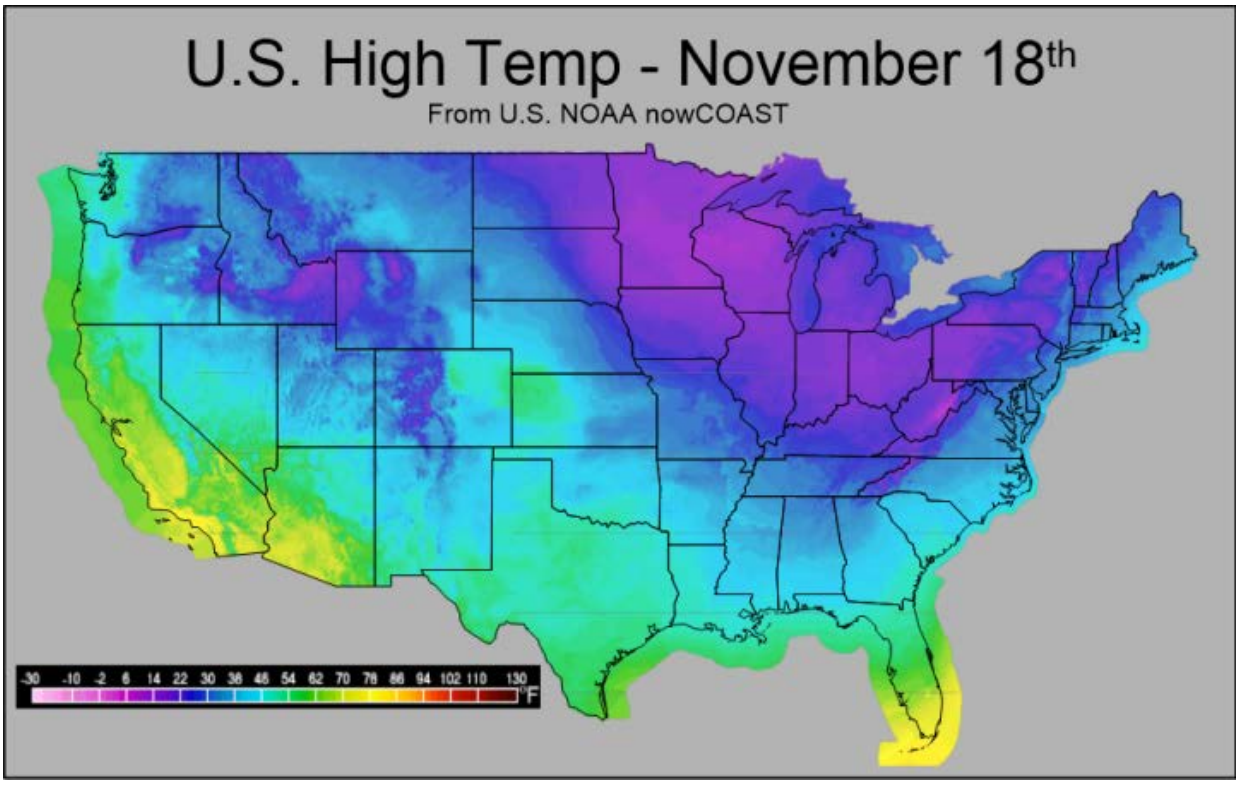
5. In the *Select Data Source (right click for options)* list, click the arrow next to *NOAA nowCOAST* to expand the group. Currently, you should only have the *Forecast* server listed. Should you desire, you can repeat the process and add other NOAA nowCOAST WMS servers to the list. Click the *Map Services* link at the top right of the nowcoast.noaa.gov web page to see the other server URLs.
6. Click the expand arrow next to the *Forecast* server, and scroll through the list of maps. The NOAA provides background maps and wave height, high temperature, low temperature, wind speed, relative humidity, and precipitation forecast maps.
7. Find and right-click on the *NDFD Maximum Surface Air Temperature 0 Day Fcst - Raster* map. Click *Add Favorite* in the context menu. This map is today's high temperature forecast for the United States. *1 Day* through *3 Day* maps are forecasts for one to three days from today.
8. Now navigate to the *Favorites* group in the *Select Data Source (right click for options)* list. Notice the map is now saved under your *Favorites*. If after this tutorial, you wish to remove the map from your *Favorites*, right-click on the map and select *Remove Favorite* from the context menu.

Downloading an Online Map

Now that we have added a new server and added a map to our *Favorites* list, we will download the map and add a boundary file.

1. Continuing from the above section, click the *NDFD Maximum Surface Air Temperature 0 Day Fcst - Raster* map in the *Select Data Source (right click for options)* list. It should now be located in both the **Favorites | Forecast** and **NOAA nowCOAST | Forecast** groups.
2. Next, we will only download the contiguous 48 states, so we will select the *Specify Latitude/Longitude extents* in the *Select Area to Download* section. Type -128, 50, 24, and -65 into the *West*, *North*, *South*, and *East* fields respectively.
3. The *Select Image Resolution to Download* slider bar selects the image resolution. To the right of the slider bar, you will see the scale, image size in pixels, and image file size, for example "1 : 4M (5K x 2K pixels, 39MB)." Increasing the resolution, increases file size, which increases download time. Increasing the extents of the map also increases the file size and download time. For this tutorial, you can select whichever position you desire, but since you likely won't publish this map, you will probably select low resolution to shorten the download time.
4. Now that you have selected a map, specified the extents, and selected a resolution, click *OK* to download the map.

A new layer is created in the plot named *WMS - NDFD Maximum Surface Air Temperature 0 Day Fcst - Raster* containing an image of the downloaded map. The map does not include a legend, but reading the help section on the nowCOAST website, you will find that map items can be downloaded by typing certain URLs into your web browser. To get the legend for the map, enter "http://nowcoast.noaa.gov/LayerInfo?layer=NDFD_RAS_MAXT_0_12&data=legend" into your web browser. Then, save and import the image into **MapViewer**. The following map also had the US48LL.gsb sample boundary file, a map collar, and a title added to it.



Congratulations, you have completed the advanced tutorial. Remember, the tutorials only show the workflow and introduce **MapViewer**. So there are many more commands and map types to experiment with. Enjoy creating beautiful and informative maps!

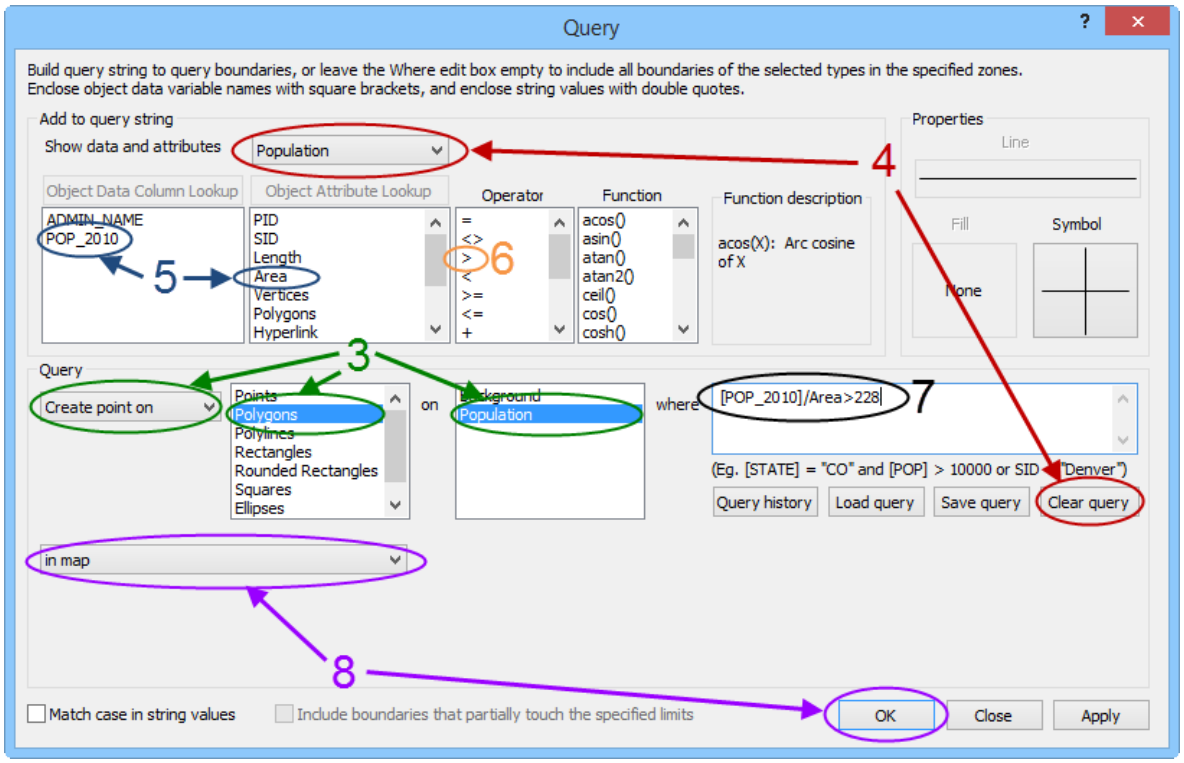
Lesson 3 - Querying - Advanced Tutorial

Querying is a useful tool for analyzing and editing specific parts of a map. After the Query command is clicked, the query is performed by selecting objects to include in the query, writing a query string to evaluate the objects, and selecting what action is performed to the objects returned by the query string. The Query Data command works similarly to the **Query** command, but the query is performed on the linked data. The Query Range command queries objects based on a specified distance from a single selected object. Since the **Query Data** command uses linked data, the **Query Data** command only works with boundary objects: polygons, polylines, and points. The **Query** and **Query Range** command can query all objects except text objects: boundary objects, rectangles, rounded rectangles, squares, ellipses, and circles.

This tutorial will show an example of each type of query command. First, open the HatchMap.gsm **MapViewer** sample file. The HatchMap.gsm file is a hatch map of the population of France by region.

Querying

First, we will perform queries on the plot with the **Query** command. If you haven't done so already, open the HatchMap.gsm sample file. The numbers on the image below correspond to steps 3 - 8 in the Tutorial.



1. Click the **Analysis | Query | Query** command  . The *Add to query string* (top) section of the **Query** dialog is used to create query strings and select properties to apply to queried objects. The *Query* (bottom) section of the **Query** dialog is read from left to right, top to bottom as a sentence and defines the query. The sentence takes the following form: *Do this* to *object(s)* on *layer(s)* where *query string 1* in *selection* on *layer(s)* where *query string 2*.
2. First, we will create points on the regions where the population density is greater than 228 people per square mile. 228.05 is the median population density. The Object Property report, Transform command, and Statistics command were used to determine the median population density for the regions, so 11 points should be created. The *Query* section should read as, "Create point on Polygons on Population where [POP_2010] / Area > 228," when we are finished.
3. In the *Query* section, select *Create point on* from the first list. In the object list, click on *Polygons*, and in the layer (on) list, click *Population*. Clicking on a deselected object/layer selects it, and clicking on a selected object/layer deselects it.
4. If there is a query string in the *where* field, click the *Clear query* button. Next, make sure *Population* is selected in the *Show data and attributes on* list near the top of the **Query** dialog.
5. In the *Object Data Column* field, double-click on *POP_2010*. Notice that *[POP_2010]* is added to the *where* field. Next double click the divisor operator, /, in the *Operator* field. Finally, double click *Area* in the *Object Attribute* field.

Note: When the query string pulls data from a linked data column, the data column name must be surrounded by brackets. When text is used in the query string, it is surrounded by double quotes. Attributes and number values are not surrounded by special characters. More complex mathematical functions can be added to query strings with the *Function* field, but the query string does not have to contain a mathematical function.

6. Double-click the greater than operator, >, in the *Operator* field. Notice the operator is added to the query string in the *where* field.
7. Type "228" in the where field after the greater than operator. The final query string should be *[POP_2010] / Area > 228*.
8. In the *in* list, select *in map*, and click *OK*.

Now there should be 11 points on the map, indicating the regions with population densities greater than 228 people per square mile. Next, we will change properties for the points in regions with fewer than two million people.

1. First, let's move the points to another layer. Click the first point listed in the **Object Manager**, hold the SHIFT key, and click the last point listed in the **Object Manager**. Now that all 11 points are selected, click the **Home | Clipboard | Move to Another Layer** command. Select *[New Layer]* in the **Move to Layer** dialog, and click *OK*.
2 Click the **Analysis | Query | Query** command again. Now we will set up the query to apply properties to points within specific polygons. Select *Apply properties to* in the *Query* list. Select *Points* in the objects list. Select *Layer #1* in the layer list, and click the *Clear query* button. The *where* field is left blank because the points referenced by it have no attributes or linked data to query.
3. Now, in the *in* field, select *in polygons*, and in the second layer list, select *Hatch*. Select *Hatch* in the *Show data and attributes on* list at the top of the **Query** dialog.
4. Next, type *[POP_2010] < 2000000* in the lower *where* field. You can also use the *Object Data Column* and *Operator* lists to create the query string.
5. Click the *Symbol* button in the top right section of the **Query** dialog to open the Symbol Properties dialog. Click on the selection in the *Symbol* field to open the symbol palette and click on the filled diamond symbol *(Symbol 6)*. Click *OK* in the **Symbol** dialog.
6. Click *OK* in the **Query** dialog.

Now the map includes three points for regions with populations under 2,000,000 people and a population density greater than 228 people per square mile, and eight points for the remaining regions with population densities greater than 228 people per square mile.

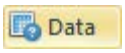
It is important to understand how the query lists, object and layer selections, and separate *where* fields function. The first line in the **Query** dialog was applying properties to points on Layer #1. If the points had attributes or linked data, we could have further defined the point selection by adding a query string to the first *where* field. The second line of the **Query** dialog was refining the query to include only points on *Layer #1* that were contained within polygons on the *Population* layer with populations of less than two million people. Query strings, object and layer selections, and the *in* field selection must be made correctly to get the desired results.

Fortunately, many things can be queried different ways to get the same results. For example, the map resulting from the steps above could be recreated by performing the following two queries: "*Create point* on *Polygons* in *Population* where *[POP_2010] / Area > 228 AND [POP_2010] < 2000000* in *map*" with *Symbol 6* selected, and "*Create point* on *Polygons* in *Population* where

[POP_2010] / Area > 228 AND [POP_2010] > 2000000 in *map*" with *Symbol 0* selected. Notice with these queries, we wouldn't create another layer for the points or use the *in polygons* selection.

Querying Data

The Query Data command generates queries on linked data. In the following example, we will create a report for the four regions closest to the median value.

1. Click the **Analysis | Query | Data** command 

to open the **Query Map Data** dialog. Like the **Query** command, the query is phrased like a sentence: "*Do this* with # of objects closest to *value/object*."
2. Select *Create report with* in the *Action* list, and type *4* into the number of object field. Select *the median value* in the *objects closest to* list.
3. In the *Limit objects to* field, select *Polygons*.
4. Click the *OK* button.

A **MapViewer Report** window opens showing the query results. The query returns the objects with the four data values closest to the median value of 2,132,882 people. Notice that three of the closest values are smaller than the median, while one is larger. The query report includes the data value for the data column selected in the *Data statistics* list in the **Query Map Data** window. In this case, there is only one data column *POP_2010*. The query report also includes the object type, ID and attribute information, vertices, length, area, etc. You can edit the report directly in the report window. You can also save the report as a TXT or RTF file.

Querying within Range

Next is a quick example of the Query Range command. We will use the query to show only regions that are completely or partially within 150 miles of the Centre region. A single object must be selected before using the **Range** command.

1. In the **Object Manager**, click *Centre* to select the polygon that represents the Centre region.
2. Click the **Analysis | Query | Range** command 

to open the **Query within Range** dialog.
3. In the *Action* list, select *Show*, and select *Polygons* in the next field.
4. Type *150* into the *Within* field. The units of the *Within* field are set on the Units page of the plot properties. In HatchMap.gsm, the *Surface distance units* are *Miles*.
5. Click the *Include boundaries partially within range* and *Apply action to all visible layers* check boxes to add check marks, and click *OK*.

Now, only the regions and points that are within 150 miles of the center of the Centre region are visible. Click the **View | Display | Show Objects** command and click *OK* in the **Show Objects** dialog after activating each layer to quickly make the objects visible again. Notice that the **Show Objects** command only shows or hides objects on the current active layer.

The End - Tutorial

Congratulations on finishing the **MapViewer** tutorial. This tutorial only scratches the surface of the many options and features in **MapViewer**. Now, however, you should have a good idea of the procedure in using commands. You can also navigate between plot and worksheet windows and use the **Object Manager** and **Property Manager** to edit layer and object properties. The **MapViewer** help is full of information, and here are some links you may find particularly useful:

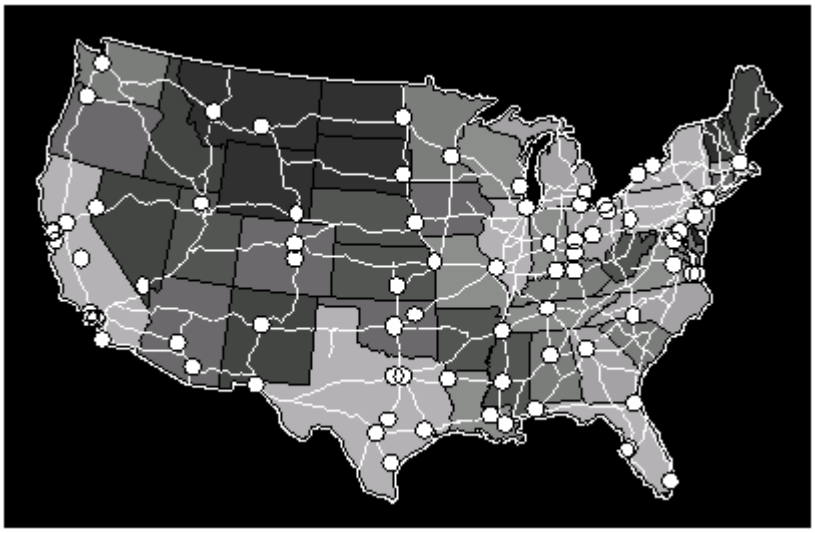
Map Types	The Map Types page includes a brief description of the thematic map types available in **MapViewer**. Links are provided to specific map pages in each map description.
Menu/Tab Commands	This page is a good starting point for finding detailed information on every command in **MapViewer**.
File Format Chart	This chart presents the boundary and data file formats that can be saved, opened, imported, or exported (or any combination thereof) in **MapViewer**.
Sample files	Sample **MapViewer** [*.GSM] files for every thematic map type are included with **MapViewer 8**. Opening and editing the sample files is a great way to experiment in **MapViewer**. Sample boundary [*.GSB] and data [*.DAT] files are also included to get you started on creating your own maps.
Browse the *Managers* | *Property Manager Pages* section of the Help Contents.	In the navigation pane to the left of this window is the help contents. You can quickly access information about **Property Manager** pages in this section. The **Property Manager** help pages are useful for determining what a particular property affects, which method to use for classification, how to add and edit data labels, change the map units, etc.
Options and Default Settings	If you find you dislike a particular user interface style, often change the same property for every map you create, etc. there is probably an option or default setting you can change to streamline your workflow.
Customizing Commands	The Ribbon, Quick Access Toolbar, and more can be customized in **MapViewer**.

Chapter 4

Boundary Files

MapViewer Boundary Types

There are three types of boundary objects in **MapViewer**: polygons, polylines, or points. Data can be linked to boundary objects for use in thematic maps. You can draw these types of objects with the **MapViewer** drawing tools or you can import boundary files that contain these types of boundaries the **File | Import** or **Map | Base Map** commands. **MapViewer** includes a number of boundary files in the SAMPLES folder under the main **MapViewer** folder.



Boundaries include areas (states), curves (interstate highways), and points (cities).

You can assign a primary ID used to link the boundary to data in a file, as well as other IDs (secondary, attribute 1, attribute 2, etc.) that can be used as additional identifiers for the object. You can also assign hyperlinks to link your data to additional information.

Polygons

Polygons, also referred to as areas, are closed boundaries. The beginning and ending points for the boundary are identical, forming a closed shape. A minimum of three vertices are required to form an area. Polygons can be assigned a fill color, fill pattern, and line style. Polygons can be drawn by selecting the **Draw | Shape | Polygon** command or using the **Draw | Shape | Spline Polygon** command.

Polylines

Polylines, also called curves, are lines drawn on a map to show features such as roads or streams. With maps such as bar maps, the thematic map object is placed on the curve's centroid. Polylines can be drawn by selecting the Draw | Polyline command or using the **Draw | Shape | Spline Polyline** command.

Points

Points show point locations on a map and are represented by a symbol. Points can be placed on a map using the Pin Map command, or they can be drawn using the **Draw | Shape | Point** command.

Other Shapes

Objects such as rectangles, rounded rectangles, ellipses, and text are not **MapViewer** boundaries so you cannot link data to these types of features. You can add these types of objects to any type of map as decorative features or you can use these objects to highlight regions on a map. However, if you need to use a rectangle, rounded rectangle, square, circle, or ellipse as a boundary, draw the shape, select it, and then use the **Boundary | Edit Boundaries | Change Boundary Type | Symmetric Shape to Area** command to convert it into a polygon boundary object.

Boundary Files

MapViewer boundaries can be imported or exported as vector files, Windows metafiles, or bitmap files. Refer to the file format chart for additional information on each file type. **MapViewer** includes a large number of boundary files in the SAMPLES folder under the main **MapViewer** folder. These files are usually in the Golden Software GSB format.

Vector Files

Vector files consist of areas (polygons), curves (polylines), and points, and are used to draw objects at precise XY locations on a map. You can use base maps to plot objects such as boundary outlines (such as a state or county outline), streams, water bodies, roads, buildings or any other type of object on a map. Vector files are used for the basis of most thematic maps. The vector file types are:

Golden Software Boundary [.GSB]

Golden Software Interchange [.GSI]

Golden Software Map [.GSM]

Golden Software Street Files [.STR]

AutoCAD [.DXF]

ESRI Shapefile [.SHP]

MapInfo [.MIF]

USGS SDTS Topological Vector Profile [.DDF]

ESRI ArcInfo Export Format [.E00]

USGS Digital Line Graph File [.DLG], [.LGO], [.LGS]

Atlas Boundary [.BNA]

Golden Software Blanking [.BLN]

Golden Software PlotCall [.PLT]

Windows Metafiles

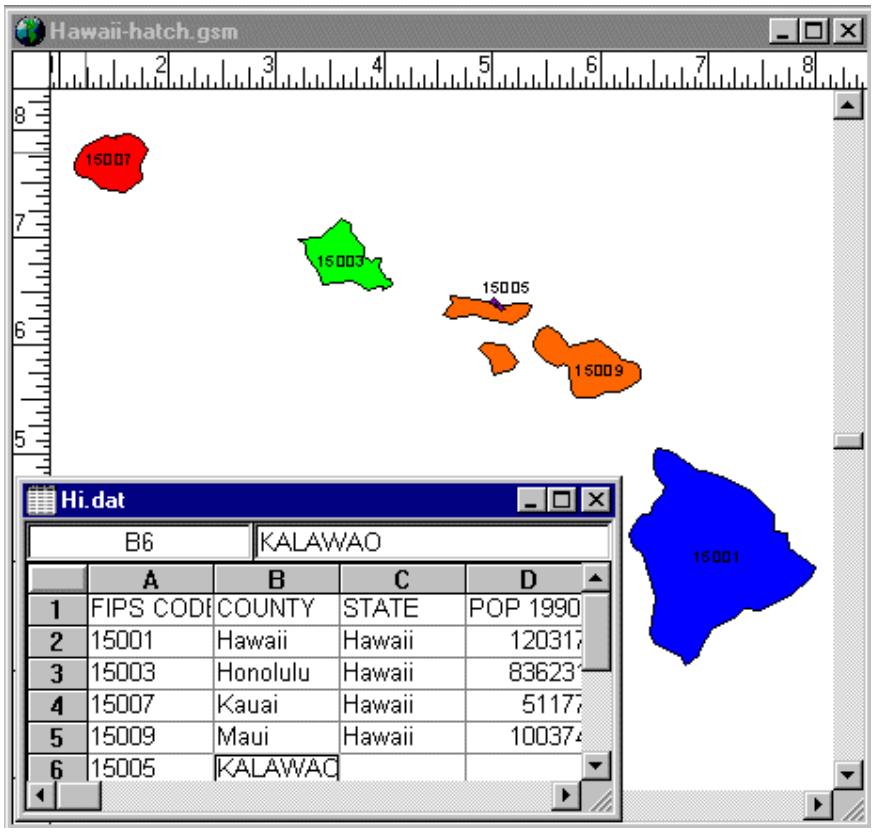
Windows metafiles contain line drawing information for reproducing vector drawings. Metafiles can be scaled without any loss of resolution, and can sometimes have attributes, such as IDs, added to them.

Bitmap (Raster) Files

Bitmap files consist of raster images that are displayed as an array of dots or pixels on the screen. Some bitmap features can be edited, you can calibrate bitmaps, and you can import georeferenced bitmaps for use as background in thematic maps.

Linking Data to Boundaries - The Primary ID

A primary ID (PID) is an identifier used by **MapViewer** as a link between a map boundary (polygon, polyline, and point) and data. Every boundary object in **MapViewer** can have a primary ID. The primary ID for a selected object is displayed in the status bar at the bottom of the **MapViewer** window and in the **Object Manager**.



This illustration shows the correspondence between the primary ID on the map and the primary ID in the data. In this example, as with all the U.S. county areas and county data files included with **MapViewer**, the primary ID is the county FIPS Code.

Primary IDs must match exactly between the boundaries on the map and the primary ID column in the data. **MapViewer** ignores leading or trailing spaces in a primary ID, but any other character is considered part of the primary ID. When there is not an exact match, data is not represented for that area, curve, or point on the map. If none of the primary IDs match between the data and boundaries, you will receive an error message when trying to produce a thematic map, indicating that there is insufficient data to produce the map. In this case, you should verify that the boundary primary IDs and the data primary IDs match exactly.

If you create your own boundaries for a map, select a boundary and assign a primary ID in the Property Inspector or enter it into the **Object Manager**. After you have assigned all primary IDs for all the boundaries on your map, you can choose the **File | New | Worksheet** command and a worksheet window is opened with all your primary IDs in column A of the worksheet. If you have a data file that already contains the primary IDs, you can use the **File | Load Data** command to import your data file.

Creating Custom Boundaries

Custom boundaries are boundaries you create. These boundaries can be drawn using the mouse or they can be based on existing boundaries, such as groups of counties or states. One common example is basing sales territories on county boundaries. **MapViewer** allows you to create your own boundaries based on groupings of county boundaries (or any types of boundaries), and then you can create a map showing those sales territories.

There are different ways you can create custom boundaries. You can:

- Select existing boundaries that define your new boundary, and use the Combine Islands/Lakes command to group them into a single complex boundary. You can then assign custom fill properties, line properties, a primary ID, additional IDs, and a hyperlink. See Selecting Objects for more information on selecting several objects at one time.
- Use the mouse to trace around the outside of the boundaries (see the *Tracing an Existing Boundary* section of the Area command). This method is effective if your boundaries parallel existing boundaries in some places, but cut across boundaries in others. For example, if your boundary is made up of only one-half of a county boundary, you can trace along the county where it and your boundary are coincident, and freehand draw where your boundary does not follow any existing boundary lines.
- Use the commands under **Boundary | New Boundaries** to create new objects.
- Draw boundaries freehand using the Polygon, Spline Polygon, Polyline, Spline Polyline, or Point commands. You can also use the Ellipse, Rectangle, and Rounded Rectangle commands and then convert the shapes into boundary objects with the Symmetric Shape to Area command.
- Use the Digitize command to digitize in the XY coordinates, and save the file as an Atlas BNA file. This is an advanced procedure, and requires familiarity with digitizing and creating Atlas BNA files. The **Boundary | Digitize** command is useful for small digitizing projects. If you have a large, complex project it is better to use software specifically created for digitizing, such as Golden Software's **Didger**.

After you create custom boundaries, you can use them in a thematic map if you have assigned primary IDs to your boundaries and have created a data file that also contains the primary IDs.

You can export your custom boundaries to a boundary file using the Export command.

Chapter 5

Data Files and the Worksheet

Worksheet Window

The worksheet window contains commands to display, edit, enter, and save data. The worksheet window has several useful and powerful editing, transformation, and statistical operations available. Several import and export options are available for opening data files from other spreadsheet programs.

Worksheet Commands

File	Opens, closes, saves, and prints files. Provides links to online references and email templates. Provides access to serial number and **MapViewer** version number.
Home	Contains undo, redo, cut, copy, paste, and links to the tutorial and help file.
View - Worksheet	Controls the display of toolbars, managers, status bar, tabbed documents; and the resetting of the window layout.
Data	Contains clear, insert, delete, find, replace, cell formatting, column width, row height, and commands to sort, transform, or display statistics for data.

The Application/Document Control menu commands control the size and position of the application window or the document window.

New Worksheet

Click the **File | New | Worksheet** command or the  button on the Quick Access Toolbar to open a new worksheet window. In worksheet windows, you can create data files which are used to create graphs. To create a new plot, click the **File | New | Plot** command.

MapViewer Data

The data represented on a **MapViewer** map needs to be in column and row format. Each row is devoted to a single polygon, polyline, or point on the map. The row of data is linked to the map boundary object by its primary ID, usually found in column A. When you create a thematic map, you are prompted to choose the variable to be displayed. The columns contain the different variables, or data values, to be represented on the map.

The simple example below shows a typical layout of data that would be effective in **MapViewer**. Notice that row 1 contains column headings. These names are useful for identifying the data contained in each column. The variable names are displayed in the plot window dialogs to assist in selecting the variable to be represented on a thematic map. If there are no text entries in row 1, the column letters (Column A, Column B, etc.) are used in the dialogs instead.

	Column A	Column B	Column C	Column D
Row 1	Primary ID	Secondary ID	Population	Sales in Dollars
Row 2	Jackson	MO	343,033	34,867
Row 3	Franklin	MO	563,198	56,798
Row 4	Adams	MO	435,667	47,653

The primary ID can be text or numbers. These primary IDs are also assigned to the polygon, polylines, or points on a map. For the example above, the primary IDs Jackson, Franklin, and Adams would be associated with areas on the map. These primary IDs link the data to the corresponding map areas.

The following example is a portion of a typical **MapViewer** data file where the FIPS code is used as the primary ID. This information is similar to the state data files included with **MapViewer**, although there are several more columns of data included in the **MapViewer** data files in the SAMPLES folder under the main **MapViewer** folder.

	Column A	Column B	Column C	Column D
Row 1	FIPS Code	Area Name	Land Area	Population
Row 2	02010	Aleutian Islands, AK	10890	8000
Row 3	02020	Anchorage, AK	1732	235000
Row 4	02050	Bethel, AK	36104	12100
Row 5	02060	Bristol Bay, AK	531	1200
Row 6	02070	Dillingham, AK	46042	5500

All the data in the same row as the primary ID are associated with the corresponding polygon, polyline, or point on the map.

Multiple Rows with the Same PID

Multi-graph maps have multiple rows with the same PID, as each object has its own XY data set. For all other map types however, when multiple rows contain the same PID only the first row (the row with the smallest Row Number) is linked to the object. Remove duplicates and other unlinked data with the **Data | Edit | Delete Unlinked Data** command.

These are the data file formats that **MapViewer** can read:

DAT Files

Excel XLS Files

Microsoft SLK Files

Comma Separated Variable CSV Files

ASCII Text TXT Files

Lotus WKx Files

Atlas BNA Files

Golden Software BLN Files

Golden Software GSB Files

Golden Software GSI Files

dBase DBF Files

Access MDB Files

Paradox DB Files

LiDAR Binary LAS Files

SEG-SP1 Data Files

Working with Worksheet Data

Data are entered into the worksheet using **File | Open** to open a data file, typing data directly into the worksheet, or copying the data from another application and pasting it into the worksheet. Use the Data Tab commands to sort the data, view statistics, or to adjust the data using mathematical functions.

Entering Data into a Cell

Edit the contents of a cell by making it the active cell. The active cell is positioned by clicking on a cell with the mouse, by using the ARROW keys, PAGE UP, PAGE DOWN, TAB, HOME, END, and SHIFT+TAB. Press the F2 key or highlight the contents of the cell edit box to edit the contents of the cell.

To enter new data and delete the old, position the active cell and begin typing. Edit mode is entered automatically and the old data is deleted. Pressing ENTER, Up or Down ARROWS, TAB, SHIFT+TAB, PAGE UP, or PAGE DOWN keys cause the edit changes to be recorded permanently in the cell. After pressing F2 or highlighting the cell edit box use the HOME, END, BACKSPACE, DEL, and ARROW keys to edit the cell. Pressing ESC while editing a cell cancels the changes and restores the original data.

Moving the Active Cell

To move the active cell:

- The active cell is the cell with a thick border drawn around it.
- ARROW keys (Up, Down, Left, Right) move the active cell to an adjacent cell.
- PAGE UP/PAGE DOWN moves the active cell up or down by the number of rows visible in the window.
- HOME moves the active cell to the first occupied cell in the current column. Pressing HOME again moves the active cell to the top row in the current column.
- END moves the active cell to the last occupied row in the current column. Pressing END again moves the active cell to the bottom row of the worksheet.
- ENTER moves the active cell down one row and ends "edit mode."
- TAB moves the active cell right one column and ends "edit mode."
- SHIFT+ENTER moves the active cell up one row and ends "edit mode."
- SHIFT+TAB moves the active cell left one column and ends "edit mode."
- CTRL+HOME moves the active cell to the top cell of the left most column in the worksheet (A1).
- CTRL+END moves the active cell to the bottom occupied row of the last occupied column in the worksheet.
- The CTRL+LEFT ARROW behavior depends on the position of the active cell. If the active cell is to the right of the last occupied column in the current row, it moves the active cell

to the last occupied column in the current row. If the active cell is in or to the left of the last occupied column in the current row, but to the right of the first occupied column in the current row, it moves the active cell to the first occupied column in the current row. Otherwise, CTRL+LEFT ARROW moves the active cell to the first column in the current row.

- The CTRL+RIGHT ARROW behavior depends on the position of the active cell. If the active cell is to the left of the first occupied column in the current row, it moves the active cell to the first occupied column in the current row. If the active cell is in or to the right of the first occupied column in the current row, but to the left of the last occupied column in the current row, it moves the active cell to the last occupied column. Otherwise, CTRL+RIGHT ARROW moves the active cell to the last column in the current row.
- The CTRL+UP ARROW behavior depends on the position of the active cell. If the active cell is below the bottom occupied row in the current column, it moves the active cell to the bottom occupied row in the current column. If the active cell is below the top occupied row in the current column, but in or above the bottom occupied row in the current column, it moves the active cell to the top occupied row in the current column. Otherwise, CTRL+UP ARROW moves the active cell to the first row in the current column.
- The CTRL+DOWN ARROW behavior depends on the position of the active cell. If the active cell is above the top occupied row in the current column, it moves the active cell to the top occupied row in the current column. If the active cell is above the bottom occupied row in the current column, but below the top occupied row in the current column, it moves the active cell to the bottom occupied row in the current column. Otherwise, CTRL+DOWN ARROW moves the active cell to the last row in the current column.
- If a block of cells is selected, the ENTER, TAB, SHIFT+ENTER, and SHIFT+TAB keys move the active cell within a group of selected cells without canceling the selection.

Moving the Active Cell within Selections

The ENTER, TAB, SHIFT+ENTER, and SHIFT+TAB keys move the active cell within a group of selected cells without canceling the selection.

Worksheet Input Modes

The worksheet has several special input modes that tracks the mouse position:

- Drag-Select Mode - for selecting cells with the mouse
- Drag-Row-Height Mode - for adjusting row heights with the mouse
- Drag-Column-Width Mode - for adjusting column widths with the mouse

Pressing the ESC key before releasing the mouse button cancels the mouse-tracking mode.

Worksheet Error Codes and Special Numeric Values

There are a few different error codes and special numeric values that can appear in a worksheet cell depending on the type and nature of the data that appears.

Codes	Explanation
#########	number will not fit in the column, the column must be wider for the number to be shown
#N/A	value cannot be computed (for example, not enough data to calculate a statistic)
#DIV/0!	an attempt to divide-by-zero was made in performing a calculation
#ERROR	a value could not be computed (for example, square root of a negative number)
#OVERFLOW	value is too large for the worksheet (largest absolute value is about 1.797E+308)
1.#INF	value is too large for the worksheet (i.e., "infinite" value)
1.#IND	numeric value is indefinite (usually the result of performing a calculation with an infinite value or attempting to divide by zero)

Selecting Cells

The keyboard and the mouse may be used to select cells. Selected cells are indicated by reverse video (white background becomes black, etc.). Hidden cells are selected if their columns or rows are within a selected block of cells. Single cells, a rectangular block of cells, one or more rows, one or more columns, or the entire worksheet can be selected.

Cells may be selected to

- perform editing and clipboard functions,
- compute statistics for selected cells, or to
- set cell, column, or row properties for multiple items via the **Data | Format** tab with column width, row height, and format cells commands.

Selecting Cells

There are several ways to select cells:

- Clicking on the small box above the row labels and to the left of the column label bar selects the entire worksheet.
- To deselect all selected cells, click the left mouse button anywhere within the worksheet, press the ESC key, or move the active cell with an ARROW key or other movement key.
- To rapidly select a large block, first select one corner of the block, and then use the scroll bars to scroll to the opposite corner. Hold down the SHIFT key and click on the cell at the opposite corner. The PAGE UP, PAGE DOWN, HOME, and END keys may also be used, but the SHIFT key must be held down while these keys are pressed. The SHIFT key is not needed while using the scroll bars.
- To select all cells in a column or row, click the column letter or row number. To select several adjacent columns or rows, press and hold the left mouse button and drag the pointer on the column letters or row numbers.
- While holding down the CTRL key, the active cell may be repositioned for selecting a new block.
- The CTRL key is used to select multiple blocks and the SHIFT key is used to resize the last selected block. Details and exceptions are given in separate help sections for selecting with the mouse and selecting with the keyboard.

- If entire rows or columns are selected by clicking on the headers, some operations, such as statistics, can take a long time. Rather than clicking on the headers, only select the cells containing data.
- Clicking and holding the left mouse button while dragging the mouse in the worksheet selects a block. Similarly, using the SHIFT key plus the ARROW keys selects a block.
- The keys used with SHIFT for selecting cells are the ARROW keys, PAGE UP, PAGE DOWN, HOME, and END. TAB and SHIFT+TAB cannot be used.
- While holding down the SHIFT key, the last selected block may be resized. Use the SHIFT key and the mouse or the SHIFT key and ARROW keys.
- The active cell is at one corner (or edge) of a selected block and must first be positioned before selecting multiple cells.
- The last block cannot be resized if the active cell has been moved.
- Once selected, a block of cells cannot be unselected unless all cells are unselected.

Selecting Cells with the Mouse

The mouse may be used to select cells. Selected cells are indicated by reverse video (white background becomes black, etc.).

To Select	Process
Single cells	Click on the cell with the left mouse button. The cell will have a thick outline around it.
A rectangular block of cells	Move the active cell to one corner of the block. Click and hold the left mouse button, and drag it to the opposite corner of the block. Then release the mouse button.
An entire row	Click the mouse on the row label.
Several adjacent rows	Click and hold the mouse on the first row label and drag it to the last row. Make sure the cursor is a normal arrow cursor not the double arrow cursor used for selecting column dividing lines.
An entire column	Click the mouse on the column label.
Several adjacent columns	Click and hold the mouse on the first column label and drag it to the last column. Make sure the cursor is a normal arrow cursor not the double arrow cursor used for selecting column dividing lines.
The entire worksheet	Click on the small box above the row labels and to the left of the column label bar.

The worksheet scrolls automatically if the mouse is dragged past the visible limits of the worksheet. To select additional blocks, hold down the CTRL key while clicking. To resize the last selected block, hold down the SHIFT key while clicking and holding the left mouse button. Then, drag the edge of the last selected block to the new position. The last block cannot be resized if the active cell has been moved. To deselect all selected cells, click the left mouse button anywhere within the worksheet or move the active cell with an arrow key or other movement key.

Selecting Cells with the Keyboard

The keyboard may be used to select cells. Selected cells are indicated by reverse video (white background becomes black, etc).

To Select	Process
Single cells	Click in the cell to select it, or use the arrow keys to select a cell. The selected cell will have a thick outline around it.
A rectangular block of cells	Move the active cell to one corner of the block. While holding down the SHIFT key, use the movement keys to position the opposite corner of the block. The movement keys include the ARROW keys, PAGE UP, PAGE DOWN, HOME, and END, but not TAB and SHIFT+TAB. When the block has been sized, release the SHIFT key. To resize the block, see the instructions below.
Several adjacent rows	Select the first or last row. Then, while holding down the SHIFT key, use the vertical movement keys. These include up ARROW, down ARROW, PAGE UP, PAGE DOWN, HOME, and END.
Several adjacent columns	Select the first or last column. Then, while holding down the SHIFT key, use the right and left ARROW keys.

To resize the last selected block, hold down the SHIFT key while using the movement keys (as appropriate to the type of block). The last block cannot be resized if the active cell has been moved. To deselect all selected cells, click the left mouse button anywhere within the worksheet or move the active cell with an ARROW key or other movement key.

Active Cell

The active cell is displayed with a heavy border surrounding the cell. The contents of this cell are displayed in the cell edit box. Enter or edit data in the active cell. To edit existing data, activate the desired cell and press the F2 key or highlight the information in the cell edit box.

Special key functions when editing the active cell are:

- ESC cancels edit mode and restores the original contents of the active cell.
- ENTER stores the contents of the cell edit box and then moves the active cell down one cell.
- CTRL+ENTER completes the entry and keeps the current cell active.
- Left and right ARROWS move within the cell's text if the F2 key has been pressed. Otherwise, these keys store the contents of the cell edit box and then move the active cell to the left or right.
- DELETE deletes the character to the right of the cursor if the F2 key has been pressed. Otherwise, pressing the delete key deletes the entire contents of the cell.
- BACKSPACE deletes the character to the left of the cursor if the F2 key has been pressed. Otherwise, pressing the backspace key deletes the entire contents of the cell.
- Up and down ARROWS store the contents of the cell edit box in the active cell and move the active cell above or below.
- PAGE UP and PAGE DOWN store the contents of the cell edit box in the active cell and move one page up or down.
- TAB and SHIFT+TAB store the contents of the cell edit box in the active cell and moves the active cell to the right or left.

Active Cell Location Box

The active cell location box shows the location of the active cell in the worksheet. Letters are the column labels and numbers are the row labels.

Cell Edit Box

The cell edit box is located at the top of the worksheet window just above the column letter bar. The cell edit box shows the contents of the active cell and is used for editing cells. Use the cell edit box to see the contents of a worksheet cell when the column is too narrow to display all of the cell contents.

To begin editing the selected cell, press the F2 key. Alternatively, highlight the contents of the cell edit box to edit the cell. To overwrite the current cell contents, simply begin typing without pressing F2. If the mouse is clicked on a new cell, the new cell becomes the active cell.

Special key functions when editing the active cell are:

- ESC cancels edit mode and restores the original contents of the active cell.
- ENTER stores the contents of the cell edit box and then moves the active cell down one cell.
- CTRL+ENTER completes the entry and keeps the current cell active.
- Left and right ARROWS move within the cell's text if the F2 key has been pressed. Otherwise, these keys store the contents of the cell edit box and then move the active cell to the left or right.
- DELETE deletes the character to the right of the cursor if the F2 key has been pressed. Otherwise, pressing the delete key deletes the entire contents of the cell.
- BACKSPACE deletes the character to the left of the cursor if the F2 key has been pressed. Otherwise, pressing the backspace key deletes the entire contents of the cell.
- Up and down ARROWS store the contents of the cell edit box in the active cell and move the active cell above or below.
- PAGE UP and PAGE DOWN store the contents of the cell edit box in the active cell and move one page up or down.
- TAB and SHIFT+TAB store the contents of the cell edit box in the active cell and move the active cell to the right or left.

Symbol Specifications in the Data File

Pin map data files can contain a column defining which symbol set and symbol index to use for each pin location. This information can be specified in one of three ways:

SymbolSet:Index	This form allows both the symbol set and the symbol index to be specified. SymbolSet specifies the face name of the desired symbol set. The colon character must appear between the symbol set and the index. If the specified face name is invalid, the default symbol set specified in the post map properties dialog is used instead. For example, *GSI Map Symbols:35* uses the GSI Map Symbols set with symbol 35 (airplane).
Index	If a single integer is specified, it is interpreted as a symbol index into the current symbol set. The current symbol set is the last specified symbol set or the default symbol set specified in the post map properties dialog.
<Empty>	If the cell is empty, the last specified symbol set and default symbol index is used.

The symbol index is the symbol or glyph number as it appears in the Symbol Properties dialog. This is the 0-based offset of the symbol within the symbol set. However, if the current symbol set is not Default Symbols, then 32 must be added to the index value obtained from the **Symbol Properties** dialog. This makes the symbol index the same as its ASCII code. You can use the Window's Character Map utility to determine the ASCII code for font symbols.

Worksheet Technical Specifications

The following technical specifications for the worksheet include the number of cells allowed in the worksheet and the nature of the numbers allowed in the worksheet.

- Maximum number of rows in a worksheet: 1 billion
- Maximum number of columns in a worksheet: 1 billion
- Approximate memory requirements (for unformatted numeric data): 10.5 bytes per cell + 24 bytes per column
- Maximum numeric precision: 15 digits (Counting the digits before and after the decimal place)
- Maximum numeric resolution: 2.22E-16 (The smallest detectable difference between two numbers)
- Maximum absolute value: 1.79769E+308 (The largest value that can be represented)
- Minimum absolute value: 2.22507E-308 (The smallest value that is different from zero)

Example: 10,000 rows of numbers in three columns

30,000 cells x 10.5 bytes/cell = 315,000 bytes (308 Kbytes)

3 columns x 24 bytes/column = 72 bytes

TOTAL MEMORY NEEDED (in addition to memory needed to run the program): 308 Kbytes

Example: three rows of numbers in 10,000 columns

30,000 cells x 10.5 bytes/cell = 315,000 bytes (308 Kbytes)

10,000 columns x 24 bytes/column = 240,000 bytes (234 Kbytes)

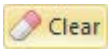
TOTAL MEMORY NEEDED (in addition to memory needed to run the program): 542 Kbytes

Data Tab Commands - Worksheet Window

The **Data** tab contains common commands to edit, sort, find, and manipulate data, format cells, and perform statistics and mathematical transformations.

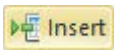
Clear	Erase the contents of selected worksheet cells
Insert	Insert a block of blank cells in place of the selected cells
Delete	Remove selected worksheet cells and move rows or columns
Delete Unlinked Data	Removes rows from the worksheet that are not used in the active thematic map
Import	Loads the content of a data file into an existing worksheet
Find	Find a particular word or phrase in the worksheet
Find Next	Find the next occurrence of the word or phrase
Replace	Replace the word or phrase with alternate text
Format Cells	Sets the numeric format, alignment, and background color for the selected cells
Column Width	Set column widths for selected columns
Row Height	Sets row height for selected rows
Sort	Sort selected cells
Transform	Apply a mathematical transform to columns, rows, or cells
Statistics	Compute statistics on selected cells
Transpose	Convert columns to rows and rows to columns
Text to Number	Convert text strings to numeric format
Number to Text	Convert numeric data to text strings

Clear - Worksheet

The **Data | Edit | Clear** command 

removes data from selected worksheet cells. The cells are left empty when the data are removed. To shift the data from unselected cells into the selected cell locations, use the Delete command.

Insert - Worksheet

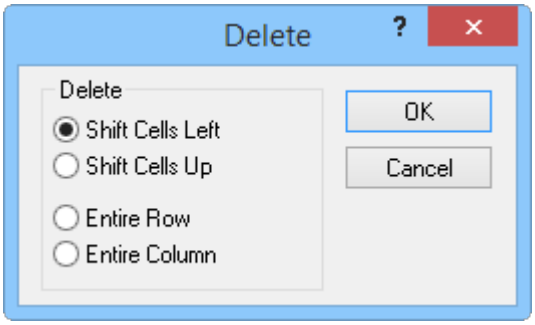
The **Data | Edit | Insert** command 

inserts a single blank cell or a block of blank cells in the worksheet. Select cells in the area to insert cells. Click either the *Shift Cells Down* or *Shift Cells Right* option button and then click the *OK* button. The blank cells are inserted and the original contents of those cells are moved accordingly to make room for the new empty cells. Click *Entire Row* or *Entire Column* to insert an entire row or column in the area that contains highlighted cells.

Delete - Worksheet

The **Data | Edit | Delete** command 

deletes the selected worksheet cells and shifts cells up or to the left to fill in the gap. After selecting **Data | Edit | Delete**, the **Delete** dialog appears. Specify the desired behavior of the cells in the **Delete** dialog and click *OK*. The selected cells are deleted and the contents of cells below or to the right are moved to fill the deleted block.



*When using **Data | Edit | Delete**, you can shift cells to the left or up to fill in the gap.*

Shift Cells Left or Shift Cells Up

Click *Shift Cells Up* or *Shift Cells Left* option button to specify if cells will be shifted to the left or shifted up to fill in the gap after deleting the selected cells.

Delete Entire Row or Entire Column

Click *Entire Row* or *Entire Column* to delete the entire row or column that contains highlighted cells.

Leave Deleted Cells Empty

To leave the selected cells empty when the data are removed, use the Clear command, press the DELETE key, or use the Cut command.

Delete Unlinked Data - Worksheet

The **Data | Edit | Delete Unlinked Data** command 

removes entire rows of data when they are not used on the active thematic map. For example, you might have a data file for an entire state in the worksheet but your thematic map only contains half the counties for that state. When this occurs and you click the **Data | Edit | Delete Unlinked Data** command, rows with primary IDs that do not have corresponding linked areas on the map are eliminated from the data file.

When multiple rows contain the same PID, only the first row (the row with the smallest Row Number) is linked to the object in the plot document. Multi-graph maps are an exception, as they contain XY data sets for each object. For all other map types, the **Delete Unlinked Data** command quickly removes duplicate PIDs and their associated data.

This command removes the rows of data from the worksheet. If the file is saved after the unlinked data is deleted, the deleted data is no longer contained in the worksheet. To preserve the original data, save the file to a new name with the **File | Save As** command immediately before deleting unlinked data.

Import - Worksheet

The **Data | Edit | Import** command 

loads the contents of a data file into the existing worksheet. Select the file to merge with the existing file in the **Import Data** dialog. The contents of the new file are merged into the worksheet at the active cell so be sure to position the cell at the edge of the existing data. Any cells in the existing worksheet that lie to the right of and below the active cell are overwritten with the contents of the merging file.

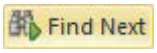
Multiple files can be opened at one time into the same worksheet with **Data | Edit | Import** using the SHIFT or CTRL keys while selecting files in the dialog.

Find - Worksheet

The **Data | Find | Find** command 

is used to find a particular word or phrase in the worksheet. The Find and Replace dialog opens to allow entry of search parameters.

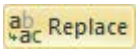
Find Next - Worksheet

The **Data | Find | Find Next** command 

is used to find the next instance of a particular number, word, or phrase in the worksheet. Each cell matching the search parameters remains selected.

If the **Data | Find | Find** command was not used initially, the Find and Replace dialog opens so that you can define your search criteria.

Replace - Worksheet

The **Data| Find | Replace** command 

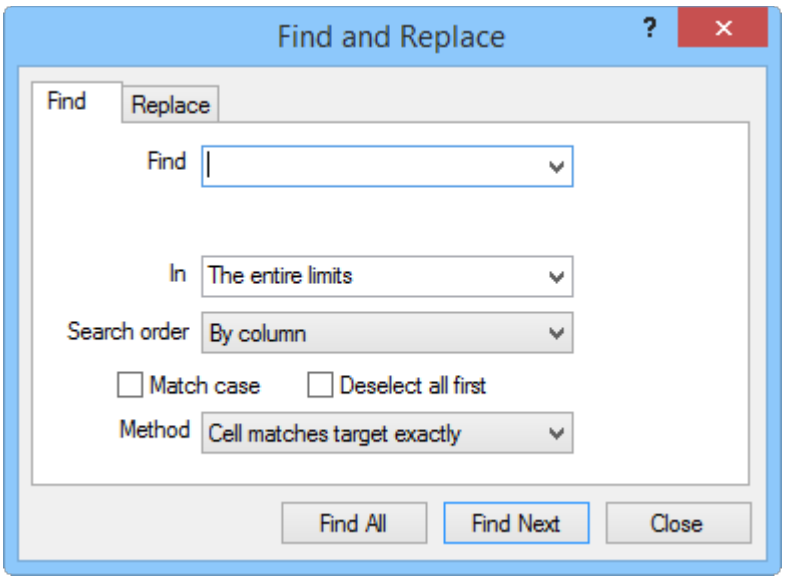
is used to replace a word or phrase with specified text. The Find and Replace dialog opens to allow entry of the replacement text.

Find and Replace

The **Find and Replace** dialog displays when the **Data | Find | Find**, **Data | Find | Find Next**, or **Data | Find | Replace** commands are chosen. The **Find and Replace** dialog is used to search for and replace specific text in the worksheet.

The Find Page

The **Data | Find | Find** and **Data | Find | Find Next** commands open the **Find** page of the **Find and Replace** dialog.



Search for and replace specific text in the worksheet with the ***Find and Replace*** *dialog.*

Find

To find a word or phrase, type the text you want to search for in the *Find* field. Click the arrow at the right to select from a list of the most recently used text strings. The asterisk * and question mark ? wildcards can be used in the Find box. Click the arrow at the right to select from a list of the most recently used criteria.

- A question mark ? finds a single character in the specified location. For example, 200? finds 2009, 2008, 200a, etc.
- An asterisk * finds any number of characters at the specified location. For example, *01 finds 601, 1201, c01, etc.

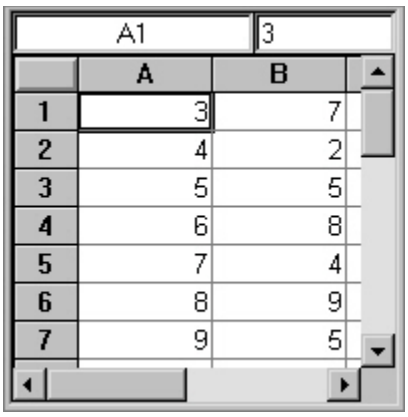
In

Next to *In*, choose the parameters of the search from the list. Choices include *The column where active cell is*, *The row where active cell is*, and *The entire limits*.

- Select *The column where the active cell is* to search only the column (i.e. column B) of the active cell (i.e. cell B2) for the information listed in the Find field.
- Select *The row where active cell is* to search only the row (i.e. row _2) of the active cell (i.e. cell B2) for the information listed in the Find field.
- Select *The entire limits* to search the entire worksheet for the information listed in the Find field.

Search Order

The *Search order* controls the direction of the search: down through columns by selecting *By columns* or to the right across rows by selecting *By rows*.



In this example, cell A1 is selected. If the Find *criteria is "7", and* By Column *is the* Search order*, cell A5 is found first. If* By row *is the search order, cell B1 is found first.*

Match Case

If you have case sensitive characters in the *Find* text string, check the *Match case* check box. Selecting *Match case* distinguishes between uppercase and lowercase characters. For example, a search for "Elevation" with the Match case option selected will not find entries for "elevation", but will find entries for "Elevation".

Deselect All First

Check the *Deselect all first* box to deselect all selected cells before performing the search. All previously selected cells will be deselected prior to the search when the *Deselect all first* check box is checked. If the *Deslect all first* box is deselected, the results of a previous search will remain highlighted when performing the next search.

Method

Choose the search *Method* from the list to determine how the search is performed.

This examples assume "Golden, CO" is in the *Find* field.

- Select *Cell matches target exactly* to require that the exact criteria in the Search box is present in a cell before it is selected. For example, only cells that have exactly "Golden, CO" will be selected.
- Select *Cell contains target phrase* to require that the phrase in the Search box is present in a cell before it is selected. For example, cells that have "Golden CO", "Golden Company", or "Golden Colorado" will be selected.
- Select *Cell contains all of the target words* to require that all of the Search criteria words are present in a cell before it is selected. For example, cells that have "Golden" and "CO" somewhere in the cell (i.e. "Golden is the best city in Colorado" will be selected).
- Select *Cell contains any of the target words* to require that any of the Search criteria words are present in a cell before it is selected. For example, cells that have "Golden is a city" or "CO is a state" will be selected.

Find All Button

Click the *Find All* button to find all occurrences of the *Find* criteria in the worksheet. All of the cells that contain the *Find* criteria will be highlighted.

Find Next Button

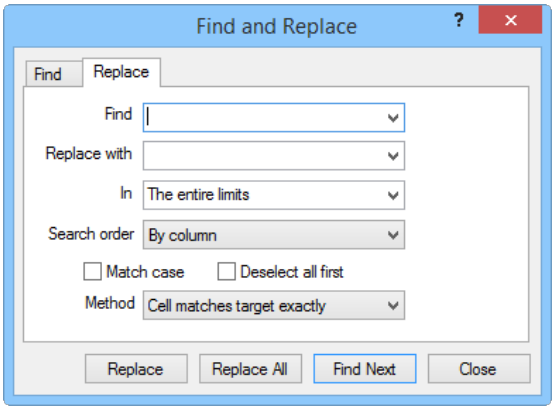
Click the *Find Next* button to find the next occurrence of the characters specified in the *Find* box. This allows you to meet the criteria one at a time. The next instance of the *Find* criteria will be highlighted.

Close Button

Click *Close* to exit the **Find and Replace** dialog.

The Replace Page

The **Data | Find | Replace** command opens the **Replace** page of the **Find and Replace** dialog. The **Replace** page has all of the **Find** page fields, with the addition of the *Replace with* field. The **Replace** page, *Method* field has only two options.



*Replace numbers or text in the worksheet with the **Find and Replace** dialog.*

Replace With

Type the text you want to replace in the *Find* box. To delete the characters in the *Find* box from your worksheet, leave the *Replace with* box blank. Click the arrow at the right to select from a list of the most recently searched items.

Method

Choose the search *Method* from the list to determine how the search is performed.

The examples assume "Golden, CO" is in the Find field.

- Select Cell matches target exactly to require that the exact criteria in the Search box is present in a cell before it is selected. For example, only cells that have exactly "Golden, CO" will be selected.
- Select Cell matches target exactly to require that the exact criteria in the Search box is present in a cell before it is selected. For example, only cells that have exactly "Golden, CO" will be selected.

- Select Cell contains target phrase to require that the phrase in the Search box is present in a cell before it is selected. For example, cells that have "Golden CO", "Golden Company", or "Golden Colorado" will be selected.

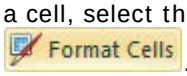
Replace Button

Click the *Replace* button to replace the selected occurrence of the criteria in the *Find* box with the criteria in the *Replace with* box, find the next occurrence of the criteria in the *Find* box, and then stop. If you want to automatically replace all occurrences of the search criteria in the worksheet, click the *Replace All* button.

Replace All Button

Click the *Replace All* button to replace all occurrences of the *Find* criteria in your document with the *Replace with* criteria. If you want to review and selectively replace each occurrence, click the *Replace* button.

Format Cells

Cell numbers, alignment, or background color can be formatted through the **Format Cells** dialog. To format a cell, select the cells to be formatted, then click the **Data | Format | Format Cells** command 

. The **Format Cells** dialog opens.

The **Format Cells** dialog has three pages: **Number**, **Alignment**, and **Background**.

Number Page

Use the Number page to change the way numeric data is displayed in the worksheet. This includes setting the numeric format for numbers and the date/time entries.

Alignment Page

Use the Alignment page to set the cell alignment.

Background Page

Select cell background color on the Background page.

Text String

Number formatting has no effect on a numeric text string (numbers entered as text). A number with an apostrophe in front of it ('8123) is a text string. The apostrophe only shows in the active cell edit box. For example, an ASCII data file might contain the digits "8123" (digits surrounded by quotes), '8123 (digits preceded with an apostrophe), numbers with letters, or numbers with symbols (i.e. a blackslash "\"). These "numbers" are read as text and not as a number. The **Data | Data | Transform** command can be used to perform a mathematical function, such as ATOI(X), to convert some text strings to integer values, such as the case wit the '8123. In other cases, the quote marks, letters, or symbols may need to be removed before using the **Transform** command.

Preserve Cell Formatting

The only formats that preserve cell formatting information are the Excel XLS, XLSX or SYLK SLK file formats. ASCII file formats (.CSV, .TXT, .DAT, .BNA, .BLN) do not preserve file format information.

Data as Numbers, Text, or Date/Time

Worksheet data is in one of three forms: numbers, text, or date/time. Thematic maps require data as numbers or date/time. Numeric and date/time data allows **MapViewer** to perform arithmetic computations necessary to create a thematic map. Text data, even if it contains numeric digits, cannot be used in arithmetic computations and cannot be used to create most thematic maps.

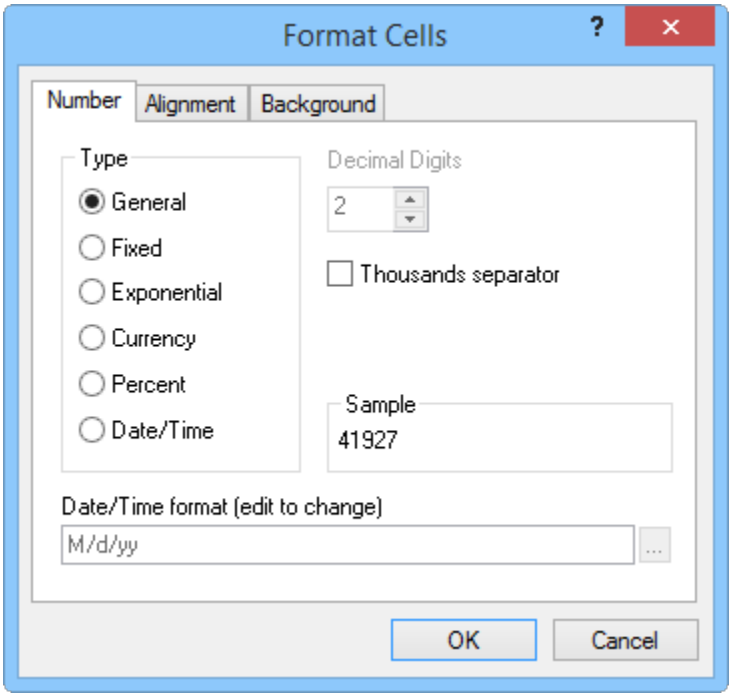
Numbers can consist of digits (0 - 9), decimal points (.), the letters "e," "d," "E," or "D" (indicating an exponent), and the plus (+) or minus (-) sign. If you type any characters other than these when entering a number (or type any of the special characters more than once), **MapViewer** automatically converts the cell entry to text. You can also convert numeric data to text by typing a single quotation mark (') in front of the number. **MapViewer** does not display the single quotation in the worksheet cell, however.

By default, numeric, and date/time data is right justified in a cell, and text is left justified. However, cell entries, whether numeric, date/time, or text, can also be justified by specifying the desired alignment using **Data | Format | Format Cells** command **Alignment** page.

Format Cells - Number

Cell numbers, alignment, or background color can be formatted through the **Format Cells** dialog. To format a cell, select the cells to be formatted, then select **Data | Format | Format Cells**. Use the **Number** page to change the numeric data display in the worksheet. This includes setting the numeric format for numbers and the date/time entries.

Number formatting has no effect on a numeric text string (numbers entered as text). For example, an ASCII data file might contain the numbers '8123 (numbers preceded by single quote) which are read as text and not as a number. The **Data | Data | Transform** command can be used to perform a mathematical function, such as ATOI(X), to convert a text string to an integer value.



*Use the **Number** page to change the numeric data display in the worksheet.*

Type

The *Type* section contains the numeric format for the selected cells. Available options are *General, Fixed, Exponential, Currency, Percent,* and *Date/Time*. Click on the desired option.

- *General* displays numbers as fixed or exponential, whichever is shorter.
- *Fixed* displays numbers as d.ddd. The number to the left of the decimal can vary. Set the number to the right of the decimal in the *Decimal Digits* box.
- *Exponential* displays numbers as d.ddde+dd. Set the number of digits to the right of the decimal in the *Decimal Digits* box.
- *Currency* displays fixed numbers with a currency symbol such as the dollar sign ($).
- *Percent* displays numeric values (such as 0.13) as percentages with a percent symbol suffix (13%).
- *Date/Time* formats the cells as dates and/or time. Select *Date/Time* and then either type the desired *Date/Time format* or insert the *Language (Country)* and *Predefined date/time formats* to create the desired date/time format for display of the data.

Decimal Digits

The *Decimal Digits* controls the number of digits to the right of the decimal when the *Type* is set to *Fixed, Exponential, Currency,* or *Percent*. To change the *Decimal Digits*, highlight the existing value and type a new value. Alternatively, click the  to increase or decrease the value.

Thousands Separator

The *Thousands separator* option controls whether a comma appears in the number, indicating thousands. When checked, a comma appears every three digits to the left of the decimal point. When unchecked, the number appears without the comma. Do not type a comma when entering data as this causes the number to be read as text.

If the **File | Options** *Decimal separator* is set to *Comma* or *System default* when comma is the system default, a period (.) will be displayed for the *Thousands separator*.

Sample

The *Sample* box displays the current number format.

Date/Time Format

When the *Type* is set to *Date/Time*, the *Date/Time format* option becomes available.

To create a *Date/Time format*, type the desired format in the *Date/Time format (edit to change)* box. Available entries are made of combinations of year, month, day, hours, minutes, seconds, AM/PM designation, BC/AD/BCE/CE designation, and/or a locale ID. Only the desired options need to be set. For instance, MMMM dd, yyyy can be entered to display month name date and year. The hours, minutes, seconds, AM/PM, and BC/AD/BCE/CE designation do not need to be specified. Other text can also be entered.

Date/Time format (edit to change)

MMMM dd, yyyy

Entering this in the Date/Time format *box results in:*

January 01, 2014

being displayed in the Sample *and in the worksheet cell.*

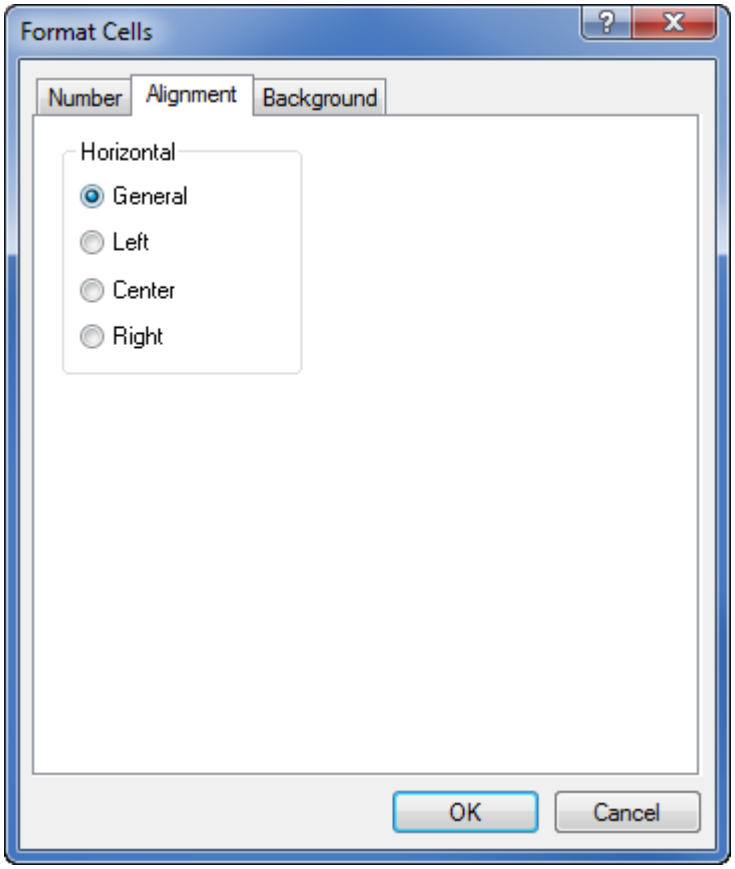
Click the button to select a predefined format or build a custom format in the Date/Time Format Builder dialog.

OK or Cancel

Click *OK* to make the change to the cell format. Click *Cancel* to return to the worksheet without making the change.

Format Cells - Alignment

Cell numbers, alignment, or background color can be formatted through the **Format Cells** dialog. To format a cell, select the cells to be formatted, then select **Data | Format | Format Cells**. In the **Format Cells** dialog, click on the **Alignment** tab to align the cell in one of four ways. By default, imported ASCII files automatically align numbers to the right and text to the left.



*Use the **Alignment** page of the **Format Cells** dialog to select the* Horizontal *alignment of cells.*

General

General aligns text on the left side of the cell and numbers, dates, and times on the right side of the cell.

Left

Left aligns text, numbers, dates, and times on the left side of the cell.

Center

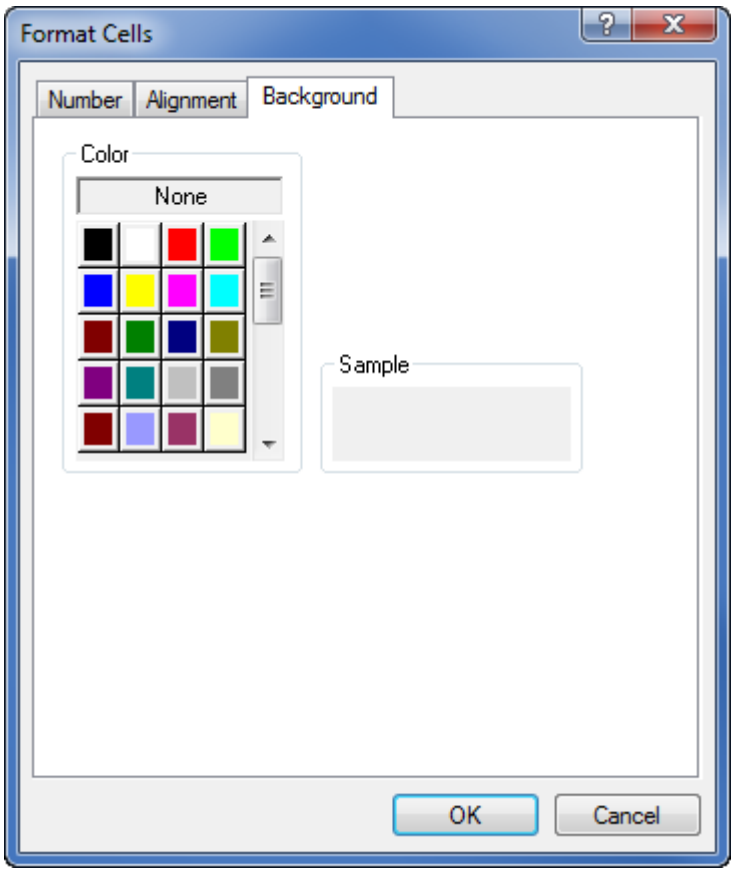
Center aligns text, numbers, dates, and time in the center of the cell.

Right

Right aligns text, numbers, dates, and time on the right side of the cell.

Format Cells - Background

Cell numbers, alignment, or background color can be formatted through the **Format Cells** dialog. To format a cell, select the cells to be formatted, then select **Data | Format | Format Cells**. You can set cell background color on the **Background** page. Save the worksheet in Excel format to save background color in the file.



*Select the cell background color the **Background** page of the **Format Cells** dialog.*

None

Click the *None* button to remove any previously assigned background colors.

Color Palette

Select a cell background color from the color palette.

Sample

A sample of the color is displayed in the *Sample* box.

Row and Column Label Bars

The worksheet cells are located by column label bars (A, B, C...) or row label bars (1,2,3...). Click the label to select entire rows or columns, to change row height, to change column width, or to hide or unhide rows and columns. To select multiple rows or columns, drag the mouse over several adjacent labels.

Selecting a Column or Row Dividing Line

The column or row dividing lines are the lines between the column letter labels and row number labels along the borders of the worksheet. These lines divide the columns or rows. Change the column width or row height by dragging the dividing line. Rows or columns can be hidden or unhidden by using the mouse. The **Data | Format | Column Width** or **Data | Format | Row Height** commands can also be used to set column widths or row heights.

Move the cursor to the label bar near the dividing line until the cursor changes to a double arrow. The cursor must be within approximately a character's width of the dividing line and it must be on the label bar. Click and hold the left mouse button and drag the dividing line as described for hiding or displaying hidden columns or rows or for setting column width and row height.

Hiding Columns or Rows

You can hide columns or rows with the mouse or with the **Format** menu.

With the Mouse

The mouse may be used to hide columns or rows. To hide a column, first click on the vertical dividing line to the right of the column. Drag the vertical dividing line to the left as far as it will go and then release the mouse button. If there are hidden columns to the right of this column, grab the left side of the vertical dividing line. If the right side of the vertical dividing line is selected, the vertical dividing line for the adjacent hidden column is selected.

To hide a row, first click on the horizontal dividing line at the bottom of the row. Drag the horizontal dividing line up as far as it will go and then release the mouse button. If there are hidden rows above this row, grab horizontal dividing line just below the line. If the top side of the horizontal dividing line is selected, the horizontal dividing line for the adjacent hidden row is selected.

With the Format Menu

Columns and rows can also be hidden with the **Data | Format | Column Width** and **Data | Format | Row Height** commands. Select the columns or rows to hide, select **Data | Format | Column Width** or **Data | Format | Row Height**, and then set the width or height to zero.

Displaying Hidden Columns or Rows

Hidden columns or rows can be displayed using the mouse or with the **Format** menu commands.

With the Mouse

The mouse may be used to display hidden columns or rows. To display a column, first click on the vertical dividing line at the **right** of the hidden column and then drag the vertical dividing line to the new position. If several adjacent columns are hidden, only the far right column is displayed after dragging the dividing line. If the cursor is to the left of the vertical dividing line when the line is selected, then the selected vertical dividing line will be for the visible column to the left and not for the hidden column.

To display a hidden row, first click on the horizontal dividing line below the hidden row and then drag the horizontal dividing line to the new position. If several adjacent rows are hidden, only the bottom row is displayed after dragging the dividing line. If the cursor is above the horizontal dividing line when the line is selected, then the horizontal dividing line is for the visible row above the hidden rows, and not for the hidden rows.

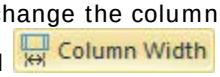
Example

If columns B, C, and D are hidden and columns A and E are visible, then one vertical dividing line appears between columns A and E. Select that vertical dividing line with the cursor slightly to the right of the dividing line. This selects the line for column D. (If the cursor is to the left of the dividing line, then the dividing line for column A is selected.) Drag the vertical dividing line to the right to unhide column D. Repeat for columns C and B.

With the Format Menu

Hidden columns and rows can also be displayed with the **Data | Format | Column Width** and **Data | Format | Row Height** commands. To display hidden rows or columns, select the columns or rows on both sides of the hidden columns or rows, select **Data | Format | Column Width** or **Data | Format | Row Height**, and then set the width or height to a number greater than zero.

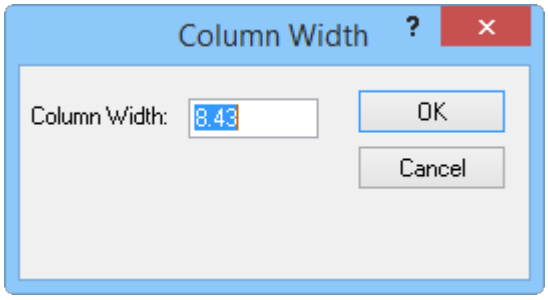
Column Width

You can change the column width of selected cells by clicking the **Data | Format | Column Width** command 

or by using the mouse to resize the column. The Excel XLS, Excel XLSX, or SYLK SLK file format must be used to save the column width in the file since ASCII file formats (.CSV, .TXT, .DAT, .BNA, .BLN) do not preserve file format information.

The Column Width Dialog

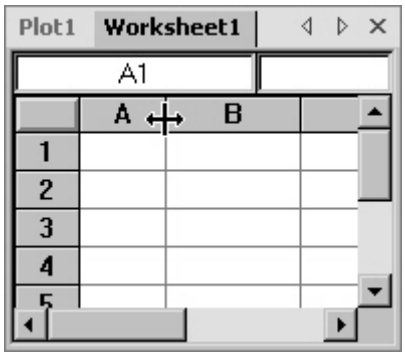
To set column widths or to hide columns, select the entire column or individual cells within the columns, and then select **Data | Format | Column Width**. Enter the width for the selected column or cells into the **Column Width** dialog. Columns can range from zero to 512 characters wide.



*Change the column width by selecting columns, choosing **Data | Format | Column Width**, and then entering a number into the **Column Width** dialog.*

Changing Column Widths with the Mouse

Column width can also be changed using the mouse. When the cursor is moved to the line that defines the right boundary of the column header, the cursor changes to a line with two arrows. Press and hold the left mouse button and move the cursor to the left or right to change the width of the column.



This example shows the cursor being used to change the width of column A.

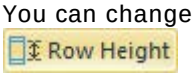
Hide a Column

You can hide a column by moving the cursor to the left until the next dividing line is reached. In the **Column Width** dialog, a *Column Width* value of zero (0) hides the column.

Display Hidden Columns

To display hidden columns, press and hold the left mouse button at the right edge of the hidden column and move the cursor to the right to widen the column.

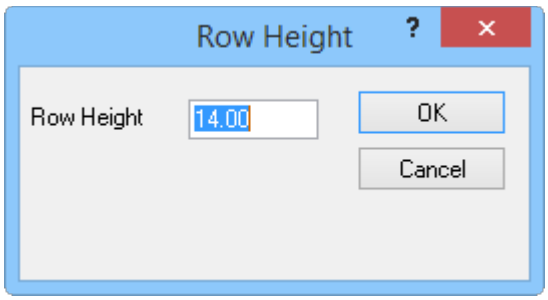
Row Height

You can change the row height of selected cells by choosing **Data | Format | Row Height** 

or by using the mouse to size the row. The Excel XLS, Excel XLSX, or SYLK SLK file format must be used to save the row height and numeric format information with the file since ASCII file formats (.CSV, .TXT, .DAT, .BNA, .BLN) do not preserve file format information.

The Row Height Dialog

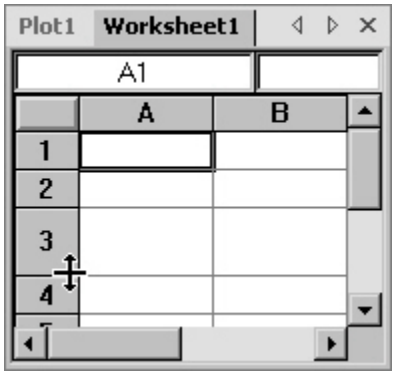
To set row heights or to hide rows, select the entire row or individual cells within the rows, and then select **Data | Format | Row Height**. Enter the width for the selected row or cells in the **Row Height** dialog. Rows can range from zero to 512 characters in height.



*Change the row height by selecting rows, choosing **Data | Format | Row Height**, and then entering a number into the **Row Height** dialog.*

Changing Row Heights with the Mouse

Row height can also be changed using the mouse. When the cursor is moved to the line that defines the lower boundary of the row header, the cursor changes to a line with two arrows ↕. Press and hold the left mouse button, move the cursor up or down to change the height of the row.



This example shows the cursor being used to change the height of row 3.

Hide a Row

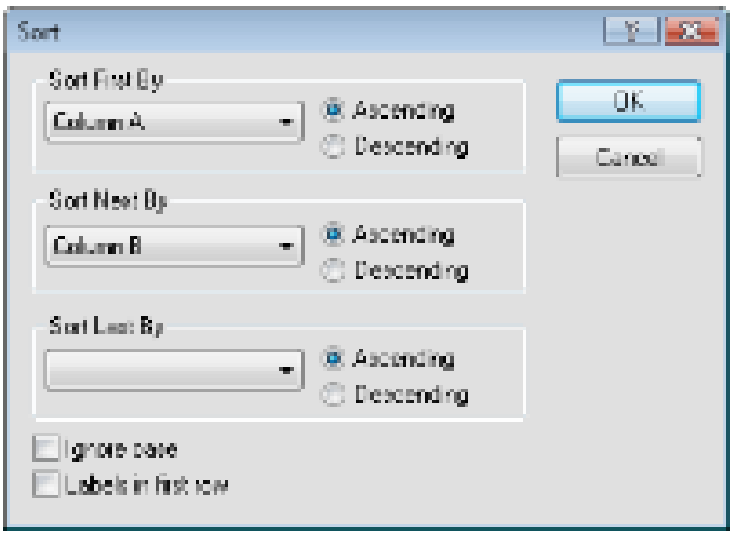
You can hide a row by moving the cursor up until the next dividing line is reached. In the **Row Height** dialog, a *Row Height* value of zero (0) hides the row.

Display Hidden Rows

To display hidden rows, press and hold the left mouse button at the bottom of the hidden row and move the cursor down to stretch the row height.

Sort - Worksheet

Click the **Data | Data | Sort** command  to arrange data according to rank in user-specified sort columns. Sorting rank is based on numbers, ASCII characters, and punctuation. You can sort numeric data, text, or mixed columns.



*Use the **Data | Data | Sort** command to sort data on multiple columns.*

Selecting Cells to Sort

Sorting is performed only on the selected columns. If only one column is selected, only that column is sorted. To keep records (rows of data) together, select all columns containing data even if only one column is sorted. To decrease sort time, select a block of cells rather than clicking on the row or column labels.

Sort Order

The *Sort First By* option defines the primary column on which the rows are sorted. The positions of the sorted rows are determined by the *Ascending* or *Descending* rank in the *Sort First By* column.

Secondary Sort

When two or more rows have identical entries in the *Sort First By* column, the *Sort Next By* column can further organize the data set. Duplicates in the *Sort First By* column are then sorted according to the rank in the *Sort Next By* column.

Final Sort

The *Sort Last By* column can be used when the *Sort Next By* column contains duplicates.

Ascending or Descending Sort

The sort order in an *Ascending* sort is based on the ASCII table. Numeric values are placed first, followed in order by cells starting with a space character, common punctuation, numeric text (numbers entered as text), uppercase letters, less common punctuation, lower case letters, uncommon punctuation, and blank cells. Descending order is the opposite of ascending order although blank cells are still listed last.

0	1	2	3	4	5	6	7	8	9
space	!	"	#	$	%	&	'	(	)
*	+	,	-	.	/	"0"	"1"	"2"	"3"
"4"	"5"	"6"	"7"	"8"	"9"	:	;	<	=
>	?	@	A	B	C	D	E	F	G
H	I	J	K	L	M	N	O	P	Q
R	S	T	U	V	W	X	Y	Z	[
\	]	^	_	`	a	b	c	d	e
f	g	h	i	j	k	l	m	n	o
p	q	r	s	t	u	v	w	x	y
z	{	|	}	~	blank				

This ASCII table shows the sort order in the worksheet.

Ignore Case

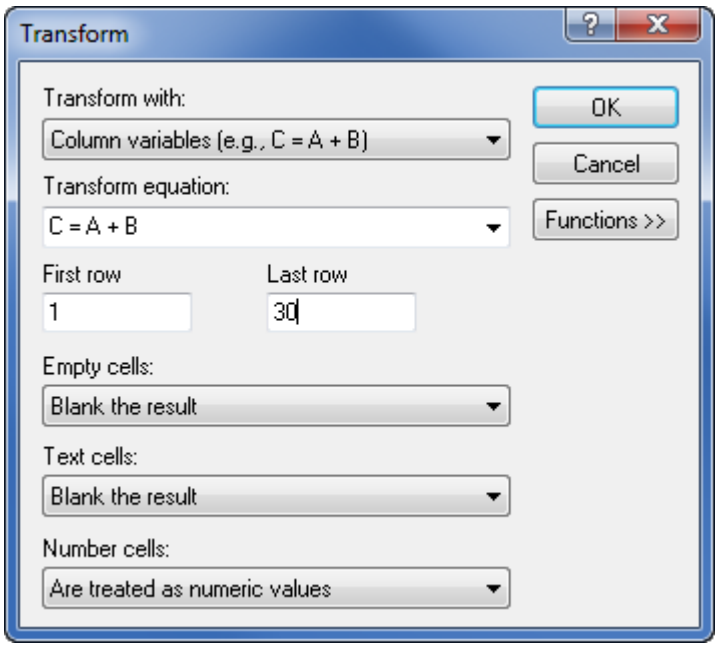
Because sorting is based on an ASCII table, upper and lowercase letters are treated differently. For example, "A" is sorted separately from "a." If the letters are to be treated as the same during the sort, check the *Ignore case* option. When this check box is activated, "A" is considered identical to "a" in the sorting rank.

Labels in First Row

The data set may contain text identifying the data in the column (header information) in Row 1. In this case, click the *Labels in first row* option to exclude the label row from the sort process.

Transform - Worksheet

Click the **Data | Data | Transform** command  to open the **Transform** dialog, where you can apply mathematical transformations to columns, rows, or cells. Valid math operators include addition (+), subtraction (-), multiplication (*), and division (/) as well as a large library of built-in mathematical functions. Parentheses should be used to override precedence or for clarification.



*Use the **Transform** dialog to apply math functions to data. The dialog options update to reflect the option selected for* Transform with *field.*

Transform With

Select the type of transform from the *Transform with* list. *Column variables (e.g., C = A + B)* applies the transform equation to the specified rows in the *Transform equation* column. *Row variables (i.e., _3 = _1 + _2)* applies the transform equation to the specified columns in the *Transform equation* row. *Cell variables (i.e., C3 = A1 + B2)* applies the transform equation only to the cell specified in the *Transform equation*.

Transform Equation

Type the formula into the *Transform equation* box. Formulas consist of a destination column, row, or cell on the left side of the equation and a mathematical manipulation on the right side of the equation. Use the column label letters, row numbers, or cell locations on both sides of the equation. Click the down arrow to use previously entered equations. For columns, a sample equation may be C = A + B. For rows, a sample equation is _4=_1+_2. For cells, a sample equation would look like C2=A1+B1-C1.

If the transform method is by column, the range functions (sum, avg, std, rowmin and rowmax) take column indices only, i.e., sum(A...C). If transform method is by variable rows, the range functions take row indices only, i.e., sum(_1..._3). If transform method is by variable cells, the range functions are not supported.

First and Last Columns and Rows

When calculating transformations on columns, enter the *First row* and the *Last row* to limit the calculation to the specified rows. When calculating transformations on rows, enter the *First col* and *Last col* to limit the calculation to the specified columns. When calculating transformations on cells, the *First row, Last row, First col,* and *Last col* options are not available.

By default, these are set to the first row and last row (or first column and last column) with text or numbers entered into a cell for the entire worksheet.

Empty Cells

The *Empty cells* option controls how empty cells are treated in the calculations of formulas. Available options are *Blank the result, Are treated as the number zero (0),* and *Are treated as empty text ("").* The default option is *Blank the result*, which results in the formula not being calculated for any row that contains a blank cell in any of transform equation rows or columns.

- Setting the *Empty cells* option to *Blank the result* results in a blank cell for the transform when the cells on the right side of the equation are empty.
- Setting the *Empty cells* option to *Are treated as the number zero (0)* results in the transform creating a number when all of the cells on the right side of the equation are empty or numeric. When the right side of the equation combines text and blank cells, the equation is blank.
- Setting the *Empty cells* option to *Are treated as empty text ("")* results in the transform creating a text string when all of the cells on the right side of the equation are empty or text. When the right side of the equation combines numeric and blank cells, the equation is blank.

Text Cells

The *Text cells* option controls how text cells are treated in the calculations of formulas. Available options are *Blank the result, Are treated as text, Are converted to numbers (if possible),* and *Are treated as the number zero (0).* The default option is *Blank the result*, which results in the formula not being calculated for any row that contains a text cell in any of transform equation rows or columns.

- Setting the *Text cells* option to *Blank the result* results in a blank cell for the transform when any of the cells on the right side of the equation contain text strings (including numbers formatted as text).
- Setting the *Text cells* option to *Are treated as text* results in the transform creating a text string when all of the cells on the right side of the equation are text (or treated as text). If a mix of text cells and numbers or empty cells (that are not treated as text) are in the cells on the right side of the equation, the transform results in a blank cell. This option allows text strings to be concatenated.
- Setting the *Text cells* option to *Are converted to numbers (if possible)* results in the transform creating a number when all of the cells on the right side of the equation are numeric or treated as numbers. Any cells with numbers formatted as text are treated as the number. For example, the text string '05 would be treated as the number 5 if this option is selected.
- Setting the *Text cells* option to *Are treated as the number zero (0)* results in the transform creating a number when all of the cells on the right side of the equation are numeric or treated as numbers. Any cells with text are replaced with the value zero for the transform. For example, if you are using the equation C=A+B and A has *Colorado* and B has *45*, the value in cell C will be 45.

Number Cells

The *Number cells* option controls how numeric cells are treated in the calculations of formulas. Available options are *Blank the result, Are treated as numeric values, Are converted to text,* and *Are treated as empty text ("").* The default option is *Are treated as numeric values*, which results in the formula being calculated for any row that contains numbers in any of transform equation rows or columns.

- Setting the *Number cells* option to *Blank the result* results in a blank cell for the transform when any of the cells on the right side of the equation contain numbers. This option is useful when you only want to combine text cells or blank cells.

- Setting the *Number cells* option to *Are treated as numeric values* results in the transform creating a number when all of the cells on the right side of the equation are number (or treated as numbers). If a mix of text cells and numbers or empty cells (that are not treated as numbers) are in the cells on the right side of the equation, the transform results in a blank cell.
- Setting the *Number cells* option to *Are converted to text* results in the transform creating a text string when all of the cells on the right side of the equation are text or treated as text. Any cells with numbers are treated as the text string of the number. For example, number 5 is in the cell, so the text string would appear as '5 if this option is selected.
- Setting the *Number cells* option to *Are treated as empty text ("")* results in the transform creating a text string when all of the cells on the right side of the equation are text or treated as text. Any cells with numbers are replaced with "" for the transform. For example, if you are using the equation C=A+B and A has *Colorado* and B has *45*, the value in cell C will be *Colorado*.

Combining Text, Numbers, and Empty Cells

Many possible combinations of the *Empty cells, Text cells,* and *Number cells* exist to allow combining these different types of cells in a *Transform equation*. If the transform result is not what you expect, check the settings for these options and adjust if necessary.

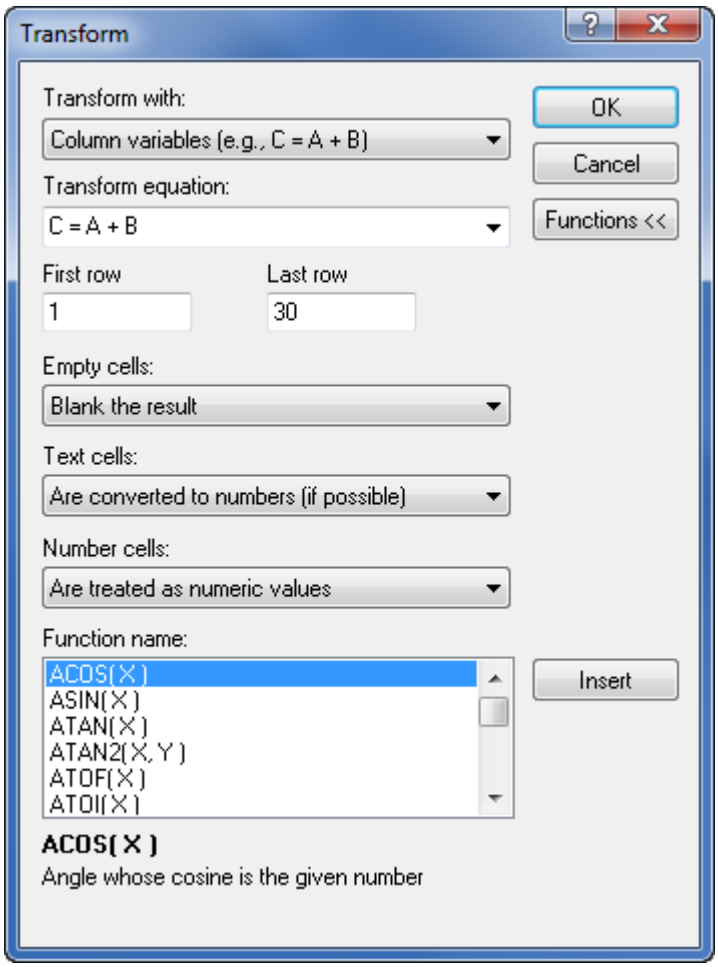
Functions

Click the *Functions* >> button to open a list of predefined mathematical functions. Click the *Functions* << button to hide the list of predefined mathematical functions.

To use a function, place the cursor in the location to add a function, select a function from the list, click the *Insert* button, and then replace the X in the function with a column letter (A), row number (_1), or cell location (A1). Also, be sure to use proper mathematical operators (+_*/) between the function and the rest of the equation. The definition of the function is listed below the *Function name* list when a function is selected.

Insert

When the *Functions* are expanded, the *Insert* button is visible. Select a function and click the *Insert* button to add a function to the equation. Change the variable (i.e. X) in the listed functions to a column letter, row number (_1), or cell location in the transformation equation.



This example used the Functions *button to choose a predefined function from the* Function name *list. The* Insert *button was used to add the selected function to the* Transform equation *box. The values were changed to fit the desired column variables.*

Examples

An example of a column formula is C = A + B. Columns A and B are added and inserted into column C with this equation. The formula adds the contents of A and B in each row and places the results in column C for that row.

An example of a row formula is _4=_1+_2. Rows 1 and 2 are added and inserted into row 4 with this equation. The formula adds the contents of the 1 and 2 in each column listed between the *First col* and *Last col* values and places the results in row 4 for that column.

An example of a cell formula is C2=A1+B1-C1. The value in C1 is subtracted from the sum of the values in cells A1 and B1. The result is inserted into cell C2 with this equation.

Example Functions

This example shows how to use the built in functions. Consider, for example, taking the cosine of data in column C. Column D is the first empty column, so we will use column D as the destination column.

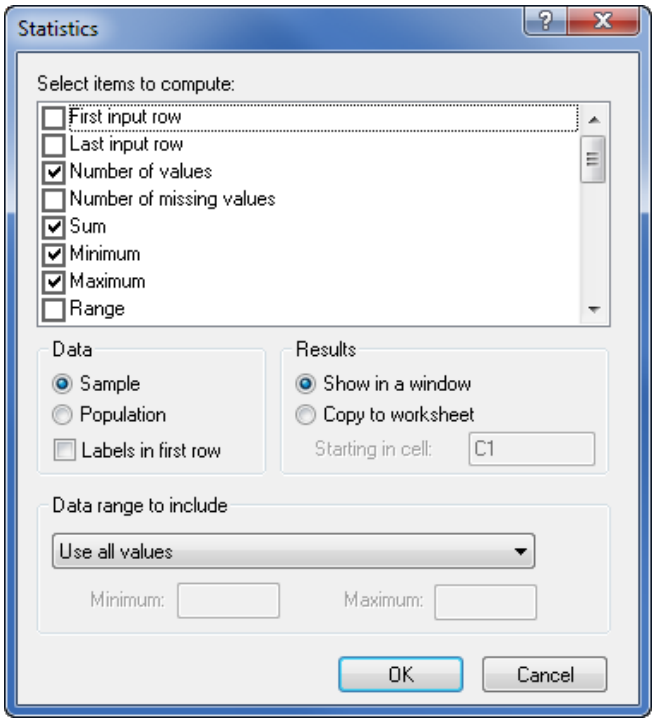
1. Click the **Data | Data | Transform** command to open the **Transform** dialog. You do not need to highlight any columns before selecting **Transform**.
2. In the *Transform equation* box, type "D = " without the quotes.
3. Click the *Functions* button.
4. Double-click on the function name COS(X) in the *Function name* group. Alternatively, you could select a *Function name* and click the *Insert* button.
5. COS(X) is automatically placed in the equation as "D = COS(X)" without the quotes.
6. Replace the X in the function with the column letter containing the data to be transformed (column C). The equation will be "D = COS(C)" without the quotes.
7. Change the *First row* and *Last row* if you wish.
8. Make sure that *Empty cells* and *Text cells* are set to *Blank the result* to only calculate values with numbers.
9. Click *OK* to create a new data column with column C's data transformed with the cosine.

Statistics - Worksheet

The **Data | Data | Statistics** command  calculates statistical values for a group of selected numeric cells (see Selecting Worksheet Cells). Select an entire column or a continuous group of cells in a column to use the **Statistics** command. If a rectangular block of rows and columns are selected, the **Statistics** command calculates the statistics for each column separately. A warning message appears if a group of cells cannot be used with the **Statistics** command. Non-numeric cell entries (empty cells or text) are ignored in statistics calculations.

The Statistics Dialog

Use the **Data | Data | Statistics** command in the worksheet to open the **Statistics** dialog.



Click in the box adjacent to the statistics name to compute the statistics for the selected column.

Select Items to Compute

The *Select items to compute* list contains a list of statistics to choose from. Multiple statistics can be chosen.

- *First input row* reports the first row number in the selection. If the *Labels in first row* option is checked, the *First input row* is the second row in the selection.
- *Last input row* reports the last row number containing data in the column.
- *Number of values* indicates the number of numeric cells in the column.
- *Number of missing values* indicates the number of non-numeric cells in the selection. If columns are selected by clicking the column letters, the number of missing values includes blank values up to the last used row in the worksheet, which may be different from the last used row in the selected column. If cells are selected by highlighting specific cells, then only the blank cells within the selection are counted.
- *Sum* is the sum of all numeric cells in the column.
- *Minimum* indicates the minimum value in the column.
- *Maximum* indicates the maximum value in the column.
- *Range* indicates the range of the numeric values in the column (*Maximum – Minimum*).
- Mean is the arithmetic average of the data values. It is the sum of the data values divided by the number of data values.
- *Median* is the middle value among the data values. Half of the data values are larger than the median and half are smaller than the median. When there are an even number of data values the median is the average of the two middle values.
- *Mode* is the value that appears most often in a data set. If applicable, **MapViewer** will display multiple modes separated by a comma.
- *First quartile (25th percentile)* is the value such that one-fourth of the data values are smaller than the quartile and three-fourths of the data values are larger than the first quartile.
- *Third quartile (75th percentile)* is the value such that three-fourths of the data values are smaller than the quartile and one-fourth of the data values are larger than the third quartile.
- Standard error of the mean
- 95% confidence interval for the mean
- 99% confidence interval for the mean
- Variance
- Average deviation
- Standard deviation
- Coefficient of variation
- Coefficient of skewness
- Coefficient of kurtosis
- Kolmogorov-Smirnov goodness of fit for normal distribution
- Critical Value of K-S statistic at 90% significance level
- Critical Value of K-S statistic at 95% significance level
- Critical Value of K-S statistic at 99% significance level

Data Group

The *Data* group is used to select *Sample* or *Population* statistics. The *Labels in first row* option is also specified in the *Data* group.

Sample or Population

Select *Sample* or *Population* statistics, depending on whether the data represent a statistical sample or the complete set of all possible members of a population.

Labels in the First Row

Check the *Labels in first row* box if the first row of the selection contains descriptive labels. If this box is checked the label appears at the top of the statistics report for each column.

Results Group

The *Results* group is used to show the statistics report in a window or copy the results to a new location of the worksheet.

Show in Window

Select *Show in a window* to write the statistics results to a Statistics Results dialog. The results in this dialog can be copied to the clipboard to paste to other locations.

Copy to Worksheet

Select *Copy to worksheet* to write the statics report to a new location in the worksheet.

Starting in Cell

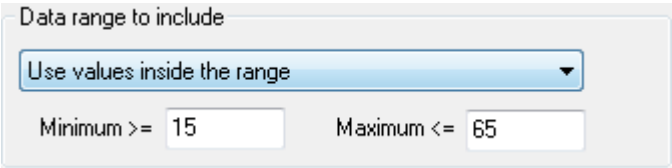
Use the *Starting in cell* box to specify the cell for the upper left corner of the statistics report. If the destination cells contain data, a warning is displayed that data will be overwritten.

Data Range to Include Group

The *Data range to include* contains options to limit the values where the statistics are calculated. Available options are *Use all values*, *Use values inside the range*, *Use values outside the range*, and *Use all values except*.

When the *Data range to include* is set to *Use all values*, all of the values in the highlighted section are used to calculate the statistics.

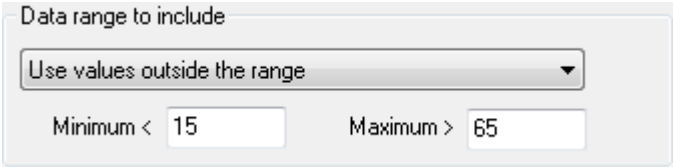
When the *Data range to include* is set to *Use values inside the range,* the *Minimum* >= and *Maximum* <= options are available. Type in the data values that bracket the range of values where the statistics should be calculated. For instance, if the *Minimum* >= is set to 15 and the *Maximum* <= is set to 65, only data points between (and including) 15 and 65 are used for calculating the statistics.



Only the values that are inside the range are included in the calculated statistics.

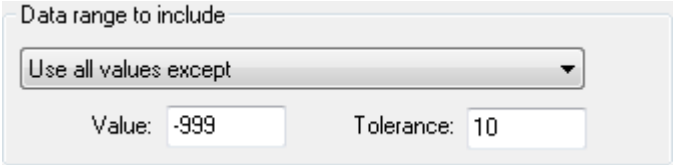
When the *Data range to include* is set to *Use values outside the range,* the *Minimum* < and *Maximum* > options are available. Type in the data values that bracket the range of values where

the statistics should be calculated. For instance, if the *Minimum* < is set to 15 and the *Maximum* > is set to 65, only data points below 15 or greater than 65 (and excluding 15 and 65) are used for calculating the statistics.



Only the values that are outside the range are included in the calculated statistics.

When the *Data range to include* is set to *Use all values except,* the *Value* and *Tolerance* options are available. Type in the data value that should be excluded in the *Value* box. The *Tolerance* value gives a range on either side of the *Value.* Everything in the range *Value-Tolerance* to *Value+Tolerance* is excluded from the statistics calculation. For instance, if the *Value* is set to -999 and the *Tolerance* is set to 10, all values between -1009 and -989 are excluded from the statistics. This means that all values less than -1009 and greater than -989 are included in the statistics calculations.

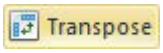


Only the values that are outside the range Value-Tolerance to Value+Tolerance are included in the calculated statistics.

OK or Cancel

Click *OK* to overwrite the data. Click *Cancel* to set a new *Starting in Cell* location.

Transpose

The **Data | Data | Transpose** command 

rearranges data from columns to rows or from rows to columns. To quickly switch the layout of your data, highlight the data that should be flipped. Click the **Data | Data | Transpose** command and the columns become rows and the rows become columns.

For example, consider the following data:

	A	B	C	D	E
1	Category	Spring	Summer	Fall	Winter
2	A	12	14	15	21
3	B	13	5	23	12
4	C	51	21	12	32

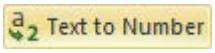
Categories A, B, and C are displayed with each category in a row.

Highlight the rows 1-4. Click the **Data | Data | Transpose** command and the data appears in columns:

	A	B	C	D
1	Category	A	B	C
2	Spring	12	13	51
3	Summer	14	5	21
4	Fall	15	23	12
5	Winter	21	12	32

Categories A, B, and C are now displayed with each category in a separate column. This makes it easier to compare the data in a graph, such as a box-whisker plot.

Text To Number

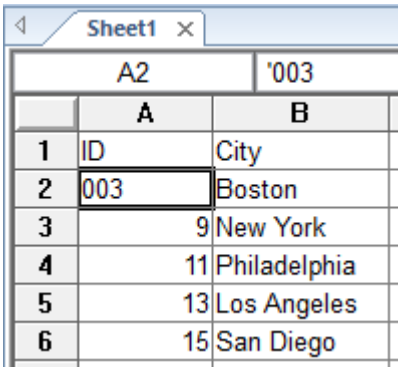
Click the **Data | Data | Text to Number** command 

to convert text strings in selected cells to numbers. This command will eliminate extraneous zeros and convert text to simplified numeric format.

To determine if the cell contains a number formatted as text, click on the cell to select it. The cell edit box displays the number with an ' before the number. For instance, in the image below, the number 3 appears as '003, if the number if formatted as text.

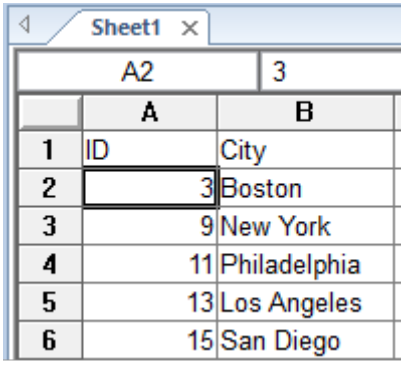
To convert a cell:

1. Click on the cell to select it.



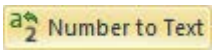
Click on the cell to select it. Notice the cell edit box contains an ' before the number.

1. Click the **Data | Data | Text to Number** command.
2. The cell converts to numeric format, if the cell had been a text number. The cell edit box now displays the number without the ' before it.



The cell now shows the number right aligned and the cell edit box does not contain an ' before the number.

Number To Text

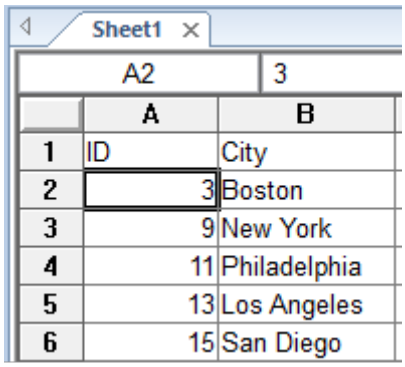
Click the **Data | Data | Number to Text** command 

to convert numeric data in selected cells to text string format.

To determine if the cell contains a number formatted as text, click on the cell to select it. The cell edit box displays the number with an ' before the number. For instance, in the images below, the number 3 is converted to '003 as the number if formatted as text.

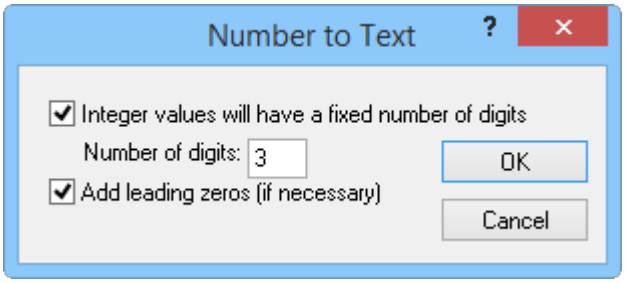
To convert a cell:

1. Click on the cell to select it.



Click on the cell to select it. Notice the Edit Cell Box does not contain an ' before the number.

2. Click the **Data | Data | Number to Text** command to open the **Number to Text** dialog.



*The **Number to Text** dialog contains options for converting numeric to text string data.*

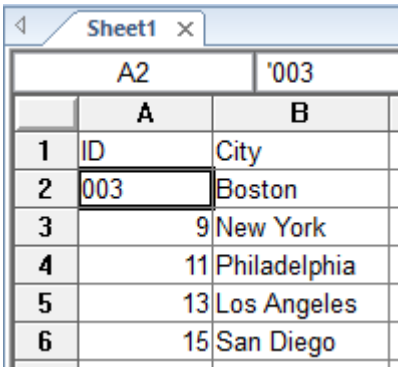
Integer values will have a fixed number of digits

Checking the *Integer values will have a fixed number of digits* box will fix the number of digits the cell contains to the value set in the *Number of digits* input box. **MapViewer** will not round or truncate any numeric data if the number length is greater than the length specified in the *Number of digits:* input box. The number will be converted to text but otherwise be unchanged.

Add leading zeros (if necessary)

If the *Integer values will have a fixed number of digits* box is selected, checking the *Add leading zeros (if necessary)* box will add leading zeros to numeric data with fewer digits than the number specified in the input box. If the *Add leading zeros (if necessary)* box is unchecked, spaces will be added to data with the fewer digits than the number specified above. If *Integer values will have a fixed number of digits* is unchecked, the *Add leading zeros (if necessary)* option will be disabled.

3. Click *OK*



The cell now shows the number as left aligned text. Notice the cell edit box contains an ' before the number.

Chapter 6

Plot Properties

Plot Properties

Properties common to all layers in a map are displayed in the **Property Manager**. Specific properties of a map layer are controlled by the specific map layer properties.

Click the **Map | Plot | Plot Properties** command 

or click in an empty area of the **Object Manager** to view the plot properties in the **Property Manager**.

Plot Properties

The **Plot Properties** control the *Scale*, *Limits*, *Coordinate System, Units, Graticules, Graticule Ticks, Collar, and Collar Ticks* for **MapViewer** maps.

Scale

The scale controls the size of a map or profile on the printed page. This is accomplished by defining a correspondence between lengths on the map (in map units) and lengths on the printed page (in page units). The map scale is specified using the **Scale** page in the plot properties. The scale for the X axis and the scale for the Y axis can be set in unison (proportionally), or they can be set independently.

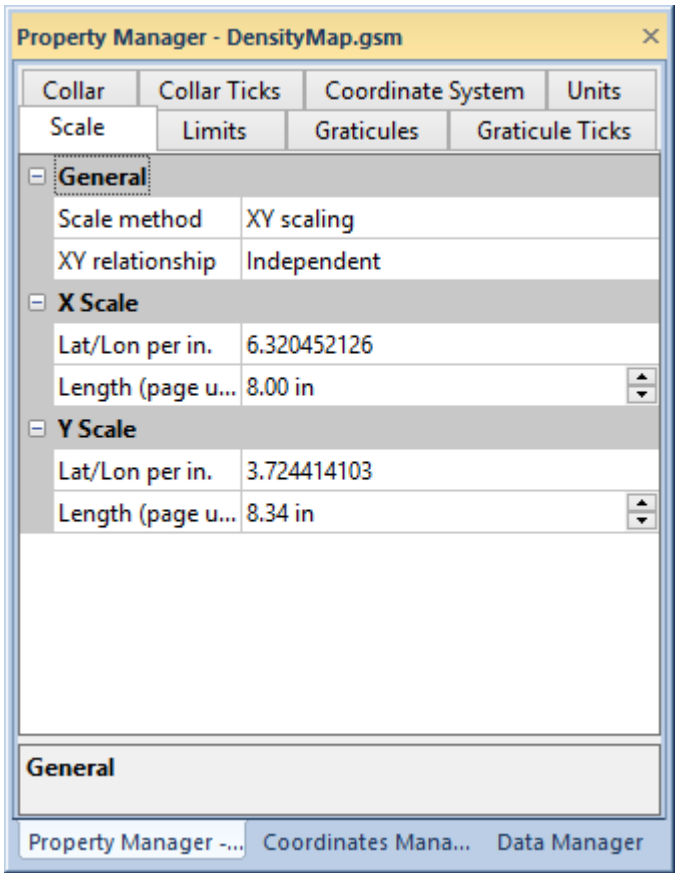
Axes are part of the map on which they are drawn. Therefore, when the scale is redefined, the axes are modified accordingly. Because **MapViewer** calculates reasonable tick spacing based on the map lengths and map limits, redefining the scales can result in different tick spacing along the axis.

<u>Unprojected Lat/Long Maps and Scale</u>

When maps using Unprojected Lat/Long are imported, different scaling is used for the X and Y dimensions. This is done to correct for the conversion of the spherical coordinates to the Cartesian coordinate system used to plot maps in **MapViewer**. For more information on scaling Unprojected Lat/Long maps, see Using Scaling to Minimize Distortion on Latitude/Longitude Maps.

The Scale Page

The **Scale** page is located in the plot properties.



Specify the relative X and Y map scaling on the ***Scale*** *page in the* ***Property Manager****.*

<u>XY Scaling</u>

The *Scale method* list contains *XY scaling*, *Fit to page*, and *Representative fraction*. Select *XY scaling* to adjust the X or Y scale by *Map Units per in. (cm.)* or *Length*.

When *Independent* is the selected *XY relationship* property, the X and Y scales can are adjusted independently.

When *Proportional* is the selected *XY relationship* property, changing an X or Y scale automatically adjusts the other scale to maintain the map proportion. Both scales have the same *Map Unit per in. (cm.)* value when *Proportional* is selected.

When *Current* is the selected *XY relationship* property, changing one scale automatically changes the other scale to maintain the current proportion between the scales. The scales do not have the same *Map Units per in. (cm.)*.

Fit to Page

The *Scale method* list contains *XY scaling*, *Fit to page*, and *Representative fraction*. Select *Fit to page* to fit the map scale to the page.

If the *XY relationship* property is *Proportional*, the scale will be increased to fit the smaller page dimension. The *Map Units per In. (cm.)* values will be the same for the X and Y scales.

When *Independent* is the selected *XY relationship* property, the X and Y scales are fit to the page dimensions independently.

If the *XY relationship* property is *Current*, the current scale proportion is maintained while one scale is fit to the maximum page dimension.

Representative Fraction

The *Scale method* list contains *XY scaling*, *Fit to page*, and *Representative fraction*. When *Representative fraction* is selected, the *Scaling ratio* property determines the map scale in the form of 1:N (1 page inch/centimeter : N map inches/centimeters). The page units (inches or centimeters) are set on the General page of the Options dialog. Since the ratio is dimensionless, the value will be the same whether the page units are inches or centimeters.

Map Units Per In. (cm.)

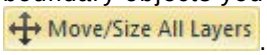
The *Map units per in. (cm.)* option sets the number of map units per page unit in the associated dimension. For example, to draw a map at a scale of 1000 map units per inch, type the value 1000 into the box. The *Length (page units)* value is automatically updated to reflect the change. For example, if the map is 8000 units in the dimension you are setting, the map is 8 inches long in that dimension.

Length

The *Length (page units)* option sets the length of the map in the X, Y, or Z dimension. When the *Length (page units)* value is changed, the *Map units per In. (cm.)* box is automatically updated to reflect the change.

Sizing a map with its selection handles does not rescale the map internally, it just resizes the map on the screen. To return to the proper scale, use the **Scale** page to scale the map. Sizing a map with the **Map | Layer | Move / Size All Layers** command changes the internal map scale.

Move / Size All Layers

When you want to reposition or resize a map and retain the correct map coordinate placement for boundary objects you must use the **Map | Plot | Move / Size All Layers** command 

. The **Move / Size All Layers** command moves or rescales the map coordinate system relative to the page, as well as all objects on all layers of your map. This retains all the objects in their correct positions relative to each other and to the map coordinate system as well. The map scaling indicated in the Scale page is updated to reflect the changes you make in this way.

When you select the **Map | Plot | Move / Size All Layers** command, selection handles appear around the entire map indicating that you can

- Move the map by clicking and dragging it anywhere on the page.

- Resize the map and coordinate system by clicking and dragging one of the selection handles. If you use one of the corner handles, the map is resized proportionally. If you use one of the side handles, you rescale the map in one dimension only. (A more precise way to scale a map is to use Scale page of the plot properties.)

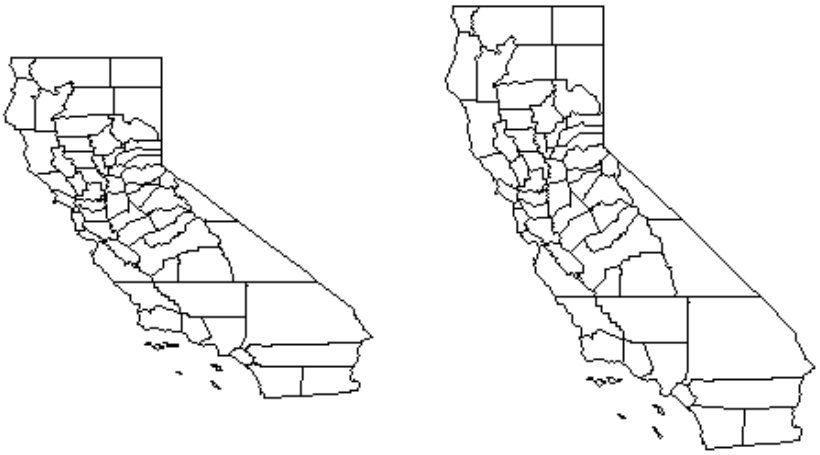
Warning

Dragging a map by its sizing handles *without* selecting this command destroys the coordinate system scaling of the map. Also, just moving the map by dragging it to a new location does not preserve the coordinate system. If you import new maps into the plot window where stretching or dragging occurred, the maps will not overlay properly.

*Use the **Map | Move/Size All Layers** command to move a map and its coordinate system. If you drag a map with your mouse to a new location without the above command, any newly appended maps will not overlay properly.*

Using Scaling to Minimize Distortion on Latitude/Longitude Maps

When you display maps based on latitude and longitude coordinates extending over a large region, they might appear somewhat distorted. This occurs because one degree of latitude is not equivalent to one degree of longitude. For example, consider a base map of the state of California (CA2000.GSB).



This shows the map of California before and after scaling. The map on the right is scaled up in the Y dimension so the map does not appear compressed.

As an approximation, the distance covered by one degree of latitude at the equator is equal to the distance covered by one degree of latitude at the poles, and is approximately 69 miles. This distance between degrees of latitude remains nearly constant over the globe, although it does vary slightly because the earth is not a perfect sphere. However, the distance between a degree of longitude decreases from the equator to the poles. For any latitudinal position, you can determine the length, in miles, between degrees of longitude based on the formula:

Distance covered by 1° of longitude (in miles) = cosine (latitude) x 69.172.

This equation assumes a Clark 1866 reference ellipsoid.

This table illustrates the change as you move from the equator to the poles.

Latitude	**Distance Covered by One Degree of Longitude**
0° (equator)	69.172 miles
30°	59.904 miles
60°	34.586 miles
90° (poles)	0 miles

Substitutions for units other than miles:

- For kilometers, you can substitute the number 111.321 for 69.172 in the formula above.
- For meters, you can substitute the number 111,321 for 69.172 in the formula above.
- For feet, you can substitute the number 365,228 for 69.172 in the formula above.

So, how can you put this information to use? Remember that you are plotting degrees of latitude and longitude, but what you really want to show on the map are the correct distances. You must scale the longitude values correctly for the correct distances to be represented on the map. The scaling factor to apply for maps is based on the cosine of the latitude for the area you are working on.

To determine the scaling factors:

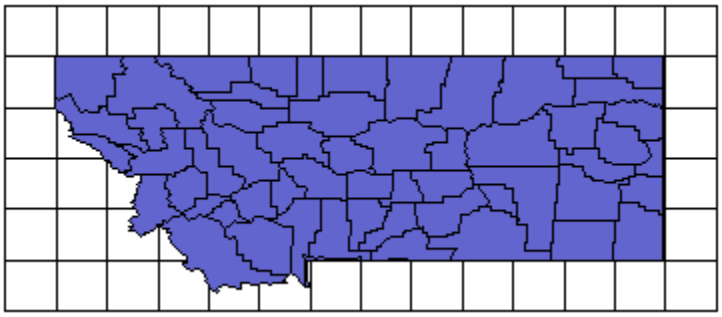
1. Determine the latitude for the parallel through the center of the map, and obtain the cosine for this latitude value. The center parallel in CA2000.GSB is approximately 37.27 degrees. The cosine of 37.27 is 0.80.
2. Click on the *Map* in the **Object Manager** to select it. The map properties are displayed in the **Property Manager**.
3. Click the Scale tab to set the X direction for the map. You can set either the *Length (page units)* value or the *Map units per in. (cm.)* value. The *X Scale* Map units is 1.72 inches in this example.
4. Uncheck the *Proportional XY scaling* box.
5. Multiply the *X Scale Map units* value by the cosine of the latitude, and enter this number into the *Y Scale Map units* field. 1.72 (*X Scale Map units*) X 0.80 (cosine of latitude) = 1.38 (*Y Scale Map units*). Enter 1.38 into the *Map units per in*. box under *Y Scale*.

The map is automatically updated.

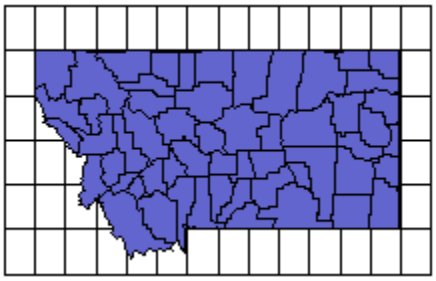
Example

Consider a map of the state of Montana. When you plot the map on a one to one scale, the map appears stretched in the east-west direction. To understand this problem, consider that for Montana the latitude ranges from 44.36° to 49°. The latitude for the center of the map is determined from this to be 46.68°. The cosine of 46.68° is 0.686. The distance covered by one degree of longitude at this latitude is only 0.686 times the distance covered by one degree of latitude. To reduce the distortion on this map, you must correct for this difference.

Let's say you are plotting the map at an X scale of 1" = 2 map units (longitude). For the map to be scaled appropriately, you would plot the Y scale at 1" = 1.372 map units (latitude, 2 x 0.686 = 1.372). This effectively stretches the map in the latitude (N-S) direction. Now the map distances are nearly the same in the longitude and latitude directions.



When the map is scaled so 1° of longitude equals 1° of latitude, map distances are distorted. Notice that the graticules form squares (equal spacing).



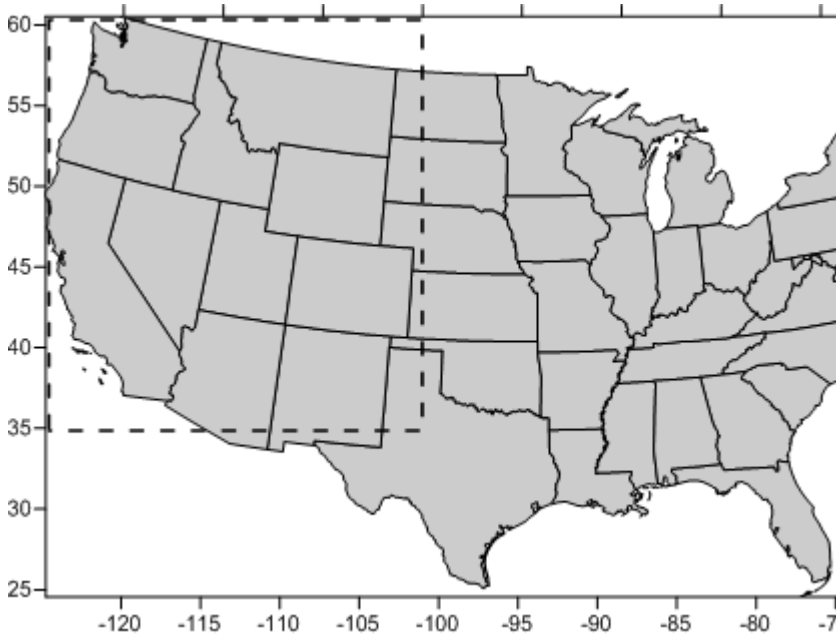
When you apply scaling factors, map distances are represented more accurately. The rectangular spacing of graticule lines indicate the difference in scaling.

Limits Page

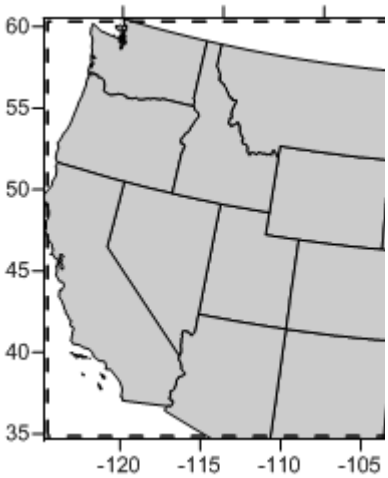
The **Limits** page in the plot properties lets you define the X and Y minimum and maximum map coordinates (specified as *xMin*, *xMax*, *yMin*, and *yMax* values).

When a map is created, the limits are automatically defined by the coordinate values contained in the file used to create the map. The limits of the selected map can be adjusted on the **Limits** page of the plot properties.

Example



The map limits of the map are set to the default limits as defined by the base map.
The limits of a smaller area of interest are indicated with the dashed rectangle.



The map limits of the map have been adjusted to the limits of the area of interest.

Limits and Map Scale

When new map limits are defined for a map, the map scale is not changed. For example, if the map uses a scaling of 1 inch = 1000 meters, the new map uses this same scale. This can result in maps much smaller or larger than the original map. In this case, click on the map and set the new scale on the Scale page.

Limits and Prism Maps

Prism maps are not clipped by the limits.

Limits and Post Maps

Limits can be set on post maps or maps containing a post map layer. When a posted point lies outside the map limits, the posted symbol and the label are clipped from the map. When a posted point is inside the map limits, the entire symbol and posted label are printed.

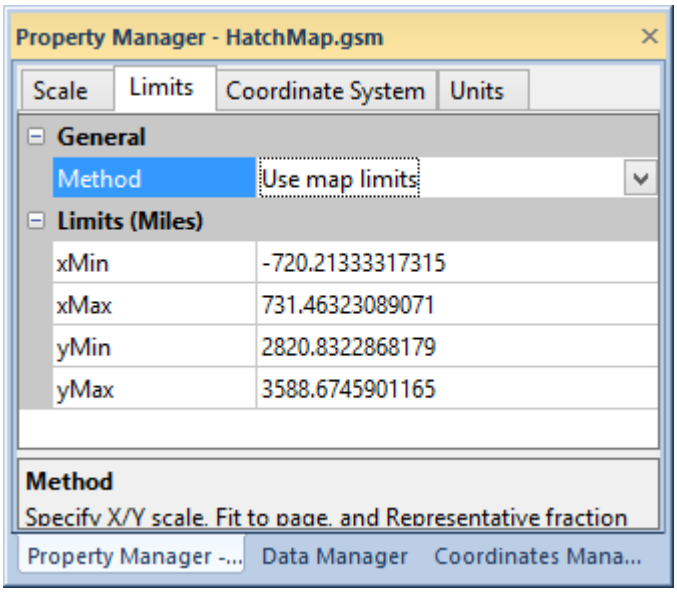
If the posted point is inside the map limits but the label and/or symbol extend beyond the map limits, the label or symbol portion outside the map limits is clipped. Use the *Edit labels* tool in the layer properties Post page to move the label within the map limits.

Limits, Scale, and Adding Map Layers

When a new map layer is added to an existing map or a modified map layer exceeds the current map limits, a message appears prompting you to adjust the map limits to include all the layers. Select *Yes* to adjust the map limits. Select *No* to preserve the current map limits.

The Limits Page

The **Limits** page is located in the plot properties.



Specify the map limits in the ***Property Manager*** *on the* ***Limits*** *page.*

General

The *Method* property determines if the limits are set by the map or user. Select *Use map limits* to use the entire map limits. Select *Specify limits* to use user defined limits by typing in the *Limits (Units)* section below.

Limits XY Min and Max

Set custom *xMin*, *xMax*, *yMin*, and *yMax* map limits in the *Limits (Units)* group. The units in parenthesis are the *Coordinate display units* on the Units page.

Map limits can be set larger or smaller than the limits of the current map. For example, if you have a map that ranges from zero to 100 in the X dimension, but you only want to display the map from 25 to 50 in the X dimension, use 25 and 50 as the new minimum and maximum values on the **Limits** page.

When using date/time formats for any of the axis labels, the minimum and maximum on the **Limits** tab are entered in date/time format. To change the value, highlight the existing value and enter the minimum or maximum date/time value. For instance, 02/02/2014 12:00:00 AM can be entered into the *xMin* option.

xMin	6/10/2010 0:00:00
xMax	7/19/2013 0:00:00
yMin	4406800
yMax	4408800

This example shows a map with xMin *and* xMax *values in date/time format.*

Original Map Limits

To return to the original map limits, choose the *Use map limits* method in the **Limits** page.

Moving Map Coordinate Systems on the Page

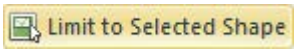
The **Map | Plot | Move/Size All Layers** command moves or rescales the map coordinate system relative to the page, as well as all objects on all layers of your map. When you want to position a map and retain the correct map coordinate placement for boundary objects you need to use the **Map | Move/Size All Layers** command. This retains all the objects in their correct positions relative to each other and to the map coordinate system as well. Graticule lines are repositioned relative to the changes you make. Also, the map scaling indicated in the Scale page is updated to reflect the changes.

When you select the **Map | Move/Size All Layers** command, selection handles appear around the entire map indicating that you can

- Move the map by dragging it anywhere on the page.
- Resize the map and coordinate system by dragging one of the selection handles. If you use one of the corner handles, the map is resized proportionally. If you use one of the side handles, you rescale the map in one dimension only. A more precise way of resizing a map is using **Map | Scale**.

Do not resize or reposition a map without using the **Map | Move/Size All Layers** command. Repositioning or resizing the map without this command will destroy the underlying coordinate system and scale.

Limit to Selected Shape

The **Map | Plot | Limit to Selected Shape** command 

limits the map in the plot window to a user-defined, closed region. The region can be specified with a polygon, spline polygon, rectangle (square), rounded rectangle, or ellipse (circle). The **Limit to Selected Shape** command is available in the context menu when an appropriate object is selected. Access the context menu by right-clicking with the mouse.

Limiting the Map to an Area

1. Draw a closed shape and select it, or select an existing shape object. Only one object may be used with the **Limit to Selected Shape** command. The object can be on any layer.

2. When a valid shape is selected, the **Limit to Selected Shape** command is enabled. Click **Map | Plot | Limit to Selected Shape**. The map limits are changed to fit the selected shape. The legend and scale bar exist outside the map limits and are not affected by the **Limit to Selected Shape** command. Any objects outside of the new map limits will become hidden. The objects will be visible in the **Object Manager**, but they will not be visible in the plot window.

3. To return the map to its original limits, set the *Method* in the Limits page of the Plot Properties to *Use map limits*.

Using Multiple Objects with Limit to Selected Shape

MapViewer can edit and combine boundaries to create one object from many. Once the shapes you wish to use to limit the map are combined into one object, you can use the **Limit to Selected**

Shape command. First, change any rectangles (squares), rounded rectangles, or ellipses (circles) to polygons with the Symmetric Shape to Polygon command. Polylines can be made into polygons with the Polyline to Polygon with Shared Border command. Next, combine the polygons with the Union of Polygons or Combine Islands/Lakes commands. Finally, select the single polygon you created with the preceding commands, and click the **Limit to Selected Shape** command.

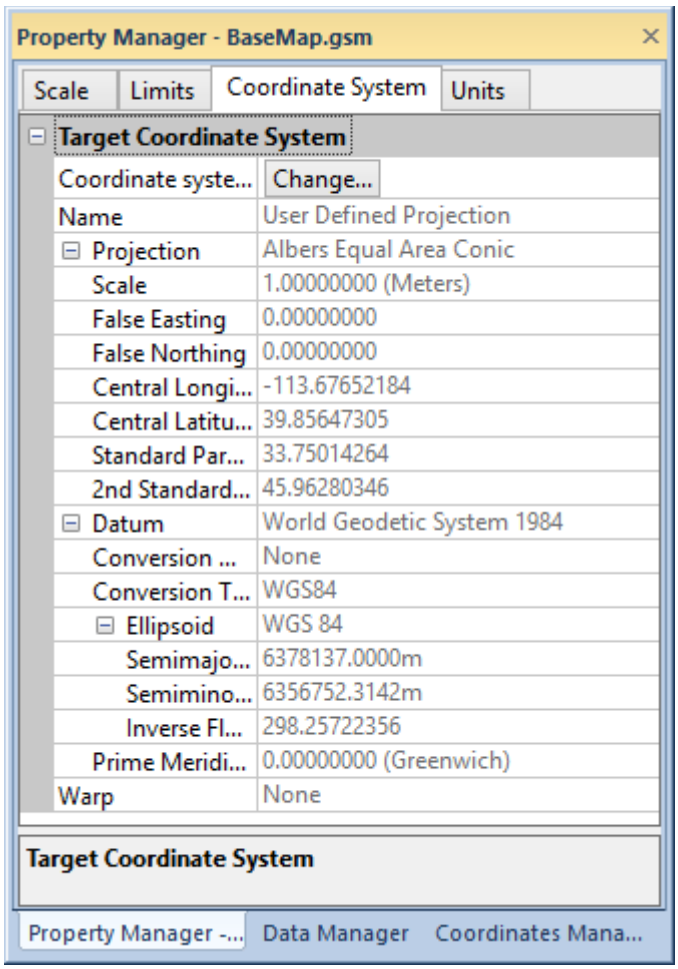
Coordinate System

Maps can be displayed in any coordinate system. The map is displayed in the coordinate system defined as the *Target Coordinate System* for the map. A coordinate system normally has a defined projection and datum. If some map layers are using a different source coordinate system than the map's target coordinate system, the map layer is converted to the map's *Target Coordinate System*. The map's *Target Coordinate System* is the new coordinate system that you want to use to project your X, Y coordinate data.

When a new plot is created, the plot and layers of the plot are set to an unreferenced coordinate system.

The Coordinate System Page

The **Coordinate System** page is located in the plot properties. Pin maps have a separate data coordinate system. Edit the *Data Coordinate System* in the **Coordinate System** page of the **Property Manager** for a pin map.



*Specify the map coordinate system on the **Coordinate System** page.*

<u>Coordinate System</u>

Click the *Change* button next to *Coordinate system* to open the Assign Coordinate System dialog. This dialog lets you set the desired target coordinate system. This is the coordinate system in which you want the map to be displayed.

Projection and *Datum* information is displayed for the current *Target Coordinate System* on the **Coordinate System** page.

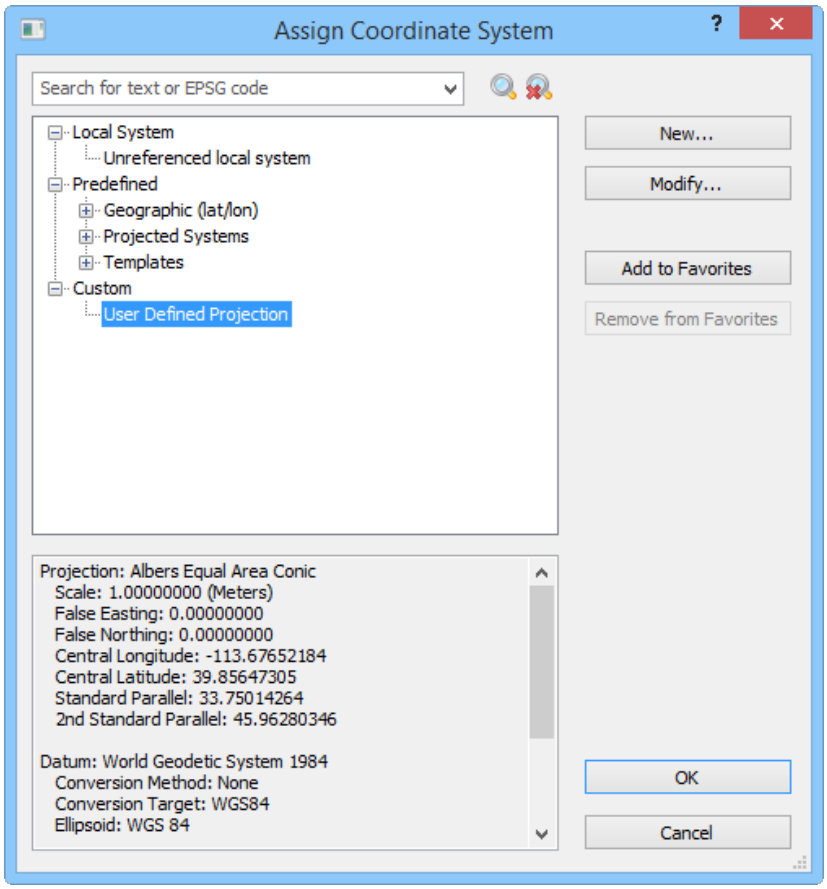
Assign Coordinate System

The **Assign Coordinate System** dialog is accessed from several locations. Most often, it is accessed by clicking the *Change...* button in the Coordinate System page of the plot properties. It links a file, map layer, or map to a specific coordinate system. Accessing the **Assign Coordinate System** dialog from the **Coordinate System** page of the **Property Manager** changes the coordinate system and reprojects the plot.

When accessed via the **Map | Plot | Calibrate** command, the **Assign Coordinate System** dialog is used to specify the current projection and coordinate system. This is for cases when the coordinate system is incorrectly defined or undefined, but the actual projection is known to the user.

Once a coordinate system is defined for a file, a Golden Software Georeference .GSR2 file is created. This file contains all the relevant coordinate system information that **MapViewer** needs to load the file in the proper coordinate system in the future. When a .GSR2 file is created for a data file, it is read when creating maps from the data file. The resulting map layer has the same coordinate system as the original data file. The projection information can be saved with the file using the Spatial References options. It is recommended to check the *GS Reference (Version 2) file* if you intend to use the grid file in Golden Software's **Surfer**, as the GSR2 retains all of the information needed.

The Assign Coordinate System Dialog



*Assign a projection to your file or map layer in the **Assign Coordinate System** dialog.*

<u>Search for Text or EPSG Code</u>

Search for a specific projection by typing text or EPSG codes into the *Search for text or EPSG code* input box. Press ENTER or click the **Search** button to search for projections. To clear the search filter from the projections list, click the **Clear Search** button .

Projection Categories

Click the ⊞ button to expand the options in the **Assign Coordinate System** dialog. Click the ⊟ button to collapse the options.

Local System

Expand *Local System* to select the *Unreferenced local system,* which contains a *Projection* of None, a *Datum* of None, and a *Warp* of None. For example, you may have a data set with an arbitrary coordinate system (i.e. not real world X, Y coordinates). You would assign this data to a *Local System*, if a coordinate system is necessary.

Predefined

Expand the *Predefined* section by clicking the ⊞ button. The *Predefined* section includes all coordinate systems that have been predefined for **MapViewer**.

Geographic (lat/lon)

Expand *Geographic (lat/lon)* to select a Latitude/Longitude coordinate system and datum that fits your needs. Detailed information about each projection is listed at the bottom of the dialog when the system is selected. If your data are currently in a form of lat/lon, you would want to select one of the options in *Geographic (lat/lon)*.

Projected Systems

Expand *Projected Systems* to select a predefined *Polar/Arctic/Antarctic, Regional/National, State Plane, UTM,* or *World* coordinate system. Detailed information about each projection is listed below when the datum is selected.

Templates

Expand the *Templates* section to select a predefined template. Click the desired template and press the *Modify* button to change the properties. Once modified, the new coordinate system is added to the *Custom* section.

Favorites

Select a coordinate system and click the *Add to Favorites* button to add a coordinate system to your *Favorites* list. Alternatively, right-click on a selected coordinate system and choose *Add to Favorites* from the menu. Select a coordinate system and click the *Remove from Favorites* button to remove a coordinate system from your *Favorites* list. By default, no favorite coordinate systems are specified. It is recommended that systems that you use frequently and *Custom* systems that you intend to use more than once be added to the *Favorites* section for ease of navigation.

Custom

Expand *Custom* to see the custom coordinate system you have defined for the current file. *Custom* systems can be defined by clicking the *New* button. By default, no custom coordinate systems are specified. Custom coordinate systems are only listed in the dialog when the file using the custom coordinate system is open.

If a *Custom* coordinate system is defined and intended to be used more than once, it is highly recommended that the system be added to the *Favorites* section by clicking the *Add to Favorites* button.

Modify Coordinate System

Select any coordinate system from the *Select a coordinate system* list. Click the *Modify* button to open the Define Coordinate System dialog. Alternatively, right-click on the coordinate system and choose *Modify* from the menu. Modify any properties and click *OK*. The modified coordinate system is added to the *Custom* list.

If the *Modify* button is unavailable, make sure that a specific coordinate system is selected. If a category of systems, such as *Predefined* or *Geographic (lat/lon)* is selected, the *Modify* button is unavailable.

New Custom Coordinate System

Click the *New* button to open the Define Coordinate System dialog and define a custom projection and datum. Alternatively, right-click on an existing coordinate system and choose *New* to create a new projection based off the selected projection. The new custom projection and datum will be listed in the *Custom* section with the name you defined.

Add to Favorites

Click the *Add to Favorites* button to add a projection to your *Favorites* list. Alternatively, right-click on a coordinate system and choose *Add to Favorites.* This is very useful if you frequently use the same projection, such as World Geodetic System 1984. This is also useful for *Custom* systems that will be used on multiple project files. Adding the projection to the *Favorites* list makes selecting the projection easier in the future.

If the *Add to Favorites* button is unavailable, make sure that a specific coordinate system is selected. If a category of systems, such as *Predefined* or *Geographic (lat/lon)* is selected, the *Add to Favorites* button is unavailable.

Remove

Select a coordinate system in the *Favorites* list and click the *Remove from Favorites* button to delete the system. Alternatively, right-click on a coordinate system in the *Favorites* section and choose *Remove.* The coordinate system is removed from the *Favorites* section.

If the *Remove from Favorites* button is unavailable, make sure that a specific coordinate system is selected in the *Favorites* list. If a category of systems, such as *Predefined* or *Geographic (lat/lon)* is selected or if a coordinate system is selected in a category other than *Favorites*, the *Remove from Favorites* button is unavailable.

Example 1: Select a Predefined Coordinate System (i.e. UTM)

1. In the **Assign Coordinate System** dialog, click the ⊞ button to the left of *Predefined*.
2. Click the ⊞ button to the left of *Projected Systems.*
3. Click the ⊞ button to the left of *UTM*.
4. Click the ⊞ button to the left of *WGS84*.
5. Select *WGS84 UTM zone 13N*.
6. Click *OK*. The projection for this data is now set to WGS84 UTM zone 13N.

Example 2: Create and Select a Custom Coordinate System (i.e. Lambert Conformal Conic)

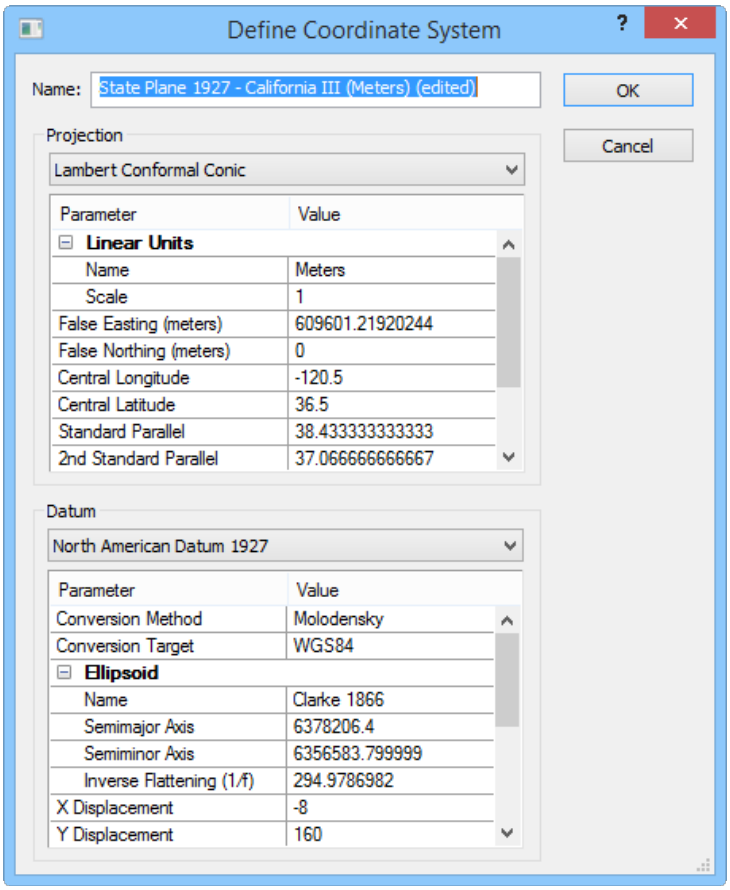
1. In the **Assign Coordinate System** dialog, click the *New* button to open the **Define Coordinate System** dialog.
2. Change the *Name* to *Lambert Conformal Conic Custom*.
3. From the *Projection* list, select *Lambert Conformal Conic*.
4. Make any necessary changes to the *Parameter* or *Values* in the *Projection* section.
5. Make any necessary changes to the *Datum* section.
6. Click *OK* and the *Lambert Conformal Conic Custom* projection is added to the *Custom* section.
7. Click the custom projection and click *OK* to apply the projection to the data.

Example 3: Saving a Custom Coordinate System

1. In the **Assign Coordinate System** dialog, click the ⊞ button to the left of *Custom.*
2. Select the coordinate system in the *Custom* section and click the *Add to Favorites* button.
3. Click the ⊞ button to the left of *Favorites* to open the *Favorites* section. The custom projection is saved here.
4. Click *OK* to close the dialog.

Define Coordinate System

Click the *New* or *Modify* buttons in the Assign Coordinate System dialog to open the **Define Coordinate System** dialog. The **Define Coordinate System** dialog allows you to create a *Custom* coordinate system. Select a *Projection*, enter the projection *Parameters*, and specify a *Datum*. Click *OK* and the new coordinate system will be added to the **Assign Coordinate System** dialog *Custom* list for future use.



Define a custom coordinate system in the ***Define Coordinate System*** *dialog.*

Name

Specify a custom name for the new coordinate system in the *Name* box. When editing a predefined coordinate system, the name is automatically appended with *(edited)* after the existing name.

Projection

Select a projection from the *Projection* list. Specify custom *Parameter* and *Value* options. *Unprojected Lat/Long* does not have *Parameter* and *Value* options to specify.

The projection options include: *Unprojected Lat/Long, Albers Equal Area Conic, Azimuthal Equidistant, Bonne, Cassini, Eckert IV, Eckert VI, Equidistant Conic, Equidistant Cylindrical, Gnomonic, Hotine Oblique Mercator, Hotine Oblique Mercator 2-Point, Lambert Azimuthal Equal Area, Lambert Conformal Conic, Mercator, Miller Cylindrical, Mollweide, New Zealand Map Grid, Oblique Mercator, Orthographic, Polyconic, Robinson, Robinson-Sterling, Sinusoidal, Stereographic, Transverse Mercator, Universal Transverse Mercator (UTM),* and *Van Der Grinten.*

Datum

Select a datum from the *Datum* list. Specify custom *Parameter* and *Value* options to fit your needs.

OK or Cancel

Click *OK* to create your new custom coordinate system. The coordinate system will be listed in the *Custom* section of the **Assign Coordinate System** dialog for this file. If you want to save the custom coordinate system for future use, add the custom coordinate system to the *Favorites* section. Click *Cancel* to return to the Assign Coordinate System dialog without creating a custom coordinate system.

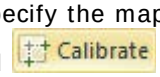
Example 1: Defining a Custom Coordinate System

1. In the **Assign Coordinate System** dialog, click the *New* button to open the **Define Coordinate System** dialog.
2. Change the *Name* to *Lambert Conformal Conic Custom*.
3. From the *Projection* list, select *Lambert Conformal Conic*.
4. Make any necessary changes to the *Parameter* or *Values*.
5. Make any necessary changes to the *Datum* section.
6. Click *OK* and the *Lambert Conformal Conic Custom* projection is added to the *Custom* section.
7. In the **Assign Coordinate System** dialog, select the custom projection and click *OK*.

Example 2: Saving a Custom Coordinate System

1. In the **Assign Coordinate System** dialog, click the ⊞ button to the left of *Custom.*
2. Select the coordinate system in the *Custom* section and click the *Add to Favorites* button.
3. Click the ⊞ button to the left of *Favorites* to open the *Favorites* section. The custom projection is saved here.
4. Click *OK* to close the dialog.

Calibration

Calibration points specify the mapping between the page and coordinates. The **Map | Plot | Calibrate** command 

specifies a coordinate system for new boundaries digitized within **MapViewer** or changes the coordinate system on an existing map. Calibration is based on two "control points." Usually the calibration points are set when a boundary file is imported and need not be changed.

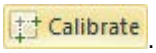
The **Map | Plot | Calibrate** command can be used in several different situations.

- Establishing a map coordinate system on an image, such as a bitmap. If the bitmap you are importing does not contain any georeferencing information, the coordinate system is based on raster coordinates. The **Map | Plot | Calibrate** command allows you to replace the raster coordinate system.
- Establishing the projection type for an imported boundary file that does not contain projection information. When you import boundaries files that do not contain projection information, the projection type is set to Unknown by default.
- Allowing for specification of a coordinate system for new boundaries drawn within **MapViewer**. When you draw boundaries in a new plot window, **MapViewer** uses a coordinate system based on 1,000,000 boundary units per inch. The origin of the internal **MapViewer** coordinate system is the center of the page.
- Reestablishing coordinates for a map after they inadvertently are changed. If you move your map on the page, you can reset the coordinates so your boundaries are again in the correct position.

Using the Calibration Command to Recalibrate a Map

To establish a coordinate system on a map, you must have two control points defined for which you know the XY coordinates. These two coordinates give **MapViewer** enough information to extend the coordinate system over the entire extent of the map.

To change the calibration of a map:

1. Click the **Map | Plot | Calibrate** command  .Notice that for unprojected maps, the *Units* in the **Calibrate** and **Digitize Calibration Limits** are *Lat/Lon*. For projected maps, the *Units* are converted to *Meters*.
2. In the **Calibrate** dialog, click the *Recalibrate...* button on the *Calibrate* page. The Digitize Calibration Limits dialog appears with a red arrow highlighting the *Upper right* line. The pointer changes to a cross hair and the upper right calibration point is indicated on the map. You do not need to use the calibration point indicated on the map.
3. Move the cursor to a point in the upper right region of the map with known coordinates and click. The *Source X* and *Source Y* fields change to the location on which you have clicked. Enter the *Destination X* and *Destination Y* coordinates of the point. If your coordinates are in latitude/longitude, enter the longitude for the X coordinate and latitude for the Y coordinate.
4. Click the *Lower left* line and follow the same procedure for the lower left calibration point.
5. Click the *OK* button in the **Digitize Calibration Limits** dialog to return to the **Calibrate** dialog.
6. The Assign Coordinate System page is used to specify the current map projection, if it is known.
7. Click the *OK* button in the **Calibrate** dialog to change the map coordinates.

You can press ESC at any time to exit without establishing the new coordinate system.

Zooming In and Out During Calibration

If necessary, you can zoom in and out while using the **Calibration** command by rolling the mouse wheel forward and backward. Pan the window by clicking and dragging with the mouse wheel button. The higher the zoom level you use during calibration, the more precise you can be when clicking the calibration points.

If your mouse does not have a wheel, before you begin the calibration zoom in on the upper right calibration point for higher precision when clicking the point. Then use the scroll bars at the bottom and right of the plot window to locate and click the second calibration point.

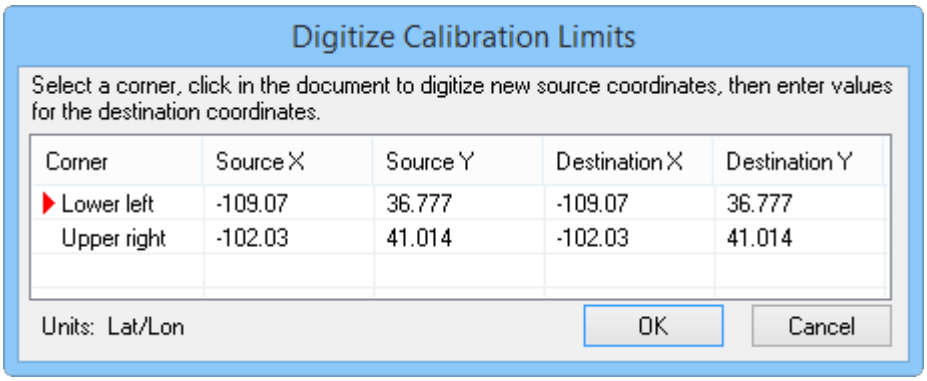
Setting the Projection Type During Calibration

The current projection is displayed on the Assign Coordinate System page. Use this page to tell **MapViewer** what the projection should be. If you do not know the projection type, you can select the *Unknown* option. A Cartesian coordinate system is used when the *Unknown* option is selected. Setting the projection requires specific knowledge of both the old and new projections.

Note: Use **Map | Plot | Calibrate** to set the existing projection of the map, not to change the projection of the map. If you would like to change the projection from one known projection to another projection, change the *Coordinate system* in the Coordinate System page of the plot properties.

Digitize Calibration Limits

During recalibration with the Calibrate command, the **Digitize Calibration Limits** dialog sets the lower left and upper right calibration points. This imposes new map coordinates on the screen. The calibration limits for unprojected maps are in *Lat/Lon* units. For projected maps, the calibration limits are in *Meters*.



Edit Source and Destination coordinates in the ***Digitize Calibration Limits*** *dialog.*

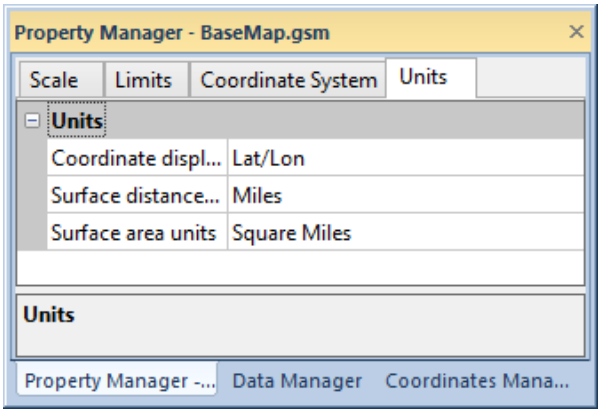
- First, click on a row to edit, the *Upper right* row or the *Lower left* row. The existing map coordinates appear in the *Source X* and *Source Y* boxes.
- If you do not want to use the pre-selected calibration point, indicated by a cross in the plot window, click the new calibration point on the map. The *Source X* and *Source Y* fields for the selected *Corner* change to the new calibration point.
- Next, enter the desired X and Y coordinates into the *Destination X* and *Destination Y* fields. Repeat the process with the next row.
- Click *OK* to change the map calibration.

Units

You can set the units of various items in the plot window on the **Units** page of the **Property Manager**. The page unit (inches or centimeters) is set in the Options dialog General page. Plots without a defined coordinate system use *Map Units* for the default unit system. Opening or importing a map into the plot window loads the map's units to the plot properties.

The Units Page

The **Units** page is located in the plot properties.



*Specify the coordinate display, surface distance, and surface area units in the **Units** page of the **Property Manager**.*

Coordinate Display Units

Coordinate display units are used for displaying cursor position information in the status bar. You can display the units in *Feet*, *Kilometers*, or a host of other units of measurement.

Surface Display Units

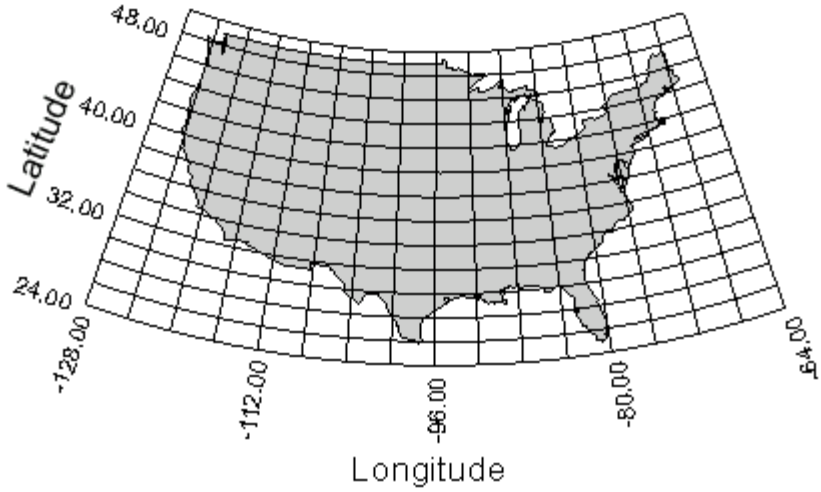
The *Surface distance units* control the **Analysis | Distance | Measure Distance** display units and the length units in the **Object Manager**.

Surface Area Units

The *Surface area units* control the polygon units in the Object Manger.

Graticule

Graticule lines are lines of constant longitude (X coordinate) or latitude (Y coordinate). Longitude lines are also called meridians, and latitude lines are also called parallels. Graticule lines can also be based on other coordinate systems.



Graticule lines reflect the map's coordinate system.

Graticule Appearance

The **Map | Add | Graticule** command  displays or hides map coordinate grid lines. The graticule is based on the map coordinate system and are not page coordinate grids. For projected coordinates, the graticule lines can curve to follow the projection (for example, on an Albers projection), or can show different spacing in the north-south dimension (for example, on a Miller projection). For maps using Unprojected Latitude/Longitude or any *Unknown* coordinate system, a rectangular grid is drawn. Only one map layer can contain graticule lines.

Graticules and Layers

MapViewer plots the graticule on the active layer at the time the **Map | Add | Graticule** command is clicked. When the layer with the graticule is deleted, the graticule lines are moved to the new active layer. If the active layer contains a prism map, then **MapViewer** searches the from the bottom layer to the top layer and assigns the graticule to a non-prism map layer. If all layers are prism map layers, then the graticule is not drawn.

The graticule state is displayed in the **Object Manager** and ribbon bar. In the **Object Manager** the show/hide eye has a graticule icon in the top right corner  . The **Map | Add | Graticule** command stays highlighted when the active layer contains the graticule to indicate the graticule is drawn.

Removing the Graticule

There are several ways to remove the graticule from the map.

- When the active layer contains the graticules, click the **Map | Add | Graticule** command.
- In the Graticules page of the **Property Manager**, uncheck the *Show graticules* boxes in the *X Graticules* and *Y Graticules* sections.

- Clicking the button in the **Object Manager** hides the layer containing the graticules without removing them.

Legends, Post Maps, Prism Maps, and Graticules

The legend and post map text is always plotted on top of the graticule lines on that layer. Graticules are not drawn on prism map layers.

Copying the Graticule

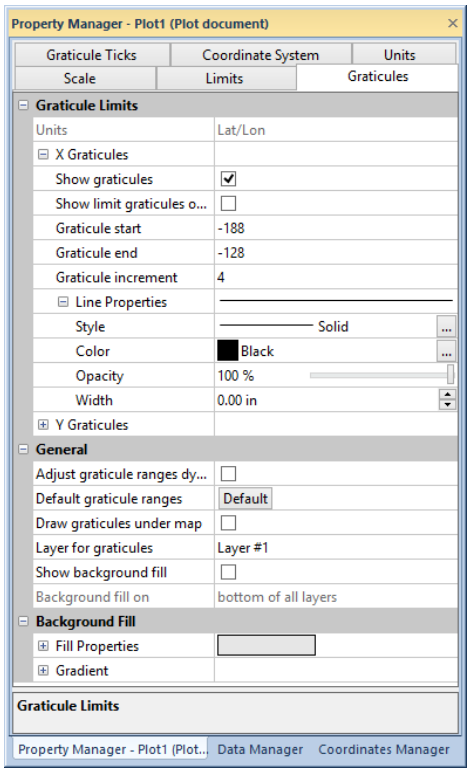
When you have a graticule displayed on a map and want to copy the map to the clipboard, you must use the Copy All Layers command. This command is the only way to copy the graticule along with the map. Otherwise, only the map is copied and the graticule lines are not included with the copied image.

Graticule Properties

The plot properties contain Graticules and Graticule Ticks pages in the **Property Manager** when graticules are displayed on one of the map layers. Show the plot properties in the **Property Manager** by clicking the **Map | Plot | Plot Properties** command or clicking white space in the **Object Manager**. See the Graticules and Graticule Ticks help pages for information on editing graticule properties in the **Property Manager**.

Graticules Page

The **Graticules** page contains all of the options and settings for the graticule line properties. The *Longitude (X)* and *Latitude (Y)* columns represent the settings for the appropriate graticule lines.



*Specify the graticule limits, spacing, general, line, and background fill properties in the **Graticule** page of the **Property Manager**.*

Units

You can choose the graticule line units from the *Units* list. If the projection is Unknown, the available units are *Map Units*, *Page Inches*, or *Page Centimeters*. If the projection is Unprojected Lat/Long the available unit is *Lat/ lon*. Any other projection allows you to choose from the full list of available distance units.

Visibility

Checking the *Show graticules* box displays the graticule lines. If these check boxes are not checked, the graticule lines are not visible. If the *Show limit graticules only* boxes are checked, only the graticule lines at the map extents are displayed. This option is a convenient way to add map axis lines to your map. When you check these boxes with the *Show background fill* option (below), a background is added to your map.

Range

Graticule start, *Graticule end*, and *Graticule increment* fields control how often lines of each type are drawn. The starting, ending, and increment values must be specified in graticule units. If the *Adjust graticule ranges dynamically* box is checked, the graticule range is adjusted each time a map is changed, such as when objects are added or deleted. Click the *Default Ranges* button to change the numeric values back to the defaults.

Line Properties

Click the line properties to change the *Style*, *Color*, *Opacity*, and *Width* of the graticule lines.

Graticule Position

The graticule can be placed above or below a map or on any layer in the plot window.

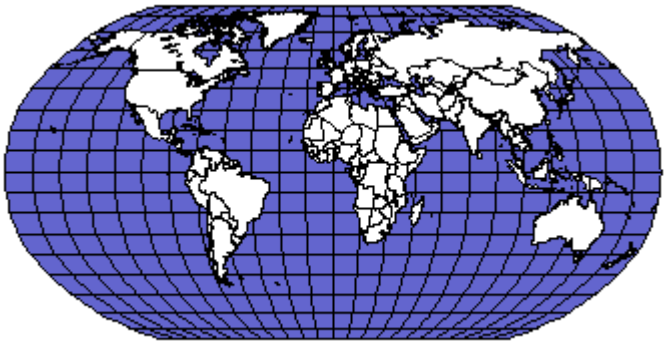
- Check the *Adjust graticule ranges dynamically* box to adjust the graticule each time objects are added or deleted.
- If *Draw graticules under map* is checked, the graticule is drawn under all other objects on the layer containing the graticule. Otherwise, the graticule is drawn on top of all other objects in the layer. If a boundary map containing areas does not have filled areas, the graticule may appear on top of the map when they are actually behind the map. Set the fill color to white (or other color) to avoid this.
- To place the graticule on a layer other than the current layer, choose a layer from the *Layer for graticules* list, and then check the *Place graticules on another layer* check box.
- To return the graticule range to the default values, click the *Default* button to the right of the *Defalut graticule ranges* property.

Background Fill

The *Show background fill* check box enables or disables the background fill for a graticule. The *Background fill on* list specifies where you want to place the background fill. Choose from *bottom of all layers* or *graticule layer*. *Bottom of all layers* places the background fill behind all of the map layers, and *graticule layer* places the background fill on the layer containing the graticule.

The buttons beneath the *Background fill on* list defines the background fill *pattern*, *colors*, *opacity*, and *gradient* properties for the graticule background.

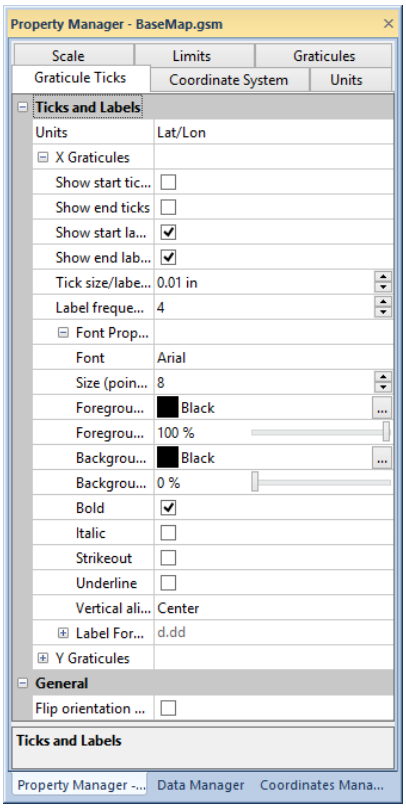
It is important to note that the graticule lines are not placed on the bottom of all layers with *Bottom of all layers*, only the graticule fill is placed there. Graticule lines are placed under the map with the *Draw graticules under map* property. Also, certain map projections (such as those projections suited for polar perspectives of the earth) are not completely compatible with graticule background fills and can have undesirable results.



Show background fill *makes it simple to add a background to your map.*

Graticule Ticks Page

The graticule **Graticule Ticks** page is used to set label and tick properties for the graticule lines. The **Graticule Ticks** page is located in the plot properties.



Show or hide ticks and labels, set tick and label size and frequency, edit label font properties, and flip label orientation on the ***Graticule Ticks*** *page in the* ***Property Manager****. The* X Graticules *and* Y Graticules *rows represent the settings for the appropriate graticule lines.*

Units

You can choose the label units from the *Units* list. If the projection is Unknown, the available label units are *Map Units*, *Page Inches*, or *Page Centimeters*. If the projection is Unprojected Latitude/Longitude the available unit is *Lat/ Lon*. Any other projection allows you to choose from the full list of available units.

Ticks

Beginning and ending ticks are displayed by checking the *Show start ticks* and the *Show end ticks* boxes.

Labels

The appearance of the labels on both ends of the graticule lines as well as the frequency of the labels can be set.

- Check the *Show start labels* box to draw the label at the beginning of the graticule line.
- Check the *Show end labels* box to draw the label at the end of the graticule line.
- The *Label frequency* box controls how many graticule lines are labeled. Typing 1 labels every graticule line, 2 labels every other graticule line, and so forth.

Tick Size and Label Offset

The *Tick size/label offset* box specifies how close the labels are to the graticule lines or the size of the graticule ticks. Click the up and down arrows or enter the number in page units to offset the labels.

Text Properties

The Font buttons define the text characteristics such as *font*, *size*, *color*, and *alignment* of the labels.

Label Format

The Format buttons specify the numeric format to use for the graticule labels.

Label Orientation

To improve the readability of graticule labels, enable the *Flip orientation of downswing text (angled 90 to 270 degrees)* check box. This option flips graticule labels that are angled between 90 and 270 degrees. This option only applies to projected maps.

Map Collar

The map collar is the area outside the neat lines in a map. This collar can contain tick marks and labels as well as information about the tick units. Map collars are created by clicking the **Map | Add | Collar** command Collar.

Removing the Collar

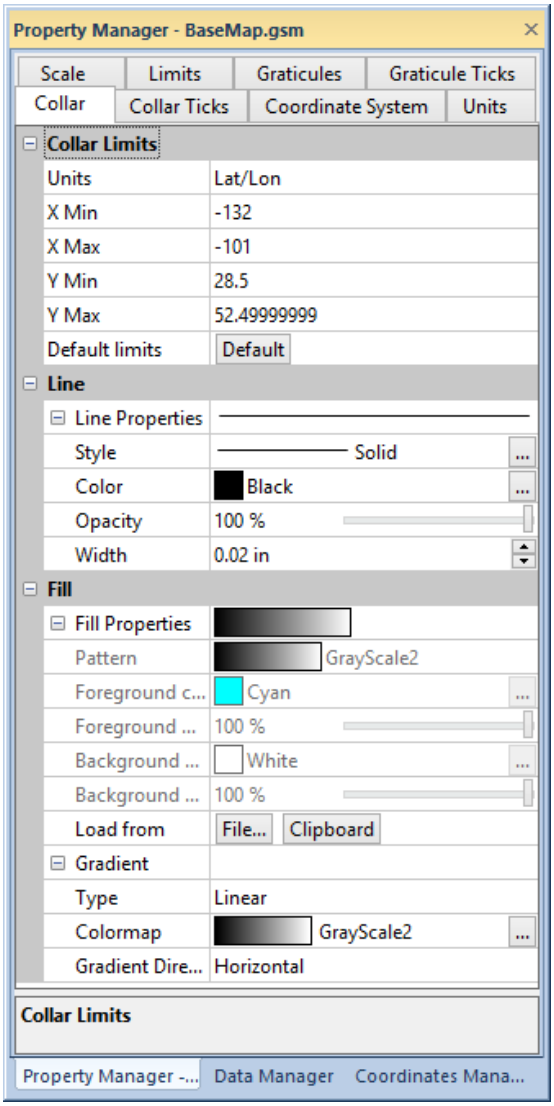
Click the **Map | Add | Collar** command while the collar is visible to remove the map collar.

Map Collar Properties

Map collar properties are located on the **Collar** and **Collar Ticks** pages in the **Property Manager**.

Collar Page

The **Collar** page is located in the plot properties.



*Set the collar limits, line, and fill properties on the **Collar** page of the **Property Manager**.*

Setting the Collar Limits

The collar extent is set in the *Collar limits* group. Select the units for the limits in the *Units* list. If the projection is Unknown, the available units are *Map Units*, *Page Inches*, or *Page Centimeters*. Any other projection allows you to choose from the full list of available distance units.

Once the units are selected, set the limits in the *X Min*, *X Max*, *Y Min*, and *Y Max* boxes. Click the *Default* button to use the **MapViewer** default collar limits.

Selecting the Line and Fill

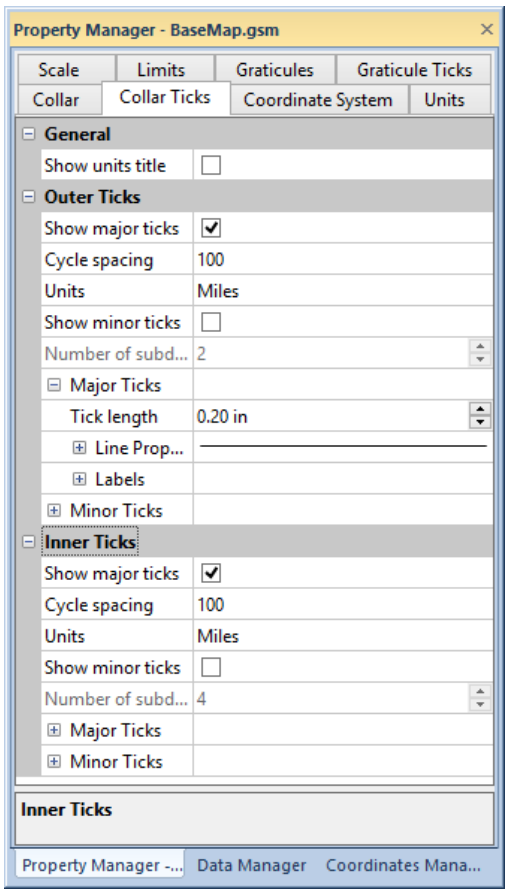
The collar line and fill properties are edited by clicking the properties in the *Line* and *Fill* sections.

Adding Additional Collar Information

A legend and annotation can be created outside the collar. Grid lines can be drawn with the Graticule command.

Collar Ticks Page

The **Collar Ticks** page is located in the plot properties when a map collar is displayed on the plot.



*Show major, minor, inner, and outer ticks and tick units, adjust spacing, and edit line, text, and label format properties on the **Collar Ticks** page of the **Property Manager**.*

Displaying the Unit Name

Check the *Show units title* box to display the tick units on the collar. The ticks must be labels for the unit display to appear. Click the *Major Ticks* button, then click the *Labels* button, and click the *Show label* box to display tick labels. The units are shown as *Outer ticks in [unit]* and *Inner ticks in [unit]* at the top of the map with the same font properties as the tick labels. If you would like other text or if you would like this information displayed in another location, uncheck the *Show units title* box and add the information wherever you like with **Draw | Shape | Text**.

Displaying Ticks

The ticks may be displayed inside the collar or outside the collar. Check the *Show major ticks* box under the *Outer ticks* or *Inner Ticks* sections to display the ticks. If neither of the boxes are checked, the collar ticks are not displayed. Major ticks must be displayed to display minor ticks by checking the *Show minor ticks* box.

Length

The length of the tick marks is set in the *Tick length* field. This value can be changed by highlighting the current value and typing a new length or by using the up or down arrows.

Setting Tick Spacing and Display Units

Select the tick mark display units from the *Units* list. This unit selection controls the units displayed on the collar as well as the spacing units used in the *Cycle spacing* box. If the projection is Unknown, the available units are *Map Units*. Any other projection allows you to choose from the full list of available distance units.

Opening Tick Properties

Click the *Major Ticks* and *Minor Ticks* expand button to edit the *Tick length*, line properties, and label display, text, and format properties.

Displaying Minor Ticks

Minor tick marks subdivide the region between the major tick marks. Check the *Show minor ticks* box to display minor tick marks. Set the number of divisions between major ticks by entering a number into the *Number of subdivisions* box.

Chapter 7

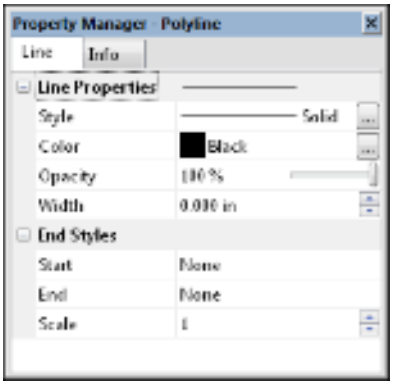
Object Properties

Line Properties

Use the **Line Properties** sections in the **Property Manager** to change line properties for selected lines in the document. You can set default line properties through **File | Options | Default Properties** by clicking on *Line*.

Most line properties are edited in the **Property Manager** in a *Line Properties* section. When changing line properties for a selected object, the *Line Properties* section will appear in a different location in the **Property Manager**, depending on the type of object selected.

Occasionally, objects will open a Line Properties dialog to access the line properties.



Specify individual line properties in the ***Property Manager*** *in a* Line Properties *section.*

Sample

The sample of the line is displayed next to *Line Properties*. The sample shows the line style, color, opacity, and width options.

If the *Line Properties* section is closed, click the ⊞ next to *Line Properties* to open the section.

Style

Click the line next *Style* to open the line style palette. Click on a style to use it for the selected line. The line style sample updates to show the new selection. Click on the ... button at the right of the line style to open the **Custom Line** dialog, where you can specify a custom line style.

Complex line styles can be selected for most object types. Wireframe map layers and surface mesh lines do not support complex line styles. When a complex line style is selected, the line *Width* automatically increased to 0.031 inches (0.079 cm). Most complex line styles require lines with the *Width* set to something larger than 0.031 inches to fully distinguish the line style.

Color

Click the color next to *Color* to open the color palette. Click on a color to use it for the selected line. The color box and the sample line update to show the new selection. Click on the button at the right of the color sample to open the **Colors** dialog, where you can specify a custom color.

Opacity

The *Opacity* is the amount of transparency of the line. This is a value from 0% (completely transparent) to 100% (completely opaque). To change the value, highlight the existing value and type a new value. Press ENTER on the keyboard or click anywhere else in the **Property Manager** to make the change. Alternatively, click and drag the to change the opacity percentage.

Width

The *Width* controls the thickness of the line in page units. The value can be zero to 0.5 inches (1.27 cm) wide. A width of zero is one pixel wide. To change the *Width*, highlight the existing number and type a new value. Press ENTER on the keyboard to make the change. Alternatively, click the buttons to increase or decrease the width.

End Styles

The *End Styles* section is unique to polylines. The ends of the polylines can have arrowheads on them as defined in the *End Styles* section. To open the *End Styles* section, click the next to *End Styles*.

The *Start* style is placed at the first vertex of the polyline. The *End* style is placed at the last vertex of the polyline. To change the *Start* or *End* style, click on the current option and select the desired option from the list.

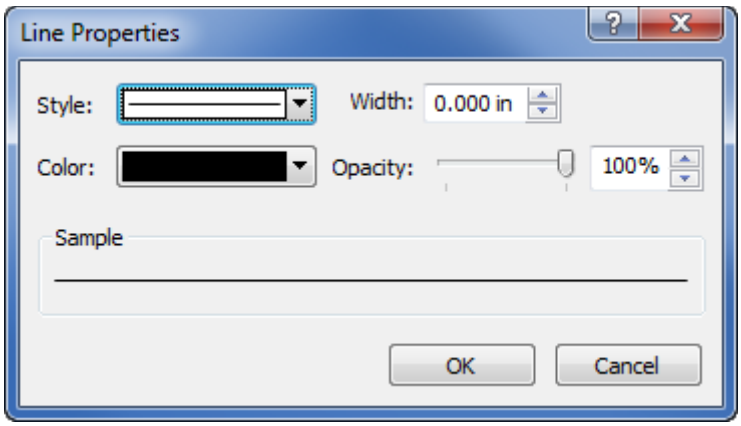
The *Scale* determines the scale factor of the arrowhead. To change the size, highlight the existing value and type a new value. Press ENTER on the keyboard to make the change. Alternatively, click the buttons to increase or decrease the values. A value of 1 makes the arrow the default size.

Line Properties Dialog

Use the **Line Properties** dialog to change line properties for selected lines in the document. You can set default line properties through **File | Options | Default Properties** section by clicking on the *Line* option.

Most line properties are edited in the **Property Manager** in a Line Properties section. When changing line properties for a selected object, the *Line Properties* section will appear in a different location in the **Property Manager**, depending on the type of object selected.

Some objects use a **Line Properties** dialog. This dialog is accessed differently, depending on the type of object selected. For example, with the *Level method* set to *Advanced* for a contour map, the **Line Properties** dialog appears when you double-click on an individual line in the **Levels for Map** dialog.



Specify individual line properties in the
*in **Line Properties** dialog.*

Style

Click the button next *Style* to open the line style palette. Click on a style to use it for the selected line. The line style sample updates to show the new selection. Click on the *Custom* button at the bottom of the line style palette to specify a custom line style.

Complex line styles can be selected for most object types. Wireframe map layers and surface mesh lines do not support complex line styles. When a complex line style is selected, the line *Width* automatically increased to 0.031 inches (0.079 cm). Most complex line styles require lines with the *Width* set to something larger than 0.031 inches to fully distinguish the line style.

Color

Click the button next to *Color* to open the color palette. Click on a color to use it for the selected line. The color box and the sample line update to show the new selection. Click on the *Custom* button at the bottom of the color palette to choose a custom color.

Width

Change the line *Width* by typing a new number into the box or by using the  buttons to the right of the box to increase or decrease the value. The line width can be zero to 0.5 inches (1.27 cm) wide. A width of zero is one pixel wide.

Opacity

The *Opacity* is the amount of transparency of the line. This is a value from 0% (completely transparent) to 100% (completely opaque). To change the value, highlight the existing value and type a new value, use the  buttons to the right of the box to increase or decrease the value, or click and drag the  to change the opacity percentage.

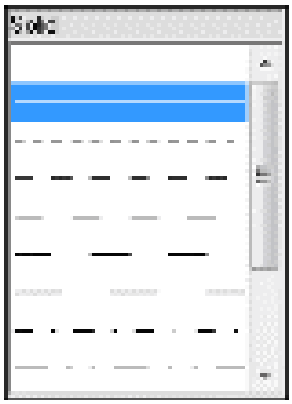
Sample

The sample of the line is displayed in the *Sample* section. The sample shows the line style, color, opacity, and width options.

Line Palette

The line palette is opened by clicking the arrow to the right of the line sample.

- The name of the line appears at the top of the palette.
- Select a line from the palette by clicking on a line.
- Create a custom line style by clicking the button to the right of the selected line style.



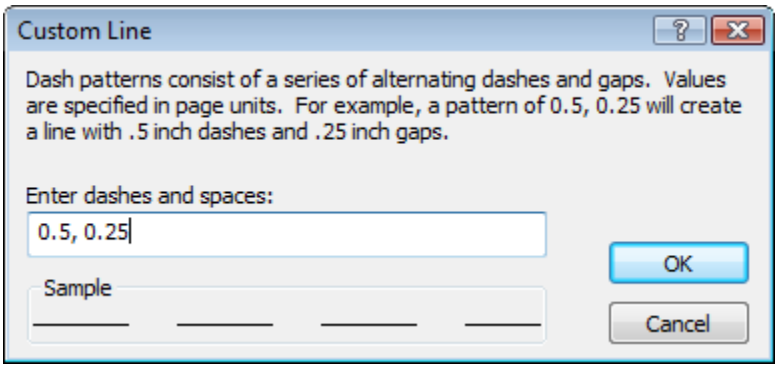
Select a predefined or custom color from the line palette.

Custom Line Style

Click the button to the right of the line style in the **Property Manager** to create new line styles. You can add line styles to the palette, remove line styles from the palette, or replace existing line styles in the palette.

The Custom Line Dialog

Click the button to the right of the line style to open the **Custom Line** dialog.



Use the Custom Line dialog to create custom line styles.

Enter Dashes and Spaces

The *Enter dashes and spaces* box determines the pattern of the custom line.

As an example, refer to the custom dash line style shown above. A pattern of 0.5, 0.25 will create a line with .5 inch dashes and .25 inch gaps. The pattern repeats the dash pattern and is displayed in the *Sample* box.

Sample

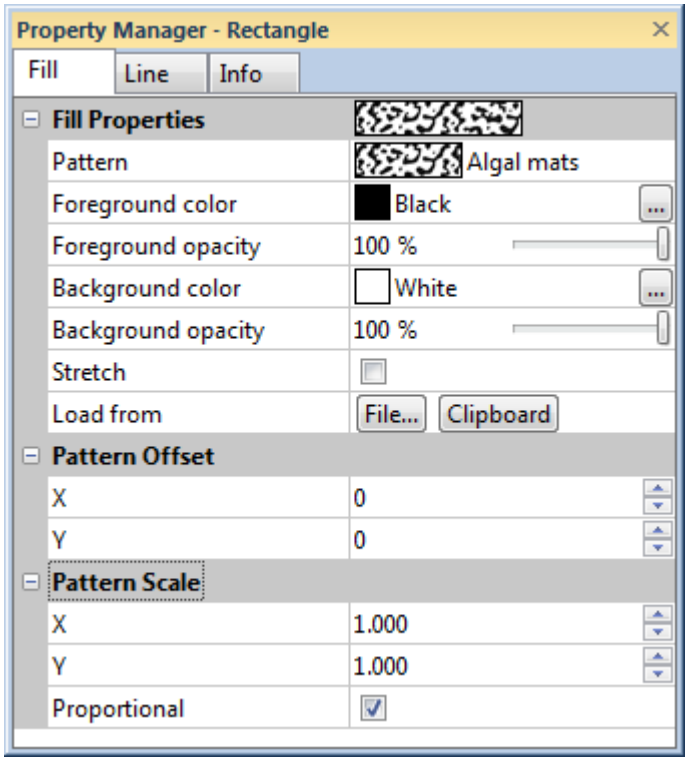
The *Sample* box shows the new line style.

Fill Properties

Use the **Fill Properties** to change fill properties for selected objects in the document. You can set default fill properties through **File | Options | Default Properties** by clicking on *Fill*.

Most fill properties are edited in the **Property Manager** in a *Fill Properties* section. When changing fill properties for a selected object, the *Fill Properties* section will appear in a different location in the **Property Manager**, depending on the type of object selected.

Occasionally, objects will open a Fill Properties dialog to access the fill properties.



Edit the Fill Properties *for a selected object in the* ***Property Manager****.*

Sample

The sample shown next to the *Fill Properties* line shows the selected pattern, foreground color, and background color.

Fill Pattern

Change the *Pattern* by selecting a pattern from the fill pattern palette. Open the pattern palette by clicking the pattern button. Click on a new pattern in the list to select it.

Load a Fill Pattern File

To load a fill pattern from a raster image file, click the *File* or *Clipboard* button. The *Clipboard* button is only active when there is an image on the clipboard suitable to use for a fill pattern. If you select *File,* an **Import** dialog will appear. Click on the image file and click *Open* to load the image as the fill pattern.

Foreground Color

Foreground color is the color of the pattern lines or pixels. Select a new color by clicking on the color in the color palette. Only the foreground color can be applied to solid colors. The foreground colors can be applied to any stock hatch pattern or grayscale image pattern. They cannot be applied to the *None* pattern or non-grayscale image patterns. Click on the button at the right of the color sample to open the **Colors** dialog, where you can specify a custom color.

Foreground Opacity

The *Foreground opacity* is the amount of transparency of the fill. This is a value from 0% (completely transparent) to 100% (completely opaque). To change the value, highlight the existing value and type a new value. Press ENTER on the keyboard or click anywhere else in the **Property Manager** to make the change. Alternatively, click and drag the to change the opacity percentage. Opacity is disabled if it does not apply to the current pattern. Note that for true color image fill patterns the *Foreground opacity* applies to the image in its entirety.

Background Color

Background color is the color behind the pattern. All patterns must have a background color. If you do not wish to see the background color, change the *Background opacity* to 0%. Click on the button at the right of the color sample to open the **Colors** dialog, where you can specify a custom color.

Background Opacity

Change the *Background opacity* by entering a value from 0% (completely transparent) to 100% (completely opaque) or dragging the slider to change the opacity percentage. Opacity is disabled if it does not apply to the current pattern.

Stretch

Check the *Stretch* option to stretch image fills to completely fill the geometry. If *Stretch* is not selected, the image will be repeated to fill the geometry. When *Stretch* is applied to the fill image, the *Pattern Scale* options are not available.

Offset

The *Pattern Offset* can be changed for image patterns. The offset controls the location of the pattern within the geometry. Change the *X* and *Y* values separately to move the image in the desired direction.

Scale

The *Pattern Scale* can be changed for image patterns. The scale controls the density of the pattern. In the **Property Manager**, check the *Proportional* box to connect the *X* and *Y* scale values. When *Stretch* is applied to the fill, the *Pattern Scale* options are not available.

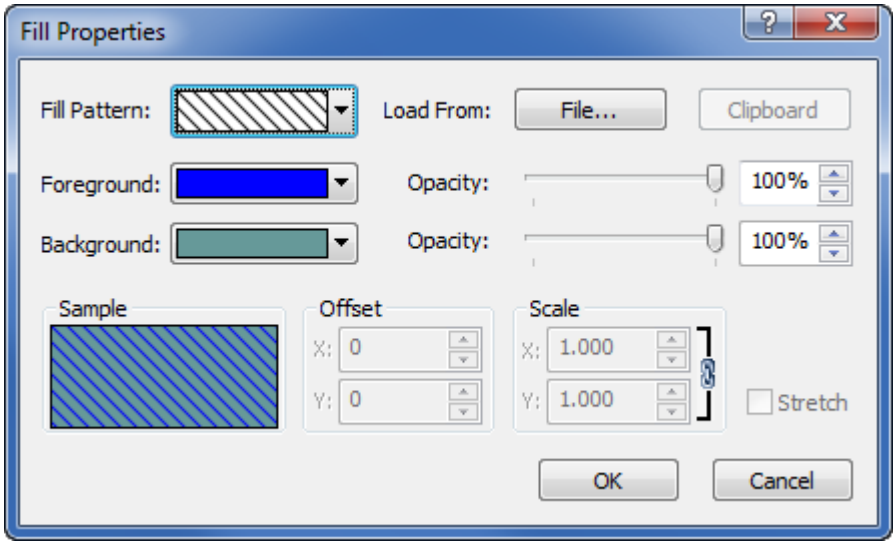
When the scale is proportional, the current aspect ratio is maintained. Changing the X or Y scale will cause the other scale to be adjusted proportionally to maintain the aspect ratio at the time the scale was set to proportional.

Fill Properties Dialog

Use the **Fill Properties** dialog to change fill properties for selected objects in the document. You can set default line properties through **File | Options | Default Properties** by clicking on *Fill*.

Most fill properties are edited in the **Property Manager** in a *Fill Properties* section. When changing fill properties for a selected object, the *Fill Properties* section will appear in a different location in the **Property Manager**, depending on the type of object selected.

Occasionally, objects will open a **Fill Properties** dialog to access the fill properties. This dialog is accessed differently depending on the type of object created.



*Specify fill properties in the **Fill Properties** dialog.*

Fill Pattern

Change the *Fill Pattern* by selecting a pattern from the fill pattern palette. Open the pattern palette by clicking the pattern button. Click on a new pattern in the list to select it.

Load a Fill Pattern File

To load a fill pattern from a raster image file, click the *File* or *Clipboard* button. The *Clipboard* button is only active when there is an image on the clipboard suitable to use for a fill pattern. If you select *File,* an **Import** dialog will appear. Click on the image file and click *Open* to load the image as the fill pattern.

Foreground Color

Foreground color is the color of the pattern lines or pixels. Select a new color by clicking on the color in the color palette. Only the foreground color can be applied to solid colors. The foreground colors can be applied to any stock hatch pattern or grayscale image pattern. They cannot be applied to the *None* pattern or non-grayscale image patterns. To create a custom color, click on the *Custom* button at the bottom of the palette. This opens the Colors dialog.

Foreground Opacity

Change the Foreground *Opacity* by entering a value from 0% (completely transparent) to 100% (completely opaque), using the arrow buttons to the right of the box, or dragging the slider to change the opacity percentage. Opacity is disabled if it does not apply to the current pattern. Note that for true color image fill patterns the Foreground *Opacity* applies to the image in its entirety.

Background Color

Background color is the color behind the pattern. All patterns must have a background color. If you do not wish to see the background color, change the Background *Opacity* to 0%. To create a custom color, click on the *Custom* button at the bottom of the palette. This opens the Colors dialog.

Background Opacity

Change the Background *Opacity* by entering a value from 0% (completely transparent) to 100% (completely opaque), using the arrow buttons to the right of the box, or dragging the slider to change the opacity percentage. Opacity is disabled if it does not apply to the current pattern.

Offset

The *Offset* can be changed for image patterns. The offset controls the location of the pattern within the geometry. Change the *X* and *Y* values separately to move the image in the desired direction.

Scale

The *Scale* can be changed for image patterns. The scale controls the density of the pattern. Click on the  button to connect or disconnect the X and Y scale for proportional or non-proportional scaling.

When the scale is proportional, the current aspect ratio is maintained. Changing the X or Y scale will cause the other scale to be adjusted proportionally to maintain the aspect ratio at the time the scale was set to proportional.

Stretch

Check the *Stretch* option to stretch image fills to completely fill the geometry. If *Stretch* is not selected, the image will be repeated to fill the geometry.

Sample

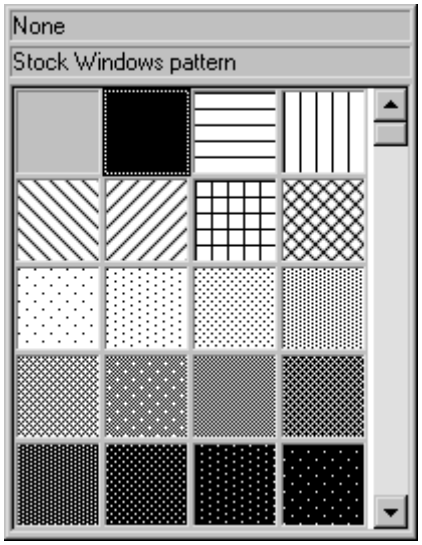
The *Sample* box shows the selected pattern, foreground color, and background color.

Fill Palette

The fill pattern palette is opened by clicking on the fill pattern in the Fill Properties section.

- The pattern name and type appears at the top of the palette.
- Select a pattern by clicking on it.

- Hold the cursor over a pattern to display a tool tip of the pattern name.
- Use the scroll bar to see all of the available fill patterns.



Select a fill pattern from the fill pattern palette.

Custom Fill Pattern

There are four types of fill patterns, Windows stock, bitmap, vector, and picture patterns. You can create custom bitmap, vector, or picture patterns. You can add patterns to the palette, replace existing patterns in the palette, or remove patterns from the palette.

Creating a Custom Fill Pattern

To create a custom pattern:

1. Open the fill properties. You can open the fill properties by selecting an object that can contain fill (for example, a rectangle) and opening the *Fill Properties* section in the **Property Manager** or by double clicking on an object and opening the **Fill Properties** page.
2. Click the sample fill pattern.
3. Select a bitmap, vector, or picture pattern in the pattern palette using the arrow keys on your keyboard. The pattern type is listed beneath the pattern name when a pattern is selected.
4. After selecting a pattern, click on the *Custom* button at the bottom of the fill pattern palette to create new patterns.
5. Edit the pattern using the features in the **Custom Pattern** dialog as described below.

The Custom Pattern Dialog

The **Custom Pattern** dialog contains three pages, **Bitmap Pattern**, **Vector Pattern**, and **Picture Pattern**. You can create any type of pattern from this dialog regardless of the type of pattern you selected in the pattern palette.

Bitmap Patterns

If you would like to create a new bitmap pattern, click on the **Bitmap Pattern** page. Bitmap patterns consist of designs that are eight pixels high by eight pixels wide. Patterns created on the **Bitmap Pattern** page cannot have transparent backgrounds.

- The pattern design box appears on the left side of the **Bitmap Pattern** page. Create new patterns by clicking areas in the box. When an area is clicked, a black box appears. Click the area a second time to remove the black box. The black box is one pixel in size.
- The *Name* field indicates the name of the selected pattern.
- The *Sample* box shows the new pattern.
- Click the *Add to List* button to add a new pattern to the end of the pattern palette. Type the new pattern name into the *Name* field before adding the new pattern.
- The *Replace* button replaces the selected pattern with the modified pattern.
- Click *Remove From List* to delete the selected pattern.
- The *Pattern Palette* on the right side of the page shows all available patterns.
- Dragging a pattern inserts it into a new location.

Vector Patterns

Vector patterns consist of straight-line segments. Vector patterns are scalable and can contain transparent backgrounds.

- The pattern design box appears on the left side of the **Vector Pattern** page. Create new patterns by creating straight-line segments in the box. Click the starting point and ending point to create a line. The line segment starting and ending points snap to the closest grid node when clicking the starting and ending points.
- Click  and then click on a line to select it.
- Click  to clear all lines from the pattern design box.
- Click  to delete a selected line.
- Click  to undo the last action (remove the last drawn line or to restore a deleted line).
- The status bar above the pattern design box the shows the cursor position.
- The *Name* field indicates the name of the selected pattern.
- The *Sample* box shows the new pattern.
- Click the *Add to List* button to add a new pattern to the end of the pattern palette. Type the new pattern name into the *Name* field before adding the new pattern.
- The *Replace* button replaces the selected pattern with the modified pattern.
- Click *Remove From List* to delete the selected pattern.
- The *Pattern Palette* on the right side of the page shows all available patterns.
- Dragging a pattern inserts it into a new location.

Picture Patterns

Picture patterns are bitmaps that can be stretched or tiled to fill an area. New pictures are created by importing or pasting a bitmap.

- The pattern design box appears on the left side of the **Picture Pattern** page. You can create new patterns by clicking the  button and importing a Windows Bitmap [.BMP] or Compuserve Bitmap [.GIF]. Alternatively, you can paste a copied image as a bitmap by clicking the  button.

- To use the bitmap in another program, you can click the button to export the bitmap or click the button to copy the bitmap.
- The *Name* field indicates the name of the selected pattern.
- Click the *Add to List* button to add a new pattern to the end of the pattern palette. Type the new pattern name into the *Name* field before adding the new pattern.
- The *Replace* button replaces the selected pattern with the modified pattern.
- Click *Remove From List* to delete the selected pattern.
- In the *Designed for* group, select *Tiling* or *Stretched* as the best mode to view the picture fill in an object. If a bitmap is designed for tiling, it usually contains edges drawn so that the pattern appears seamless when tiled.
- In some cases, the bitmap resolution is not contained in the bitmap file. You can enter a resolution in the *Best Viewing DPI* field.
- The *Pattern Palette* on the right side of the page shows all available patterns.
- Dragging a pattern inserts it into a new location.

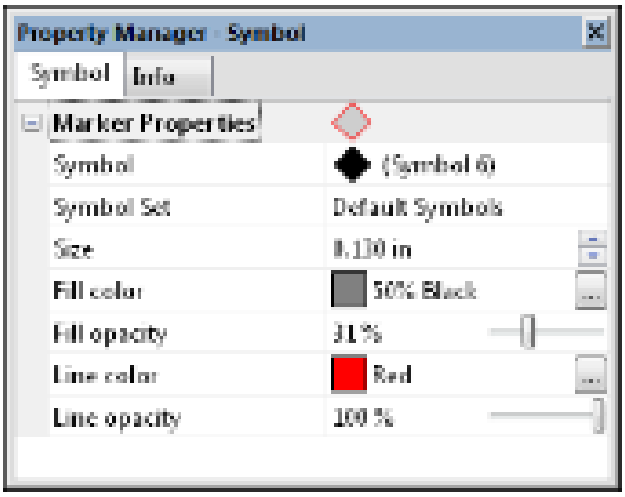
Symbol Properties

Use the **Symbol Properties** in the **Property Manager** to change or set symbol properties. You can set default symbol properties in the **File | Options | Default Properties** section by clicking on *Symbol*.

Symbol Properties

Most symbol properties are edited in the **Property Manager** in a *Symbol Properties* or *Marker Properties* section. When changing symbol properties for a selected object, the *Symbol Properties* or *Marker Properties* section will appear in a different location in the **Property Manager**, depending on the type of object selected.

Occasionally, objects will open a Symbol Properties dialog to access the symbol properties.



*Specify symbol properties in the **Property Manager** window.*

Symbol Page

The **Symbol** page allows you to customize the *Symbol, Symbol Set, Size, Fill color, Fill opacity, Line color,* and *Line opacity.*

Symbol

Choose the *Symbol* by clicking the existing symbol and selecting a new symbol from the symbol palette. The number of the selected symbol is indicated in the title bar above the palette. This number is useful when automating the application with **Scripter** or when using a *Symbol* column with a pin map. In these cases, add 32 to the number displayed.

Symbol Set

Select the *Symbol Set* from the list. The *Symbol Set* can be any TrueType font installed on your system. To change the *Symbol Set*, click on the existing font name. Select the new font from the list.

Size

Change the *Size* of the symbol by highlighting the existing value and typing a new number into the box. Alternatively, click the buttons to increase or decrease the symbol size. Symbols can be from 0 to 4.000 inches (0 to 10.160 centimeters) in size. Sizes are reported in page units.

Fill Color

The *Fill color* is the inside color of a solid symbol. Change the *Fill color* of the symbol by selecting a new color from the color palette. Create new colors by clicking the button to the right of the selected color.

Fill Opacity

Change the *Fill opacity* of the symbol by highlighting the existing value and typing a new value or by clicking and dragging the to change the opacity percentage. Percentages range from 0% (completely transparent) to 100% (completely opaque).

Line Color

The *Line color* is the outside edge color of the symbol. Change the *Line color* of the symbol by selecting a new color from the color palette. Create new colors by clicking the button to the right of the selected color.

Line Opacity

Change the *Line opacity* of the symbol by highlighting the existing value and typing a new value or by clicking and dragging the to change the opacity percentage. Percentages range from 0% (completely transparent) to 100% (completely opaque).

Custom Symbols

Custom symbols can be created using a third party TrueType font editing software.

Symbol Index

The symbol index is the symbol or glyph number as it appears next to the *Symbol* option. This is the 0-based offset of the symbol within the symbol set. To make the symbol the same as its ASCII code, add 32 to the value. You can also use the Window's Character Map to determine the ASCII code for font symbols.

Info Page

The Info page in the **Symbol Properties** dialog displays the *Position* in terms of X, Y and any attributes associated with the symbol.

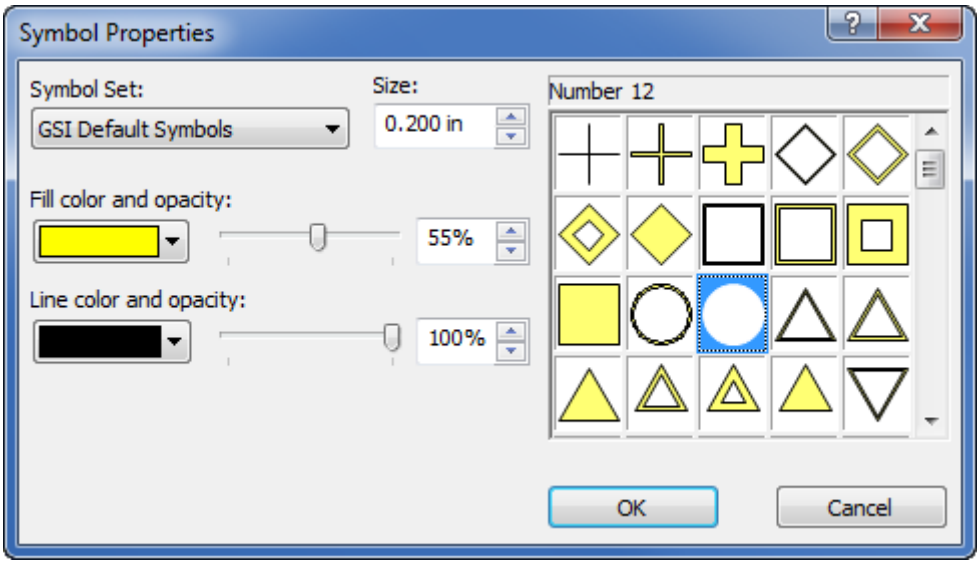
Symbol Properties Dialog

Use the **Symbol Properties** in the **Property Manager** to change or set symbol properties. You can set default symbol properties in the **File | Options** dialog in the *Default Properties* section by clicking on *Symbol*.

Symbol Properties

Most symbol properties are edited in the **Property Manager** in a *Symbol Properties* or *Marker Properties* section. When changing symbol properties for a selected object, the *Symbol Properties* or *Marker Properties* section will appear in a different location in the **Property Manager**, depending on the type of object selected.

Occasionally, objects will open a **Symbol Properties** dialog to access the symbol properties.



*Specify symbol properties in the **Symbol Properties** dialog.*

Symbol Page

The **Symbol** page allows you to customize the *Symbol Set, Fill color and opacity, Line color and opacity, Size, Opacity,* and *Symbol.*

Symbol Set

Select the *Symbol Set* from the list.

Symbol

Choose the *Symbol* from the symbol palette. The number of the selected symbol is indicated in the title bar above the palette. This number is useful when automating the application with **Scripter** or when using a *Symbol column* with a pin map. In these cases, add 32 to the number displayed.

Fill Color and Opacity

The *Fill color* is the inside color of a solid symbol. Change the *Fill color* of the symbol by selecting a new color from the color palette. Create new colors by clicking *Custom* at the bottom of the color list.

Change the *Fill opacity* of the symbol by highlighting the existing value and typing a new value or by clicking and dragging the  to change the opacity percentage. Percentages range from 0% (completely transparent) to 100% (completely opaque).

Line Color and Opacity

The *Line color* is the outside edge color of the symbol. Change the *Line color* of the symbol by selecting a new color from the color palette. Create new colors by clicking *Custom* at the bottom of the color list.

Change the *Line opacity* of the symbol by highlighting the existing value and typing a new value or by clicking and dragging the  to change the opacity percentage. Percentages range from 0% (completely transparent) to 100% (completely opaque).

Size

Change the *Size* of the symbol by typing a new number into the box.

Custom Symbols

Custom symbols can be created using a third party TrueType font editing software.

Symbol Index

The symbol index is the symbol or glyph number as it appears next to the *Symbol* option. This is the 0-based offset of the symbol within the symbol set. To make the symbol the same as its ASCII code, add 32 to the value. You can also use the Window's Character Map to determine the ASCII code for font symbols.

Info Page

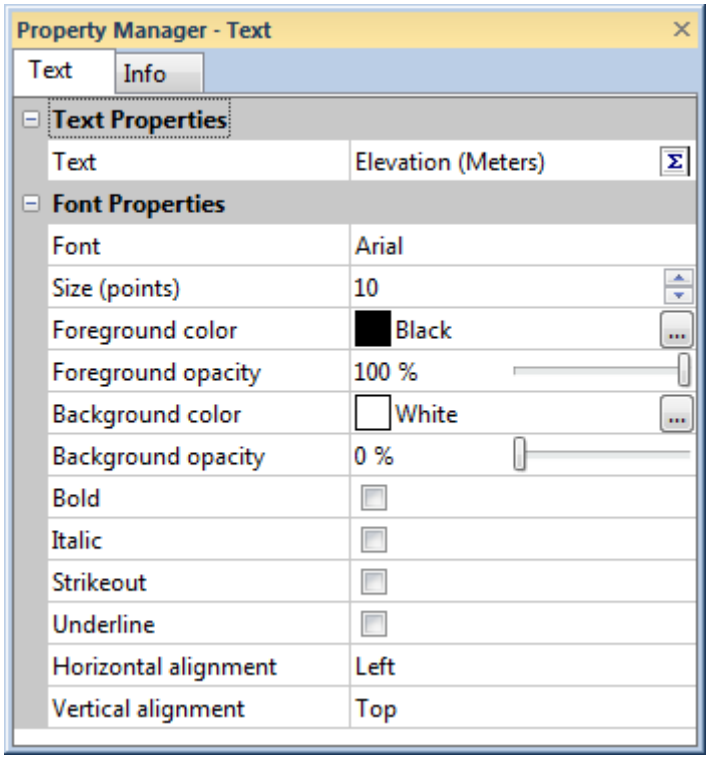
The Info page in the **Symbol Properties** dialog displays the *Position* in terms of X, Y.

Text and Font Properties

Click the **Draw | Shape | Text** command to create new text. The Text Editor is used to initially create text. After the text is created, the text and font properties are displayed in the **Property Manager**. Use the following options to change the text and font properties.

The Text Editor is linked with the *Text* and *Font Properties*. Changes in one will be represented in the other. This does not include alignment options. Changing the alignment in the *Font Properties*

changes the alignment with respect to the reference point, or the point that was clicked to create the text. Editing the text alignment in the **Text Editor** aligns the text within the text box.



Edit text in the Text Properties *section and font properties in the* Font Properties *section of the* ***Property Manager****.*

Text Properties

The text can be edited in the **Property Manager** or in the Text Editor. Click the ⊞ next to *text* to open the *Text* section. You can set the text that appears by highlighting the existing text next to *Text* and typing the desired text for simple text strings.

For complex text or multiple lines of text, click the button. The **Text Editor** opens, allowing each character to have different properties.

Math text commands can be entered in the **Property Manager**, but cannot be entered in the **Text Editor**. To include math text commands in the **Text Editor**, highlight the text that should be altered and click the appropriate button to apply the change.

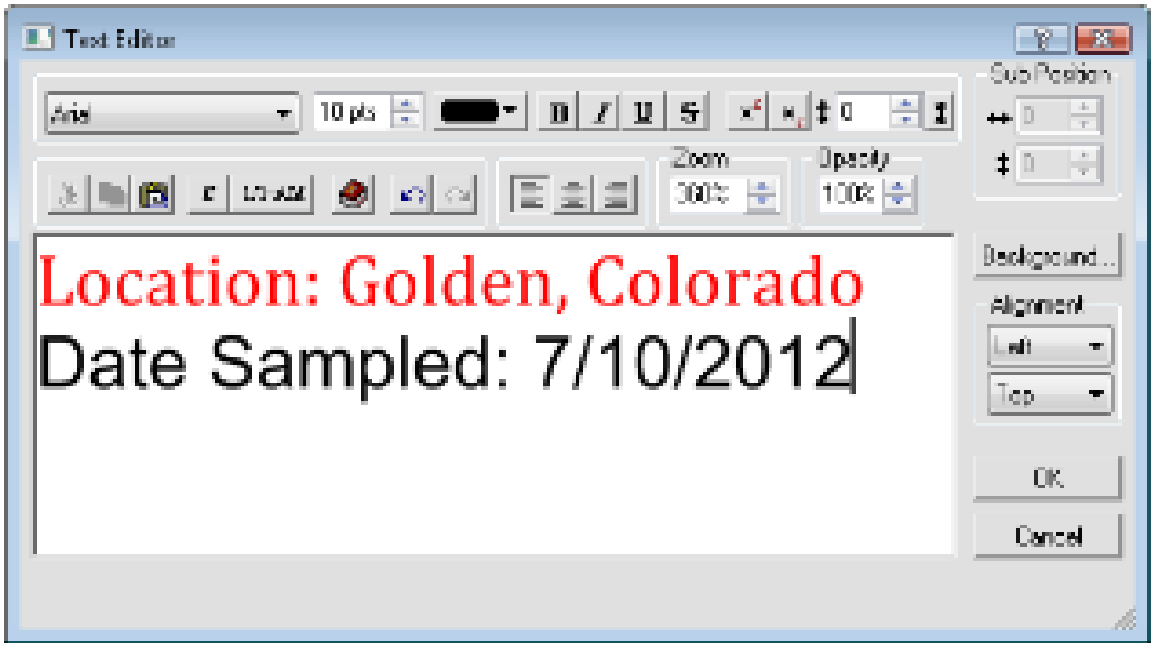
Font Properties

Text properties for the entire text block can be edited in the **Property Manager** in the *Font Properties* section. Some options may not be available for all text, depending on the type of object selected. For example, when editing axis labels, the *Alignment* options are not available.

The changes made in the *Font Properties* section are considered the baseline text properties and are applied to each line of a text block. Changes made here override "normal" font options in the **Text Editor**. To have all text the same, click the button. Highlight all the text and set all the

properties in the **Text Editor**, as desired. Then, the changes in the *Font Properties* section will apply to all text in the text object.

For example, suppose you type in the following in the **Text Editor**. After typing the text, you have highlighted the first line and made the color red and the font *Cambria*.



After clicking *OK* in the **Text Editor**, the following appears in the *Text Properties* section of the **Property Manager**.

The two lines of text appear in the plot window as:

Location: Golden, Colorado
Date Sampled: 7/10/2012

Now, in the **Property Manager** in the *Font Properties* section, set the *Font* to "Times New Roman", the *Foreground Color* to Blue, and check the boxes next to *Bold* and *Italic*. Because the first line contains a font name and color, the font and color will not change for this line. But, the red text will be bold and italic. The text now appears as:

Location: Golden, Colorado
Date Sampled: 7/10/2012

If the second line of text should remain without any text embellishments, such as bold or italics, in the **Property Manager**, click before the word *Date* and add a *\plain* math text option. This does not control the font name and color, so they will still change. The **Property Manager** would now appear as:

And, the text would appear in the plot window as:

Font

The *Font* is the font that is used for the text. To change the *Font*, click on the current font name. Select the desired font name from the *Font* list. Click the arrow button or select a font and use the ARROW keys on the keyboard to scroll through the *Font* list. The selected font is displayed in the **Text Editor**. The font files that are installed on your computer are displayed in the *Font* list. **MapViewer** supports true type fonts. All text in a text block uses the same *Font*, unless a math text operation is applied or unless the font for some of the text has been specifically edited in the **Text Editor**.

Size (points)

Set the text size in the *Size (points)* field. Highlight the existing value and type a new value. Press ENTER on the keyboard to make the change. Or, click the buttons to increase or decrease the size. A *Size (points)* value between zero and 720 can be specified.

Foreground and Background Color

Change the *Foreground color* and *Background color* of the text by selecting a new color from the color palette. The *Foreground color* controls the color of the text. The *Background color* controls the area behind the text. Create new colors by clicking the button to the right of the color name.

Foreground and Background Opacity

Change the *Foreground opacity* and *Background opacity* of the text by entering a value from 0% (completely transparent) to 100% (completely opaque). To change the opacity, highlight the existing value and type a new value. Press ENTER on the keyboard to make the change. Or, click and drag the to change the opacity percentage.

Style

Check the boxes next to *Bold*, *Italic*, *Strikeout*, or *Underline* to apply a style to the text. Note that some typefaces, such as *Symbol*, do not support bold or italicized text.

- *Bold* will increase the thickness of the text (i.e. **example**).
- *Italic* will create oblique text (i.e. *example*).
- *Strikeout* will add a horizontal line through the center of the text (i.e. ~~example~~).
- *Underline* will add a horizontal line under the text (i.e. example).

Alignment

The *Alignment* controls the location of the text relative to the reference point. A reference point is the point clicked in the plot window when the crosshair cursor is placing the text on the screen. The

text box is horizontally and vertically aligned relative to the reference point. The default position is that the reference point is at the upper left corner of the bounding box (left, top). Move the reference point by clicking and dragging the text box or entering a position on the page in the **Arrange | Position** fields. You can also move the reference point in relation to other objects with the **Arrange | Align** commands.

- *Left* horizontally aligns the text box so that the reference point is to the left of the text box.
- *Center* horizontally centers the text box on the reference point.
- *Right* horizontally aligns the text box so that the reference point is to the right of the text box.
- *Top* vertically aligns the text box so that the reference point is above the text box.
- *Baseline* vertically aligns the text box so that the reference point is located at the base of the text. The baseline is the imaginary line along which characters are positioned as they are drawn. Descenders on characters are drawn below the baseline.
- *Bottom* vertically aligns the text box so that the reference point is below the text box.
- *Center* vertically centers the text box on the reference point.

Default Settings

Set default text properties through **File | Options**. In the Default Properties section, click *Font* to specify default properties.

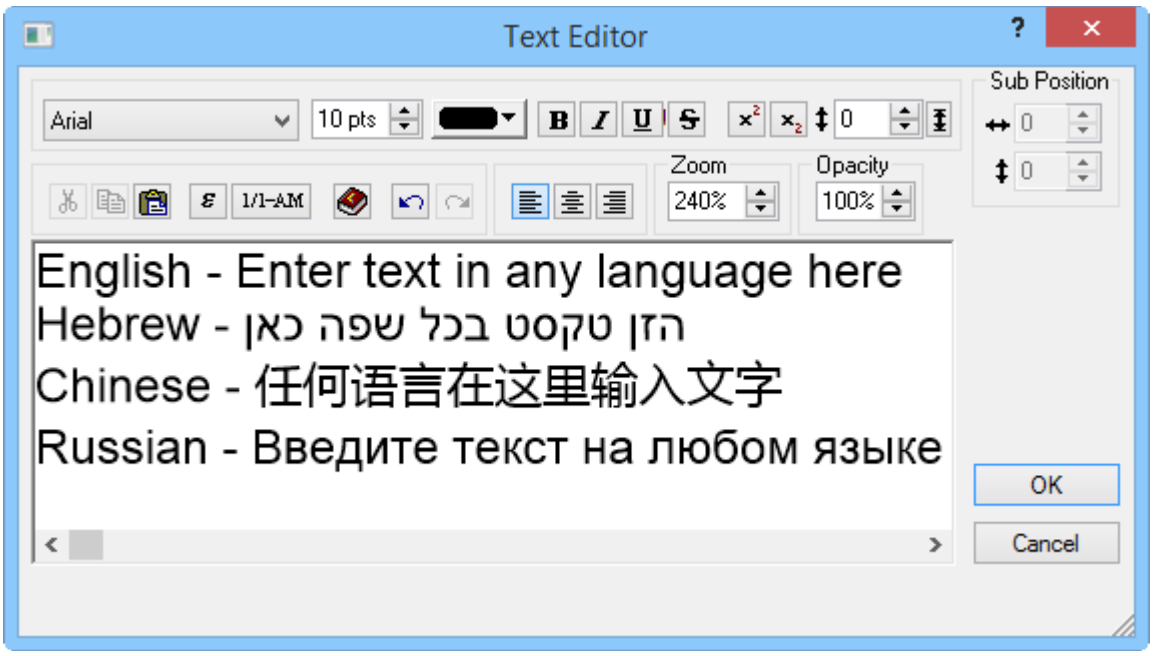
Pin Map and Post Data Font Properties

Font attributes for labels and posted data are edited in the **Property Manager**

Text Editor

You can access the **Text Editor** by creating new text or by editing existing text. To open the **Text Editor** with existing text, double-click on the text object in the **Object Manager** or the button in the **Property Manager** to open the **Text Editor**.

Text and Font properties are linked with the **Text Editor**. Changes in one will be represented in the other. This does not include alignment options. Changing the alignment in the *Font Properties* changes the alignment with respect to the reference point, or the point that was clicked to create the text. Editing the text alignment in the **Text Editor** aligns the text within the text box.



*Type or edit text in the **Text Editor**.*

Text Appearance

Select a typeface from the list in the upper left corner of the dialog.

Set the size (in points) of the typeface in the box to the right of the typeface list.

Click the colored button to the right of the size box to display the color palette and change the color for the highlighted text.

Several styles (including bold, italic, underline, and strikethrough) can be applied to the text. Note that some typefaces, such as Symbol, do not support bold or italicized text.

Superscripts and Subscripts

When working with superscripts and subscripts, you can type the character, highlight it, and then click the superscript or subscript buttons. Alternatively, you can also click the button or button and then type the characters. Click the button or button a second time to return to the normal size font and placement.

If the default superscript or subscript placement is not sufficient, you can highlight the text and enter a number in the box adjacent to the subscript box to raise or lower text from the midpoint of the existing line. Click the button to reset the highlighted character's position to the default unsuperscripted or unsubscripted position.

Sub Position

You can click in any field in a template and use the boxes below *Sub Position* to modify the position of the field in a template. The values are offsets from the main character's zero position and are in pixels. How far each value moves the template field is determined in part by the font size. Positive values move the field to the right and up. The *Sub Position* values are only available when editing text in a template field.

Editing Tools

Text can be edited using the following tools:

- You can cut , copy, or paste selected text, or paste objects from the clipboard into the **Text Editor**.
- Click the button to open the Symbol Properties dialog and add a symbol to the text block.
- Click the 1/1-AM button to open the Date/Time Format Builder dialog and enter the date or time. The information entered in this dialog will automatically update every time the **MapViewer** project is redrawn.
- Click to open the Template Library dialog and enter equations based on a template.
- You can undo and redo actions.
- You can left justify , right justify , or center the text in the bounding box. These options only make a difference with multiple lines of text.
- You can magnify text in the **Text Editor** by entering a new number in the *Zoom* box. By default, the text is zoomed to a reasonable level.
- You can adjust the opacity of the selected text by entering a new number in the *Opacity* box. Enter a value between zero (no opacity, full transparency) and 100% (full opacity, no transparency).

Background

Use the **Property Manager** Font page to edit the *Background color* and *Background opacity*.

Text Box Alignment

A reference point is the point clicked on in the plot window after clicking the **Draw | Shape | Text** command. The text box is horizontally and vertically aligned relative to the reference point. The default position is that the reference point is at the upper left corner of the bounding box (left, top).

To edit the alignment for text that already exists, change the *Horizontal alignment* and *Vertical alignment* options in the **Property Manager** on the Font page.

Resize the Text Editor

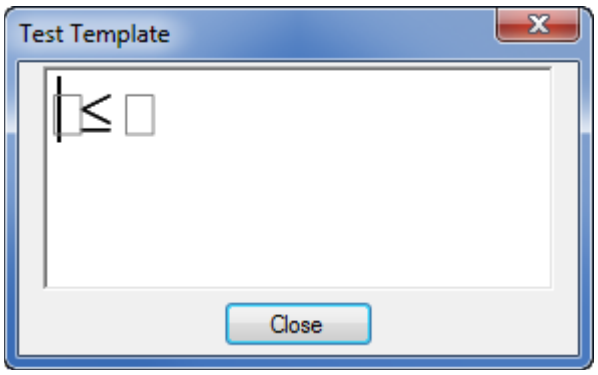
To make the **Text Editor** larger or smaller, click and drag on the lower left corner of the dialog. When the dialog is the desired size, release the mouse button.

OK or Cancel

Click the *OK* button to save your changes and close the **Text Editor**. Click the *Cancel* button to exit the **Text Editor** without saving your changes.

Text Editor Test Template

Click *Test* in the Create/Edit Template dialog to see what the final template will look like without the string and line symbols.



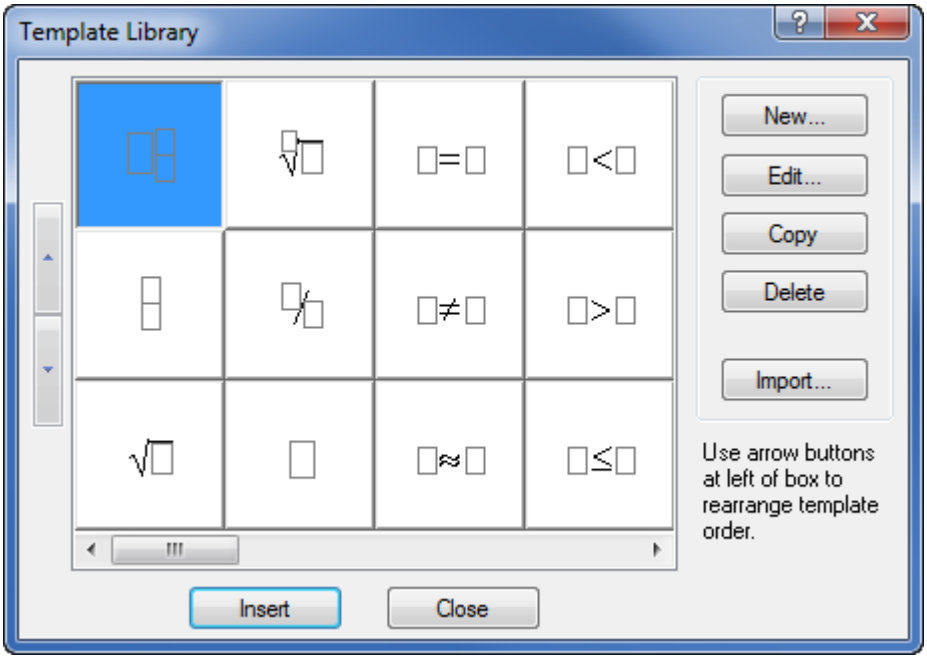
*The **Test Template** dialog displays the final template.*

Text Editor Template Library

You can use text templates from the **Template Library** to add equation formats into the Text Editor.

<u>Template Library Dialog</u>

Click the button in the **Text Editor** dialog to open the **Template Library** dialog.



*Use the **Template Library** to insert templates that can be used to input equations into the **Text Editor**.*

Up/Down

Use the up and down buttons at the left side of the screen to reposition a selected template in the library.

New

Click the *New* button to create a new template. The Symbol Properties dialog opens. Select a base symbol, click *OK*, and the **Create\Edit Template** dialog appears.

Edit

Click the *Edit* button to edit the selected template in the **Create\Edit Template** dialog.

Copy

Click the *Copy* button to duplicate the selected template. The copied template is automatically pasted at the end of the template library.

Delete

Click the *Delete* button to delete a template.

Import

Click the *Import* button to use a different Golden Software template library file [.LBT].

Insert

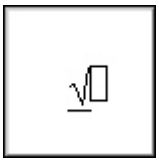
Click the *Insert* button to insert a template into the **Text Editor**.

Close

Click the *Close* button to close the template library without inserting a template into the **Text Editor**.

Example

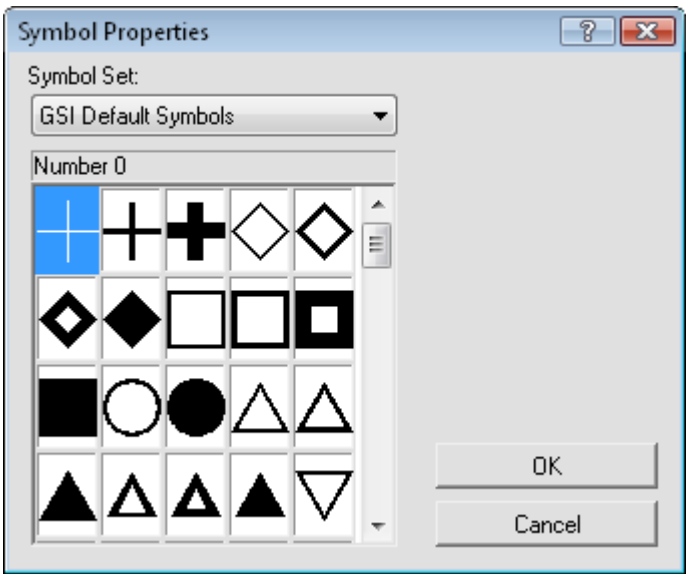
For example, to use the **Template Library** to create an image of the square root of a number:

1. Click the **Draw | Shape | Text** command.
2. Click on the view window where you want the text to be displayed.
3. In the **Text Editor** dialog, click the  button.
4. In the **Template Library** dialog, select the  template and click the *Insert* button.
5. In the **Text Editor**, the template is inserted as  . Enter the numeric value, for example the number nine, and click *OK* to display the  in the view window.

Symbol Properties Dialog

The **Symbol Properties** can be used to insert symbols from any font into a text block in the Text Editor or change for selected objects in the text template.

You can set default symbol properties through the **File | Options** command's Default Properties section. In the **Options** dialog, scroll down to the *Symbol* section to access these defaults. Changes made in the **Options** dialog affect all subsequent documents. Custom symbols can be created using a third party TrueType font editing software.



Specify a Symbol Set *and* Symbol
in the ***Symbol Properties*** *dialog.*

Symbol Set

The *Symbol Set* displays all the fonts installed on the computer. Click on the symbol set name and then you can choose a new font from the list.

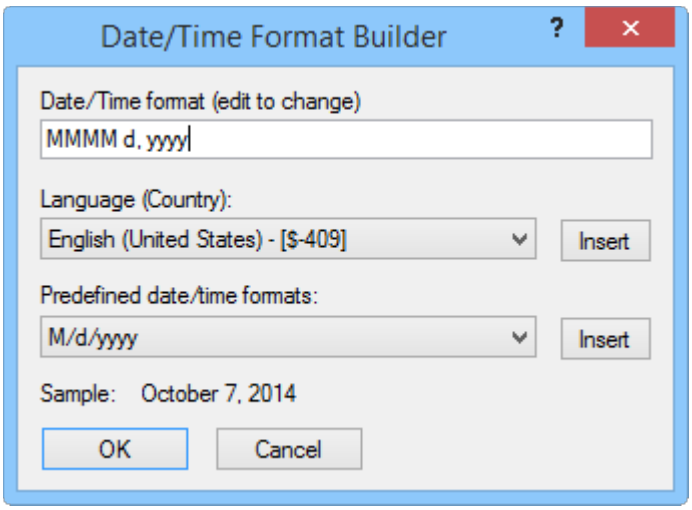
Symbol

Click on the displayed symbol to choose a *Symbol* from the symbol palette. The number of the selected symbol is indicated in the title bar above the palette and adjacent to the symbol in the **Property Manager**.

The symbol index is the symbol or glyph number as it appears in the title bar above the palette and adjacent to the symbol in the **Property Manager**.

Date/Time Format Builder Dialog

In the Text Editor dialog, click the 1/1-AM button to open the **Insert Date/Time** dialog. From the worksheet, click the ... button in the Format Cells dialog Number page. The date/time will update every time the project updates.



*The **Date/Time Format Builder** dialog is used to insert or create date/time formats for worksheet cells or text objects.*

Date/Time Format

Type a Date/Time Format into the *Date/Time format (edit to change)* field to set the date/time format. You can also use the *Language (Country)* and *Predefined date/time formats* lists to insert multiple date/time formats and languages.

Language (Country)

By default, the program will use the computer's default language settings for displaying the date/time options in the worksheet. The computer default is controlled by the Windows Control Panel. Refer to your Windows documentation for information about setting the locale. The *Language (Country)* uses the same codes to override the display. For instance, if the date/time values should always be displayed in English, regardless of locale, you could select *English (United States) - [$-409]* and click the *Insert* button. Insert the locale setting first in the *Date/Time format* box. Any cells with the specified language will appear in that language. In addition, the options in the *Predefined date/time formats* will change to show the common formats for that locale. Locale IDs are input as [$-####] in the *Date/Time format* field, where the #### is the locale identifier.

Note: The *Insert* button must be clicked after selecting the *Language (Country)* option. Simply selecting the *Language (Country)* does not change the *Date/Time format*. The *Date/Time format* does not change until *Insert* is clicked.

Predefined Date/Time Formats

The *Predefined date/time formats* list contains the common formats for the selected *Language (Country)* option or for your Windows locale. Available formats are made of combinations of year, month, day, hours, minutes, seconds, and AM/PM designation. Years are shown as yy or yyyy. Months are shown as M, MM, MMM, MMMM, or MMMMM. Days are shown as d, dd, ddd, or dddd. Hours are shown as h, hh, H, HH, or [h]. Minutes are shown as m, mm, or [mm]. Seconds are shown as ss, ss.0, ss.00, ss.000, ss.0000, or [ss]. AM/PM designation is shown as tt or TT. BC/AD or BCE/CE designation is shown as g, gg, ggg, G, GG, or GGG. Refer to formats for information about each specific option.

Note: The *Insert* button must be clicked after selecting the *Predefined date/time formats* option. Simply selecting the *Predefined date/time formats* does not change the *Date/Time format*. The *Date/Time format* does not change until *Insert* is clicked.

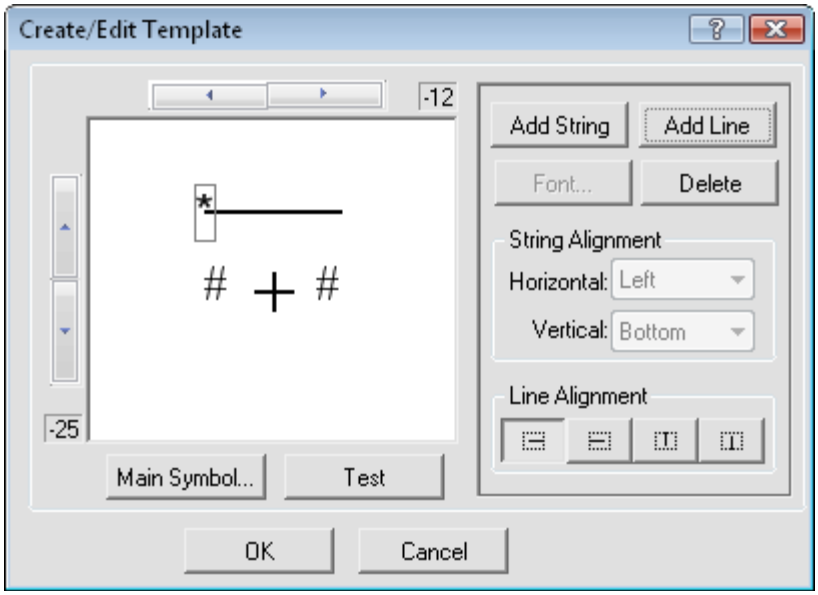
Sample

The *Sample* text updates to show a sample of the current entry in the *Date/Time format (edit to change)* field.

Text Editor Create / Edit Template

To add custom templates to the Text Editor's template library, click the *New* button in the Template Library dialog. To edit an existing template, select the template and click the *Edit* button.

If you are creating a new template select a symbol and click the *OK* button before the **Create / Edit Template** dialog opens.



*Use the **Create / Edit Template** dialog to create new templates or edit existing templates from the template library.*

Arrow Buttons

Click the arrow buttons on the left and top sides of the dialog to position a string or a line. The numbers at the edge of the arrow buttons show the string location.

Add String

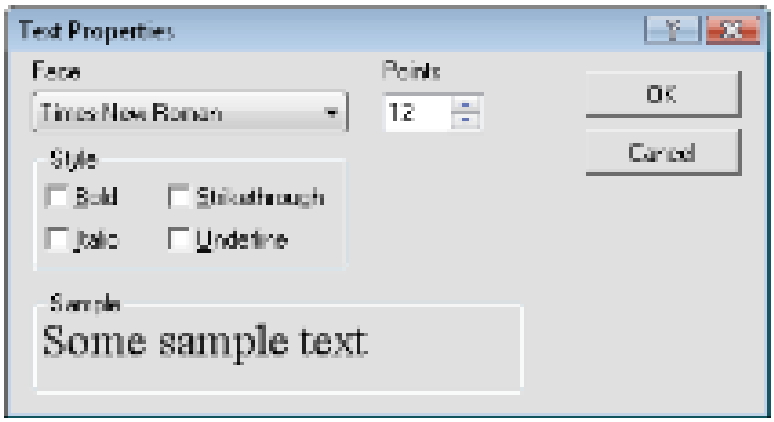
Click the *Add String* button to add a text string box. Text string boxes in the templates allow numbers or letters to be entered into the template in the **Text Editor**.

Add Line

Click the *Add Line* button to add a line to the template.

Font

Select a text string (#) and click the *Font* button to open the **Text Properties** dialog and set the properties of the text string.



Set the properties of the text string in the ***Text Properties*** *dialog.*

Delete

Select a text string or a line, and then click the *Delete* button to remove it from the template.

String Alignment

Once a text string is created (#), you can set the *String Alignment* of the entered text. Text is entered after the template has been inserted into the text editor. Refer to the *Text Box Alignment* section of the Text Editor topic for more information on alignment.

Line Alignment

You can set the *Line Alignment* to extend to the right, left, top, or bottom of the marker by selecting a line and clicking one of the *Line Alignment* buttons. The line length depends on the bounding box size.

Use the Line Alignment *buttons to determine how lines are drawn.*

Main Symbol

Click the *Main Symbol* button open the Symbol Properties dialog and change the main symbol appearing in the template.

To delete the main symbol, click the *Main Symbol* button to open the **Symbol Properties** dialog. Choose an empty symbol box, such as symbol number zero.

Test

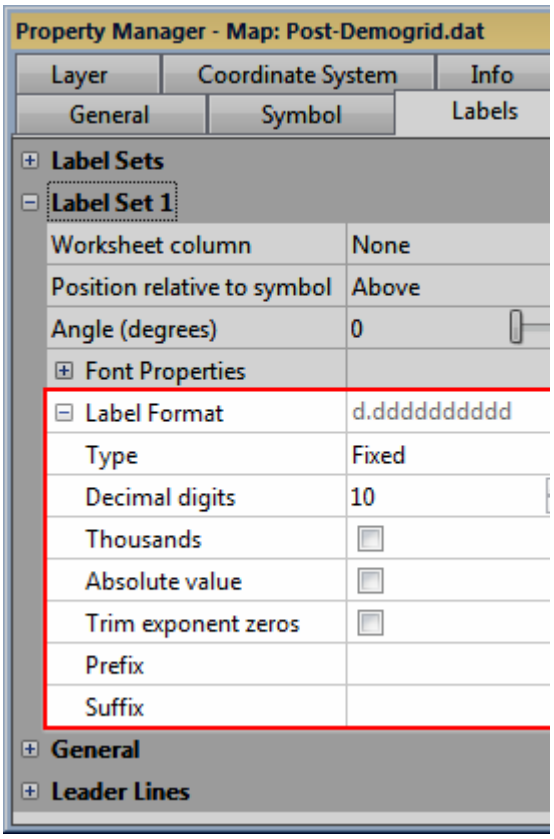
Click the Test button to open the Test Template dialog and see how the template will appear in the **Text Editor**.

1. Use the *Symbol Set* menu to select a set of symbols or text.
2. Highlight the desired symbol and click **OK**. The **Create / Edit Template** dialog opens.
3. Use the following instructions with the **Create / Edit Template** dialog.

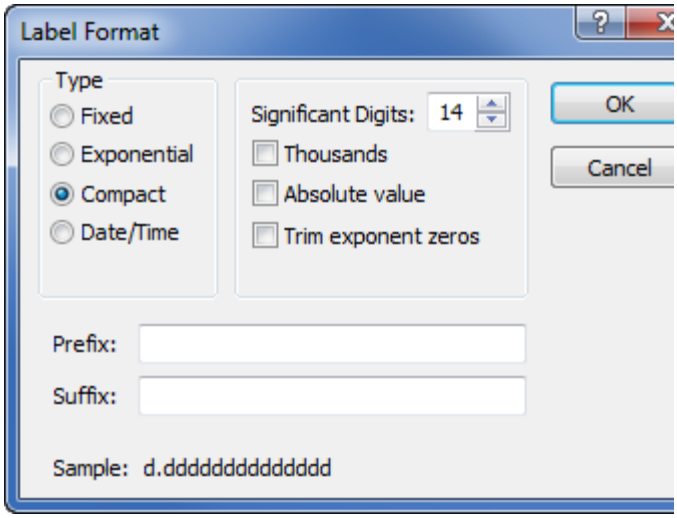
Label Formats

The label format used by various objects may be modified using the *Label Format* section in the **Property Manager** or the **Label Format** dialog. The label *type*, *length*, *prefix*, and *suffix* may be set using the label format options.

The *Label Format* section in the **Property Manager** is typically accessed by clicking the **Labels** tab and opening the *Label Format* section. The dialog is displayed for a contour map that uses the *Advanced Levels* options. The options in both the **Property Manager** and the dialog work in the same manner.



The Label Format *section for a post map allows customizing the format for post map labels.*



Contour maps with Advanced label options display in the ***Label Format*** *dialog.*

Type

The *Type* option changes how numbers are displayed.

Setting *Type* to *Fixed* displays numbers as dd.dd. The numbers to the right of the decimal are set in the *Decimal digits* box. For example, if the numeric format is set to *Fixed* with three digits after the decimal point, the number 1998 displays as 1998.000.

The *Exponential* option displays numbers as d.ddE+dd where d is a single digit, dd can be one or more digits, and +dd is a sign and three digits. The numbers to the right of the decimal are set in the *Decimal digits* box. For example, if the numeric format is set to *Exponential* with two *Decimal digits*, then 1998 displays as 1.99E+003.

The *Compact* option displays the labels in either fixed or exponential fashion, whichever requires fewer digits. Enter the number of digits to display in the *Significant digits* box. For example, if the numeric format is set to *Compact* with two total digits, the year 1998 displays as 1.9E+003.

The *Date/Time* option displays the labels as a combination of date and time formats. When the *Type* is set to *Date/Time*, the *Date format* and *Time format* options become available. When the *Type* is set to *Date/time*, if *Invalid date* text is displayed instead of the actual date/time format, the value for the label is outside the defined date/time range.

Decimal Digits

The numbers to the right of the decimal are set in the *Decimal digits* box when *Type* is set to either *Fixed* or *Exponential* labels.

Significant Digits

The number of significant digits is set in the *Significant digits* box when *Type* is set to *Compact* labels. *Significant digits* include numbers before and after the decimal. So, if the *Significant digits* are set to 2 and posted numbers are larger than 100, rounding will occur in the display of the labels.

Thousands

If the *Thousands* box is checked, a comma appears every three digits to the left of the decimal point.

Absolute Value

Check the *Absolute value* check box to display the absolute value of the numbers. Negative numbers are displayed without negative signs.

Trim Exponent Zeros

Check the *Trim exponent zeros* box to remove leading zeros in exponential numbers. For example, 1.9E+003 becomes 1.9E+3 if the *Trim exponent zeros* box is checked.

Date Format

When the *Type* is set to *Date/Time*, the *Date format* option becomes available. Click on the existing option and select the desired date format from the list. To display only a date format, set the *Time format* to (None).

Time Format

When the *Type* is set to *Date/Time*, the *Time format* option becomes available. Click on the existing option and select the desired time format from the list. To display only a time format, set the *Date format* to (None).

Prefix

You can add a text string before each label using the *Prefix* box. For example, a "$" could be used as a prefix. Type the text exactly as you want it to appear in the *Prefix* box.

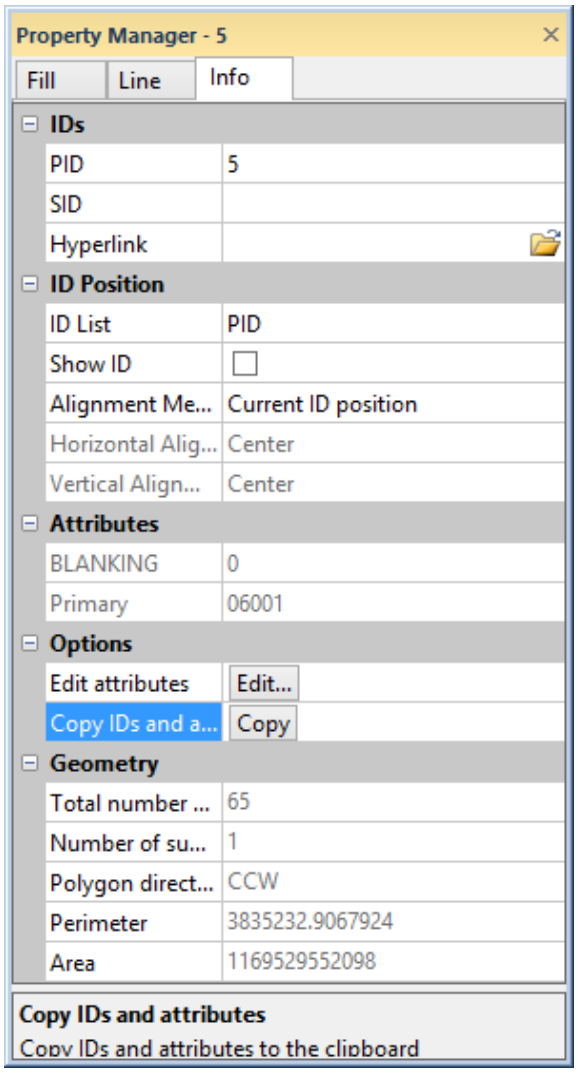
Suffix

You can add a text string after each label using the *Suffix* box. For example, a unit of measure " ppm" could be used as a suffix. Type the text exactly as you want it to appear in the *Prefix* box.

Info Page

The **Info** page contains information about the selected object. The **Info** page is available with drawn objects, such as polylines, polygons, points, images, and metafiles, with map objects, and map layers, such as base layers. The information displayed is dependent on the type of object.

The **Info** page is located in the **Property Manager** for the selected object or layer. A single object must be selected to display the **Info** page.



*The **Info** page displays information dependent on the selected object.*

IDs Section

The **IDs** section allows you to edit the object PID and SID. You can also add or edit a Hyperlink.

Geometry Section

The **Geometry** section allows you to set the *Coordinate system* and display the perimeter, length, position, or area of the selected object. Click on the ⊞ next to *Geometry* to open the section. This section is only available for polylines, polygons, symbols, rectangles, rounded rectangles, ellipses, or spline polylines.

Coordinate System

Specify a coordinate system from the *Coordinate system* list to be used for the information displayed for the object.

- *Page* uses the page coordinate system (inches or centimeters depending on the setting in **File | Options | General**).
- *Local* uses the units the geometry was originally specified in. For example, if the geometry was loaded from a file, this is the original file units. If the geometry was created interactively, this is an internal coordinate system with 0.0 in the center of the page (in inches).
- *Map* displays information in map units if the geometry is part of a map. If the object is not part of a map, this option is not available.

Total Number of Vertices

The *Total number of vertices* displays how many vertices are used in the selected object. The Reshape command can be used to see the vertex locations for polygons and polylines.

Number of Sub-Polygons

If the object contains a complex polygon, the *Number of sub-polygons (rings)* displays how many polygons are included in the complex polygon. For example, the sample file CA2000.GSB has polygons of California counties. Some of the counties are complex polygons (i.e. Santa Barbara) that include sub-polygon islands.

Number of Curves

The *Number of curves* is displayed for a spline polyline. The *Number of curves* is the number of inflection points along the spline polyline. This is one less than the total number of vertices.

Perimeter/Length

Depending on the object selected, either *Perimeter* or *Length* will be displayed.

- The *Perimeter* displays the calculated perimeter of the selected closed object (i.e. polygon).
- The *Length* displays the calculated length of the selected open object (i.e. polyline). The units displayed are dependent on what is selected for the *Coordinate system*.

Area

The *Area* displays the calculated area of the selected object. The units displayed are dependent on what is selected for the *Coordinate system*.

Info Section

The **Info** section allows you to view the *Type, Description, Number of records, size in bytes, Objects in group* and image information for the selected object. Click on the ⊞ next to *Info* to open the section. This section is only available for text, images, metafiles, and grouped objects.

Type

The *Type* displays the type of metafile being displayed.

Description

The *Description* displays any information about the metafile.

Number of Records

The *Number of records* displays the number of objects in the metafile.

Pixel Format

The *Pixel format* option displays the type of image imported, including the number of bits per pixel included in the image.

Size in Bytes

The *Size in bytes* or the *Size (bytes)* option displays the file size of the image or metafile in bytes.

Size in Pixels

The *Size (pixels)* option displays the number of pixels in the image.

Image Source

The *Image source* displays the name of the file imported for an image.

Attributes Section

The *Attributes* section contains any information that is available about the selected object. To open the *Attributes* section, click the ⊞ next to *Attributes*.

Attributes can be image properties, such as *TIFF_Compression*, or can be information about a specific object that was imported from a file, such as a .DEM, .DXF, or .SHP file. Each object (such as polylines in a base map) can have its own attribute information. The *Attributes* can also contain user generated information. To add an attribute, click the *Edit* button in the *Options* section. Add the new values or edit the existing values in the Attribute Editor dialog.

Options Section

The *Options* section contains options to edit or copy the attribute data for a selected object. To open the *Options* section, click the ⊞ next to *Options*.

Edit Attributes

Click the *Edit* button next to the *Edit attributes* option to add, delete, or edit the information contained in the attributes. The changes are made in the Attribute Editor dialog.

Copy Attributes

Click the *Copy* button next to *Copy to clipboard* to copy all of the information on the **Info** page for the selected object to the clipboard. The text can be pasted into **MapViewer** or any other program using the Paste command. All information on the **Info** page is copied, including the information in the *Geometry* and *Info* sections. If the *Copy* button is not available, no attribute information is available for the selected item.

Editing Attributes

To edit an attribute for an object,

1. Click on the object to select it.
2. In the **Property Manager**, click on the **Info** tab.
3. Open the *Options* section by clicking the ⊞ next to *Options*.
4. Click on the *Edit* button next to *Edit attributes*.
5. In the **Attribute Editor**, click the button to add a new blank row.
6. In the blank row, click in the *Name* column. Type the desired attribute name, such as *Surveyor's Name*.
7. Click in the *Value* column. Type the desired description, such as *Thomas Denver*.
8. To move the attribute, click on the row and click the or until the attributes are in the desired order.
9. Click *OK* and the attributes are displayed on the **Info** page.

Exporting Attributes

Attribute information is exported for polygons, polylines, and points to file formats that support metadata. The file type will determine how many attributes are exported. Refer to the specific file type pages for specific information.

Data Statistics Section

For bar, pie, and territory maps, the *Info* page shows a data statistics summary for each variable column selected in the General page. In the territory map *Info* page, data statistics summaries are separated by territory and data column. For example, in a bar map using data columns D and E, the data statistics are separated as follows: Column D: Var 1, Column E: Var 2, etc. For a territory map with two territories using the same data columns, the statistics summaries are separated into four groups: Territory 1 - Column D: Var 1, Territory 1 - Column E: Var 2, Territory 2 - Column D: Var 1, and Territory 2 - Column E: Var 2. In **MapViewer**, the territory names and variable names listed above are replaced with the actual territory and data column titles.

The *Data Statistics* section shows the *Total count*, *Active count*, *Inactive count*, *Min*, *Max*, *Range*, *Sum*, *Mean*, and *Std. dev.* (Standard deviation) for each data column, and territory if applicable, used in the map.

Information Displayed for Objects

All objects display an *Attributes* and *Options* section. The information in the *Geometry* section changes depending on the object selected.

Polyline

The **Info** page for Polyline Properties displays the *Coordinate system, Number of vertices,* and *Length.*

Polygon

The **Info** page for Polygon Properties displays the *Coordinate system, Total number of vertices, Number of sub-polygons (rings), Perimeter,* and *Area.*

Point

The **Info** page for Point Properties displays the *Coordinate system* and *Position* in X and Y units.

Rectangle

The **Info** page for Rectangle Properties displays the *Coordinate system, Perimeter* and *Area.*

Rounded Rectangle

The **Info** page for Rounded Rectangle Properties displays the *Coordinate system, Perimeter* and *Area.*

Ellipse

The **Info** page for Ellipse Properties displays the *Coordinate system, Perimeter* and *Area.*

Spline Polyline

The **Info** page for Spline Polyline Properties displays the *Coordinate system, Number of curves* and *Length*.

Spline Polygon

The **Info** page for Spline Polygon Properties displays the *Coordinate system, Number of curves* and *Length*.

Metafile

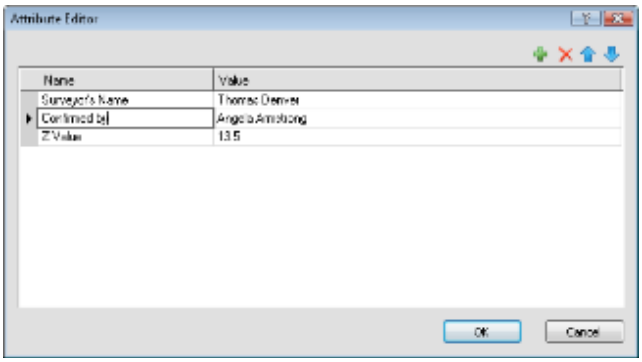
The **Info** page for Metafile Properties displays the *Type* of metafile, *Description, Number of records,* and *Size in bytes*.

Image

The **Info** page for Image Properties displays the *Pixel format*, *Size (pixels), Size (bytes), and Image source*.

Attribute Editor

The **Attribute Editor** contains the ability to edit the attributes, or metadata, associated with any object. To open the **Attribute Editor** click on an object. In the **Property Manager**, click on the Info tab. In the *Options* section, click the *Edit* button next to *Edit attributes*. Attributes can be added, deleted, edited, and reordered in the **Attribute Editor** dialog.



*Edit or add information for each object in the **Attribute Editor** dialog.*

Name

The *Name* column contains the name of the attribute. To change the name, click in the box next to the existing text and type the desired text.

Value

The *Value* column contains the text associated with the attribute. Values can be text or numbers. To change the value, click in the box next to the existing text and type the desired text.

Adding New Attributes

Click the button in the top right section of the dialog to add a new blank row. In the blank row, click in the *Name* box and type the name of the attribute. Click in the *Value* box and type the value for the attribute.

Deleting Attributes

Click the button in the top right section of the dialog to delete the selected row. If the button is not available, click anywhere in the row to select that row and then click the button.

Reordering Attributes

Click the button to move the selected attribute up one row. Click the button to move the selected attribute down one row. The order of the attributes in the Attribute Editor dialog is the same order that the items appear on the Info page in the **Property Manager**.

Editing Attributes

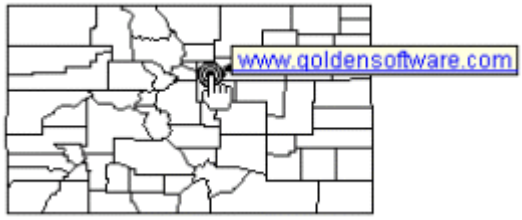
To edit an attribute for an object,

1. Click on the object to select it.
2. In the **Property Manager**, click on the **Info** tab.
3. Open the *Options* section by clicking the ⊞ next to *Options*.
4. Click on the *Edit* button next to *Edit attributes*.
5. In the **Attribute Editor**, click the button to add a new blank row.
6. In the blank row, click in the *Name* column. Type the desired attribute name, such as *Surveyor's Name*.
7. Click in the *Value* column. Type the desired description, such as *Thomas Denver*.

8. To move the attribute, click on the row and click the  or  until the attributes are in the desired order.
9. Click *OK* and the attributes are displayed on the **Info** page.

Hyperlink

Hyperlinks can be associated with map objects. Hyperlinks are links to data files, internet sites, email addresses, or simply additional text descriptions of an object. Map objects with web hyperlinks are actively linked, so you can click on an object using the hyperlink tool and the website opens in a web browser (provided an internet connection is available).



Hyperlinks add additional information to your map.

Adding Hyperlinks

Associate a hyperlink with an object or change the hyperlink for a selected object in the Info section of the **Property Manager**.

Exporting Hyperlinks

When exporting the plot to an HTML Image Map file, hyperlinks are preserved and can be used in a website, for example.

Hyperlink Abbreviations

The hyperlink can contain an abbreviation (title) that appears when using **View | Hyperlink**. When creating or editing a hyperlink add a pipe symbol (|) and the abbreviation as in: http://www.goldensoftware.com|GSI.

When you move the cursor over the object with the above hyperlink, GSI is displayed rather than http://www.goldensoftware.com.

Viewing Hyperlinks

Click **View | Display | Hyperlink** 

to move the cursor over the plot window and identify objects with associated hyperlinks. If an object has a hyperlink, the hyperlink text appears in a yellow pop up window when the cursor hovers above the object. If the hyperlink is a web address, file path, or an email address, click on the object to go directly to the web site, open the file, or compose an email message.

Color Palette

The color palette is opened by clicking the color sample or button.

- The name of the color appears at the top of the palette.
- Select a color from the palette by clicking on a color.
- Create new colors by clicking on the Custom button at the bottom of the color palette.

Select a predefined or custom color from the color palette.

Custom Colors

Click the *Custom* button at the bottom of the color palette to create new colors. New colors are created by mixing red, green, and blue. You can add colors to the palette, remove colors from the palette, or replace existing colors in the palette.

- The *Name* field indicates the name of the selected color.
- The *Red, Green,* and *Blue* scroll bars show the amount of each color used to form the color. The color values range from zero to 255. To change the color amounts slide the box along the scroll bar or press the arrow keys.
- The *Sample* box shows the new color.
- Click *Add to List* to add a new color to the end of the color palette. Type the new color name into the *Name* field before adding the new color.
- Click *Replace* to replace the selected color with the modified color.
- Click *Remove From List* to delete the selected color.
- The *Color Palette* shows all available colors.
- Dragging a color inserts it into a new location in the color palette.

Colors Dialog

Click the button to the right of any color in the **Property Manager** to open the **Colors** dialog. Use the **Colors** dialog to load standard colors or create custom colors. There is a *Custom* button at the bottom of all palettes.

Standard Page

The standard colors appear on the **Standard** page in a standard palette spectrum.

Colors

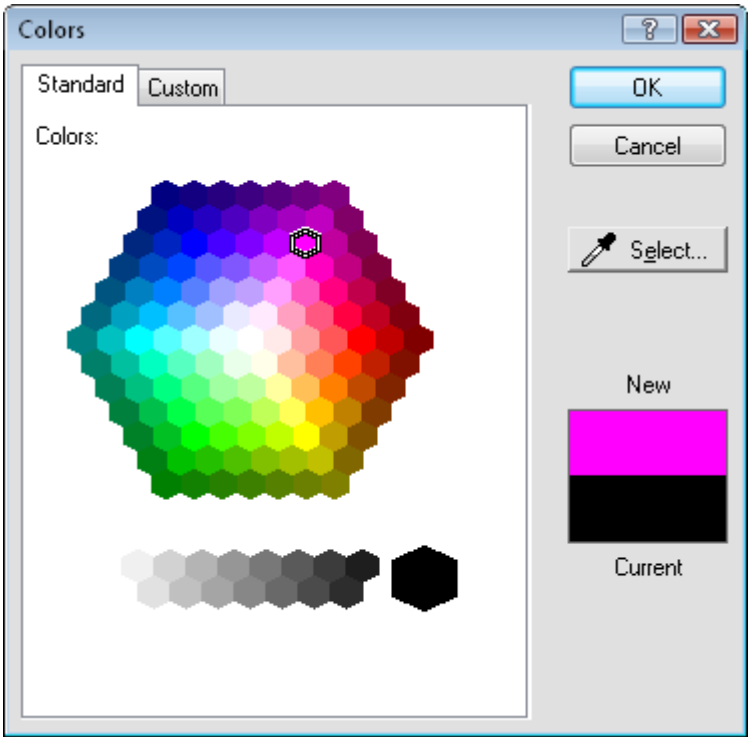
Click a color in the standard palette spectrum.

New

A preview of the selected color appears under *New* on the right side of the dialog. Click the *OK* button to accept the new color. The **Colors** dialog closes.

Select

Click the *Select* button to color match to any color on the screen. The cursor changes to an eyedropper. Move the cursor around the screen and the color under *New* changes accordingly. Click the mouse when you find the color you want, and that color appears under *new*. Click the *OK* button to accept the new color. The **Colors** dialog closes.



*Use the **Colors** dialog to load standard colors or create custom colors.*

Custom Page

You can create custom colors on the **Custom** page. New colors are created by mixing red, green, and blue.

Colors

Click anywhere in the color spectrum to choose a new color, or enter new values in the *Hue, Sat, Lum, Red, Green,* and *Blue* boxes. You can drag the slider next to the color spectrum to adjust the new color's intensity.

New

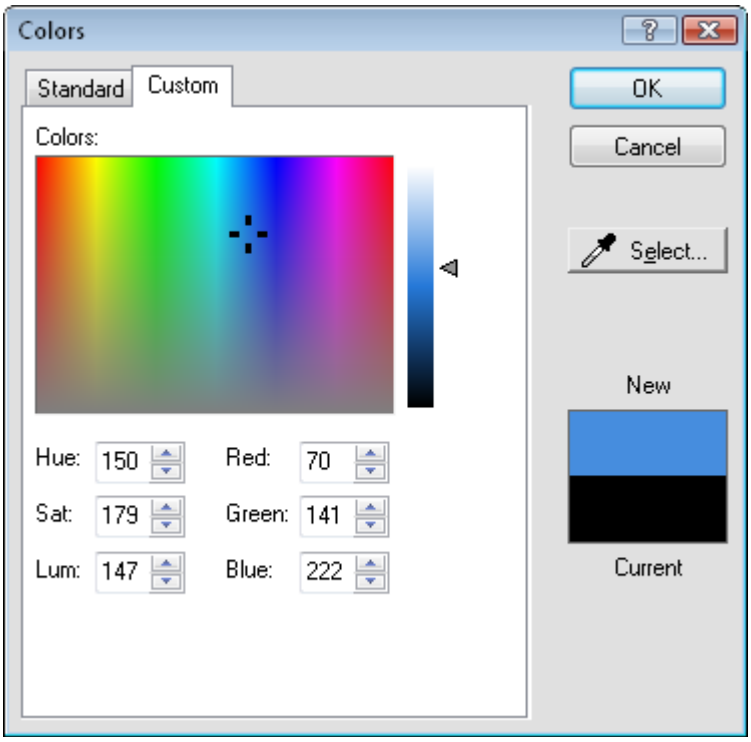
A preview of the new color appears under *New* on the right side of the dialog. Click *OK* to accept the new color. The **Colors** dialog closes.

Select

Click *Select* to color match to any color on the screen. The cursor changes to an eyedropper. Move the cursor around the screen and the color under *New* changes accordingly. Click the mouse when you find the color you want, and that color appears under *New*. Click *OK* to accept the new color. The **Color** dialog closes.

Cancel

While in the **Colors** dialog, click *Cancel* to close the dialog without making any color changes.



*Use the **Colors** dialog to load standard colors or create custom colors.*

Custom Color Spectrums

Color spectrums are used to assign color to hatch maps, prism maps, and gradient maps. Custom color spectrums can be created by clicking the *Custom* button at the bottom of the color spectrum list.

The color spectrum has specific colors assigned to nodes along the spectrum. **MapViewer** automatically blends colors between the nodes to produce a smooth color gradation over your map. After you create a color spectrum, you can add the color spectrum to **MapViewer** or save the spectrum for use on other computers. Several predefined color scales are available in **MapViewer**.

Assigning Colors

The **Custom Color Spectrum** dialog allows you to specify the colors to the map. Blended colors are achieved by creating anchor nodes along a color bar and assigning specific colors to the specified anchor nodes. Colors are linearly interpolated between adjacent anchors. To add a color node to the spectrum, hold down the CTRL button on your keyboard while clicking above the color spectrum. To delete a node, select it and then press DELETE on your keyboard.

The *Color* field identifies the selected color in the color palette. To change or assign a color to a color node, click on the node and then click on a color in the color palette. If you do not see a color you like, click the *Custom Color* button to create a color in the Custom Color dialog.

Color Spectrum Range

The *Scaled node value* displays the value of the selected node based on a scale from 0 to 1. The first and last nodes are permanently fixed to 0 and 1. To place a color node at a given location along the 0 to 1 range, type the value in the *Scaled node value* field. For example, to start a color change halfway through your data, place a node at the *Scaled node value* of .5.

Saving a Color Spectrum

Click the *Save* button in the **Custom Color Spectrum** dialog to create a color spectrum file [.CLR] based on the current color spectrum settings. When you click the *Save* button, the Save As dialog is displayed. Type the file name for the color spectrum file and click the *OK* button. The file is saved for use with other data files.

Loading a Color Spectrum

The *Load* button opens an existing color spectrum file [.CLR]. When you click the *Load* button, the **Open** dialog. Locate the [.CLR] files and double-click the file you want to use and the color spectrum is updated to show the color spectrum file settings.

Color Spectrum List

Once you have created a color spectrum you can add it to **MapViewer's** palette and you can rearrange or delete color spectrums.

- The *Color spectrum list* displays all of the available color spectrums. This list includes all of the color spectrums included with **MapViewer**, along with any spectrums you have created or loaded. If you have color spectrums that you use frequently, you may want to move them to the top of the *Color spectrum list*. Arrange the color spectrums by selecting a spectrum and clicking the *Move to top, Move up, Move down*, or *Move to bottom* buttons.
- The *Name* field allows you to name new color spectrums. Use a name that does not already exist.
- Click the *Add to list* button to add the color spectrum defined in the *Edit color spectrum* group to the *Color spectrum list*.
- Click the *Replace* button to replace the selected spectrum in the *Color spectrum list* with the one defined in the *Edit color spectrum* group.
- If you want to remove a spectrum from the *Color spectrum list*, select the spectrum and click the *Remove from list* button.

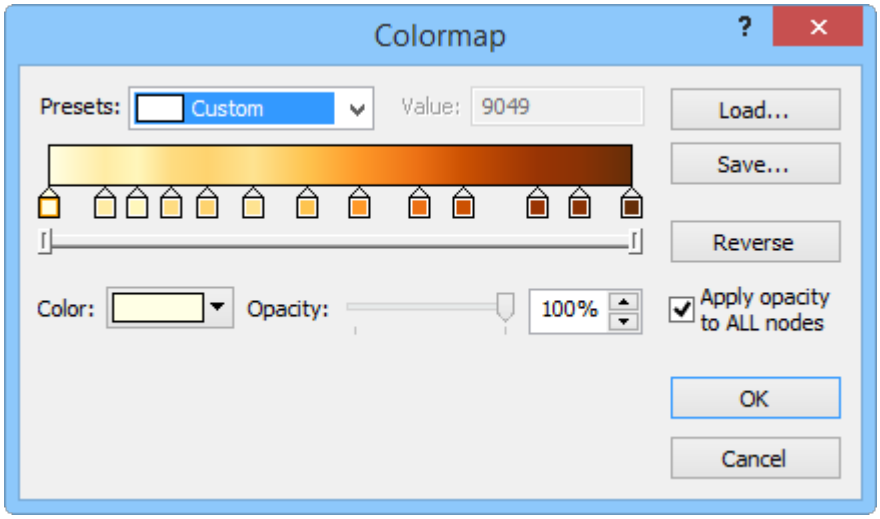
Colormap Dialog

The **Colormap** dialog is used to assign either *Preset* or custom color spectrums to a map.

The colormap has specific colors assigned to nodes along the spectrum. **MapViewer** automatically blends colors between the nodes to produce a smooth color gradation over your map. After you create a colormap, you can save the spectrum as a .CLR file for later use with other maps. Although the colors are assigned to specific values on a map, the spectrum can be used with maps containing different Z ranges because the node values are stored as percentages. Several predefined colormaps are available in the SAMPLES directory and are shown in the *Presets* list.

The Colormap Dialog

The **Colormap** dialog is opened differently depending on the map type you are using to access the dialog.



*Use the **Colormap** dialog to assign colors to a map.*

Presets

The *Presets* list allows you to select a predefined .CLR file created by Golden Software. Custom colormaps cannot be added to the preset list.

Data Value

The *Value* displays the data value of the node selected. The selected node may be accurately repositioned by entering a new value in the *Value* box. The first and last nodes cannot be changed and this control is disabled when an end node is selected.

The *Value* option is not used the same way with the classed post map. To determine the color in the colormap associated with each class, the following rules are used:

- The first class uses the *Minimum* value color. This is the node on the far left side of the colormap.
- Subtract the *Minimum* from the *Maximum* value and divide by the *Number of classes*. This is the separation value. Add the separation value to the *Minimum* value. This will be the value color associated with the next class.
- Add the separation value to the previous value. This is the value color associated with the next class.
- Repeat adding the separation value to the previous value until only the last class remains. The last class uses the *Maximum* value color. This is the node on the far right side of the colormap.
- **Surfer** automatically interprets the colormap to determine the color value associated with each class. Any number of nodes can exist on the colormap. The nodes and the *Value* in the colormap are not associated with the classes.

Loading a Colormap

The *Load* button opens an existing colormap .CLR file. When you click the *Load* button, the **Open** dialog is displayed with a list of colormap files. Click the file you want to use and click *Open*. The colormap is updated to show the colormap file settings.

Colormap files can be used with maps of varying Z ranges since the anchor nodes are stored as percentages rather than as data values. To use the exact same colors in the exact same data locations when the Z ranges vary slightly, override the default data limits and assign custom values in the *Data to Color Mapping* group.

Saving a Colormap

Click the *Save* button in the **Colormap** dialog to create a colormap .CLR file based on the current colormap settings. When you click the *Save* button, the **Save As** dialog is displayed. Type the *File name* for the colormap file and click *Save*. The file is saved for use with other files.

Reversing a Colormap

The *Reverse* button flips the order of colors in the colormap so that colors currently associated with low data values will be mapped to high values and colors currently associated with high values will be mapped to low values. The sample colormap updates to show the new color order.

Colormap Example

The sample of the generated colormap is display directly above the anchor nodes.

Assigning Colors

The **Colormap** dialog allows you to specify the colors to associate with a range of data within the map. Blended colors are achieved by creating anchor nodes along a color bar and assigning specific colors to the specified anchor nodes. Colors are linearly interpolated between adjacent anchors.

Adding a Node

You can add additional anchor nodes at any position along the colormap. To create a new anchor node, left-click below or on the colormap where you want the new node added. The new anchor is automatically assigned a color in the color palette, and the value is displayed in the *Value* box. You can add as many anchor nodes as you want. This lets you blend colors in many different ways on the colormap.

Deleting a Node

Left-click on an anchor node and press the DELETE key on the keyboard to delete a node. Nodes can also be dragged outside the top or bottom of the dialog to remove it from the spectrum. The first (far left) and last (far right) anchor nodes cannot be deleted.

Scroll Control

The scroll control appears as a horizontal bar with draggable end handles. Drag a handle left or right to zoom the colormap in or out. Drag the center section to scroll the visible portion left or right. Double-click the center section to return it to the fully visible state.

Use the scroll control to zoom the colormap in or out.

Color

Click the *Color* box to specify the color of the currently selected anchor node. The color palette opens.

Changing the Opacity

Change the *Opacity* of a node by selecting the node and entering a value from 0% (completely transparent) to 100% (completely opaque), using the arrow buttons to the right of the box, or dragging the slider to change the opacity percentage.

3D surface maps cannot be made transparent.

Changing the Opacity of All Nodes

Click the *Apply opacity to ALL nodes* option to change the opacity for all nodes. Uncheck the *Apply opacity to ALL nodes* to change individual node opacity.

Colormap Data Range

The *Data to Color Mapping* group contains options for setting the minimum and maximum data values to use in the colormap.

Use Data Limits

Check the *Use data limits* check box to use the data minimum and maximum values. This option is not available for classed post maps.

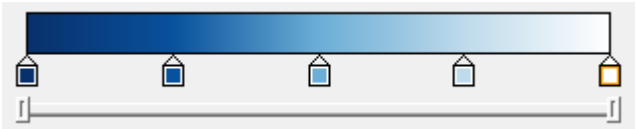
Colormap Data Minimum and Maximum

If you would prefer to set the colormap minimum and maximum values to other values, enter the new numbers into the *Minimum* and *Maximum* boxes. This is useful when you are mapping different data sets in a similar range and would like to have the same data values represented by the same colors each time. If a data value within the map falls outside this range, it is assigned the minimum or maximum color, whichever is closest.

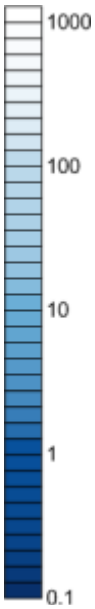
The minimum and maximum values cannot be set for the classed post map. For the classed post map, the far left *Minimum* node is always the median value for the first class. The far right *Maximum* node is always the median value for the last class. This cannot be changed.

Logarithmic Scaling

Check the box next to the *Logarithmic scaling* to set the intervals between the nodes to a log(10) scale. The *Minimum* and *Maximum* values are the same. The nodes between the minimum and maximum and the color definitions adjust to fit the log(10) scale. On a log(10) scale, there is as much distance on the colormap sample between 1 and 10 as between 10 and 100 or 100 and 1000. In the example below, the nodes are displayed at 0.1, 1, 10, 100, and 1000. To use a regular linear scale on the colormap, uncheck the box next to *Logarithmic scaling.*



When the Logarithmic scaling *option is checked,*
the color scale bar uses a Log(10) scale between nodes.
This colormap displays nodes at 0.1, 1, 10, 100, and 1000.



The associated color scale bar for the colormap above
is shown with the major log intervals displayed.

Anchor Nodes

The color spectrum is defined by anchor nodes at user-defined points along a color spectrum in the Colormap dialog. Colors are automatically blended between adjacent anchors.

Anchor nodes are represented by a slider button below the color spectrum. A node with a colored arrow and an orange boundary indicates the node is currently selected.

Anchor Node Value

The data value for the node is displayed in the *Value* box. Except for the first and last nodes, any node can be assigned to a specific value by typing a new number into the *Value* box.

Initially, the minimum grid value and the maximum grid value anchor node colors are defined as black and white, respectively. You can change either of the colors by clicking once on the anchor slider button and then clicking on any color in the color palette. The color spectrum is updated to show the change.

Add Anchor Node

You can add additional anchor nodes at any position along the color spectrum. To create a new anchor node, left-click below or on the color spectrum where you want the new node added. The new anchor is automatically assigned a color in the color palette, and the value is displayed in the *Value* box. You can add as many anchor nodes as you want. This lets you blend colors in many different ways on the color spectrum.

Delete Anchor Node

Left-click on an anchor node and press the DELETE key on the keyboard to delete a node. Nodes can also be dragged outside the top or bottom of the dialog to remove it from the spectrum. The first (far left) and last (far right) anchor nodes cannot be deleted.

Positioning an Anchor Node

To position an anchor node:

1. Move the mouse cursor over the slider button.
2. Click and hold the left mouse button.
3. Drag the slider button to the desired position and release the left mouse button. As you move the slider button, the data value is indicated in the *Value* box. Alternatively, you can set the anchor to a specific data value by entering a number into the *Value* box. Note that the beginning and ending anchors cannot be moved or deleted.
4. Reset the *Minimum* and *Maximum* to change the range, and therefore, the position of the starting and ending nodes.

Selecting a Color for an Anchor

To select a color to associate with the anchor node:

1. Click on the anchor you wish to modify.
2. Click on the desired color in the color palette. The color spectrum is updated to indicate the change.

Alternatively, use a preset .CLR color file by selecting one of the options from the *Presets* list or click the *Load* button to load a custom .CLR file.

Chapter 8

Map Layers

Layers

Each layer can contain only one thematic map, but you can place different thematic map types on different layers within a single plot window. To create a drawing with several thematic maps, you must use a new layer for each thematic map type. The dialog displays a list of all layers in the map. The order of the layers in the list coincides with the order the layers are drawn. The layer at the top of the list appears on top of all other layers when drawn.

Create a new layer or lock an existing layer with the **Layer** commands in the Map tab. Arrange layers in the **Object Manager** or the **Move** commands in the Arrange tab.

Create New Layer

Click the **Map | Layer | New Layer** command 

to create a new layer. The new layer automatically becomes the active layer. You can also create a new layer by right clicking in the **Object Manager** and selecting *New Layer* from the context menu. Some commands also have an option to create a new layer in their related dialogs.

Name the new layer, arrange layers, or make a different layer the active layer in the **Object Manager**.

Using Layers

Layers partition a map into one or more overlays. Layers are like transparencies in that you can see all layers at the same time. Layers also let you isolate objects by placing them on separate layers. Layers are created and manipulated using the **Object Manager** and **Map | Layer | New Layer**.

Active Layer

Only one layer can be active at a time and most commands only apply to the active layer. For most commands, objects on other layers remain unaffected by any changes you make on the active layer. However, some commands do apply to all layers at the same time.

The commands that apply to all layers are:

- Copy All Layers copies all objects on all map layers.
- Move/Size All Layers moves all objects on all layers at the same time.
- Clicking the **Property Manager Coordinate System** page *Change...* button converts the projection across all map layers.
- Scale scales the boundary objects on all layers.
- Calibrate converts the coordinates for all objects on all layers.
- Checking the *Append image* check box during **File | Import** appends imported objects relative to all boundary objects on all layers.
- **File | Export** exports all objects on all layers, unless otherwise specified.

One Thematic Map Per Layer

Each layer may contain a single thematic map and have only one data file associated with the layer. By using more than one layer, you can combine different map types to make multivariate thematic maps. For example, you could draw a scaled symbol map over the top of a hatch map to show two different variables. You might have a hatch map showing population and a scaled symbol map showing sales for the same areas.

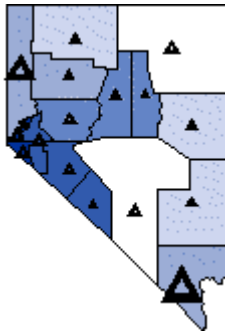
Tips on Using Layers

There are several things you can accomplish when you use layers in **MapViewer**. When using layers, there are a few tips and tricks we can share that might help you.

- If you want to move a map on the page, use the Move/Size All Layers command. This moves all objects on all layers simultaneously.
- When copying a multi-layer map to the clipboard, use the Copy All Layers command. This copies all objects on all layers simultaneously.
- Use "NONE" for the fill type on areas on top layers. Otherwise, filled areas or objects can obscure objects on lower layers.
- Use layer names (specified in the **Object Manager**) to easily keep track of what you have included on each layer.
- Use layers to isolate different types of objects. It is easier to select and modify objects when you do not have too many objects on a single layer.
- Hatch maps work best when on the bottom layer, or a layer near the bottom, since most hatch fills obscure any maps on lower layers.

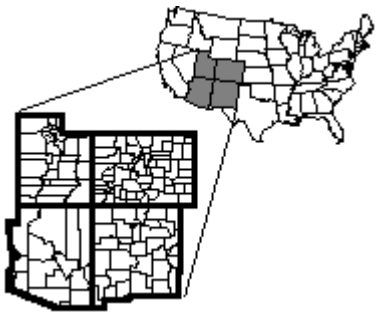
Examples

Here are some possible applications.



Making a map with different thematic maps on different layers. This way, you can display different data variables on a "single" map. You could show a hatch map on one layer, and a scaled symbol map on another layer.

Using layers to emphasize particular boundaries. An example is to have two layers, one with the county outlines and one with the state outlines. In this situation, you can place the state boundaries on a top layer and use no fill for the states. Then give the states a heavy line style relative to the county boundaries.

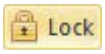


Show "zoomed" maps, with a small-scale map and large-scale map on the same page. This could be used to indicate a location from the small-scale map, and then present the data on the large-scale map.

Delete Map Layer (Break Apart Overlay)

To delete a map layer (overlay) from a composite map, select the map layer in the **Object Manager** and press the DELETE key on your keyboard. Alternatively, select the map in the **Object Manager**, right-click and select *Delete*.

Lock Layer

The **Map | Layer | Lock** command 

locks the active layer and all of the objects on the active layer. When the layer is locked, the size, position, and properties of the layer and all its objects cannot be changed. Objects, including drawn objects, cannot be added to a locked layer. Select a layer in the **Object Manager**, and click the **Map | Layer | Lock** command to lock the layer.

Locked State Indicators

There are two images that indicate a locked layer. First the show/hide icon in the **Object Manager** has a lock in the lower right corner  . Also, the **Map | Layer | Lock** command stays yellow when the active layer is locked 

.

Moving or Sizing a Locked Layer

The Move/Size All Layers command will not move or size a locked layer. The map limits and projection are changed however, so portions of the map may fall outside of the map limits when unlocked layers are moved with the **Move/Size All Layers** command. In most cases, all layers should be unlocked before using the Move/Size All Layers command.

Collapse All Layers

The **Collapse All Layers** command collapses all of the layers in the **Object Manager**. Collapse the layers in the **Object Manager** by right-clicking in the **Object Manager** and clicking **Collapse All Layers** in the context menu. After the layers are collapsed, click the ⊞ button next to a layer to view the objects contained on the layer in the **Object Manager**, or use the Expand All Layers command to view all objects in the **Object Manager**.

Expand All Layers

The **Expand All Layers** command expands all layers in the **Object Manager**, so the complete object list is visible in the **Object Manager**. Expand all layers by right-clicking in the **Object Manager** and clicking **Expand All Layers** in the context menu. After expanding all layers, click the ⊟ button or the Collapse All Layers command to collapse individual layers or all layers respectively.

Chapter 9

Creating Thematic Maps

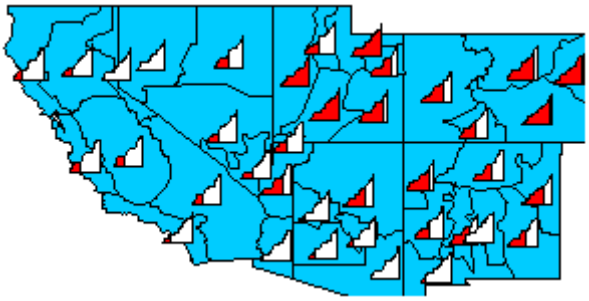
What is a Thematic Map?

A thematic map is a way to represent the geographic distribution of data visually. A thematic map shows what data value is associated with a particular map location. The data can be represented for curves, areas, or point locations. Areas, curves, and points are referred to as boundary objects. A common thematic map example is a population map. Relative population could be represented by gradational colors such as blue to red, where blue represents the lowest population and red represents the highest population. This makes it easy to evaluate the population distribution quickly.

MapViewer thematic maps can associate data with areas (also called polygons), curves (polylines), or points on a map. **MapViewer** uses a primary ID to associate data with an area, curve, or point on the map (see Linking Data to Boundaries for more information). Each area, curve, or point on the map can have an associated primary ID, and this primary ID can also be found in the data file linked to the map.

Once you have determined the type of data you want to represent on the map, you need to decide how to show that data. There are many ways to represent data on a thematic map. Data can be represented by color, patterns, scaled symbols, scaled lines, scaled circles, dot densities, prism height, pie charts, bar charts, filled line graphs or by simply posting the data value at the location. For more information, see Map Types.

In addition, you can represent two or more map types at one time by using layers. Each layer in **MapViewer** can only contain a single map type.However, by creating two or more layers, you can easily display two or more types of data on a map.



Line graph maps are an easy way to display the distribution of your data. By looking at an individual line graph, you can see how an object's data value relates to the entire data set.

Creating and Editing Thematic Maps

Thematic maps show both location and value. This requires that you have boundaries on a map, data associated with the boundaries, and matching primary IDs between the boundaries (areas, curves, and points) and the data file. See Linking Data to Boundaries for more information on primary IDs and linking data.

In general terms, to make a thematic map in **MapViewer**, you must:

1. Import a boundary map.

2. Specify the data file to use with the map.
3. Indicate the location of the primary ID in the data file.
4. Indicate the variable column that contains the data you want to portray on the map.

Creating a Thematic Map

The procedure for creating thematic maps is essentially the same for all thematic map types. So, the procedure for creating a hatch map is the same as the procedure for creating a prism map, etc. As an example, let's make a hatch map of Ohio population.

1. In a new plot window, choose the **Map | Create Map | Hatch** command 

. The Import Boundary File dialog is displayed prompting you to select the boundary file to use for the map. Browse to the SAMPLES folder and double-click the OH2000.GSB file. If the **GS Boundary Import Options** dialog appears, do not check the *Areas to Curves* box, and then click the *OK* button.
2. The **Import Options** dialog appears so you can select IDs for the boundary file. The *Create PID* box should be checked and the ID should be *Primary*. Uncheck the *Create Hyperlink* box since there are no hyperlinks associated with the boundary file. Checking the rest of the boxes is optional. Click the *OK* button.
3. Next, the Open Data File dialog is displayed. Double-click the OH2000.DAT file.
4. The **Hatch Map** dialog is displayed. Verify that the *PID* (primary ID) column is set to the correct column in the data file, in this case, Column A: FIPS CODE. This column in the data file matches the primary ID selected for the boundaries in the **Import Options** dialog.
5. Select Column C: POP 2000 from the *Variable* list.
6. Click the *OK* button and a hatch map of Ohio population is created.

Switching to Another Map Type

Switching to another map type is quite simple. Since the boundary and data files are already loaded, you can select a new map type and the available information is reused. Choose the new map type (such as the Density Map command) to display the dialog for the map type. Click the *OK* button in the map properties dialog and the new map showing population in the new map style is displayed.

Changing the Map Properties

To make changes to the map after it is created, you can open the map properties by:

- First, select the layer with the map by clicking on the map layer in the **Object Manager** or selecting the **Map | Layer | Layer Properties** command.
- Edit map properties in the **Property Manager**

The **Property Manager** pages for that map type is displayed after using one of the methods listed above. For example, you can change the *Variable* column to display different data on your map or you can change the data file used to create the map.

Adding More Boundaries to Your Map

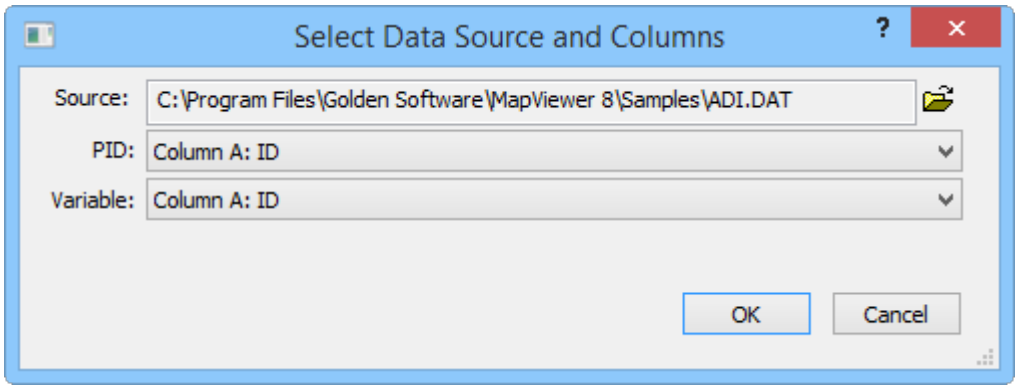
After you have created a thematic map, you can add boundaries to the existing map. The boundaries are included as part of the thematic map if they have the appropriate link to data. When you import new boundaries to the map, you should use the *Append image* option in the **Import**

Boundary Files dialog. This assures that the incoming boundaries and the existing boundaries are drawn in the correct relative positions. If you do not want the boundaries to be appended, you can switch off the *Append image* option and the incoming boundaries are drawn as if the window is empty and are scaled to fit the page without regard for the existing boundaries.

You can also draw additional boundaries and add primary IDs to the boundaries you draw. After a boundary is drawn, you can add a primary ID by typing it into the **Object Manager** or **Property Manager**.

Select Data Source and Columns Dialog

When the selected data sheet and thematic map type generate a data related error, the **Select Data Source and Columns** dialog opens after *OK* is clicked in the error pop-up.



The *Source* selection specifies the data file for the thematic map. Click the button to select a different data file in the Open Data File dialog.

The *PID* column selection must contain the same Primary IDs as the objects on the layer. If none of the PIDs in the data sheet and **Object Manager** match, a thematic map cannot be created.

The *Variable* column selection must contain numeric data, not numbers as text. The Text to Number command converts numbers saved as text back to number format. At least one item in the data column must also be within the data limits for the selected map layer.

Copying and Pasting Maps

The Windows clipboard allows you to copy information from one location to another within Windows. This is useful for copying maps from one window to another, copying objects between layers, or even copying maps to other applications. In fact, if you want to incorporate your maps in other applications, the most efficient way to do this is by copying the map to the clipboard and then pasting these clipboard contents into the other application. When you copy and paste objects within the same plot window, or between plot windows, the objects are preserved in their native format. These copied objects can be modified in the same way as the original.

There are several commands to consider when copying maps or portion of maps to the clipboard.

- Copy copies selected objects to the clipboard.
- Cut removes the selected objects from the window as it copies them to the clipboard.

- Paste places the clipboard contents in the active layer.
- Paste Special sets the input clipboard format types.
- Copy to Another Layer makes a copy of the selected objects in the specified layer. The original objects remain in the current layer.
- Copy All Layers makes a copy of all objects on all layers to the clipboard.
- Move to Another Layer makes a copy of the selected object or objects in specified layer. The original objects are removed from the active layer.

Copying Maps to Another Windows Application

You can also use the clipboard to copy a map from **MapViewer** into a word processor or other application. You can copy an entire drawing, including a map and any associated objects. When you make a copy using the clipboard, usually only the drawing commands are sent to the clipboard, so you lose the **MapViewer** controls over the map. Although you can often modify the individual objects (such as polygons, polylines, text, and so on) in the accepting application.

There are two different ways to copy a map to the clipboard.

- When you use the **Home | Clipboard | Copy** command, only the selected objects are copied to the clipboard and only objects from the current layer can be copied. You can select individual objects to the clipboard, or you can copy the entire drawing. You can use the mouse to click individual objects, use the **Arrange | Selection | Block Select** command to select limited portions of the drawing or use the **Arrange | Selection | Select All** command to select all the objects on the page. When the desired objects are selected, choose **Home | Clipboard | Copy**, and a copy of all selected objects is sent to the clipboard. You can then paste the clipboard image into another Windows application
- If your map consists of more than one layer, you can use the **Home | Clipboard | Copy All Layers** command to copy all objects from all layers to the clipboard.

Pasting Information from Other Applications

You can copy information from other applications into the plot window or worksheet window. The plot window can accept metafiles, bitmaps, or text, and the worksheet window can accept text information.

When information resides in the clipboard, choose the **Home | Clipboard | Paste** or **Home | Clipboard | Paste Special** commands. In the plot window, a cross hair cursor appears allowing you to indicate the position on the page that you want to paste the incoming information. Move the cross hair cursor to the desired position and click the left mouse button to paste the information into the window.

Map Tab Commands

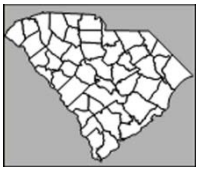
The **Map** tab contains commands for creating base and thematic maps, downloading maps, adding legends, graticules, collars, scale bars, and insets, and adjusting layers.

Base Map	Polygon, polyline, and point boundaries without data links
Thematic Maps	
Hatch Map	Polygons are filled with a pattern corresponding to a range of data
Contour Map	Constant value lines are drawn on a grid of interpolated values.
Symbol Map	Scaled symbols represent a data variable at each polygon, polyline, or point
Density Map	Number of dots in each polygon are proportional to the area's data value
Territory Map	Group boundaries into territories for statistical analysis of data values
Vector Map	Vectors show the direction and magnitude of the steepest slopes
Line Graph Map	Shows a line graph of the data at each polygon, polyline, or point.
Multi-Graph Map	Shows a unique graph for each object data set
Gradient Map	Draw color gradients based on points, areas, or curves
Bar Map	Bar charts represent multiple data variables at each area, curve, or point
Flow Map	Draw curve widths based on data values
Prism Map	Areas are represented as 3D prisms whose height is proportional to the data
Pie Map	Pie charts represent multiple data variables at each area, curve, or point
Cartogram Map	Create a Dorling cartogram
Pin Map	Show point locations on a map
Download Map	Download base maps and images from online WMS servers
Legend	Creates a legend for thematic maps
Graticule	Draws a graticule (grid) in the plot window
Collar	Create a map collar
Scale Bar	Places a scale bar on the map
Inset	Adds an inset to the map
Limit to Selected Shape	Limits the map layers to the selected shape
Move/Size All Layers	Move or resize the entire map and the underlying coordinate system
Plot Properties	Click to open the plot options in the **Property Manger**
Calibrate	Calibrates the screen and boundary coordinate systems
New Layer	Adds a layer to the map

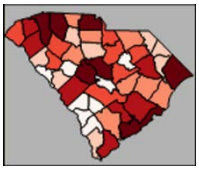
Lock	Locks the active layer and all layer objects' size, position, and properties
Layer Properties	Click to open the active layer options in the **Property Manger**

Map Types

The following map types are available in **MapViewer**.

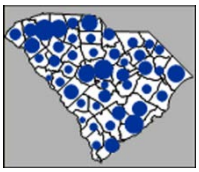


Base maps contain boundaries without any data representation. Boundaries can be polygons, polylines, and points. Base maps can be used with other maps to show features such as roads, streams, city locations, boundaries that have no data associated with them, and so on. You can overlay base maps on other thematic maps by creating the base map on a separate **MapViewer** layer.



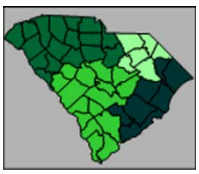
Hatch maps use colors to represent classes of data for each polygon, polyline, or point on the map. Hatch maps color code objects based on the data values associated with them. Data values are placed in classes that are defined by data ranges, and one color is associated with each class.

Contour maps interpolate from discrete data values to create a regularly-spaced grid. The grid is displayed as lines of constant data values. The areas between the lines may be filled with colors and patterns of your choice.

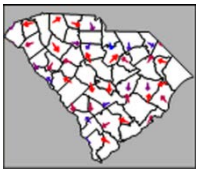


Symbol maps place a scaled symbol on an area, curve, or point location on the map. The symbols are scaled in proportion to the data values represented for each boundary object. The larger the symbol, the greater the associated data value.

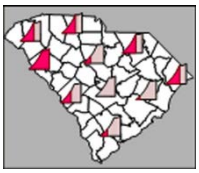
Density maps, also called dot density maps, use symbols to represent data values for areas on a map. On a density map, each symbol represents some data value, so the number of symbols drawn in an area is in relation to the data value associated with that area. Areas with more symbols have higher associated data values.



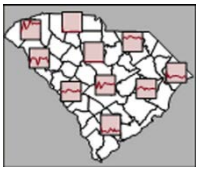
Territory maps allow areas, curves, or points to be grouped into territories by defining a grid or by hand selecting the areas for territories. All objects within a territory are displayed with the same color. Statistical information about the objects' associated data is available in the Info page of the **Property Manager**



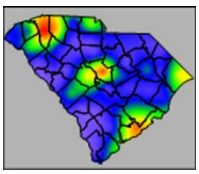
Vector maps interpolate from discrete data values to create a regularly-spaced grid. Vectors are drawn to show the direction and magnitude of the steepest slopes across the grid.



Line graph maps show line graphs of the data at each polygon, polyline, or point location. By looking at a single line graph, you can see how the individual data value relates to the whole data set. The *Graph fill* color represents the data value.

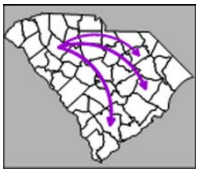


Multi Graph maps display unique line graphs or scatter plots for objects in a map. Each object has a unique XY data set. Multi-Graph data can be related, so you can compare values in different locations.

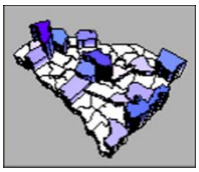


Gradient maps display a range of colors based on information from points, curves, and areas. The centroid of an area, all vertices of a curve, and center of a point are used as data point locations and the data value of the area, curve, or point is interpolated onto a grid. The gridded data values are assigned colors based on the selected color spectrum. The resulting map is a smooth color spectrum between the original data.

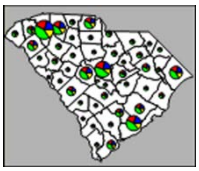
Bar maps can be drawn for areas, curves, or points, and are a way to represent several data values. Bar charts can show one or more variables where each variable is represented by a proportionally sized bar.



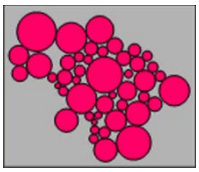
Flow maps scale the width of existing curves on the map or connect the centroids of boundary objects based on starting and ending locations. The curves are scaled in proportion to the data values represented for each curve. The wider the curve, the greater the data value associated with the curve.



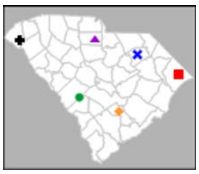
Prism maps draw each area, curve, or point as a raised prism, where the height of the prism is relative to the associated data value. Taller prisms indicate higher data values. Prism maps can be colored using the base map color, with interpolated color between minimum and maximum colors, or based on variable classification.



Pie maps can be drawn for areas, curves, or points, and are a way to represent several data values by drawing a proportionally sized pie chart for each location. Pie charts show two or more variables where each variable is represented by a proportionally sized slice of the pie. Within a single pie, the size of the slices gives you the relative proportion of the values for that particular area, curve, or point. The entire pie chart is sized in relation to the total of all variables for the boundary object, as compared to the totals of the variables for other boundary objects.



Cartogram maps display variables by varying area size. **MapViewer's** cartograms are Dorling cartograms. The areas are replaced by circles and the circles are scaled according to a variable. The maps can be controlled so that the circles do not overlap and are positioned as close to the base map's centroids as possible.



Pin maps draw points at particular locations on a map. Pin maps can be used to show locations, post labels, or display data values. Pin map point locations are based on XY locations, such as longitude/latitude or US 5-digit ZIP code or US City and State centroids. Pin maps can also use colors and symbols to represent data ranges or classes of data. Pin maps color code or symbol code locations based on the data value associated with pins. In addition, pin maps can be converted to other thematic maps such as symbol maps, pie maps, or bar maps.

Chapter 10

Base Maps

Base Map

Base maps display polygon, polyline, or point boundaries without data representations. Base maps are useful as reference maps to simply show the location of objects. Boundaries can be areas (also called polygons), curves (which are lines or polylines), and points. Base maps can be used with other maps to show features such as roads, streams, city locations, boundaries that have no data associated with them, and so on. You can overlay base maps on other thematic maps by creating the base map on a separate **MapViewer** layer. After a base map is displayed, you can convert it to a thematic map by choosing the desired map command and specifying the data file to use for the map.

Creating a Base Map

To create a base map from a boundary file,

1. Choose the **Map | Create Map | Base** command 

and the Import Files dialog is displayed.
2. Double-click the boundary file name in the **Import Files** dialog to open the base map in the plot window.

Alternatively, you can select the **File | Import** command since the result is a base map from this command as well.

Editing a Base Map

Properties for base map polygons, polylines, or points can be set by selecting the object and changing the properties in the **Property Manager**. Base map properties are edited in the **Info** and **Data Labels** pages of the **Property Manager**.

Creating Custom Boundaries

To create custom boundaries, refer to the Creating Custom Boundaries discussion.

Thematic Maps without Data

If a thematic map is opened with the **File | Open** command and the associated data file does not exist, the map is automatically converted to a base map.

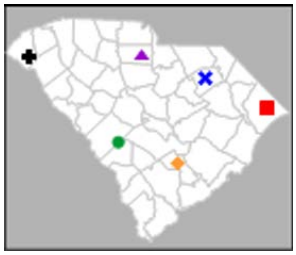
Base Maps from Golden Software

We have included some base maps with **MapViewer**. There are three- and five-digit ZIP code maps, county boundaries, country boundaries, as well as other maps. The most commonly used files are located in the SAMPLES folder and the rest are located on CD.

Chapter 11

Pin Maps

Pin Map



Pin maps show point locations on a map similar to placing push pins on a paper map. Pin maps are based on data files containing XY locations or primary ID (ZIP code, other) for each pin. Pin maps show point locations and can have associated labels. You can also classify pins based on variable information.

Pin locations can be based on coordinates, on five-digit ZIP code centroids, or custom location files. When based on coordinates, the coordinate locations must be contained in the data file. After you create a pin map, you can use the map as a symbol, pie, line graph, flow, or bar map, if the pins have been assigned an appropriate primary ID.

Creating and Editing a Pin Map

Click the **Map | Create Map | Pin** command 

to create a pin map. Edit pin map properties in the **Property Manager**.

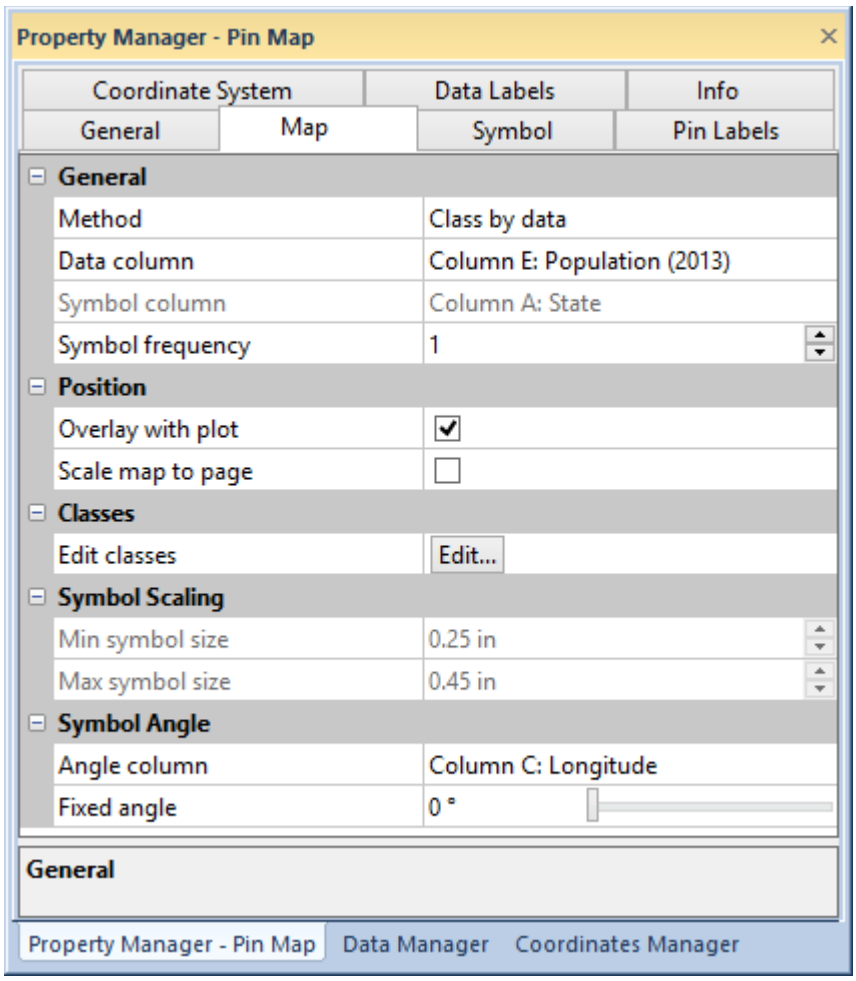
See *Creating and Editing Thematic Maps* for more information on creating a map, changing a map to another map type, and changing map properties.

Pin Map Properties

The **Property Manager** contains **General**, **Symbol**, **Coordinate System**, **Data Labels**, **Pin Labels**, **Info**, and **Map** pages.

Map Page

The **Map** page of the **Property Manager** has pin method, position, class, scale, and angle properties.



*Edit pin map properties in the **Map** page of the **Property Manager**.*

General

Pin methods and associated options are edited in the *General* section of the **Map** page. Select *Uniform symbol*, *Proportional symbol size, Class by data*, or *Class by text* from the *Method* list.

- The *Uniform symbol* method uses the same symbol for each pin. Edit symbol properties on the *Symbol* page of the **Property Manager**.
- The *Proportional symbol size* method scales the pin based on the selected *Data column* and *Symbol Scaling* properties. Select a data column for symbol sizing in the *Data column* list.
- Select *Class by data* or *Class by text* to determine symbol properties based on classes defined in the Classes dialog. Select the data for classification in the *Data column* list.

The *Symbol column* property can be changed when the *Method* is *Proportional symbol size*. A data column in the linked worksheet determines the symbol for each pin. Symbol color and size are edited on the Symbol page. Specify the data column containing symbol information by selecting it from the *Symbol column* list.

The *Symbol frequency* property determines which pins will be drawn on the map. A value of "1" shows every pin. A value of "3" shows every third pin. Set the *Symbol frequency* by typing a number into the input box or clicking the buttons. The *Symbol frequency* must be between 1 and 100.

Position

The *Position* section of the **Map** page has options map scale and position. The pin map data can have a different coordinate system and projection than the plot. The pin map and plot coordinate systems are set on the Coordinate System page of the **Property Manager**. Select the map layer to set the pin map coordinate system, and click the **Map | Plot | Plot Properties** command to set the plot coordinate system

Click the *Overlay with plot* check box to transform the pin map Coordinate System and place the pins in the correct position relative to the plot. Activating the *Overlay with plot* property does not change the data coordinate system, but only moves the pins.

Click the *Scale map to page* check box to scale the pin map to the page.

Classes

When *Class by data* or *Class by text* is selected in the *Method* list, the *Classes* section is available for editing. Click the Edit... button to open the Classes dialog and change class properties.

Symbol Scaling

When the *Proportional symbol size* method is used, the *Min symbol size* is applied to the pin with the smallest data value. The *Max symbol size* is applied to the pin with the largest data value. The remaining pins are sized proportionally between these two sizes. Edit the *Min symbol size* or *Max symbol size* by typing a number into the field, or clicking the .

Symbol Angle

Symbol angles can by applied to pins separately by linking to a data column containing values in degrees. Select the column for symbol angles in the *Angle column* list. Select *None* to use one angle for all symbols on the map.

The *Fixed angle* option allows you to set a symbol angle from 0 to 359 degrees. Positive angles rotate the symbol in the counterclockwise direction. The angle is applied to all the pin map symbols. The *Fixed angle* property is disabled when a data column is selected in the *Angle column* list.

Pin Placement Based on Location Files

Location files contain Location IDs and XY coordinates for pin positioning. Location files contain a column of data that matches a column of data in the file used to create the pin map. When you choose *US 5-Digit ZIP Code* on the pin map General page, the EXTENDEDZIP5.CSV location file is automatically loaded for you. If you select *Other Location File* as the pin map *Locating method*, you must specify the *Location ID* column from your original data file. The location ID is the link between your data file and the location file. The location ID can be the same as the primary ID.

Example

The first file shown is a data file containing a number of customers, but no location data. You might want to place a pin on your map at the location of each customer. In this case, you have the ZIP code for each customer but need the XY coordinates for the ZIP code locations. By specifying *US 5-Digit ZIP Code* for the *Locating method* in the Pin Map dialog, you can link this data file to the EXTENDEDZIP5.CSV location file and thereby locate the pins on the map. If you use the ZIP code

column in this location file for the **Pin Map** *Location ID* variable, you can link your customers to the Longitude and Latitude columns in the EXTENDEDZIP5.CSV file.

Here is an example of the data file for the pin map. Notice that there are no XY coordinates in this file.

Name	Customer No.	Time	ZIP Code
Joe Foonman	Customer 1	5 years	"47881"
John Doe	Customer 2	7 years	"47882"
Jane Smith	Customer 3	4 years	"47901"
Jack Donnely	Customer 4	3 years	"47885"

Below is a short portion of the EXTENDEDZIP5.CSV location file included with **MapViewer**. The ZIP CODE column contains the link (the *Location ID*) between this file and the customer file above. **MapViewer** uses the longitude and latitude values from the EXTENDEDZIP5.CSV location file to position the pins on the map. The ZIP code column is located in column A in EXTENDEDZIP5.CSV.

ZIP Code	Longitude (X)	Latitude (Y)
47881	-87.1253	39.5163
47882	-87.4349	39.104
47885	-87.4761	39.5109
47901	-86.8904	40.4179

You can create your own location files based on any coordinates. The only requirement is that you have matching *Location IDs* in both the original data file and the location file.

Using Your Own Location File

You can create your own pin map location file in **MapViewer**. If the location file contains XY coordinates, such as latitude and longitude coordinates, and data then you can use *Coordinate* as the *Locating method*. Sometimes, the XY coordinates are not in the same file as the data to be mapped. This is useful when you use the same XY location each time but may have different data files to map over time. If this is the case, use *Other Location File* as your *Locating* method.

To use your own locating file:

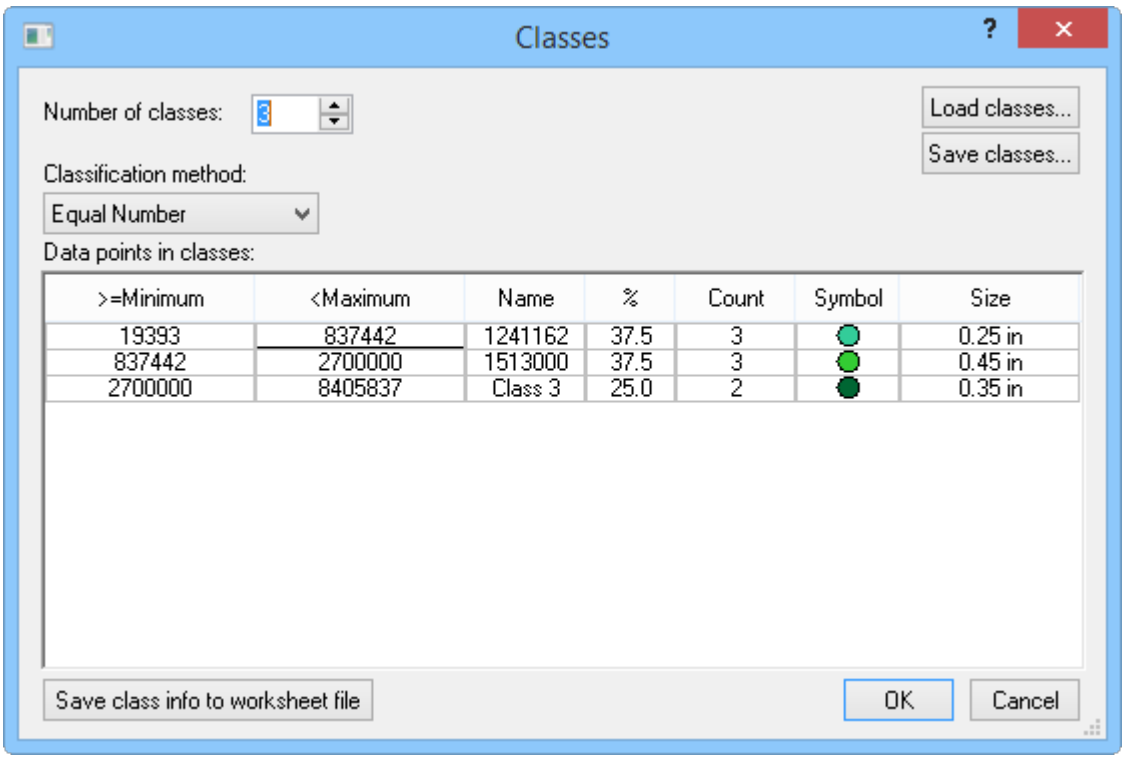
1. Select **Map | Pin Map**.
2. Select your data file in the **Open Data File** dialog.
3. In the **Pin Map** dialog, choose *Other Location File* for the *Locating method*.
4. Set options on the **General**, **Labels**, and **Classes** pages if you like.
5. Click the *OK* button in the **Pin Map** dialog.
6. After you click the *OK* button, select a location file in the **Open Location File** dialog. The location file must contain *Location ID*, *X coordinates*, and *Y coordinates* columns.
7. After the location file is chosen, select the columns containing *Location ID*, *X coordinates*, and *Y coordinates*. A pin map is created with your location IDs.

Pin Classes

Pin symbol properties can be determined by classifying data or text values in the worksheet. Select *Class by data* or *Class by text* in the *Method* list and click the *Edit Classes* Edit... button to open the **Classes** dialog.

Classes Dialog

Data and text are classified in the **Classes** dialog. The symbol properties for the pin map are edited for each class independently.



*Edit pin map classes and class symbol properties in the **Classes** dialog.*

Number of Classes

The *Number of classes* value is used to specify the number of classes or groupings on the map. This number is the number of classes displayed in the *Data points in classes* table. You can have up to 100 classes.

Creating Classes

The *Classification method* specifies the method used to calculate the limits of the classes.

- *Equal Number* assigns the class ranges so that an approximately equal numbers of points are included in each class. In this case, the interval of each class is usually different.
- *Equal Intervals* calculates the class limits such that the interval between the minimum and maximum of each class is equal. In this case, different numbers of points might be assigned to each class. The *Increment* box is displayed when *Equal Intervals* is selected. This box shows the range covered by each bin.
- *Standard deviation* generates data classes based on the standard deviation of the data. When the *Standard deviation* method is selected, the *Increment* field appears. The

Increment field allows you to define the standard deviation increment to establish the class ranges and number of classes. The *Increment* and *Number of classes* values are dependent upon each other, so changing one value automatically changes the other.

- The Jenks' Natural breaks method creates classes based on the optimal natural breaks in your data.
- *User Defined* allows you to create your own class definitions. Overlapping or discontinuous classes are not allowed. Double-click on the minimum and maximum values in the *Data points in classes* list to define the classes after you define the *Number of classes*.

Saving and Loading Classes

Once the classes are defined, they can be saved for reuse in a class file [.CLS]. Click the *Save Classes* button to save the classes. To use an existing class file, click the *Load Classes* button. You can also save the class information to a worksheet file by clicking the *Save Class Info to Worksheet File* button.

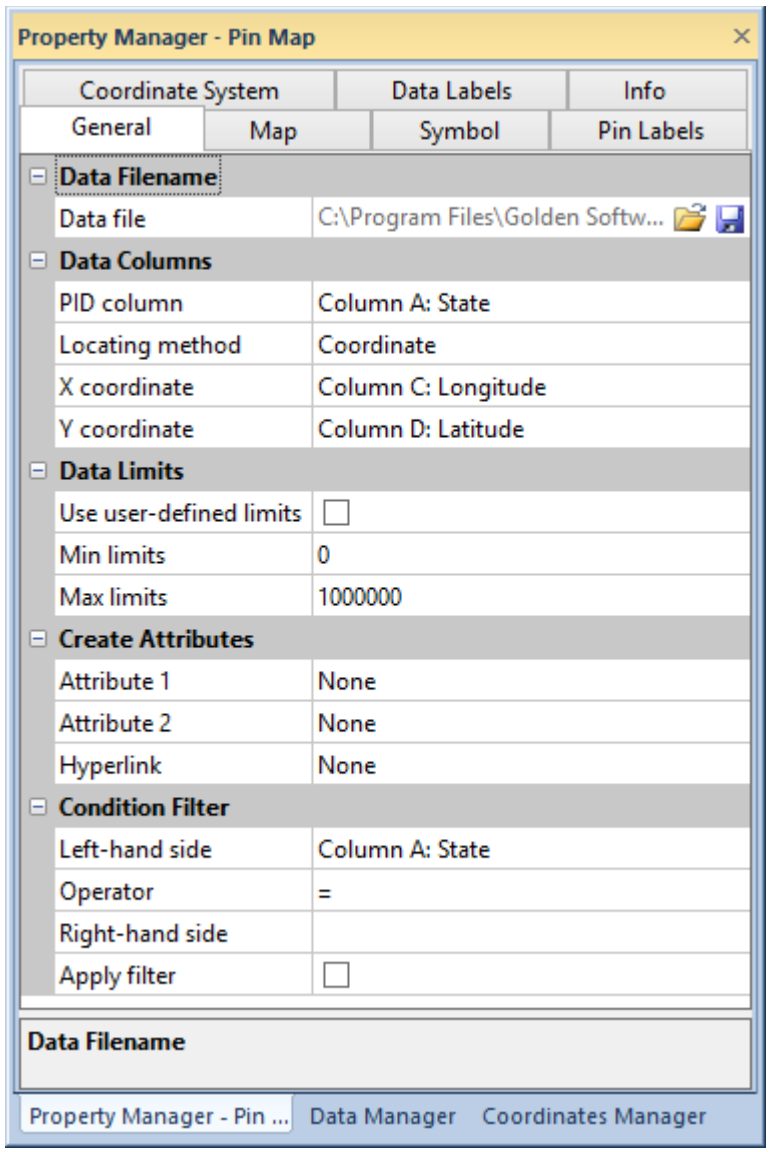
Class Information

The *Data points in classes* group displays summary statistics and allows you to specify the properties for each class.

- The >= *Minimum* list specifies the lower limit for each class of data. You can double-click the number for any of the classes and change the value in the **Class Limit** dialog.
- The <*Maximum* list specifies the upper limit for each class of data. You can double-click the number for any of the classes and change the value in the **Class Limit** dialog.
- The *Name* column indicates the optional class title used in the legend.
- The *%* column indicates the percentage of linked data points in the particular class. This value cannot be edited and is for informational purposes only.
- The C*ount* column indicates the number of points included in each class. This value cannot be edited and is for informational purposes only.
- The *Symbol* column displays the symbol used for each class. To change a symbol or symbol property used for a particular class, double-click the symbol, and then make changes in the Symbol Properties dialog.
- The *Size* column specifies the size of the symbol. To change the size of a symbol for a particular class, double-click the *Size* value in the list, and change the value in the Symbol Properties dialog.

General

The **General** page is located in the **Property Manager** when a Pin Map is selected for the active layer. Information about the map's data file can be viewed and changed in the **General** page.



Change or save the map data file, specify the PID and Variable columns, and set data limits on the ***General*** *page of the* ***Property Manager****.*

Data Filename

The *Data File* property shows the current loaded data file for the map. Load a new data file into the map with the open button. Save changes to the data file with the save button.

Data Columns

The properties in the *Data Columns* section specify which data columns contain the map object PIDs and X and Y variables.

PID Column

PID column indicates the location of the primary ID in the data. The data primary ID must match the primary IDs used on the boundaries.

Pin Locating Methods

Pin map point locations are based on XY coordinates that can be contained in a data file, or the pins can be based on special location files. You can locate points on a map in three ways. The *Locating method* controls the placement of pins on the map.

- *Coordinate* places pins based on XY locations contained in the data file. For example, you might have a column of longitude and a column of latitude data in the file. With this option, you must specify the data file columns containing the *X coordinate* and *Y coordinate* in the *Data columns* section. *X coordinate* specifies the column containing the X coordinate used to locate the pin on the map when you use the *Coordinate Locating Method*. *Y coordinate* specifies the column containing the Y coordinate used to locate the pin on the map when you use the *Coordinate Locating Method*.
- *US 5-Digit ZIP Code* places the pins on the map based on five-digit ZIP codes. Placement is based on the five-digit ZIP code centroids read from the EXTENDEDZIP5.CSV data file included with **MapViewer**. The EXTENDEDZIP5.CSV file contains the five-digit ZIP code and the XY coordinates for the centroids. The five-digit ZIP code is the link between your file and the EXTENDEDZIP5.CSV file. **MapViewer** uses the centroid coordinates to place the pins on the map. If you have more than one entry for a ZIP code, only one of the entries is plotted.
- *US City and State* places the pins based on the city and state names, specified in separate columns in the worksheet. City names can have common abbreviations or be complete. For example, the *US City and State* method would correctly place either "St. Louis, MO" or "Saint Louis, MO". The state column can have the two-letter abbreviation or the complete state name. Placement is based on the coordinate locations in the CITYSTATE.CSV file included with **MapViewer**. CITYSTATE.CSV contains town names and their corresponding state, longitude, and latitude. If you have multiple entries for a city and state, only one entry is plotted. Town names can be repeated for similarly named towns in separate states. For example Abbeville, AL and Abbeville, Georgia would each be plotted in their respective locations, because they are separate towns.
- *Other Location File* places the pins on the map based on a location file you supply. This file must have codes (like primary IDs) that match with the codes in your data file, and have the XY coordinates for each coded point so **MapViewer** can properly locate the pins on the map. The code must be identical in the data file and location file for **MapViewer** to properly link the two files and locate the pins correctly on the map. See Pin Placement Based on Location Files for more information.
- If the map is currently associated with a projection other than *Unknown*, you can specify the appropriate XY coordinate units in the *Coordinate units* list. If you are using latitude and longitude coordinates, they must be in decimal degrees (i.e. -104.882, 39.555), not in degrees, minutes, seconds (-104° 54', 39° 33'). If the projection is Unknown, you can select *Lat/Lon* or *Others*.
- *Location ID* specifies the column containing the ZIP code or location ID for the pin when using the *US 5-Digit ZIP Code* or *Other Location File* methods. The ZIP code or location ID is used to link each pin to the file containing the ZIP or location XY locations.
- *City* and *State* specify the columns containing the locations to add to the pin map when using the *US City and State* method.

Data Limits

The *Data Limits* section contains properties for specifying linked, global, or user defined data limits, and if absolute values are used for negative numbers.

Selecting Data Limits

Clicking the *Use user-defined limits* check box allows editing in the *Min limits* and *Max limits* cells. Type numeric values into *Min limits* and *Max limits* to set your own data limits.

If the *Use user-defined limits* box is not selected, the data limits are the minimum and maximum linked values in the *Variable column*.

Create Attributes

The *Create Attributes* group specifies the location of information within the data file.

- Select a column from the *Attribute 1* list to set the pin Attribute 1 IDs.
- Select a column from the *Attribute 2* list to set the pin Attribute 2 IDs.
- Select a column from the *Hyperlink* list to set the pin hyperlinks.

Condition Filter

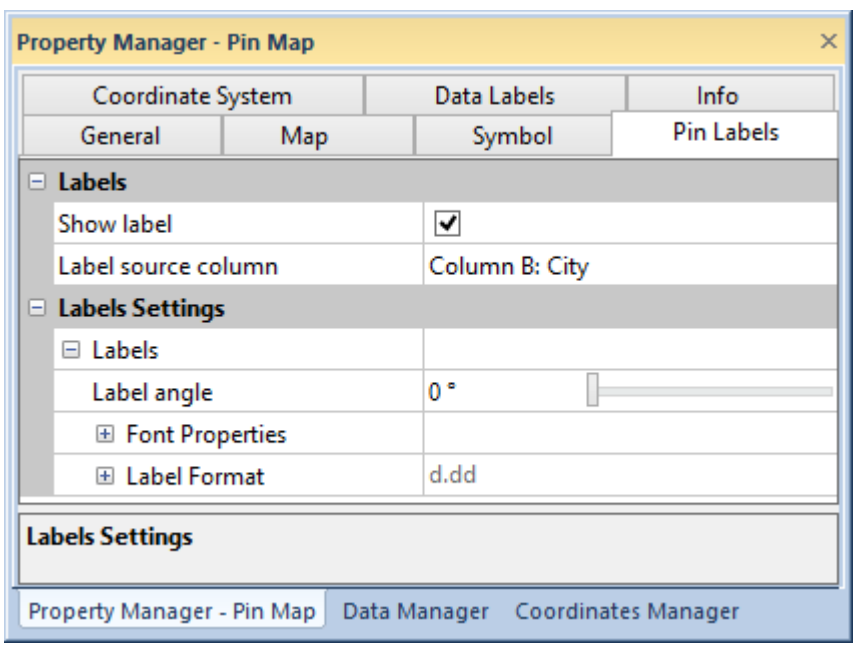
The *Condition Filter* group shows or hides pins based on a user-defined condition.

1. Select a data file column from the *Left-hand side* list to start creating a condition filter.
2. Next select an *Operator* to compare the left and right sides. See Mathematical Functions for a list of operator descriptions.
3. Type the condition value into the *Right-hand side* box. Enclose non-numeric text values with double quotes (").

Click the *Apply filter* check box to apply your filter to the pin map.

Pin Labels

The pin map **Pin Labels** page adds labels to pin maps.



*Add pin labels and edit label properties in the **Pin Labels** page of the **Property Manager**.*

Labels

Click the *Show label* check box to show data labels on the pins. Once the labels are displayed, a label can be moved by clicking on the label and dragging it to a new position.

Select the text for the pin labels in the *Label source column* list.

Labels Settings

Label font and format properties are edited in the *Labels Settings* section of the **Pin Labels** page. Labels can also be rotated in the *Labels Settings* section.

Enter the number of degrees for label rotation in the *Label angle* box. The label rotation can also be adjusted by clicking and dragging the  bar.

Edit font and format properties in the *Font Properties* and *Label Format* groups respectively. See the font properties and format properties help pages for more information on editing label font and format properties.

Label Position

Position relative to symbol controls the placement of the pin map labels.

- You can position the labels relative to the pin locations with *Center*, *Left*, *Right*, *Above*, *Below*, or *User Defined*.
- *X offset* and *Y offset* control the placement of the labels when the *User Defined* position option is used. The values are in page coordinates.

Text Properties

The *Font* button displays the Text Properties dialog. Use this dialog to specify the text properties for the pin labels. The same properties are applied to all labels.

Numeric Format

The Format button allows you to set numeric label format and to add suffixes or prefixes to the labels.

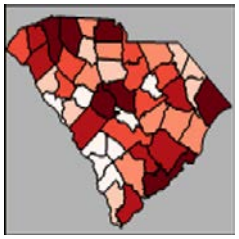
Source Coordinate System

Maps can be created from data or boundary files in any coordinate system. The *Source Coordinate System* is the coordinate system for the original data or boundary file used to create a map layer. A coordinate system normally has a defined projection and datum. If some map layers are using a different source coordinate system than what you want the map to display, the map layer is converted to the map's *Target Coordinate System*.

Chapter 12

Hatch Maps

Hatch Map



Hatch maps use colors or patterns to show the distribution of different classes of data. Hatch maps color code boundary objects based on the associated data value. Data values are placed in classes defined by data ranges, and one color or pattern is associated with each class. You can use color and fill patterns to define classes for areas. For curves and symbols, colors define the classes.

Creating and Editing a Hatch Map

In a new plot window, choose the **Map | Create Map | Hatch** command 

. The Import Boundary File dialog is displayed prompting you to select the boundary file to use for the map.

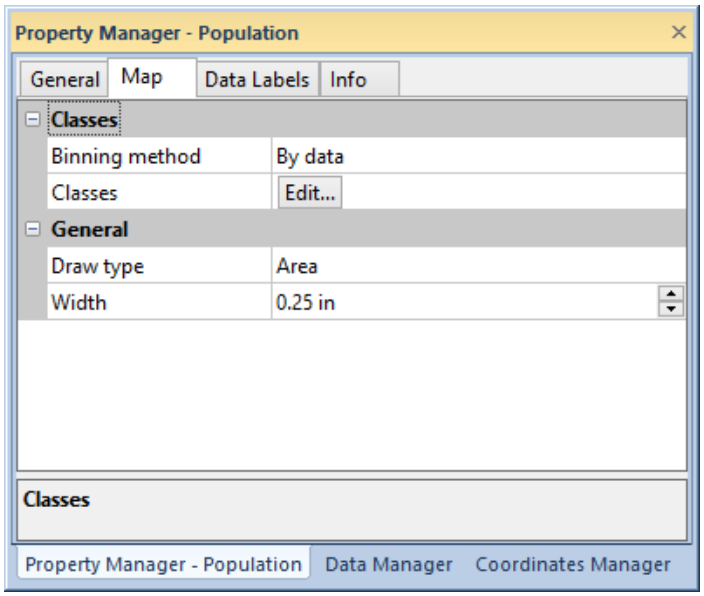
See Creating and Editing Thematic Maps for more information on creating a hatch map, changing a hatch map to another map type, and changing map properties.

Hatch Map Properties

The hatch categories and properties can be set in the **Property Manager**. The **Property Manager** for a hatch map contains General, **Map**, Data Labels, and Info pages. Click the preceding hyperlinks for information on properties in each of the property manager pages.

Map Page

The **Map** page in the **Property Manager** has properties unique to hatch maps.



*Edit hatch map properties in the **Map** page of the **Property Manager**.*

Classes

Hatch maps group data values into classes. All boundaries in a single group use the same properties so it is easy to tell which boundaries are in the same data class on the map. Each group is assigned unique coloring or shading so you can tell the relative differences in data values by glancing at the map. You can have from one to 100 data classes on your map. The *Classes* group allows you to specify the classes.

Select *By data* or *By text* in the *Binning method* list to use numeric values or text for classification.

Click the Edit... button near *Classes* to change the class bin properties in the **Data Classes** or **Text Classes** dialog.

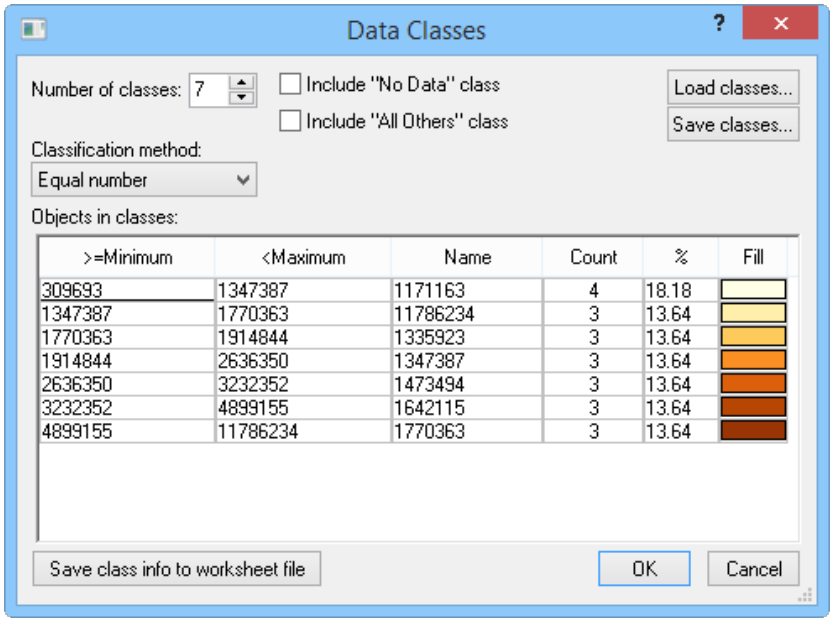
Hatch Draw Type

The *General* group contains options for the display of the map hatching.

- *Area* shows each area as the specified fill color and pattern, or it displays each point and polyline as the specified color.
- *Circle* draws a circle in each polygon, on the polyline mid-line, or on the point and shades it as the specified fill color and pattern.
- *Square* draws a square in each area, on the curve mid-line, or on the point and shades it as the specified fill color and pattern.
- If you select *Square*, set the width of the square in the *Width* box. If you select *Circle*, set the circle diameter in the *Diameter* box.

Data / Text Classes Dialog

Clicking the Edit... button in the *Classes* section of the **Property Manager** *Map* page opens either the **Data Classes** or the **Text Classes** dialog.



Change class number or classification method, load, and save classes in the ***Data Classes*** *dialog.*

Number of Classes

Number of classes specifies the number of classes used in the map. This is equal to the number of classes displayed in the *Objects in classes* box. Type a number into the *Number of classes* box or change the value with the . Select up to 100 classes.

Classification Method

Select a *Classification method* from the list.

- *Equal number* calculates the class minimum and maximums such that an equal number (or as close to it as possible) of data values fall within each class.
- *Equal intervals* calculates the class limits such that the interval between the minimum and maximum of each class is equal. The *Increment* box is displayed when *Equal intervals* is selected, and this shows the range covered by each class.
- *Standard deviation* generates data classes based on the standard deviation of the data. When the *Standard deviation* method is selected, the *Increment* field appears. The *Increment* field allows you to define the standard deviation increment to establish the class ranges and number of classes. The *Increment* and *Number of classes* values are dependent upon each other, so changing one value automatically changes the other.
- The Jenks' Natural breaks method creates classes based on the optimal natural breaks in your data.
- *User defined* allows you to create your own class definitions. Overlapping or discontinuous classes are not allowed. Double-click on the minimum and maximum values in the *Objects in classes* list to define the classes after you define the *Number of classes* (below).

Saving and Loading Classes

Once the classes are defined, they can be saved for reuse in a class file [.CLS]. Click the *Save Classes* button to save the classes. To use an existing class file, click the *Load Classes* button. You can also save the class information to a worksheet file by clicking the *Save Class Info to Worksheet File* button.

No Data and Undefined Data

The *Include "No Data" class* option creates a new class. All boundaries without a data value are placed in this class. This is one way to tell if your primary IDs on your map and data are mismatched. The *Include "All Others" class* option creates a new class that contains all values that do not fall in the specified classes. <*Maximum* and >=*Minimum* fields cannot be edited for *No Data* and *All Others* classes.

Class Information

The *Objects in classes* box shows the minimum and maximum class values, percentage (%) of linked objects in the class, number of linked objects for each class (*Count*), and the fill pattern and color for each class (*Fill*).

- >=*Minimum* and <*Maximum* indicate the upper and lower limits for the class. If a data value is greater than or equal to the minimum value and less than the maximum value, it is plotted in the class. You can change these values by double-clicking on a minimum or maximum value and then typing a new value into the **Class Limit** dialog.
- You can click the *Fill* button to display the **Color Spectrum** dialog. This lets you specify the color spectrum and pattern to use for the classes. **MapViewer** automatically scales the change between the color spectrum so you have a spectrum of colors over the hatch map classes.

- You can click the fill color sample in the list to specify the fill properties for the selected class. This displays the Fill Properties dialog, letting you specify the properties. Hold down the control key and click on the color sample to apply the color change in the class color spectrum.

Save Class Info to Worksheet File

Click the *Save class info to worksheet file* button to save the information in the *Objects in classes* box to a [.DAT] file. Clicking the *Save class info to worksheet file* button opens the Data Export Options Dialog.

Jenks' Natural Breaks

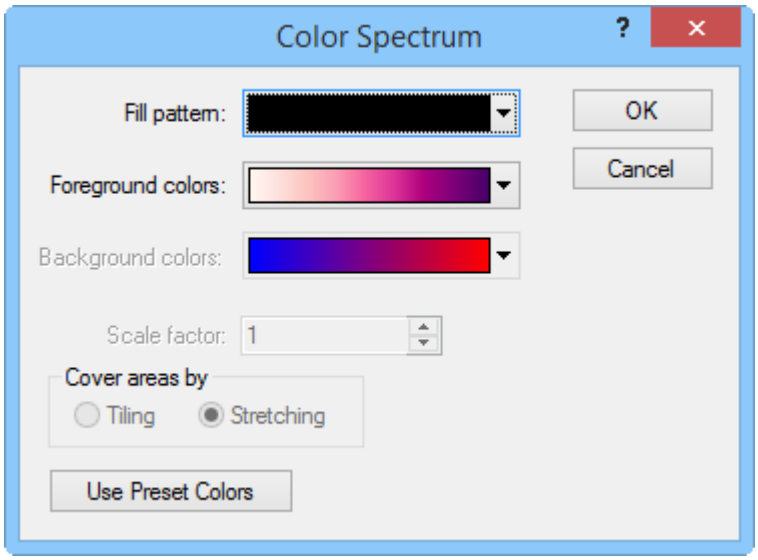
Jenks' natural breaks data classification method identifies natural breaks within the data set. Typically these natural breaks are ideal beginnings and endings for data classes, but finding the natural breaks and defining each natural break class can be difficult and time consuming. The Jenks' natural breaks data classification method makes data classification based on natural breaks quick and easy.

MapViewer uses the Fisher-Jenks algorithm to calculate the ideal natural breaks in the data. The algorithm is based on Fisher's statement that any optimal classification of data consists of the sum of optimal classes of subsets of the data.

To learn more about Jenks' natural breaks data classification method, please refer to Slocum, Terry A. *Thematic Cartography and Visualization*. New Jersey: Prentice-Hall, 1999.

Color Spectrum

Hatch maps and territory maps use the **Color Spectrum** dialog to assign map colors based on data. The color spectrum has specific colors assigned to nodes along the spectrum. After you create a color spectrum, you can save the spectrum for later use with other maps. A number of predefined color spectrums are included with **MapViewer**.



*Select the color spectrum for hatch and territory maps in the **Color Spectrum** dialog.*

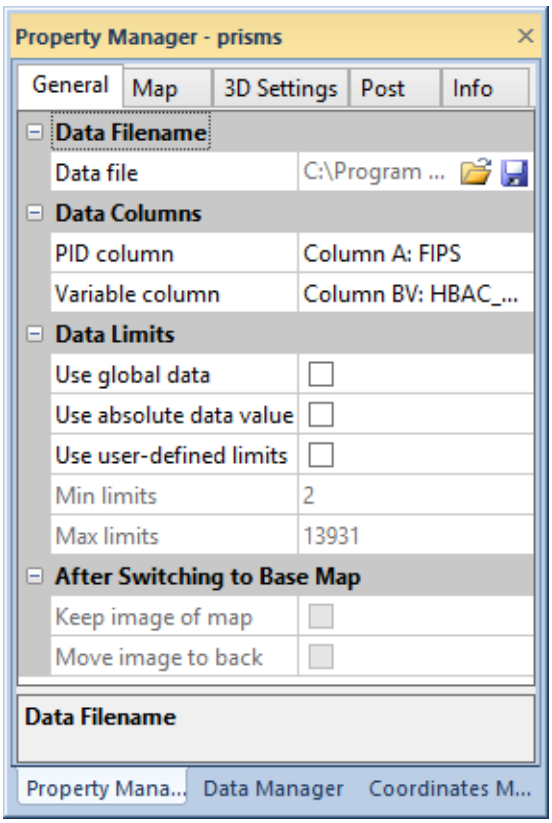
The Color Spectrum Dialog

Click the *Fill* button in the **Data Classes** or **Text Classes** dialog to open the **Color Spectrum** dialog.

- Click the *Foreground Colors* button to select the color spectrum for solid patterns and for the lines in non-solid patterns.
- If you have selected a pattern other than *Solid*, a *Background Colors* button is available. Click this button to assign background fill colors.
- Click the *Fill Pattern* button to apply a fill pattern to the map.
- When the *Fill Pattern* is a selection other than *Solid*, adjust the *Scale factor* for the pattern by typing a value in the *Scale factor* field or clicking the buttons.
- Also when a non-solid pattern is selected, the pattern can be tiled or stretched by selecting *Tiling* or *Stretching* in the *Cover areas by* group respectively.
- With territory and hatch maps, you can click the *Use Preset Colors* button to assign a fixed list of foreground colors to the classes rather than assigning the color spectrum colors.

General Page

The **General** page is located in the **Property Manager** when a thematic map is selected for the active layer. Information about the map's data file can be viewed and changed in the **General** page. The Contour and Prism map options for switching to a base map are also available on the **General** page.



Change or save the map data file, specify the PID and Variable columns, and set data limits on the ***General*** *page of the* ***Property Manager****.*

Data Filename

The *Data File* property shows the current loaded data file for the map. Load a new data file into the map with the open button. Save changes to the data file with the save button.

Data Columns

The properties in the *Data Columns* section specify which data columns contain the map object PIDs and variable.

PID Column

PID column indicates the location of the primary ID in the data. The data primary ID must match the primary IDs used on the boundaries.

Variable Column

Variable column indicates the data column for use in the map. The variable must contain numeric data to create the map.

Data Limits

The *Data Limits* section contains properties for specifying linked, global, or user defined data limits, and if absolute values are used for negative numbers.

Selecting Data Limits

When the *Use global data* check box is clicked, the data limits are the minimum and maximum values in the *Variable column*, including unlinked data values.

Clicking the *Use user-defined limits* check box allows editing in the *Min limits* and *Max limits* cells. Type numeric values into *Min limits* and *Max limits* to set your own data limits.

If neither the *Use global data* or *Use user-defined limits* boxes are selected, the data limits are the minimum and maximum linked values in the *Variable column*.

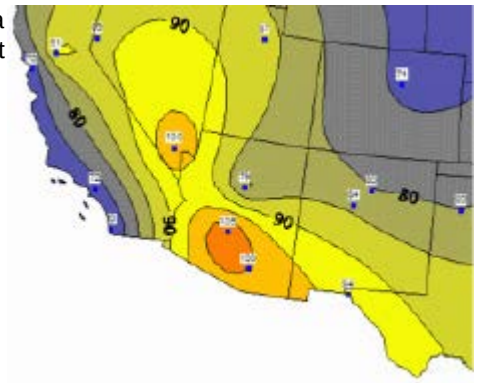
Absolute Data Value

Clicking the *Use absolute data value* check box treats negative numbers in the *Variable column* as positive numbers for mapping.

Chapter 13

Contour Maps

Contour Map



Contour maps interpolate from discrete data values to create a regularly-spaced grid. The grid is displayed as lines of constant data values. The areas between the lines may be filled with colors and patterns of your choice.

Creating and Editing Contour Maps

Create a contour map by selecting a layer with linked boundary objects, then clicking the **Map | Create Map | Contour** command 

. Edit contour maps in the **Property Manager**.

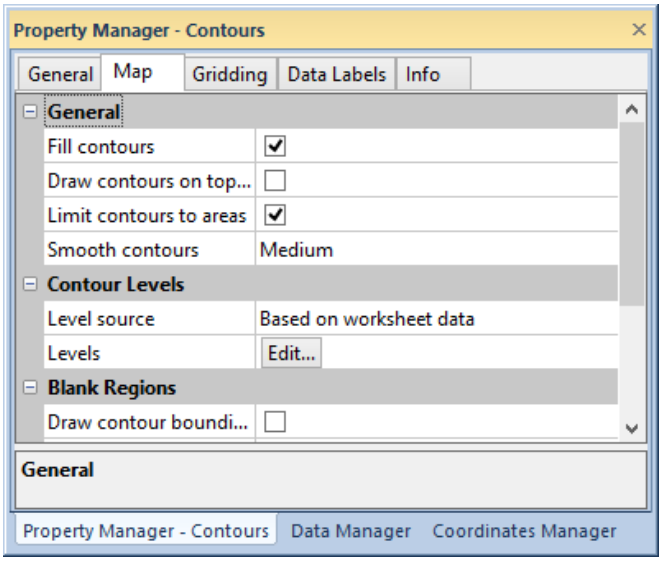
See Creating and Editing Thematic Maps for an example of creating a map, editing the map, and changing the map to another type.

Contour Map Properties

The **Property Manager** for a contour map contains General, Gridding, Data Labels, Info, and **Map** pages. Click the preceding hyperlinks for information on properties in each of the property manager pages.

Map Page

Edit properties unique to contour maps in the **Map** page of the **Property Manager**.



*Edit contour map properties in the **Map** page of the **Property Manager**.*

General

The *general* group contains general contour options.

Click the *Fill contours* check box to apply a fill to the contours. Change the fill properties in the Levels dialog.

Click the *Draw contours on top of layer* check box to draw the contours on top of the objects in the contour map layer. Boundary objects in the contour map will not be visible if *Draw contours on top of layer* is active. Boundary objects on another layer can overlay the contour map by moving the layer above the contour map in the **Object Manager**.

Click the *Limit contours to areas* check box to limit contours to the boundaries of the objects on the contour map layer. Overlapping objects will create lakes, or holes, in the contour map. When *Limit contours to areas* is not active, contours fill the bounding box of all objects on all layers.

Select a level of contour smoothing in the *Smooth contours* list. Click on the smoothing level and select *None*, *Low*, *Medium*, or *High*.

Contour Levels

Select the data source for classification in the *Level source* list. Select *Based on worksheet data* to use the linked data sheet to determine contour level classes. Select *Based on grid nodes* to determine contour level classes with grid nodes.

Click the Edit... button to edit contour levels in the Levels dialog.

Blank Regions

Show the contour bounding box and edit its line and fill properties in the *Blank Regions* group.

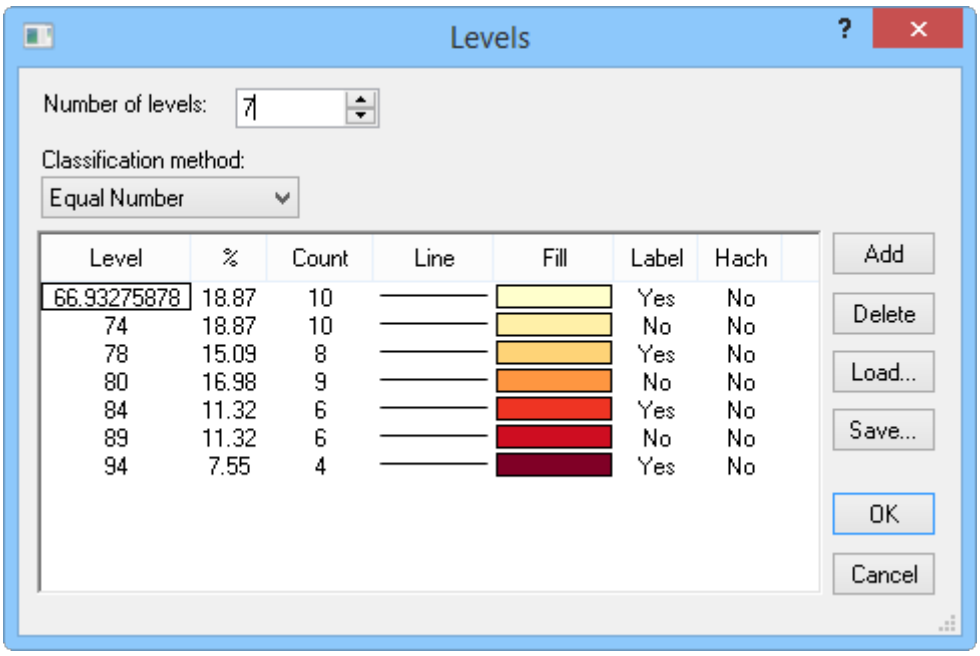
Click the *Draw contour bounding box* check box to show the bounding box. Activating *Draw contour bounding box* deactivates *Limit contours to areas*, extends the contours to the extent of the bounding box, and makes the line and fill properties available.

Click the + button to expand the line, fill, or gradient properties.

Select a gradient type, colormap using the, and direction to apply a gradient to the fill. Make a custom colormap in the Colormap dialog by clicking on the ... button.

Levels Dialog

Clicking the Edit... button in the *Map* page of the **Property Manager** for a contour map opens the **Levels** dialog.



Select the number of classes and classification method, set user-defined levels, and load or save levels in the ***Levels*** *dialog.*

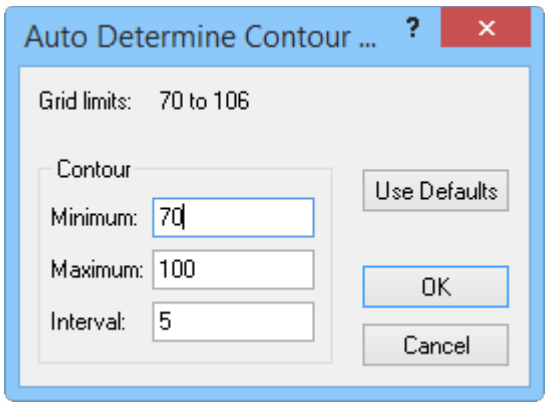
Number of Levels

Number of levels specifies the number of levels used in the map. This is equal to the number of levels displayed in the *Objects in levels* box. Type a number into the *Number of levels* box or change the value with the .

Classification Method

Select a *Classification method* from the list.

- *Equal number* calculates the level minimum such that an equal number (or as close to it as possible) of data values fall within each level.
- *Equal intervals* calculates the level minimum such that the intervals between levels are equal. The *Increment* box is displayed when *Equal intervals* is selected, and this shows the range covered by each level The *Auto determine levels* box is also displayed when *Equal Intervals* is selected. Click the *Auto determine levels* box to have **MapViewer** determine the number of levels.
- *Standard deviation* generates data levels based on the standard deviation of the data. When the *Standard deviation* method is selected, the *Increment* field appears. The *Increment* field allows you to define the standard deviation increment to establish the level ranges and number of levels. The *Increment* and *Number of levels* values are dependent upon each other, so changing one value automatically changes the other.
- The Jenks' Natural breaks method creates levels based on the optimal natural breaks in your data.
- *User defined* allows you to create your own level definitions. Double-click on the *Level* values in the *Objects in levels* list to define the classes after you define the *Number of levels*. Click on the *Level* column title to open the **Auto Determine Contour Levels** dialog where you can specify the range and interval for levels.



Set contour level range and interval in the ***Auto Determine Contour Levels*** *dialog.*

Editing Line and Fill Properties

Click on the *Line*, *Fill*, or *Label* column headers to edit properties for all levels in the Line or Fill dialog. Alternatively, double click on an individual level line or fill to edit its properties.

Labels

Edit contour labels in the Labels dialog by clicking on the *Labels* title in the header row of the *Objects in levels* list.

Hachures

Edit contour hachures in the Hachures dialog by clicking on the *Hach* title in the header row of the *Objects in levels* list.

Adding and Deleting Levels

Click *Add* to add another level to the *Objects in levels* list.

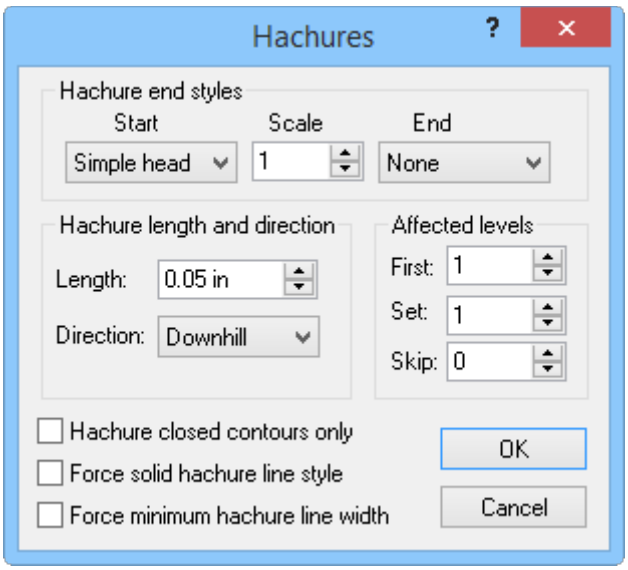
Click a level row and then click *Delete* to remove a level from the *Objects in levels* list.

Saving and Loading Levels

Once the levels are defined, they can be saved for reuse in a level file [.LVL]. Click the *Save...* button to save the levels. To use an existing level file, click the *Load...* button.

Hachures Dialog

Edit contour line hachures in the **Hachures** dialog, accessed by clicking *Hach* in the header row of the Levels dialog *Objects in levels* list.



Add hachures and edit hachure properties in the ***Hachures*** *dialog.*

Hachure End Styles

Select start and end hachure styles and change their scale in the *Hachure end styles* section.

To add or change hachures, select *None*, *Simple head*, *Filled head*, *Triangle head*, or *2-stick head* in the *Start* or *End* lists.

To change the hachure size, type a number into the *Scale* box. You can also change the value by clicking the buttons.

Hachure Length and Direction

Change the hachure length by typing a number into the *Length:* box or clicking the buttons.

Select *Uphill* or *Downhill* in the *Direction:* list to select the hachure direction.

Affected Levels

Pick the first contour line to have hachures in the *First:* box. Type a level number or click the to select the first affected level.

Choose the level set in the *Set:* box. Type a number or click the to select the affected level set.

Skip lines with hachures by changing the value in the *Skip:* box. Type a number or click the to select the number of contour lines to skip between hachures. For example, setting *Skip:* to "0" draws hachures on every contour line, setting *Skip:* to "2" places hachures on every third contour line.

Hachure Options

Click the *Hachure closed contours only* check box to only draw hachures on closed contour lines.

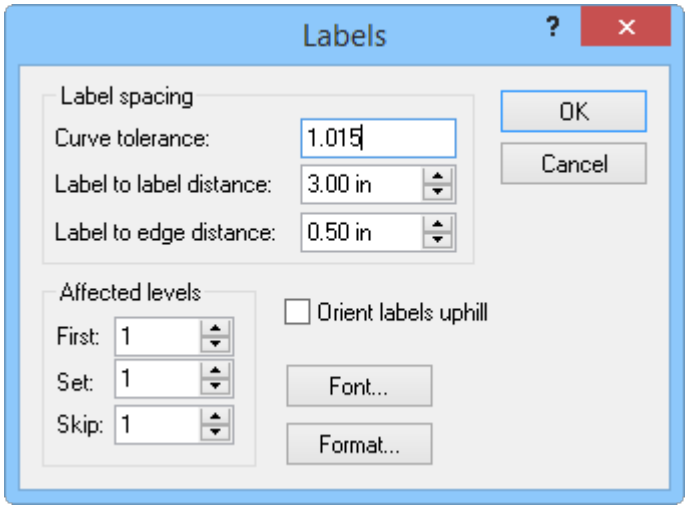
Click the *Force solid hachure line style* check box to force the solid line style on hachure lines.

Click the *Force minimum hachure line width* to make the hachure lines as narrow as possible.

Click *OK* to apply your changes to the hachures. Click *Cancel* to discard changes and close the **Hachures** dialog.

Labels Dialog

Edit contour labels in the **Labels** dialog. The **Labels** dialog is accessed by clicking *Labels* in the header row of the Levels dialog *Objects in levels* list.



*Set label spacing, affected labels, label orientation, font and label format properties in the **Labels** dialog.*

Label Spacing

Set the *Curve tolerance:* by typing into the *Curve tolerance:* input box. Tolerance values must be greater than 1. Areas of the contour with sharper curves than the value in the *Curve tolerance:* box will not have labels.

Type in the *Label to label distance:* box to set the distance between labels on a contour line. You can also adjust the value by clicking the . The distance is in page units.

Set the label distance from the boundary edge in the *Label to edge distance:* box. Type a value into the box, or click the to change the value. The distance is in page units.

Affected Levels

Pick the first contour line to have a label in the *First:* box. Type a level number or click the to select the first affected level.

Choose the level set in the *Set:* box. Type a number or click the to select the affected level set.

Skip labels by changing the value in the *Skip:* box. Type a number or click the to select the number of contour lines to skip between labels. For example, setting *Skip:* to "0" draws labels on every contour line, setting *Skip:* to "2" places labels on every third contour line.

Label Font and Format

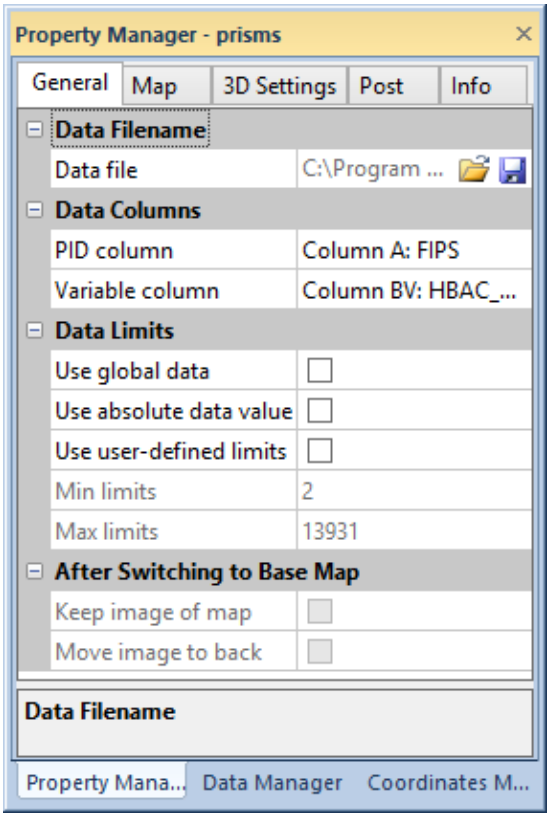
Click the *Orient labels uphill* check box to orient the labels in the direction of increasing contour level. This style is typically used on topographic maps. When *Orient labels uphill* is not active, the labels are oriented in the same direction as the page for easier reading.

Click the *Font...* button to change label font properties.

Click the *Format...* button to change the label format properties.

General Page

The **General** page is located in the **Property Manager** when a thematic map is selected for the active layer. Information about the map's data file can be viewed and changed in the **General** page. The Contour and Prism map options for switching to a base map are also available on the **General** page.



Change or save the map data file, specify the PID and Variable columns, and set data limits on the ***General*** *page of the* ***Property Manager****.*

Data Filename

The *Data File* property shows the current loaded data file for the map. Load a new data file into the map with the open button. Save changes to the data file with the save button.

Data Columns

The properties in the *Data Columns* section specify which data columns contain the map object PIDs and variable.

PID Column

PID column indicates the location of the primary ID in the data. The data primary ID must match the primary IDs used on the boundaries.

Variable Column

Variable column indicates the data column for use in the map. The variable must contain numeric data to create the map.

Data Limits

The *Data Limits* section contains properties for specifying linked, global, or user defined data limits, and if absolute values are used for negative numbers.

Selecting Data Limits

When the *Use global data* check box is clicked, the data limits are the minimum and maximum values in the *Variable column*, including unlinked data values.

Clicking the *Use user-defined limits* check box allows editing in the *Min limits* and *Max limits* cells. Type numeric values into *Min limits* and *Max limits* to set your own data limits.

If neither the *Use global data* or *Use user-defined limits* boxes are selected, the data limits are the minimum and maximum linked values in the *Variable column*.

Absolute Data Value

Clicking the *Use absolute data value* check box treats negative numbers in the *Variable column* as positive numbers for mapping.

After Switching to Base Map

Contour and Prism maps have the *After Switching To Base Map* section of the **General** page. The *After Switching To Base Map* properties involve retaining map features after changing the map to a base map with the **Map | Create Map | Base** command.

Contour Map - After Switching to Base Map

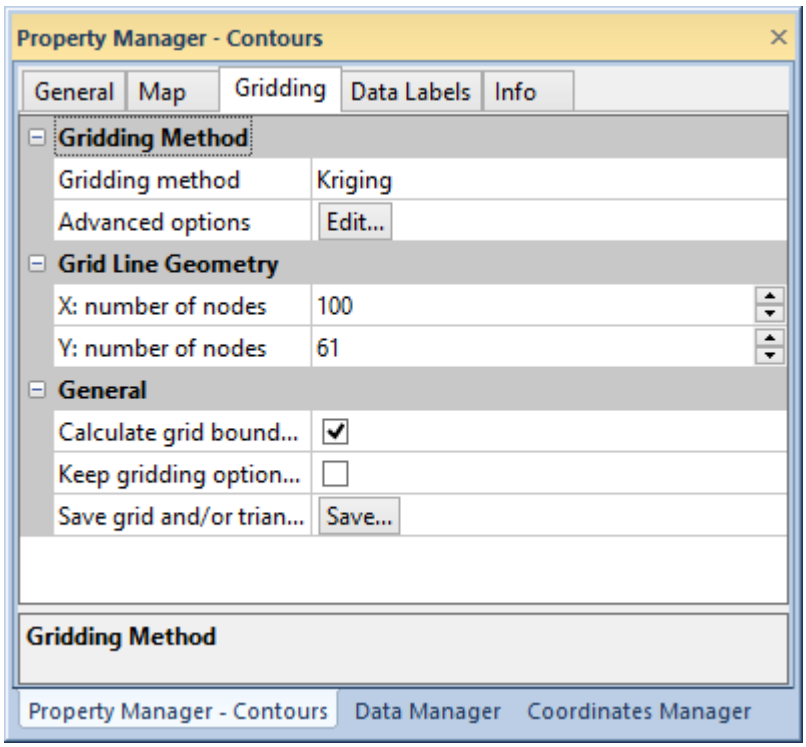
The *Retain contours* property saves the contour fill and generates polylines representing the contours when switching a contour map to a base map. Click the check box next to *Retain contours* before clicking **Map | Create Map | Base** to keep the contours visible on the base map.

Gridding

The **Gridding** page is used to set the gridding options. The data are typically randomly spaced, and this data must be converted into an evenly spaced grid before **MapViewer** draws the gradient map. The **Gridding** page is available in the **Property Manager** when a Contour, Gradient, or Vector map is selected.

When creating a grid you can usually accept all of the default gridding parameters and generate a grid that represents your data well. Under most circumstances, the recommended gridding method is kriging.

There are several gridding parameters you can set when producing a grid. Refer to the gridding method for more information on specific parameters. All gridding methods require at least three non-collinear data points. Some methods require more data points. For example, a higher-order polynomial fit needs more than three data points; there must be at least as many data as there are degrees of freedom.



*Change the gridding method, grid line geometry, and gridding options on the **Gridding** page of the **Property Manager**.*

Gridding Method

Choose the gridding method and *Advanced options* in the *Gridding method* group. Refer to individual gridding method pages for more information and advanced options.

Grid Line Geometry

Grid line geometry defines the grid density. The grid density is defined by the number of columns and rows in the grid. The *X: number of nodes* property is the number of grid columns, and the *Y: number of nodes* property is the number of grid rows. There is a maximum of 10,000 rows and 10,000 columns.

Higher grid densities increase the smoothness in the map. However, this increases the gridding time. Although highly dense grids can be created, time and space are practical limits. Limited memory, very large number of data, very dense grids, or any combination of these factors can greatly increase gridding time. When gridding begins, the status bar provides you with information about the estimated gridding time to complete the task.

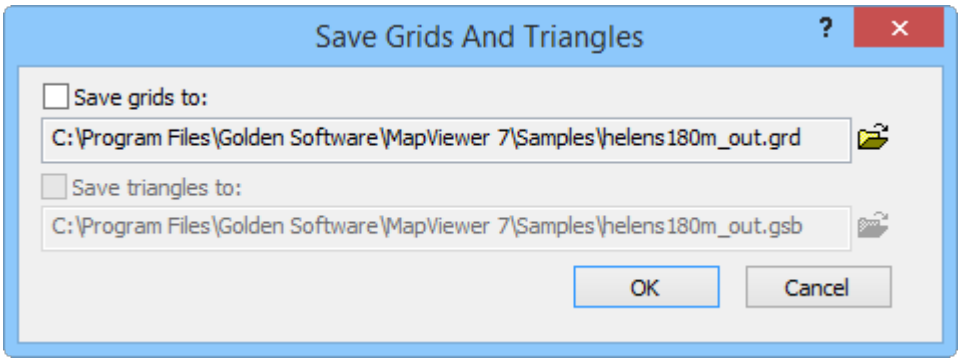
General

The *General* section contains options to calculate grid bounds, keep gridding options when changing data settings, and saving grids and triangles.

Click the check box next to *Calculate grid bounds with all layers* to include boundary objects from all layers in the grid bounds calculation.

Click the check box next to *Keep gridding options when data settings change* to keep the *Gridding method Advanced options* settings after changing the data for the map. Large changes in data with the *Keep gridding options when data settings change* property active will result in the entire grid being blanked out.

Click the Save... button next to *Save grid and/or triangles* to save the grid [.GRD] and/or triangles [.GSB] in the **Save Grids And Triangles** dialog.



*Select files to save and file location in the **Save Grids And Triangles** dialog.*

Select which file to save by clicking the *Save grids to:* or *Save triangles to:* check boxes. Triangles can only be saved if the gridding method is *Triangulation with Border Color Interpolation* or *Triangulation with Linear Interpolation*. If any other gridding method is selected the *Save triangles to:* area is grayed out.

Click the button to select the file location in the Save As dialog.

Click *OK* to save the selected files. Click *Cancel* to close the dialog without saving grid or triangle files.

Notes on Grids and Gridding

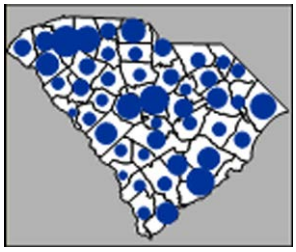
The grids are internally created and used within **MapViewer**. There is no access to these files. If you need to access grid files, use more advanced gridding, or manipulate grids, use Golden Software's **Surfer** instead.

Some gridding operations can take a few seconds, depending on the gridding settings, data set, and your computer's capabilities. The status bar displays information about the gridding process, from left to right: the gridding method, a completion bar, completion percent, time remaining estimate, and a *Cancel* button. Click the *Cancel* button to pause the gridding operation and choose to *Continue* or *Abort* in the dialog that is displayed. However, the gridding operation that is performed when creating a contiguous cartogram map cannot be cancelled.

Chapter 14

Symbol Maps

Symbol Map



Symbol maps display a scaled symbol proportional to the boundary object's associated data value. Bivariate data can be displayed by varying symbol color from a separate data column. The symbols may be repositioned relative to the boundary object by using the Move Centroids command.

Symbol maps can be made for polygons, polylines, or points.

- For polygons, the scaled symbols are drawn at the area's centroid (geographic center). The areas use the default fill and line properties, or you can set unique fill and line properties for each area on the map.
- For polylines, the scaled symbols are drawn at the midpoint along the curve.
- For points, the scaled symbols are drawn directly on top of the point symbol. If the scaled symbols are open, like an open circle with no fill, you can see the point symbol beneath the symbol map symbol. To avoid this, disable the display of the point symbol by selecting the symbols and changing the color to white. The symbol map symbols are still drawn, but the point location symbols are not visible. Alternatively, you can use the **View | Display | Show Objects** command and turn off the display of the point symbols by unchecking the *Symbol* box and then checking the *Theme of hidden object* box. The symbol map symbols are still drawn, but the point location symbols are not displayed.

Creating and Editing a Symbol Map

Create a symbol map by selecting a layer with linked boundary objects. Then, click the **Map | Create Map | Symbol** command 

.

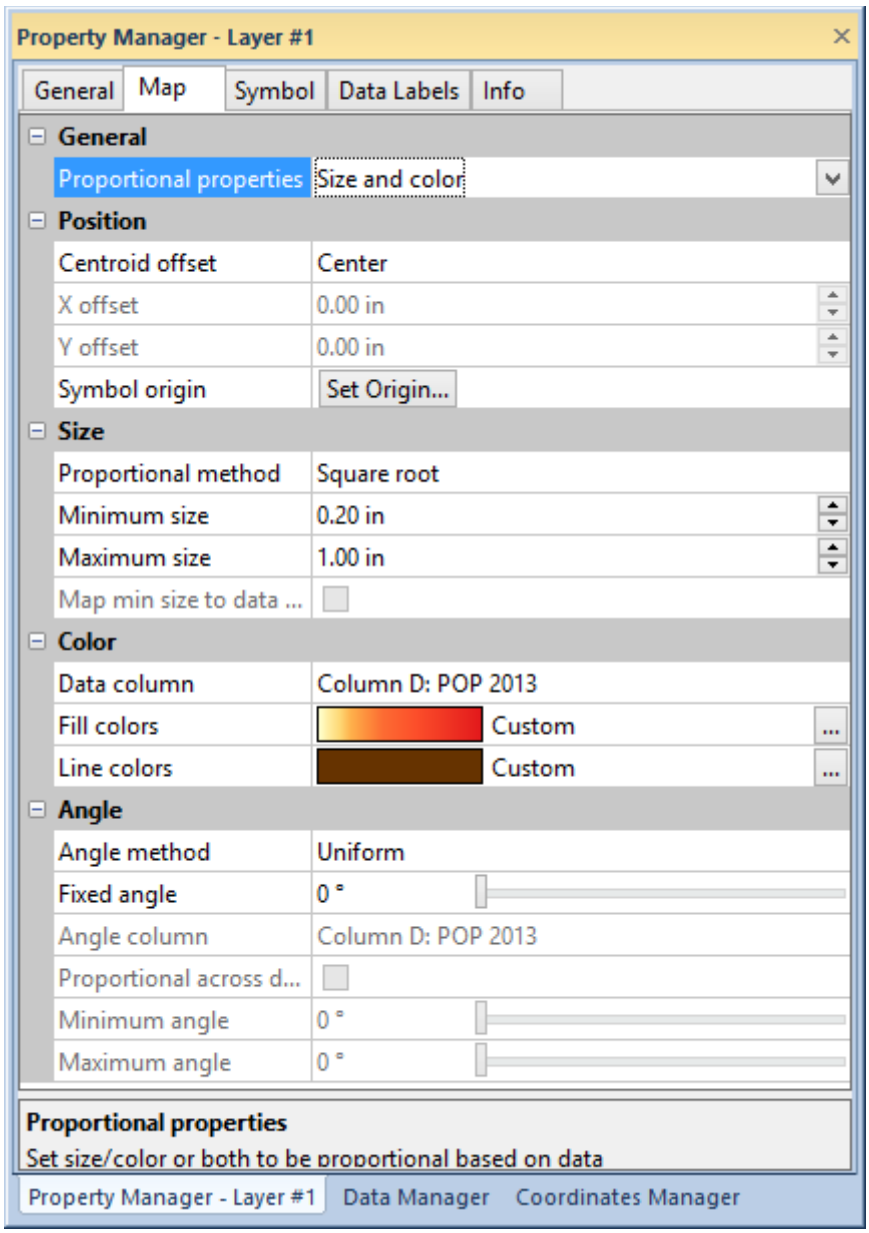
See Creating and Editing Thematic Maps for information on creating a maps, changing a map to another map type, and changing map properties.

Symbol Map Properties

You can set the symbol type as well as other options in the **Property Manager**. The **Property Manager** for a symbol map contains General, Symbol, Data Labels, Info, and **Map** pages. Click the preceding hyperlinks for information on properties in each of the property manager pages.

Map Page

Properties that are unique to symbol maps are edited on the **Map** page of the **Property Manager**.



*Edit symbol map properties in the **Map** page of the **Property Manager**.*

General

The *Proportional properties* list selects which properties are proportional to the data in the *Variable* column on the *General* page. You can select *Size*, *Color*, or *Size and color* in the *Proportional properties* list.

Position

The centroid is the geographic center of an polygon, the midpoint along a polyline, or the location of a point. The centroid location can be moved for all polygons, polylines, or points. The *Centroid offset* is used to offset each symbol from its corresponding position. *Center*, *Left*, *Right*, *Above*, and *Below* position the symbol in the specified direction. *User defined* enables the X and Y boxes so you can enter any arbitrary offset amount. The offsets must be specified in page units.

Click the *Origin* button to specify the origin of the symbol. The symbol is positioned, rotated, and scaled about the origin. Clicking the *Origin* button displays the Symbol Origin dialog with some cross hairs in a box. The intersection of the cross hairs represents the symbol origin, and the box represents the limits of the symbol. Use the horizontal and vertical scroll bars to position the origin

Size

Symbol size *Proportional method* is used to determine the relative size of the symbols. *Linear* makes the height and width of each symbol directly proportional to its data value, while *Square root* makes them proportional to the square roots of their values. *Linear* should be used if your symbol is very narrow (like a bar), since it results in each symbol's height being proportional to its data value. Otherwise, *Square root* should be used, since it results in the symbol's area being proportional to its data value. Studies show the viewer mentally compares the areas of two symbols and not their heights.

The box containing symbol size and data values allows you to specify how much the symbols are scaled. Enter a minimum value into the *Minimum size* field, and a maximum value into the *Maximum size* field. The smallest data value is drawn with the minimum width and height. The largest data value is drawn with the maximum width and height. All data values in between are scaled proportionally. You can use the arrows to increase or decrease each value, or type the size you want. The size is specified in page units.

Click the *Map min size to data value of 0* check box to associate the minimum symbol size with a data value of zero. The *Use absolute data value* option must be activated on the General page of the **Property Manager** for the *Map min size to data value of 0* property to be available.

Color

Select the data column for proportional color in the *Data column* list.

Select fill and line colors by clicking on the color bar next to either *Fill colors* or *Line colors*. Click the ... to open the Colormap dialog and create a custom colormap for the line or fill.

Negative Data

When *Size* is the selected *Proportional properties* item, the *Negative Data* group is available. The *Negative Data* options specify a color for negative data values if desired. Click the *Specify color for negative values* check box to make symbols with negative values a separate color. Click the *Fill color* or *Line color* lists to select a color in the Color Palette. Click the ... buttons to open the Colors dialog and select a custom color.

Angle

Symbols can be rotated in a symbol map uniformly or by using information in a column in the data file. The symbol rotation can be entered as angles (degrees) or the angle information can be calculated based on the column's data in relation to the minimum and maximum angle values.

Select either *Uniform* or *From data* in the *Angle method* list. The *Uniform* angle method applies one angle to all the symbols in the map. Use the slider bar to change the symbol angle.

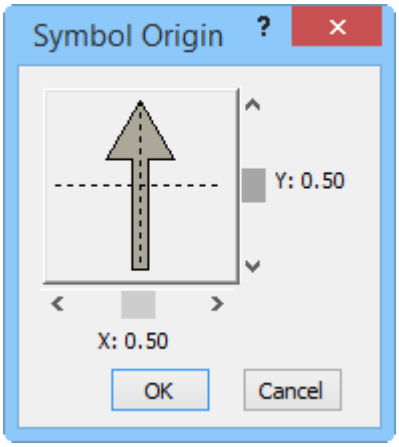
When *From data* is selected, symbol angles are specified by an angle column or proportional to data values in the specified data column. Select the data column for specified angles or proportional

angles in the *Angle column* list. The *Angle column* should contain numeric values in degrees if *Proportional across data* is not checked.

Click the *Proportional across data* check box if the *Angle column* contains map data and not specific symbol angles in degrees. Use the slider bar  to set the *Minimum angle* rotation for the smallest data value symbol. Use the slider bar  to set the *Maximum angle* rotation for the largest data value symbol. The remaining symbols are rotated in proportion to the minimum and maximum values and their symbol angles.

Symbol Origin Dialog

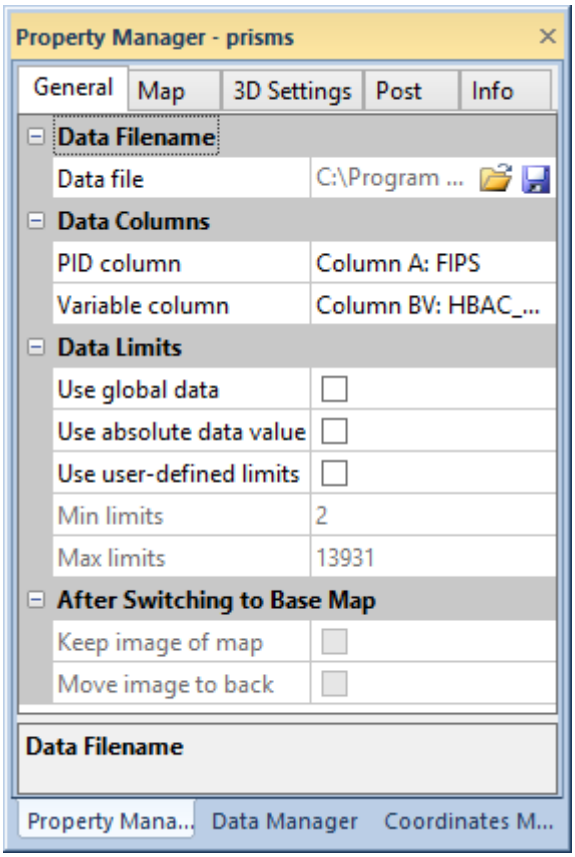
The **Symbol Origin** dialog allows you to specify the origin for symbols in a symbol map. The symbol is positioned and scaled about this point on a symbol map.



The intersection of the cross hairs represent the origin, and the surrounding box represents the extents of the symbol. The origin distance between 0 and 1 is also displayed next to each scroll bar. Use the horizontal and vertical scroll bars to position the origin.

General Page

The **General** page is located in the **Property Manager** when a thematic map is selected for the active layer. Information about the map's data file can be viewed and changed in the **General** page. The Contour and Prism map options for switching to a base map are also available on the **General** page.



Change or save the map data file, specify the PID and Variable columns, and set data limits on the ***General*** *page of the* ***Property Manager****.*

Data Filename

The *Data File* property shows the current loaded data file for the map. Load a new data file into the map with the open button. Save changes to the data file with the save button.

Data Columns

The properties in the *Data Columns* section specify which data columns contain the map object PIDs and variable.

PID Column

PID column indicates the location of the primary ID in the data. The data primary ID must match the primary IDs used on the boundaries.

Variable Column

Variable column indicates the data column for use in the map. The variable must contain numeric data to create the map.

Data Limits

The *Data Limits* section contains properties for specifying linked, global, or user defined data limits, and if absolute values are used for negative numbers.

Selecting Data Limits

When the *Use global data* check box is clicked, the data limits are the minimum and maximum values in the *Variable column*, including unlinked data values.

Clicking the *Use user-defined limits* check box allows editing in the *Min limits* and *Max limits* cells. Type numeric values into *Min limits* and *Max limits* to set your own data limits.

If neither the *Use global data* or *Use user-defined limits* boxes are selected, the data limits are the minimum and maximum linked values in the *Variable column*.

Absolute Data Value

Clicking the *Use absolute data value* check box treats negative numbers in the *Variable column* as positive numbers for mapping.

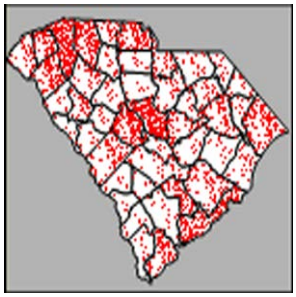
After Switching to Base Map

Contour and Prism maps have the *After Switching To Base Map* section of the **General** page. The *After Switching To Base Map* properties involve retaining map features after changing the map to a base map with the **Map | Create Map | Base** command.

Chapter 15

Density Maps

Density Map



Density maps use randomly positioned symbols to represent data values for areas on a map. On a density map, each symbol represents a set number of data units, so the number of symbols drawn in an area is proportional to the data value associated with that area. Areas with more symbols have higher associated data values. This type of map does not use classes like the hatch map and can show a more continuous distribution.

Density maps are effective at displaying data because the density of symbols is in relation to the size of an area. For example, consider a small area and a large area that both have the same associated data value. Although the two areas display the same number of symbols, the symbols are more crowded in the small area and therefore indicate the higher relative density of data for that area.

Creating and Editing a Density Map

Select a layer with data linked boundary objects and click the **Map | Create Map | Density** command 

. Edit density maps in the **Property Manager**.

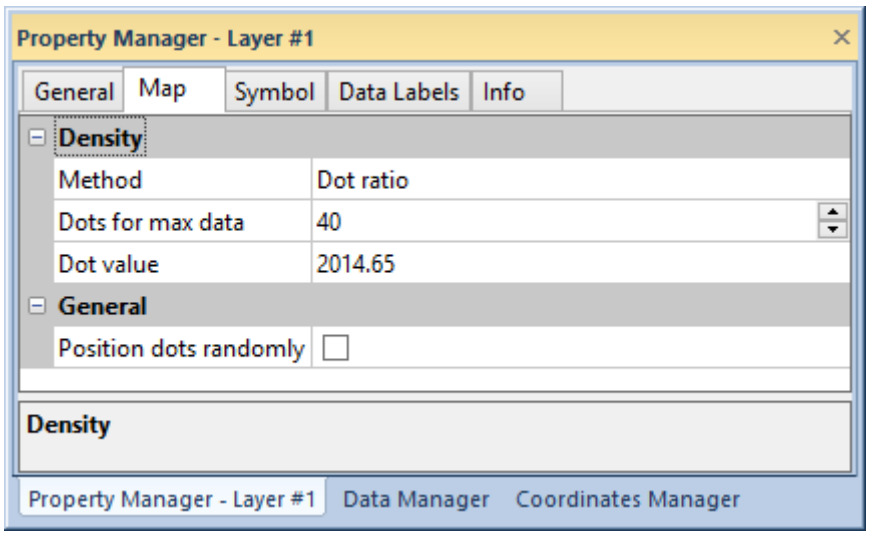
See Creating and Editing Thematic Maps for information on creating a map, changing a map to another map type, and changing map properties.

Density Map Properties

The **Property Manager** for a density map contains General, Symbol, Data Labels, Info, and **Map** pages. Click the preceding hyperlinks for information on properties in each of the property manager pages.

Map Page

The **Property Manager Map** page contains properties unique to density maps.



*Select the density method and options in the **Map** page of the **Property Manager**.*

Symbol Values

The *Density* group lets you specify the relative number of dots to draw on the map. There are two methods you can use to create your density map. The *Dot ratio* method assigns a data value to each dot, or defines a set number of dots for the maximum data value. The *Dot sum* method defines a number of dots that represent the sum total of the variable. This method provides a simple way to make each dot represent a percentage of the data. For example, if the total number of dots is set to 100, each dot represents one percent of the variable.

Density settings:

- *Dots for max data* is the number of dots that appear in the area with the largest data value for the *Dot ratio* method.
- The *Dot value* field displays the number of data units represented by a single dot for the *Dot ratio* method. This field is linked to the *Dots for max data* value. When you change the value of either field, the other is updated accordingly. The *Dot value* field is calculated by the maximum data value divided by the *Dots for max data* value.

You can set the *Dot value* to any number, but **MapViewer** might recalculate the *Dot value* slightly to ensure the *Dots for max data field* is an integer. Also, the *Dot value* can be set to be larger than the data minimum. In this case, the area with the data minimum does not show any dots on the density map. Although, because of rounding, a single dot might appear in an area with data slightly below the *Dot value*.

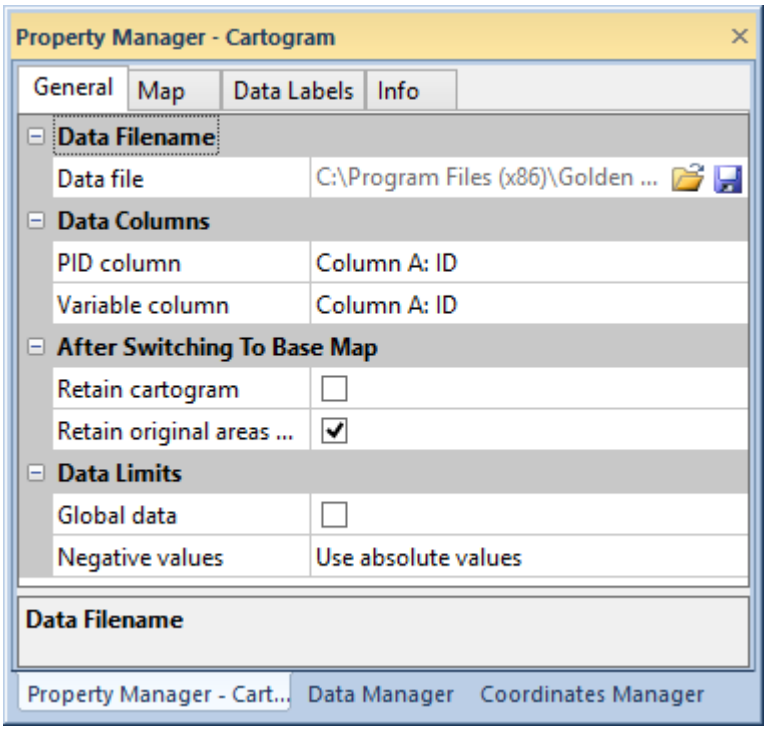
- The *Sum of dots* value defines the total number of dots used to represent the sum of the variable values for the *Dot sum* method.

Random Positioning

Check the *Position dots randomly* box to randomly position the dots each time the map is redrawn.

General Page

The **General** page is located in the **Property Manager** when a thematic map is selected for the active layer. Information about the map's data file can be viewed and changed in the **General** page. The Cartogram map options for switching to a base map are also available on the **General** page.



*Change or save the map data file, specify the PID and Variable columns, and set data limits on the **General** page of the **Property Manager**.*

Data Filename

The *Data File* property shows the current loaded data file for the map. Load a new data file into the map with the open button. Save changes to the data file with the save button.

Data Columns

The properties in the *Data Columns* section specify which data columns contain the map object PIDs and variable.

PID Column

PID column indicates the location of the primary ID in the data. The data primary ID must match the primary IDs used on the boundaries.

Variable Column

Variable column indicates the data column for use in the map. The variable must contain numeric data to create the map.

Data Limits

The *Data Limits* section contains properties for specifying linked, global, or user defined data limits, and if absolute values are used for negative numbers.

Selecting Data Limits

When the *Global data* check box is clicked, the data limits are the minimum and maximum values in the *Variable column*, including unlinked data values. If *Global data* is not selected, the data limits are the minimum and maximum linked values in the *Variable column*.

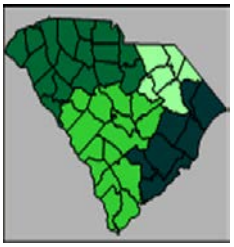
Negative Values

Choose how to treat negative values in the *Negative values* list. Selecting *Ignore negative values* does not include negative data values in the map. Selecting *Use absolute values* treats negative numbers in the data columns as positive numbers for mapping.

Chapter 16

Territory Maps

Territory Map



Territory maps allow polygons, polylines, or points to be grouped into territories by defining a grid or by hand selecting the areas for territories. The **Property Manager** *Territory* and *Map* pages display information about the territory map including the active territory, the territory name, fill color, number of objects in a territory, and statistics.

Territory maps can be made for polygons, polylines, or points. The fill color is assigned to the territory's polygons, polylines, or points.

Categorizing Objects

The territory map is used to group objects and report statistics based on the groups. If you wish to assign colors to areas based on data, use the hatch map instead. If you wish to categorize points based on data, use a pin map. If you wish to categorize curves, use a flow map.

Creating and Editing a Territory Map

Click the **Map | Create Map | Territory** command 

to create a territory map. Edit a territory map in the **Property Manager**.

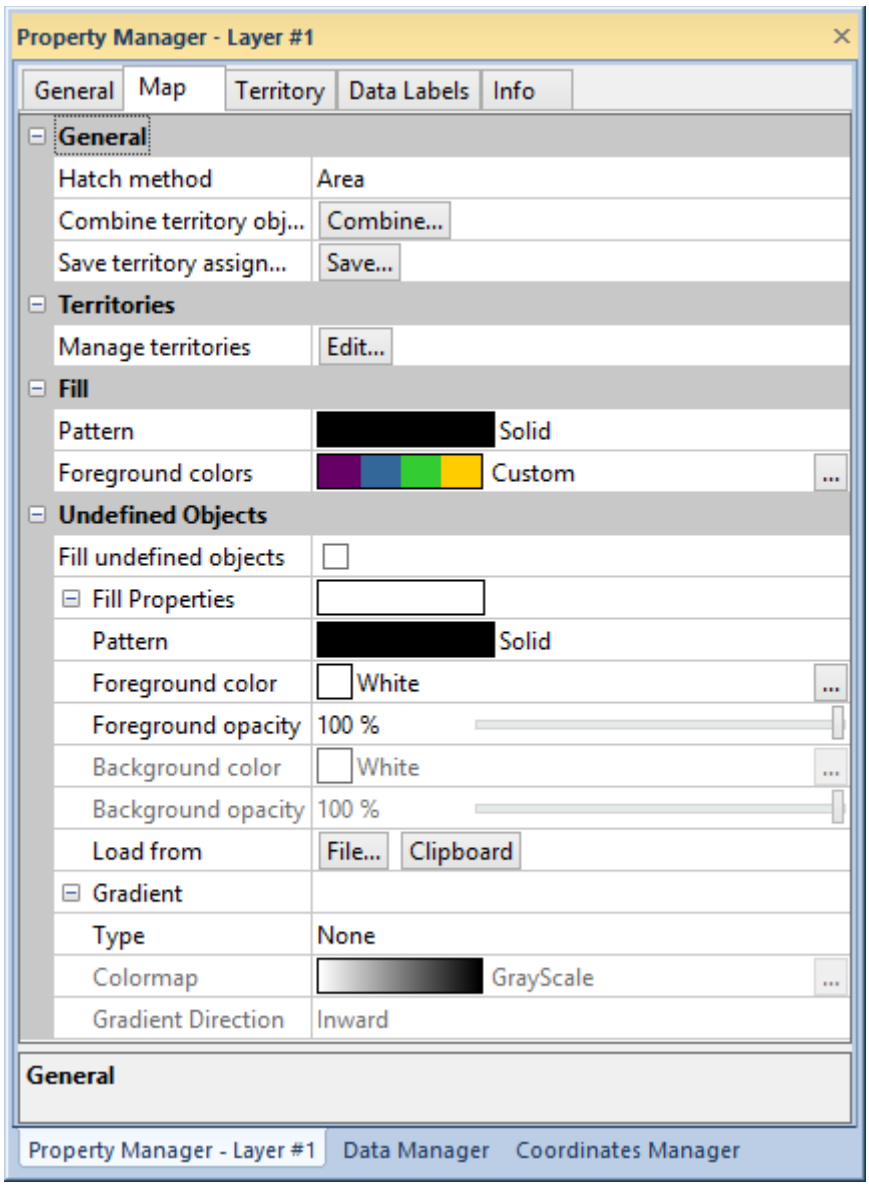
See Creating and Editing Thematic Maps for information on creating a map, changing a map to another map type, and changing map properties.

Territory Map Properties

The **Property Manager** for a territory map contains General, Data Labels, Info, Map, and Territory pages. Click the preceding hyperlinks for information on properties in each of the property manager pages.

Map Page

Edit hatch and fill properties, combine, manage, and save territories for territory maps in the **Map** page of the **Property Manager**.



*Edit territory map properties in the **Map** page of the **Property Manager**.*

General

The *General* group contains options for the display of the map hatching.

- *Area* shows each area as the specified fill color and pattern, or it displays each point and polyline as the specified color.
- *Circle* draws a circle in each polygon, on the polyline mid-line, or on the point and shades it as the specified fill color and pattern.
- *Square* draws a square in each area, on the curve mid-line, or on the point and shades it as the specified fill color and pattern.
- If you select *Square*, set the width of the square in the *Width* box. If you select *Circle*, set the circle diameter in the *Diameter* box.

Click the *Combine...* button next to *Combine territory objects* to combine territory objects into a single polygon in the Combine Territory Areas dialog.

Click the *Save...* button next to *Save territory assignments* to save territory names and/or numbers to worksheet columns in the **Save Territory Assignments to Linked Worksheet** dialog.

- Click the *Save territory number to the following column* check box to save the territory number. Select the destination column from the list.
- Click the *Save territory name to the following column* check box to save the territory name. Select the destination column from the list.
- Click the *View worksheet after operation* check box to open the worksheet in the worksheet window after clicking *OK*.

Territories

Map territories on grids, by data classes, or by text classes, or manually manage the territories in the **Territories** dialog. Click the Edit... button next to *Manage Territories* to edit territories in the Territories dialog.

Fill

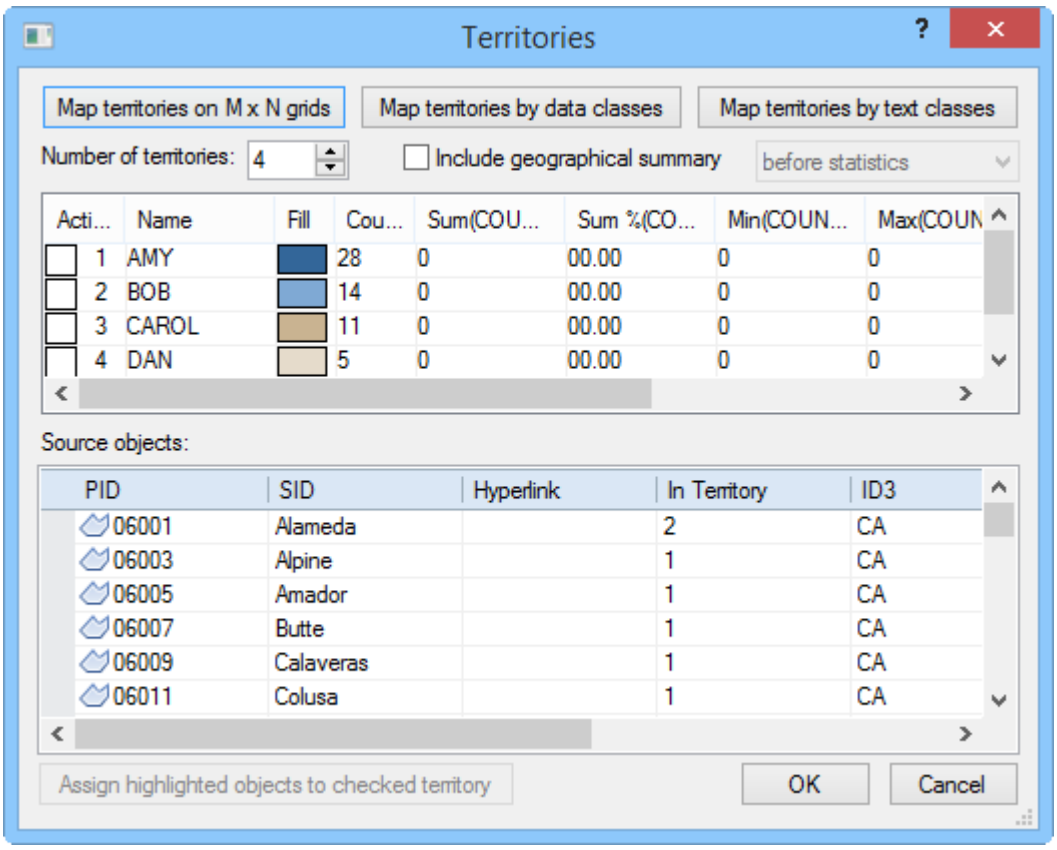
Fill pattern and colors for territories are changed in the *Fill* group. Click the *Pattern* style to select a pattern in the fill palette. Click on a *Foreground colors* style to select a predefined colormap for the territories. Click the button to select a custom colormap in the Colormap dialog.

Undefined Objects

Click the *Fill undefined objects* check box to add fill properties to objects not included in the map territories. Click the *Fill properties* option to edit fill properties. Select a gradient *Type*, *Colormap*, and *Gradient Direction* to apply a gradient fill. Clicking the button near *Colormap* opens the Colormap dialog.

Territories Dialog

The **Territories** dialog is used to manage the territories in a territory map. Access the **Territories** dialog by clicking the *Edit...* button next to *Manage Territories* in the *Map* page of the **Property Manager**.



Select the number of territories, assign objects to territories, and automatically generate territories in the ***Territories*** *dialog.*

Automatically Creating Territories

Territories can be grouped in a grid-like manner automatically. To create territories automatically click the *Map Territories on M x N Grids* button and enter the number of horizontal and vertical territories in the *Horizontal Territories* and *Vertical Territories* boxes in the **Territory Grids** dialog.

Number of Territories

Change the number of territories by typing a value into the *Number of territories:* box. You can also adjust the value by clicking the buttons.

Geographical Summary

Add a geographical summary to the *Territory Properties* section by clicking the *Include geographical summary* check box. Select *before statistics* to show the geographical summary before the data statistics, or select *after statistics* to show the summary after the data statistics.

Territory Properties

The top worksheet area is the *Territory Properties* sheet.

- The *Active* column indicates the active territory with a cross in the box.
- The *Name* column lists the territory names

- The *Fill* column contains fill properties for the territories. Double-click a territory fill color to open the territory's fill properties. Click the *Fill* title in the header row to open the Color Spectrum dialog.
- The *Counts* column shows the number of objects in each territory

A statistical data summary is shown for each territory. If *Include geographical summary* is active, a geographical summary is also included in the *Territory Properties* sheet.

Source Objects

The *Source objects:* worksheet contains object information for the map layer. The *Source Objects* list can be sorted in ascending or descending order by clicking on a column header. For example, to sort by SID in descending order, click the *SID* column header twice. Object *PID*, *SID*, *Hyperlink*, *In Territory*, and user-defined attributes are displayed for each object. Select an object by clicking on any of its attributes. Select multiple objects by clicking while holding the CTRL key. Select a group of objects by holding SHIFT and clicking the first and last objects in the group.

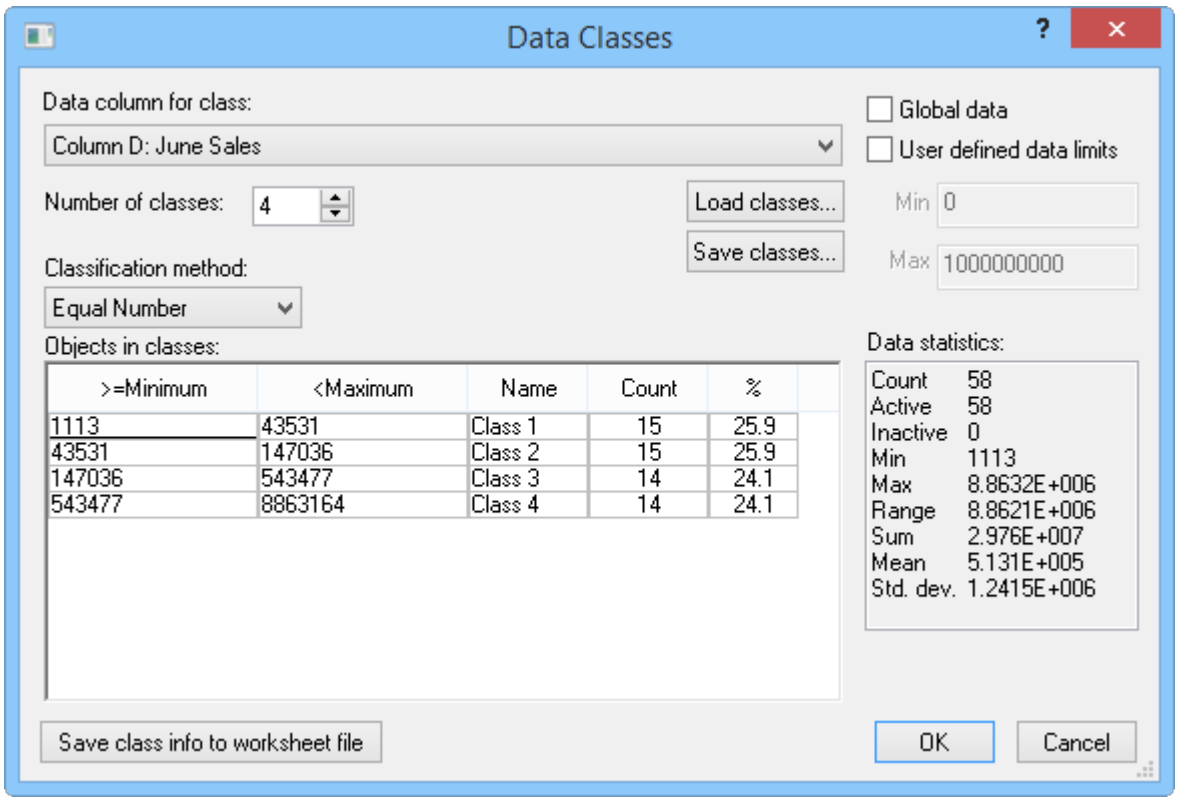
Adding Objects to Territories

Objects can be added to territories in the **Territories** dialog.

1. Select the territory to have objects added by clicking the box in the *Active* column next to the territory.
2. Select objects by clicking on them in the *Source objects:* sheet. Select multiple objects by clicking while holding CTRL. Select a group of objects by holding SHIFT and clicking the first and last object in the group.
3. Click the *Assign highlighted objects to checked territory* button to assign the objects to the active territory.

Data/Text Classes Dialog - Territories

Clicking the *Map territories by data classes* or *Map territories by text classes* button in the Territories dialog opens the **Data Classes** or the **Text Classes** dialog respectively.



Change class number or classification method, load, and save classes in the ***Data Classes*** *dialog.*

Data

Select the data column for classification in the *Data column for class:* list.

Click the *Global data* check box to use the global data minimum and maximum for data limits.

Click the *User defined data limits* check box to define data limits in the *Min* and *Max* boxes.

Number of Classes

Number of classes specifies the number of classes used in the map. This is equal to the number of classes displayed in the *Objects in classes* box. Type a number into the *Number of classes* box or change the value with the .

Classification Method

Select a *Classification method* from the list.

- *Equal number* calculates the class minimum and maximums such that an equal number (or as close to it as possible) of data values fall within each class.
- *Equal intervals* calculates the class limits such that the interval between the minimum and maximum of each class is equal. The *Increment* box is displayed when *Equal intervals* is selected, and this shows the range covered by each class.
- *Standard deviation* generates data classes based on the standard deviation of the data. When the *Standard deviation* method is selected, the *Increment* field appears. The *Increment* field allows you to define the standard deviation increment to establish the

class ranges and number of classes. The *Increment* and *Number of classes* values are dependent upon each other, so changing one value automatically changes the other.

- The Jenks' Natural breaks method creates classes based on the optimal natural breaks in your data.
- *User defined* allows you to create your own class definitions. Overlapping or discontinuous classes are not allowed. Double-click on the minimum and maximum values in the *Objects in classes* list to define the classes after you define the *Number of classes* (below).

Saving and Loading Classes

Once the classes are defined, they can be saved for reuse in a class file [.CLS]. Click the *Save Classes* button to save the classes. To use an existing class file, click the *Load Classes* button. You can also save the class information to a worksheet file by clicking the *Save Class Info to Worksheet File* button.

No Data and Undefined Data

The *Include "No Data" class* option creates a new class. All boundaries without a data value are placed in this class. This is one way to tell if your primary IDs on your map and data are mismatched. The *Include "All Others" class* option creates a new class that contains all values that do not fall in the specified classes.

Class Information

The *Objects in classes* box shows the minimum and maximum class values, percentage (%) of linked objects in the class, number of linked objects for each class (*Count*), and the fill pattern and color for each class (*Fill*).

- *>=Minimum* and *<Maximum* indicate the upper and lower limits for the class. If a data value is greater than or equal to the minimum value and less than the maximum value, it is plotted in the class. You can change these values by double-clicking on a minimum or maximum value and then typing a new value into the **Class Limit** dialog.
- *Name* is the territory name. Double click a territory name to change it in the **Edit Name** dialog.
- *Count* indicates the number of objects in each territory, and *%* shows the proportion of total objects in the territory.

Save Class Info to Worksheet File

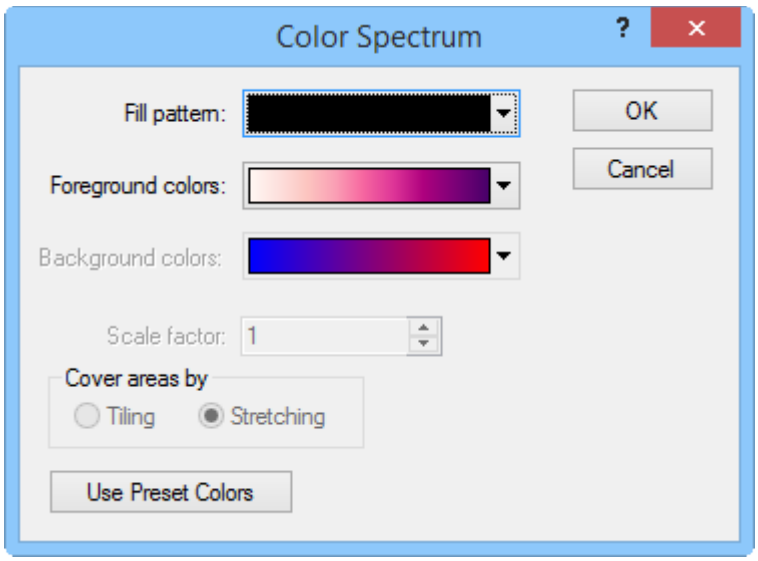
Click the *Save class info to worksheet file* button to save the information in the *Objects in classes* box to a [.DAT] file. Clicking the *Save class info to worksheet file* button opens the Data Export Options Dialog.

Data Statistics

The *Data statistics:* section displays statistical information for the territory map.

Color Spectrum

Hatch maps and territory maps use the **Color Spectrum** dialog to assign map colors based on data. The color spectrum has specific colors assigned to nodes along the spectrum. After you create a color spectrum, you can save the spectrum for later use with other maps. A number of predefined color spectrums are included with **MapViewer**.



*Select the color spectrum for hatch and territory maps in the **Color Spectrum** dialog.*

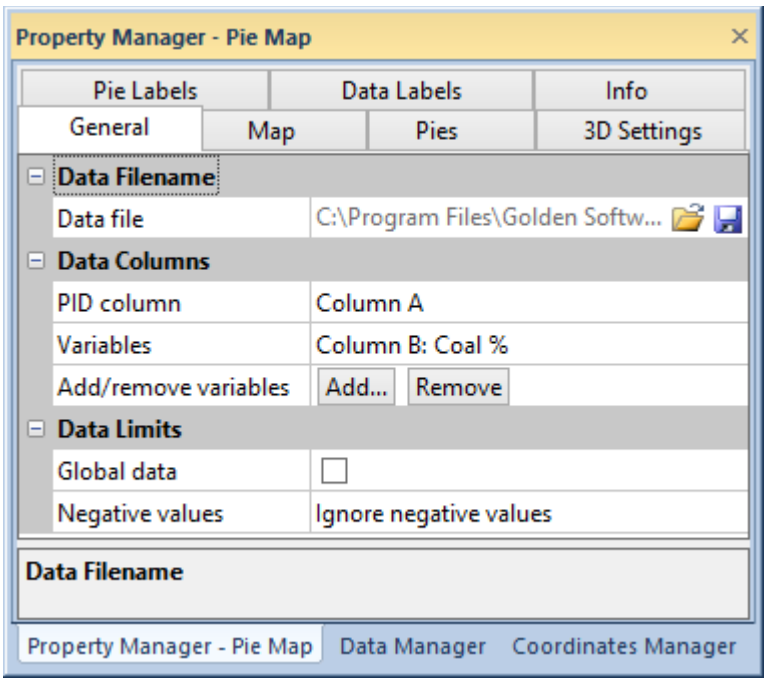
The Color Spectrum Dialog

Click the *Fill* button in the **Data Classes** or **Text Classes** dialog to open the **Color Spectrum** dialog.

- Click the *Foreground Colors* button to select the color spectrum for solid patterns and for the lines in non-solid patterns.
- If you have selected a pattern other than *Solid*, a *Background Colors* button is available. Click this button to assign background fill colors.
- Click the *Fill Pattern* button to apply a fill pattern to the map.
- When the *Fill Pattern* is a selection other than *Solid*, adjust the *Scale factor* for the pattern by typing a value in the *Scale factor* field or clicking the buttons.
- Also when a non-solid pattern is selected, the pattern can be tiled or stretched by selecting *Tiling* or *Stretching* in the *Cover areas by* group respectively.
- With territory and hatch maps, you can click the *Use Preset Colors* button to assign a fixed list of foreground colors to the classes rather than assigning the color spectrum colors.

General Page - Bar, Pie, and Territory Maps

The **General** page is located in the **Property Manager** when a thematic map is selected for the active layer. Information about the map's data file can be viewed and changed in the **General** page.



*Change or save the map data file, specify the PID and Variable columns, and set data limits on the**General** page of the **Property Manager**.*

Data Filename

The *Data File* property shows the current loaded data file for the map. Load a new data file into the map with the open button. Save changes to the data file with the save button.

Data Columns

The properties in the *Data Columns* section specify which data columns contain the map object PIDs and variable.

PID Column

PID column indicates the location of the primary ID in the data. The data primary ID must match the primary IDs used on the boundaries.

Variables

The *Variables* list indicates the location of data columns used in the map. The data column must contain numeric values.

Add/remove Variables

The *Add/remove variables* buttons add or remove columns from the *Variables* list. Click the *Add...* button to add variable columns in the Pick Columns to Add dialog.

To remove a data column from the *Variables* list, first select the data column you wish to remove in the *Variables* list. Then click the *Remove* button to remove the variable from the map.

Data Limits

The *Data Limits* section contains properties for specifying linked, global, or user defined data limits, and if absolute values are used for negative numbers.

Selecting Data Limits

When the *Global data* check box is clicked, the data limits are the minimum and maximum values in the *Variable column*, including unlinked data values. When *Global data* is not selected, the minimum and maximum linked data values are the data limits.

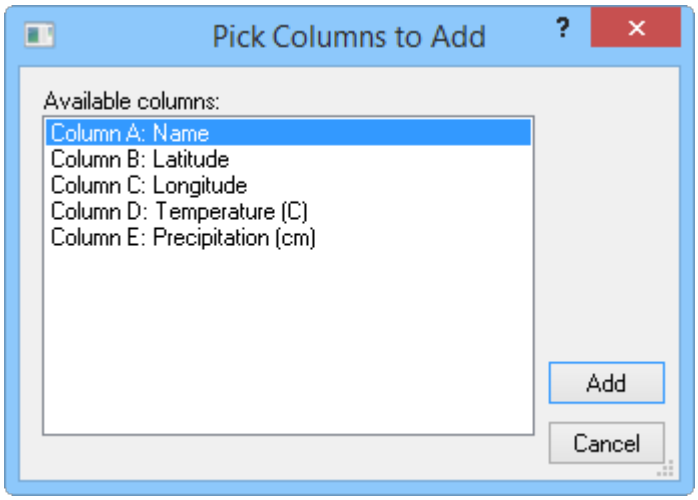
Territory maps do not have a *Data Limits* section.

Negative Values

Pie maps cannot show negative values in the pie charts. Choose how to treat negative values in the *Negative values* list. Selecting *Ignore negative values* does not include negative data values in the pie map. Selecting *Use absolute values* treats negative numbers in the data columns as positive numbers for mapping.

Pick Columns to Add Dialog

Pick columns to add to *Data Columns* on the **Property Manager** General page or to *Label Sets* on the Data Labels page.

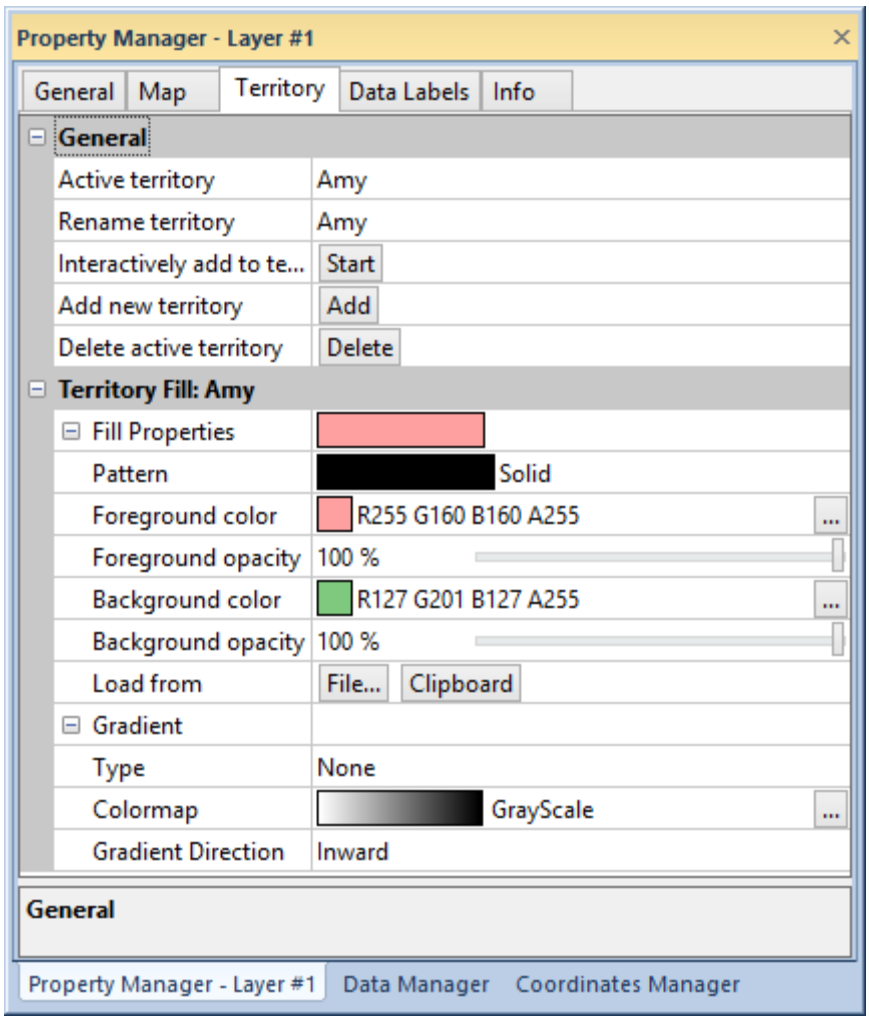


*Select columns to add in the **Pick Columns to Add** dialog.*

Click on a column name to select the column. Hold the CTRL key to select multiple items. To select a group of items, hold the SHIFT key and click the first and last items in the group. Click *Add* to add the selected data columns to the *Variables* list. Click *Cancel* to close the dialog without adding any data columns to the *variables* list.

Territory Page

The **Territory** page in the **Property Manager** is used to manually or automatically assign objects to territories in territory maps.



*Rename, edit, add, and delete territories, and change territory fill properties in the **Territory** page of the **Property Manager**.*

Editing the Active Territory

To activate a territory for editing, select a territory from the *Active Territory* list. Rename the territory by typing into the *Rename territory* box.

To add objects to the active territory interactively, click the *Start* button next to *Interactively add to territory*. Next, click on objects in the plot window to add them to the active territory. When you are finished adding territories, click the *Finish* button to end *Interactively add to territory* mode.

Click the *Add* button near *Add new territory* to add a new empty territory.

Click the *Delete* button near *Delete active territory* to delete the active territory.

Territory Fill

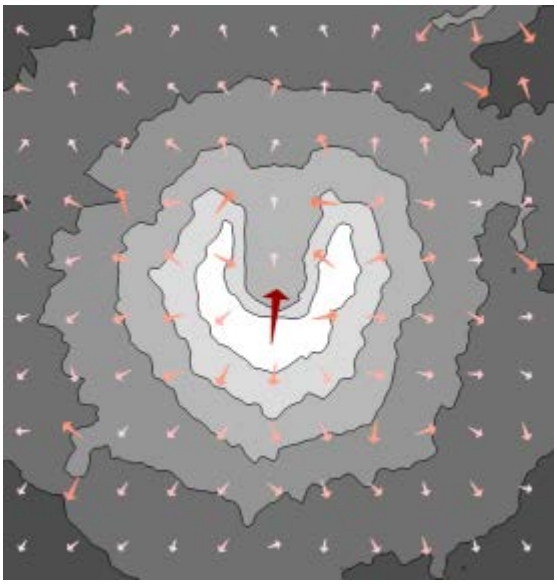
The active territory fill properties are edited in the *Territory Fill: [Active Territory]* group. Select a *Type*, *Colormap*, and *Gradient Direction* to apply a gradient fill to the territory. Click the *Colormap* button to open the Colormap dialog and create a custom colormap.

Chapter 17

Vector Maps

Vector Map

Vector maps interpolate from discrete data values to create a regularly-spaced grid. Vectors are drawn to show the direction and magnitude of the steepest slopes across the grid.



Creating and Editing a Vector Map

Click the **Map | Create Map | Vector** command 

to create a vector map. Edit vector map properties in the **Property Manager**.

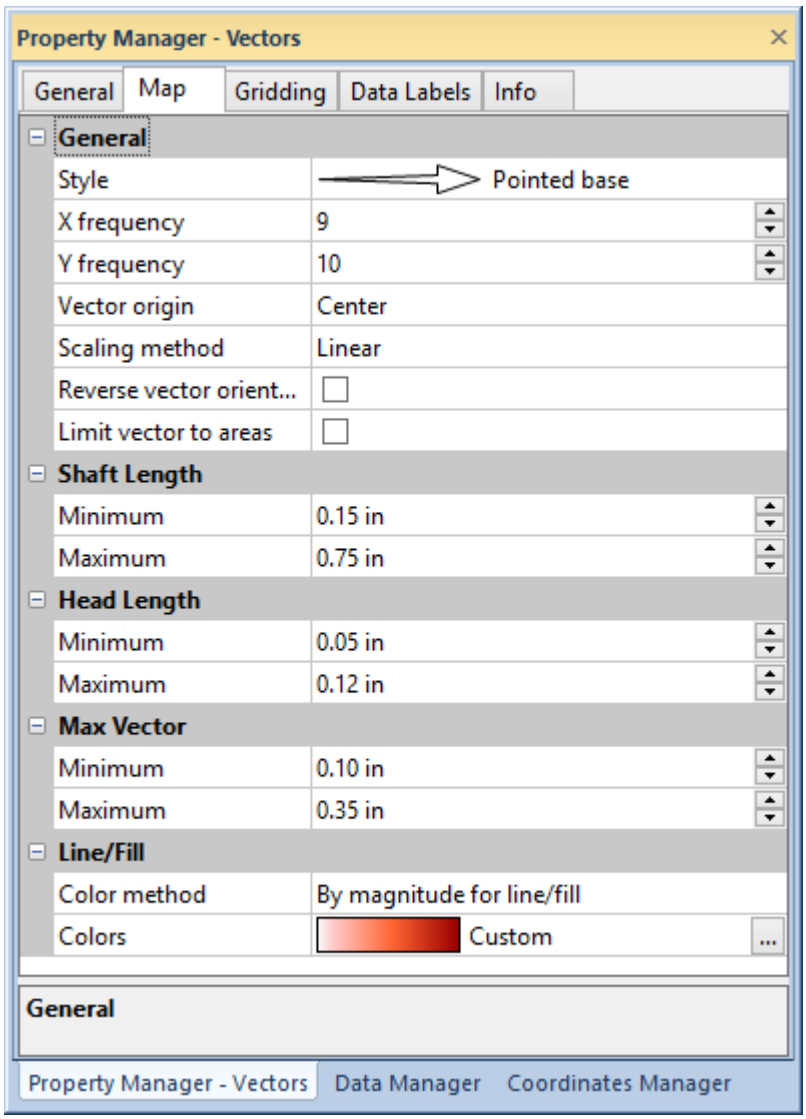
See Creating and Editing Thematic Maps for information on creating a map, changing a map to another map type, and changing map properties.

Vector Map Properties

The **Property Manager** for a vector map has General, Gridding, Data Labels, Info, and **Map** pages. Click the preceding hyperlinks for information on properties in each of the property manager pages.

Map Page

The **Property Manager Map** page for vector maps contains vector style, size, limits, line, and fill properties



*Change vector properties in the **Map** page of the **Property Manager**.*

General

The *General* group properties control the vector style, frequency, location, and scale.

Click the vector *Style* to select a style from the vector palette.

The *X frequency* and *Y frequency* values are the number of grid nodes skipped between plotted vectors. Increasing the value increases the distance between vector origins, and decreasing the value decreases the distance between vectors. Type a number into the *X frequency* or *Y frequency* box, or adjust the value by clicking the buttons.

Select the *Vector origin* by clicking on the current option and selecting *Tail*, *Center*, or *Head* from the list.

Select the *Scaling method* by clicking on the current option and selecting *Linear*, *Square root*, or *Logarithmic* from the list. All of the options are proportionally scaled to the data values in the *Variable column* selected on the *General* page. The *Linear* method scales the vectors to the data values and is best for data in a small range. The *Square root* method scales vectors to the square root of the data values, and the *Logarithmic* method scales vectors to the log of the data values. For large data ranges use the *Square root* method, and for very large data ranges use the *Logarithmic* method to scale the vectors.

Click the *Reverse vector orientation* check box to reverse the vector direction without changing the symbol or origin.

Click the *Limit vector to areas* check box to limit the vectors to the area defined by the base map

Vector Size

The *Shaft Length*, *Head Length*, and *Max Vector* groups set the minimum and maximum vector length (*Shaft* and *Head Length*) and width (*Max Vector*). The vector associated with the smallest data value is sized by the *Minimum* fields. The vector associated with the largest data value is sized by the *Maximum* fields, and the remaining vectors are scaled proportionally between the two based on the *Scaling method*. The *Minimum* and *Maximum* fields are in page units. Change the values by typing a number into the boxes or clicking the buttons.

Line/Fill

The *Line/Fill* group contains the *Color method*, line, and fill properties. Click the current *Color method* selection to open the list and select *Classes for line*, *Classes for fill*, *Classes for line/fill*, *By magnitude for line*, *By magnitude for fill*, *By magnitude for line/fill*, or *Uniform*.

The *Color method* property selects the vector line and/or fill properties determined by classes or magnitude. The property determined by the *Color method* is edited in the Vector Color Classes or Colormap dialog. The property not determined by the *Color method* is edited in the **Property Manager**. For example, if *Classes for line* is selected the fill properties are edited in the **Property Manager** and the line properties are edited in the Vector Color Classes dialog. Conversely, if *By magnitude for fill* is selected the line properties are edited in the **Property Manager** and the fill properties are edited in the Colormap dialog. If *Classes for line/fill* or *By magnitude for line/fill* is selected, then both properties are changed in the appropriate dialog.

If one of the *Classes for...* options is selected, click the Edit... button next to *Classes* to open the Vector Color Classes dialog.

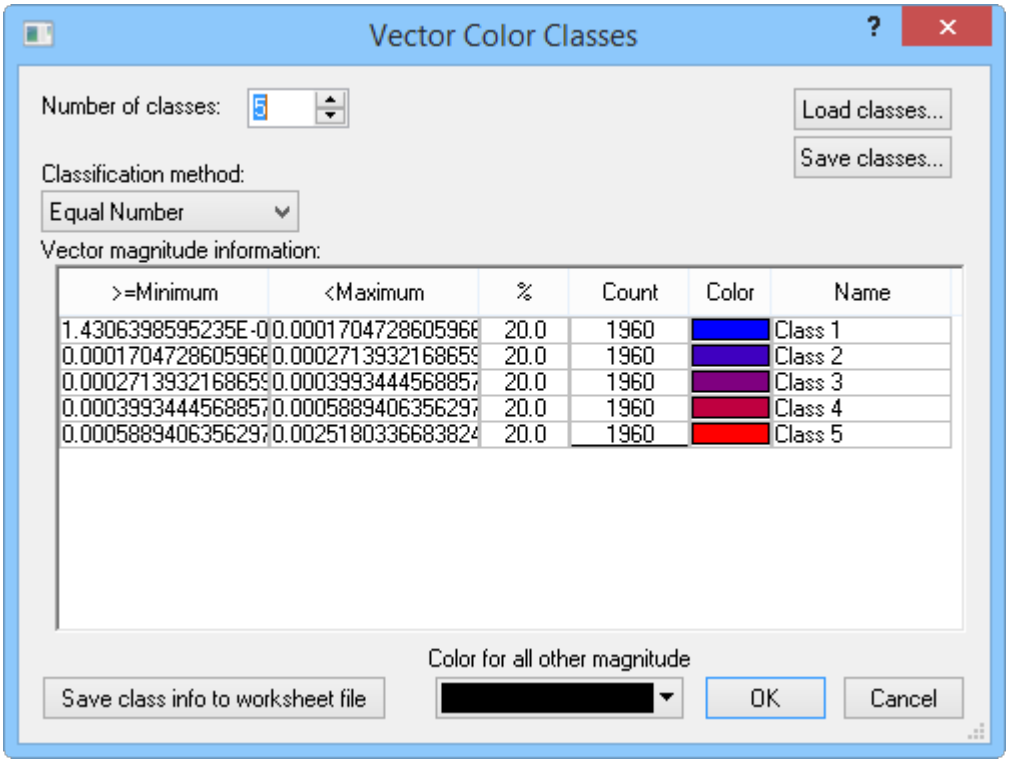
If one of the *By magnitude for...* options is selected, Click the current *Colors* option and select a color spectrum from the Color Spectrum list or click the ... button to create a custom color spectrum in the Colormap dialog.

For more information on editing properties not determined by the selected *Color method*, see the line properties and fill properties help pages.

Vector Color Classes

The **Vector Color Classes** dialog is opened when you click the *Classes* Edit... button on the *Map* page of the **Property Manager** for a vector map. The color classes operate similarly to hatch map

coloring. Set the *Color method* to *Classes for line*, *Classes for fill*, or *Classes for line/fill* to activate the *Classes* Edit... button. You can categorize the data by color, and these colors are plotted on the area prisms.



Edit classes in the ***Vector Color Classes*** *dialog.*

Data Classes

Number of classes specifies the number of color classes (groupings) used for the variable. Up to 100 classes can be specified. Type a number into the box or adjust the value by clicking the buttons.

Undefined Data

Color for all other magnitude is the color used for all areas without a corresponding data value and for areas that contain values that do not fall in the specified classes.

Saving and Loading Classes

Once the classes are defined, they can be saved for reuse in a class file [.CLS]. Click the *Save Classes* button to save the classes. To use an existing class file, click the *Load Classes* button. You can also save the class information to a data file by clicking the *Save Class Info to Worksheet File* button.

Classification Method

The *Classification method* is the method by which the class limits are calculated.

- *Equal Number* calculates the class minimum and maximums such that an approximately equal number of data values fall within each class.

- *Equal Intervals* calculates the class limits so that the interval between the minimum value and maximum value of each class is equal. The *Increment* box is displayed when *Equal Intervals* is selected, and this shows the range covered by each class.
- *User Defined* allows you to create your own class definitions. Overlapping or discontinuous classes are not allowed. Double-click on the minimum and maximum values in the class list to define the classes after you define the *Number of classes*.
- *Standard deviation* generates data classes based on the standard deviation of the data. When the *Standard deviation* method is selected, the *Increment* field appears. The *Increment* field allows you to define the standard deviation increment to establish the class ranges and number of classes. The *Increment* and *Number of classes* values are dependent upon each other, so changing one value automatically changes the other.
- The Jenks' Natural breaks method creates classes based on the optimal natural breaks in your data.

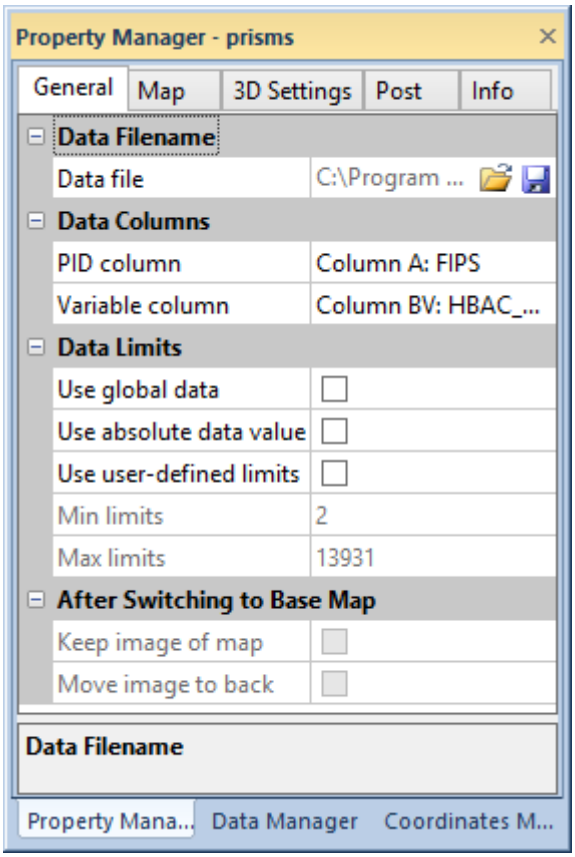
Class Information

The *Objects in classes* group displays summary statistics and allows you to specify the properties for each class.

- *>=Minimum* and *<Maximum* indicate the lower and upper limits for the class. If a data value is greater than or equal to the minimum value and less than the maximum value, it is plotted in the class. You can change these values by double-clicking on a minimum or maximum value to change it in the **Class Limit** dialog.
- The *%* column indicates the percentage of linked data in the particular class. This value cannot be edited and is for informational purposes only.
- The C*ount* column indicates the number of data included in each class. This value cannot be edited and is for informational purposes only.
- The *Color* column specifies the class's color. To change the color for a particular class, double-click the color in the list, and select a new color in the Colors dialog. To change the entire color spectrum, click the word *Color* at the top of the column and select a new color spectrum from the Color Spectrum dialog. Click the *Custom...* button in the **Color Spectrum** dialog to create a custom color spectrum in the Colormap dialog
- The *Name* column indicates the optional class title used in the legend.

General Page - Contour, Gradient, Hatch, Line Graph, Prism, Symbol, and Vector Maps

The **General** page is located in the **Property Manager** when a thematic map is selected for the active layer. Information about the map's data file can be viewed and changed in the **General** page. The Contour and Prism map options for switching to a base map are also available on the **General** page.



Change or save the map data file, specify the PID and Variable columns, and set data limits on the ***General*** *page of the* ***Property Manager****.*

Data Filename

The *Data File* property shows the current loaded data file for the map. Load a new data file into the map with the open button. Save changes to the data file with the save button.

Data Columns

The properties in the *Data Columns* section specify which data columns contain the map object PIDs and variable.

PID Column

PID column indicates the location of the primary ID in the data. The data primary ID must match the primary IDs used on the boundaries.

Variable Column

Variable column indicates the data column for use in the map. The variable must contain numeric data to create the map.

Data Limits

The *Data Limits* section contains properties for specifying linked, global, or user defined data limits, and if absolute values are used for negative numbers.

Selecting Data Limits

When the *Use global data* check box is clicked, the data limits are the minimum and maximum values in the *Variable column*, including unlinked data values.

Clicking the *Use user-defined limits* check box allows editing in the *Min limits* and *Max limits* cells. Type numeric values into *Min limits* and *Max limits* to set your own data limits.

If neither the *Use global data* or *Use user-defined limits* boxes are selected, the data limits are the minimum and maximum linked values in the *Variable column*.

Absolute Data Value

Clicking the *Use absolute data value* check box treats negative numbers in the *Variable column* as positive numbers for mapping.

After Switching to Base Map

Contour and Prism maps have the *After Switching To Base Map* section of the **General** page. The *After Switching To Base Map* properties involve retaining map features after changing the map to a base map with the **Map | Create Map | Base** command.

Prism Map - After Switching to Base Map

Keep image of map and *Move image to back* properties affect a prism map when the **Map | Create Map | Base** command is clicked. Click the check box next to *Keep image of map* to generate an image of the prism map before switching the map back to a base map. The image can be edited with the **Draw | Image** commands, but prism map properties, prism height for example, cannot be changed. Click the check box next to *Move image to back* to send the image to the back of the layer objects.

Contour Map - After Switching to Base Map

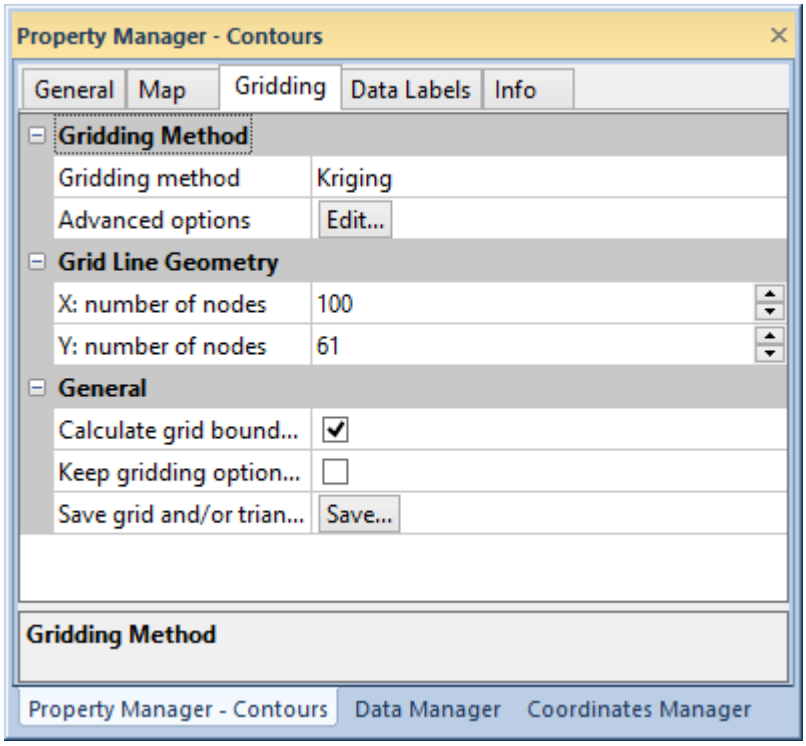
The *Retain contours* property saves the contour fill and generates polylines representing the contours when switching a contour map to a base map. Click the check box next to *Retain contours* before clicking **Map | Create Map | Base** to keep the contours visible on the base map.

Gridding

The **Gridding** page is used to set the gridding options. The data are typically randomly spaced, and this data must be converted into an evenly spaced grid before **MapViewer** draws the gradient map. The **Gridding** page is available in the **Property Manager** when a Contour, Gradient, or Vector map is selected.

When creating a grid you can usually accept all of the default gridding parameters and generate a grid that represents your data well. Under most circumstances, the recommended gridding method is kriging.

There are several gridding parameters you can set when producing a grid. Refer to the gridding method for more information on specific parameters. All gridding methods require at least three non-collinear data points. Some methods require more data points. For example, a higher-order polynomial fit needs more than three data points; there must be at least as many data as there are degrees of freedom.



*Change the gridding method, grid line geometry, and gridding options on the **Gridding** page of the **Property Manager**.*

Gridding Method

Choose the gridding method and *Advanced options* in the *Gridding method* group. Refer to individual gridding method pages for more information and advanced options.

Grid Line Geometry

Grid line geometry defines the grid density. The grid density is defined by the number of columns and rows in the grid. The *X: number of nodes* property is the number of grid columns, and the *Y: number of nodes* property is the number of grid rows. There is a maximum of 10,000 rows and 10,000 columns.

Higher grid densities increase the smoothness in the map. However, this increases the gridding time. Although highly dense grids can be created, time and space are practical limits. Limited memory, very large number of data, very dense grids, or any combination of these factors can greatly increase gridding time. When gridding begins, the status bar provides you with information about the estimated gridding time to complete the task.

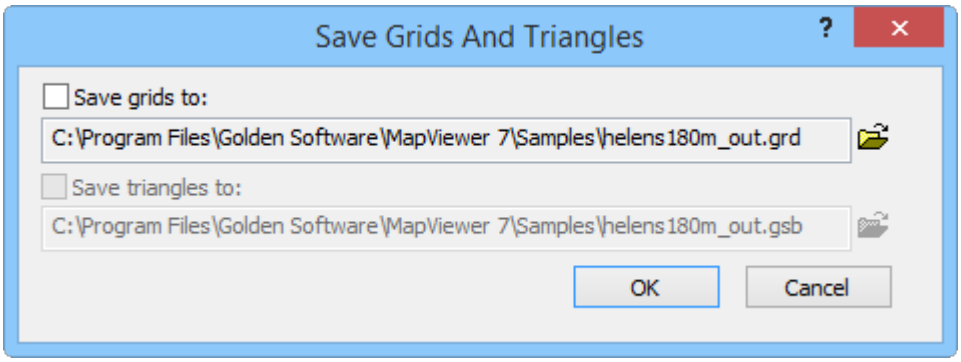
General

The *General* section contains options to calculate grid bounds, keep gridding options when changing data settings, and saving grids and triangles.

Click the check box next to *Calculate grid bounds with all layers* to include boundary objects from all layers in the grid bounds calculation.

Click the check box next to *Keep gridding options when data settings change* to keep the *Gridding method Advanced options* settings after changing the data for the map. Large changes in data with the *Keep gridding options when data settings change* property active will result in the entire grid being blanked out.

Click the Save... button next to *Save grid and/or triangles* to save the grid [.GRD] and/or triangles [.GSB] in the **Save Grids And Triangles** dialog.



*Select files to save and file location in the **Save Grids And Triangles** dialog.*

Select which file to save by clicking the *Save grids to:* or *Save triangles to:* check boxes. Triangles can only be saved if the gridding method is *Triangulation with Border Color Interpolation* or *Triangulation with Linear Interpolation*. If any other gridding method is selected the *Save triangles to:* area is grayed out.

Click the button to select the file location in the Save As dialog.

Click *OK* to save the selected files. Click *Cancel* to close the dialog without saving grid or triangle files.

Notes on Grids and Gridding

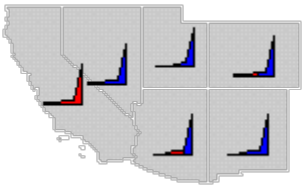
The grids are internally created and used within **MapViewer**. There is no access to these files. If you need to access grid files, use more advanced gridding, or manipulate grids, use Golden Software's **Surfer** instead.

Some gridding operations can take a few seconds, depending on the gridding settings, data set, and your computer's capabilities. The status bar displays information about the gridding process, from left to right: the gridding method, a completion bar, completion percent, time remaining estimate, and a *Cancel* button. Click the *Cancel* button to pause the gridding operation and choose to *Continue* or *Abort* in the dialog that is displayed. However, the gridding operation that is performed when creating a contiguous cartogram map cannot be cancelled.

Chapter 18

Line Graph Maps

Line Graph Map



Line graph maps show line graphs of the data at each centroid location. By looking at a single line graph, you can see how the individual data value relates to the whole data column. All data are sorted from minimum to maximum values and then graphed. The Y axis displays the relative data values, and the X axis displays the number of values in the data column. The *Graph fill* portion of the line graph (left side) displays the individual data value, and the *Profile fill* section (right side) fills remainder of the graph with another color to represent the entire data column.

To graph different data sets for each object, use a multi-graph map.

Line graph maps can be made for polygons, polylines, or points.

- For polygons, the line graphs are drawn at the area's centroid (geographic center). The polygons use the default fill and line properties, or you can set unique fill and line properties for each polygon on the map.
- For polylines, the line graphs are drawn at the midpoint along the polyline.
- For points, the line graphs are drawn directly on top of the points.

Creating and Editing a Line Graph Map

Click the **Map | Create Map | Line Graph** command 

to create a line graph map. Edit the line graph map properties in the **Property Manager**.

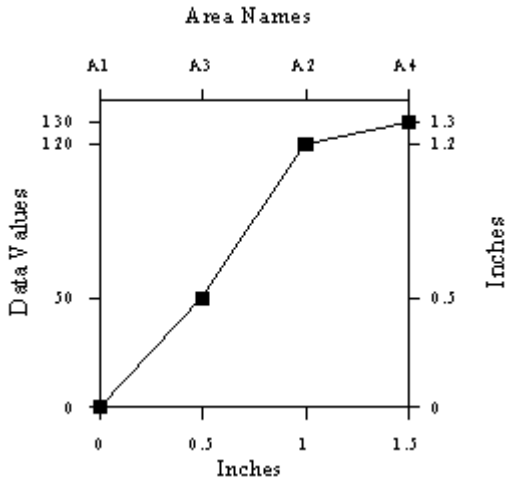
See Creating and Editing Thematic Maps for information on creating a map, changing a map to another map type, and changing map properties.

Line Graph Map Properties

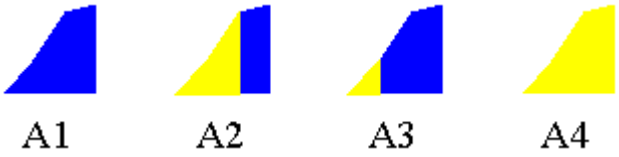
The **Property Manager** for a line graph map has General, Data Labels, Info, Graph, and Map pages. Click the preceding hyperlinks for information on properties in each of the property manager pages.

Line Graph Construction

Let's say we have four boundaries, named A1, A2, A3, and A4, and their linked data values are 0, 120, 50, and 130, respectively. The Line Graph Map dialog specifies that the graph *Width* is 1.5 inches, the *Graph height* is 1.3 inches, and the *Base height* is 0 inches. The graph fill is yellow and profile fill is blue. After the *OK* button is clicked, the four boundaries are sorted in ascending order in a list according to their linked values. The order results in A1 - A3 - A2 - A4. Since the line graph is 1.5 inches wide, that leaves a horizontal gap of 0.5 inches between each data value height of the four boundaries. The shape of the line graph would look like the following graph.

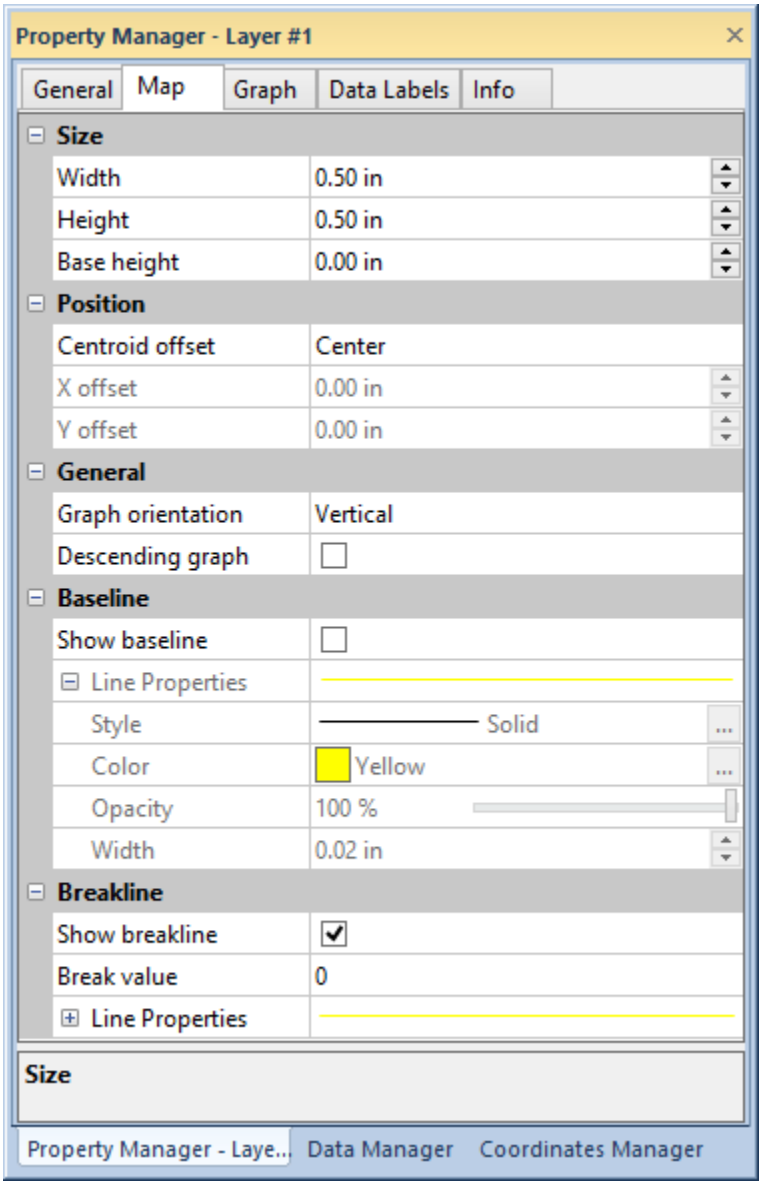


The line graph is plotted on the respective boundaries as follows. Note boundary A1 does not have any yellow fill because it corresponds to a line graph height of 0 inches. The boundary with the smallest data value always has 100 percent profile fill. The boundary with the largest data value has 100 percent graph fill.



Map Page

The **Map** page of the **Property Manager** contains graph size, position, orientation, baseline, and breakline properties for line graph maps and multi-graph maps.



*Change line graph size, position, and display options in the **Map** page of the **Property Manager**.*

Size

The *Size* group contains settings for line graph and multi-graph *Width* and *Height* and the line graph *Base height*. The *Height* value changes the maximum Y axis height of the graph. The *Width* value changes the maximum X axis width of the graph. The *Base height* is the height between the X axis line and the minimum data value. Change the *Width*, *Height*, and *Base height* values by typing into the box or clicking the buttons. The *Width*, *Height*, and *Base height* values are in page units.

Position

The centroid is the geographic center of an polygon, the midpoint along a polyline, or the location of a point. The centroid location can be moved for all objects with the Move Centroids command. The *Centroid offset* property is used to offset each graph from the centroid position. *Center*, *Left*, *Right*, *Above*, and *Below* position the graph in the specified direction relative to the centroid. *User defined* enables editing in the *X offset* and *Y offset* boxes so you can enter any offset amount. The offsets must be specified in page units.

General

Line graph data can be graphed vertically or horizontally. Select *Vertical* or *Horizontal* in the *Graph orientation* list to select the graph orientation. The graph fill is on the left side of the graph, and the profile fill is on the right side of the graph for a vertically oriented graph. In a horizontally oriented graph, the graph fill is above the profile fill.

By default, line graphs are graphed in ascending order. If you wish to graph the data in descending order, click the *Descending graph* check box. When the graph is descending, the maximum value is on the left side of the graph for vertical line graphs or on the top of the graph for horizontal line graphs.

Baseline

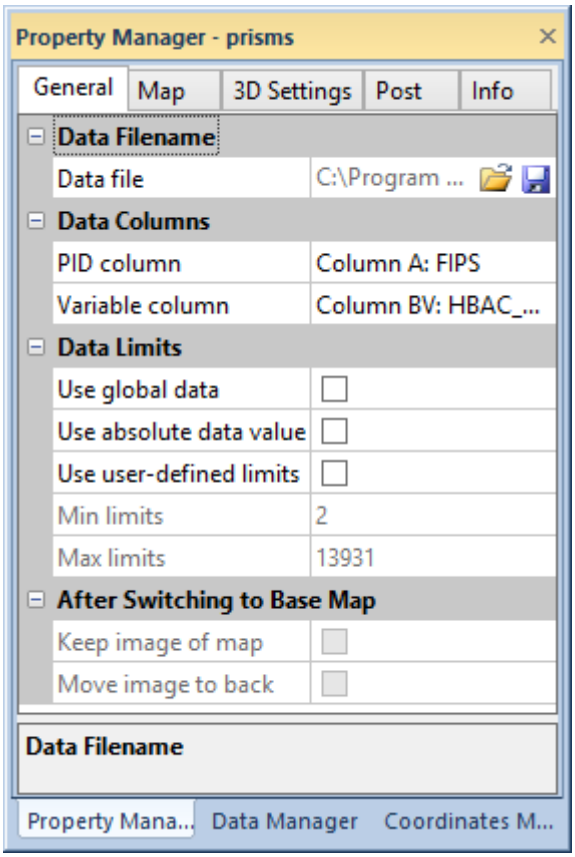
Click the *Show baseline* check box to add a baseline to the line graphs. When a baseline is drawn on the map, the baseline line properties can be edited.

Breakline

A breakline can be added to the line or multi graphs to identify a specific data value. Typically a break line is used to identify a benchmark or threshold value. Click the *Show breakline* check box to add a breakline to the line graphs. When a breakline is drawn on the map, the *Break value* and line properties can be edited. Type a number into the *Break value* box to set the breakline position.

General Page - Contour, Gradient, Hatch, Line Graph, Prism, Symbol, and Vector Maps

The **General** page is located in the **Property Manager** when a thematic map is selected for the active layer. Information about the map's data file can be viewed and changed in the **General** page. The Contour and Prism map options for switching to a base map are also available on the **General** page.



Change or save the map data file, specify the PID and Variable columns, and set data limits on the ***General*** *page of the* ***Property Manager****.*

Data Filename

The *Data File* property shows the current loaded data file for the map. Load a new data file into the map with the open button. Save changes to the data file with the save button.

Data Columns

The properties in the *Data Columns* section specify which data columns contain the map object PIDs and variable.

PID Column

PID column indicates the location of the primary ID in the data. The data primary ID must match the primary IDs used on the boundaries.

Variable Column

Variable column indicates the data column for use in the map. The variable must contain numeric data to create the map.

Data Limits

The *Data Limits* section contains properties for specifying linked, global, or user defined data limits, and if absolute values are used for negative numbers.

Selecting Data Limits

When the *Use global data* check box is clicked, the data limits are the minimum and maximum values in the *Variable column*, including unlinked data values.

Clicking the *Use user-defined limits* check box allows editing in the *Min limits* and *Max limits* cells. Type numeric values into *Min limits* and *Max limits* to set your own data limits.

If neither the *Use global data* or *Use user-defined limits* boxes are selected, the data limits are the minimum and maximum linked values in the *Variable column*.

Absolute Data Value

Clicking the *Use absolute data value* check box treats negative numbers in the *Variable column* as positive numbers for mapping.

After Switching to Base Map

Contour and Prism maps have the *After Switching To Base Map* section of the **General** page. The *After Switching To Base Map* properties involve retaining map features after changing the map to a base map with the **Map | Create Map | Base** command.

Prism Map - After Switching to Base Map

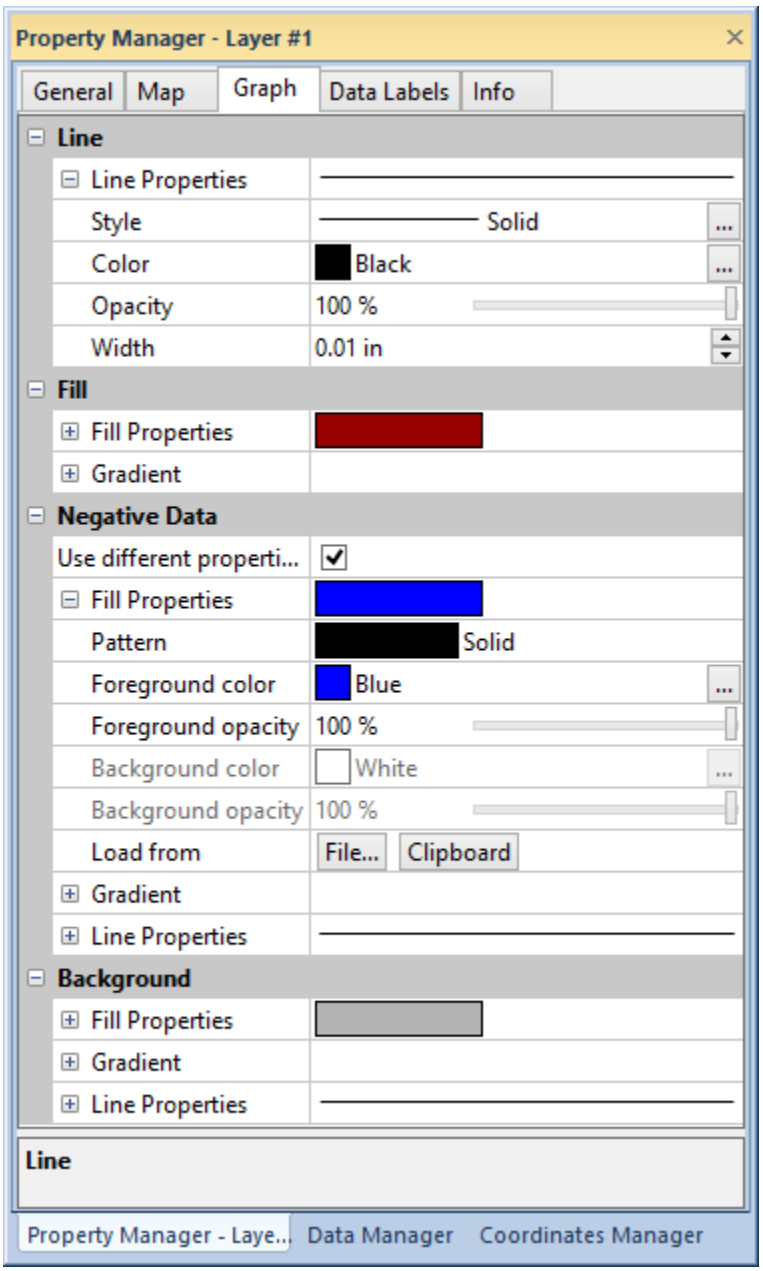
Keep image of map and *Move image to back* properties affect a prism map when the Map | Create Map | Base command is clicked. Click the check box next to *Keep image of map* to generate an image of the prism map before switching the map back to a base map. The image can be edited with the **Draw | Image** commands, but prism map properties, prism height for example, cannot be changed. Click the check box next to *Move image to back* to send the image to the back of the layer objects.

Contour Map - After Switching to Base Map

The *Retain contours* property saves the contour fill and generates polylines representing the contours when switching a contour map to a base map. Click the check box next to *Retain contours* before clicking **Map | Create Map | Base** to keep the contours visible on the base map.

Graph Page

The **Graph** page contains line and fill properties for line graph maps and multi-graph maps. The multi-graph map **Graph** page has only *Line* and *Background* properties sections.



*Edit line graph and multi-graph line and fill properties in the **Graph** page of the **Property Manager**.*

Line

The *Line* group controls the line properties for the outline of the graph fill section of a line graph map and the graph line in a multi-graph map. See the line properties help page for information on changing line properties.

Fill

The *Fill* section controls the fill properties for the graph fill section of a line graph map. See the fill properties help page for information on changing fill properties.

To apply a gradient fill, select a gradient *Type* by clicking on the current option and selecting *None*, *Linear*, or *Radial* from the list. Select a preset *Colormap* from the list, or click the button to make a custom colormap in the Colormap dialog. Select *Horizontal*, *Vertical*, *Inward*, or *Outward* from the *Gradient direction* list to choose a gradient direction.

Negative Data

Negative data can be represented with separate line and fill properties in a line graph map. Click the *Use different properties for negative data* check box to enable separate negative data properties.

The *Fill properties* group controls the fill properties for the graph fill section of a line graph map. See the fill properties help page for information on changing fill properties. Add a gradient fill using the same procedure as in the *Fill* section above.

The *Line properties* group control the outline of the graph fill in a line graph map. See the line properties help page for information on changing line properties.

Background

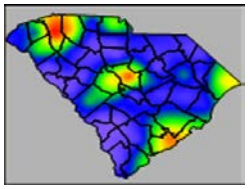
The *Background* group controls line and fill properties for the profile fill side of the line graphs in a line graph map and the background of multi-graph map graphs.

See the fill properties and line properties help pages for information on changing line and fill properties. Add a gradient fill using the same procedure as in the *Fill* section above.

Chapter 19

Gradient Maps

Gradient Map



A gradient map displays a range of colors based on information from points, polylines, and polygons. The centroid of an polygon, all vertices of a polyline, and center of a point are used as data point locations and the data value of the polygon, polyline, or point is interpolated onto a grid. The gridded data values are assigned colors based on the selected color spectrum. The resulting map is a smooth color spectrum between the original data.

- For polygons, the data originates at the polygon's centroid (geographic center). The color spectrum blends across area boundaries. If you would rather have a discrete colors for each area, use the hatch map instead.
- For polylines, the data originate at all vertices on the polyline. The color gradient is drawn in a rectangular shape that encompasses all the polylines.
- For points, the data originate directly on top of the points. The color gradient is drawn in a rectangular shape that encompasses all the points.

Creating and Editing a Gradient Map

Click the **Map | Create Map | Gradient** command 

to create a gradient map. Edit gradient map properties in the **Property Manager**.

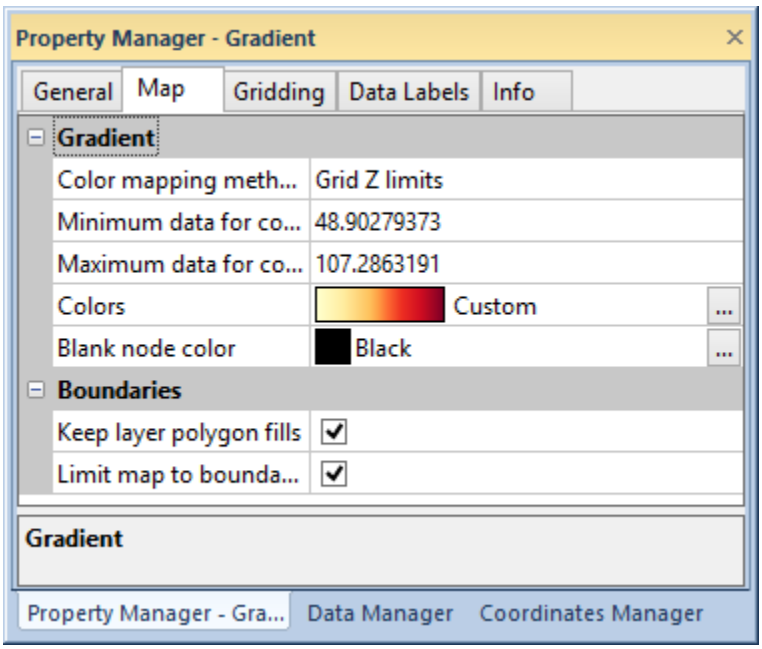
See Creating and Editing Thematic Maps for information on creating a map, changing a map to another map type, and changing map properties.

Gradient Map Properties

The **Property Manager** for a gradient map has General, Gridding, Data Labels, Info, and **Map** pages. Click the preceding hyperlinks for information on properties in each of the property manager pages.

Map Page

The **Map** page in the **Property Manager** for a gradient map controls the color mapping method, data limits for colors, color spectrum, and boundary options.



*Edit gradient map properties in the **Map** page of the **Property Manager**.*

Gradient

Color and data options for the gradient map are in the *Gradient* section of the **Map** page. Select *Worksheet data limits*, *Grid Z limits*, or *User defined* from the *Color mapping method* list. Selecting *Worksheet data limits* sets the *Minimum data for colors* and *Maximum data for colors* fields to the minimum and maximum data values in the linked worksheet. The *Grid Z limits* method sets the *Minimum data for colors* and *Maximum data for colors* to the minimum and maximum grid limits.

Type a value into the *Minimum data for colors* or *Maximum data for colors* to set user defined color limits. Adjusting the data limits automatically changes the *Color mapping method* to *User defined*.

The *Colors* property sets the color spectrum used in the gradient map. Click the current color spectrum to select a preset color spectrum. Click the ... button to create a color spectrum in the Colormap dialog.

Select a color for blank nodes and nodes outside the *Minimum data for colors* and *Maximum data for colors* range in the *Blank node color* list. Click the current color to select a color from the color palette. Click the ... button to select a color or create a custom color in the Colors dialog.

Boundaries

The *Boundaries* group on the **Map** page contains options for gradient map boundaries. Click the *Keep layer polygon fills* check box to show fills from polygons on the gradient map layer on top of the gradient map fill.

Click the *Limit map to boundaries* check box to limit the gradient map fill to the boundaries on all layers. When *Limit map to boundaries* is not checked, the gradient map fills the bounding box for the objects on all layers.

General Page

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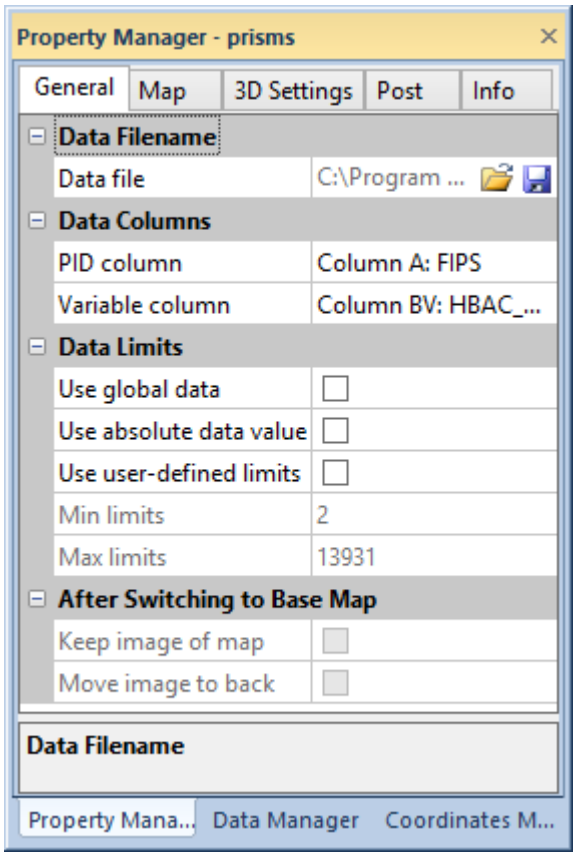

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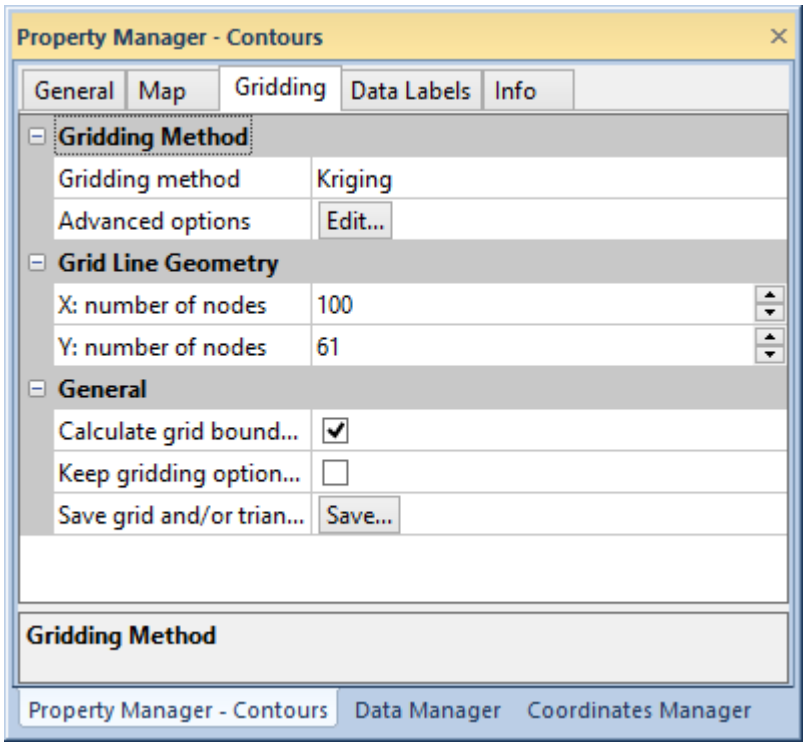


*Change the gridding method, grid line geometry, and gridding options on the **Gridding** page of the **Property Manager**.*

Gridding Method

Choose the gridding method and *Advanced options* in the *Gridding method* group. Refer to individual gridding method pages for more information and advanced options.

Grid Line Geometry

Grid line geometry defines the grid density. The grid density is defined by the number of columns and rows in the grid. The *X: number of nodes* property is the number of grid columns, and the *Y: number of nodes* property is the number of grid rows. There is a maximum of 10,000 rows and 10,000 columns.

Higher grid densities increase the smoothness in the map. However, this increases the gridding time. Although highly dense grids can be created, time and space are practical limits. Limited memory, very large number of data, very dense grids, or any combination of these factors can greatly increase gridding time. When gridding begins, the status bar provides you with information about the estimated gridding time to complete the task.

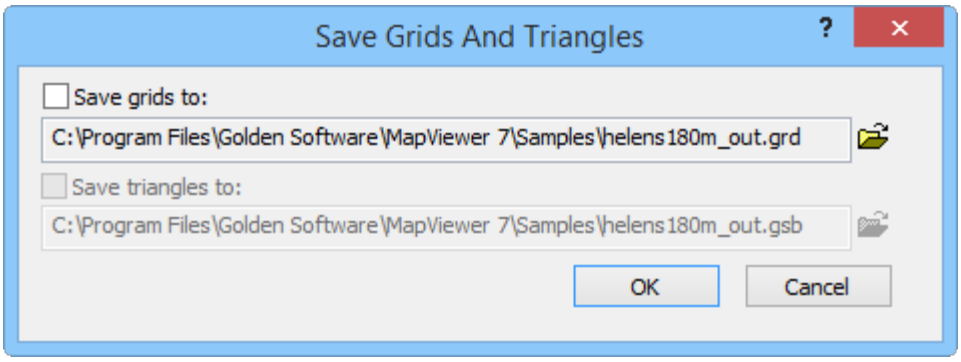
General

The *General* section contains options to calculate grid bounds, keep gridding options when changing data settings, and saving grids and triangles.

Click the check box next to *Calculate grid bounds with all layers* to include boundary objects from all layers in the grid bounds calculation.

Click the check box next to *Keep gridding options when data settings change* to keep the *Gridding method Advanced options* settings after changing the data for the map. Large changes in data with the *Keep gridding options when data settings change* property active will result in the entire grid being blanked out.

Click the Save... button next to *Save grid and/or triangles* to save the grid [.GRD] and/or triangles [.GSB] in the **Save Grids And Triangles** dialog.



*Select files to save and file location in the **Save Grids And Triangles** dialog.*

Select which file to save by clicking the *Save grids to:* or *Save triangles to:* check boxes. Triangles can only be saved if the gridding method is *Triangulation with Border Color Interpolation* or *Triangulation with Linear Interpolation*. If any other gridding method is selected the *Save triangles to:* area is grayed out.

Click the button to select the file location in the Save As dialog.

Click *OK* to save the selected files. Click *Cancel* to close the dialog without saving grid or triangle files.

Notes on Grids and Gridding

The grids are internally created and used within **MapViewer**. There is no access to these files. If you need to access grid files, use more advanced gridding, or manipulate grids, use Golden Software's **Surfer** instead.

Some gridding operations can take a few seconds, depending on the gridding settings, data set, and your computer's capabilities. The status bar displays information about the gridding process, from left to right: the gridding method, a completion bar, completion percent, time remaining estimate, and a *Cancel* button. Click the *Cancel* button to pause the gridding operation and choose to *Continue* or *Abort* in the dialog that is displayed. However, the gridding operation that is performed when creating a contiguous cartogram map cannot be cancelled.

Chapter 20

Bar Maps

Bar Map

Bar maps represent one or more data items side-by-side in a bar chart format. The height of each bar is proportional to the associated data value. The position of the bar chart is relative to the polygon, polyline, or point centroid. Centroids may be moved using the Move Centroids command.

Bar maps can be made for polygons, polylines, or points.

- For polygons, the bar charts are drawn at the polygons's centroid (geographic center). The polygons use the default fill and line properties, or you can set unique fill and line properties for each area on the map.
- For polylines, the bar charts are drawn at the midpoint along the polyline.
- For points, the bar charts are drawn directly on top of the points.

Creating and Editing a Bar Map

Click the **Map | Create Map | Bar** command 

to create a bar map. Edit bar map properties in the **Property Manager**.

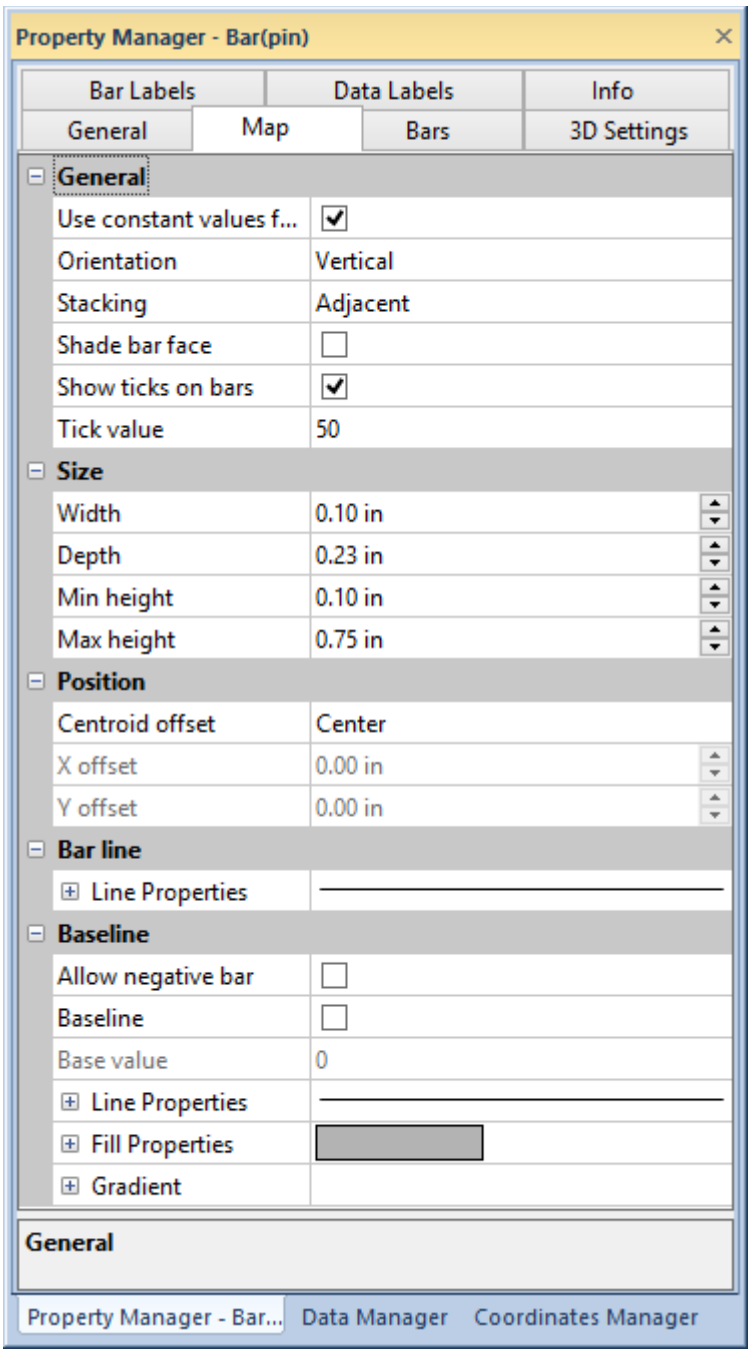
See Creating and Editing Thematic Maps for information on creating a map, changing a map to another map type, and changing map properties.

Bar Map Properties

The **Property Manager** for a bar map contains General, Data Labels, Info, Bars, Bar Labels, 3D Settings, and **Map** pages. Click the preceding hyperlinks for information on properties in each of the property manager pages.

Map Page

The bar map **Property Manager Map** page contains general bar style, size, and position properties. See the Bars page for variable specific bar properties.



*Change bar map properties in the **Map** page of the **Property Manager**.*

General

The *General* section of the **Map** page properties control the general bar properties in a bar map.

Click the *Use constant values for all variables* to use the same relative sizes for all data variables represented on the map. The *Use constant values for all variables* options should be checked when data values are related and/or have the same approximate magnitude. Differences between data in the smaller data columns are not easily discernible when *Use constant values for all variables* is

clicked. When *Use constant values for all variables* is active, size, tick, negative bar, and baseline properties for all variables are edited on the *Map* page.

If the *Use constant values for all variables* property is not active, the bars are scaled relative to their individual variable data. Size, tick, negative bar, and baseline properties are edited for each variable in the Bars page.

Select a *Vertical* or *Horizontal* bar direction in the *Orientation* list.

Select *Stacked* or *Adjacent* in the *Stacking* list to stack the bars or show them side by side.

Click the *Shade bar face* check box to apply shading to the bar face.

Click the *Show ticks on bars* check box to add reference tick marks to the bars. If *Show ticks on bars* and *Use constant values for all variables* is active, the *Tick value* can be changed by typing a number into the *Tick value* box. If *Use constant values for all variables* is not checked, the tick value is edited for each variable independently on the Bars page.

Size

The *Size* section specifies the *Width*, *Depth*, *Min height*, and *Max height* for the bars. The *Size* properties are only available on the *Map* page when *Use constant values for all variables* is checked. If different values are used for each variable, the bar size properties for each variable are edited in the Bars page. The *Width* and *Depth* fields change the size of all the displayed bars. The *Min height* value is applied to the minimum data value for all variables used in the bar map. The *Max height* value is the height of the bar corresponding to the largest data value for all variables used in the bar map. The remaining bars are sized proportionally between the minimum and maximum bar heights. Type a number in page units into one of the size fields or click the buttons to change the bar size.

Position

Select the bar position by clicking *Center*, *Left*, *Right*, *Above*, *Below*, or *User Defined* in the *Centroid offset* list. Selecting *User Defined* enables editing in the *X offset* and *Y offset* boxes. Type a value in page units into the *X offset* and *Y offset* fields or click the buttons to move the bar position relative to the object centroids. Object centroids can be moved with the Move Centroids command.

Bar line

Change the bar line properties in the *Bar line* section of the **Map** page. See the line properties help page for more information on editing line properties.

Baseline

The *Baseline* section of the **Map** page contains properties to show a baseline, set the base value, and edit baseline line and fill properties. Click the *Allow negative bar* check box to allow bars to grow in the opposite direction (down for *Vertical* bars, left for *Horizontal* bars) for negative data values. When *Allow negative bar* is not active, data value difference from the data minimum is represented by the bar height. When *Allow negative bar* is checked, the data value difference from the *Base value* is represented by the bar height.

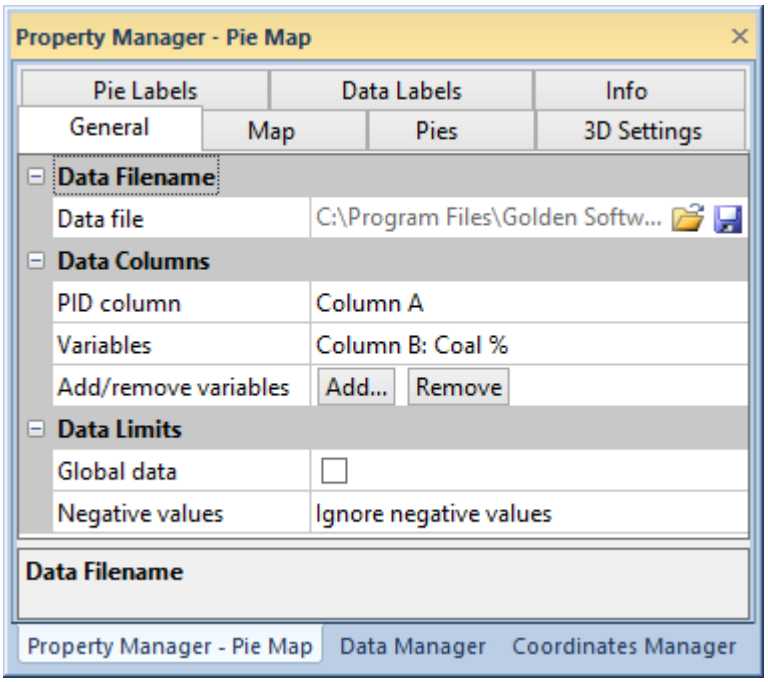
Click the *Baseline* button to show a baseline on the bar charts

The *Base value* field sets the base value when *Allow negative bar* and *Use constant values for all variables* are active. The *Base value* can be set by typing a number into the *Base value* field. If constant values are not used for variables, edit individual variable base values in the Bars page. When *Allow negative bar* is not checked the *Base value* is disabled and set at the minimum data value.

See the line properties and fill properties pages for more information on editing baseline line and fill properties. Apply a gradient fill to the baseline by selecting *Linear* or *Radial* from the *Type* list. Click on the *Colormap* selection to pick a predefined colormap for the gradient, or click the button to create a custom colormap in the Colormap dialog. Select a *Vertical*, *Horizontal*, *Inward*, or *Outward* gradient direction in the *Gradient Direction* list.

General Page

The **General** page is located in the **Property Manager** when a thematic map is selected for the active layer. Information about the map's data file can be viewed and changed in the **General** page.



*Change or save the map data file, specify the PID and Variable columns, and set data limits on the**General** page of the **Property Manager**.*

Data Filename

The *Data File* property shows the current loaded data file for the map. Load a new data file into the map with the open button. Save changes to the data file with the save button.

Data Columns

The properties in the *Data Columns* section specify which data columns contain the map object PIDs and variable.

PID Column

PID column indicates the location of the primary ID in the data. The data primary ID must match the primary IDs used on the boundaries.

Variables

The *Variables* list indicates the location of data columns used in the map. The data column must contain numeric values.

Add/remove Variables

The *Add/remove variables* buttons add or remove columns from the *Variables* list. Click the *Add...* button to add variable columns in the Pick Columns to Add dialog.

To remove a data column from the *Variables* list, first select the data column you wish to remove in the *Variables* list. Then click the *Remove* button to remove the variable from the map.

Data Limits

The *Data Limits* section contains properties for specifying linked, global, or user defined data limits, and if absolute values are used for negative numbers.

Selecting Data Limits

When the *Global data* check box is clicked, the data limits are the minimum and maximum values in the *Variable column*, including unlinked data values. When *Global data* is not selected, the minimum and maximum linked data values are the data limits.

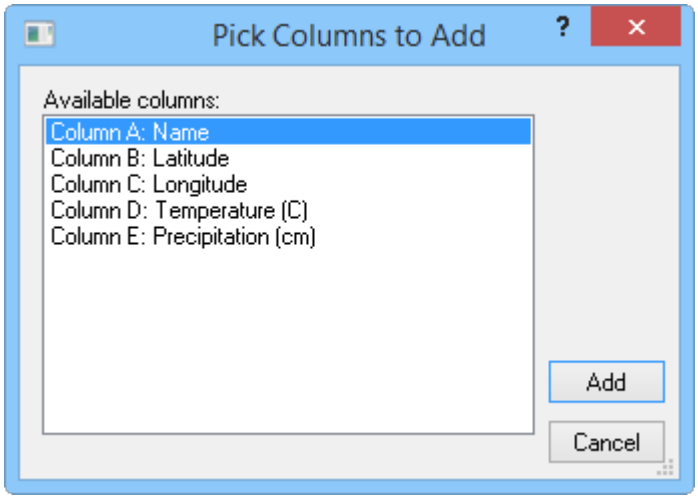
Territory maps do not have a *Data Limits* section.

Negative Values

Pie maps cannot show negative values in the pie charts. Choose how to treat negative values in the *Negative values* list. Selecting *Ignore negative values* does not include negative data values in the pie map. Selecting *Use absolute values* treats negative numbers in the data columns as positive numbers for mapping.

Pick Columns to Add Dialog

Pick columns to add to *Data Columns* on the **Property Manager** General page or to *Label Sets* on the Data Labels page.

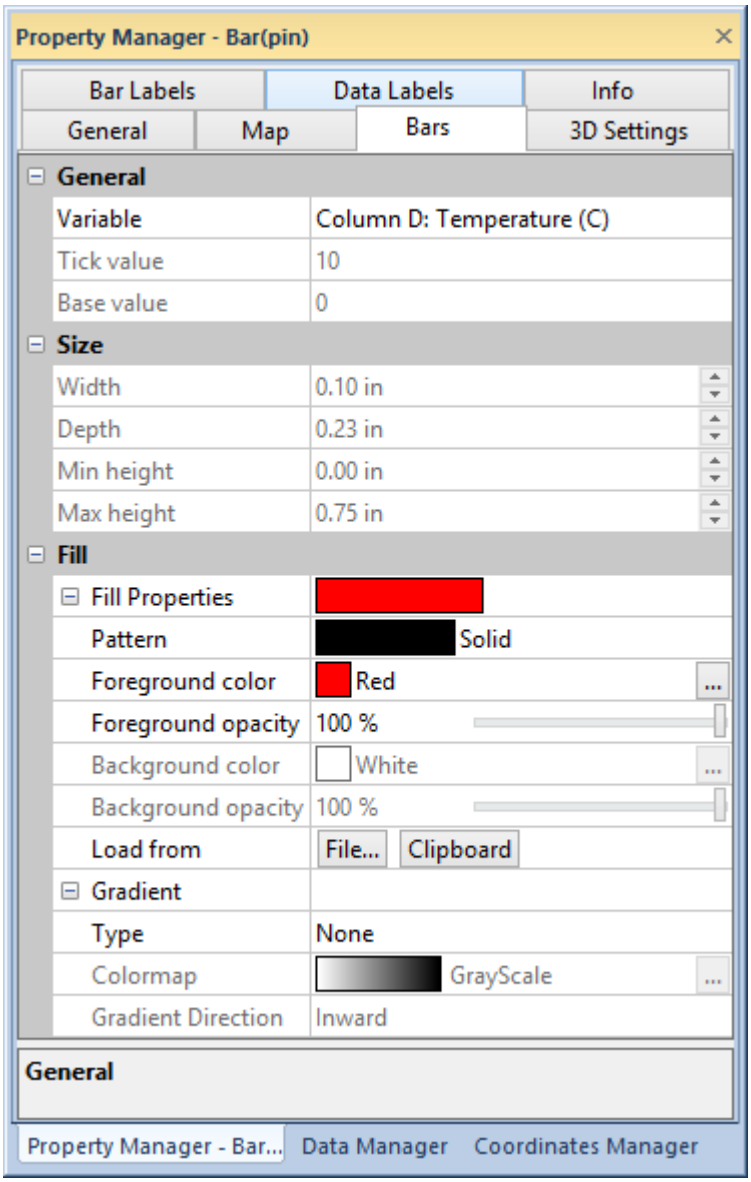


*Select columns to add in the **Pick Columns to Add** dialog.*

Click on a column name to select the column. Hold the CTRL key to select multiple items. To select a group of items, hold the SHIFT key and click the first and last items in the group. Click *Add* to add the selected data columns to the *Variables* list. Click *Cancel* to close the dialog without adding any data columns to the *variables* list.

Bars Page

The **Bars** page of the bar map **Property Manager** contains variable column specific bar properties. See the bar map **Map** page for general bar properties. If the *Use constant values for all variables* is active on the Map page, only variable column bar fill properties are changed on the **Bars** page.



*Change variable column specific bar properties in the **Bars** page of the **Property Manager**.*

General

Select the variable column and change tick and base values in the *General* section. The properties in the **Bars** page are unique to each column in the *Variable* list and are edited independently. Click on the current selection in the *Variable* list to select a variable column to edit. The *Variable* list is populated by the variable columns specified in the *Data Columns* section of the General page.

If *Use constant values for all variables* is not checked and *Show ticks on bars* is active on the Map page, the *Tick value* for each *Variable* column is changed by typing a number into the *Tick value* box.

If *Use constant values for all variables* is not checked and *Allow negative bar* is active on the Map page, the *Base value* for each *Variable* column is changed by typing a number into to *Base value* box. If *Allow negative bar* is not checked on the Map page, the *Base value* field is disabled and set at the minimum data value in the *Variable* column.

Size

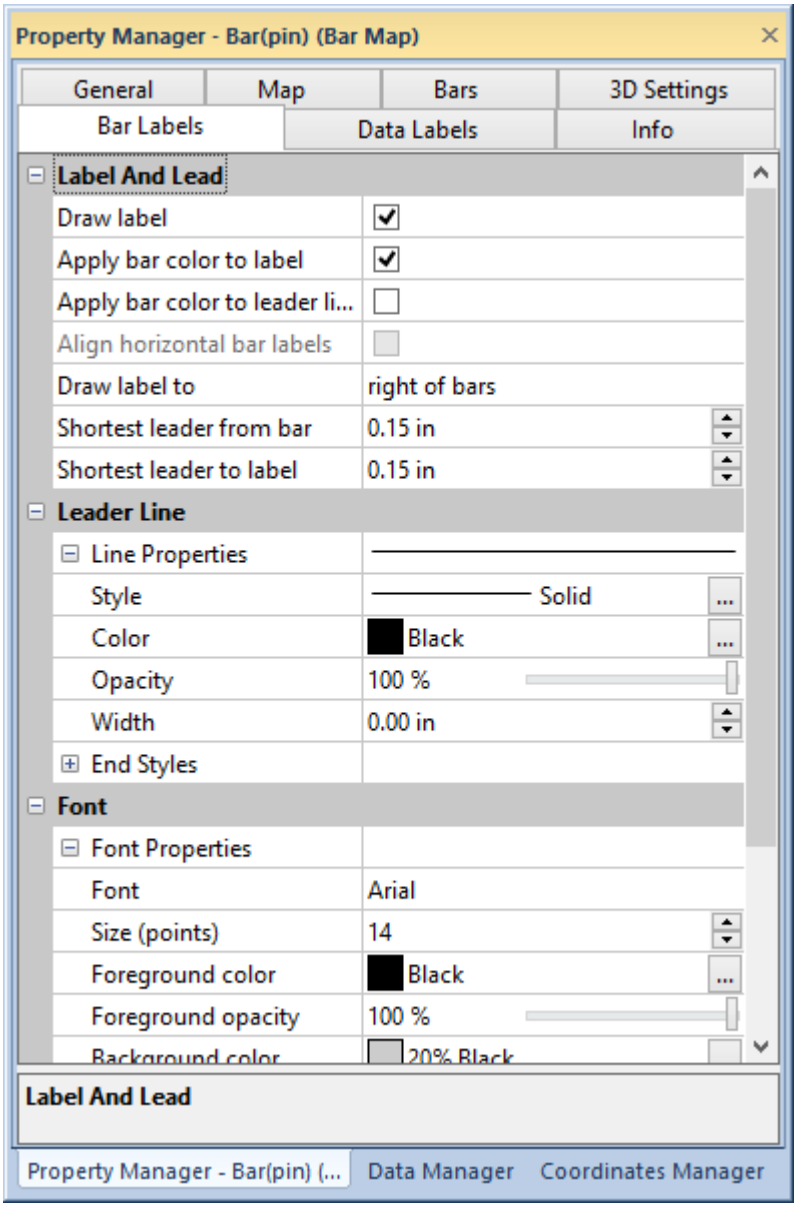
The *Size* section specifies the *Width*, *Depth*, *Min height*, and *Max height* for the bars. The *Size* properties are only available on the **Bars** page when *Use constant values for all variables* is not active. The *Width* and *Depth* fields change the size of the displayed bars for the selected *Variable* column. The *Min height* value is applied to the minimum data value for the selected *Variable* column. The *Max height* value is the height of the bar corresponding to the largest data value in the *Variable* column. The remaining bars are sized proportionally between the minimum and maximum bar heights. Type a number in page units into one of the size fields or click the buttons to change the bar size.

Fill

Apply individual fill properties to each *Variable* column's bars in the *Fill* section of the **Bars** page. See the fill properties help page for more information on changing bar fill properties. Apply a gradient fill to the bars by selecting *Linear* or *Radial* from the *Type* list. Click on the *Colormap* selection to pick a predefined colormap for the gradient, or click the button to create a custom colormap in the Colormap dialog. Select a *Vertical*, *Horizontal*, *Inward*, or *Outward* gradient direction in the *Gradient Direction* list.

Bar Labels Page

The **Bar Labels** page in the **Property Manager** for a bar map has options to show labels and leader lines and edit label and leader line properties.



*Add bar labels and lead lines, and edit label properties in the **Bar Labels** page of the **Property Manager**.*

Label And Lead

The *Label And Lead* section of the **Bar Labels** page has color and position properties for bar labels and leader lines. Click the *Draw label* check box to show data labels for bars.

To apply bar colors to labels and leader lines, click the *Apply bar color to label* and the *Apply bar color to leader line* check boxes.

When *Horizontal* is the selected *Orientation* on the Map page, the *Align horizontal bar labels* option is available. To align the horizontal labels for multi-variable bars click the *Align horizontal bar labels* check box.

Select *right of bars*, *left of bars*, or *center of bars* from the *Draw label to* list to change the label position. If the bars are drawn horizontally, only *right of bars* is available.

The *Shortest leader from bar* and *Shortest leader to label* values control the leader line length. Lead lines are made up of two sections. The vertical leader line section length is adjusted by typing a number in page units in the *Shortest lead from bar* field. The horizontal leader line section length is adjusted by typing a number in page units in the *Shortest leader to label* field. These values can also be adjusted by clicking the buttons. When labels are drawn to the *center of bars*, only the *Shortest leader from bar* value is applicable. The *Shortest leader to label* property is disabled since lead lines to center aligned labels have no horizontal section.

Leader Line

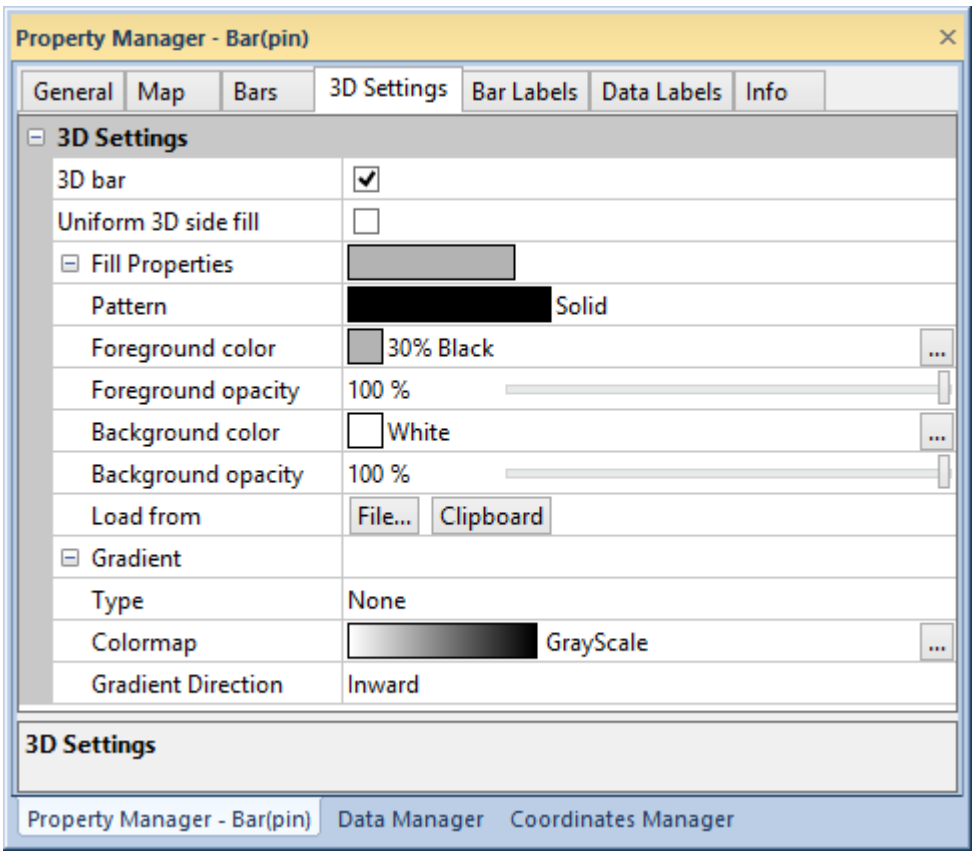
The leader line properties are changed in the *Leader Line* section of the *Bar Labels* page. The leader line color set in the *Leader Line* section is overridden by the *Apply bar color to leader line* property. See the line properties help page for more information on editing line properties.

Font

Label font properties are changed in the *Font* section of the *Bar Labels* page. The *Apply bar color to label* property overrides the text color selection in the *Font* section. See the text and font properties help page for more information on editing font properties.

3D Settings Page

The **3D Settings** page in the **Property Manager** for bar maps contains 3D bar image options.



*Activate 3D bars and apply a uniform 3D fill in the **3D Settings** page of the **Property Manager**.*

Click the *3D bar* check box to make bars appear three dimensional. The bar depth is set in the *Depth* field of the Map page when the *Use constant values for all variables* property in the Map page is active. The bar depth is set in the *Depth* field of the Bars page when the *Use constant values for all variables* property in the Map page is not checked. When constant values are not used for the bar variables, bar depths are set independently for each *Variable* in the Bars page.

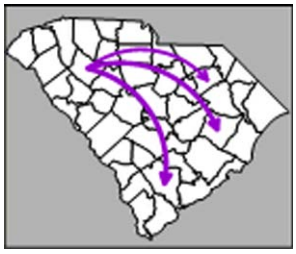
Click the *Uniform 3D side fill* check box to apply a uniform fill to 3D bar sides. When *Uniform 3D side fill* is not checked, the sides of the bar use the same fill as the face. The bar fill is set in the Bars page for each variable independently.

See the fill properties help page for more information on editing bar side fills. Apply a gradient fill to the sides of the bars by selecting *Linear* or *Radial* from the *Type* list. Click on the *Colormap* selection to pick a predefined colormap for the gradient, or click the ... button to create a custom colormap in the Colormap dialog. Select a *Vertical*, *Horizontal*, *Inward*, or *Outward* gradient direction in the *Gradient Direction* list.

Chapter 21

Flow Maps

Flow Map



Flow maps show the movement of people, commodities, animals, or other data from one location to another. These maps show data based on routes of travel and vary line thickness to show amount of travel. The greater the movement, the thicker the line. **MapViewer** can draw lines from centroid to centroid to create a flow map, or associate a data file with a base map of polylines to create a flow map design.

Creating and Editing a Flow Map

Click the **Map | Create Map | Flow** command 

to create a flow map. Edit flow map properties in the **Property Manager**.

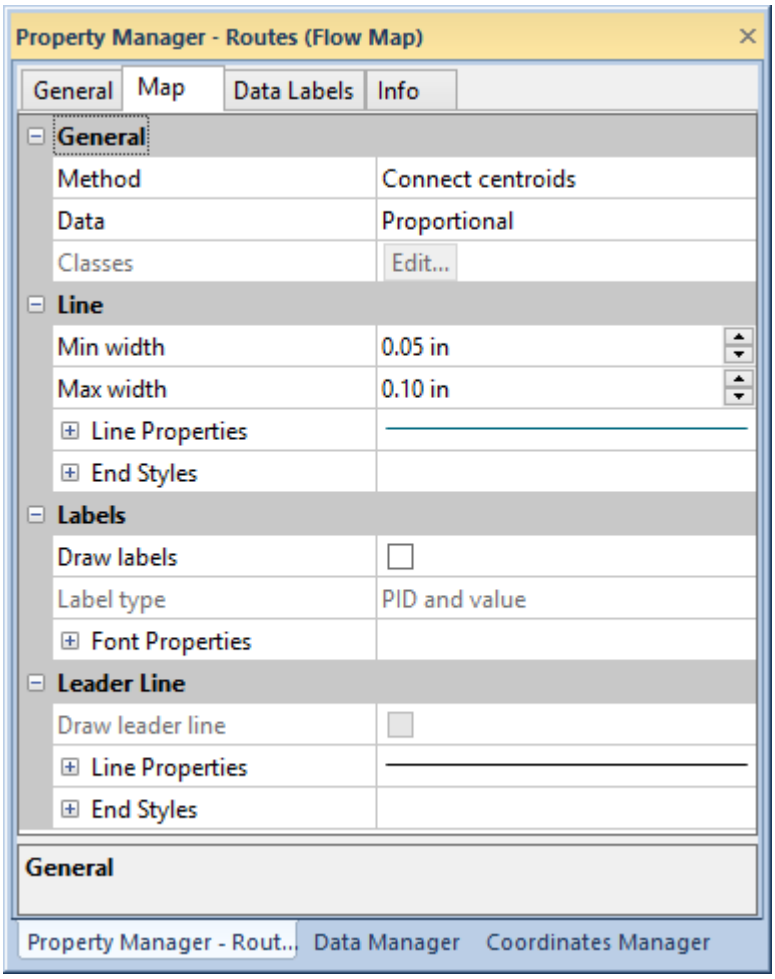
See Creating and Editing Thematic Maps for information on creating a flow map, changing a flow map to another map type, and changing map properties.

Flow Map Properties

The **Property Manager** has General, Data Labels, Info, and **Map** pages for editing flow maps. Click the preceding hyperlinks for information on properties in each of the property manager pages.

Map Page

The **Map** page in the **Property Manager** for a flow map contains method, data, line, and label properties.



*Edit flow map properties in the **Map** page of the **Property Manager**.*

General

The *General* section of the **Map** page contains the method, data, and class properties. Select *Apply to polylines* or *Connect centroids* for the flow map method in the *Method* list.

- The *Connect centroids* method connects boundary object centroids based upon starting and ending primary IDs. You can connect the centroids of polygons, polylines, or points.
- The *Apply to polylines* method applies flow map properties to polyline objects associated with a data file. Each polyline must be associated with a primary ID and data value. This method is useful for mapping direct line data, such as traffic volume or river flow.

Start PID	End PID	Flow Data
AZ	FL	17
AZ	TN	5

Data for the Connect centroids *method should be similar to the above format.*

PID	Flow Data
Polyline1	17
Polyline2	5

Data for the Apply to polylines *method should be similar to the above format.*

Select *Proportional* or *Use classes* for the flow line property method in the *Data* list. The *Proportional* method draws flow lines with the same color and style and varies the line width based on the data value. The *Use classes* method applies properties to flow lines based on classes specified in the Classes dialog.

Open the Classes dialog to specify data classes by clicking the Edit... button in the *Classes* field. If the *Proportional* method is selected in the *Data* field, the *Classes* box is disabled.

Line

Edit line properties for flow maps in the *Line* section of the **Map** page. If the *Use classes* method is selected in the *Data* field, the line properties are disabled in the **Property Manager** and the flow lines are edited in the Classes dialog.

Set the *Min width* and *Max width* for the *Proportional* data method by typing a value in page units or clicking the buttons. The flow line with the smallest data value is sized by the *Min width* value, and the flow line with the largest data value is set to the *Max width*. The other flow lines are sized proportionally between the minimum and maximum widths.

See the line properties help page for more information on editing flow line properties.

Labels

Labels are added in the *Labels* section of the **Map** page. Labels cannot be added to a flow map drawn with the *Apply to polylines* method. Click the *Draw labels* check box to show labels for the flow lines.

Select *PID*, *Value*, or *PID and value* from the *Label type* list to select the information displayed on the flow line label. The *PID* option shows the start and end object PIDs. The *Value* option shows the value for the flow line. The *PID and value* option shows both start and end PIDs and values separated by a colon.

When the *Data* property is *Proportional*, edit the labels' font properties in the *Front Properties* section. See the Text and Font Properties help page for more information on editing font properties.

Leader Line

Leader lines are added in the *Leader Line* section of the **Map** page. Leader lines cannot be added to a flow map drawn with the *Apply to polylines* method. Click the *Draw leader line* check box to draw leader lines between the flow lines and labels.

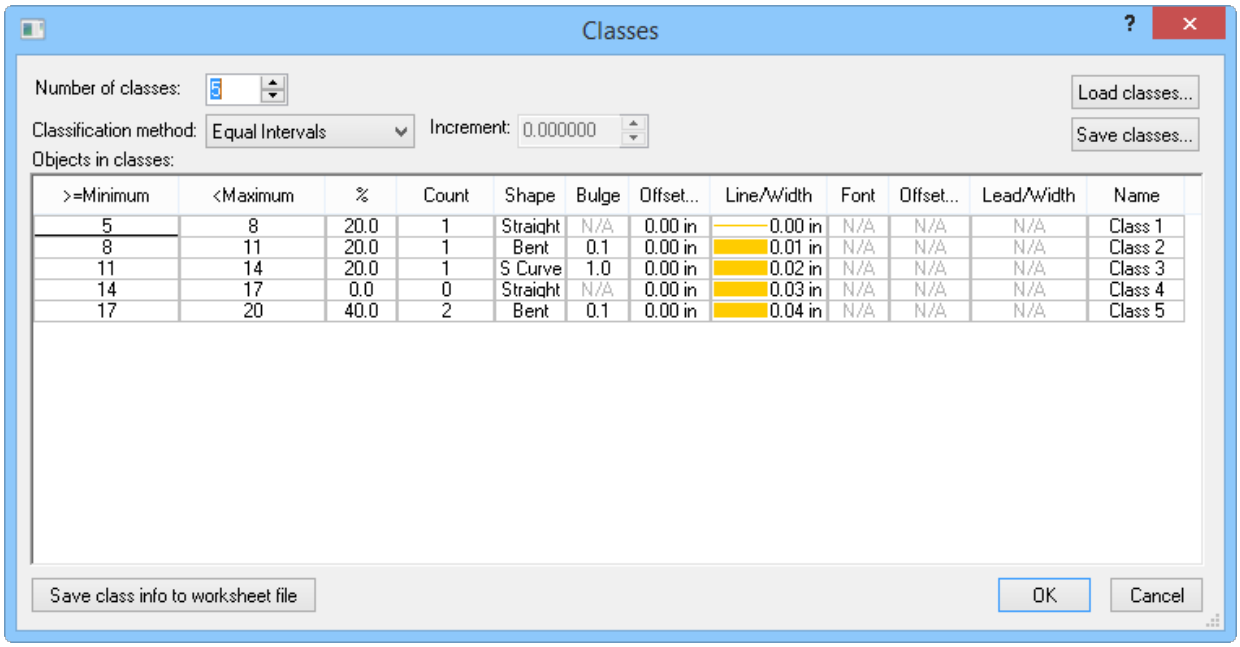
When the *Data* property is *Proportional*, edit the leader line properties in the *Line Properties* and *End Styles* sections. See the Line Properties help page for more information on editing line properties.

Labels and Leader Lines when Using Classes

Edit label and leader line properties in the Classes dialog when the *Data* property is *Use Classes*.

Classes Dialog

The **Classes** dialog contains the classification method and properties for a flow map with *Use classes* as the selected *Data* method. The Classes dialog is opened by clicking the Edit... button in the *Classes* field of the *Map* page in the **Property Manager**.



Set the number of classes and classification method, class minimum and maximums,

Number of Classes

The *Number of classes* value is used to specify the number of classes or groupings on the map. This number is the number of classes displayed in the *Objects in classes* table. You can have up to 100 classes.

Classification Method

The *Classification method* specifies the method used to calculate the limits of the classes.

- *Equal Number* assigns the class ranges so that an approximately equal numbers of flow lines are included in each class. In this case, the interval of each class is usually different.
- *Equal Intervals* calculates the class limits such that the interval between the minimum and maximum of each class is equal. In this case, different numbers of flow lines might be assigned to each class. The *Increment* box is displayed when *Equal Intervals* is selected. This box shows the range covered by each bin.
- *Standard deviation* generates data classes based on the standard deviation of the data. When the *Standard deviation* method is selected, the *Increment* field appears. The *Increment* field allows you to define the standard deviation increment to establish the class ranges and number of classes. The *Increment* and *Number of classes* values are dependent upon each other, so changing one value automatically changes the other.
- The Jenks' Natural breaks method creates classes based on the optimal natural breaks in your data.
- *User Defined* allows you to create your own class definitions. Overlapping or discontinuous classes are not allowed. Double-click on the minimum and maximum values in the *Objects in classes* list to define the classes after you define the *Number of classes*.

Saving and Loading Classes

Once the classes are defined, they can be saved for reuse in a class file [.CLS]. Click the *Save Classes* button to save the classes. To use an existing class file, click the *Load Classes* button. You

can also save the class information to a worksheet file by clicking the *Save Class Info to Worksheet File* button.

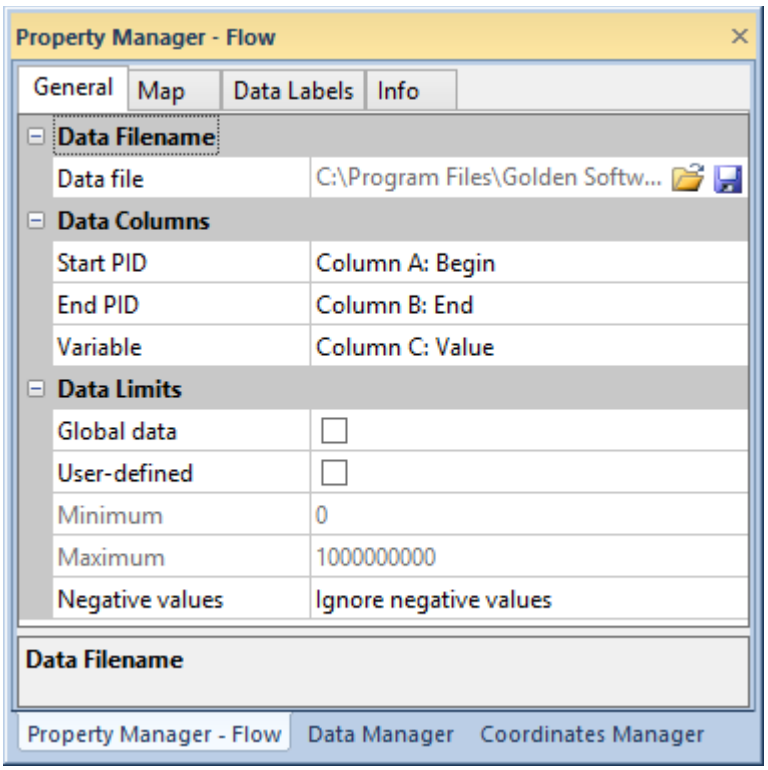
Class Information

The *Objects in classes* group displays summary statistics and allows you to specify the properties for each class.

- The >= *Minimum* list specifies the lower limit for each class of data. All values greater than or equal to this value are included in the class. You can double-click the number for any of the classes and change the value in the Class Limit dialog.
- The <*Maximum* list specifies the upper limit for each class of data. All values less than the maximum value are included in the class. You can double-click the number for any of the classes and change the value in the Class Limit dialog.
- The *%* column indicates the percentage of linked data in the particular class. This value cannot be edited and is for informational purposes only.
- The C*ount* column indicates the number of flow lines included in each class. This value cannot be edited and is for informational purposes only.
- When the *Method* is set to *Connect centroid*, the *Shape* column sets the shape of the flow map lines. *S Curve* creates a flow similar to the shape of the letter "S." *Bent* creates lines that consist of a single arc that extends from the start centroid to the end centroid. *Straight* draws straight lines from the start centroid to the end centroid. Double-click on the shape type for each class to change the flow line shape.
- When the *Method* is set to *Connect centroid*, *Bulge* determines the exaggeration of the flow line shape for *S Curve* or *Bent* lines. Negative bulge values create downward flowing bent lines, while positive values create bent lines flowing upward. Negative bulge values reverse the shape of S flow lines. Bulge values range from -1 to +1. Double-click on the bulge value for each class to change the flow line exaggeration. Increasing *Bulge* increases the curve in a *Bent* flow and decreases the curve in an *S Curve* flow.
- The *Offset (Flow)* defines the distance from the end of the flow line to the centroid. This is useful if you wish to place an arrow head on the end of the flow line or if you do not want to interfere with object labels. An *Offset* value of zero places the ends of the flow lines directly on the centroids. A higher *Offset* value moves the ends of the flow lines away from the centroid. When the *Offset* value is increased, the flow line is moved in the direction of the starting object's centroid. The *Offset* value is a number between zero and 10 inches (zero and 25.4 cm). Double-click on the offset value for each class to change the value.
- Double-click on a line sample in the *Line/Width* column to change the line properties. When using the *Proportion* option, the *Line/Width* column is disabled.
- Double-click on the word *Font* in the *Font* column to change label font properties. If you are using the *Connect centroids* and *Use classes* methods, you can have a different font for each class. The *Draw labels* box must be checked before setting the font.
- The *Offset (Text)* column controls the distance between the label and the line's centroid position when the *Draw labels* box is checked.
- The leader line properties are opened by double-clicking on the line in the *Leader/Width* column. Lead lines are drawn when an offset is specified.
- The *Name* column indicates the optional class title used in the legend.

General Page - Flow Map

The **General** page is located in the **Property Manager** when a Flow Map is selected for the active layer. Information about the map's data file can be viewed and changed in the **General** page.



Change or save the map data file, specify the PID and Variable columns, and set data limits on the ***General*** *page of the* ***Property Manager****.*

Data Filename

The *Data File* property shows the current loaded data file for the map. Load a new data file into the map with the open button. Save changes to the data file with the save button.

Data Columns

The properties in the *Data Columns* section specify which data columns contain the map object PIDs and variable.

Start PID Column

Start PID indicates the location of the primary ID of the start locations in the data file. The data primary ID must match the primary IDs used on the boundaries. The *Start PID* column is only available when *Connect centroids* is the selected *Method* on the Map page.

End PID Column

End PID indicates the location of the primary ID of the end locations in the data file. The data primary ID must match the primary IDs used on the boundaries. The *End PID* column is only available when *Connect centroids* is the selected *Method* on the Map page.

PID Column

PID indicates the location of the primary ID of the polylines in the data file. The data primary ID must match the primary ID used for the polylines. The *PID* column is only available when *Apply to polylines* is the selected *Method* on the Map page.

Variable Column

Variable column indicates the data column for use in the map. The variable must contain numeric data to create the map.

Data Limits

The *Data Limits* section contains properties for specifying linked, global, or user defined data limits, and if absolute values are used for negative numbers.

Selecting Data Limits

When the *Global data* check box is clicked, the data limits are the minimum and maximum values in the *Variable column*, including unlinked data values.

Clicking the *User-defined* check box allows editing in the *Minimum* and *Maximum* cells. Type numeric values into *Minimum and Maximum* to set your own data limits.

If neither the *Global data* or *User-defined* boxes are selected, the data limits are the minimum and maximum linked values in the *Variable column*.

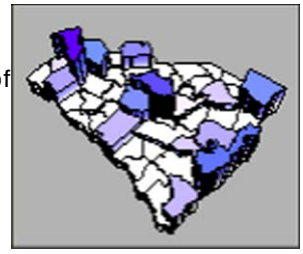
Negative Values

Choose how to treat negative values in the *Negative values* list. Selecting *Ignore negative values* does not include negative data values in the map. Selecting *Use absolute values* treats negative numbers in the data columns as positive numbers for mapping.

Chapter 22

Prism Maps

Prism Map



Prism maps draw each data linked polygon, polyline, or point as a raised prism, where the height of the prism is proportional to the associated data value. Vertical lines can be drawn on the prism sides indicating the position of each vertex along the area boundary. Prism maps can be tilted and rotated on the page for more effective displays. The prisms can also be colored with one of three different coloring methods.

Creating and Editing a Prism Map

Click the **Map | Create Map | Prism** command 

to create a prism map. Edit prism map properties in the **Property Manager**.

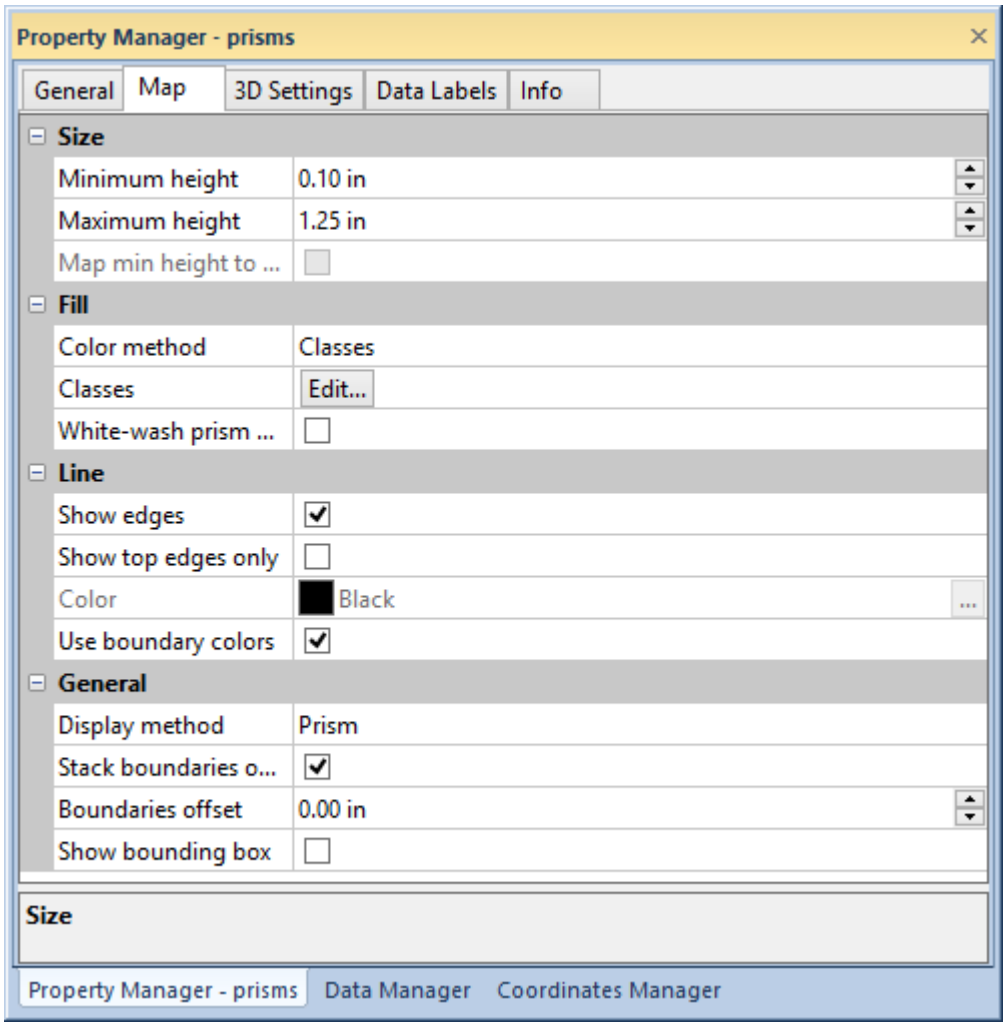
See Creating and Editing Thematic Maps for information on creating a map, changing a map to another map type, and changing map properties.

Prism Map Properties

The **Property Manager** for a prism map contains General, Data Labels, Info, 3D Settings, and **Map** pages. Click the preceding hyperlinks for information on properties in each of the property manager pages.

Map Page

The **Property Manager Map** page has prism size, line, fill, and display properties.



*Edit prism map properties in the **Map** page of the **Property Manager**.*

Size

The *Size* group on the **Map** page sets the minimum and maximum prism heights. Define the minimum and maximum prism heights by typing a value in page units into the *Minimum height* and *Maximum height* fields. The prism heights can also be adjusted by clicking the . The minimum and maximum prism heights are applied to the boundary objects with the minimum and maximum data values respectively. All prisms with intermediate data values are scaled linearly between the minimum and maximum height.

Click the *Map min height to data value of 0* to force the minimum height to be associated with a data value of zero regardless of the data minimum. The *Use absolute data value* property on the General page must be active to use the *Map min height to data value of 0* option. When *Use absolute data value* is not active, the *Map min height to data value of 0* is disabled.

Fill

Select a fill type in the *Color method* list. Click *Classes*, *Boundaries*, or *Colormap* to select a *Color method*.

When *Classes* is the selected *Color method*, prism objects are grouped in classes by data value, and independent fill properties are applied to each class in the Color Classes dialog. Click the Edit... button in the *Classes* field to open the **Color Classes** dialog.

If *Boundaries* is the selected *Color method*, prism objects use the fill color of the boundary objects used to create the map. A fill pattern or bitmap can be applied to the prism map in the Texture Mapping dialog. Click the Edit... button in the *Texture* field to open the **Texture Mapping** dialog.

If *Colormap* is the selected *Color method*, a gradient fill is applied to the prism map. Select a predefined color spectrum from the *Colors* list, or click the ... button to create a custom colormap in the Colormap dialog.

Click the *White-wash prism walls* to apply the *Color method* to the prism map faces only. The sides of the prisms will be white when *White-wash prism walls* is selected.

Line

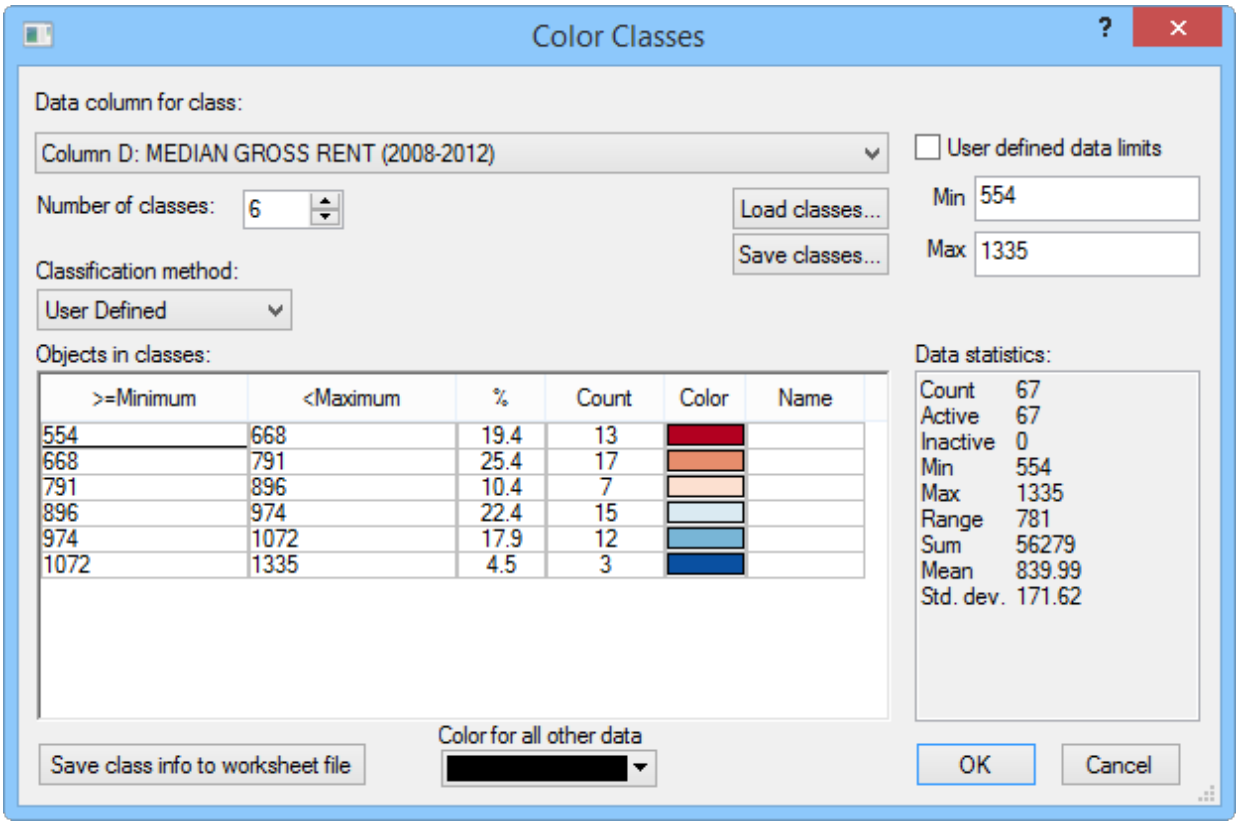
The *Line* section contains options for displaying prism lines. Click the *Show edges* check box to draw lines along prism edges. Click the *Show top edges only* check box to show only the edge around the prism faces. Select a line color by clicking on the *Color* field and selecting a color in the Color Palette. Click the ... button to select a color or create a custom color in the Colors dialog. Click the *Use boundary colors* check box to apply the line color from the boundary objects to the prism map edge lines. When *Show edges* is not active, the *Show top edges only*, *Color*, and *Use boundary colors* properties are disabled.

General

Select the *Display method* for the prism map by clicking on the current selection and choosing *Prism* or *Pyramid* from the list. Click the *Stack boundaries on map* to show the base map above the prism map. When *Stack boundaries on map* is checked the *Boundaries offset* and *Show bounding box* options are available. Set the boundary distance from the tallest prism in the *Boundaries offset* field. Type a value in page units or click the buttons to set the boundary offset. Click the *Show bounding box* check box to show the bounding box around the prism map.

Color Classes

The **Color Classes** dialog is opened when you click the *Color Classes* Edit... button on the Map page of the **Property Manager**. The color classes operate similarly to hatch map coloring. Set the *Color method* to *Classes* to activate the *Classes* Edit... button. You can categorize the data by color, and these colors are plotted on the area prisms. The variable used to color the prisms can be different from the variable used for prism height (General page).



*Set data classes and fill properties in the **Color Classes** dialog.*

Data

Select the data for prism colors in the *Data column for class* list. The list shows the available data columns from the linked data sheet. This variable can be different from the prism height variable, so you can show two variables at one time on the map.

Undefined Data

Color for all other data is the color used for all areas without a corresponding data value and for areas that contain values that do not fall in the specified classes.

Data Classes

Number of classes specifies the number of color classes (groupings) used for the variable. Up to 100 classes can be specified.

Saving and Loading Classes

Once the classes are defined, they can be saved for reuse in a class file [.CLS]. Click the *Save Classes* button to save the classes. To use an existing class file, click the *Load Classes* button. You can also save the class information to a data file by clicking the *Save Class Info to Worksheet File* button.

Classification Method

The *Classification method* is the method by which the class limits are calculated.

- *Equal Number* calculates the class minimum and maximums such that an approximately equal number of data values fall within each class.
- *Equal Intervals* calculates the class limits so that the interval between the minimum value and maximum value of each class is equal. The *Increment* box is displayed when *Equal Intervals* is selected, and this shows the range covered by each class.
- *User Defined* allows you to create your own class definitions. Overlapping or discontinuous classes are not allowed. Double-click on the minimum and maximum values in the class list to define the classes after you define the *Number of classes*.
- *Standard deviation* generates data classes based on the standard deviation of the data. When the *Standard deviation* method is selected, the *Increment* field appears. The *Increment* field allows you to define the standard deviation increment to establish the class ranges and number of classes. The *Increment* and *Number of classes* values are dependent upon each other, so changing one value automatically changes the other.
- The Jenks' Natural breaks method creates classes based on the optimal natural breaks in your data.

Class Information

The *Objects in classes* group displays summary statistics and allows you to specify the properties for each class.

- *>=Minimum* and *<Maximum* indicate the lower and upper limits for the class. If a data value is greater than or equal to the minimum value and less than the maximum value, it is plotted in the class. You can change these values by double-clicking on a minimum or maximum value to change it in the **Class Limit** dialog.
- The *%* column indicates the percentage of linked data in the particular class. This value cannot be edited and is for informational purposes only.
- The C*ount* column indicates the number of data included in each class. This value cannot be edited and is for informational purposes only.
- The *Color* column specifies the class's color. To change the color for a particular class, double-click the color in the list, and select a new color in the Colors dialog. To change the entire color spectrum, click the word *Color* at the top of the column and select a new color spectrum from the Color Spectrum dialog. Click the *Custom...* button in the **Color Spectrum** dialog to create a custom spectrum in the Colormap dialog.
- The *Name* column indicates the optional class title used in the legend.

Statistics

The *Data Statistics* box shows data statistics for the selected variable.

Data Limits

The *Set Data limits* group lets you specify the extents of the prism classes. If you would like to keep the prism class range the same for a series of maps, even if your data range varies between data sets, check the *User defined* box and set the *Min* and *Max* values. The minimum value is plotted as the minimum value of the first class and the maximum value is plotted as the maximum value of the last class. This is useful when you would like to plot a series of maps and show the same colors at the same classes each time. Use **Map | Add | Legend** to display a legend of the prism map class colors and values.

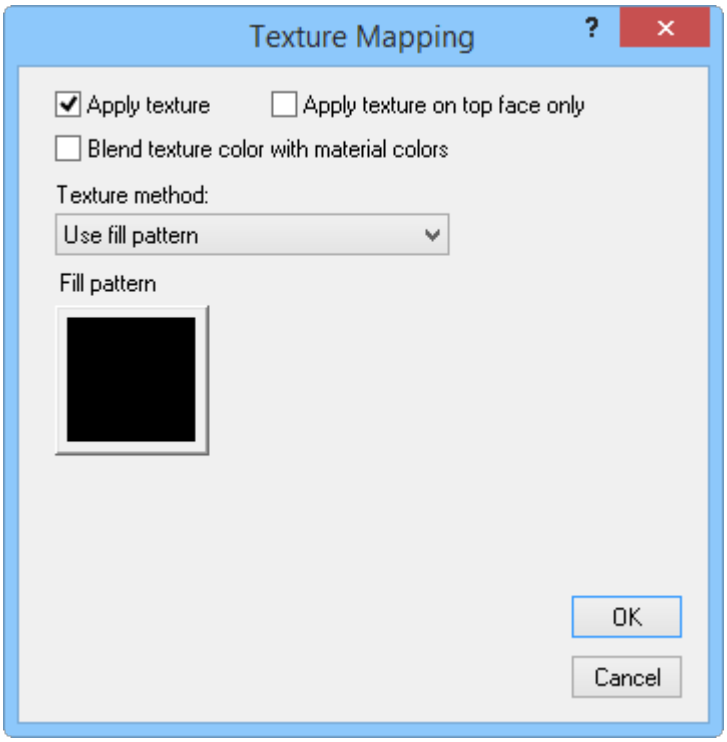
Texture Mapping

The **Texture Mapping** dialog allows you to display a fill pattern or an image on prism maps. This can add additional information to your map, such as a company logo or an advertisement. You

might also want to display a texture fill pattern or an image across prism map faces simply to enhance the map appearance.

To add texture to a prism map:

1. Create a prism map.
2. Click on the *Map* page in the **Property Manager**.
3. Set the *Color method* to *Boundaries*.
4. Click the *Texture* Edit... button to open the **Texture Mapping** dialog.



*Display a fill pattern or bitmap on a prism map in the **Texture Mapping** dialog.*

Applying Texture

Check the *Apply texture* box to add texture to a prism map. This option must be checked to access the other settings in the dialog. If the *Apply texture on top face only* box is checked, the image or fill pattern is only drawn on the top of the prism map areas. If this option is disabled the texture is drawn on the sides and tops of the prism map objects. The *Blend texture color with material color* option blends the defined texture with the fill properties of the prism map objects.

Texture Method

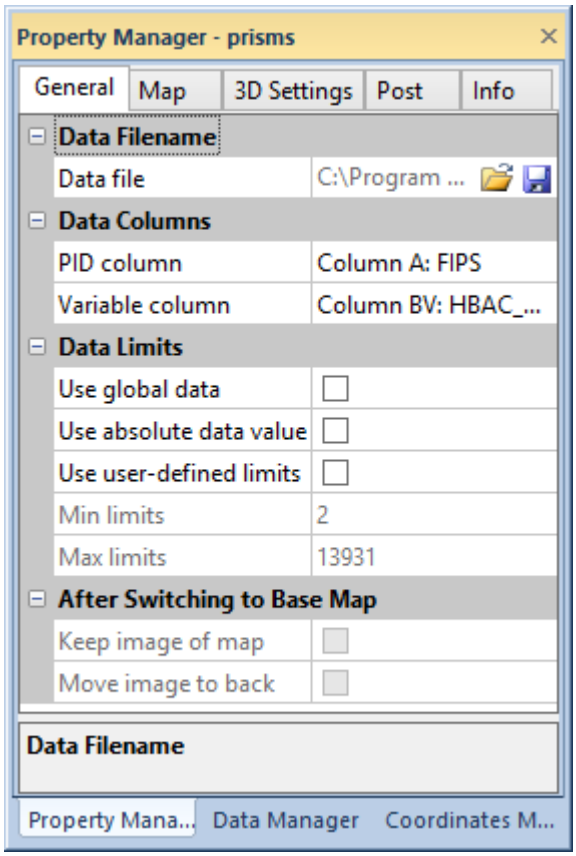
There are two texture methods to choose from in the *Texture method* list:

- *Use fill pattern* allows you to specify a fill pattern to use for the prism map texture. A *Fill pattern* button appears when this option is selected. Click the *Fill pattern* button to access the Fill Properties dialog.

- The *Use image* texture method creates a prism map texture based on an image. When this option is selected, an *Image file* option appears. Click the button to select an image file. After an image is selected, a preview of the image is shown in the dialog. A number of image file formats can be opened. Once you have selected a image, a small preview of the image is displayed in the dialog window.

General Page - Contour, Gradient, Hatch, Line Graph, Prism, Symbol, and Vector Maps

The **General** page is located in the **Property Manager** when a thematic map is selected for the active layer. Information about the map's data file can be viewed and changed in the **General** page. The Contour and Prism map options for switching to a base map are also available on the **General** page.



Change or save the map data file, specify the PID and Variable columns, and set data limits on the ***General*** *page of the* ***Property Manager****.*

Data Filename

The *Data File* property shows the current loaded data file for the map. Load a new data file into the map with the open button. Save changes to the data file with the save button.

Data Columns

The properties in the *Data Columns* section specify which data columns contain the map object PIDs and variable.

PID Column

PID column indicates the location of the primary ID in the data. The data primary ID must match the primary IDs used on the boundaries.

Variable Column

Variable column indicates the data column for use in the map. The variable must contain numeric data to create the map.

Data Limits

The *Data Limits* section contains properties for specifying linked, global, or user defined data limits, and if absolute values are used for negative numbers.

Selecting Data Limits

When the *Use global data* check box is clicked, the data limits are the minimum and maximum values in the *Variable column*, including unlinked data values.

Clicking the *Use user-defined limits* check box allows editing in the *Min limits* and *Max limits* cells. Type numeric values into *Min limits* and *Max limits* to set your own data limits.

If neither the *Use global data* or *Use user-defined limits* boxes are selected, the data limits are the minimum and maximum linked values in the *Variable column*.

Absolute Data Value

Clicking the *Use absolute data value* check box treats negative numbers in the *Variable column* as positive numbers for mapping.

After Switching to Base Map

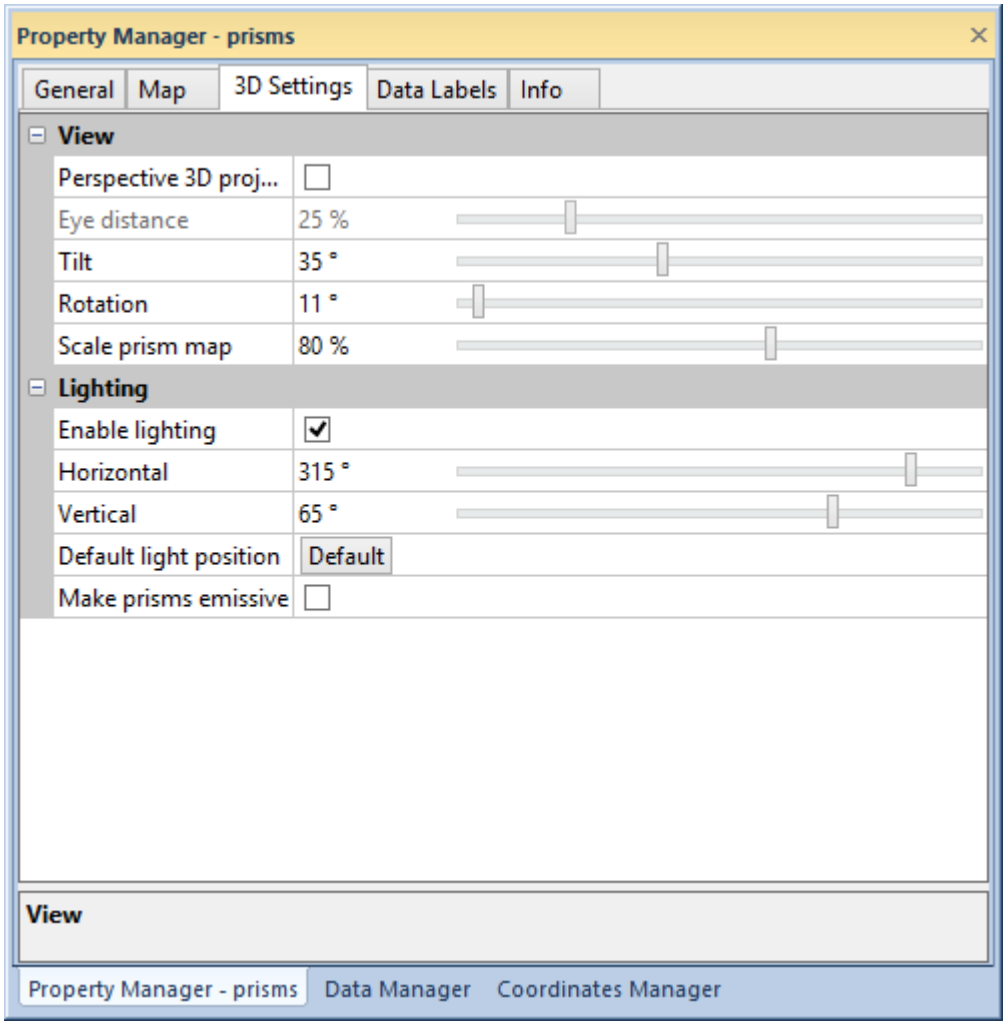
Contour and Prism maps have the *After Switching To Base Map* section of the **General** page. The *After Switching To Base Map* properties involve retaining map features after changing the map to a base map with the **Map | Create Map | Base** command.

Prism Map - After Switching to Base Map

Keep image of map and *Move image to back* properties affect a prism map when the **Map | Create Map | Base** command is clicked. Click the check box next to *Keep image of map* to generate an image of the prism map before switching the map back to a base map. The image can be edited with the **Draw | Image** commands, but prism map properties, prism height for example, cannot be changed. Click the check box next to *Move image to back* to send the image to the back of the layer objects.

3D Settings Page

View and lighting properties for a prism map are located on the **3D Settings** page in the **Property Manager**.



View

The *View* section of the **3D Settings** page changes the view of the prism and changes the prism map scale. The Rotate Prism command changes the properties in the *View* section interactively with the mouse or keyboard. Click the *Perspective 3D projection* check box to change the projection from orthographic to perspective. Change the *Eye distance* for a *Perspective 3D projection* by typing a percent value into the *Eye distance* field or by clicking and dragging the  .

Change the prism map *Tilt* and *Rotation* by typing a value in degrees into the *Tilt* and *Rotation* fields. The values can also be adjusted by clicking and dragging the  . The *Tilt* varies from 0 degrees to 90 degrees. The *Rotation* varies from 0 degrees to 359 degrees.

Change the scale of the prism map by typing a percent value into the *Scale prism map* field or clicking and dragging the  .

Lighting

Enable lighting and edit light position and properties in the *Lighting* section of the **3D Settings** page. The prisms reflect color when the *Enable lighting* box is clicked. Also, when *Enable lighting* is active, the *Horizontal*, *Vertical*, and *Make prisms emissive* properties are available for editing.

The *Horizontal* box defines the direction for the light source in the horizontal plane. A horizontal angle of zero degrees corresponds to the light source shining from due east. Positive angles rotate the light source counterclockwise. For example, a horizontal angle of 90 degrees places the light source located due north of the topographic surface. Type a value in degrees into the *Horizontal* field or click and drag the  to set the *Horizontal* direction.

The *Vertical* box rotates the light source in the vertical plane. A vertical angle of zero degrees places the light source at the horizon. An angle of 90 degrees places the light source directly overhead. As the vertical angle approaches zero, shadows lengthen and the overall display shifts to the colors at the left end of the color spectrum. Type a value in degrees into the *Vertical* field or click and drag the  to set the *Vertical* direction.

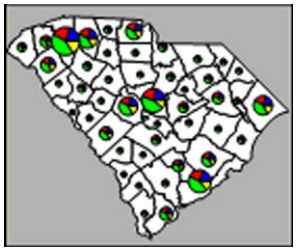
Click the *Default* button to reset the *Horizontal* and *Vertical* properties to default values.

Click the *Make prisms emissive* check box to make the prisms emit light.

Chapter 23

Pie Maps

Pie Map



Pie maps are used to represent multivariate data by drawing a proportionally sized pie chart for polygon, polyline, or point. Pie charts show two or more variables where each variable is represented by a proportionally sized slice of the pie. Up to 20 variables can be displayed on a pie map. Within a single pie, the size of the slices gives you the relative proportion of the values for that object. The entire pie chart is sized in relation to the total of all variables for a particular boundary, as compared to the totals of the variables for other boundaries. The position of the pies relative to the polygon, polyline, or point may be moved with the Move Centroids command.

- For polygons, the pie charts are drawn at the area's centroid (geographic center). The areas use the default fill and line properties, or you can set unique fill and line properties for each area on the map.
- For polylines, the pie charts are drawn at the midpoint along the polyline.
- For points, the pie charts are drawn directly on top of the points.

Creating and Editing a Pie Map

Click the **Map | Create Map | Pie** command 

to create a pie map. Edit pie map properties in the **Property Manager**.

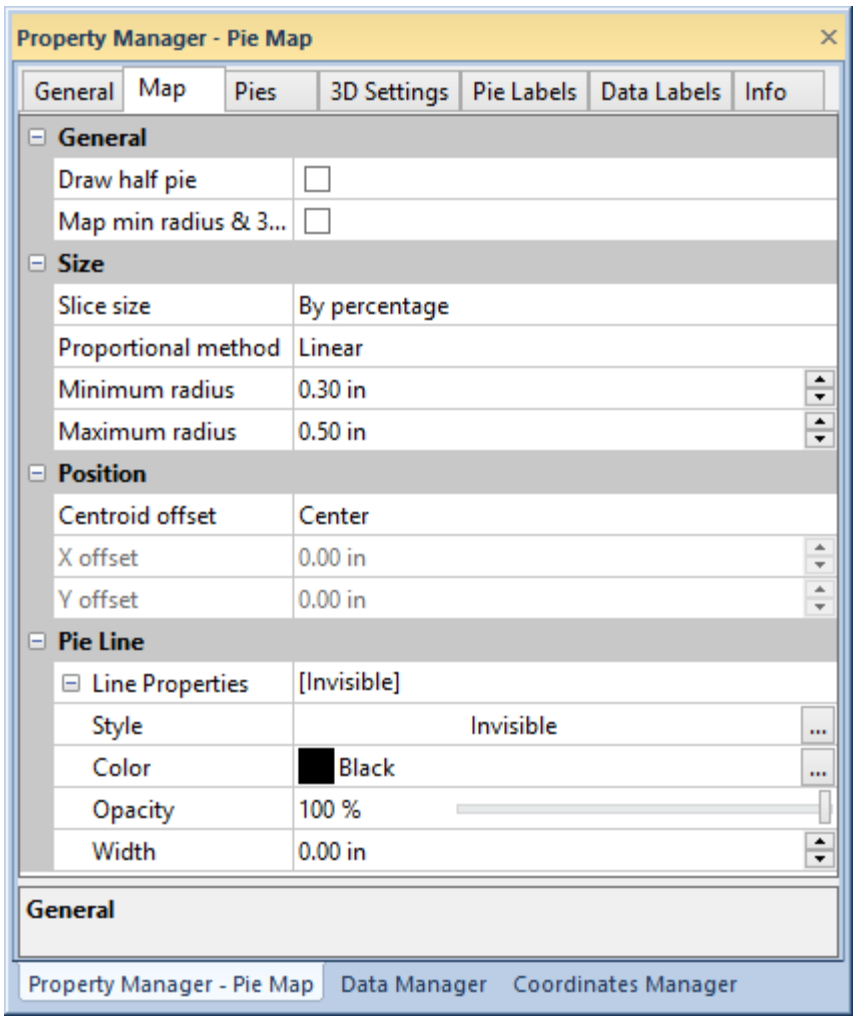
See Creating and Editing Thematic Maps for information on creating a pie map, changing a bar map to another map type, and changing map properties.

Pie Map Properties

The **Property Manager** for a pie map contains General, Data Labels, Info, Pies, 3D Settings, Pie Labels, and **Map** pages. Click the preceding hyperlinks for information on properties in each of the property manager pages.

Map Page

The **Property Manager Map** page has size, position, and display properties for a pie map.



*Edit pie map properties in the **Map** page of the **Property Manager**.*

General

The *General* section of the **Map** page has display options for the pie map. Click the *Draw half pie* check box to display a half pie chart. The half pie is not the default pie chart cut in half. Rather, in a half pie chart, the pie slices are proportions of half a circle, or cylinder for 3D pie charts.

Click the *Map min radius & 3D height to a value of 0* to force the minimum radius or height to a data value of zero regardless of the data minimum.

Size

Change the pie map sizes in the *Size* section of the **Map** page. Select the feature of the pie map to vary with the data value in the *Slice size* list; click *By percentage*, *By radius*, or *By radius and percentage. By percentage* varies the area of the pie slices, and *By radius* varies the radius of the slices to represent the data value. When *By percentage* is selected the pie radius represents the total value of the pie. The *By radius* and *By radius and percentage* options only show the relationship of slices for each pie and does not show total pie values relative to each other.

Select *Linear* in the *Proportional method* list to scale the pie radiuses with the *By percentage* method, or slice radiuses with the *By radius* method, linearly between the minimum and maximum data values. Select *Square root* to scale the radii proportionally to the square root of the data values.

Set the *Minimum radius* and *Maximum radius* by typing a number in page units into the *Minimum radius* and *Maximum radius* fields. The radiuses can also be adjusted by clicking the buttons. When *By percentage* is the *Slice size*, the pie with the smallest total value is sized with the *Minimum radius*, and the pie with the largest total value is sized to the *Maximum radius.* The remaining pies are scaled between the two radiuses by the *Propportional method*. When *By radius* is selected, the smallest data value for each slice is represented by the *Minimum radius*, and the largest data value for each slice is represented by the *Maximum radius*. The remaining slices of each pie are scaled by the *Proportional method*.

Position

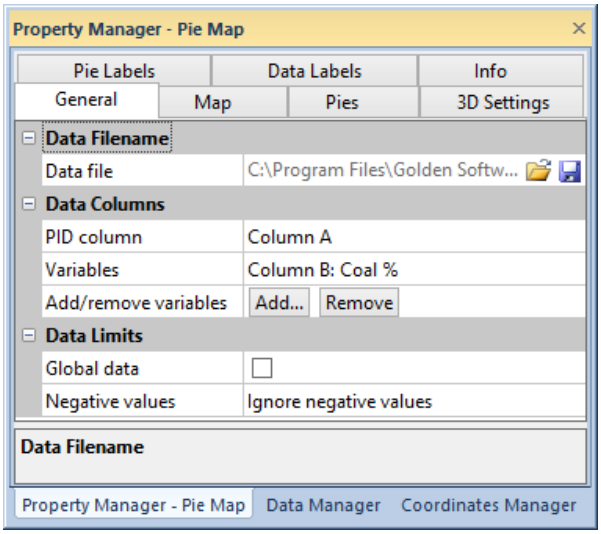
The centroid is the geographic center of an polygon, the midpoint along a polyline, or the location of a point. The centroid location can be moved for objects with the Move Centroids command. The *Centroid offset* is used to offset each pie from the centroid position. *Center*, *Left*, *Right*, *Above*, and *Below* position the pie in the specified direction. *User defined* enables the *X offset* and *Y offset* boxes so you can enter any offset amount. Type a value in page units into the *X offset* and *Y offset* fields or click the to set the offset values for a *User defined Centroid offset*.

Pie Line

Edit line properties for the lines between slices and around the circumference in the *Pie line* section of the **Map** page. See the line properties help page for more information on editing pie line properties.

General Page

The **General** page is located in the **Property Manager** when a thematic map is selected for the active layer. Information about the map's data file can be viewed and changed in the **General** page.



*Change or save the map data file, specify the PID and Variable columns, and set data limits on the **General** page of the **Property Manager**.*

Data Filename

The *Data File* property shows the current loaded data file for the map. Load a new data file into the map with the open button. Save changes to the data file with the save button.

Data Columns

The properties in the *Data Columns* section specify which data columns contain the map object PIDs and variable.

PID Column

PID column indicates the location of the primary ID in the data. The data primary ID must match the primary IDs used on the boundaries.

Variables

The *Variables* list indicates the location of data columns used in the map. The data column must contain numeric values.

Add/remove Variables

The *Add/remove variables* buttons add or remove columns from the *Variables* list. Click the *Add...* button to add variable columns in the Pick Columns to Add dialog.

To remove a data column from the *Variables* list, first select the data column you wish to remove in the *Variables* list. Then click the *Remove* button to remove the variable from the map.

Data Limits

The *Data Limits* section contains properties for specifying linked, global, or user defined data limits, and if absolute values are used for negative numbers.

Selecting Data Limits

When the *Global data* check box is clicked, the data limits are the minimum and maximum values in the *Variable column*, including unlinked data values. When *Global data* is not selected, the minimum and maximum linked data values are the data limits.

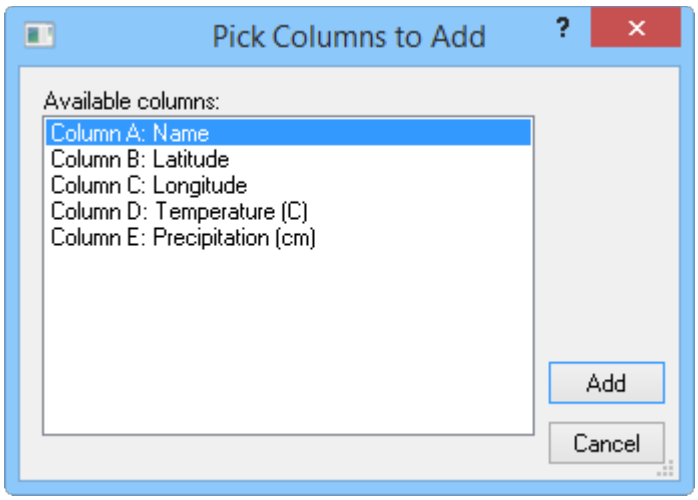
Territory maps do not have a *Data Limits* section.

Negative Values

Pie maps cannot show negative values in the pie charts. Choose how to treat negative values in the *Negative values* list. Selecting *Ignore negative values* does not include negative data values in the pie map. Selecting *Use absolute values* treats negative numbers in the data columns as positive numbers for mapping.

Pick Columns to Add Dialog

Pick columns to add to *Data Columns* on the **Property Manager** General page or to *Label Sets* on the Data Labels page.

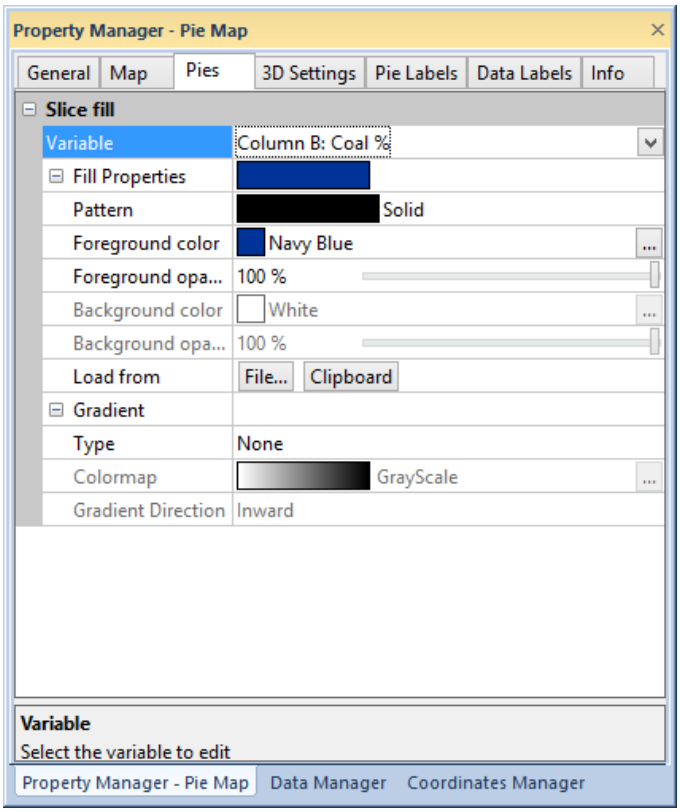


*Select columns to add in the **Pick Columns to Add** dialog.*

Click on a column name to select the column. Hold the CTRL key to select multiple items. To select a group of items, hold the SHIFT key and click the first and last items in the group. Click *Add* to add the selected data columns to the *Variables* list. Click *Cancel* to close the dialog without adding any data columns to the *variables* list.

Pies Page

The **Pies** page of the **Property Manager** controls the fill properties for the pie slices in a pie map.



*Edit slice fill properties in the **Pies** page of the **Property Manager**.*

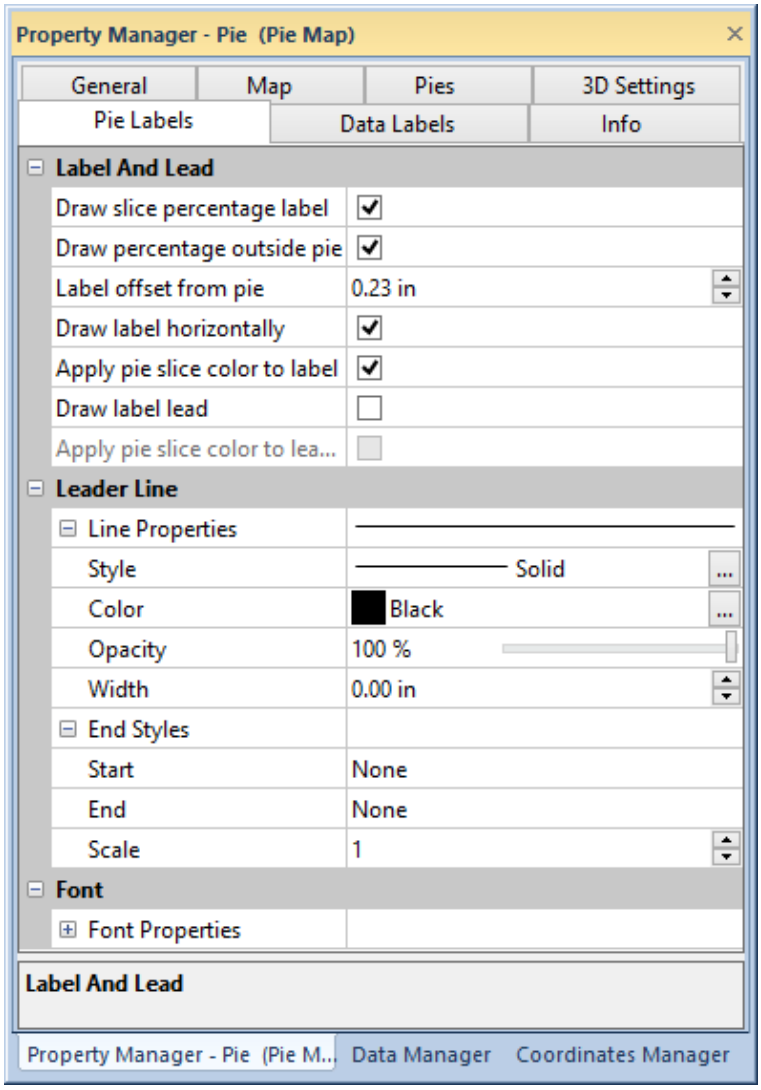
Slice Fill

Slices fills are edited independently from one another. Select the slice to edit in the *Variable* list. The data columns populating the *Variable* list are selected in the *Data Columns* section of the General page.

See the fill properties help page for more information on editing slice fill properties. Apply a gradient fill to the pie slices by selecting *Linear* or *Radial* from the *Type* list. Click on the *Colormap* selection to pick a predefined colormap for the gradient, or click the ... button to create a custom colormap in the Colormap dialog. Select a *Vertical*, *Horizontal*, *Inward*, or *Outward* gradient direction in the *Gradient Direction* list.

Pie Labels Page

Pie map label properties are specified on the **Pie Labels** page of the **Property Manager**.



*Add labels and lead lines to map pies in the **Pie Labels** page of the **Property Manager**.*

Label And Lead

Each pie slice can be labeled with its corresponding data value. The labels can be inside or outside the pies. You can control the appearance of the text, such as color, as well as draw lead lines to labels outside of the pies.

- To display variable labels for each pie slice, click the *Draw slice percentage label* check box.
- *Draw percentage outside pie* is used to place the pie percentage text outside of the pie. The text is placed within the pie unless this box is checked. The remaining *Label And Lead* properties are disabled if *Draw percentage outside pie* is not active.
- The *Label offset from pie* value determines the distance outside of the pie to place the percentage text. Type a number in page units or click the buttons to adjust the *Label offset from pie*.
- Use the *Draw label horizontally* box to orient the pie percentage text horizontally. If this box is not checked, the text is oriented in the same direction as the corresponding pie slice.
- Click the *Apply pie slice color to label* check box to draw the percentage text in the color corresponding to the variable pie slice color. The *Apply pie slice color to label* property takes precedence over the *Font Foreground color*.
- Click the *Draw label lead* check box to add lead lines between the slice and label.
- Click the *Apply pie slice color to leader line* check box to apply the variable slice color to the leader line. The *Apply pie slice color to leader line* property takes precedence over the *leader line Color*.

Leader Line

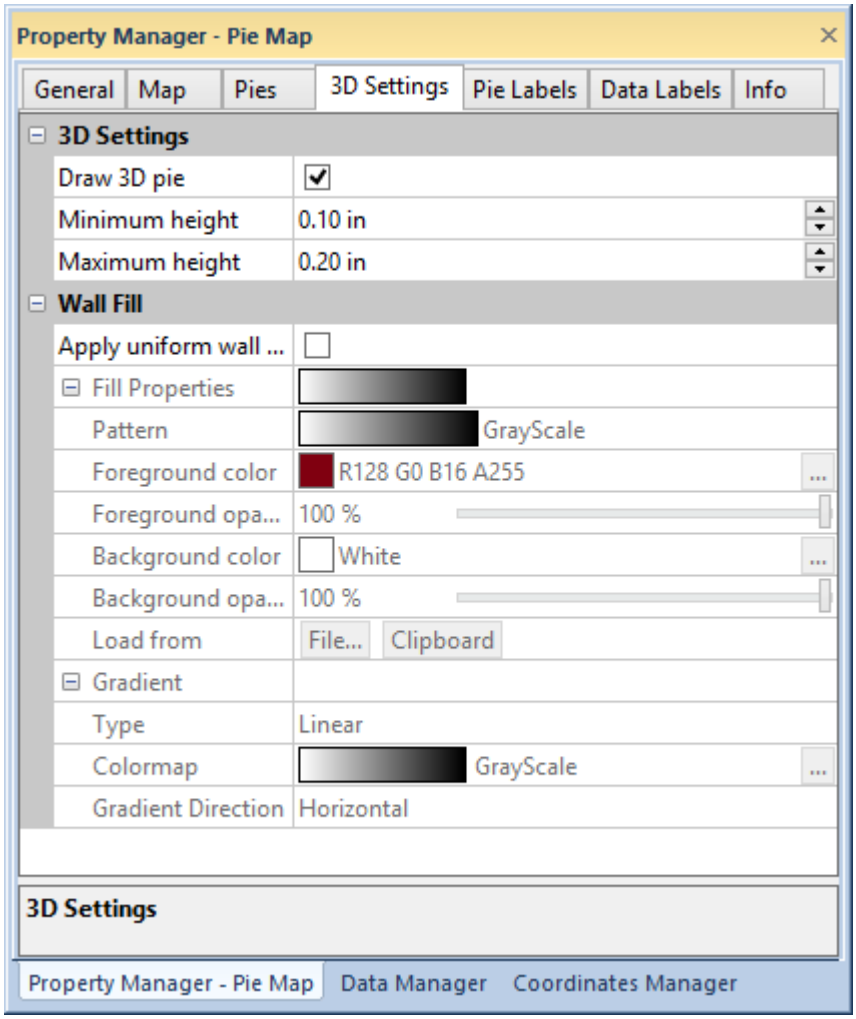
Leader line properties are edited in the *Leader Line* section of the **Pie Labels** page. See the line properties help page for more information on editing leader lines.

Font

Label font properties are edited in the *Font* section of the **Pie Labels** page. See the font properties help page for more information on editing pie labels.

3D Settings Page

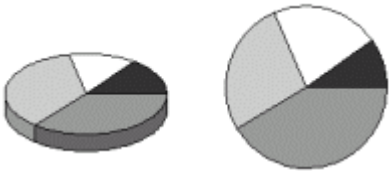
Select 3D pie rendering, pie height, and wall fill in the **3D Settings** page of the **Property Manager**.



*Edit settings for 3-dimensional pies in the **3D Settings** page of the **Property Manager**.*

3D Settings

The *3D Settings* group sets the three-dimensional state of the pies. Click the *Draw 3D pie* check box to view the pies in 3D.



3D pie charts (left) can enhance the visual appeal of your pie map.

The pie height can be used to represent the total value of the pies. Set the *Minimum height* and *Maximum height* values by typing a number in page units or clicking the buttons. The pie with the smallest sum of data values is set to the *Minimum height*, and the pie with the largest data value sum is set to the *Maximum height*. The remaining pies are scaled between the height values by the *Proportional method* selected on the Map page.

Wall Fill

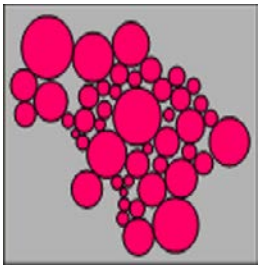
By default, the wall fill is shared with the slice fill set in the Pies page. Apply a uniform wall fill by clicking the *Apply uniform wall fill* check box. See the fill properties help page for more information on editing wall fill properties.

Apply a gradient fill to the pie walls by selecting *Linear* or *Radial* from the *Type* list. Click on the *Colormap* selection to pick a predefined colormap for the gradient, or click the button to create a custom colormap in the Colormap dialog. Select a *Vertical*, *Horizontal*, *Inward*, or *Outward* gradient direction in the *Gradient Direction* list.

Chapter 24

Cartogram Maps

Cartogram Map



Cartogram maps display variables by varying area size. **MapViewer's** can create Dorling, contiguous, and noncontiguous cartograms. In a Dorling cartogram the areas are replaced by circles and the circles are scaled according to a variable. The maps can be controlled so the circles do not overlap and are positioned as close to the base map's centroids as possible. In a noncontiguous cartogram, polygon shapes are disconnected, and the area is proportional to the selected variable. In a contiguous cartogram, polygons remain connected, and their size and shape are distorted as the area is scaled to the selected variable.

Creating and Editing a Cartogram Map

Click the **Map | Create Map | Cartogram** command 

to create a cartogram map. Edit cartogram map properties in the **Property Manager**.

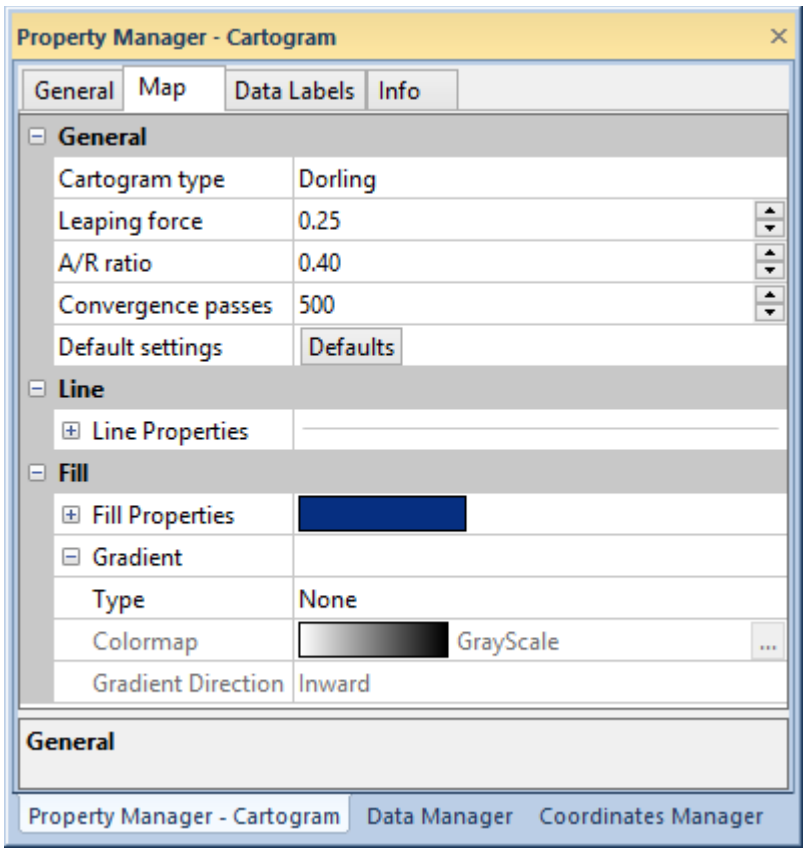
See Creating and Editing Thematic Maps for information on creating a map, changing a map to another map type, and changing map properties.

Cartogram Map Properties

The cartogram map **Property Manager** has General, Data Labels, Info, and **Map** pages. Click the preceding hyperlinks for information on properties in each of the property manager pages.

Map Page

Select cartogram type and edit cartogram specific properties in the *Map* page of the **Property Manager**.



*Edit cartogram map properties in the **Map** page of the **Property Manager**.*

General

The *General* section properties select the cartogram type and edit the cartogram map. Click the *Cartogram type* list to select a *Dorling, Non-contiguous*, or *Contiguous* cartogram.

Generating a contiguous cartogram map can take a few seconds, depending on the cartogram map settings, data set, and your computer's capabilities. Unlike other gridding operations, contiguous cartogram map creation cannot be cancelled.

The *Leaping force* controls the distance the circles or polygons move in each convergence pass. The circles or polygons move away from the previous position with each pass. Type a value between 0.01 and 1.00 in the *Leaping force* field or click the buttons to set the *Leaping force*. A *Leaping force* of 1.0 moves the circle far away from the previous position with each pass. A *Leaping force* of 0.01moves the circles very little with each pass. *Dorling* and *Non-contiguous* cartograms have the *Leaping force* property.

The *A/R ratio* is the attraction/repulsion ratio that controls circle or polygon overlap. Type a value between 0.01 and 1.00 in the *A/R ratio* field or click the buttons to set the *A/R ratio.* An *A/R ratio* of 1.0 makes the circles overlap each other. An *A/R Ratio* of 0.01 leads to minimum overlap. *Dorling* and *Non-contiguous* cartograms have the *A/R ratio* property.

Convergence passes controls the number of times the circles are repositioned with the *Leaping force* and *A/R ratio* values. Only *Dorling* cartograms have the *Convergence passes* property.

Click the *Defaluts* button in the *Default settings* field to return the cartogram to the **MapViewer** defaults. Only *Dorling* and *Non-contiguous* cartograms have the *Defalut settings* option.

Line

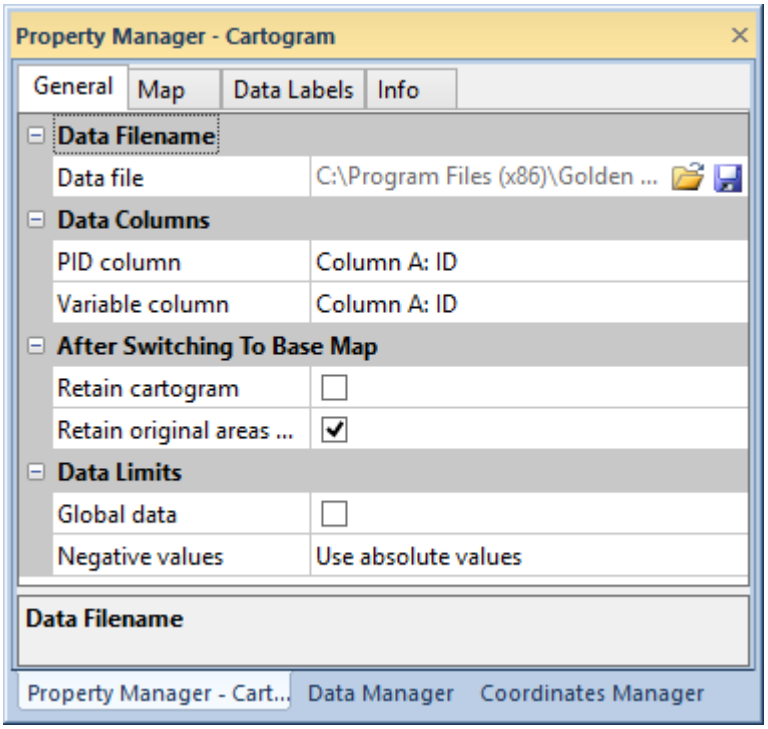
Set the line properties for the cartogram map in the *Line* section. See the line properties help page for more information on editing cartogram line properties.

Fill

Set the cartogram fill properties in the *Fill* section. See the fill properties help page for more information on editing cartogram map fill properties. Apply a gradient fill to the cartogram map by selecting *Linear* or *Radial* from the *Type* list. Click on the *Colormap* selection to pick a predefined colormap for the gradient, or click the ... button to create a custom colormap in the Colormap dialog. Select a *Vertical*, *Horizontal*, *Inward*, or *Outward* gradient direction in the *Gradient Direction* list.

General Page

The **General** page is located in the **Property Manager** when a thematic map is selected for the active layer. Information about the map's data file can be viewed and changed in the **General** page. The Cartogram map options for switching to a base map are also available on the **General** page.



*Change or save the map data file, specify the PID and Variable columns, and set data limits on the **General** page of the **Property Manager**.*

Data Filename

The *Data File* property shows the current loaded data file for the map. Load a new data file into the map with the open button. Save changes to the data file with the save button.

Data Columns

The properties in the *Data Columns* section specify which data columns contain the map object PIDs and variable.

PID Column

PID column indicates the location of the primary ID in the data. The data primary ID must match the primary IDs used on the boundaries.

Variable Column

Variable column indicates the data column for use in the map. The variable must contain numeric data to create the map.

Data Limits

The *Data Limits* section contains properties for specifying linked, global, or user defined data limits, and if absolute values are used for negative numbers.

Selecting Data Limits

When the *Global data* check box is clicked, the data limits are the minimum and maximum values in the *Variable column*, including unlinked data values. If *Global data* is not selected, the data limits are the minimum and maximum linked values in the *Variable column*.

Negative Values

Choose how to treat negative values in the *Negative values* list. Selecting *Ignore negative values* does not include negative data values in the map. Selecting *Use absolute values* treats negative numbers in the data columns as positive numbers for mapping.

After Switching to Base Map

Cartogram maps have the *After Switching To Base Map* section of the **General** page. The *After Switching To Base Map* properties involve retaining map features after changing the map to a base map with the **Map | Create Map | Base** command. The *Retain cartogram* property saves the cartogram circles or polygons when switching to a base map. Click the check box next to *Retain original areas with cartogram* before clicking **Map | Create Map | Base** to keep the original areas as well as the cartogram circles or polygons.

Chapter 25

Multi-Graph Maps

Multi-Graph Map

In a multi-graph map, each object's graph is different than the graph for the other objects. To show a single data point for each object on a similar graph, use a line graph map. In a multi-graph map, each object has a unique XY data set that is displayed as a line graph or scatter plot. The graph is positioned in relation to the object centroid. Centroids can be moved with the Move Centroids command.

Multi-graph maps can be made for polygons, polylines, or points.

- For polygons, the graphs are drawn at the polygons's centroid (geographic center). The polygons use the default fill and line properties, or you can set unique fill and line properties for each area on the map.
- For polylines, the graphs are drawn at the midpoint along the polyline.
- For points, the graphs are drawn directly on top of the points.

Showing monthly average gas price by state over the course of a year is an example of the type of information best displayed in a multi-graph map. Time is the x-axis of each line graph, and average gas price each month are represented by XY data points. The map shows changes in price over time in each state, and comparisons can be made between locations by comparing the separate graphs. However, X or Y data does not need to be the same for each object as the X data in this example. A multi-graph map can be used to display completely different data set for each area.

Creating and Editing a Multi-Graph Map

Click the **Map | Create Map | Multi Graph** command 

to create a multi-graph map. Edit multi-graph map properties in the **Property Manager**.

See Creating and Editing Thematic Maps for information on creating a map, changing a map to another map type, and changing map properties.

Multi-Graph Map Data

Multi-graph map data should be arranged in three columns: PID, X data, and Y data.

PID	X	Y
04001	51.358352	2023.6657
04001	149.49369	2150.2086
04001	251.07238	2192.3896
04015	51.358352	4442.0419
04015	151.21537	3036.0092
04015	252.79406	3218.7935
04003	51.358352	2431.4152
04003	152.93704	2656.3804
04003	251.07238	3134.4315

An example of the data worksheet format for use with a multi-graph map.

The PID is repeated for each point in the object's data set. The above image is a small sample of the data linked to the MultiGraphMap.gsm sample file included with **MapViewer**.

Multi-Graph Properties

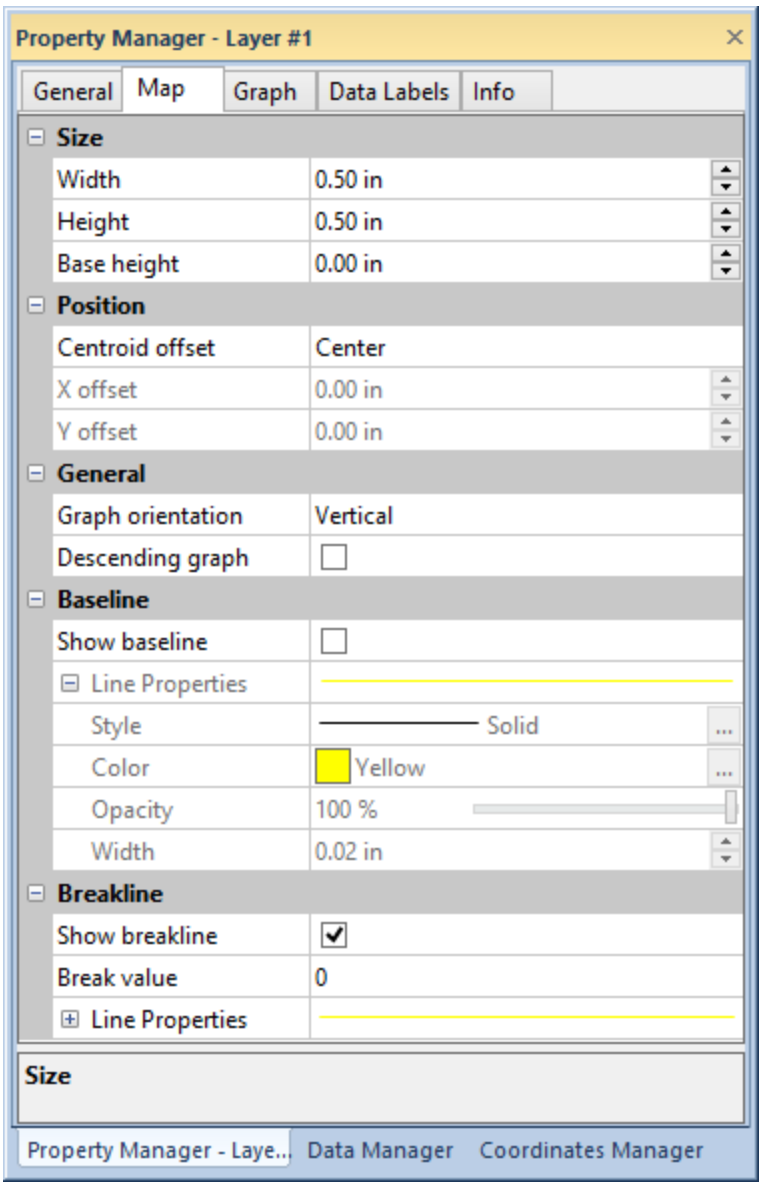
The **Property Manager** for a multi-graph map contains General, Graph, Symbol, Map, Data Labels, Info, and Axes pages.

Multi-Graph Line and Scatter Plots

The multi-graph map graphs can be displayed as line graphs, XY scatter plots, or XY scatter plots with lines. Select a line *Style* in the **Property Manager** Graph page to display line graphs. Click the *Show symbols* check box, and select a *Symbol* in the Symbol page to display XY scatter plots. Select both a line style and symbol to display the object graphs as scatter plots with lines.

Map Page

The **Map** page of the **Property Manager** contains graph size, position, orientation, baseline, and breakline properties for line graph maps and multi-graph maps.



*Change line graph size, position, and display options in the **Map** page of the **Property Manager**.*

Size

The *Size* group contains settings for line graph and multi-graph *Width* and *Height* and the line graph *Base height*. The *Height* value changes the maximum Y axis height of the graph. The *Width* value changes the maximum X axis width of the graph. The *Base height* is the height between the X axis line and the minimum data value. Change the *Width*, *Height*, and *Base height* values by typing into the box or clicking the buttons. The *Width*, *Height*, and *Base height* values are in page units.

Position

The centroid is the geographic center of an polygon, the midpoint along a polyline, or the location of a point. The centroid location can be moved for all objects with the Move Centroids command. The *Centroid offset* property is used to offset each graph from the centroid position. *Center*, *Left*, *Right*, *Above*, and *Below* position the graph in the specified direction relative to the centroid. *User*

defined enables editing in the *X offset* and *Y offset* boxes so you can enter any offset amount. The offsets must be specified in page units.

General

Line graph data can be graphed vertically or horizontally. Select *Vertical* or *Horizontal* in the *Graph orientation* list to select the graph orientation. The graph fill is on the left side of the graph, and the profile fill is on the right side of the graph for a vertically oriented graph. In a horizontally oriented graph, the graph fill is above the profile fill.

By default, line graphs are graphed in ascending order. If you wish to graph the data in descending order, click the *Descending graph* check box. When the graph is descending, the maximum value is on the left side of the graph for vertical line graphs or on the top of the graph for horizontal line graphs.

Baseline

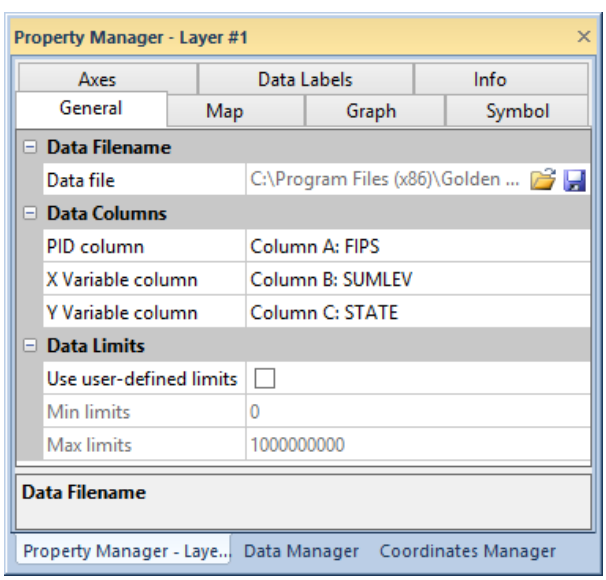
Click the *Show baseline* check box to add a baseline to the line graphs. When a baseline is drawn on the map, the baseline line properties can be edited.

Breakline

A breakline can be added to the line or multi graphs to identify a specific data value. Typically a break line is used to identify a benchmark or threshold value. Click the *Show breakline* check box to add a breakline to the line graphs. When a breakline is drawn on the map, the *Break value* and line properties can be edited. Type a number into the *Break value* box to set the breakline position.

General Page - Multi Graph Map

The **General** page is located in the **Property Manager** when a thematic map is selected for the active layer. Information about the map's data file can be viewed and changed in the **General** page.



*Change or save the map data file, specify the PID and Variable columns, and set data limits on the **General** page of the **Property Manager**.*

Data Filename

The *Data File* property shows the current loaded data file for the map. Load a new data file into the map with the open button. Save changes to the data file with the save button.

Data Columns

The properties in the *Data Columns* section specify which data columns contain the map object PIDs and X and Y variables.

PID Column

PID column indicates the location of the primary ID in the data. The data primary ID must match the primary IDs used on the boundaries.

X and Y Variable Column

X Variable column indicates the X values data column for use in the in the map. *Y Variable column* indicates the Y values data column for use in the in the map. The variables must contain numeric data to create the map.

Data Limits

The *Data Limits* section contains properties for specifying linked, global, or user defined data limits, and if absolute values are used for negative numbers.

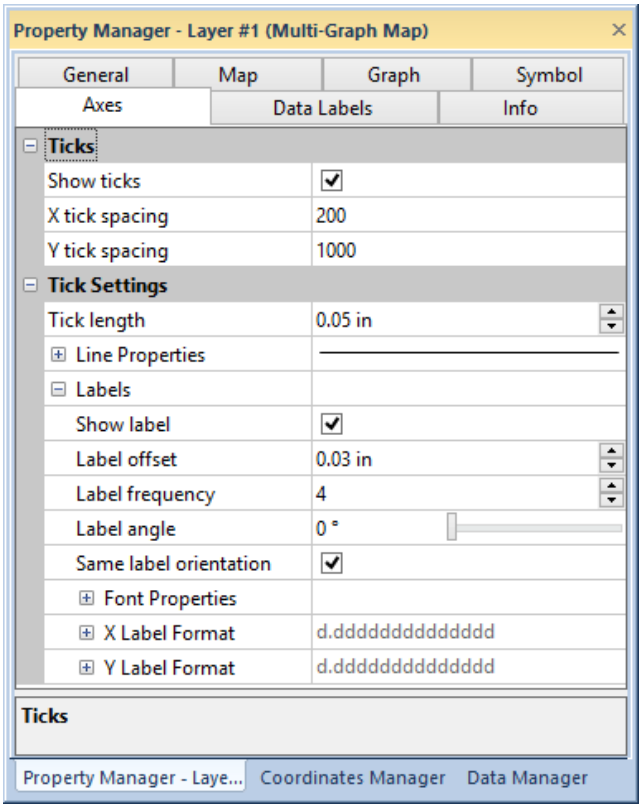
Selecting Data Limits

Clicking the *Use user-defined limits* check box allows editing in the *Min limits* and *Max limits* cells. Type numeric values into *Min limits* and *Max limits* to set your own data limits.

If the *Use user-defined limits* box is not selected, the data limits are the minimum and maximum linked values in the *Variable column*.

Axes Page

The **Axes** page of the **Property Manager** contains tick mark and axis label properties for multi-graph map line graph axes.



*Edit tick mark and label properties in the **Axes** page of the **Property Manager**.*

Ticks

The *Ticks* section of the **Axes** page shows ticks and adjusts tick spacing. Click the *Show ticks* check box to display tick marks on the multi-graph map graphs. Type a value into the *X tick spacing* and *Y tick spacing* fields to set the tick mark spacing.

Tick Settings

The *Tick Settings* section of the **Axes** page contains tick length and line properties. The *Tick Settings* section also displays labels and edits label font and format properties.

Adjust tick length by typing a value in page units into the *Tick length* field or clicking the buttons. See the line properties help page for more information on editing tick line properties.

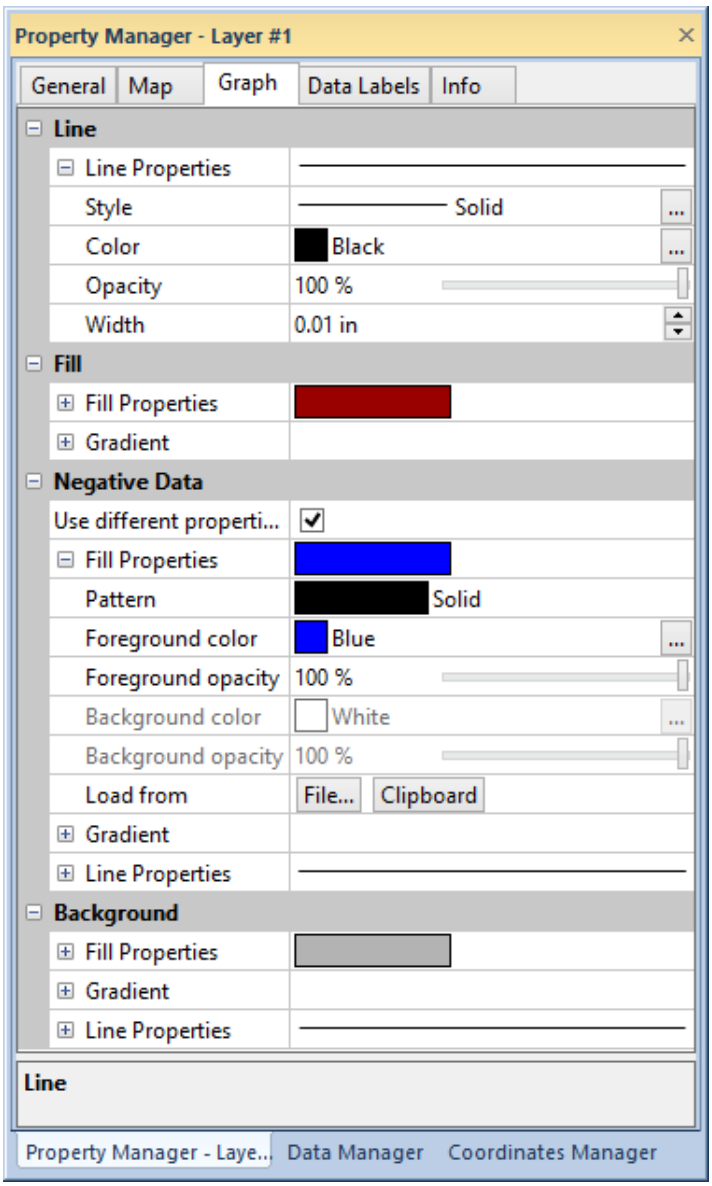
Click the *Show label* check box to show tick labels next to the tick marks. The distance labels are drawn from the tick marks is set in the *Label offset* field. Type a value in page units or click the buttons to change the offset distance. The *Label frequency* property determines how often labels are added to tick marks. A value of "1" shows every tick mark label; a value of "5" shows every fifth tick mark label. Type a number into the *Label frequency* box or click the buttons to change the label frequency. Labels can be rotated between 0 and 359 degrees. Type a value in degrees in

the *Label angle* field or click and drag the  bar to adjust the label rotation. Click the *Same label orientation* to orient both X and Y axis tick mark labels in the same direction.

Edit tick mark label font and format properties in the *Font Properties* and *Label Format* groups. The *X Label Format* and *Y Label Format* are edited independently. See the font properties and label format help pages for more information on editing tick mark label font and format properties.

Graph Page

The **Graph** page contains line and fill properties for line graph maps and multi-graph maps. The multi-graph map **Graph** page has only *Line* and *Background* properties sections.



*Edit line graph and multi-graph line and fill properties in the **Graph** page of the **Property Manager**.*

Line

The *Line* group controls the line properties for the outline of the graph fill section of a line graph map and the graph line in a multi-graph map. See the line properties help page for information on changing line properties.

Fill

The *Fill* section controls the fill properties for the graph fill section of a line graph map. See the fill properties help page for information on changing fill properties.

To apply a gradient fill, select a gradient *Type* by clicking on the current option and selecting *None*, *Linear*, or *Radial* from the list. Select a preset *Colormap* from the list, or click the button to make a custom colormap in the Colormap dialog. Select *Horizontal*, *Vertical*, *Inward*, or *Outward* from the *Gradient direction* list to choose a gradient direction.

Negative Data

Negative data can be represented with separate line and fill properties in a line graph map. Click the *Use different properties for negative data* check box to enable separate negative data properties.

The *Fill properties* group controls the fill properties for the graph fill section of a line graph map. See the fill properties help page for information on changing fill properties. Add a gradient fill using the same procedure as in the *Fill* section above.

The *Line properties* group control the outline of the graph fill in a line graph map. See the line properties help page for information on changing line properties.

Background

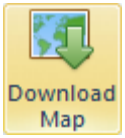
The *Background* group controls line and fill properties for the profile fill side of the line graphs in a line graph map and the background of multi-graph map graphs.

See the fill properties and line properties help pages for information on changing line and fill properties. Add a gradient fill using the same procedure as in the *Fill* section above.

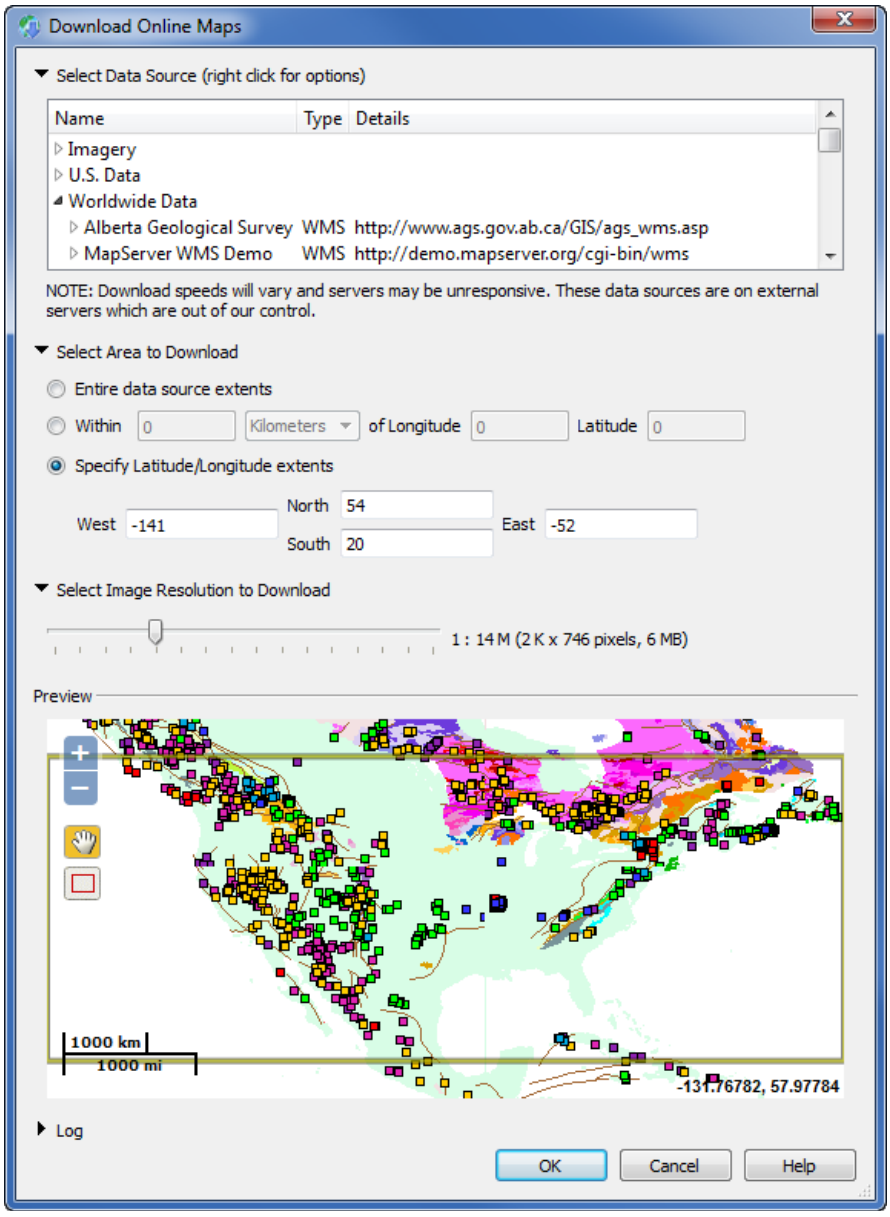
Chapter 26

Downloading Online Maps

Download Maps

Click the **Map | Add | Download Map** command 

button to open the **Download Online Maps** dialog. This dialog downloads data or maps from any web mapping server (WMS). Images can be downloaded from any of the existing servers or new servers can be added to the list.



*Set the image properties in the **Download Online Maps** dialog.*

Data Source

In the *Select Data Source* section, click the to open a section. The arrow turns black when a section is opened. Available options include *Imagery, U.S. Data, Worldwide Data*, and *Favorites*.

Server Information

To see additional options for a specific server, right-click in the *Select Data Source* section on the existing data source name, such as *NAIP Color Imagery for US* layer.

Right-click on the layer name to see the URL for the layer or additional information about the layer.

To view the data source for any predefined server, right-click on the predefined server name and select *View*. The **View Data Source** dialog allows predefined web server *URL*s to be edited. This may be useful if the location for the server changes.

To view information about the server, right-click on the server name and select *Info*. The Server Information dialog displays the results of attempting to connect to the server.

Layer information from the data source is cached on the local hard drive. This reduces the load time for the *Select Data Source* list. Update the layer information by right-clicking on the data source and selecting *Reload* in the context menu.

Layer Information

To view information about the specific layer, right-click on the layer name and select *Info*. The Layer Information dialog displays information such as the minimum scale, height or width, layer name and title. None of the options are editable.

To copy the server and layer name, right-click on the layer name and select *Copy to Clipboard*. You can then paste the text to any text editor, word processing program, or to the **MapViewer** window. The pasted information includes the name of the server, the server location, the layer title and layer name selected.

Favorites Section

To add any layer to the *Favorites* section, right-click on the layer name and select *Favorites*. Any server from the *Imagery, U.S. Data,* or *Worldwide Data* section can be added to the *Favorites.* Only the selected layer is added to the favorites. Other layers from the same server are not added.

To remove any layer from the *Favorites* section, right-click on the layer name in the *Favorites* section and click *Remove Favorite*. Click *Yes* in the dialog to remove the layer from the *Favorites*. Click *No* in the dialog to keep the layer in the *Favorites*. Removing the layer from the *Favorites* section does not remove the server and layer from the *Imagery, U.S. Data,* or *Worldwide Data* section.

Adding New Categories

To add a new category to the *Select Data Source* section, right-click in the white space of the *Select Data Source* section. Select *Add New Category* to open the **Create Category** dialog. Type the name for the new category in the *Category Name:* field and click *OK* to create the category. Click *Cancel* to close the **Create Category** dialog without making any changes in the *Select Data Source* section.

Adding New Data Sources

To add additional data sources to the list, right-click on the white space in the *Select Data Source* section. Select *Add Map Source* to open the Add Data Source dialog. Set the *Name, Type,* and *URL* to the new web mapping service. Click *Next* and the web server can be tested. If the test is successful, click *Finish* and the new web mapping service is added to the *Select Data Source* list. If the test is not successful, click *Back* and edit the *URL*. After the new server is added to the *Select Data Source* list, the list is alphabetized.

All custom data sources are saved to an INI file, allowing multiple Golden Software programs to use the custom definitions. The INI file is located at C:\Users\<username>\AppData\Roaming\Golden Software\Shared\Geode.ini. The file can be copied from one computer to another to share custom data sources between multiple computers and users.

Editing Custom Data Sources

To edit the data source for any custom server, right-click on the custom server name and select *Edit*. The **Edit Data Source** dialog allows custom web server *Name, Type,* and *URL*s to be edited. This may be useful if the location for the server changes or if the name listed in the **Download Online Maps** dialog should be changed.

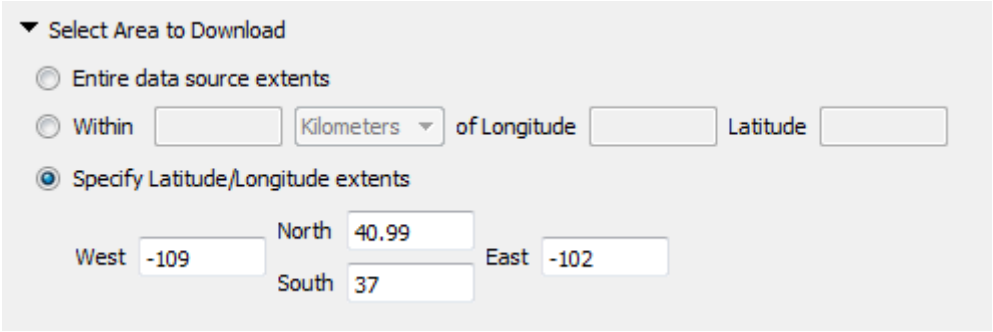
To view information about the server, right-click on the server name and select *Info*. The Server Information dialog displays the results of attempting to connect to the server.

Deleting Custom Data Sources

To delete a custom server from the *Select Data Source* list, right-click on the server name and select *Delete*. In the **Delete Data Source** dialog, click *Yes* to delete the server. Click *No* to keep the server in the *Select Data Source* list.

Select Area to Download

The *Select Area to Download* section controls the areal extent of the image being downloaded. Available options are *Entire data source extents, Within XX units of Longitude X Latitude Y,* or *Specify Latitude/Longitude extents*. Click on the desired option to select it.



Select the extents of the image to download in the Select Area to Download *section.*

The *Entire data source extents* reads all of the data on the specified server. All of the data is downloaded in the single image. With servers that cover large areas, this option is not recommended because even at high resolutions, very little detail will appear on the downloaded map.

The *Within XX units of Longitude X Latitude Y* option allows a single longitude and latitude value to be entered. A square area is downloaded based on the *XX* value and the *units* option. The square is centered on the value entered for the *Longitude* and *Latitude*. To use this option, enter valid values in each box.

- The first box sets the width and height of the square area. For instance, 25 can be input.
- The second option (units) can be set to either *Kilometers* or *Miles*. Click on the existing option to select the desired option.
- The third option is the central *Longitude* value. In the example below, the center point of the downloaded image will be -105.220139. Longitude values must be between -180 and +180. Negative values are western hemisphere longitudes. Positive values are eastern hemisphere longitudes.
- The last option is the central *Latitude* value. In the example below, the center point of the downloaded image will be 39.753304. Latitude values must be between -90 and +90. Negative values are entered for the southern hemisphere. Positive values are entered for the northern hemisphere.

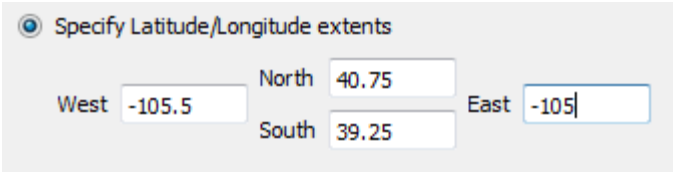
The downloaded area will be 25 miles wide and 25 miles tall. The image will be centered on the longitude and latitude location of -105.220139, 39.753304.

The *Specify Latitude/Longitude extents* option allows a rectangular area to be input in latitude and longitude coordinates. When adding a base map layer to an existing map with a defined coordinate system, this option is automatically selected. The boxes are filled in with the map limits of the current map. After selecting this option,

- Type in the western-most edge for the downloaded map in longitude degrees coordinates in the *West* box. Longitude values must be between -180 and +180. Negative values are western hemisphere longitudes. Positive values are eastern hemisphere longitudes.
- Type in the eastern-most edge for the downloaded map in longitude degrees coordinates in the *East* box. Longitude values must be between -180 and +180. Negative values are western hemisphere longitudes. Positive values are eastern hemisphere longitudes.
- Type in the northern-most edge for the downloaded map in latitude degrees coordinates in the *North* box. Latitude values must be between -90 and +90. Negative values are

entered for the southern hemisphere. Positive values are entered for the northern hemisphere.

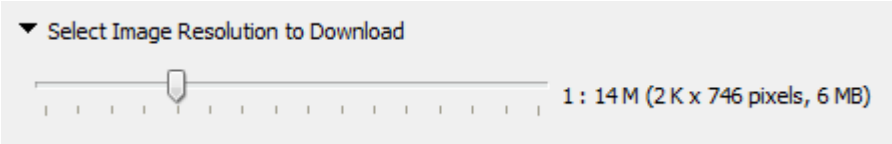
- Type in the southern-most edge for the downloaded map in latitude degrees coordinates in the *South* box. Latitude values must be between -90 and +90. Negative values are entered for the southern hemisphere. Positive values are entered for the northern hemisphere.



The downloaded area will cover from -105.5 to -105 degrees longitude and 39.25 to 40.75 degrees latitude.

Select Image Resolution to Download

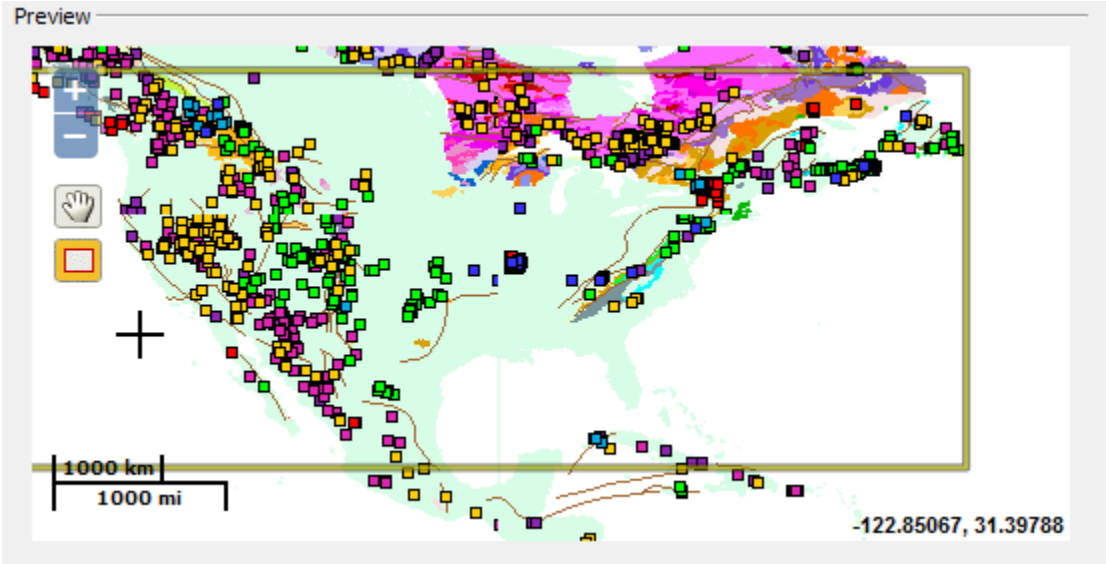
The *Select Image Resolution to Download* section controls the quality of the image being downloaded. Drag the slider to the right to increase the image resolution. The farther to the right the slider is located, the better the resolution and the larger the image. Clicking on one of the lines on the left side of the slider will normally download a map of sufficient quality that is smaller in size. The larger the file size, the longer the image will take to process and the more memory the program will use to manipulate the image. If N/A is displayed or no size information is displayed, the image cannot be downloaded at the requested resolution. Change the resolution by moving the slider to select a different size image.



Set the image quality by dragging the slider to the right or left. Setting the slider to the far left side downloads a small map with less resolution. Setting the slider to the far right side downloads a very large map with very fine resolution. This should only be used for small areas.

Image Preview

The *Preview* section displays a picture of the area to be downloaded. The image quality is controlled by the *Select Image Resolution to Download*. The *Preview* section contains a low resolution preview of the area.



The Preview *window displays the area to download, buttons to zoom in/out, pan, or change the download area, a map scale, and the coordinates of map cursor.*

- Click the  buttons on the left side of the image preview to zoom in or out on the area. Changing the zoom level does not affect the area to download. The area to download is indicated in the *Preview* section by a yellow outline.
- Click the  button on the left side of the image preview to quickly move the image in the *Preview* section. The cursor changes to  , indicating pan mode. Click and hold the left mouse button down and drag the image to change the view. Changing the view does not affect the area to download. The area to download is indicated in the *Preview* section by a yellow outline.
- Click the  button on the left side of the image preview to change the extents of the image that is downloaded. The cursor changes to  , indicating draw mode. Click and hold the left mouse button down and drag the mouse over the area to download. The zoom extents update and the yellow box coincides with the area drawn. The *Select Area to Download* also updates. Only the portion of the image highlighted by the yellow box will download.

Note: The selected server may have an original data source resolution (for example, 1 meter/pixel) for its imagery. You may be able to select an image resolution higher or lower than this original data source resolution. Increasing the image resolution here cannot give you better image detail over the original data source. By requesting a higher resolution than the original data source, the image is simply larger in size and in the number of pixels. The server returns the requested image in the requested size. There is no way to know what the original data resolution is for each individual server.

Log

The *Log* section displays the tiles that have previously been downloaded in the current session.

OK, Cancel and Help

Once all of the options are set, click *OK* to download the image. Click *Cancel* to cancel the download and return to the **Surfer** plot window. Click *Help* to open the help file.

If the *OK* button is not available, the layer is not selected. Go back to the *Select Data Source* section and select a specific layer, not a server name.

Server Responsiveness

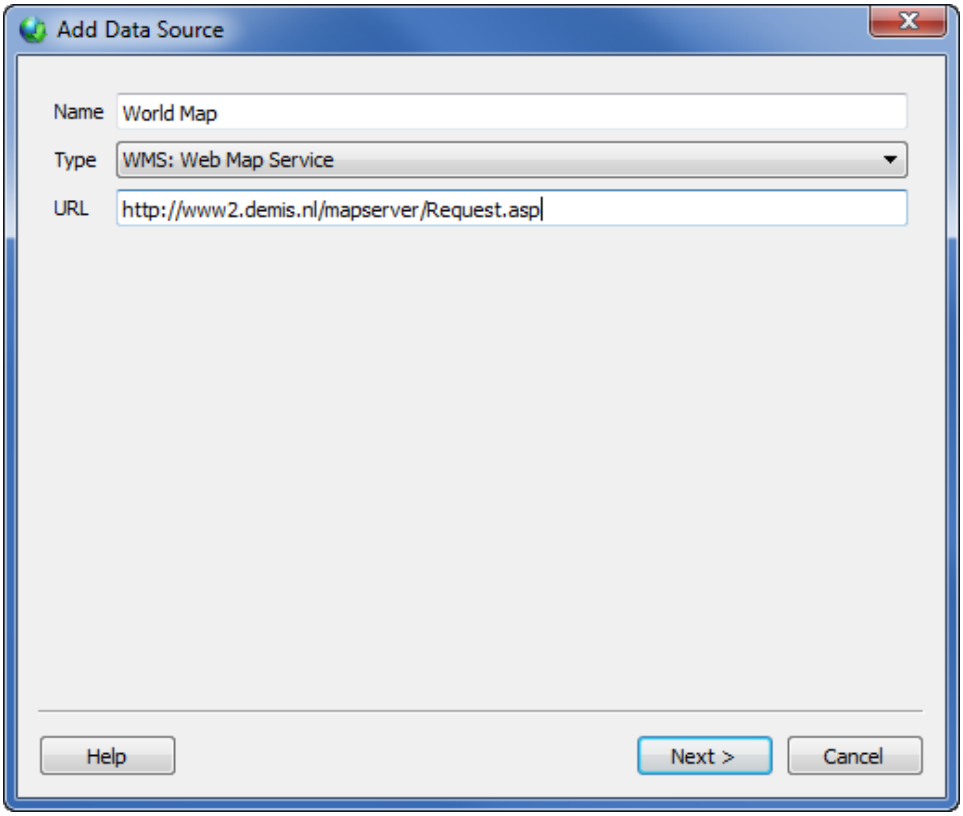
Note: Download speeds will vary, depending on the server selected. Some servers may become unresponsive. These data sources are on external servers which are out of Golden Software's control. If one server is unresponsive or slow to download, you may wish to select a different server.

Base Map Naming Convention

Base maps from servers are named with the map server name, such as *Base-Orthoimagery/USGS_EDC_Ortho_NAIP*. In addition, the image downloaded with the base map from server adds attribute information, including the server name and layer title.

Add Data Source Dialog

Right-click in the open white space in the Download Online Maps dialog to open the **Add Data Source** dialog. This dialog allows new web servers to be added to the list in the **Download Online Maps**.



Type a name and the website location to add the data source.

Name

In the *Name* section, type the name of the server. This is the name that is listed in the **Download Online Maps** dialog, so the name can be as descriptive as desired.

Type

Select the *Type* from the list. Available types are currently limited to *WMS: Web Map Service*.

URL

In the *URL* section, type the full internet location of the web mapping service. The address must contain the http:// and the www before the location. Sites with https:// or sites that redirect to SSL servers are not currently supported. **Surfer** currently only supports WMS (web map service) servers.

Next

Click *Next* to test the *URL* location. The program initiates communication with the server. If the communication is successful, an *Initial Test Success* message appears. The dialog will contain information, such as name, title, and location, for the new server. Click *Finish* to return to the **Download Online Maps** dialog.

If the program cannot communicate with the server, an *Initial Test Failed* message appears. The program is unable to connect to the server. There are a variety of reasons this could happen. The web server URL could have changed or could be input incorrectly, the web server is temporarily down, a firewall or virus scanner is preventing the program from connecting to the server, or an internet connection cannot be established.

Back

Click *Back* to return to the previous page, allowing the *Name, Type,* or *URL* to be re-edited.

Cancel or Finish

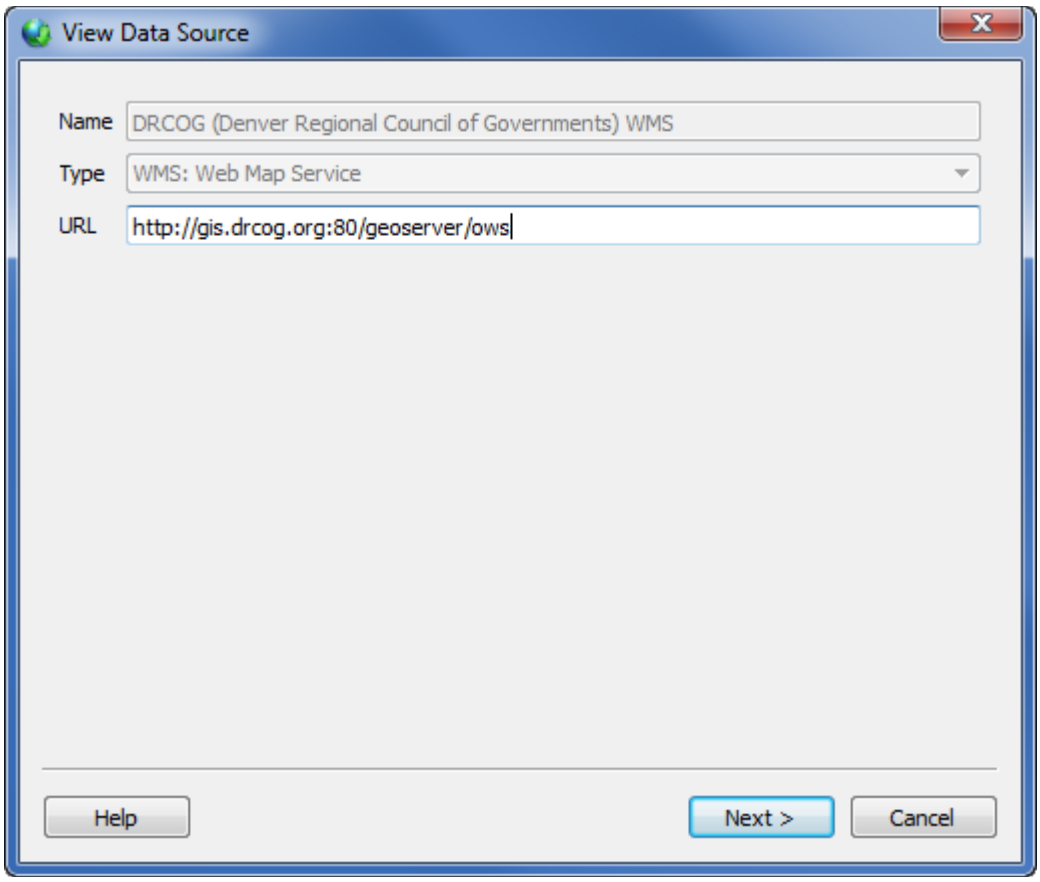
Click *Cancel* to return to the **Download Online Maps** dialog, without making any changes. Click *Finish* to return to the **Download Online Maps** dialog, making any changes to the *Name, Type,* or *URL* in the dialog.

Help

Click *Help* to open the online help file with information about the open dialog.

View Data Source Dialog

Right-click on a predefined server name in the Download Online Maps dialog to open the **View Data Source** dialog. This dialog allows predefined web servers to be edited in the **Download Online Maps**.



*In the **View Data Source** dialog, you can change the web location of the server.*

Editing the URL

For predefined layers, the *Name* cannot be edited. The *URL* can be edited. This is useful if the URL for the server changes. Highlight the existing location and type the new location.

Next

Click *Next* to test the *URL* location. The program initiates communication with the server. If the communication is successful, an *Initial Test Success* message appears. The dialog will contain information, such as name, title, and location, for the new server. Click *Finish* to return to the **Download Online Maps** dialog.

If the program cannot communicate with the server, an *Initial Test Failed* message appears. The program is unable to connect to the server. There are a variety of reasons this could happen. The web server URL could have changed or could be input incorrectly, the web server is temporarily down, a firewall or virus scanner is preventing the program from connecting to the server, or an internet connection cannot be established.

Back

Click *Back* to return to the previous page, allowing the *Name* or *URL* to be re-edited.

Cancel or Finish

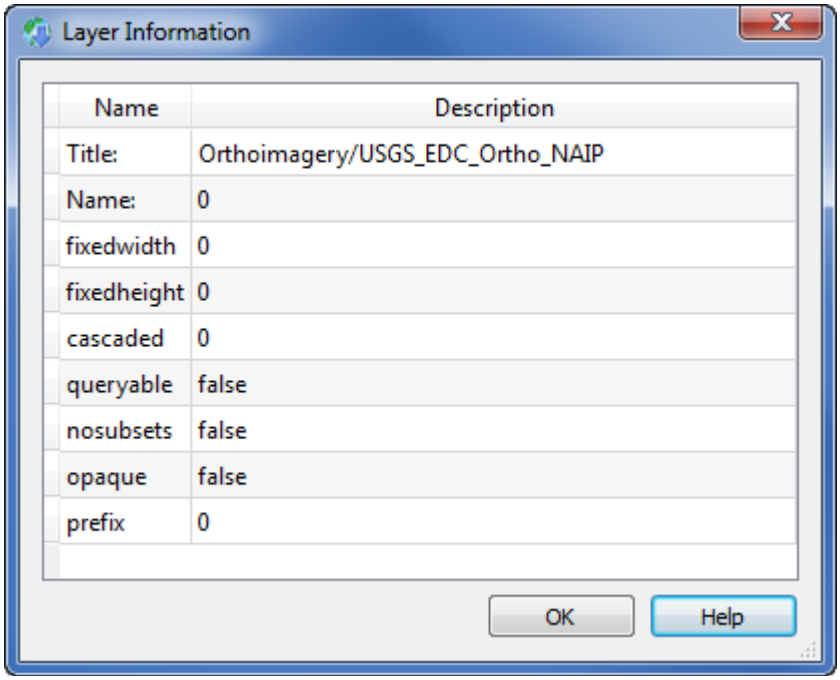
Click *Cancel* to return to the **Download Online Maps** dialog, without making any changes. Click *Finish* to return to the **Download Online Maps** dialog, making any changes to the *Name* or *URL* in the dialog.

Help

Click *Help* to open the online help file with information about the open dialog.

Layer Information Dialog

Right-click on any layer in the Download Online Maps dialog to open the **Layer Information** dialog. Information such as the minimum scale, height or width, layer name and title are listed in the dialog. None of the options are editable.



*The **Layer Information** dialog contains information about the selected web server.*

OK

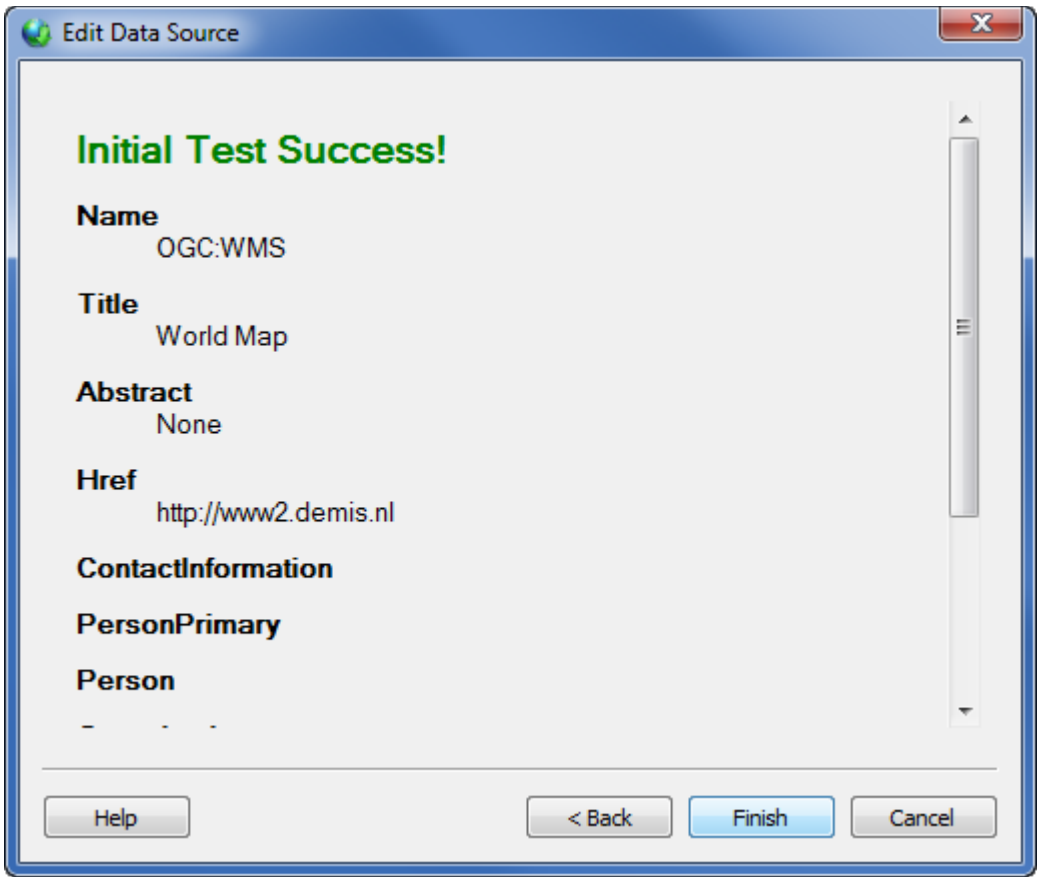
Click *OK* to return to the **Download Online Maps** dialog.

Help

Click *Help* to open the online help file with information about the open dialog.

Server Information Dialog

Right-click on any server name in the Download Online Maps dialog and select *Info* to check the connectivity of the server.



The server location is tested and the results of the test are reported.

Server Connectivity

The program initiates communication with the server. If the communication is successful, an *Initial Test Success* message appears. The dialog will contain information, such as name, title, and location, for the server. Different servers will have different information available. Click *OK* to return to the **Download Online Maps** dialog.

If the program cannot communicate with the server, an *Initial Test Failed* message appears. The program is unable to connect to the server. There are a variety of reasons this could happen. The web server URL could have changed or could be input incorrectly, the web server is temporarily down, a firewall or virus scanner is preventing the program from connecting to the server, or an internet connection cannot be established. Sites with https:// or sites that redirect to SSL servers are not currently supported.

Server Information

Below the *Success* or *Failure* message, additional information about the server appears. This will include the *Name*, *Title*, and *HRef* at a minimum. It can also include *Abstract, Keyword List, Contact Information, Layer Limits, Maximum Width, Maximum Height, Fees,* and *Access Constraints*.

Name

The Name option lists the type of server. Currently, this is always WMS.

Title

The Title option lists a brief yet descriptive description of the server. This is created by the server provider.

HRef

The HRef option is the website URL that hosts the server.

Abstract

The *Abstract* option is similar to the *Title* option, however the description can be longer and in narrative format. This is created by the server provider.

Keyword List

The *Keyword List* is a list of keywords or phrases that describe the server as a whole. Keywords can include definitions. For example, a server could show a vocabulary attribute that is defined by an organization such as the *International Standard*.

Contact Information

The *Contact Information* can include name of the contact person, physical address, email address, organization name, country, or position.

Layer Limits

The *Layer limits* section includes the maximum number of layers a client is permitted to include in a single GetMap request.

Maximum Width and Maximum Height

The *Maximum Width* or *Maximum Height* option can contain the maximum allowed width or height values for a downloaded image.

Fees

The *Fees* section includes usage costs for the server.

Access Constraints

The *Access Constraints* section can contain any limitations on usage of the server.

Help

Click *Help* to open the online help file with information about the open dialog.

Chapter 27

Data Labels

Data Labels can be posted for objects on a base or thematic map. Data must be linked to the active layer to open the **Data Labels** page. The map objects must have primary IDs associated with them.

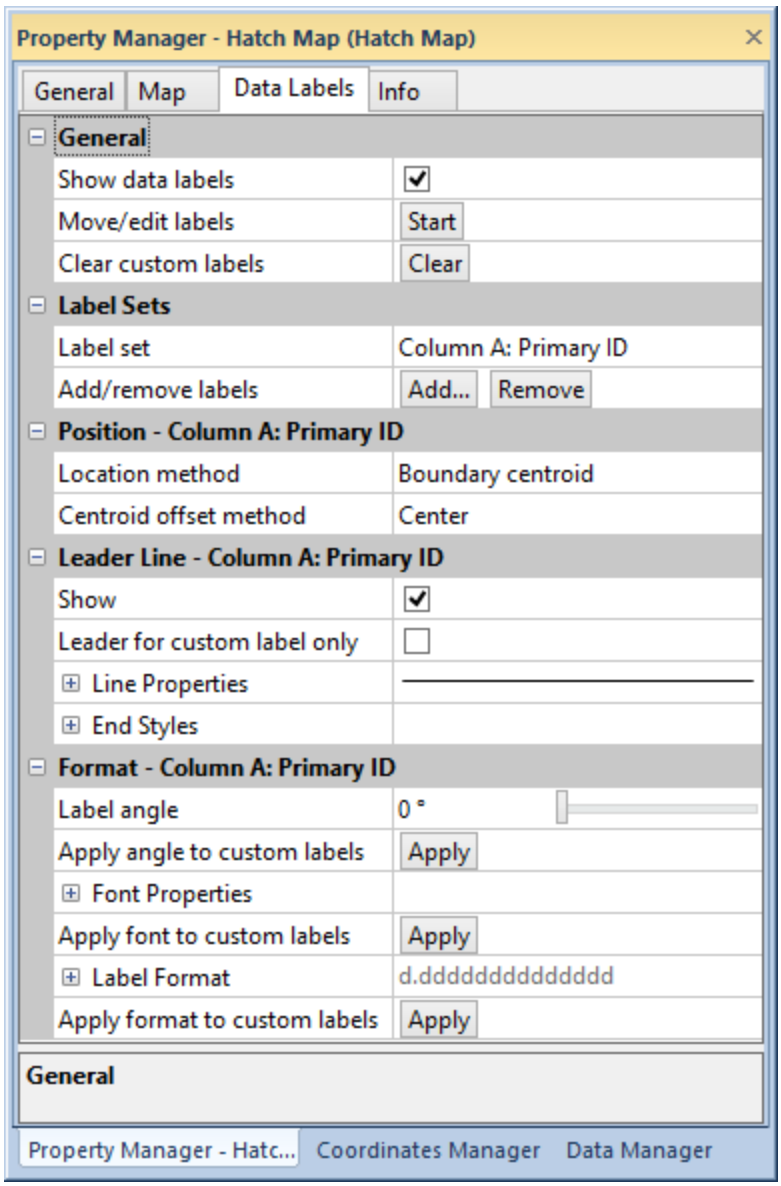
Symmetric shapes cannot be linked to data, and therefore rectangles, rounded rectangles, and ellipses cannot have data labels. Click the Symmetric Shape to Polygon command to be able to post data labels to symmetric shapes.

Data labels can be added for polygon, point, or polyline objects.

- When data labels are added to polygons, the posted data is drawn at the polygon's centroid (geographic center). The polygons use the default fill and line properties or you can set unique fill and line properties for each polygon on the map.
- For points, the data is posted directly on top of the points. If you want, you can use the **View | Display | Show Objects** command and disable the display of the point symbol by unchecking the *Symbol* option. The posted data is still shown, but the point location symbols are not drawn. Points can be added to a map using the **Draw | Shape | Point** command. Also, you can create points from XY coordinates in a data file with a pin map.
- For polylines, the posted data are drawn at the midpoint along the curve.

Data Labels Page

Show, select, and format labels on the **Data Labels** page in the **Property Manager**.



Select labels to show, move and edit labels, and add lead lines on the ***Data Labels*** *page of the* ***Property Manager****.*

General

The *General* group contains options to show, move, edit, and clear labels and select the columns containing the primary ID.

- Click the *Show data labels* check box to add data labels to the map.
- Click the *Start* button next to *Move/edit labels* to start Edit Post Labels mode. Click the *Finish* button to stop editing data labels.
- Click the *Clear* button to the right of *Clear custom labels* to return labels to default position and style.

Label Sets

The *Label Sets* group contains the selected labels. Labels are added and removed in the *Label Sets* group.

- The *Label set* list contains the data labels that are displayed on the map. Select a data column in the *Label set* list to edit the label position, lead lines, and format.
- Click the *Add...* button to add data columns to the *Label set* list with the Pick Columns to Add dialog.
- To remove a data column label from the map, select the data column you wish to remove in the *Label set* list, then click the *Remove* button.

Position: [Current data column selection]

The selected data column in the *Label set* list is positioned in the *Position:* group.

The *Position* options indicate the relative location of the posted data. You can select either *Boundary centroid* or *Data coordinates* for each posted variable. If you choose *Data coordinates*, the X and Y coordinates must be in the current data file. Select the X and Y coordinate data columns in the appropriate *X column* and *Y column* list. Move an individual data label with Edit Post Labels or Move an object's centroid with Move Centroids.

The *Centroid offset method* options let you specify the relative offset for each posted variable. If you are posting more than one variable, you can use different *Centroid offset method* settings so the posted labels to not overwrite one another. If a *User Defined* offset is selected, set the *X offset* and *Y offset* boxes to place the labels. The values are in page coordinates.

Leader Line: [Current data column selection]

Leader lines are added for the selected data column in the *Label set* list in the *leader line:* group. Line properties for leader lines are edited in the *Leader Line:* group.

Click the *Show* check box to show or hide leader lines. Click the *Leader for custom labels only* check box to add leader lines to only labels moved with the *Move/edit labels* command in the *General* section.

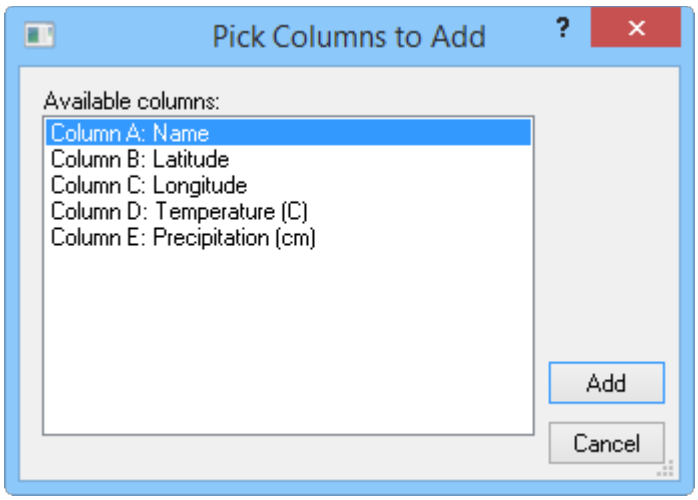
Format: [Current data column selection]

The *Label angle* property rotates the data labels. Type a value in degrees into the *Label angle* field, or click and drag the slider bar to adjust the label angle. If you have custom moved labels, click the *Apply* button in the *Apply angle to custom labels* field to rotate the custom labels.

Set text and font properties and label format properties for the data column selected in the *Label set* list in the *Format:* group. Apply font and format property changes to custom labels by clicking the *Apply* button in the *Apply font to custom labels* and *Apply format to custom labels* fields, respectively.

Pick Columns to Add Dialog

Pick columns to add to *Data Columns* on the **Property Manager** General page or to *Label Sets* on the Data Labels page.



*Select columns to add in the **Pick Columns to Add** dialog.*

Click on a column name to select the column. Hold the CTRL key to select multiple items. To select a group of items, hold the SHIFT key and click the first and last items in the group. Click *Add* to add the selected data columns to the *Variables* list. Click *Cancel* to close the dialog without adding any data columns to the *variables* list.

Edit Post Labels

Data labels can be moved interactively so that labels do not overlap or so that labels appear in a more desirable location.

Enter Edit Post Labels Mode

To enter the post map label edit mode, click on the *Start* button on the Data Labels page of the **Property Manager**. Alternatively, right-click on the selected map and select *Edit Post Labels.* The cursor will change to to indicate you are now in data label editing mode. The data labels can now be individually moved.

Move Individual Data Labels

To move a label, enter the **Edit Post Labels** mode. Click once on the label you wish to move. Once the label is selected, hold down the left mouse button and drag the label to a new location. When the label is in the desired location, release the mouse button.

Labels can also be moved using the keyboard. To click on a label using the keyboard, hold down the ARROW keys until the cursor is above the label. Press and hold the SPACEBAR to select the label. Press the ARROW keys to move the label to a new location. When the label is in the desired location, release the SPACEBAR.

Edit Individual Data Labels

Double click on a data label to open the text and label format properties for the label.

Exit Edit Post Labels Mode

To end post map label edit mode, press the ESC key or click the *Finish* button on the Data Labels page.

Move Around the Plot Window in Edit Mode

If you are zoomed in on the post map, use the scroll bars to move to locations that appear off the screen. Alternatively, click and hold the scroll button of a mouse wheel to pan the plot window.

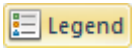
Custom Label Location and Changed Coordinate System

When the target coordinate system changes, all data labels are returned to the default location.

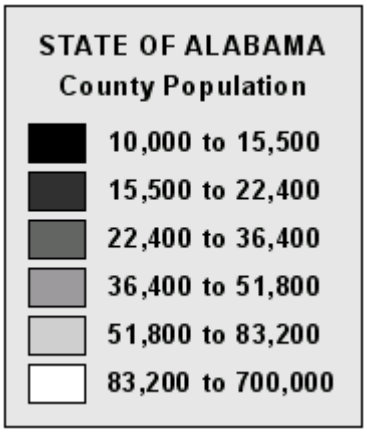
Reset Labels to Default

All labels in the post map can be reset to the default position. To reset the labels, click on the map to select it. In the **Property Manager**, click on the Data Labels page. Click *Clear* next to *Clear custom labels* to return labels to their default style and position.

Legend

The **Map | Add | Legend** command 

adds a legend to a thematic map. The type of legend depends on the type of map. For example, a hatch map shows the colors related to each of the hatch map ranges. If you have a multiple layer map with more than one thematic map type, the legend can include information for any or all of the thematic maps. When the map or data are updated, the legend is updated automatically. Legends are not available when you do not have a thematic map displayed. To modify an existing legend, select the legend and edit the legend properties in the **Property Manager**.



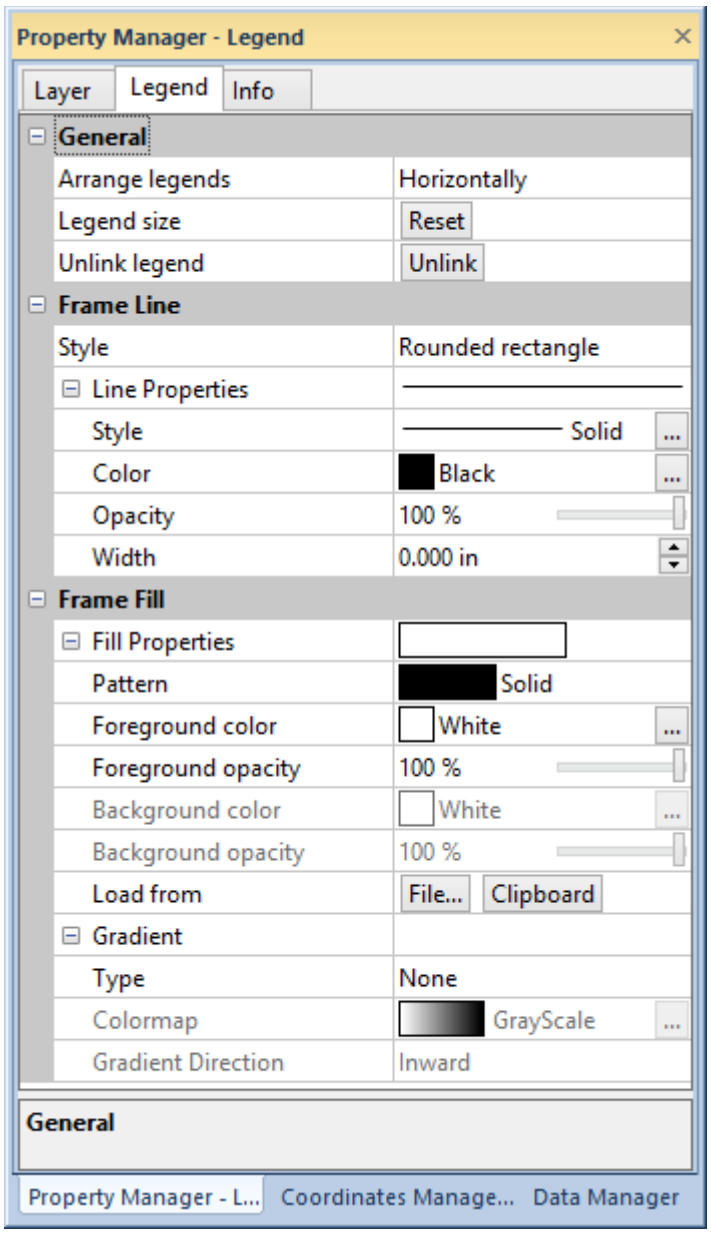
This is an example of a hatch map legend.

Legend Properties

The **Property Manager** contains a number of options for editing legends. The legend **Property Manager** has Legend, Layer, and Info pages. Some of these options are universal to all map legends, while others are specific to individual thematic map types.

Legend Page

The **Property Manager Legend** page contains legend frame line and fill, arrangement, size, and linking options.



*Edit legend properties in the **General** page of the **Property Manager**.*

Legend Arrangement

If you have multiple map layers included in the legend, the *Arrange legends* list arranges legends either *Vertically* or *Horizontally*. Add and remove layers displayed in the legend in the Layer page of the **Property Manager**.

Legend Size

If you alter the legend size, you can click the *Reset* button in the *Legend size* field to revert to the original legend size. Changing the legend size affects the size of the symbols that may appear in the legend.

Unlinking the Legend

Unlink legend breaks the legend apart into individual drawing objects. This allows each individual part of the legend to be customized. Click the *Unlink* button in the *Unlink legend* field to break the legend apart. Double click on any part of the legend you wish to change after unlinking it. **Once a legend is unlinked, it cannot be relinked**, so if the data or map changes, the legend is no longer updated. Use the Align Objects command to align unlinked legend text, etc.

Frame Line

The *Style* property displays either a *Rectangle* or *Rounded rectangle* for the legend box outline.

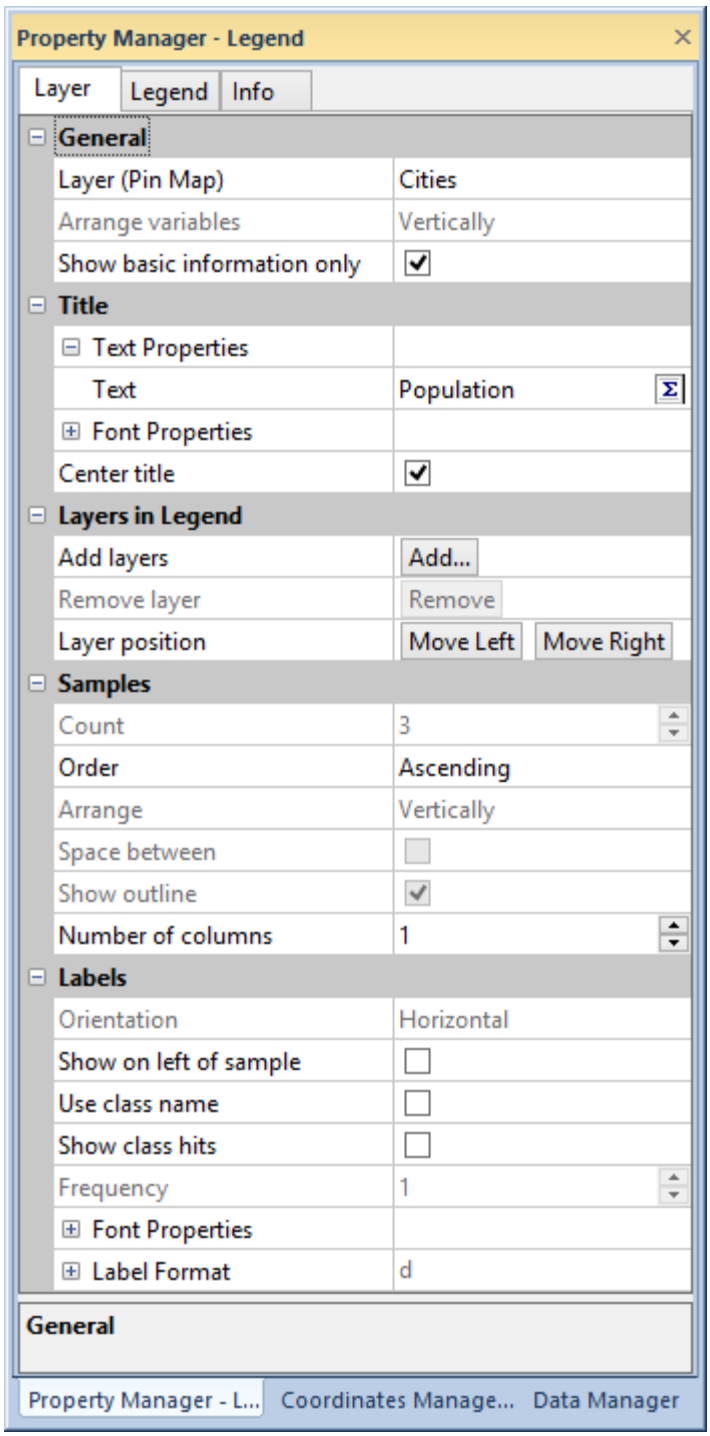
The *Frame Line* section of the **Legend** page contains line properties for the legend frame. See the line properties help page for more information on editing legend frame line properties.

Frame Fill

The *Fill* section of the **Frame** page contains fill properties for the legend frame. See the fill properties help page for more information on editing legend frame fill properties. To apply a gradient fill, select a gradient *Type* by clicking on the current option and selecting *None*, *Linear*, or *Radial* from the list. Select a preset *Colormap* from the list, or click the button to make a custom colormap in the Colormap dialog. Select *Horizontal*, *Vertical*, *Inward*, or *Outward* from the *Gradient direction* list to choose a gradient direction.

Layer Page

The **Layer** page of the **Property Manager** for a legend edits display properties for the information in the legend. Add and remove layers from the legend in the **Layer** page.



*Edit layer information for the legend in the **Layer** page of the **Property Manager**.*

General

The *General* section of the **Layer** page selects the layer currently being edited in the **Property Manager**.

- The *Layer (Map Type)* list contains all the layers currently included in the legend. Select the layer information you wish to edit in the *Layer* list.

- The *Arrange variables* property is enable when the selected *Layer* contains more than one variable in the legend. Select *Horizontally* or *Vertically* from the *Arrange variables* list to arrange the variables in the legend.
- Click the *Show basic information* check box to show only the legend title and samples.

Title

The *Title* section of the **Layer** page contains text and font properties for legend titles. Click the *Center title* check box to center align the title and legend information. See the text and font properties help page for more information on editing legend title text and font.

Layers in Legend

The *Layers in Legend* section of the **Layer** page add, removes, and rearranges the layers included in the legend.

- To add a layer, click the *Add* button and select a map layer or layers to add to the legend in the **Pick Layers to Add** dialog. Click on a layer in the *Available layers to add:* list to select the layer. Hold the CTRL key to click and select multiple layers. Hold the SHIFT key and click the first and last layer to select a group of layers. Click the *Add* button to add the layer(s) to the *Layer* list in the **Property Manager**.
- To remove a layer, click on the layer name in the *Layer* list, and then click the *Remove* button. The active layer's legend cannot be removed. To delete the legend from the map, select the legend in the plot window or object manager and press the DELETE key or use the Delete command.
- The directional buttons in the *Layer position* field reorder the layers in the legend. When the *Arrange legends* property on the General page is set to *Horizontally*, click *Move Left* or *Move Right* to change the legend order. The buttons are *Move Up* and *Move Down* when *Vertically* is selected in the *Arrange legends* list.

Samples

Some map types have specific legend settings. The map-specific settings are disabled until you have selected a particular map layer or type in the *General* section of the **Layer** page. Many of the map specific settings are in the *Samples* section of the **Layer** page.

- Type a number in the *Count* field or click the buttons to define the number of data samples you want to show in the legend. You can have between 2 and 100 samples in a legend for all map types. You can also set the *Count* value to 0 or 1 for pie map legends.
- Use the *Order* property to arrange sample in the legend in *Ascending* or *Descending* order. The order is based on the map data classes.
- Use *Arrange* to arrange the data samples *Horizontally* or *Vertically* in the legend.
- Click the *Space between* check box to put space between the sample color boxes.
- Click the *Show outline* check box to draw an outline on the sample color boxes. If you disable this option along with the *Space between* option, the legend samples appear as a continuous spectrum.
- By default, there is one column containing the legend information. You can create more than one column by changing the number in the *Number of columns for samples* box.

  Type a value in the *Number of columns* field or click the buttons to adjust the value.

Labels

The *Labels* section of the **Layer** page has label options, font, and format properties.

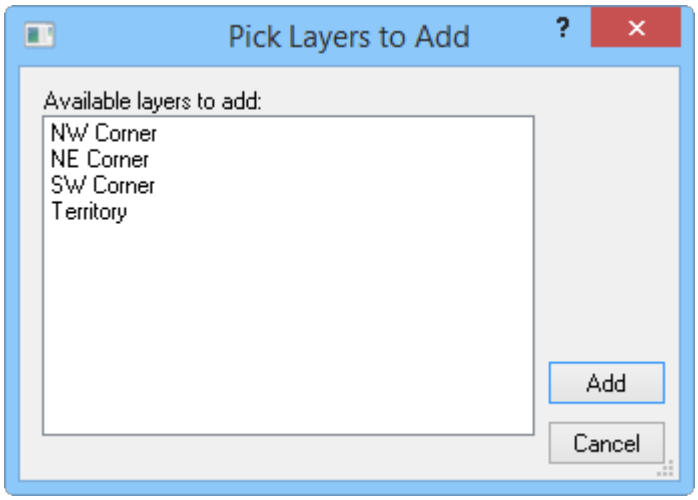
- Select *Horizontal* or *Vertical* in the *Orientation* list to display horizontal or vertical sample labels for a bar, flow, pie, or symbol map legend.
- Click the *Show on left of sample* check box to position the sample text to the left of the sample. The default position for sample text is to the right of the sample.

- Click the *Use class name* check box to display class name from the map properties *Name* column.
- To display the number of objects in each class, click the *Show class hits* check box.
- The *Frequency* value determines which labels will be added to the samples. To show a label for every sample, set the *Frequency* to "1," or setting *Frequency* to "3" shows every third sample label after the first label. Change the *Frequency* value by typing a number in to field or clicking the buttons.

See the font properties and label format properties help pages for more information on editing legend label font and format.

Pick Layers to Add Dialog

Pick layers to add to legends and insets in the **Pick Layers to Add** dialog. Click the *Add...* button in the Layer page or Inset page to open the **Pick Layers to Add** dialog.



*Select columns to add in the **Pick Columns to Add** dialog.*

Click on a layer name in the *Available layers to add:* list to select the layer. Hold the CTRL key to select multiple items. To select a group of items, hold the SHIFT key and click the first and last items in the group. Click *Add* to add the selected layer to the legend or inset list. Click *Cancel* to close the dialog without adding any layers.

Scale Bar

The **Map | Add | Scale Bar** command Scale Bar places a distance scale on your map. The distance scale is relative to the coordinate system used for the map. If the map has a known projection, the scale bar can be set to centimeters, chains, feet, inches, kilometers, links, meters, miles, millimeters, nautical miles, rods, US feet, or yards.

Scale Bars on Projected Maps

Because of the inherent problems in plotting the globe on a flat surface (see Introduction to Map Projections), scale bars are exact at only one or two latitudes (or Y coordinates) on the map. On large scale maps that cover a relatively small area, such as a single state, the inaccuracies are minor and can be ignored. On small-scale maps, that cover large areas, the inaccuracies become more pronounced but some knowledge of how the scale bars are calculated helps to interpret scale.

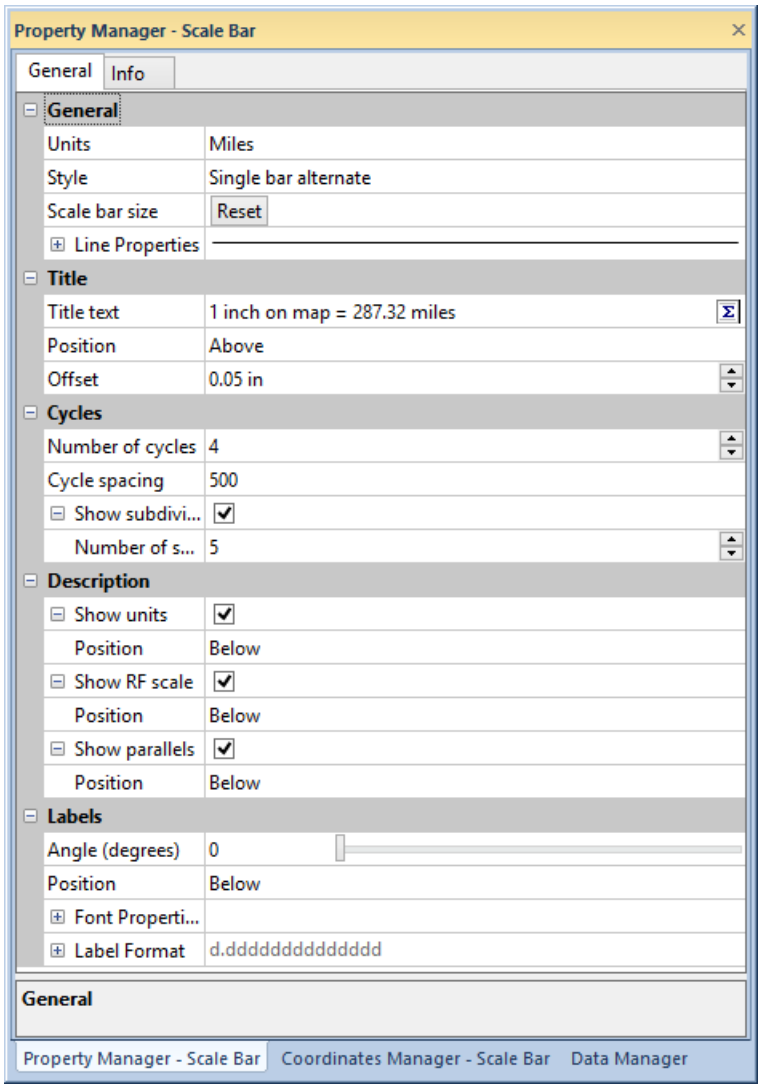
- On an Unprojected Lat/Long map, the scale bar is designed to match the scaling at the latitudinal center of the map. Scaling is accurate in the north-south dimension over the extent of the map. In the east-west direction, the scale is accurate at the north-south center of the map. Scaling increases towards the poles, and decreases toward the Equator.
- On projected maps, check the *Show parallel true to scale* option to find out where the maps are true to scale. You can also check the projection properties (Coordinate System, click the *Change...* button) to find out where the map is true to scale.
- On maps using *Unknown* coordinates or projections, the scale bar is based on the scaling at the vertical (Y coordinate) center of the map.

Scale Bar Properties

Scale bar properties are located in the **Property Manager**. The **Property Manager** contains **General** and Info pages when the scale bar is selected.

General Page

The **General** page of the **Property Manager** contains description, cycle spacing, font, and format properties for the scale bar.



*Edit scale bar properties in the **General** page of the **Property Manager**.*

Scale Bar Description

Title text is the text that appears on the scale bar. The default description is based on the measurement option you select. For example, if your page units are in inches, your map is in latitude/longitude, and your scale is in nautical miles, the default text would be, "1 inch on map = # nautical miles" where # is a number. If you want to change the default description, you can enter the desired text into the box. If you do not want a title to appear, delete the text from the *Title text* box. You can use math text in the *Description* box for text formatting, or edit description text in the text editor by clicking the button.

The *Position* option in the *Title* section places the title text above or below the scale bar. The title bar is always the first line of text when *Above* is selected. When *Below* is selected, the *Title text* is always the last line of text.

Edit the title text *Offset* by typing a value in page units into the *Offset* box or clicking the buttons. The offset value determines how far the *Title text* is drawn from other text or the scale bar, depending on the four *Position* selections.

Scale Bar Units

Select the units for the scale bar in the *Units* list. Available units include *Centimeters*, *Chains*, *Feet*, *Inches*, *Kilometers*, *Links*, *Meters*, *Miles*, *Millimeters*, *Nautical Miles*, *Rods*, *Unit of 1*, *US Feet*, and *Yards*. If the projection is unknown, *Map units* are the scale units.

Click the *Show units* check box in the *Description* section to indicate the scale units on the scale bar. Select *Above* or *Below* in the *Position* field below *Show units* to place the units above or below the scale bar.

Representative Fraction

Click the *Show RF scale* check box to show the ratio of distance on the map to distance on the Earth's surface. The RF scale has the form of 1 page unit : # scale units. Select *Above* or *Below* in the *Position* field below *Show RF scale* to place the RF scale above or below the scale bar.

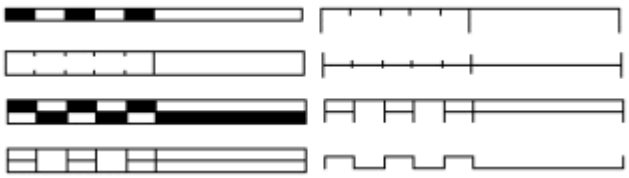
Parallel True to Scale

The *Parallel true to scale* group controls the true latitude text display.

- Check the *Show parallel true to scale* box to display text that indicates the latitude on which the scale bar is based. For any projected map, the scale bar can only be exact for one or two latitudes on the map. This latitude value is indicated by the *Parallel true to scale* information.
- Select *Above or Below* in the *Position* field below *Show parallels* to place the true latitude above or below the scale bar.

Scale Bar Styles and Cycles

Select a scale bar style from the *Style* list. Available style options include *Single bar alternate*, *Single bar unfilled*, *Double bar alternate*, *Double bar unfilled*, *Comb*, *Double-sided comb*, *Rail*, and *Zigzag*.



The scale bar styles include (clockwise from the upper right): Comb, Double-sided comb, Rail, Zigzag, Double bar unfilled, Double bar alternate, Single bar unfilled, and Single bar alternate.

Select the number of cycles in the *Number of cycles* field. Type a number in the *Number of cycles* box or click the buttons to set the number of cycles.

Set the *Cycle spacing* by typing a value into the *Cycle spacing* field. The units for the cycle are selected in the *Units* list.

Subdivisions

Subdivisions can be added to the first cycle by clicking the *Show subdivision* check box. Select the *Number of subdivisions* for the first cycle by typing a number in the box or clicking the buttons.

Default Size

If you have used the selection handles to size the scale bar, click the *Default Scale Bar Size* button to return the scale bar to its original size.

Line Properties

Edit scale bar line properties in the *General* section. See the line properties help page for more information on editing scale bar line properties.

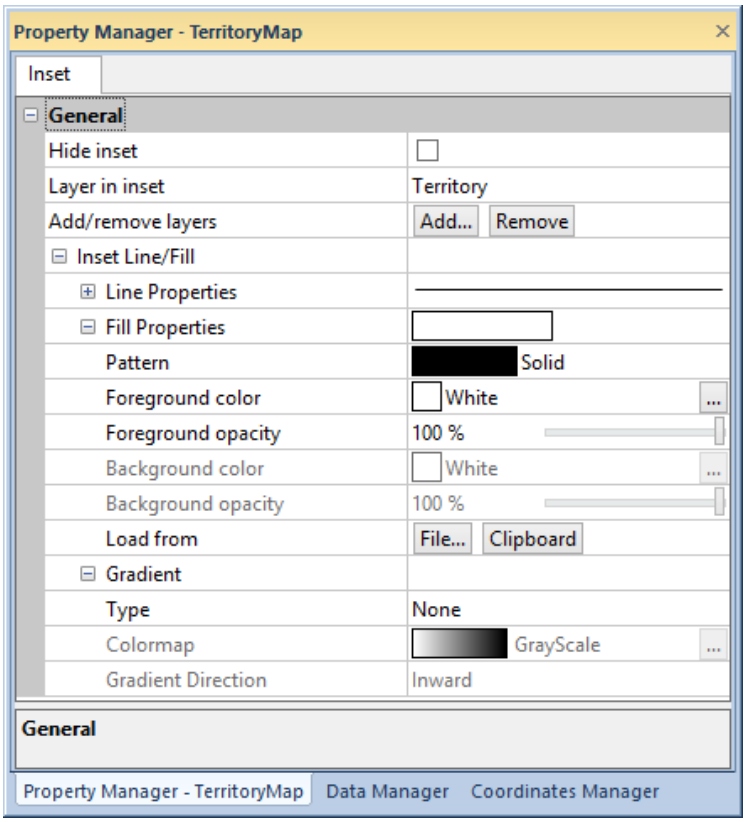
Labels

Change the display angles of the scale bar labels by typing a value in degrees into the *Angle (degrees)* field. You can also adjust the label angle by clicking and dragging the bar. Select *Above* or *Below* in the *Position* field in the *Labels* section to place the labels above or below the scale bar.

See the font properties and label format help pages for more information on editing scale label font and format properties.

Inset Page

The **Inset** page of the **Property Manager** edits layer, visibility, line, and fill properties for the active inset.



*Edit inset properties in the **Inset** page of the **Property Manager**.*

Visibility and Layer Properties

Click the *Hide inset* check box to hide the inset in the plot window. The inset can also be shown or hidden in the Inset Manager. To add layers to the inset, click the *Add...* button in the *Add/remove layers* field and select layers in the Pick Layers to Add dialog. To remove layers from the inset, select the layer to remove in the *Layer in inset* list and click the *Remove* button. The Inset must contain at least one layer. To remove the inset, click the **Delete Inset** button in the Inset Manager.

Inset Line and Fill Properties

The *Line Properties* section edits the inset border line properties. The *Fill Properties* and *Gradient* sections edit the inset background properties. See the line properties and fill properties help pages for more information on editing inset line and fill properties. Apply a gradient fill to the inset background by selecting *Linear* or *Radial* from the *Type* list. Click on the *Colormap* selection to pick a predefined colormap for the gradient, or click the button to create a custom colormap in the Colormap dialog. Select a *Vertical*, *Horizontal*, *Inward*, or *Outward* gradient direction in the *Gradient Direction* list.

Note for Editing Line Properties

The active inset border is changed to a dotted blue line in the plot window to make active inset identification easier. Changes to the inset line properties cannot be seen until the inset is deactivated by double-clicking the active inset in the Inset Manager. Other ways to deactivate the inset include activating another inset in the **Inset Manager**, clicking the Plot Properties or Layer Properties command, clicking in the plot window outside the inset, or clicking empty space in the **Object Manager**. Selecting an object in the **Object Manager** will not deactivate the inset.

Chapter 28

File Menu Commands

File Menu Commands

New Plot	Creates a new plot window
New Worksheet	Creates a new worksheet document
Open	Opens a file in a plot document or worksheet
Close	Closes the active document
Close All	Closes all documents
Save	Saves the active document
Save As	Saves the active document window in the specified format
Import	Loads various file formats into the active layer, only available from the Plot Window
Export	Outputs the document in various file formats, only available from the Plot Window
Print	Prints the active document
Page Setup	Formats the page for printing
Options	Sets general program options, and default settings for rulers, page, line properties, fill properties, text properties, and symbol properties
Defaults	Controls most of the default settings used throughout MapViewer's dialogs
Customize Ribbon	Opens dialog for customizing the Quick Access Toolbar, Ribbon, and Tools
Online	Checks for a **MapViewer** update and provides links to the **Golden Software** home page, main product page, frequently asked questions, knowledge base, and forums. There is also a link to the USGS home page.
Feedback	Send a problem report, suggestion, or information request to Golden Software
About MapViewer	Displays program information and serial number
Search Commands	Searches the ribbon for commands matching the user-input text
Exit	Closes **MapViewer**

File List (File Menu)

Use the numbers and file names listed at the right of the **File** menu to open the last four closed documents. Click on a document name to open it or type the number on your keyboard corresponding to the document to open a file. To increase or decrease the number of files displayed

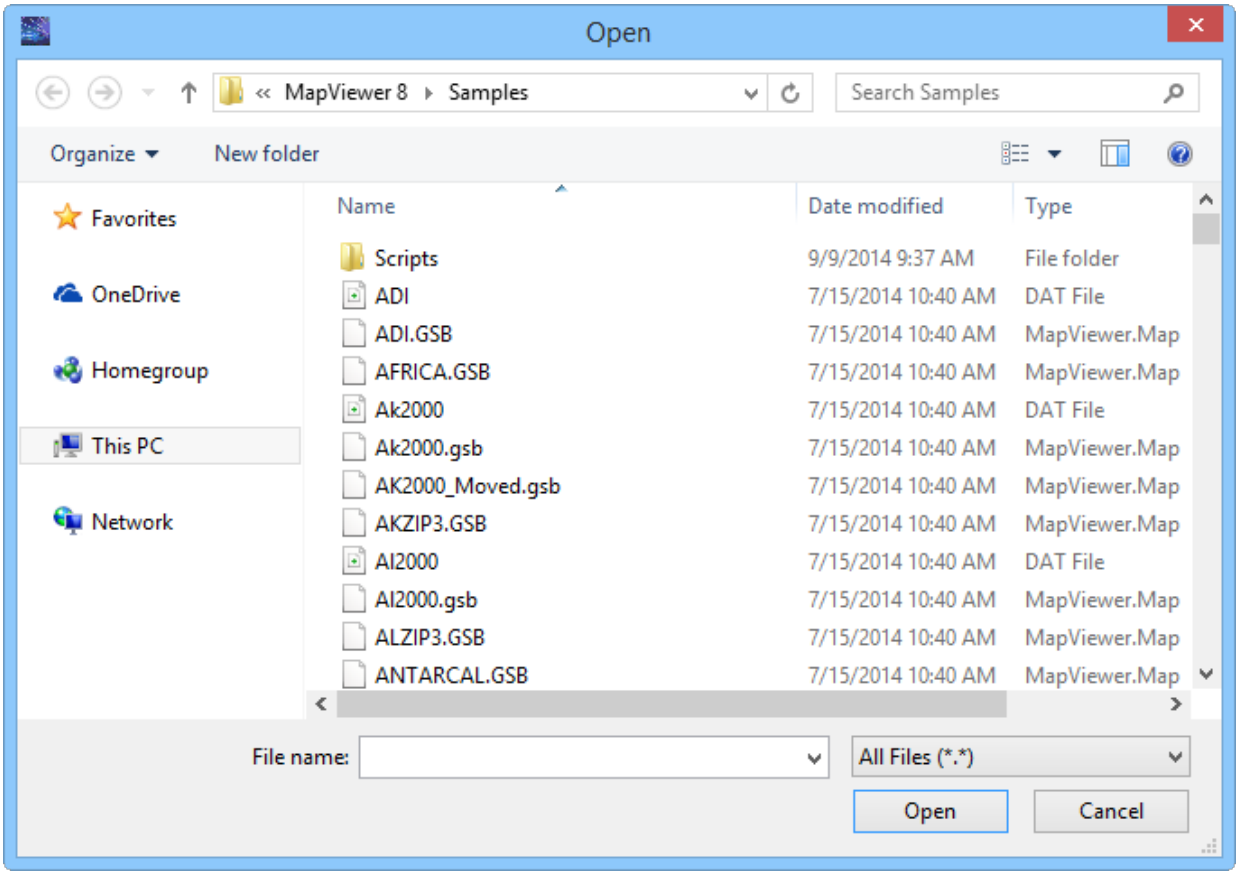
in the list, change the number in the *Recent files* field in **File | Options**. The file list maximum is 16.

Open

The **File | Open** command opens a file into a new window. A **MapViewer** file .GSM opens in a plot document and data files open in the worksheet. You can also click on the button on the toolbar, or press the CTRL + O on the keyboard to open files.

The Open Dialog

Use the **File | Open** command in the plot document or worksheet document to open the **Open** dialog.



*Select a file to open in the **Open** dialog*

Look In

The *Look in* field shows the current directory. Click the down arrow to see the directory structure and click on the folders to change directories.

Creating New Folders and Changing the View

The buttons to the right of the *Look in* field allow you to create new folders and change the view of the file list.

File List

The file list displays files in the current directory. The current directory is listed in the *Look in* field. The *Files of type* field controls the display of the file list. For example, if *Golden Software Data (*.DAT)* is listed in the *Files of type* field only [*.DAT] files appear in the files list.

Specify a File Name

The *File name* field shows the name of the selected file, or type a path and file name into the box to open a file.

Specify a File Type

The *Files of type* field shows the file format to be opened. To change the file format, click the down arrow and select the file type from the list. *All Files (*.*)* display all files in a directory.

The *Common Document Files (*...)* format type is selected by default. This displays all the common file formats in the navigation pane. If a different format type is selected, **MapViewer** will remember the setting until the end of the current session. When **MapViewer** is restarted, the default format type will be used.

To see all files in the directory, choose *All Files (*.*)* from the *Files of type* list. Double-click on a file to open it or single click the file and then click the *Open* button. The *All Files* shows all of the file formats even if the file type is not appropriate for the action chosen (i.e. displaying a data file when creating a grid based map that requires a grid file).

MapViewer files open in the Plot Document and data files open in the Worksheet Document.

File Types

MapViewer Files open in a new plot window. These are *.gsm, *.gsb, and *.gsi files.

Data Files open in the worksheet. These include *.accdb, *.bln, *.bna, *.csv, *.dat, *.dbf, *.las, *.mdb, *.sp1, *.seg, *.slk, *.txt, *.xls, *.xlsm, *.xlsx

Close

The **File | Close** command closes the active window. If you have not saved the current changes, you are prompted to save changes before the window closes. You can also select the **Close** command by right-clicking an MDI tab at the top of the plot or worksheet window and clicking **Close**.

- Click *Yes* to save changes and then close the window. If the file has not been previously saved the Save As dialog appears.
- Click *No* to close the document without saving changes.
- Click *Cancel* to return to the active document window.

Close All

The **File | Close All** command closes all documents in **MapViewer**. If you have not saved the current changes in each document, you are prompted to save changes before the window closes.

- Click *Yes* to save changes and then close the window. If the file has not been previously saved the Save As dialog appears.
- Click *No* to close the documents without saving changes.

- Click *Cancel* to return to the active document window.

Save

If the file has already been saved, **File | Save** updates the saved file. If the file has not been saved previously, the Save As dialog appears when **Save** is selected. Click the **File | Save** command or the button on the Quick Access Toolbar to save the file. You can also select the **Save** command by right-clicking an MDI tab at the top of the plot or worksheet window and clicking **Save**.

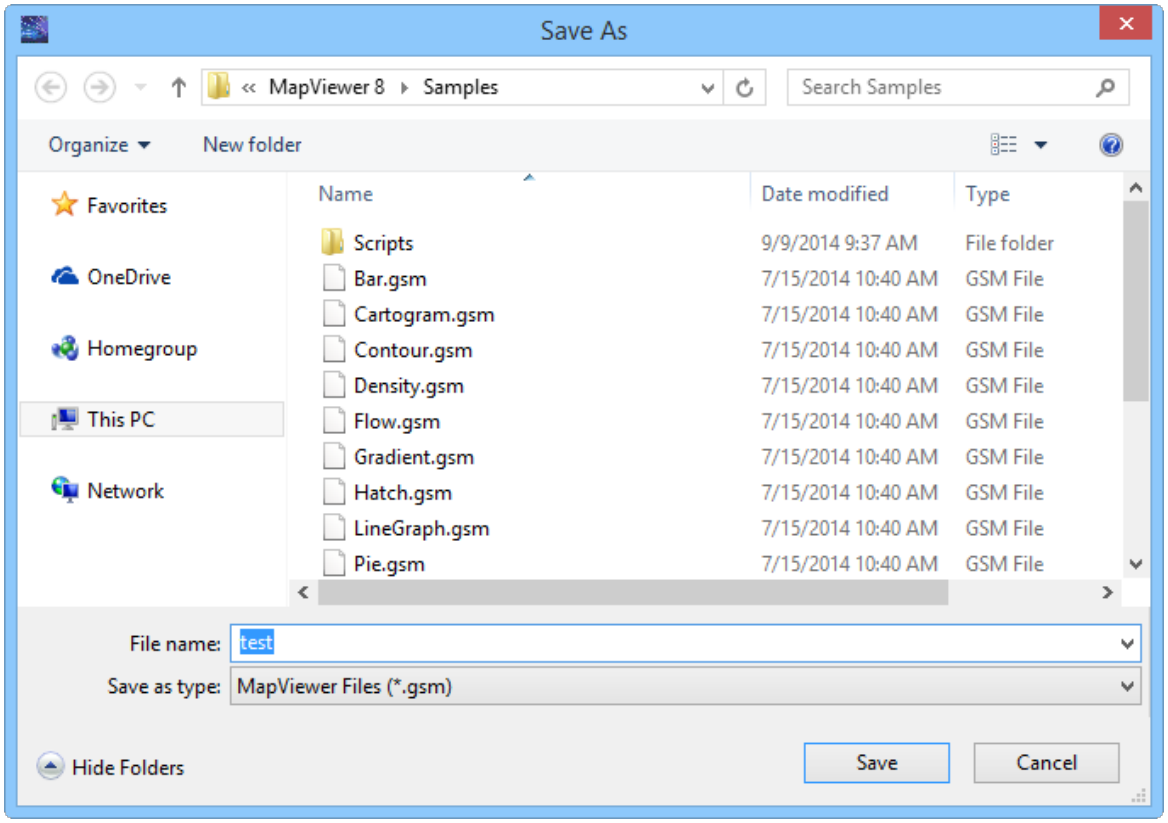
- Save **MapViewer** Files [. GSM] in the plot window.
- Save XLS, SLK, CSV, TXT, DAT, BNA, and BLN in the worksheet.
- Export TIF, WMF, DXF, GSB, etc. with **File | Export**.

Use Caution when Saving Excel Files!

A file can be saved in an Excel format from **MapViewer**, but only one worksheet can be saved. **MapViewer** does not allow for saving multiple worksheets in a single Excel document. If a multi-worksheet Excel document is opened and saved as an [. XLS] file from **MapViewer**, be aware that only the single worksheet is saved in the document. All the unused worksheets are lost. In this case, a warning message is issued. The message reads: "Data in additional worksheets in file xxxx will be lost. Proceed?" Save the file as an alternate file type, such as [. DAT] or [. CSV], to save the changes in your worksheet and to avoid destroying the additional worksheets in an [. XLS] file.

Save As

The **File | Save As** command saves a new document or saves a modified document with a new file name. The **File | Save As** command in the plot document and worksheet document opens the **Save As** dialog.



*Specify the save location, file name, and file type in the **Save As** dialog.*
This graphic may look different, depending on the operating system.

Save In

The *Save In* field shows the current directory. Click the down arrow to see the directory structure and click on the folders to change directories.

Button Shortcuts

The buttons to the right of the *Save in* field allow you to create new folders and change the view of the file list.

File List

The *File list* displays the files using the extension specified in the *Save as type* box. A file can be overwritten by selecting it from the file list.

File Name

The *File name* box displays the name of the selected file, or type in the path and file name of the file to be saved.

Save As Type

Select the file format in the *Save as type* list.

File Types

The available file types to save as or export depend on the location you are exporting from.

- Save **MapViewer** files .GSM in the Plot Document with **File | Save As**. *MapViewer Document (*.gsm)* files can only be opened in **MapViewer 8.**
- Save BLN, BNA, CSV, DAT, SLK, TXT, XLS, XLSX files in the Worksheet Document with **File | Save As**.

File Names, Formats, and File Extensions

When a worksheet file is saved, the file format can be specified by typing the appropriate extension on the file name. If the needed file is an ASCII DAT file, type a file name such as MYDATA.DAT. The ".DAT" extension tells the worksheet to save the file as an ASCII DAT file.

If the extension is not included in the file name the format is determined by the *Save as type* field. For example, if the name MYDATA is typed into the file name field and the *Save as type* field is set to *Excel Spreadsheet (*.XLS)*, the file is saved as MYDATA.XLS in Excel format.

The file can be saved with any extension by enclosing the file name in double quotes. The file is saved with the name and extension typed in the file name box, but it is saved in the format specified in the *Save as type* field. For example, type the name (with quotes) " MYDATA.ABC" in the file name box. If the *Save as type* field is set to *Comma Separated Variables (*. csv)*, the file is saved as MYDATA.ABC in the .CSV format.

Use Caution when Saving Excel Files!

A file can be saved in an Excel format from **Surfer**, but only one worksheet can be saved. **Surfer** does not allow for saving multiple worksheets in a single Excel document. If a multi-worksheet Excel document is opened and saved as an .XLS file from **Surfer**, be aware that only the single

worksheet will be saved in the document. If the existing file is overwritten all the unused worksheets will be lost. In this case, a warning message is issued.

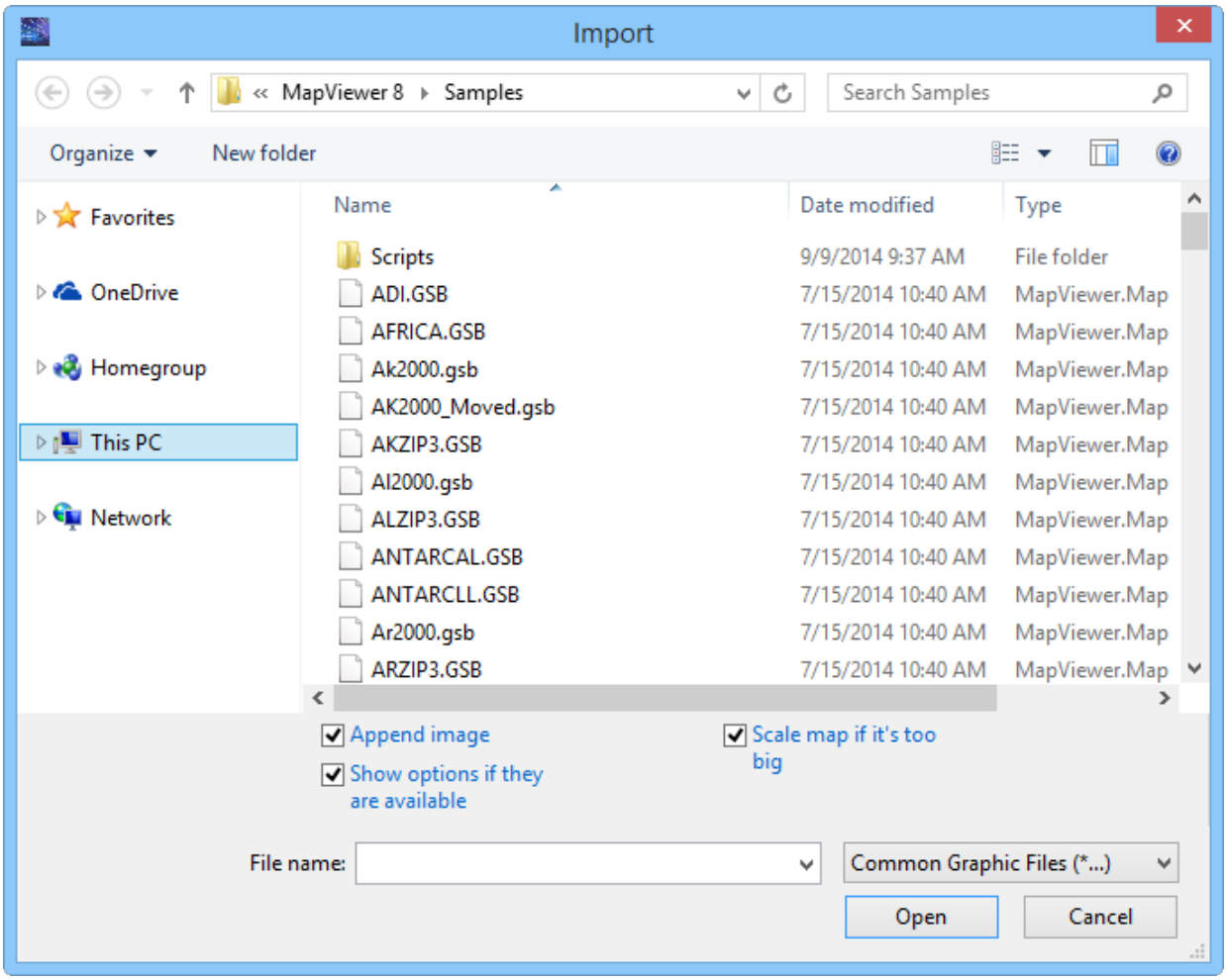
Import - Plot

You can import graphic files in **MapViewer** with the **File | Import** command. The **File | Import** command is similar to the **Map | New | Base Map** command except that the file is imported as a grouped graphic object rather than as a map.

Click the **File | Import** command, or click the button, to import graphic "trim" objects, background graphics, or some form of annotation. Use **Map | Create Map | Base** to import boundary information suitable for overlaying on top of other map types.

The Import Dialog

The **File | Import** command in the plot opens the **Import** dialog.



*Specify files to import using the **Import** dialog.*

Look In

The *Look in* field shows the current directory. Click the down arrow to see the directory structure. Click on the folders to change directories.

Creating New Folders and Changing the View

The buttons to the right of the *Look in* field allow you to create new folders and change the view of the file list.

File List

The file list displays files in the current directory. The current directory is listed in the *Look in* field. The *Files of type* field controls the display of the file list. For example, if *Golden Software Boundary (*.GSB)* is listed in the *Files of type* field only .GSB files appear in the files list. To see all files in the directory, choose *All Files (*.*)* from the *Files of type* list. Double-click on a file to open it or single-click the file and then click the *Open* button.

File Name

The *File name* field shows the name of the selected file. Also, a path and file name can be typed into the box to open a file.

Files of Type

The *Files of type* field shows the file format to be opened. To change the file format, click the down arrow and select the file type from the list.

The *Common Graphic Files (*...)* format type is selected by default. This displays all the file formats that can be imported with **File | Import** in the navigation pane. If a different format type is selected, **Surfer** will remember the setting until the end of the current session. When **Surfer** is restarted, the default format type will be used.

To see all files in the directory, choose *All Files (*.*)* from the *Files of type* list. Double-click on a file to open it or single-click the file and then click the *Open* button. The *All Files (*.*)* option shows all of the file formats in the current directory, even if the file type is not appropriate for the action chosen.

Import Format Types

The **File | Import** command in the plot document opens the **Import** dialog. In the **Import** dialog, select one of the following formats to import data into the worksheet.

- AN? ACR-NEMA Medical Image (*.an1, *.an2)
- BLN Golden Software Blanking (*.bln)
- BMP Windows Bitmap (*.bmp)
- BNA Atlas Boundary (*.bna)
- DICOm3 Medical Image (*.dic, *.dcm)
- DDF SDTS TVP (*.ddf, *.tar, *.tar.gz, *.zip, *.tgz)
- DLG USGS Digital Line Graph (*.dlg, *.lgo, *.lgs)
- DXF AutoCAD Drawing (*.dxf)
- E00 ESRI ArcInfo Export Format (*.e00)
- ECW ERMapper (*.ecw)
- EMF Windows Enhanced Metafile (*.emf)
- GIF Image (*.gif)
- GSB Golden Software Boundary (*.gsb)

- GSI Golden Software Interchange (*.gsi)
- JPG Compressed BItmap (*.jpg, *.jpeg)
- JPEG-2000 Bitmap (*.jp2, *.j2k, *.jpc, *.jpt, *.jpeg2000, *.j2000)
- KML KMZ Google Earth Keyhole Markup (*.kml, *.kmz)
- MIF MapInfo Interchange Format (*.mif)
- PDF Adobe PDF (Raster) (*.pdf)
- PLT Golden Software PlotCall (*.plt)
- PLY Stanford PLY (*.ply)
- PNG Portable Network Graphics (*.png)
- PNM/PPM/PGM/PBM Image (*.pnm, *.ppm, *.pgn, *.pbm)
- RGB SGI-RGB Image (*.rgb, *.rgba, *.bw)
- SEG-P1 Exchange Format (*.sp1, *.seg)
- SHP ESRI Shapefile (*.shp)
- SID LizardTech MrSID Image (*.sid)
- SUN Sun Raster Image (*.ras, *.sun)
- TGA Targa (TrueVision) (*.tga)
- TIF Tagged Image (*.tif, *.tiff)
- WMF Windows Metafile (*.wmf)
- X AVS X-Image (*.x, *.ximg)

Remarks

- To open Golden Software Blanking .BLN and Atlas Boundary .BNA files in the worksheet use **File | Open** rather than **File | Import**.
- Images are typically imported into **MapViewer** as a base map.
- Where applicable, **MapViewer** automatically imports all available attribute information.

Export

The **File | Export** command saves files as graphic files to use in other programs.

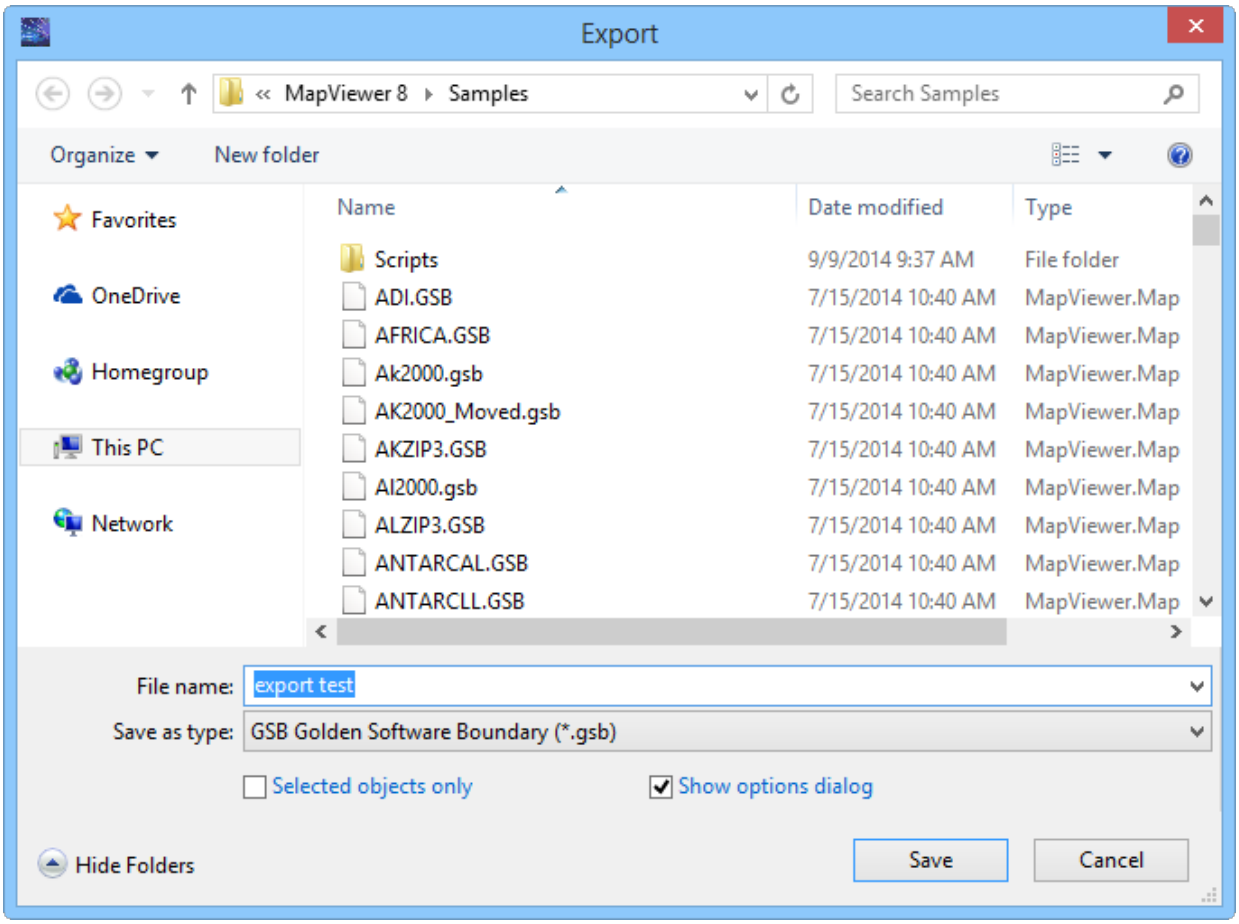
Click the **File | Export** command, or the  button, to open the **Export** dialog. The **File | Export** command is disabled if there are no objects in the **MapViewer** document.

Attribute Information

Where applicable, the export filter exports attribute information for lines, polygons, and symbols. With contour maps, the **File | Export** command can be used to export Z information to an attribute field for BLN, BNA, GSB, GSI, KML, KMZ, MIF, and SHP files.

The Export Dialog

Click the **File | Export** command to open the **Export** dialog.



*Specify the save location, file name, and file type in the **Export** dialog.*

Save In

The *Save in* field shows the current directory. Click the down arrow to see the directory structure and click on the folders to change directories. The buttons to the right of the *Save in* field allow you to create new folders and change the view of the file list.

File List

The file list displays the files using the extension specified in the *Save as type* box. A file can be overwritten by selecting it from the file list.

File Name

The *File name* box displays the name of the selected file, or type in the path and file name of the file to be exported.

Save As Type

The *Save as type* list box specifies the format of the file to be exported.

Selected Objects Only

Check the *Selected objects only* box to export selected objects rather than the entire plot.

Show Options Dialog

Check the *Show options dialog* option to display the **Export Options** dialog for the selected *Save as type.* If the *Show options dialog* option is selected when the *Save* button is clicked, the **Export Options** dialog appears. The Scaling page and Size and Color page of the **Export Options** dialog is uniform. Additional pages in the **Export Options** dialog may be available dependent on the export format type.

File Name

Export files typing a name into the *File name* box and then selecting the file type in the *Save as type* list. For example, typing MYPLOT in the *File name* box and choosing *Tagged Image (TIFF)* from the *Save as type* list results in MYPLOT.TIF. There is no need to type in an extension because it is automatically added. If a file extension is typed in the box along with the file name, the file type is determined by the typed extension. For example, if MYPLOT.DXF is typed in the *File name* box, the resulting file is in the AutoCAD DXF format, no matter what is set in the *Save as type* field.

Projected Coordinates

If the map that you are exporting is in a defined coordinate system, the Spatial References tab will appear after clicking *Save*. This dialog allows you to specify the file format to which you want to save the projected information. Check the desired file formats. It is recommend that *GS Reference (Version 2) file* option be checked to generate a .GSR2 file. Click *OK* and the file is saved.

Export Format Types

The file specific page in the **Export Options** dialog is specific to the export type you selected.

MapViewer supports the following export format types:

- BLN Golden Software Blanking (*.bln)
- BMP Windows Bitmap Image (*.bmp)
- BNA Atlas Boundary (*.bna)
- DXF AutoCAD Drawing (*.dxf)
- EMF Windows Enhanced Metafile (*.emf)
- EPS Encapsulated Postscript (*.eps)
- GIF Image (*.gif)
- GSB Golden Software Boundary (*.gsb)
- GSI Golden Software Interchange (*.gsi)
- JPG Compressed Bitmap Image (*.jpg, *.jpeg)
- JP2 JPEG2000 Interchange Format (*.jp2, *.jpeg2000)
- KML Google Earth KML (*.kml)
- KMZ Google Earth KMZ (*.kmz)
- MIF MapInfo Interchange Format (*.mif)
- PDF (Vector) (*.pdf)
- PDF (Raster) (*.pdf)
- PNG Portable Network Graphics (*.png)
- PNM Image (*.pnm)

- RGB SGI-RGB Image (*.rgb, *.rgba, *.bw)
- SHP ESRI Shapefile (*.shp)
- SUN Sun Raster Image (*.ras, *.sun)
- SVG Scalable Vector Graphics (*.svg)
- TGA Targa (TrueVision) (*.tga)
- TIF Tagged Image (*.tif, *.tiff)
- WMF Windows Metafile (*.wmf)
- X AVS X-Image (*.x, *.ximg)

Search Commands

The *Search Commands* field 

at the bottom of the File menu is useful for selecting commands when the user does not know where the command is located. Begin typing in the *Search Commands* field, and the **File** menu commands will be replaced by a list of commands or ribbon bar sections that contain the text.

For example, type "do" into the *Search Commands* field and the **Undo** and **Redo** commands are among the list. Also, the **Home | Undo** and **View | Window** ribbon sections are shown on the list. Click a command to use it. Or click a command section, like **Window**, to view all of the commands contained in that section of the ribbon bar.

Exit

File | Exit closes **MapViewer**. If changes have been made to any open documents there is a prompt to save the changes.

Chapter 29

Home Tab Commands

The **Home** tab contains common commands, such as copying, pasting, importing, and exporting.

Paste	Insert clipboard contents into the document
Paste Special	Insert clipboard contents into the document with formatting options
Copy	Copy an object to the clipboard
Cut	Cut the selected object to the clipboard
Delete	Deletes the selected object in the Plot Window
Copy All Layers	Copies all information from the map layers to the clipboard
Copy to Another Layer	Copies selected objects from the active Layer to another map Layer
Move to Another Layer	Moves selected objects to another map Layer
Undo	Undo the last action
Redo	Redo the previously undone action
View	Opens the active layer's worksheet data
Load	Loads a data file into the active layer
Reload	Reloads the worksheet from the saved version. Only available in the worksheet window.
Digitize	Writes map coordinates to a data file
Reproject Data File(s)	Reprojects coordinates in data file or files
Contents	Displays help for the **MapViewer** program
Tutorial	Provides a link to the tutorial introduction
Automation	Provides a link to the **Scripter** Object Hierarchy help page
Commands	Provides a link to the **MapViewer** commands help page
Search	Input field for the **Find** command
Find	Opens the **Find Object** dialog, Selects object matching *Search* field, only available from the Plot Window
Find Next	Selects the next object meeting the **Find** command criteria, only available from the Plot Window

Paste

The **Home | Clipboard | Paste** command  pastes the clipboard contents into the current document. The objects must first be placed on the clipboard using the **MapViewer Home | Clipboard | Cut** or **Home | Clipboard | Copy** commands or similar commands in some other application. The clipboard contents remain on the clipboard until something new is cut or copied to the clipboard. The Paste command can also be performed by pressing CTRL+V.

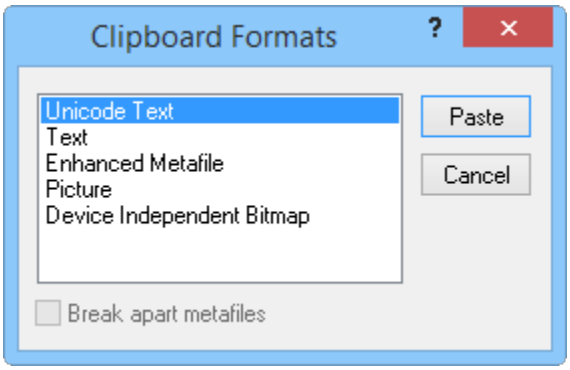
The object is pasted to the center of the plot window. Use the Pan or Zoom commands to center the window on the desired location before using the **Paste** command, or move the object from the center of the plot window to the desired location after using the paste command.

In the worksheet, the upper left corner of the pasted data is placed in the active cell. Any cells in the existing worksheet that lie to the right of and below the active cell will be overwritten with the contents of the pasted data.

Paste Special

Clicking the down arrow on the **Home | Clipboard | Paste** command 

and clicking **Paste Special** opens the **Paste Special** dialog, where the format for pasting the object into **MapViewer** is specified. Click the **Home | Clipboard | Paste | Paste Special** command for selecting one of several formats for pasting the clipboard contents. The **Paste Special** command is also available in the context menu, accessed by right-clicking in the application window.



*Use the **Paste Special** dialog in the plot window to paste objects from the clipboard.*

Formats

Paste special format types vary depending on the origin of the clipboard information. The *As* field lists the available formats. Use the *As* field to specify how the information is pasted into your document. You can highlight the clipboard format in the *As* box and then refer to the *Result* box for more information on clipboard format types. This option is not available for some types of documents.

Other Options

When pasting into a plot document, the *Break apart metafiles* option is available. Click the check box to break the clipboard contents into polygons, polylines, points, and text.

When pasting into a worksheet document, the *Show Import Options* option is available. Click the check box to display the Data Import Options dialog after you select a format and click *OK*.

Paste or Cancel

To insert the information into your current document, click *OK.* To exit the dialog without inserting the information into your current document, click *Cancel*.

Copy

The **Home | Clipboard | Copy** command 

moves the selected item to the clipboard. The original objects remain in the window. Use this command to duplicate objects in a different location in the same window, or copy the objects into a different window or application. The copied objects can later be pasted with the Paste or Paste Special commands.

Only one plot window selection or one worksheet selection may be placed in the clipboard at a time. The next **Cut** or **Copy** command replaces the contents of the clipboard.

Cut

The **Hone | Clipboard | Cut** command 

moves the selected item to the clipboard. This deletes the selected objects from the file after copying them to the clipboard. Cut objects can later be pasted with the **Home | Clipboard | Paste** or **Home | Clipboard | Paste | Paste Special** commands.

Only one plot window selection or one worksheet selection can be placed on the clipboard at a time. The next **Cut** or Copy command replaces the contents of the clipboard.

Delete

The **Home | Clipboard | Delete** command 

removes an object from the document. An object can sometimes be restored through **Home | Undo | Undo**. To delete an object, select the object in the plot window or **Object Manager** and press the DELETE key.

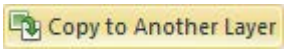
Copy All Layers

The **Home | Clipboard | Copy All Layers** command 

copies the information from all map layers to the clipboard. When you have a map that uses more than one layer or a map that includes graticules use the **Copy All Layers** command.

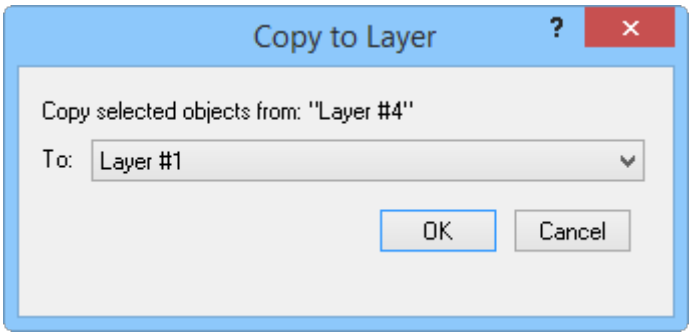
The **Copy All Layers** command copies the map in the Picture (Windows Metafile) format only. If you need boundary objects copied in the **MapViewer** (MapViewer Object) format, use the **Home | Clipboard | Copy** command. **Copy** only copies objects from one layer at a time.

Copy to Another Layer

The **Home | Clipboard | Copy to Another Layer** command 

copies all selected objects from the active layer to another layer of the map. The objects are copied to the same position in the destination layer as they are in the existing layer. After the command is selected, the **Copy to Layer** dialog appears allowing you to choose the destination layer. The **Copy to Another Layer** command can also be clicked in the context menu accessed by right-clicking on the selected object(s).

Copy to Layer Dialog



Specify the destination Layer *for the objects copied with the* **Copy to Layer** *command*

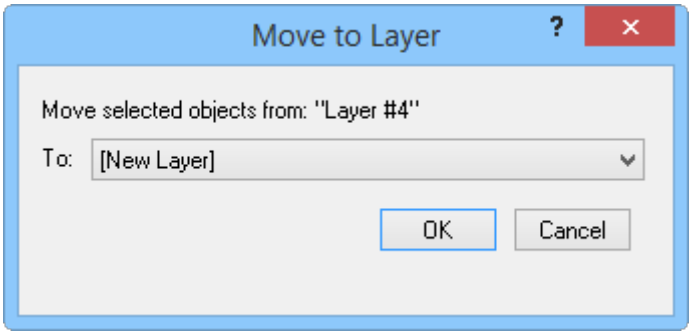
Links to data are not preserved when using this command so only the objects, object coordinates, and their IDs are copied to the new layer.

Move to Another Layer

The **Home | Clipboard | Move to Another Layer** command 

moves all selected objects from the active layer to another layer of the map. The objects are copied to the same position in the destination layer as they are in the existing layer. After the command is clicked, the **Move to Layer** dialog appears allowing you to choose the destination layer. The **Move to Another Layer** command can also be selected in the context menu after right-clicking on the selected object(s).

Move to Layer Dialog



Specify the destination Layer for objects moved with ***Home | Clipboard | Move to Another Layer***

Links to data are not preserved when using this command so only the objects, object coordinates, and their IDs are copied to the new layer.

Undo

Click the **Home | Undo | Undo** command 

, click the  button on the Quick Access Toolbar, or press CTRL+Z on the keyboard to reverse the last operation performed. If the last operation cannot be reversed, the **Undo** command is disabled.

After you have undone an operation, the **Home | Undo | Redo** command becomes highlighted, allowing you to reverse the just completed **Undo** command. Up to 25 undo levels can be set though the General Options section in the **File | Options** dialog.

Redo

Click the **Home | Undo | Redo** command  , click the  button on the Quick Access Toolbar, or press CTRL+Y on the keyboard to reverse the last Undo command.

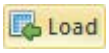
View Linked Data

The **Home | Data | View** command 

opens a worksheet window. If data is currently loaded for an active layer, that data is displayed in the worksheet. If data is not loaded and there is a base map in the plot window, the base map primary IDs are automatically loaded into column A of the worksheet. If the base map contains secondary IDs, the secondary IDs are entered into column B.

The title of the worksheet window is the name of the loaded data file. If base map is displayed (without data), the worksheet name is Sheet #. When the worksheet window is active the ribbon changes to show the worksheet commands.

Load Data

The **Home | Data | Load** command 

reads a data file into the worksheet but does not automatically open a worksheet window. This data is made available to the active layer if you are making a thematic map.

After you load the data using this command you can view the worksheet by clicking the **Home | Data | View** command. If the worksheet has already been opened, you can also access the data through the worksheet tab at the top of the **MapViewer** window.

If the original worksheet contains unsaved data, you are offered a chance to save it with the same file name. Next, you are prompted to select a new data file to load. After a data file name is entered, the original worksheet is cleared and the specified file is read.

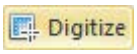
Reload

The worksheet **Home | Data | Reload** command 

reloads the worksheet contents from a saved version of the file. This is useful when you make changes to the data file in another program (i.e. Excel) and want the changes to appear in **MapViewer**. Save the contents of the file in the other program before selecting the **Reload** command. When the data are reloaded, any previous changes made to the original data are overwritten. If you import the data and plan to make changes, do not use **Home | Data | Reload**, as there is no **Undo** command for it.

Imported databases appear in a new worksheet window. Once the worksheet is saved, the link to the database is removed.

Digitize

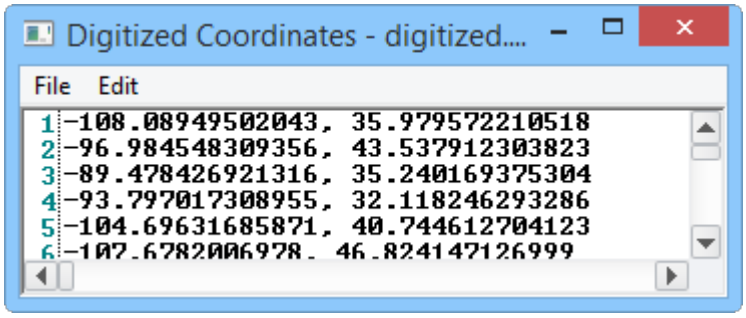
The **Home | Data | Digitize** command 

allows you to write map coordinates to a data file. As you move the pointer across the selected map, the X and Y map coordinates for the current mouse position are shown in the status bar. Left-click on a map to write digitized points to the **Digitized Coordinates** dialog.

Digitized Coordinates Window

Click the **Home | Data | Digitize** command 

to enter into digitize mode. Left-click on a map, and the **Digitized Coordinates** window is displayed.



*The digitized X and Y values are written to the **Digitized Coordinates** window.*

The coordinates for the clicked point are written to the **Digitized Coordinates** window. Each time the map is clicked, a small, temporary red symbol is drawn on the map, and the map coordinates for the current mouse position are written to the **Digitized Coordinates** window. In this way, you can digitize boundaries from maps and easily create boundary files from the digitized information. You can also create a blanking file with **Map | Digitize**.

The **Digitized Coordinates** window stays open until it is closed by clicking the  button in the top right corner of the **Digitized Coordinates** window. This allows convenient editing of the data and allows digitizing to start and stop multiple times and be recorded in the same window.

Menu Commands

The **Digitized Coordinates** window has two menus: **File** and **Edit**.

File

The **File** menu allows you to save or open an ASCII .DAT data file or Golden Software boundary .BLN file.

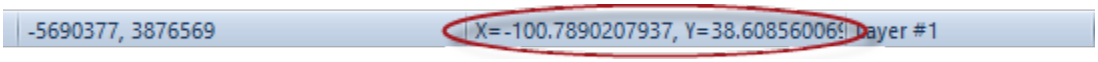
Edit

The **Edit** menu command allows for common editing, such as undo, redo, cut, copy, paste, delete, find, replace, and select all. These commands work in much the same way as the **Clipboard**, **Undo**, and **Tools** commands in the Home tab for a worksheet.

Digitizing Information from a Map

To digitize information from a map, follow these steps:

1. Create a map in the plot window and select the map.
2. Choose the **Home | Data | Digitize** command  . The cursor becomes a cross hair to indicate digitize mode.
3. As you move the cross hair cursor within the plot window, the map coordinates for the position are displayed in the status bar.



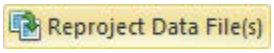
The status bar displays the X and Y coordinates before you click on the map.

4. Click the left mouse button in the plot window to write the current coordinates to the **Digitized Coordinates** window. Continue adding points in this manner. Digitized points appear as temporary small red plus-signs on the map.
5. When you are finished using the **Digitize** command, click on any tool button or command, or press the ESC key on the keyboard.
6. To save the data in the **Digitized Coordinates** window, click the **File | Save As** command in the window. You are prompted to save the data as *Boundary Files (*.bln)* or *Data Files (*.dat).* Type a *File name* and click *Save* to save the data. Click *Cancel* to not save the data and return to the **Digitized Coordinates** window.
7. Click the  button in the top right corner of the window to close the **Digitized Coordinates** dialog. The dialog will stay open until closed in this manner.

Coordinate System Information

If the map that you are digitizing from is referenced with a coordinate system on the **Coordinate System** page, the digitized .BLN or data file automatically creates a .GSR2 file. The points digitized and the .GSR2 file contains the map's target coordinate system information. This is the map's coordinate system, not the map layer's coordinate system.

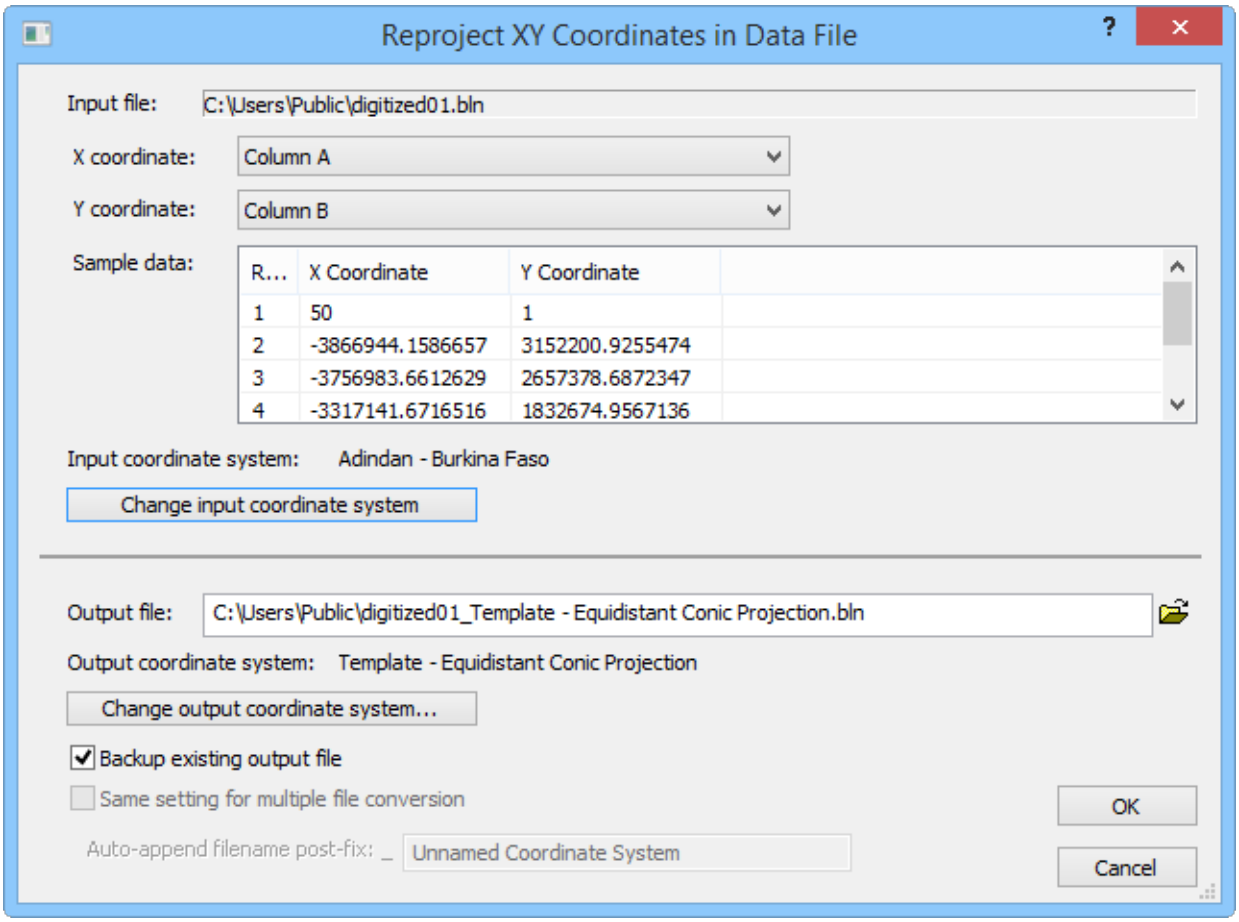
Reproject Data File

The **Home | Data | Reproject Data File(s)** command  reprojects coordinates in data files. You must know the coordinate's original projection to use this command. See the individual projection types for a description of the projection settings. If you do not choose appropriate projection settings, your data may not display correctly. Please refer to the United States Geological Survey professional paper 1395, *Map Projections - A Working Manual* by John Snyder for more information on projections.

Data

After **Home | Data | Reproject Data File(s)** is selected, select one or more data files in the **Open Data File** dialog and the **Reproject XY Coordinates in Data File** dialog is displayed. To select multiple data files, use the SHIFT or CTRL keys.

Reproject XY Coordinates in Data File Dialog



*Reproject a data file in the **Reproject XY Coordinates in Data File** dialog.*

Input File

The input file is selected after clicking the **Home | Data | Reproject Data File(s)** command. The data file is listed in the *Input file* box. If multiple data files are selected, the *Input file* box displays the path only.

XY Coordinate Locations

Select the data file's X and Y coordinate columns from the *X coordinate column* and *Y coordinate column* lists.

Sample Data

The *Sample data* grid displays some data from the selected X and Y coordinate columns.

Output File

Select the output file path and file name in the *Output file* box. Type a new path and file name into the box or click the button to browse to a folder and select a file name. The default file name is

the original file name with the current output projection name appended to avoid overwriting the original file.

Backup

Check the *Backup existing output file* box to create a backup file of the output data file with a [.BAK] extension.

Multiple Files

Check the *Same setting for multiple file conversion* box if you are converting similar multiple data files. The data files should contain the XY columns in the same position and have the same input projection. If this box is checked, the output projection is the same for each file. If this box is checked, you can append a post-fix to each file through the *Auto-append filename post-fix* box.

If the *Same setting for multiple file conversion* box is not checked, the dialog reappears for each file. This allows you to select the XY columns, input projection, and output projection for each file.

Projections

Choose the input and output projections projection from the *Projection* lists. If the projection has options, click the *Settings* button to open the Modify Projection Settings dialog. The options in this dialog vary depending on which projection is selected. Refer to the specific projection in online help for more information on the specific options. If *State Plane 1927*, *State Plane 1983*, or *Universal Transverse Mercator* is selected, choose the appropriate zone in the *Zone* list.

Datum

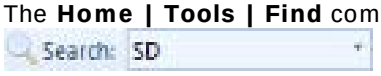
See the Datums topic for detailed information on datum. In the **Reproject XY Coordinates in Data File** dialog, check the *Apply datum conversion* box to activate the *Datum* lists and then select the input and output datum you wish to use. If you select the *User Defined* datum, click the *Custom* button to define the datum.

Units

If the projection is not *Unprojected Lat/Long*, select the input and output units from the *Data units* lists.

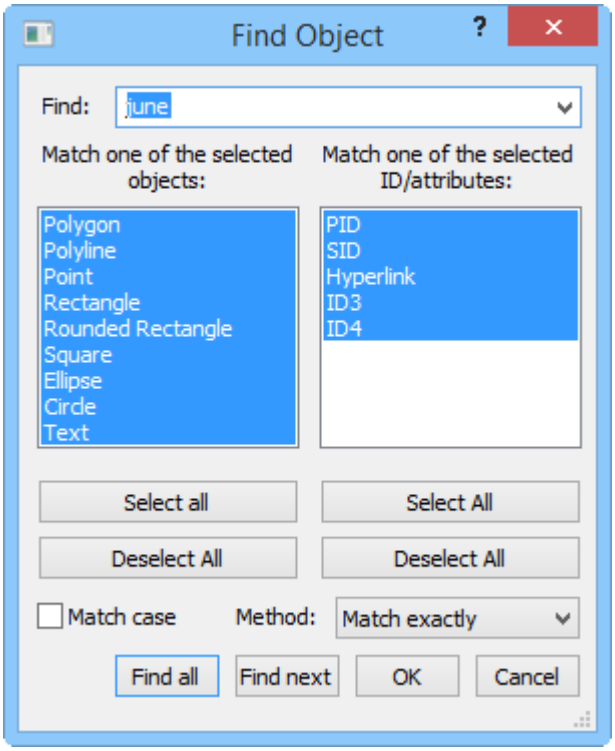
Find and Search

The **Home | Tools | Find** command 

and **Home | Tools | Search** field 

finds objects based on a specific ID and criteria. The **Find** command opens the **Find Object** dialog, where search criteria are specified. To find objects using the current search criteria, type the text you want to search for in the **Search** field and press ENTER. Use the arrow at the right to select from a list of the most recently used text strings.

Find Object Dialog



Find objects in the active layer with ***Home | Tools | Find*** *command*

Enter the desired text in the *Find* input box. Click the down arrow to the right of the box to select a recently used text string.

The type(s) of object(s) included in the search can be selected in the *Match one of the selected objects* list on the left of the dialog. You can select or deselect objects from the list by clicking on the object name. To select all of the object types, click the *Select All* button below the list. Click the *Deselect All* button below the list to deselect all object types.

The *Match one of the selected ID/attributes* section to the right of the dialog lists all of the possible IDs to search. Choose from *PID, SID, Hyperlink*, and any available attributes. In the image above, *ID3* and *ID4* are user defined attributes. To select or deselect one of the IDs, click on the ID. Click the *Select All* or *Deselect All* buttons to select or deselect all IDs/attributes respectively.

If you have case sensitive characters in the *Find* text string, enable the *Match case* check box.

Select a search method in the *Method* list.

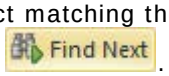
- *Match exactly* returns items the are equivalent to the text string in the *Find* field in the dialog or **Search** field on the ribbon bar.
- *Contain phrase* returns items that contain the entire phrase. For example, "Gold" would return "Golden" since the search phrase is contained within the word.
- *Contain all of the words* returns items that have every word of the text string, regardless of order.

- *Contain any of the words* returns items that have any word of the text string.

The *Find All* button finds all the objects that satisfy the above criteria. If you want to find the objects that meet the criteria one at a time, click the *Find Next* button.

Click *OK* or *Cancel* to close the dialog without searching. Clicking *OK* saves the attribute and object selections for the next time you use the **Home | Tools | Search** command. Clicking *Cancel* does not save the selected objects and attributes.

Find Next

To find the next object matching the criteria specified in the Find dialog, use the **Home | Tools | Find Next** command 

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Chapter 30

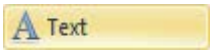
Drawing

Draw Tab Commands

The **Draw** tab contains commands to create text, polygons, polylines, symbols, insert objects, and reshape objects.

Text	Creates a new text block
Polygon	Creates a new polygon
Spline Polygon	Create a new spline polygon
Polyline	Creates a new polyline
Spline Polyline	Creates a new spine polyline
Point	Creates a new point
Rectangle	Creates a new rectangle or square
Rounded Rectangle	Creates a new rectangle or square with rounded corners
Ellipse	Creates a new ellipse or circle
Reshape	Moves, adds, or deletes points in the selected polygon, polyline, spline polygon, or spline polyline
Break Apart	Breaks WMF or EMF objects into component parts for editing
Select	Select, move, and size objects
Lock Object	Locks the size and position of the selected object(s)
Blend	Creates a blended boundary bitmap
Backdrop	Creates a color graded bitmap outline around boundary objects
Crop to Shape	Crops a bitmap based on the shape of the selected object(s)
Filters	Applies a Spatial or Median filter to the selected image
Colors	Edit the image with Sharpen, Convert Color Depth, Collect Colors, and Select Transparent colors, or adjust Saturation, Brightness, and Contrast
Ellipse - Region	Defines a new ellipse or circle region for map analysis
Rectangle - Region	Defines a new rectangle or square region for map analysis
Polygon - Region	Defines a new polygon region for map analysis
Buffer	Defines a buffer zone around a selected object or group of objects
By Selecting	Defines a region by selecting PIDs from the object list
By Current Selection	Defines a region around the current selection
Add	Allows for defining two or more regions
Clear	Clears all defined regions

Text

You can use the **Draw | Shape | Text** command 

to create text in a document. The typeface, size, style, alignment, and color can be set for text blocks.

To create text:

1. Click the **Draw | Shape | Text** command. The cursor changes to .
2. Click where you want text to appear in the document.
3. Enter text into the Text Editor.
4. Set the text properties in the **Text Editor**.
5. Click the *OK* button to return to the plot window.
6. Press the ESC key or click the **Draw | Shape | Text** command or another tool button to end draw mode.

Drawing Tips

- The text appears in a movable, sizable text box. Click on the box and drag it to move the box to the desired location.
- You can edit the selected text block properties in the **Property Manager** or in the **Object Manager**.
- To change the properties for a group of selected text blocks, use the **Property Manager**.
- Default text properties are set in the **File | Options** dialog under *Default Properties*.

Editing Text Properties

The text can be edited in the Text Editor. To edit existing text content, double-click on the text object in the **Object Manager** or click the button in the **Property Manager** to open the **Text Editor**, or you can edit text content in the **Property Manager**:

1. Click on the text object in the plot window or the **Object Manager** to select it.
2. In the **Property Manager**, the text and font properties can be edited.
3. To change the font properties, click on the next to *Font Properties*. Set any font properties for all of the text in the text block.
4. To change the text, click on the next to *Text Properties*. Click in the box next to *Text* to edit the text. For a single line of text, highlight the characters and type the desired text. Math text instructions can be added directly to the *Text* line in the **Property Manager**.
5. To include multiple lines of text or to edit individual characters in the text block, click the button. Edit the text in the **Text Editor**.
6. When all changes have been made in the **Text Editor**, click *OK* to view the changes in the plot window.

Text Properties

The *Font*, *Size*, *Color, Opacity*, and *Style* can be set for text blocks in the **Text Editor** dialog when typing text. These options can be set in the **Property Manager** in the Font Properties section after the text is drawn.

Default Properties

Set the default font properties with the **File | Options** command. In the Default Properties section, click on *Font* to set the default font and text properties.

Drawing Text Along a Curve

Text can be drawn along a polyline or spline polyline. The text can be the PID, SID, or both. After displaying the ID(s), the text properties can be edited in the **Property Manager** by clicking on the text and changing the Text and Font Properties. For spline polylines, it is best to use *Above* or *Below* for the *Vertical Alignment* property.

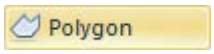
*Above is an example of text following a Spline Polyline. Text can also follow Polylines. The label text is edited by clicking on the text and editing its properties in the **Property Manager**.*

To Draw Text Along a Spline Polyline or Polyline:

1. First, draw the line with the Polyline or Spline Polyline command.
2. Exit draw mode by pressing ESC or clicking the Select command. Select the line by clicking on it in the plot window or the **Object Manager**.
3. Click on the **Info** page in the **Property Manager**.
4. Enter the desired text into the *PID* and/or *SID* fields.
5. Select the text you wish to display in the *ID List* field, and click the *Show ID* check box.
6. Change the *Alignment Method* to *In relation to curve*, and change the *Horizontal Alignment* and *Vertical Alignment* properties to your desired setting.
7. Edit text properties by clicking the text in the plot window and changing the properties in the **Property Manager**.

You can show/hide the polyline object and object PID/SID labels separately, if you would like to display the curved text without showing the line.

Polygon

Click the **Draw | Shape | Polygon** command 

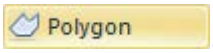
to draw an irregularly shaped area. Polygons must have at least three vertices (points).

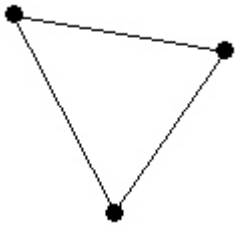
Polygon Properties

Polygons contain two types of properties: line properties and fill properties. You can change these properties in the **Property Manager**.

Drawing a Polygon

To draw a polygon:

1. Click the **Draw | Shape | Polygon** command  .
2. Move the cross hair cursor over the location for the start of the polygon and click the left mouse button.
3. Move the cursor to the next position along the line and click again.
4. Continue this procedure until you click the final point and then press the ENTER key, or double-click the final point with the left mouse button. Pressing ENTER closes the polygon by connecting the first and last points that were selected regardless of cursor position. Double-clicking the left mouse button places a point where the cursor is located and connects that point to the first point.
5. Press the ESC key to exit drawing mode.

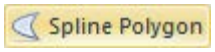


This shows a Polygon drawn through three points.

Drawing Tips

- Click points on the page to draw individual points, or click and hold the left mouse button and drag the pointer to draw a continuous stream of points.
  - Click the right mouse button to remove the last drawn point. This can be done repeatedly.
  - If the CTRL key is pressed while clicking points, the points are constrained to 45-degree angles.
  - Double-click the left mouse button or press the ENTER key to close the polygon.
  - To cancel drawing a polygon, press the ESC key before closing the polygon.
  - Edit the polygon shape by using the **Draw | Tools | Reshape** command.
  - Line and fill properties are set through the **Property Manager**.
  - Line and fill default properties are set in the **File | Options** dialog under *Default Properties.*

Spline Polygon

Click the **Draw | Shape | Spline Polygon** command  to create a spline polygon. Spline polygons are smooth, flowing areas with no sharp or distinct angles.

Spline Polygon Properties

Spline polygons contain two types of properties: line properties and fill properties. You can change these properties in the **Property Manager**.

Spline Polygons and Thematic Maps

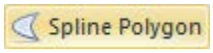
Spline polygons can be used to represent data on some thematic maps. Spline areas can be assigned a fill color, fill pattern, and line style (see Property Inspector). You can assign a primary ID used to link the spline area to data in a file. Secondary IDs, attribute 1 IDs, attribute 2 IDs, and hyperlinks can be used as an additional identifiers for the spline area. Spline areas can be imported using the **File | Import** command, the **Map | Create Map | Base** command, or they can be drawn on the map using the **Draw | Shape | Spline Polygon** command.

Spline Areas and Primary IDs

Spline areas can be used to display thematic information stored in the data file. A spline area is linked to a corresponding row in the data by its primary ID. If you want to assign a primary ID to a spline area, select the spline area after it is completed, and then type the PID into the **Object Manager**. You can also change the IDs for a selected spline area in the Object Descriptions section of the **Property Manager**.

Drawing Spline Areas

To draw a spline area:

1. Choose the **Draw | Shape | Spline Polygon** command 

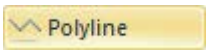
to begin drawing a spline area.
2. Move the pointer over the location for the start of the spline area and click the left mouse button.
3. Move the pointer to the next position along the line and click again. Spline areas are generated by clicking on anchor points during the area creation. The anchor points identify a change in the spline area's shape and direction. Notice that the spline area shape is visible, and the curvature can be changed by moving the mouse. Continue this procedure for the remaining vertices.
4. Continue this procedure until you click the final point, and then press the ENTER key, or double click with the left mouse button to place the final point.
5. Press ESC or select another tool button to end draw spline polygon mode.

The first and last points are automatically connected and the new spline area is drawn.

Drawing Tips

- Click the right mouse button to remove the last drawn point. Repeatedly clicking right mouse button removes all points in reverse order.
- To cancel drawing a spline area, press the ESC key before closing the spline area.
- Areas with lakes (excluded regions) can be created by combining a spline area with another area using the **Boundary | Island/Lakes | Combine** command.
- You can edit the spline area's shape with the **Draw | Tools| Reshape** command.
- You can edit the selected spline area properties in the Property Manger or in the **Object Manager**.
- To change the properties for a group of selected spline areas, use the **Property Manager**.
- Line and fill default properties are set in the **File | Options** dialog under *Default Properties*.

Polyline

The **Draw | Shape | Polyline** command 

is used to draw a polyline at any position on the page. Lines drawn in this manner can have as many segments as desired. Polylines can display any line style or color and can include arrowheads at either end of the polyline. Polylines can have associated primary IDs so you can use polylines as boundary files with pie, bar, symbol, flow, prism, line graph, post and territory maps.

Polylines and Thematic Maps

Polylines can be used to represent data on some thematic maps. Polylines can be assigned a line style, color, and width (see **Property Manager**). You can assign a primary ID (PID) used to link the polyline to data in a file. Secondary IDs, attributes, and hyperlinks can be used as an additional identifiers for the polyline. Polylines can be imported using the **File | Import** command, the **Map | Create Map | Base** command.

Polylines and Primary IDs

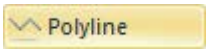
Polylines can be used to display thematic information stored in the data file. A polyline is linked to a corresponding row in the data by its primary ID. If you want to assign a primary ID to a polyline, select the polyline after it is completed, and then type the PID into the **Object Manager**. You can also change the IDs for a selected polyline in the Info section of the **Property Manager**.

Polyline Properties

Polylines contain line properties. You can change these properties in the **Property Manager**.

Drawing a Polyline

To draw a polyline:

1. Click the **Draw | Shape | Polyline** command 

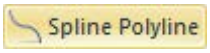
to enter drawing mode and begin drawing a polyline.
2. Move the cross hair cursor over the location for the start of the polyline and click the left mouse button.
3. Move the pointer to the next position along the line and click again.
4. Continue this procedure until you click at the final point for the line then press the ENTER key, or double-click the left mouse button to place the final point.
5. Press the ESC key or select another command button to exit drawing mode.

This shows a Polyline drawn through three points.

Drawing Tips

- Click the endpoints of the line to draw a straight line, or click several points to create an irregularly shaped line.
- Click the right mouse button to remove the last drawn point. This can be done repeatedly.
- Click and hold the left mouse button to create a continuous stream of points.
- If the CTRL key is pressed while clicking points, the points are constrained to 45-degree angles.
- Double-click the left mouse button or press the ENTER key to end the line.
- To cancel drawing the line, press the ESC key before ending the line.
- Edit the shape of the line using the **Draw | Tools | Reshape** command.
- Line properties are set through the **Property Manager**.
- Line default properties are set in the **File | Options** dialog under *Default Properties*.

Spline Polyline

Click the **Draw | Shape | Spline Polyline** command 

to draw a spline polyline. Spline polylines are smooth, flowing polylines with no sharp or distinct angles. Spline polylines can have associated primary IDs, so you can use spline polylines as boundary files with pie, bar, symbol, flow, prism, line graph, territory, and post maps.

Spline Polylines and Thematic Maps

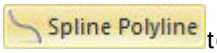
Spline polylines can be used to represent data on some thematic maps. Spline polylines can be assigned a line style, color, and width (see **Property Manager**). You can assign a primary ID (PID) used to link the spline polyline to data in a file. Secondary IDs, attribute 1 IDs, attribute 2 IDs, and hyperlinks can be used as an additional identifiers for the spline polyline. Spline polylines can be imported using the **File | Import** command, the **Map | Create | Base** command.

Spline Polylines and Primary IDs

Spline polylines can be used to display thematic information stored in the data file. A spline polyline is linked to a corresponding row in the data by its primary ID. If you want to assign a primary ID to a spline polyline, select the spline polyline after it is completed, and then type the PID into the **Object Manager**. You can also change the IDs for a selected spline polyline in the Info section of the **Property Manager**.

Drawing a Spline Polyline

To draw a spline polyline:

1. Click the **Draw | Shape | Spline Polyline** command 

to enter drawing mode and begin drawing a spline polyline.
2. Move the cross hair pointer over the location for the start of the spline polyline and click the left mouse button.
3. Move the pointer to the next position along the line and click again. Generate the spline polyline by clicking on the anchor points during the polygon creation. The anchor points identify a change in the spline polyline's shape and direction. Notice that the spline polyline shape is visible and that you can change its curvature by moving the mouse.
4. Continue clicking on the anchor points until you click the final point then press the ENTER key, or double-click the left mouse button to place the final point. The new spline polyline is drawn.

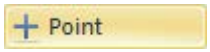
5. Press the ESC key or another command button to exit drawing mode.

This shows a Spline Polyline drawn through three points.

Drawing Tips

- Click points on the page to draw a spline polyline.
- If the CTRL key is pressed while clicking points, the points are constrained to 45-degree angles.
- Click the right mouse button to remove the last drawn point. Repeated clicking of the right mouse button removes all points in reverse order.
- Double-click the left mouse button or press the ENTER key to close the spline polyline.
- Press the ESC key to cancel drawing the spline polyline before ending the line.
- Click the **Draw | Tools | Reshape** command to change the spline polyline's shape.
- Edit the spline polyline properties in the **Property Manager**.
- Change the properties for a group of selected spline polylines in the **Property Manager**.
- Use the **File | Options** dialog *Default Properties* page to set the default line properties for the spline polyline.

Point

The **Draw | Shape | Point** command 

is used to indicate a point location at the specified position on the map. Points can have associated primary IDs, secondary IDs, attributes, and hyperlinks. Points can be used in pie, bar, symbol, flow, line graph, and post maps.

To draw a point:

1. Click the **Draw | Shape | Point** command.
2. Click on a location in the plot window to create a point.
3. Press ESC to exit drawing mode.

Drawing Tips

- You can edit the selected point properties in the Symbol Properties page of the Property Manger.
- To change the properties for a group of selected points, use the **Property Manager**.
- You can also change the IDs for a selected point in the Info page of the **Property Manager**.
- Symbol default properties are set in the **File | Options** dialog under *Default Properties*.

Rectangle

Click the **Draw | Shape | Rectangle** command Rectangle to create a rectangle or square in the document.

Rectangle Properties

Rectangles contain two types of properties: line properties and fill properties. You can change these properties in the **Property Manager**.

Drawing a Rectangle

To draw a rectangle:

1. Select the **Draw | Shape | Rectangle** command Rectangle to enter drawing mode and begin drawing a rectangle.
2. Press and hold the left mouse button at one corner of the rectangle.
3. Drag the pointer to the opposite corner of the rectangle. The size of the rectangle appears in the status bar as it is drawn.
4. Release the left mouse button when the rectangle is the preferred size and shape.
5. Press the ESC key to exit drawing mode.

Drawing a Square

To draw a square, hold down the CTRL key while dragging the mouse to draw a square rather than a rectangle.

Drawing Tips

- Line and fill properties are set through the Line page and Fill page of the **Property Manager**.
- Line and fill default properties are set in the **File | Options** dialog under *Default Properties*.
- You can draw a rectangle out from the center rather than corner to corner by holding down the SHIFT key while dragging the mouse.
- You can draw a square out from the center rather than corner to corner by holding down the CTRL and SHIFT key while dragging the mouse.

Rounded Rectangle

Click the **Draw | Shape | Rounded Rectangle** command Rounded Rectangle to create a rounded rectangle or square in the document.

Rounded Rectangle Properties

Rounded rectangles contain two types of properties: line properties and fill properties. You can change these properties in the **Property Manager**.

Drawing a Rounded Rectangle

To draw a rounded rectangle:

1. Select the **Draw | Shape | Rounded Rectangle** command Rounded Rectangle to enter drawing mode and begin drawing a rounded rectangle.

2. Press and hold the left mouse button at one corner of the rounded rectangle.
3. Drag the pointer to the opposite corner of the rounded rectangle. The size of the rounded rectangle appears in the status bar as it is drawn.
4. Release the left mouse button when the rounded rectangle is the preferred size and shape.
5. Press the ESC key to exit drawing mode.

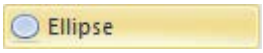
Drawing a Rounded Square

To draw a rounded square, hold down the CTRL key while dragging the mouse to draw a rounded square rather than a rounded rectangle.

Drawing Tips

- Line and fill properties are set through the **Property Manager**.
- Line and fill default properties are set in the **File | Options** dialog under *Default Properties*.
- You can draw a rounded rectangle out from the center rather than corner to corner by holding down the SHIFT key while dragging the mouse.
- You can draw a rounded square out from the center rather than corner to corner by holding down the CTRL and SHIFT key while dragging the mouse.

Ellipse

Click the **Draw | Ellipse** command 

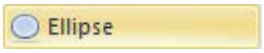
to create an ellipse or circle in the plot document.

Ellipse Properties

Ellipses contain two types of properties: line properties and fill properties. You can change these properties in the **Property Manager**.

Drawing an Ellipse

To draw an ellipse:

1. Click the **Draw | Shape | Ellipse** command 

.
2. Press and hold the left mouse button at one corner of the bounding box of the ellipse.
3. Drag the cursor to the opposite corner of the ellipse. The size of the ellipse's bounding box appears in the status bar as it is drawn.
4. Release the left mouse button when the ellipse is the preferred size and shape.
5. Press the ESC key to exit drawing mode.

Drawing a Circle

To draw a circle, hold down the CTRL key while dragging the mouse to draw a circle rather than an ellipse.

Drawing Tips

- Draw an ellipse out from the center rather than corner to corner by holding down the SHIFT key while dragging the mouse.
- Draw a circle out from the center rather than end to end by holding down the SHIFT and CTRL keys while dragging the mouse.

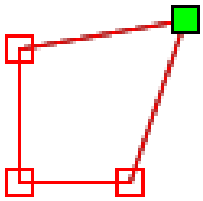
- Line and fill properties are set through the **Property Manager**.
- Line and fill default properties are set in the **File | Options** dialog under *Default Properties*.

Reshape

Use the **Draw | Tools | Reshape** or **Boundary | Edit Boundaries | Reshape** command 

to move, add, and delete vertices within a selected polyline or polygon. This command is available only when a single polyline or polygon is selected. For doing detailed work, or when there is an abundance of vertices in the area you want to reshape, it is helpful to zoom in your view of the area you are working on before using this feature.

After selecting **Reshape**, all vertices in the selected object are shown with hollow squares. You can click a vertex to select it. The selected vertex is indicated by a solid green square and it can be moved by dragging it with the mouse.



*When **Reshape** is selected, the object color changes to red, vertices that make up the object are shown by small hollow squares. A selected vertex is shown as a solid green square.*

Reshaping Boundaries

To edit the shape of a curve or area:

1. Select the object.
2. Click **Draw | Tools | Reshape** (or **Boundary | Edit Boundaries | Reshape**)
3. The object line color changes to red and vertices appear as small hollow squares.
4. To ***move*** a vertex, click on the vertex with the mouse and drag it to a new location. To ***add*** a vertex, hold down the CTRL key and click the area on the area or curve. To ***delete*** a vertex, select it and then press the DELETE key.
5. After reshaping the object, press the ENTER key to end reshaping or press the ESC key to cancel the changes.

Reshape Keys

There are a number of special keys that control the **Reshape** operation.

- ALT - To snap the selected vertex to the closest point of another curve or area, press the ALT key while dragging the vertex.
- CTRL - To insert a vertex, press the CTRL key. The + cursor is displayed when the CTRL key is being held down. Hold down the CTRL key and then click the left mouse button at the location where the point is to be inserted. The cursor changes back to the cursor after the point is inserted. If the vertices on either side of the inserted vertex are shared with other objects, the inserted vertex is also shared.

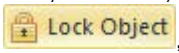
- CTRL+SHIFT - To keep the vertex from being shared, hold down the SHIFT key in addition to the CTRL key before inserting.
- DEL - To delete a selected vertex, press the DEL key.
- DEL+SHIFT - If the vertex is shared, hold down the SHIFT key before deleting so the vertex is only deleted from the selected object.
- SHIFT - When you are moving a shared vertex, you can hold down the SHIFT key before dragging the vertex. This moves the vertex in the selected object only.

Break Apart

The **Draw | Tools | Break Apart** command 

is used to separate a metafile into its component parts. The **Break Apart** command allows you to manipulate a .WMF or an .EMF object if the *Break apart metafile* option in the Windows Enhanced Metafile Import Options Dialog was not selected. After selecting **Draw | Tools | Break Apart** the image is represented as a group of polylines. The **Break Apart** command is also available in the context menu when a .WMF or an .EMF object is selected. Right-click to access the context menu.

Lock Object

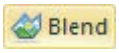
To lock an object's position, rotation, and size, click on the object to select it. Click the **Draw | Tools | Lock Object** command 

, or right-click on the object and select *Lock Object*. When an object is locked it cannot be moved with the **Map | Layer |** Move/Size All Layers command or by dragging it with the mouse. Objects that are locked cannot be resized, moved, or rotated.

Properties for locked objects can still be edited in the **Property Manager**. For example, the line and fill properties for a locked polygon can still be changed. Use the Lock Layer command to protect object properties, sizes, and locations from accidental changes.

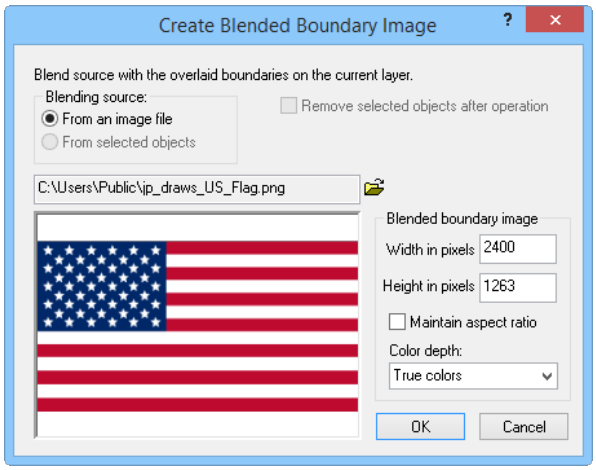
Repeat the above instructions to unlock a locked object.

Blend

The **Draw | Image | Blend** command 

creates a blended boundary bitmap. A base map must be loaded into the plot document to use the **Draw | Image | Blend** command. Clicking the **Draw | Image | Blend** command opens the **Create Blended Boundary Bitmap** dialog.

Create Blended Boundary Bitmap Dialog



Select bitmap image and set options for a blended boundary bitmap

Blending Source:

If you wish to import an image into **MapViewer**, select the *From a bitmap file* option, click the open file button, and select the desired image in the Open dialog.

If you wish to use an image already imported into the plot document, choose the *From selected objects* option. Selecting *From selected objects* allows you to enable the *Remove selected objects after operation* option. *Remove selected objects after operation* deletes the object(s) used in generating the blended boundary bitmap.

Width in Pixels:

The *Width in pixels* box specifies the width of the image imported or selected for generating the blended boundary bitmap. You can adjust the width of the image by typing directly into the box. The value must be between 10 and 16384 pixels.

Height in Pixels:

The *Height in pixels* box specifies the height of the image imported or selected for generating the blended boundary bitmap. You can adjust the height of the image by typing directly into the box. The value must be between 10 and 16384 pixels.

Maintain Aspect Ratio:

When the *Maintain aspect ratio* option is selected, **MapViewer** automatically adjusts the image width or height to maintain the original image aspect ratio when the user specifies either the image width or height.

Color Depth:

The *Color depth* dropdown box contains *True colors* and *256 colors* options for the output image.

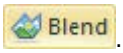
Select *OK* to create the blended boundary bitmap, select *Cancel* to return to the plot document without making any changes.

Blended Boundary Image

MapViewer base maps can be blended with image files or selected objects to create a unique image, called a blended boundary image. Blended boundary images act as a background for a base map or for some thematic map types.

Creating a Blended Boundary Image

To create a blended boundary image:

1. Create a base map using the **Map | Create | Base Map** command  .
2. Once you have a base map file loaded, select the **Draw | Image | Blend** command  .
3. In the **Create Blended Boundary Image** dialog, select a *Blending source*. The *From a bitmap file* option uses the bitmap file specified in the dialog. Click the  button to open a bitmap. The *From selected objects* option uses the selected objects to create a blended boundary bitmap. The selected objects must be located within the base map boundaries and on the same layer to appear in the blended boundary bitmap
4. After all the appropriate settings have been made, click the *OK* button. Once you return to the plot window, notice there is a bitmap object listed in the **Object Manager**.
5. If you would like to create a thematic map, select **Map | Thematic Map** and the map type. (Prism maps and hatch maps with hatched areas do not work with blended boundary bitmaps.)

Blended Boundary Images and Filled Objects

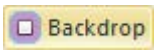
If your boundary file does not contain any filled objects, it is recommended to select the blended boundary image and use the **Arrange | Move to Back** command to move it behind the boundary objects.

Hatch maps created with the *Hatched Area* option do not work well with blended boundary images as the hatch fill obscures the blended boundary image or vice versa. Select *Hatched Circle* or *Hatched Square* if you wish to use a blended boundary image with a hatch map.

Blended Boundary Images and Prism Maps

Blended boundary images cannot be used with prism maps. If you would like to use a image with a prism map, use the prism map texture mapping instead.

Boundary Backdrop

The **Draw | Image | Backdrop** command 

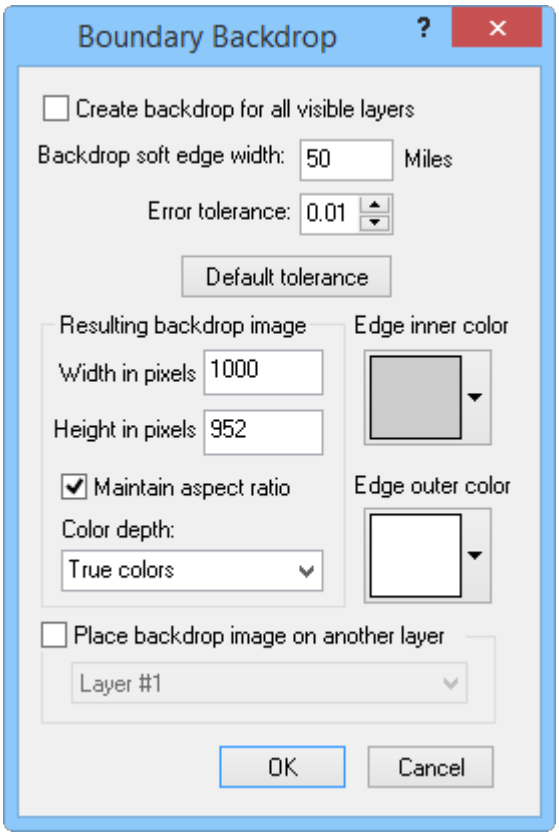
creates a color graded image outline around boundary objects.

Creating a Boundary Backdrop

To create a backdrop:

1. Create boundary objects (polygons, polylines, points).
2. Select **Draw | Image | Backdrop**.
3. Select the backdrop options in the **Boundary Backdrop** dialog.

The Boundary Backdrop Dialog



*You can select the backdrop image dimensions, color, backdrop width, and the backdrop layer in the **Boundary Backdrop** dialog.*

Create Backdrop for All Visible Layers:

Check the *Create backdrop for all visible layers* box to create a backdrop for all objects on all layers, excluding layers containing cartogram maps or prism maps.

Backdrop Soft Edge Width:

Set the backdrop width in the *Backdrop soft edge width* box. The units depend on the surface distance units selected in the **Property Manager**.

Resulting Backdrop Image:

The *Resulting backdrop image* group contains options to set the backdrop image properties including the width, height, color depth, and whether or not to maintain the aspect ratio. The color depth options are *True color* or *256 colors*.

Edge Inner/Outer Color:

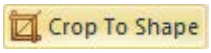
Select the color closest to the objects by clicking on the current color for the *Edge inner color* and selecting a new color from the palette.

Select the outer color by clicking on the current color for the *Edge outer color* and selecting a new color from the palette.

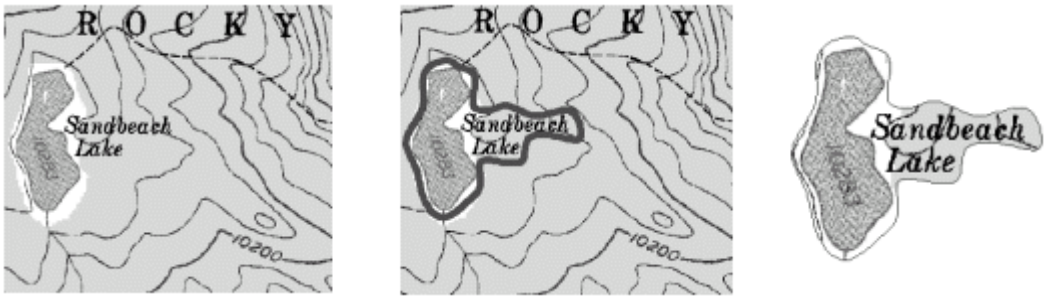
Place Backdrop Image on Another Layer:

Check the *Place backdrop image on another layer* box to create the image on a different layer. Select a layer from the list below. The list does not include locked layers or layers containing cartogram maps.

Crop to Shape

The **Draw | Image | Crop to Shape** command 

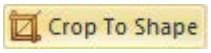
crops a bitmap based on the shape of a selected object. Areas, points, rectangles, ellipses, text, etc can all be used to crop a bitmap. The cropping object's edge width is ignored in the cropping process. The size, shape, and location of the object should represent the region of the bitmap you wish to keep. If you are cropping a georeferenced bitmap, the georeferencing is preserved in the cropped bitmap. You can use more than one object to crop a single bitmap.



The lake in the bitmap on the left was cropped with the black area in the middle image, to create the cropped bitmap on the right.

To crop a bitmap, follow these steps:

1. Import a bitmap.
2. In the plot window, create an object you want to use to crop a bitmap. Objects used to crop a bitmap include: text, areas, spline areas, points, rectangles, rounded rectangles, squares, ellipses, circles, primary IDs, and secondary IDs.
3. Select the bitmap and the object you want use to crop. You can select the objects in the plot window by clicking the objects and holding the SHIFT key or clicking and dragging around a group of objects. You can select objects in the **Object Manager** by holding down the CTRL key and clicking on each object, holding down the SHIFT key and clicking the first and last object in a desired group, or using the selection commands under the Arrange Tab.

4. Use **Draw | Image | Crop to Shape** 

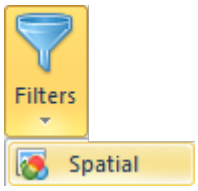
to create a new bitmap based on the cropped region.
5. If you want to remove the area object(s) after the bitmap has been cropped, check the *Remove cropping objects after operation* option in the **Crop Bitmap** dialog.
6. Click the *OK* button in the **Crop Bitmap** dialog to crop the bitmap.

Image Filters

Click the **Draw | Image | Filters** button 

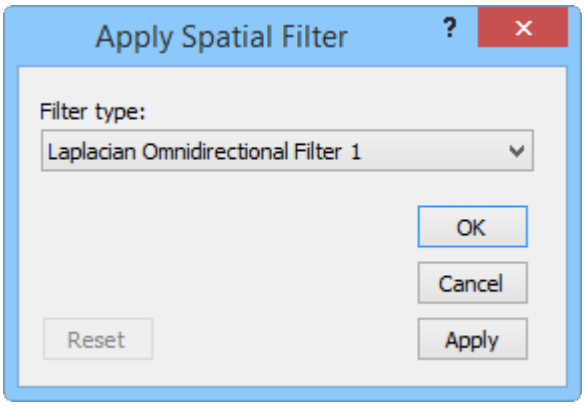
to open the filters list. The following are the available image filters in **MapViewer**:

Spatial Filter

Use the **Draw | Image | Filters | Spatial** command 

to access the **Apply Spatial Filter** dialog. There are 17 spatial filters to choose from in **MapViewer**. Spatial filters help to accentuate the appearance of an image. The filters can bring out the spatial details that might be required to digitize objects from an image.

Apply Spatial Filter Dialog:



Change filter types and preview their effects in the ***Apply Spatial Filter*** *dialog.*

To view the effects of a filter, choose a filter and then click the *Apply* button. To return to the original image state, click the *Reset* button.

<u>Available filters:</u>

Laplacian Omnidirectional Filter 1

Laplacian Omnidirectional Filter 2

Laplacian Omnidirectional Filter 3

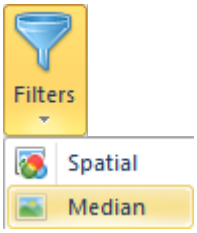
Laplacian Diagonal
Laplacian Horizontal
Laplacian Vertical
Sobel Horizontal
Sobel Vertical
Prewitt Horizontal
Prewitt Vertical
Shift-Difference Diagonal
Shift-Difference Horizontal
Shift-Difference Vertical
Line Segment Horizontal
Line Segment Vertical
Line Segment L-R
Line Segment R-L

For more information on the filters listed above, refer to the following references or any other imaging reference.

Baxes, Gregory A., (1994), *Digital Image Processing: Principles and Applications*, John Wiley and Sons, Inc., New York, 480 pp.

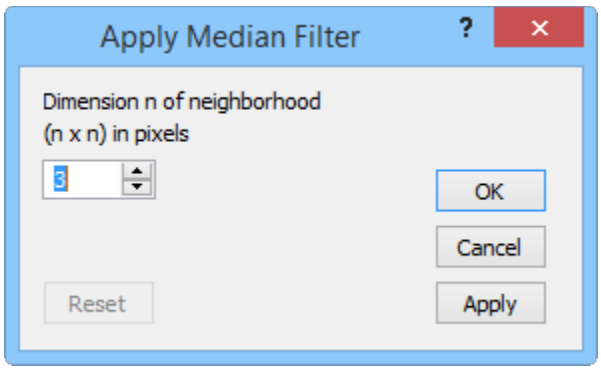
Crane, Randy, (1996), A *Simplified Approach to Image Processing: Classic and Modern Techniques in C*, Prentice Hall, 336 pp.

Median Filter



Use the **Draw | Image | Filters | Median** command to remove detail from the image. The median filter "blurs" the image such that major details are seen more easily while removing the intricate details. Median filters are a nonlinear filter based on the median brightness value of each input group of pixels. This filter is good for removing noise and other anomalies from an image.

Apply Median Filter Dialog:



*Select the level of blurring and preview the median filter effect with the **Apply Median Filter** dialog.*

Dimension n of Neighborhood (n *x* n) in Pixels:

Type a number between 3 and 11 or use the  buttons to select the amount of filtering to apply.

To view the effects of the filter, click the *Apply* button. Click the *Reset* button to revert the image back to its original state.

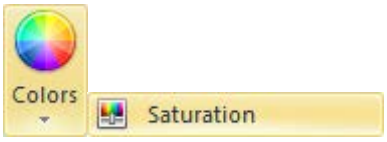
Click *OK* to save your changes and close the **Apply Median Filter** dialog. Click *Cancel* to return the image to its original state.

Image Colors

Click the **Draw | Image | Colors** button 

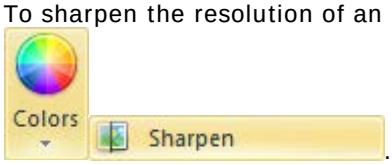
to open the color adjustment list. The following are the available image color adjustments in **MapViewer**:

Adjust Saturation

The **Draw | Image | Colors | Saturation** command 

adjusts the color saturation of the image. Saturation refers to relative purity or the amount of white light mixed with hue. The **Draw | Image | Colors | Saturation** command opens the Adjust Image Saturation dialog.

Sharpen

To sharpen the resolution of an image, use the **Draw | Image | Colors | Sharpen** command 

. Clicking the **Draw | Image | Colors |Sharpen** command opens the Sharpen Image dialog. Sharpening is used to emphasize the details in an image. This filter

increases the contrast between adjacent pixels. When an image appears fuzzy, this function can aid in restoring it to a better-enhanced state.

Adjust Brightness

The **Draw | Image | Colors | Brightness** command 

controls the amount of light assigned to the image. Using the **Brightness** command opens the Adjust Image Brightness dialog.

Adjust Contrast

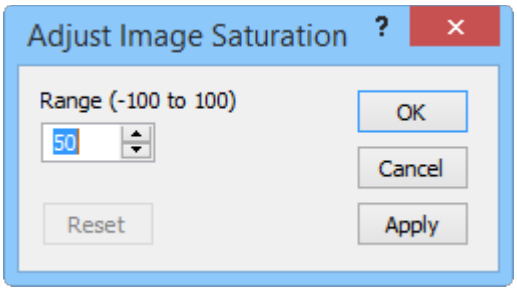
The **Draw | Image | Colors | Contrast** command 

adjusts the amount of contrast in the image. Clicking the **Draw | Image | Colors | Contrast** command opens the Adjust Image Contrast dialog. Contrast is the difference in brightness between the dark and light components of an image.

Adjust Image Dialogs

The **Adjust Image Saturation**, **Sharpen Image**, **Adjust Image Brightness**, and **Adjust Image Contrast** dialogs are opened via the Saturation, Sharpen, Brightness, and Contrast commands respectively. The dialogs are used in the same manner.

The **Adjust Image Saturation**, **Adjust Image Brightness**, and **Adjust Image Contrast** *Range (-100 to 100)* are percent adjustments, so entering *0* makes no change to the image. The **Sharpen Image** *Range (-100 to 100)* is an amount of sharpening. *-100* corresponds to slight sharpening, *0* to moderate sharpening and *100* to maximum sharpening.

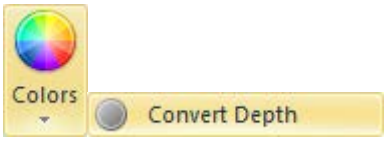


*The **Adjust Image Saturation** dialog is one of four similar dialogs for manipulating images.*

Enter a value in the *Range (-100 to 100)* input box, or click the  buttons to adjust the value. Click the *Apply* button to apply the adjustment to the image. You can continue changing the value in the *Range (-100 to 100)* field and clicking *Apply* until the image appears as desired. Then click *OK* to save the changes. Click *Cancel* to close the dialog without saving the image changes.

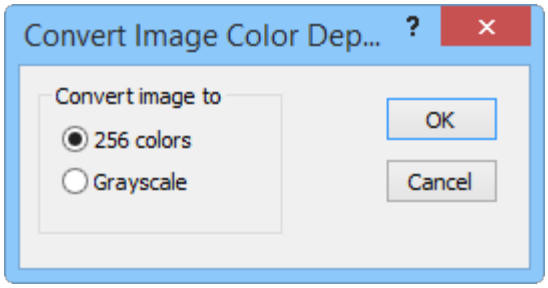
Once you click *OK*, subsequent image adjustments are made to the image in its current state, not the original image. For example, entering *50* in the **Sharpen Image** dialog and clicking *OK*, and then using the **Sharpen** command again and entering *-50* in the **Sharpen Image** dialog does not return the image to its original state. Use the Undo command (CTRL+Z) to return the image to its original state.

Convert Color Depth

Use the **Draw | Image | Colors | Convert Depth** command 

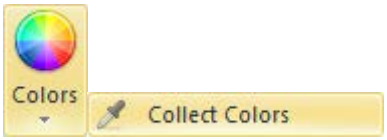
to reduce the image color depth to 256 colors or grayscale. This feature is useful when the file size is very large. Converting the image color depth reduces the memory overhead and allows the program to process information more quickly.

Convert Image Color Depth Dialog:



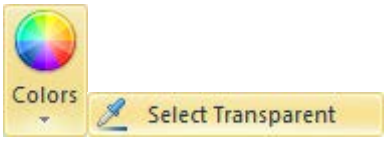
Choose *256 colors* to convert the selected image to 256 colors, or click the *Grayscale* button to convert the image color depth to eight shades of gray.

Collect Colors

The **Draw | Image | Colors | Collect Colors** command 

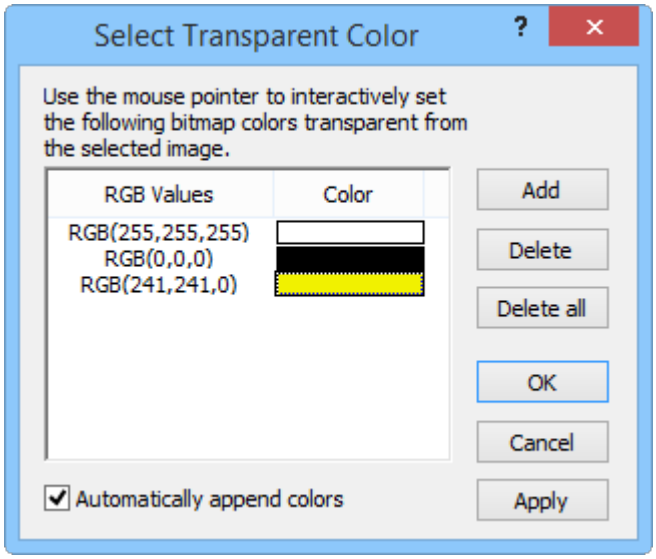
pulls colors from a polygon or an imported image and add them to the color palette. Selecting **Draw | Image | Colors | Collect Colors** opens the Collect Colors dialog and changes the cursor to a crosshair  .

Select Transparent Colors

The **Draw | Image | Colors | Select Transparent** command 

allows you to select up to 256 colors to specify as transparent on an image. If an image with transparent color is overlayed on top of another object, the object beneath the image shows

through. Transparency can be slow. Use as few transparent colors as possible if the program is running slowly.



*View selected colors in the **Select Transparent Color** dialog*

To create transparent colors:

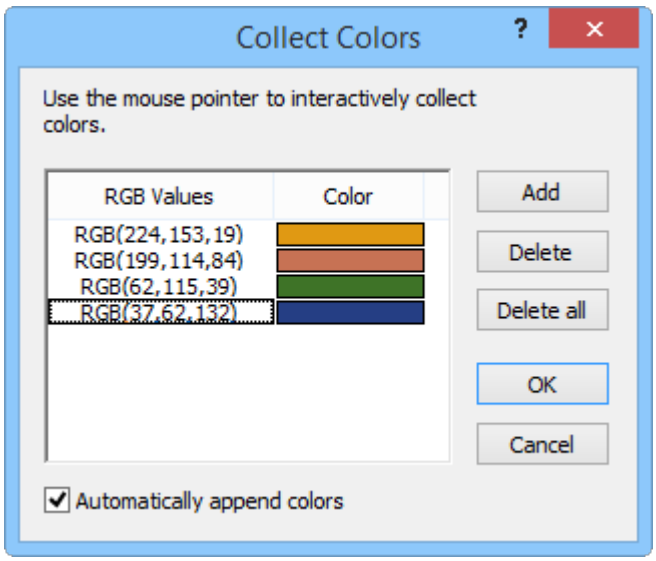
1. Import an image.
2. Select the image.
3. Click **Draw | Image | Colors | Select Transparent**.
4. The cursor turns into a crosshair . Click on a color in the image. This color is entered into the Select Transparent Color dialog.
5. After all the colors are selected, click the *OK* button to create transparent colors.

Collect Colors and Select Transparent Color Dialogs

The Collect Colors and Select Transparent commands open the **Collect Colors** and **Select Transparent Color** dialogs respectively. The dialogs function in the same manner, and the only difference is the **Select Transparent Color** dialog has an *Apply* button.

Collect Colors Dialog

The collect colors dialog lists the user-selected colors. Once all the desired colors are collected, clicking *OK* adds the colors to the Color Palette.

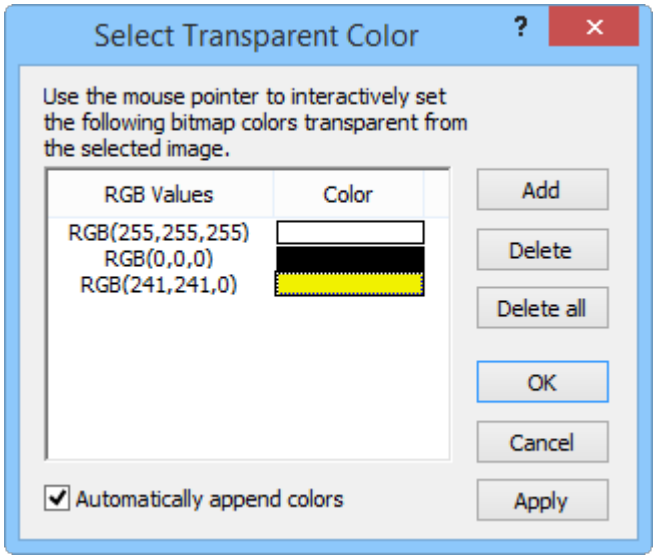


*View the collected colors in the **Collect Colors** dialog*

Once an area on the image or polygon is clicked, the color of the pixel is displayed in the dialog. When *Automatically append colors* is selected, each click on a unique color generates another item in the **Collect Colors** dialog. If *Automatically append colors* is not selected, one color is added to the dialog, and its value changes with each subsequent click. You must click *Add* to save the collected color. *Delete* and *Delete All* are used to remove colors from the dialog box.

Click *OK* to close the **Collect Colors** dialog and add the selected colors to the Color Palette. Click *Cancel* to close the dialog without saving the collected colors.

Select Transparent Color Dialog



*View selected colors in the **Select Transparent Color** dialog*

To select transparent colors:

1. Import an image.
2. Select the image.
3. Click **Draw | Image | Colors | Select Transparent**.
4. The cursor turns into a crosshair . Click on a color in the image. This color is entered into the **Select Transparent Color** dialog.
   - 4a. With *Automatically append colors* selected, continue clicking colors you would like to be transparent. Then click *OK.*
   - 4b. If *Automatically append colors* is not selected, follow steps 5 - 8.
5. To add additional colors, click the *Add* button and then click on a color on the image.
6. To change a color already in the dialog, click on the color (in the *RGB Values* or the *Color* column), and then click on the image.
7. To remove transparency, click the *Delete All* button. To remove some transparency, select a color and click the *Delete* button.
8. After all the colors are selected, click the *OK* button to create transparent colors.

If you wish to make the selected colors transparent without closing the dialog, click the *Apply* button. The image is updated in the plot window. You can then delete or add colors in the **Select Transparent Color** dialog to further refine your image. Once you are satisfied with the image, click the *OK* button to close the dialog.

Define Region

When displaying a map, you might want to obtain information on selected portions of the map. The **Draw | Region** commands allow you to specify a selection region by drawing a ellipse, rectangle, or polygon. Alternatively, you can select boundary objects by their primary IDs or in the Plot Window to create a selection region or buffer zone.

If you want to define more than one selection region at the same time, you can use the **Draw | Region | Add** command. The selection region you define remains displayed on the screen until you define another selection region, or you choose the **Draw | Region | Clear** command.

Once you have defined the region or regions, you can use the **Analysis | Data | Records in Regions** command to display information for the contained boundary objects.

Create a region with one of the following **Draw | Region** commands:

Ellipse	Selects boundary objects within a user-defined circle
Rectangle	Selects boundary objects within a user defined rectangle
Polygon	Selects boundary objects within a user defined polygon
Buffer	Selects boundary objects within an automatically generated buffer zone
By Selecting	Selects boundary objects based on their primary IDs Selection is made through the Define Regions by PIDs dialog
By Current Selection	Defines region with the current selection's boundary objects Objects are selected in the plot window or object manager Opens the Regions by Selection dialog

Ellipse - Region

Click the **Draw | Region | Ellipse** command 

to create an ellipse region in the plot document. You can obtain information on selected portions of the map for defined regions with the **Analysis | Data | Records in Regions** command.

Ellipse Properties

Ellipses contain two types of properties: line properties and fill properties. You can change these properties in the **Property Manager**.

Drawing an Ellipse

To draw an ellipse:

1. Click the **Draw | Region | Ellipse** command 

.
2. Press and hold the left mouse button at one corner of the bounding box of the ellipse.
3. Drag the cursor to the opposite corner of the ellipse. The size of the ellipse's bounding box appears in the status bar as it is drawn.
4. Release the left mouse button when the ellipse is the preferred size and shape.
5. Press the ESC key to exit drawing mode.

Drawing a Circle

To draw a circle, hold down the CTRL key while dragging the mouse to draw a circle rather than an ellipse.

Drawing Tips

- Draw an ellipse out from the center rather than corner to corner by holding down the SHIFT key while dragging the mouse.
- Draw a circle out from the center rather than end to end by holding down the SHIFT and CTRL keys while dragging the mouse.

- Line and fill properties are set through the **Property Manager**.

Rectangle - Region

Click the **Draw | Region | Rectangle** command Rectangle to create a rectangle region in the plot document. You can obtain information on selected portions of the map for defined regions with the **Analysis | Data | Records in Regions** command.

Rectangle Properties

Rectangles contain two types of properties: line properties and fill properties. You can change these properties in the **Property Manager**.

Drawing a Rectangle

To draw a rectangle:

1. Select the **Draw | Region | Rectangle** command Rectangle to enter drawing mode and begin drawing a rectangle.
2. Press and hold the left mouse button at one corner of the rectangle.
3. Drag the pointer to the opposite corner of the rectangle. The size of the rectangle appears in the status bar as it is drawn.
4. Release the left mouse button when the rectangle is the preferred size and shape.
5. Press the ESC key to exit drawing mode.

Drawing a Square

To draw a square, hold down the CTRL key while dragging the mouse to draw a square rather than a rectangle.

Drawing Tips

- Line and fill properties are set through the **Property Manager**.
- You can draw a rectangle out from the center rather than corner to corner by holding down the SHIFT key while dragging the mouse.
- You can draw a square out from the center rather than corner to corner by holding down the CTRL and SHIFT key while dragging the mouse.

Polygon - Region

Click the **Draw | Region | Polygon** command Polygon to create a rectangle region in the plot document. You can obtain information on selected portions of the map for defined regions with the **Analysis | Data | Records in Regions** command.

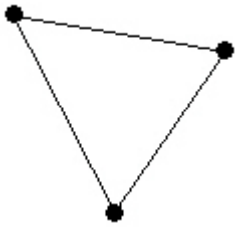
Polygon Properties

Polygons contain two types of properties: line properties and fill properties. You can change these properties in the **Property Manager**.

Drawing a Polygon

To draw a polygon:

1. Click the **Draw | Region | Polygon** command  .
2. Move the cross hair cursor over the location for the start of the polygon and click the left mouse button.
3. Move the cursor to the next position along the line and click again.
4. Continue this procedure until you click the final point and then press the ENTER key, or double-click the final point with the left mouse button. Pressing ENTER closes the polygon by connecting the first and last points that were selected regardless of cursor position. Double-clicking the left mouse button places a point where the cursor is located and connects that point to the first point.
5. Press the ESC key to exit drawing mode.



This shows a Polygon drawn through three points.

Drawing Tips

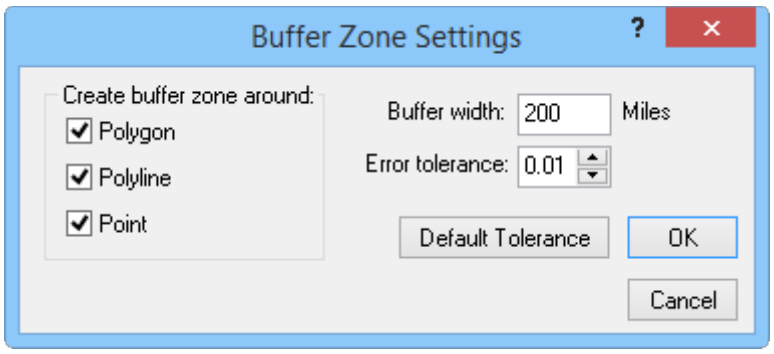
- Click points on the page to draw individual points, or click and hold the left mouse button and drag the pointer to draw a continuous stream of points.
  - Click the right mouse button to remove the last drawn point. This can be done repeatedly.
  - If the CTRL key is pressed while clicking points, the points are constrained to 45-degree angles.
  - Double-click the left mouse button or press the ENTER key to close the polygon.
  - To cancel drawing a polygon, press the ESC key before closing the polygon.
  - Edit the polygon shape by using the **Draw | Tools | Reshape** command.
  - Line and fill properties are set through the **Property Manager**.

Auto Buffer Zone

The **Draw | Region | Buffer** command  allows you to create a buffer (outlined boundary) around the selected objects. Once a buffer zone is created, you can query the buffer zone with **Analysis | Query** or analyze the region with **Analysis | Data | Records in Regions**.

Buffer Zone Settings Dialog

Before using this command, select points, polygons, and/or polylines on the map or in the **Object Manager**.



Create a buffer zone with the Buffer Zone Settings dialog

Create buffer zone around:

Check object types (*Polygon*, *Polyline*, and *Point*) to select around which objects the buffer zone will be generated.

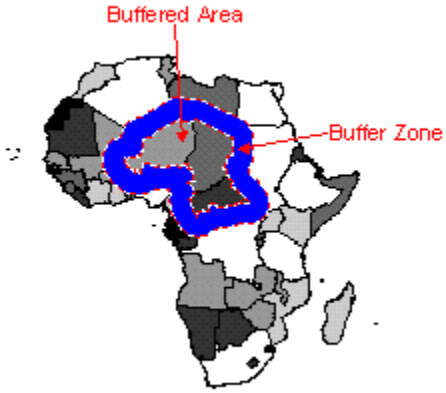
Buffer width:

Set the distance around the selected polygons, polylines, or points in the *Buffer width* box. The units of the *Buffer width* are set in the Property Manger

Error tolerance:

Set the error tolerance for the buffer zone by typing in the *Error tolerance* box or using the button. The error tolerance must be between 0 and 0.5. Pressing the *Default Tolerance* button sets the error tolerance to 0.01.

After the *OK* button is clicked in the **Buffer Zone Settings** dialog, a red dotted line is drawn surrounding the original selected boundaries, and a second red dotted line is drawn at the specified buffer width from the selected boundaries. The buffer zone is the area between the selected boundaries and the buffer width line, shown in blue below. The buffered area is the original selected boundaries.



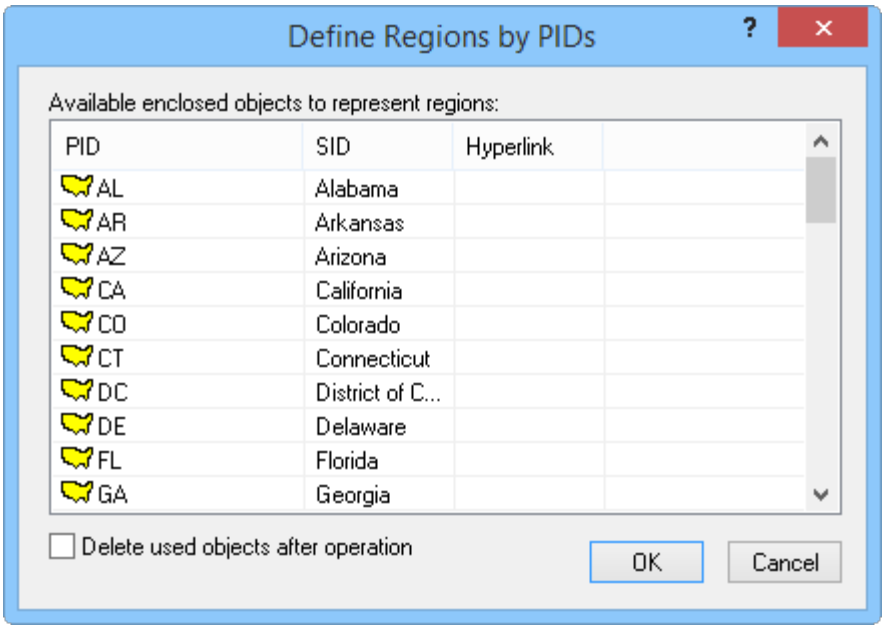
The buffered area contains the originally selected areas. The buffer zone is the area drawn around the originally selected areas. You can also create buffer zones around points and curves.

Clearing Buffer Zones

To remove all buffer zones, select the **Draw | Region | Clear** command.

Define Regions by PIDs

You can use the **Define Regions by PIDs** dialog to select one or more areas or shapes on a map. The **Define Regions by PIDs** dialog is opened with the **Draw | Region | By Selecting** command. After you make your selection and click the *OK* button, you can use the **Analysis | Data | Records in Regions** command to display a dialog of selected items with linked data.



Select objects for generating a region in the **Define Regions by PIDs** *dialog*

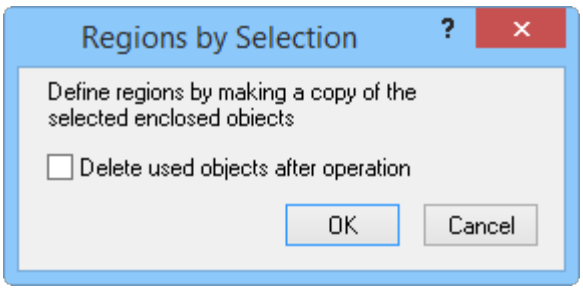
You can select any number of items from the list. If you hold down the CTRL key, you can select individual items that are not necessarily contiguous in the list. By using the SHIFT key, you can select groups of items by clicking on the first item, holding down the SHIFT key, and clicking on the last item in the list. You can also select multiple items by clicking and dragging from the first item to the last item. This includes the two items you clicked on as well as all items between the two.

Delete used objects after operation:

The *Delete used objects after operation* option deletes the objects selected for generating the region.

Regions by Selection Dialog

The **Regions by Selection** dialog is opened with the **Draw | Region | By Current Selection** command.

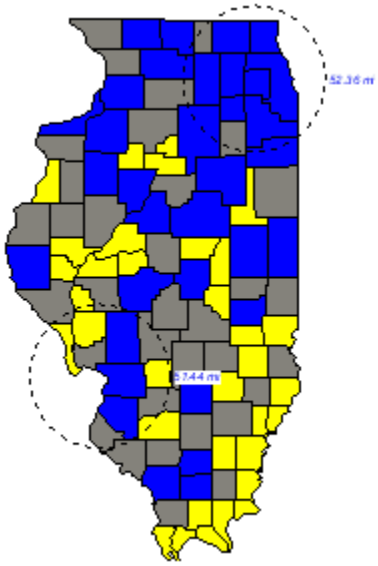


Choose to delete the selected objects after generating the region

Selecting *Delete used objects after operation* will remove the selected objects from the plot.

Add Regions

The **Draw | Region | Add** command Add lets you define two or more selection regions at the same time. As you define additional selection regions with the **Draw | Region** commands, the previous regions remain activated and the new region is drawn as well. If **Draw | Region | Add** is not activated, the previous regions are removed each time a new region is defined. To view the data records for all the selection regions select **Analysis | Data | Records in Regions**.



*To define multiple regions on a map, choose the **Draw | Region | Add** command.*

Click to activate the **Draw | Region | Add** command Add. The button stays depressed and changes color Add to indicate **Draw | Region | Add** is activated. To turn this feature off, click on the **Draw | Region | Add** command again.

When you want to remove all the selection regions, use the **Draw | Region | Clear** command.

Clear Regions

The **Draw | Region | Clear** command Clear removes the currently defined selection region(s). Selection regions are defined with the **Draw | Region** commands.

Chapter 31

Boundary Editing

Boundary Tab Commands

The **Boundary** tab contains commands for editing boundaries and polylines, creating new boundaries, splitting or combining islands and lakes, and assigning attributes to boundaries.

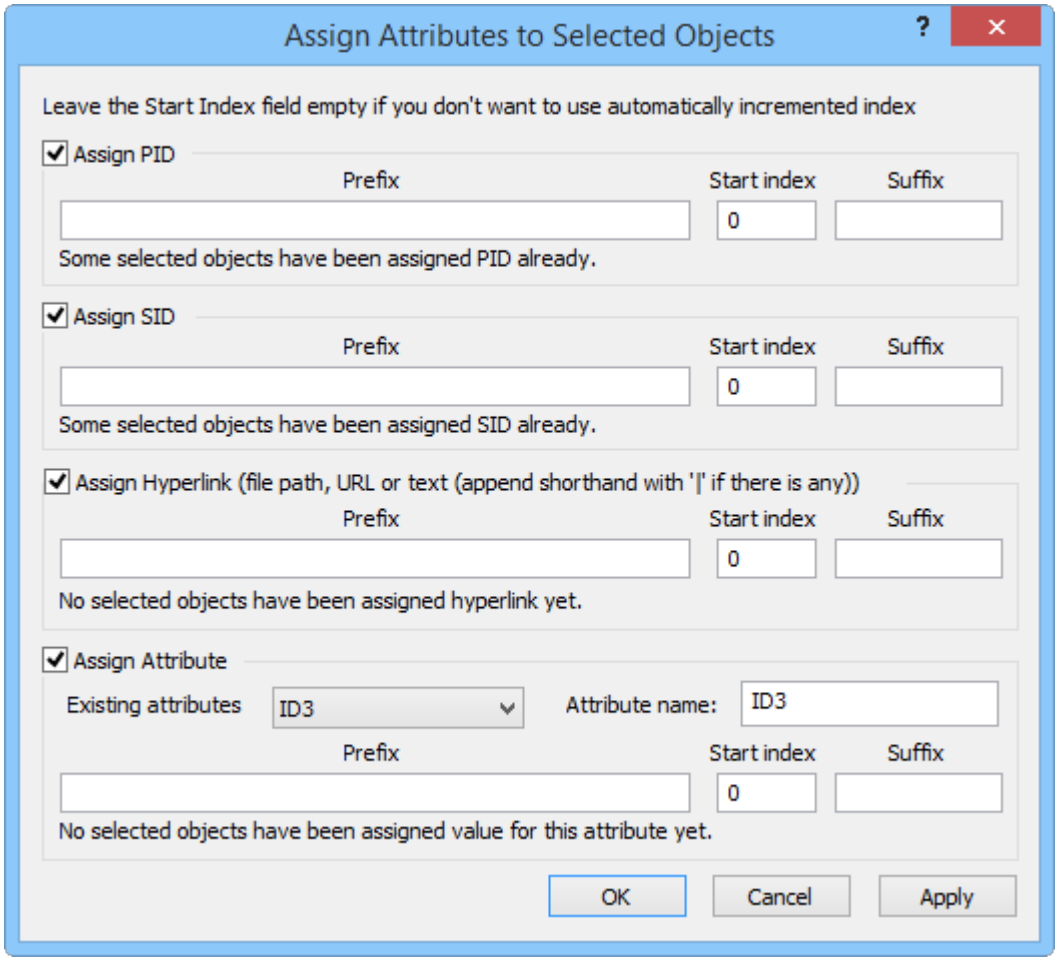
Multi-Assign Attributes	Assigns attributes to multiple objects
Redefine Attributes	Reassigns object IDs and hyperlinks
Change Boundary Type	Converts boundaries: Polygon to Polyline, Points to Polyline, Polyline to Points, Polyline To Polygon, Polyline To Polygon (Shared Border), Symmetric Shape to Polygon, Spline to Regular Object
Emphasize	Shrinks or expands selected objects
Emphasize Group	Shrinks or expands a group of selected objects
Move Centroids	Moves centroid positions of selected objects
Thin	Removes points from selected polygons and polylines
Smooth	Smooths a selected polygon or polyline
Reshape	Reshapes selected polygon or polyline
Reverse Direction	Reverses the order of the vertices of the selected polygon
Connect Polylines	Joins two or more selected polylines
Break Polyline	Breaks a polyline into multiple polylines
Break at Intersections	Breaks selected polylines into multiple polylines at intersections
New Boundaries	Creates new boundaries with Union of Polygons, Intersect Polygons, Difference of Polygons, Divide Polygons, Intersection Points, Enclose, Convex Hull, Triangulation, Thiessen Polygons
Split	Breaks a complex area into simple islands and lakes
Combine	Combines selected areas into a single complex polygon

Multi-Assign Attributes

The **Boundary | Attributes | MultiAssign** command 

assigns IDs and hyperlinks to multiple selected objects. Clicking **Boundary | Attributes | MultiAssign** opens the **Assign Attributes to Selected Objects** dialog box.

Assign Attributes to Selected Objects Dialog



*Use the **Assign Attributes to Selected Objects** dialog to assign PIDs, SIDs, Attributes, and hyperlinks to objects*

Assign PID, SID, Attributes, or Hyperlink

Click in the *Assign PID*, *Assign SID*, *Assign Hyperlink (file path, URL or text (append shorthand with | if there is any))* check boxes to select which attributes to assign to the selected objects

Prefix

Type into the *Prefix* input box to designate a shared prefix for the selected objects.

Start index

Type a starting number for the progressive index in the *Start index* input box. Objects will be assigned sequential numbers starting at the bottom object and finishing at the top object in the **Object Manager**. Leave the *Start index* box blank to assign identical attributes to all selected objects.

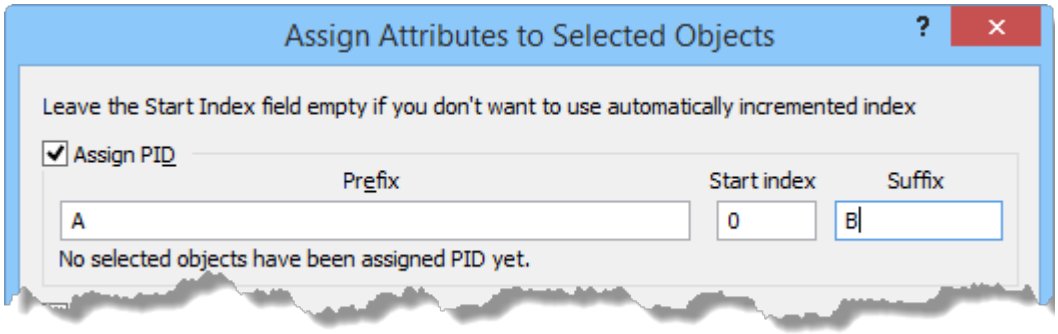
Suffix

Type a shared suffix into the *Suffix* input box.

Example

Assume three objects are selected, and **Boundary | Attributes | MultiAssign** 

is clicked. The letter "A" is entered into the *PID Prefix* input box, the number "0" default is left in the *PID Start index* input box, and the letter "B" is typed into the *PID Suffix* input box.



The selected objects' PIDs will be assigned "A0B, A1B, A2B" from bottom to top in the **Object Manager** or back to front on the layer.

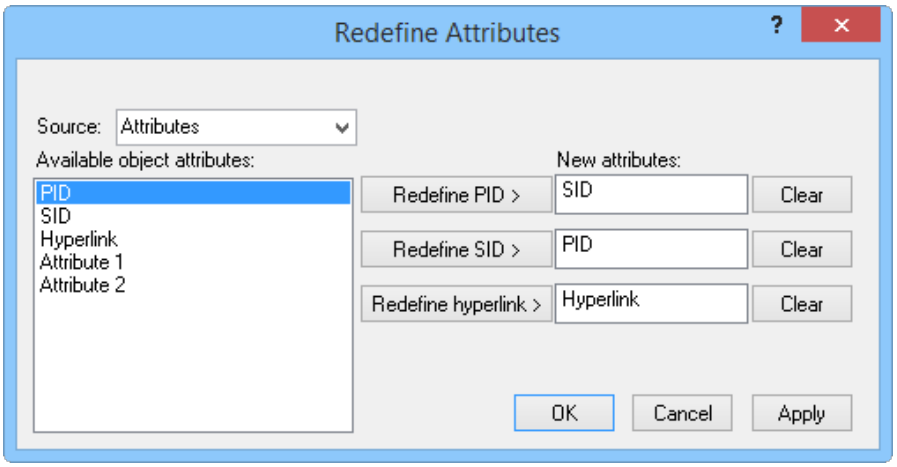
Redefine Attributes

The **Boundary | Attributes | Redefine** command 

allows you to redefine the PID, SID, or Hyperlink with the object's PID, SID, Hyperlink, or Attributes. This tool can be particularly useful when you have a conflict between primary IDs in your boundary and data files. For example, the US County boundary files included with **MapViewer** have the FIPS codes as the primary IDs, and county names as the secondary IDs. You may have a data file with county names but not have the FIPS code information. Rather than editing your data file, simply exchange the boundary file primary and secondary IDs with the **Boundary | Attributes | Redefine** command. (You can also assign IDs to the entire map during the boundary import.)

Redefine Attributes Dialog

The **Redefine Attributes** dialog opens when **Boundary | Attributes | Redefine** is clicked.



Redefine the PID, SID, or Hyperlink with the object's PID, SID, Hyperlink, or Attributes.

Available Object Attributes

The *Available object attributes* list displays all of the attributes that exist for objects in the map layer. The list can include primary and secondary IDs, a hyperlink, and other attributes.

Redefine and Clear buttons

The *Redefine PID, Redefine SID,* and *Redefine hyperlink* buttons allow you to redefine IDs. Click on an ID in the *Available object attributes* list, and then click one of these buttons to reassign the ID. If you wish to remove an ID from its existing location, click the appropriate *Clear* button located to the right of the *New attributes* list.

New Attributes

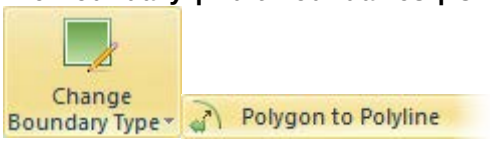
The *New attributes* list displays the configuration of IDs that will be applied when *OK* is clicked. When the **Redefine Attributes** dialog is initially opened, this list shows the current configuration (PID = PID, SID = SID, hyperlink = Hyperlink)

Example

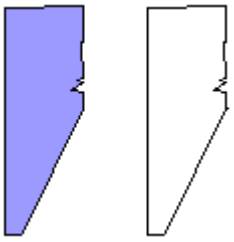
Let's imagine that we want to redefine the secondary ID to match the primary ID. First, click on the word *PID* to select it from the *Available object attributes* list. Next, click the *Redefine SID* button to change the secondary IDs so they match the primary IDs. Click the *OK* button to apply the changes and close the dialog.

Polygon to Polyline

The **Boundary | Edit Boundaries | Change Boundary Type | Polygon to Polyline** command



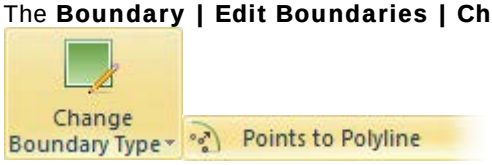
converts all selected Polygons into Polylines. Complex areas are converted into multiple polylines - one curve for each polygon in the area. The line style of each polygon is copied to the newly created polylines. You can assign IDs in the **Object Manager** or **Property Manager**.



The area on the left has been converted to a curve (right).

Points to Polyline

The **Boundary | Edit Boundaries | Change Boundary Type | Points to Polyline** command



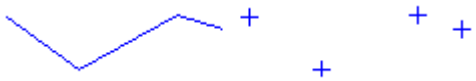
converts all selected points into a Polyline. The points are connected in the order they appear in the **Object Manager**. You can assign IDs in the **Object Manager** or **Property Manager**.

*Use **Points to Polyline** to create a curve (right) from selected points (left).*

Polyline to Points

The **Boundary | Edit Boundaries | Change Boundary Type | Polyline to Points** command

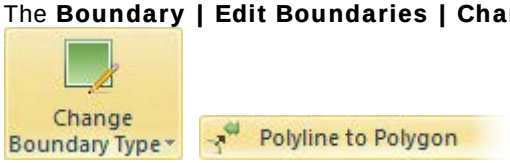
converts one or more selected polylines into points. Each polyline vertex is converted into a point. The new points use the default symbol properties. The line's primary ID is used for each of the points.



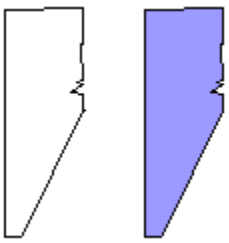
***Polyline to Points** changes polylines (left) to points (right).*

Polyline to Polygon

The **Boundary | Edit Boundaries | Change Boundary Type | Polyline to Polygon** command

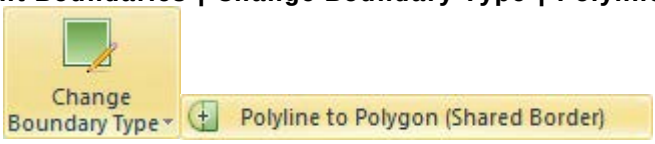


converts one or more selected polylines to polygons. Each selected polygon is converted to a separate polygon. For each polyline, a new line segment is created between the curve endpoints to form the polygon. The new area uses the default fill properties and retains the line properties defined for the polylines. The line's primary ID is also retained.

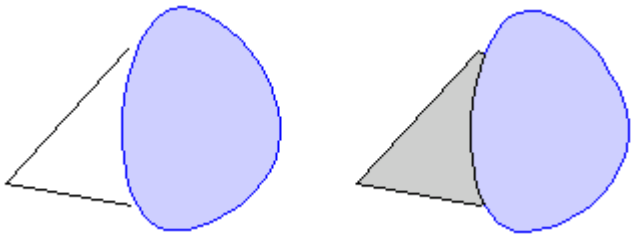


The polyline on the left was converted into a polygon (right).

Polyline to Polygon with Shared Border

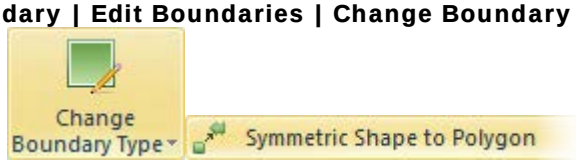
The **Boundary | Edit Boundaries | Change Boundary Type | Polyline to Polygon (Shared Border)** command 

changes a polyline into a polygon where one of the sides is shared with an existing area. The polyline is converted to a polygon by snapping the polyline endpoints to the nearest selected polygon. The newly created polygon has a common border shared by both the old and new polygons. Select one polygon and one polyline object before selecting this command. The original polygon and polyline should not have self-intersecting loops.



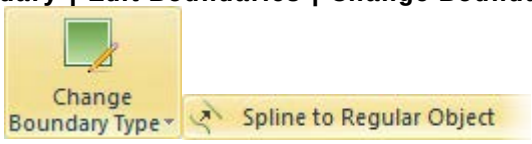
*The **Polyline to Polygon (Shared Border)** command changes a polyline into a polygon where one of the borders is shared with an adjacent polygon.*

Symmetric Shape to Polygon

The **Boundary | Edit Boundaries | Change Boundary Type | Symmetric Shape to Polygon** command 

transforms the selected rectangle, rounded rectangle, or ellipse into a polygon. Once the area has been created from the shape, it can be used for a thematic map, projected, and scaled like a regular boundary object (polygon, polyline, and point).

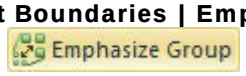
Spline to Regular Object

The **Boundary | Edit Boundaries | Change Boundary Type | Spline to Regular Object** command 

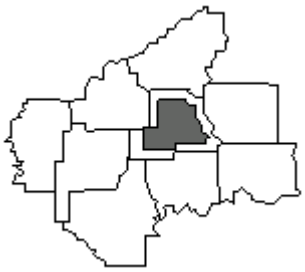
transforms a spline polyline or spline polygon into a regular polyline or polygon. The shape of the selected spline object is maintained when using the **Spline to Regular Object** command.

Emphasize and Emphasize Group

The **Boundary | Edit Boundaries | Emphasize** 

and **Boundary | Edit Boundaries | Emphasize Group** 

commands offset selected object(s) from the rest of the objects on the map by reducing or expanding it in size. Use **Boundary | Edit Boundaries | Emphasize** if you want to emphasize each boundary independently and use **Boundary | Edit Boundaries | Emphasize Group** if you have multiple selected objects to emphasize as a group. All object types, except Text, can be used with the **Emphasize** and **Emphasize Group** commands, but at least one polygon must be selected. Use Font Properties to adjust Text size.

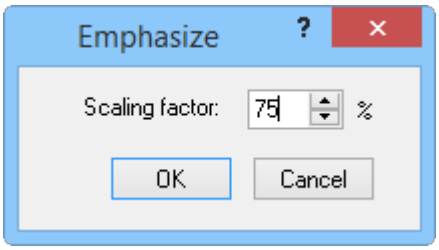


Emphasized areas can be made smaller so they stand out, like the dark area here.

Emphasize Group contracts or expands the group from its geographic center. For example, you can use the **Emphasize Group** command to offset a region, such as the Western States, away from the rest of the states.

When you emphasize a group, the entire group is shrunk towards the center of the group.

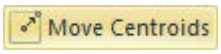
Emphasize Dialog



You can enter a *Scaling factor* from 10 percent to 200 percent in the **Emphasize** dialog. Ten percent scaling reduces the selected objects to 10 percent its original size, 100 percent does not change the object size at all, and 200 percent expands the objects to 200 percent its original size. Only the selected objects are emphasized. To be emphasized, text, points, and other objects contained within an area must be also selected.

You can draw connecting lines (or callout lines) with **Draw | Shape | Polyline**.

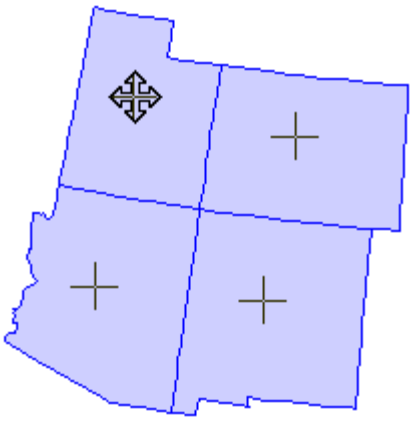
Move Centroids

The **Boundary | Edit Boundaries | Move Centroids** command 

moves the selected object's centroid. The centroid for a polygon is defined as the geographic center of the area. For a polyline, the centroid is defined as the midpoint of the line. For a point, the centroid coincides with the center of the point. The centroid is used for the default ID placement and the position for symbols, pie charts, posted labels, bar charts, and so on. When the command is active,

the centroids are marked with a small cross +. You can select any number of objects before selecting **Move Centroids**, and all the centroids are moved simultaneously. Alternatively, you can select individual objects and move the centroids one at a time.

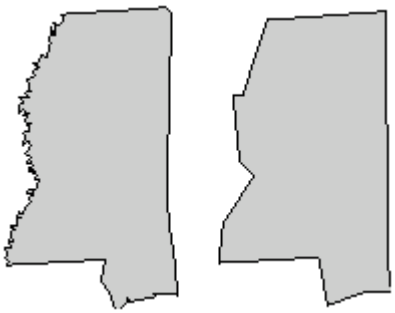
To move centroids, choose the **Move Centroids** command, click and hold the mouse button anywhere on the map and drag the mouse to move the centroid(s). Press ESC before releasing the mouse button to cancel the operation. Press ENTER or ESC to finish moving boundaries.



*You can move selected object's centroids with the **Boundary | Move Centroids** command.*

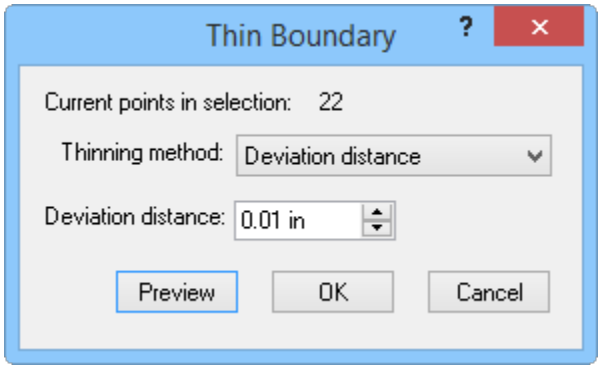
Thin Boundary

The **Boundary | Edit Boundaries | Thin** command  removes vertices from a selected polyline or polygon. Thinning is accomplished using one of three methods: *Deviation distance*, *Keep every nth vertex*, or *Vertex averaging*. To thin an area, specifying the *Thinning method* and the rate or distance to remove points. **MapViewer** uses these options to determine a series of straight-line segments that approximate the area or curve. The **Thin Boundary** command can be used on one or more objects at the same time.



Thinning boundaries reduces their complexity. The boundary on the right has been thinned.

Thin Boundary Dialog



*The **Thin Boundary** dialog contains options for the thinning method and for the distance or rate of vertex removal.*

Current Points in Selection

The total number of points in the selected objects is displayed in the *Current points in selection* field.

Thinning Method

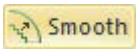
The *Deviation distance* thinning method controls how many points are removed by the thinning process. Points closer than the *Deviation distance* from the general trend of the line are removed. A distance of 0 does not remove any points. A distance of 0.1 inch removes all points that are 0.1 inch or closer to the general trend of the line. The *deviation distance* must be between 0 and 10.00 inches.

The *Keep every nth vertex* thinning method keeps every n^{th} vertex point from the curve or area, and then reconnects the line segments. For example, if the *Removal rate* is set to 10, the first node is kept, the next nine vertices are removed, the tenth is kept, and so on.

Vertex averaging preserves the first and last point in a curve or area, but averages the vertices along the object based on the number set in the *Average rate* field. For example, a curve that has 10 vertices when averaged using an *Average rate* of three yields a curve with six vertices.

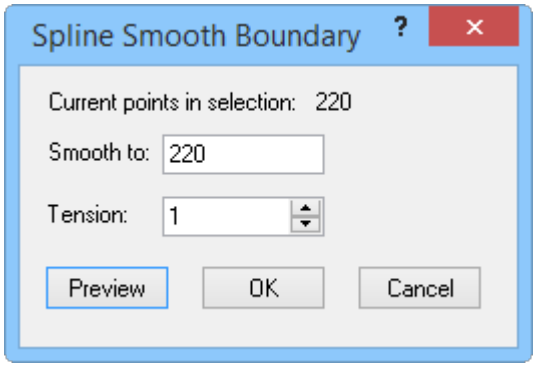
The *Preview* button allows you to see what the selected objects look like after thinning. Different thinning methods may be quickly tried out by entering the distance or rate value and clicking *Preview* to view the results. To return to the original number of vertices, enter 0 as the *Deviation distance* or 1 as the *Removal rat*e or *Average rate.* You can also click the *Cancel* button to return to the original number of vertices.

Smooth Boundary

The **Boundary | Edit Boundaries | Smooth** command 

adds vertices to a selected polyline or polygon. Smoothing is accomplished by specifying a number of vertices and a tension value. **MapViewer** uses this information to determine a series of segments that approximate the area or curve. The **Smooth Boundary** command can only be used on a one selected polyline or polygon at a time.

Spline Smooth Boundary Dialog



*You can add points and a tension factor in the **Spline Smooth Boundary** dialog.*

Current Points in Selection

The *Current points in selection* indicates the current number of vertices in the selected object.

Smooth to Box

The *Smooth to* box controls how many points are added by the smoothing process. The number represents the total number of vertices in the smoothed object. The default value for the *Smooth to* field is 10 times the original number of points.

Tension

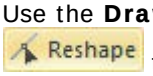
The *Tension* value is a number between 0 and 1. The tension value determines the amount of smoothing to take place. A low tension value tends to exaggerate the amount of curvature in a selected object, while a high tension value produces a smoothed object with a minimal amount of curvature exaggeration.

The *Preview* button allows you to see what the selected object looks like after smoothing. Use this button to quickly view the affects of different tension values on an object.

To create the smoothed object, press the *OK* button. To go back return to the original object's shape, click the *Cancel* button.

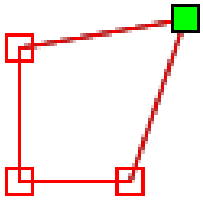
The curve on the left contains four vertices. The curve on the right is the same curve, smoothed using 40 vertices.

Reshape

Use the **Draw | Tools | Reshape** or **Boundary | Edit Boundaries | Reshape** command 

to move, add, and delete vertices within a selected polyline or polygon. This command is available only when a single polyline or polygon is selected. For doing detailed work, or when there is an abundance of vertices in the area you want to reshape, it is helpful to zoom in your view of the area you are working on before using this feature.

After selecting **Reshape**, all vertices in the selected object are shown with hollow squares. You can click a vertex to select it. The selected vertex is indicated by a solid green square and it can be moved by dragging it with the mouse.



*When **Reshape** is selected, the object color changes to red, vertices that make up the object are shown by small hollow squares. A selected vertex is shown as a solid green square.*

Reshaping Boundaries

To edit the shape of a curve or area:

1. Select the object.
2. Click **Draw | Tools | Reshape** (or **Boundary | Edit Boundaries | Reshape**)
3. The object line color changes to red and vertices appear as small hollow squares.
4. To ***move*** a vertex, click on the vertex with the mouse and drag it to a new location. To ***add*** a vertex, hold down the CTRL key and click the area on the area or curve. To ***delete*** a vertex, select it and then press the DELETE key.
5. After reshaping the object, press the ENTER key to end reshaping or press the ESC key to cancel the changes.

Reshape Keys

There are a number of special keys that control the **Reshape** operation.

- ALT - To snap the selected vertex to the closest point of another curve or area, press the ALT key while dragging the vertex.
- CTRL - To insert a vertex, press the CTRL key. The + cursor is displayed when the CTRL key is being held down. Hold down the CTRL key and then click the left mouse button at the location where the point is to be inserted. The cursor changes back to the cursor after the point is inserted. If the vertices on either side of the inserted vertex are shared with other objects, the inserted vertex is also shared.
- CTRL+SHIFT - To keep the vertex from being shared, hold down the SHIFT key in addition to the CTRL key before inserting.
- DEL - To delete a selected vertex, press the DEL key.
- DEL+SHIFT - If the vertex is shared, hold down the SHIFT key before deleting so the vertex is only deleted from the selected object.
- SHIFT - When you are moving a shared vertex, you can hold down the SHIFT key before dragging the vertex. This moves the vertex in the selected object only.

Reverse Islands/Lakes

The **Boundary | Edit Boundaries | Reverse Direction** command Reverse Direction reverses the order of the vertices in the selected areas. This converts islands to lakes and lakes to islands by

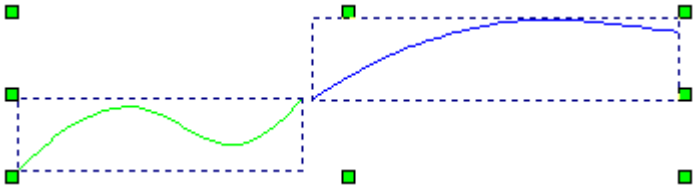
reversing the order of the vertices. The vertices on islands are oriented clockwise and vertices for lakes are oriented counterclockwise. The direction of the areas are listed as CCW (counterclockwise) and CW (clockwise) in the *Polygon Direction* column in the **Property Manager** Info page.

Complex areas will have all component polygons reversed. To reverse a single polygon of a complex area, first use Split Islands/Lakes, reverse the desired areas, and then use Combine Islands/Lakes.

Connect Polylines

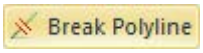
The **Boundary | Edit Polylines | Connect Polylines** command 

joins two or more selected polylines to form a single curve. The polylines are connected at the closest endpoints in the selected curves. You must select two or more curves for this command to be active. The line style, width, and color of the connected curve is set to the default settings. You can assign IDs to the new curve in the **Object Manager** or **Property Manager**.



Select two or more curves to connect them to create one curve.

Break Polyline

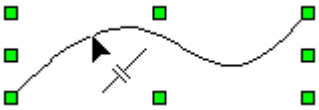
The **Boundary | Edit Polylines | Break Polyline** command 

breaks a polyline into two curves. The two new polylines retain the object IDs and attributes as well as the line properties.

To break a polyline:

1. Select a polyline.
2. Select the **Boundary | Edit Polylines | Break Polyline** command.
3. Click on the polyline at the point you would like to break the curve.

The polyline is broken into two polylines.



*Use **Break Curve** to break a selected curve into two curves.*

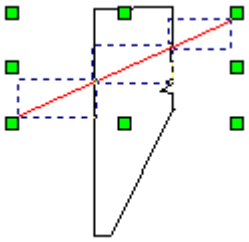
Break at Intersection

The **Boundary | Edit Polylines | Break at Intersection** command 

breaks a selected polyline at every intersection with another boundary object, such as other curves or areas. If the selected polyline intersects a rectangle, rounded rectangle, or ellipse the curve is not broken. The intersection must occur between a polyline and another boundary object. (You can convert the rectangle, rounded rectangle, ellipse, square, or circle to a boundary object using the Symmetric Shape to Area command and then use this command.) After a polyline is broken, multiple polyline objects are created based on the boundary intersections with the original polyline.

To break a polyline:

1. Select the polyline that is intersecting with another boundary object.
2. Click the **Boundary | Edit Polylines | Break at Intersection** command.



In this example, the polyline is broken into three polylines since the curve crosses the area twice.

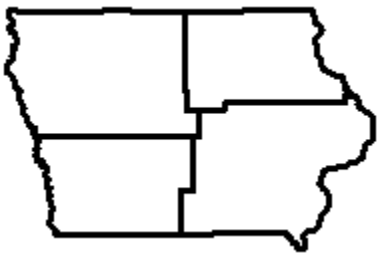
Union of Polygons

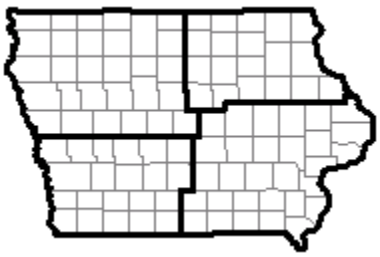
The **Boundary | New Boundaries | Union of Polygons** command 

is a way to automatically trace around the outside of a group of contiguous areas. This command is useful for defining regions based on existing areas. For example, you might have a sales territory based on several counties. If you want to indicate the sales territory on the map, select all the counties that define that territory and choose the **Union of Areas** command. This traces around the outside of the entire group. You can apply a unique line style to the new traced boundary for emphasis, or you can assign a primary ID to the new area so you can link it to data.

To use the **Union of Polygons** command:

1. Select all the areas that define the boundary to be grouped together.
2. Choose the **Boundary | New Boundaries | Union of Polygons** command.
3. Select options for the original objects and lakes in the **Union of Areas** dialog.
4. Click the *OK* button and the selected areas are traced. The new traced boundary is the selected area when the process is completed.

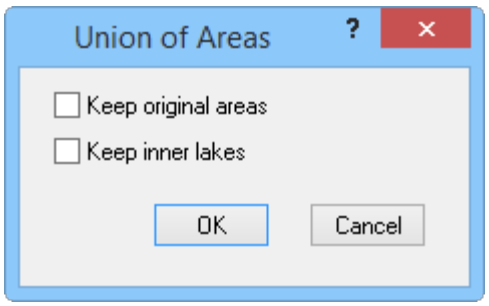




*With **Union of Areas**, you do not have to preserve the original boundaries. In this example, four new boundaries are based on groups of counties. When creating the example on the left,* Keep original areas *was not checked.* Keep original areas *was checked when creating the example on the right.*

Union of Areas Dialog

The **Union of Areas** dialog contains the options for the **Union of Polygons** command.



*Select whether to keep original areas and/or inner lakes with the **Union of Areas** dialog*

Keep Original Areas

When *Keep original areas* is activated, the selected areas are traced to create a new area while leaving the original selected areas unchanged. When *Keep original areas* is NOT activated, the areas are traced to create a new area, and the original group is deleted.

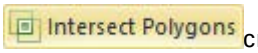
Keep Inner Lakes

When *Keep inner lakes* is activated, inner boundaries, called lakes, are included in the new traced boundary. When *Keep inner lakes* is not activated, inner boundaries, called lakes, are removed from the new traced boundary.

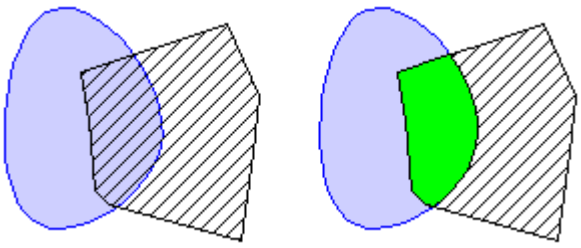
Difference between Combine Islands/Lakes and Union of Areas

This command differs from the Combine Islands/Lakes command. With the **Union of Areas** command, the outside boundary for the selected group is generated. With **Boundary | Combine Islands/Lakes**, the group is combined into a single complex polygon, but the outer boundary is not traced. If you want to indicate the outer boundary with a heavy line and preserve the inner boundaries with thinner lines, you can accomplish this with the **Union of Polygons** command, not with the **Combine Islands** command.

Intersect Polygons

The **Boundary | New Boundaries | Intersect Polygons** command 

creates a new boundary from two or more intersecting boundaries. The area that intersects all selected boundaries is the new area. The original areas outside of the intersecting portion are removed. You can apply a unique line style to the new traced boundary for emphasis, and assign a primary ID to the new area so you can link it to data. If none of the selected boundaries overlap, a new boundary is not created.

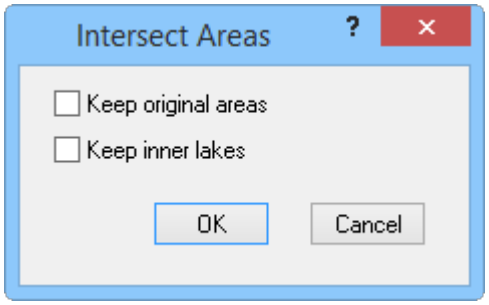


*Use the **Intersect Areas** command to create a new area (green on right) from intersecting areas (left).*

To use the **Intersect Polygons** command:

1. Select all the areas that define the boundary of overlapping areas.
2. Choose the **Boundary | New Boundaries | Intersect Polygons** command.
3. Select options for the original areas and lakes in the **Intersect Areas** dialog.
4. Click the *OK* button and the intersecting area is created.

Intersect Areas Dialog



*Select whether to keep original areas and/or lakes in the **Intersect Areas** dialog.*

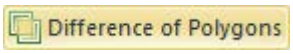
Keep Original Areas

When *Keep original areas* is activated, the intersection of the selected areas is traced to create a new area while leaving the original selected areas unchanged. When *Keep original areas* is NOT activated, the areas are used to create a new area, and the original group is deleted.

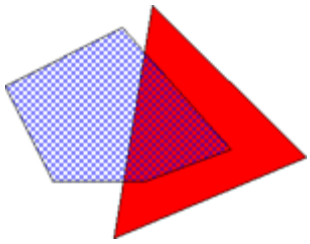
Keep Inner Lakes

When *Keep inner lakes* is activated, inner boundaries, called lakes, are included in the new traced boundary. When *Keep inner lakes* is not activated, inner boundaries, called lakes, are removed from the new traced boundary.

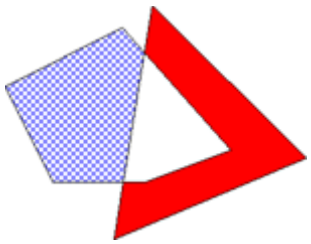
Difference of Polygons

The **Boundary | New Boundaries | Difference of Polygons** command 

creates new areas that do not contain overlapping portions of the selected areas.



These two areas are selected.



*After the **Difference of Areas** command is selected, two new areas are created without the intersecting area. Note that the area's fill was changed for emphasis.*

Creating a Difference of Polygons:

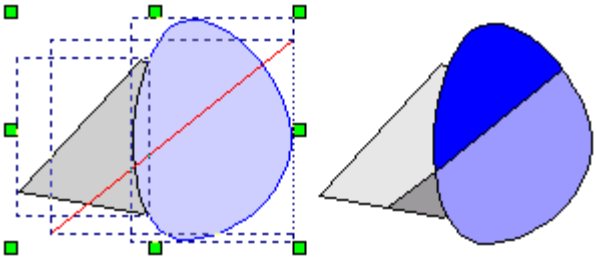
To create a difference of polygons:

1. Select two or more areas.
2. Select **Boundary | New Boundaries | Difference of Polygons** command.
3. Set new fill and ID properties and choose whether or not to create the new areas on a new layer in the Difference of Areas dialog.
4. Click the *OK* button in the Difference of Areas dialog to create new areas.

Divide Polygons

Select the **Boundary | New Boundaries | Divide Polygons** command 

to divide areas with a polyline.



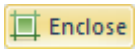
Select one or more areas and one curve (left) to create new areas intersected by the curve (right). Colors were added for emphasis in the example on the right.

Creating a Division of Polygons

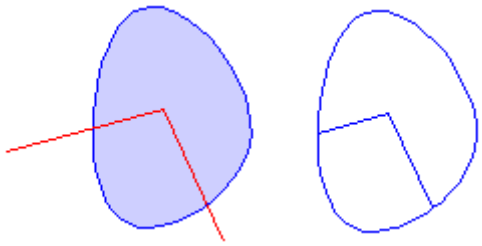
To create divided areas:

1. Select one or more areas and select ***one*** polyline to use this command. The selected curve end points must be positioned outside all the selected area objects.
2. Select the **Boundary | New Boundaries | Divide Polygons** command.
3. Set new fill and ID properties and choose whether or not to create the new areas on a new layer in the Divide Areas dialog.
4. Click the *OK* button in the Divide Areas dialog to create new areas.

Enclose

The **Boundary | New Boundaries | Enclose** command 

creates new areas from selected polylines or polygons. New areas are formed from the enclosed portion of the selected curves or areas.



*Use the **Enclose** command to create new areas from the enclosed portion of selected curves or areas.*

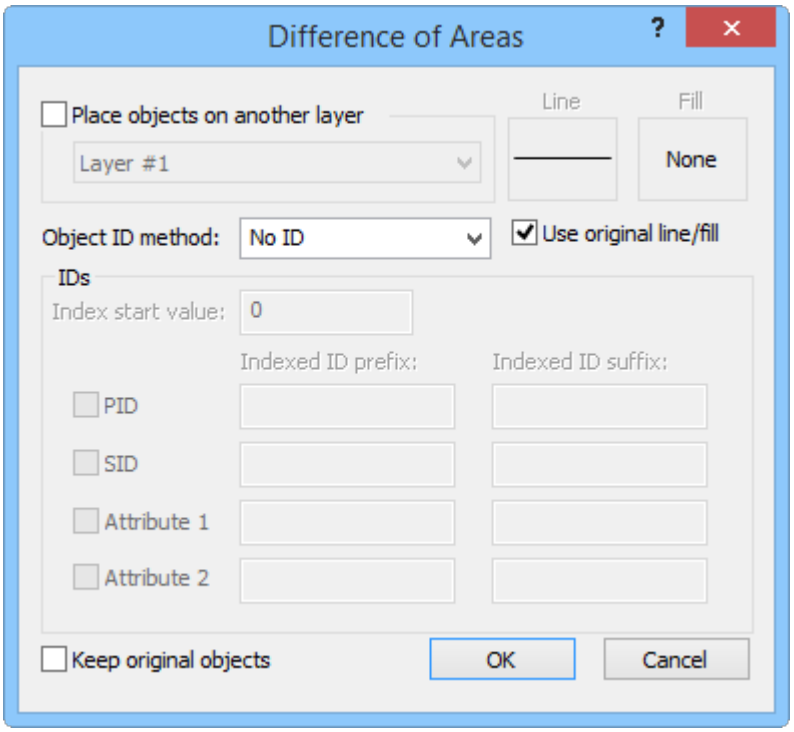
Creating an Enclosure

To create an enclosure:

1. Select two or more polylines or polygons.
2. Select the **Boundary | New Boundaries | Enclose** command.
3. Set new line, fill, and ID properties and choose whether or not to create the new areas on a new layer in the Enclose dialog.
4. Click the *OK* button in the Enclose dialog to create new areas.

Enclose, Difference of Areas, Divide Area, and Combine Territory Areas Dialogs

The **Enclose**, **Difference of Areas**, **Divide Areas**, and **Combine Territory Areas** dialogs allow you to place the new objects on another layer, to set IDs, to create line and fill properties, and to keep the original objects when using the Enclose, Difference of Areas, or Divide Area commands.



*Control options for the **Difference of Polygons** command in the **Difference of Areas** dialog.*

Place Objects on Another Layer

Check the *Place objects on another layer* box to create the new areas on a different layer. Select a layer from the list below. The list does not include locked layers, layers containing cartogram maps, or layers containing prism maps.

Line and Fill Properties

Deselect *Use original line/fill* to select unique line and fill options for the new difference area. Click the *Line* button to select line properties, and click the *fill* button to select fill properties for the new areas.

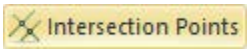
Object ID Method

You can choose IDs from the *Object ID method* list. Choose *No ID* and no IDs are assigned to the new areas. Select *Prefix+index+suffix* to create an ID from the items in the *IDs* group. Select *Source IDs* to use the original area's IDs in the new area.

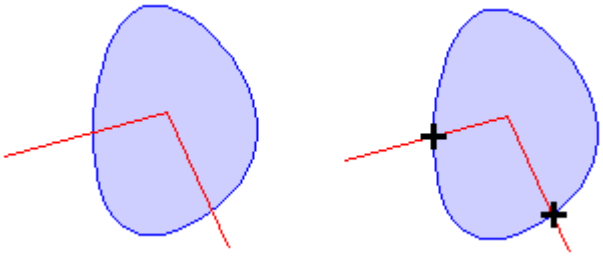
Keep Original Objects

Check the *Keep original objects* box to create new areas while leaving the original selected areas unchanged.

Intersection Points

Select the **Boundary | New Boundaries | Intersection Points** 

to create a point at each place selected areas and curves intersect with one another.



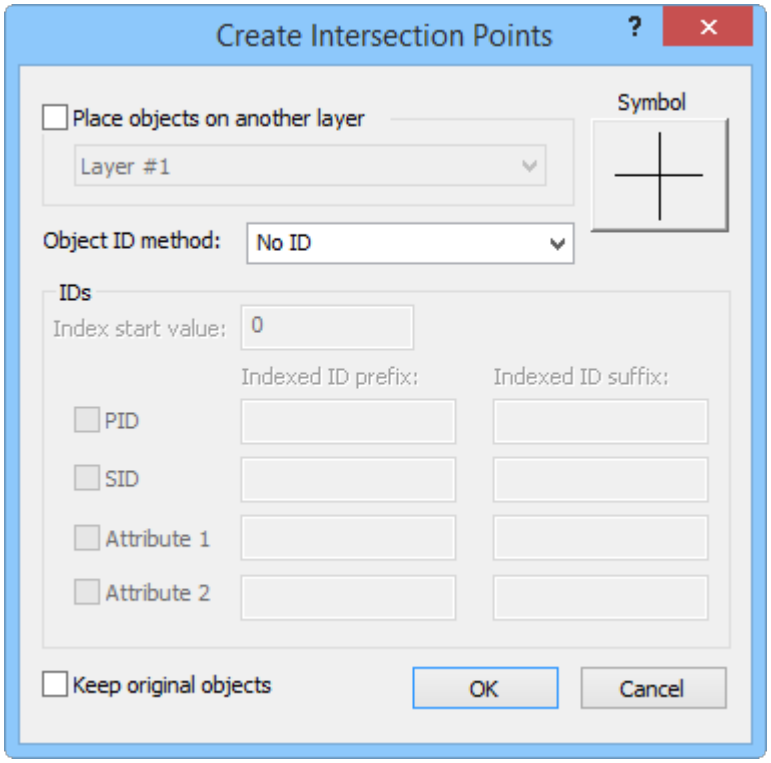
Intersection Points *creates points at each place selected curves and/or areas intersect.*

Creating a Intersection Points

To create points at intersections:

1. Select two or more areas or curves.
2. Select **Boundary | New Boundaries | Intersection Points** command.
3. Set new symbol and ID properties and choose whether or not to create the new points on a new layer in the **Create Intersection Points** dialog.
4. Click the *OK* button in the **Create Intersection Points** dialog to create points at intersections.

Create Intersection Points Dialog



*The **Create Intersection Points** dialog places the new objects on another layer, sets IDs, sets symbol properties, and keeps the original objects.*

Place Objects on Another Layer

Check the *Place objects on another layer* box to create the new areas on a different layer. Select a layer from the list below. The list does not include locked layers, layers containing cartogram maps, or layers containing prism maps.

Symbol Properties

Click the *Symbol* button to select symbol properties for the new points.

Object ID Method

You can choose IDs from the *Object ID method* list. Choose *No ID* and no IDs are assigned to the new areas. Select *Prefix+index+suffix* to create an ID from the items in the *IDs* group. Select *Source IDs* to use the original area's IDs in the new area.

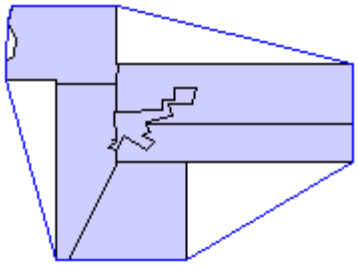
Keep Original Objects

Check the *Keep original objects* box to create new areas while leaving the original selected areas unchanged.

Convex Hull

The **Boundary | New Boundaries | Convex Hull** command 

creates a new area from selected polygons, polylines, or points. A new area is formed around the selected objects.



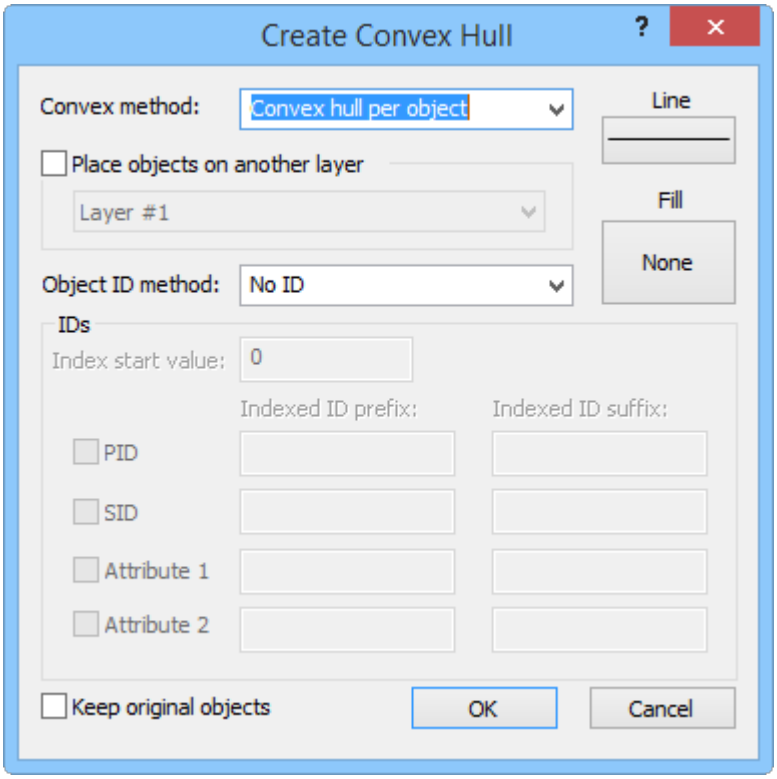
*The **Convex Hull** command creates a new area around selected boundary objects.*

Creating a Convex Hull

To create a convex hull:

1. Select one or more polygons, polylines, or points.
2. Select the **Boundary | New Boundaries | Convex Hull** command.
3. Set new line, fill, and ID properties and choose whether or not to create the new area(s) on a new layer in the **Create Convex Hull** dialog.
4. Click the *OK* button in the **Create Convex Hull** dialog to create the new area(s).

Create Convex Hull Dialog



*The **Create Convex Hull** dialog places the new areas on another layer, sets IDs, sets line and fill properties, and keeps the original objects.*

Convex Method

You can choose to create a convex hull around each of the selected objects with the *Convex hull per object* option. Create the convex hull around all selected objects with *Convex hull per group.*

Place Objects on Another Layer

Check the *Place objects on another layer* box to create the new areas on a different layer. Select a layer from the list below. The list does not include locked layers, layers containing cartogram maps, or layers containing prism maps.

Line and Fill Properties

Click the *Line* button to select line properties, and click the *fill* button to select fill properties for the new areas.

Object ID Method

You can choose IDs from the *Object ID method* list. Choose *No ID* and no IDs are assigned to the new areas. Select *Prefix+index+suffix* to create an ID from the items in the *IDs* group. Select *Source IDs* to use the original area's IDs in the new area.

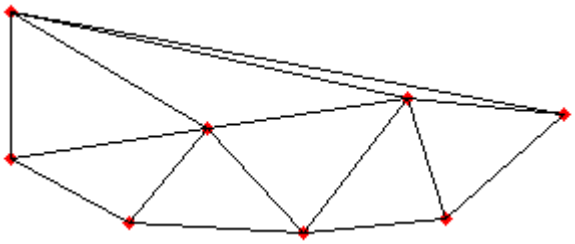
Keep Original Objects

Check the *Keep original objects* box to create new areas while leaving the original selected areas unchanged.

Triangulation

The **Boundary | New Boundaries | Triangulation** command 

creates triangles from selected points. The triangles can be polylines or polygons. None of the triangles are intersected by other triangles.



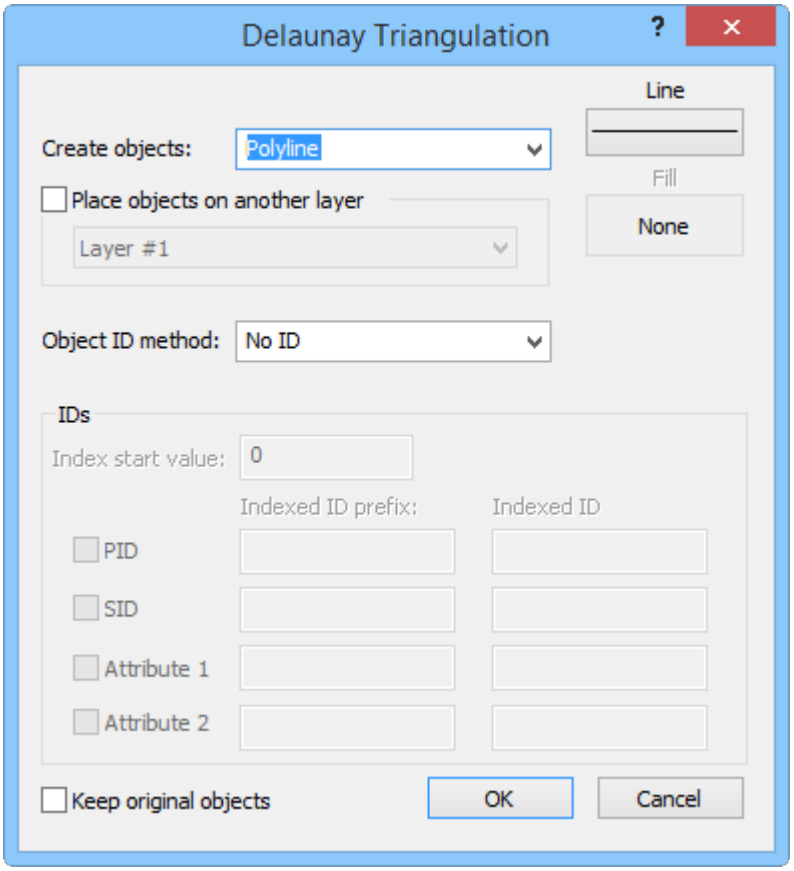
Triangulation *creates triangles from selected points.*

Creating a Triangulation Diagram

To create a triangulation diagram:

1. Select two or more points.
2. Select the **Boundary | New Boundaries | Triangulation** command.
3. Set new fill and ID properties and choose whether or not to create the new areas or curves on a new layer in the **Delaunay Triangulation** dialog.
4. Click the *OK* button in the **Delaunay Triangulation** dialog to create a triangulation diagram.

Delaunay Triangulation Dialog



Set new fill and ID properties and choose whether or not to create the new areas or curves on a new layer in the ***Delaunay Triangulation*** *dialog.*

Create Objects

You can choose to create polygons or polylines in the *Create objects* list.

Place Objects on Another Layer

Check the *Place objects on another layer* box to create the new areas on a different layer. Select a layer from the list below. The list does not include locked layers, layers containing cartogram maps, or layers containing prism maps.

Line and Fill Properties

Click the *Line* button to select line properties, and click the *fill* button to select fill properties for the new areas.

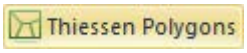
Object ID Method

You can choose IDs from the *Object ID method* list. Choose *No ID* and no IDs are assigned to the new areas. Select *Prefix+index+suffix* to create an ID from the items in the *IDs* group. Select *Source IDs* to use the original area's IDs in the new area.

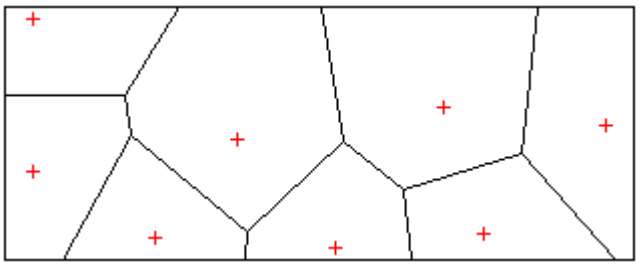
Keep Original Objects

Check the *Keep original objects* box to create new areas while leaving the original selected areas unchanged.

Thiessen Polygons

The **Boundary | New Boundaries | Thiessen Polygons** command 

creates boundaries from selected points. The diagram can consist of polygons, polylines, or points. In a Thiessen polygon diagram, also known as a Voronoi diagram, a region is drawn around each point so that for each point every position in the region around that point is closer to that point than to any of the other points.



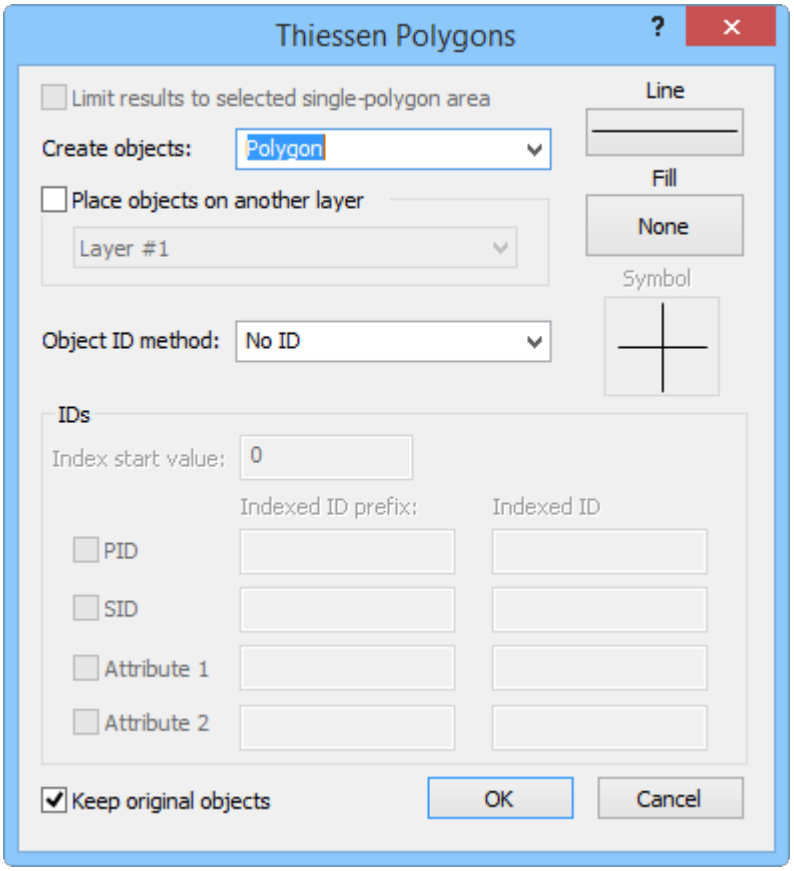
In this example, an area diagram was created from selected points.

Creating a Thiessen Polygon Diagram

To create a Thiessen polygon diagram:

1. Select two or more points and an area if you wish to contain the diagram within an area.
2. Select the **Boundary | New Boundaries | Thiessen Polygons** command.
3. Set new line, fill, symbol, and ID properties and choose whether or not to create the new polygons, polylines, or points on a new layer in the **Thiessen Polygons** dialog.
4. Click the *OK* button in the **Thiessen Polygons** dialog to create Thiessen polygons.

Thiessen Polygons Dialog



Set new line, fill, symbol, and ID properties and choose whether or not to create the new polygons, polylines, or points on a new layer in the ***Thiessen Polygons*** *dialog.*

Limit Results to Selected Single-polygon Area

Check the *Limit results to the selected single-polygon area* box to limit the diagram to a selected area's boundary.

Create Objects

You can choose to create polygons, polylines, or points in the *Create objects* list.

Place Objects on Another Layer

Check the *Place objects on another layer* box to create the new areas on a different layer. Select a layer from the list below. The list does not include locked layers, layers containing cartogram maps, or layers containing prism maps.

Line, Fill, and Symbol Properties

Click the *Line* button to select line properties, click the *fill* button to select fill properties, and click the *Symbol* button to select symbol properties for the new areas.

Object ID Method

You can choose IDs from the *Object ID method* list. Choose *No ID* and no IDs are assigned to the new areas. Select *Prefix+index+suffix* to create an ID from the items in the *IDs* group. Select *Source IDs* to use the original area's IDs in the new area.

Keep Original Objects

Check the *Keep original objects* box to create new areas while leaving the original selected areas unchanged.

Delaunay Triangulation and Thiessen Polygon Dialogs

The **Delaunay Triangulation** and **Thiessen Polygons** dialogs allows you to place the new objects on another layer, to set IDs, to create line and fill properties, and to keep the original objects when using Triangulation or Thiessen Polygons.

- Check the *Limit results to the selected single-polygon area* box to limit the diagram to a selected area's boundary in the **Thiessen Polygons** dialog.
- You can choose to create areas, curves, or points in the *Create objects* list.
- Check the *Place objects on another layer* box to create the new areas, curves, or points on a different layer. Select a layer from the list below. The list does not include locked layers, layers containing cartogram maps, or layers containing prism maps.
- You can choose IDs from the *Object ID method* list. Choose *No ID* and no IDs are assigned to the new areas, curves, or points. Select *Prefix+index+suffix* to create an ID from the items in the *IDs* group.
- If *Prefix+index+suffix* is selected as the *Object ID method*, the *IDs* group is activated. Select a starting number in the *Index start value* list. You can enter prefixes or suffixes for the *PID*, *SID*, *Attribute 1*, or *Attribute 2* by adding information in the *Indexed ID prefix* and the *Index ID suffix* boxes. For example, if the *Index start value* is 1, with a PID *Indexed ID prefix* of SW, the new areas, curves, or points would be named SW1, SW2, SW3, etc.
- Click the *Line/fill* button to select line and fill properties for the new areas or curves. Note that only line properties are available for curves.
- Click the *Symbol* button to select the symbol properties for new points.
- Check the *Keep original objects* box to create new objects while leaving the original selected points unchanged.

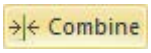
Split

The **Boundary | Islands/Lakes | Split c**ommand 

breaks complex polygons into their component parts. Complex areas can be made from areas that are touching or are completely separate, or can even use one area contained completely inside another area. Each individual area in the group is called an island. An example of islands that can form a complex area is the Hawaiian Islands. You can also have one area completely inside another area. This is referred to as a lake. Lakes form holes in a complex area so you can see through the lake to any underlying objects.

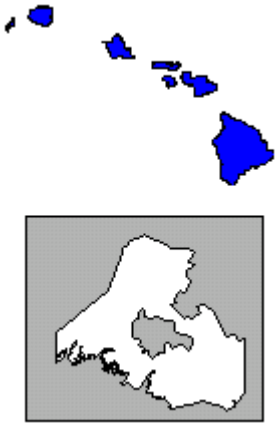
When you use the **Boundary | Islands/Lakes | Split** command each area becomes completely independent of the other areas in the group. The original object's fill and line properties and primary ID are assigned to all the new areas. You can change the new areas' primary and secondary IDs through the **Object Manager** or the **Property Manager**.

Combine

The **Boundary | Islands/Lakes | Combine** command 

groups all selected areas into a single complex polygon. Complex areas can be made from areas that are touching or are completely separate, or can even use one area contained completely inside another area. Each individual area in the group is called an island. An example of islands that can form a complex area is the Hawaiian Islands. You can also have one area completely inside another area. This is referred to as a lake. Lakes form holes in a complex area so you can see through the lake to any underlying objects.

One of the original areas' primary ID, secondary ID, and other attributes and properties are assigned to all the islands. You can assign properties through the **Object Manager** or the **Property Manager**. If one area is inside another area, the inside area becomes a hole inside the larger area so you can see through to any underlying objects. The inner area(s) do not have IDs.



Complex areas can be separate islands as shown for Hawaii (top), or can contain lakes that form holes in the larger area (bottom).

Chapter 32

Analysis

Analysis Tab Commands

The **Analysis** tab contains commands for querying data, making reports, evaluating boundary objects, measuring distance, and geocoding.

Query	Query boundary subset
Data	Query the map data based on data statistics
Range	Query boundaries within a specified distance from a singly selected boundary object
Make Report	Create boundary and territory records reports, data, coordinates, properties, and centroids object reports, text look-up table reports, and map document reports
Records in Regions	Display data records within the region (boundaries must have primary IDs)
Browse Database Records	Browse database entries and generate reports
Create Data	Counts the number of points in each area or each unique data value in a worksheet column and outputs the data in a new column
Shortest Path	Calculate shortest distance of travel
Closest Neighbor	Find neighboring point locations
Bordering Neighbors	Create a list of areas that share borders with the selected area
Polylines in Polygon	Finds and selects polylines within a polygon
Touched by Polyline	Finds and selects objects touched or intersected by a polyline
Weighted Mean Center	Places point in the weighted mean center of an object or group of selected objects
Measure Distance	Measure the surface distance
Distance of Travel	Calculate the total distance of travel between selected primary IDs
Tabulated Distance	Create tabulated distance for boundary objects
Geocode	Assign latitude/longitude coordinates to U.S. addresses

Query

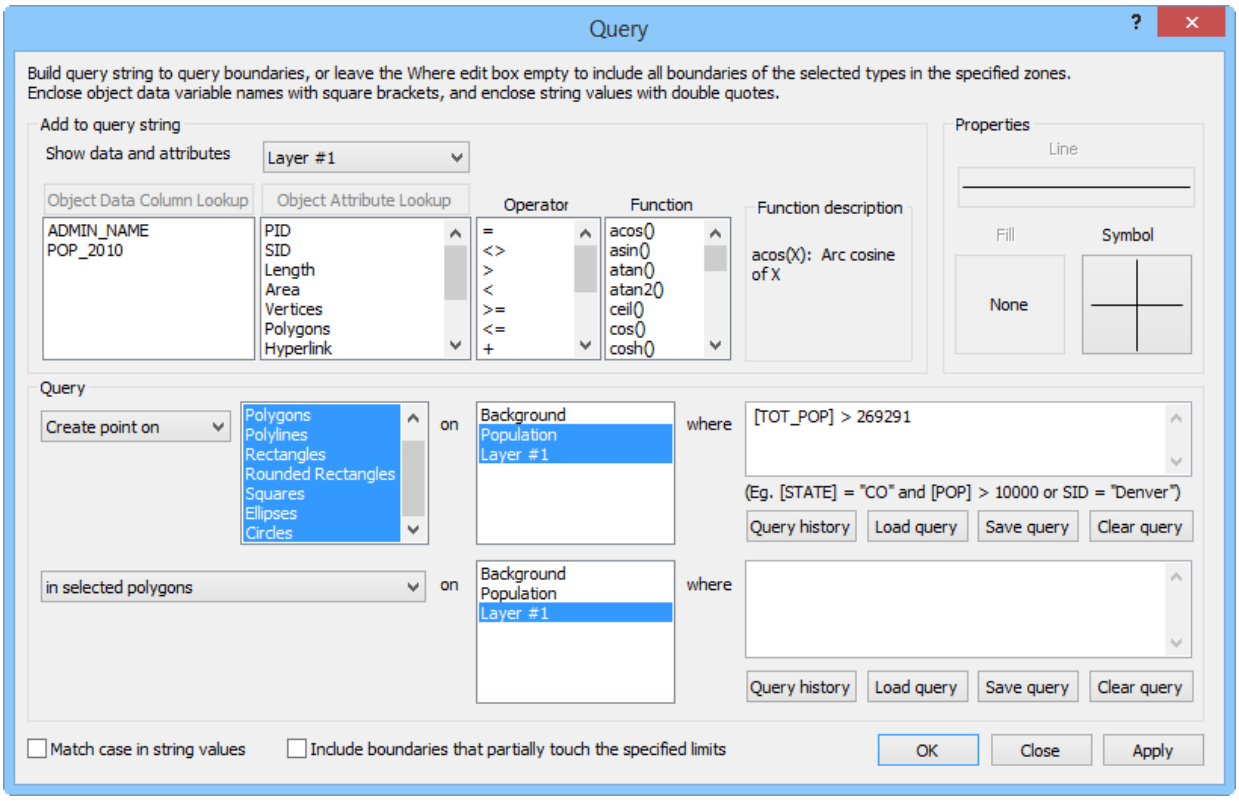
You can use the **Analysis | Query | Query** command 

to view the boundary data that meets specified criteria. Queries can be performed on multiple objects across multiple layers. Queries require object data and/or object attribute(s), an operator, and an operand (condition). In the *Add to query string* group, you can select the object data, object attribute, operator, and an optional function. See the Advanced Tutorial - Lesson 3 for querying examples.

This query [Life Expectancy 1997] > 75, shows life expectancy greater than age 75 in 1997. The query action was to show only those countries that met the query criteria. The outlines of the other countries are shown as a base map on a separate layer.

Query Dialog

The **Query** dialog allows you to build a string to query boundaries. The boundaries can be queried by data and/or attributes. Queries can be used to select, show, or apply properties to objects. A query can also be used to create worksheets, reports, layers, or points.



*Build query strings, choose what action to perform with queried objects, and select regions or areas to query with the **Query** dialog*

Add to Query String

In the *Add to query string* group, you can select the object data, object attribute, operator, and an optional function.

- All of the data file columns associated with the current map layer are listed in the *Object Data* list. The current map layer is selected in the *Show data and attributes on* drop down box. You can double-click a variable in the *Object Data* list to search for object data in the plot window. Alternatively, you can enter the object data name into the *Where* box. Enclose all object data names in square brackets if you choose to enter the name. For example, if you have object data named POP 2000, enter it into the *Where* box as [POP 2000].
- Click the *Object Data Column Lookup* button to select an item from the selected data column. Double-click on the item or click on the item and then click the *OK* button to add it to the query.
- If you would like to search on object attributes, use the *Object Attribute* list. This column includes all the items listed in the **Property Manager** Info tab including the *PID*, *SID*, *Attrib1*, *Attrib2*, *Length*, *Area*, *Vertices*, *Polygons*, and *Hyperlink*. You can create a query string to query for object data and object attributes, or you can query for each one individually. Double-click on an object attribute to add it to the *Where* field. Alternatively, you can enter the object attribute name into the *Where* box.
- Click the *Object Attribute Lookup* button to select a from a list of the selected attribute. For example, if *PID* is the selected object attribute, clicking the *Object Attribute Lookup* button allows you to select from a list of primary IDs in the current layer. Double-click on the item or click on the item and then click the *OK* button to add it to the query.
- Double-click an operator in the *Operator* list to add it to the *Where* field. Alternatively, you can type the operator into the *Where* box.
- Click a function in the *Function* list to add it to the query string. Alternatively, you can type the function name into the *Where* box. A description of the function appears in the *Function description* group next to the *Function* list. The trigonometric functions require angles in radians.

Query

The *Query* group contains options for displaying the query results.

You can choose to *Select*, *Show*, *Apply properties to*, *Create worksheet with*, *Create report with*, *Create layer with*, or *Create point on* the queried boundaries.

- Visible boundaries that meet the criteria are selected if *Select* is chosen.
- If you select *Show*, only boundaries that meet the criteria are displayed on the map.
- *Apply properties to* changes the line properties, fill properties, and symbol properties of the boundaries that meet the criteria. If you have a hatch or territory map, the fill properties do not change the map since the hatch or territory properties take precedence over fill properties. Density, pie, bar, symbol, flow, and line graph maps all show with the specified color in the boundaries. The symbol property change only applies to pin maps. You can specify the queried object properties with the *Line, Fill,* and *Symbol* buttons in the *Properties* group.
- *Create worksheet with* displays the query results in a worksheet window. The worksheet contains all of the available data for the boundary objects that meet the query criteria.
- *Create report with* creates a report on queried objects similar to a Map Document Report.

- To create a new map layer of the query results, choose *Create layer with.*
- Select *Create point on* to create a point on the boundaries meeting the criteria.

Select the type of object you wish to query with the Points, Polygons, Polylines, Rectangles, Rounded Rectangles, *Squares*, Ellipses, and *Circles* list. For example, if you want to show all counties with a POP 2010 of greater than 500,000, make sure *Polygons* box is selected. If you have a pin map, make sure *Points* is selected. Also, you can use this list to select objects of the specified type without building a query. For example, if your map contains polygons, points, and polylines, and you want to select all the points on the map, select *Points*, leave the *Where* field blank, and click the *OK* button to select all the points on the map. The **Arrange | Select by Object** command can be used for this purpose as well.

You can select which layers to query in the *on* list. Click on layers to select or deselect them.

You can further define the scope of your selection by choosing an option from the *In* list.

- Select the *in buffered areas* option if you would like to apply the query to objects within the defined buffer area only. Check the *Include boundaries that partially touch the specified limits* option to include boundaries that are not fully included in the defined buffer area.
- Select the *in buffer zones* option if you would like to apply the query to objects within the defined buffer zone only. Check the *Include boundaries that partially touch the specified limits* option to include boundaries that are not fully included in the defined buffer zone.
- Select the *in regions* option if you would like to apply the query to objects within the defined region only. Check the *Include boundaries that partially touch the specified limits* option to include boundaries that are not fully included in the defined region.
- If *in map* is selected, all boundaries or pins on the map meeting the criteria are selected, displayed, or emphasized with property changes (see above).
- Select *in selected polygons* to apply the query to objects within the selected polygons only. Check the *Include boundaries that partially touch the specified limits* option to include boundaries that are not fully included in the selected polygons.
- Select *touched by selected polylines* to query objects that touch selected polylines.
- Select the *in polygons* option to query objects contained within polygons. Check the *Include boundaries that partially touch the specified limits* option to include boundaries that are not fully included in the polygons.
- Select *touched by polylines* to query objects intersected by polylines on the map.

Where Box

The *Where* box contains the query. The conditions of the query are typed directly into the *Where* box. For example, if you want to show all counties with a POP 2000 of greater than 500,000 you can build the [POP 2000] > portion of the query in the *Add to query string* group, then you need to type 500000 into the *Where* box. You can use the * and ? wild card characters in the query.

- * substitutes for any number of characters in the specified position. For example, [COUNTY] = " A*" returns all counties beginning with the letter A. All characters after the * are ignored. For example, " A*" and " A*C*" return the same results.
- ? substitutes for a single character in the specified position. For example, [COUNTY] = "C???" returns all four letter county names beginning with the letter C.

Match Case

Check the *Match case in string values* box to make the query case-sensitive.

Query History

Queries are stored in the **Query History** dialog so that you may reuse queries. To access a previously written query, click the *Query History* button and select it from the **Query History** dialog. The last 15 queries are saved in the query history.

Saving and Loading Queries

If you plan to perform a query more than once, it may be useful to save the query for future use. To do this, create the query in the **Query** dialog and then click the *Save Query* button. This opens the **Save As** dialog. Saved queries are stored as Map Query [.MQE] files. To use a saved map query, click the *Load Query* button and select a Map Query [.MQE] file.

Clear Query

The contents of the *Where* box are retained in the dialog between **MapViewer** sessions. If you would like to delete the contents of this box, click the *Clear Where Edit Box* button, or highlight the contents of the *Where* box and press the DELETE button on your keyboard. Use the *Save Query* button to save a query you have created, and click the *Load Query* button to load a query a Map Query File [. MQE].

Performing the Query

Click the *OK* button to perform the query and close the **Query** dialog. Click the *Close* button to close the **Query** dialog without performing a query. Click the *Apply* button to perform the query without closing the **Query** dialog. The *Apply* button is useful when you need to perform multiple queries and do not need to return to the plot window. If you use *Apply* to perform all desired queries, you should click *Close* to close the **Query** dialog. Clicking *OK* will duplicate the most recent query.

Data

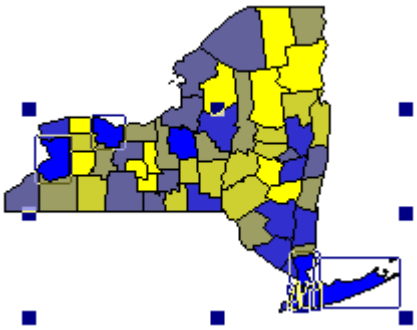
If you would like to see the data associated with selected objects, use **Analysis | Make Report | Records Report | Boundary**. Alternatively, you can use *Create worksheet with*.

Example

Open a new plot window and import ny2000.gsb. Load county data with the **Home | Data | Load** command, and select ny2000.dat in the **Open Data File** dialog.

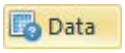
To show all counties with a population greater than 500,000:

1. If there are any queries in the *Where* box, click the *Clear Where Edit Box* button.
2. Double-click on *POP 2000* in the *Variable* list in the upper left corner of the dialog. *[POP 2000]* is added to the *Where* box.
3. Double-click on the greater than sign (>) in the *Operator* list. > is added to the *Where* box after *[POP 2000]*.
4. Type *500000* into the *Where* box after the greater than sign. Note that you cannot include thousands separators (commas) in the number.
5. Choose the type of action, *Select*, in the *Query* group.
6. In the next box, highlight *Polygons*.
7. Select *in map* from the *In* field.
8. Click the *OK* button and the areas with population values greater than 500,000 are selected. The number of selected areas appears in the status bar.

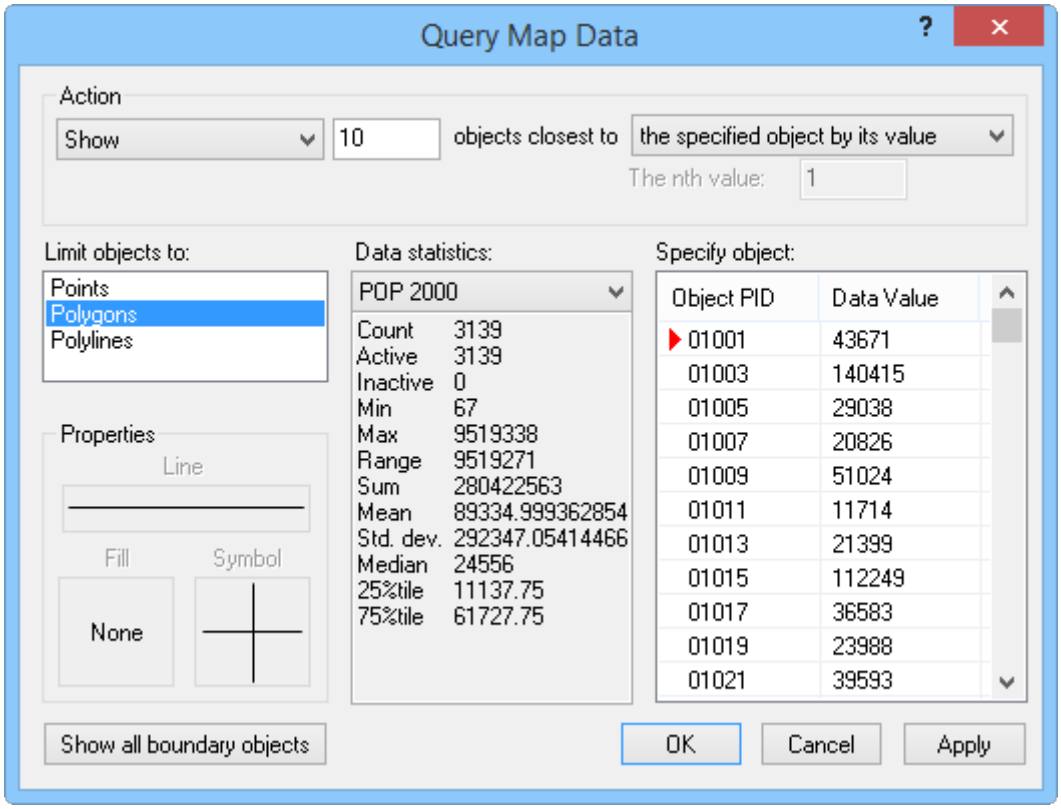


The counties with a population greater than 500,000 are selected using the query described in the example.

Query Map Data

The **Analysis | Query | Data** command  allows you to perform map queries based upon statistics of the map's data. In order to use the **Analysis | Query | Data** command, you must have a thematic map or a pin map on the active map layer. You can query the map and return results based upon statistics on all the map data, such as finding the three objects with data values closest to the mean, or you can query the map based upon the data value for a single boundary object. For example, you can identify a map object and quickly find three other map objects with data values closest to the identified object.

Query Map Data Dialog



*Query map data and select the desired action for queried objects in the **Query Map Data** dialog.*

Action

In the **Query Map Data** dialog, the *Action* group determines what to search for with the query. This group also controls how the results of the query are to be displayed. The combination of all the settings in the *Action* group reads like a sentence, indicating what the query will do.

The list on the left side of the *Action* group contains all of the available methods for displaying your query results.

- Visible boundaries that meet the criteria are selected if *Select* is chosen.
- If you select *Show*, only boundaries that meet the criteria are displayed on the map. If you performed a query using this action and want to make all of the map objects visible again, click the *Show All Boundary Objects* button.
- *Apply properties to* changes the line properties, fill properties, and symbol properties of the boundaries that meet the criteria. If you have a hatch or territory map, the fill properties do not change the map since the hatch or territory properties take precedence over fill properties. Density, pie, bar, symbol, flow, and line graph maps all show with the specified color in the boundaries. The symbol property change only applies to pin maps. You can specify the queried object properties with the *Line, Fill,* and *Symbol* buttons in the *Properties* group.
- *Create worksheet with* displays the query results in a worksheet window. The worksheet contains all of the available data for the boundary objects that meet the query criteria.
- *Create report with* creates a report on queried objects similar to a Map Document Report.
- To create a new map layer of the query results, choose *Create layer with.*
- Select *Create point on* to create a symbol on the boundaries meeting the criteria.

The next field in the *Action* group defines how many objects you want to find that meet the query criteria. Enter a numeric value into this field.

The last field in the *Action* group indicates the basis for the query. The *objects closest to* list displays all of the possible criteria you can use to query a map.

- Select *the min value* to return the map objects closest to the minimum data value.
- To identify the map objects closest to the data maximum value, choose *the max value.*
- If *the mean value* is chosen, the query results consist of the map objects closest to the data mean value.
- To return map objects closest to the data median value, select *the median value* option.
- To identify objects closest to the first quartile (25th percentile) of the data, select *the 1st quartile value* option.
- Objects nearest to the third quartile (75th percentile) can be found using *the 3rd quartile value*.
- If you want to choose objects closest to a particular data value, select *the specified value* option. Once this option is selected, click on a value in the *Specify value* section of the dialog. The selected data value is identified in the *Specify value* list with a red arrow indicator. The query identifies the boundary objects with data values closest to the selected data value.
- To identify map objects closest to a particular map object's data value, choose *the specified object by its value* and then select the object by its primary ID in the *Specify object* section of the dialog. The selected object is identified in the *Specify object* list with a red arrow indicator. The query finds the boundary objects with data values closest to the selected object's value.

- To identify map objects closest to a value in the ascending data list, select *the nth value in ascending order*.

Limit Queried Objects

The *Limit objects to* box lists all the types of boundary objects that can be used to create thematic symbols of the map type on the current layer. To select or deselect an object type, click on the appropriate text. A query only operates on the object types selected in the *Limit objects to* box.

Statistics

The *Data Statistics* box shows statistics for the selected variable used in the query. Thematic maps using a single variable, such as a hatch map, have one variable in the *Data statistics* list. A map with multiple variables such as a bar map have show all of the mapped variables in the *Data statistics* list.

Data

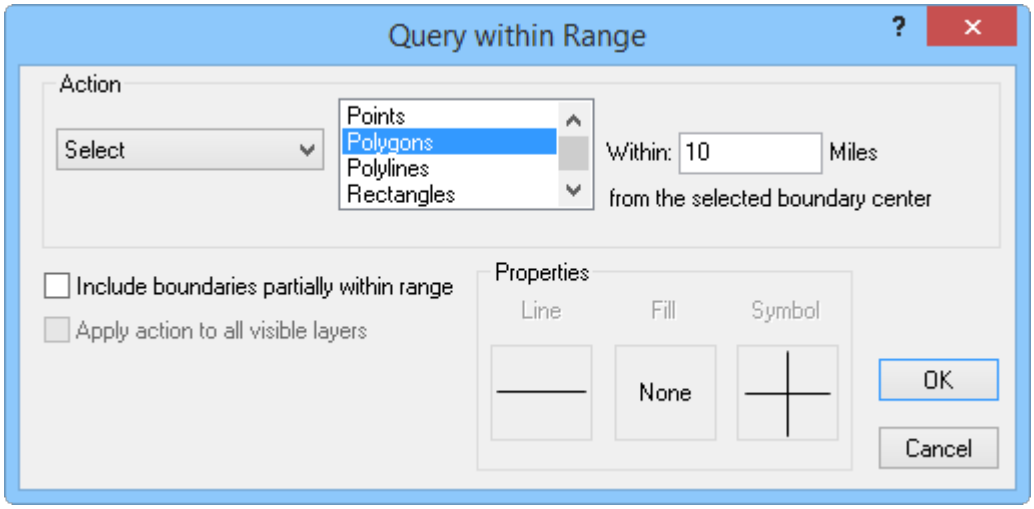
If you would like to see the data associated with selected objects, use **Analysis | Make Report | Record Report | Boundary**. Alternatively, you can use *Create worksheet with*.

Query within Range

The **Analysis | Query | Range** command 

allows you to select, show, or apply properties to all objects within a specified distance of the selected object's center. Select only one object to activate this command. If you would like to select multiple objects, use **Draw | Region | Buffer**.

Query within Range Dialog



Query within a specified range from a selected object to select, show, or edit objects or to create worksheets, reports, layers, or points with the ***Query within Range*** *dialog.*

Action

In the **Query within Range** dialog, you can choose to *Select*, *Show*, *Apply Properties, Create worksheet with, Create report with, or Create layer with* the queried boundaries in the *Action* group.

- Visible boundaries that fall within the specified distance are selected if *Select* is chosen.
- If you select *Show*, only boundaries that fall within the specified distance are displayed.
- *Apply properties to* changes the line properties, fill properties, and symbol properties of the boundaries that fall within the specified distance. If you have a hatch or territory map, the fill properties do not change the map since the hatch or territory properties take precedence over fill properties. Density, pie, bar, symbol, flow, and line graph maps all show with the specified color fill in the boundaries. The symbol property change only applies to pin maps. You can specify the queried object properties with the *Line, Fill,* and *Symbol* buttons in the *Properties* group.
- *Create worksheet with* displays the query results in a worksheet window. The worksheet contains all of the available data for the boundary objects that meet the query criteria.
- *Create report with* creates a report on queried objects similar to a Map Document Report.
- To create a new map layer of the query results, choose *Create layer with.*
- Select *Create symbol on* to create a symbol on the boundaries meeting the criteria.

Select the type of object you wish to query (Points, Polygons, Polylines, Rectangles, Rounded Rectangles, *Squares*, Ellipses, and *Circles*) from the list box. For example, if you selected a county boundary, make sure *Polygon* is highlighted to select the areas that fall within the specified distance of the selected county. Clicking on an object once selects it, clicking on it again deselects it. You can select multiple objects in the list by clicking on them once. Check the *Include boundaries partially within range* box to apply the action to boundaries that do not completely fall into the specified distance from the selected boundary.

Enter a number into the *Within* box to define the distance you would like to extend the selection from the object. The units of the distance depend on what is selected on the Units page in the **Property Manager**.

Query Layers

The *Apply action to all visible layers* check box queries all map layers. Check this box to apply the map query across every layer in the plot window.

Data

If you would like to see the data associated with selected objects, use **Analysis | Make Report | Records Reports | Boundary**. Alternatively, you can use *Create worksheet with*.

Boundary Records

If you would like to see the data for a group of selected objects, use the **Analysis | Make Report | Records Reports | Boundary** command 

. The resulting records are displayed in the worksheet. The advantage to displaying the results in the worksheet is that you can use all of the worksheet commands (statistics, transform, save as, etc.), and create new data files to use in thematic maps.

To view a group of records in the worksheet:

1. Select one or more boundary objects (polyline, polygon, or point). You can select boundary objects by clicking on them or through Queries, Query within Range, and Records in Regions.

2. Click **Analysis | Make Report | Records Reports | Boundary**.
3. A worksheet window opens displaying the records for the selected objects.

Each time the command is selected a new worksheet is created. The new worksheet may be edited and saved. The worksheet created with **Boundary Records** is not linked to the map, so edits in this worksheet do not appear on the map. To use the boundary records with the active layer, use **Home | Data | Load** to load the new worksheet.

Territory Records

Use the **Analysis | Make Reports | Record Reports | Territory** command 

to generate a records report for a Territory Map. Statistics for each territory and variable are output in a new worksheet report. Add a geographical summary to the territory records report in the Territories dialog. Change territory and variable options in the Territory and Data pages of the Property Manger. The active layer must contain a Territory Map to use the **Record Reports | Territory** command.

Object Data Report

To create a report of the selected object's data, use the **Analysis | Make Report | Object Reports | Data** command 

. You can also create an object data report by right-clicking and selecting *Data Report* in the Data Manager. Before using the **Object Reports | Data** command one object must be selected. Reports can be edited in the report window and saved in Rich Text Format (.RTF) or Text Format (.TXT). The **Object Data Report** command generates a data report when the Data Manager is in *Data* view, and it generates a statistics report when the **Data Manager** is in *Stats* view.

Object Coordinates Report

To create a report of the selected object's coordinates, select the **Analysis | Make Report | Object Reports | Coordinates** command 

. You can also generate an object coordinates report by right clicking and selecting *Coordinates Report* in the Coordinates Manager. Only one object may be selected to create an object coordinates report. Reports can be edited in the report window and saved in Rich Text Format (.RTF) or Text Format (.TXT).

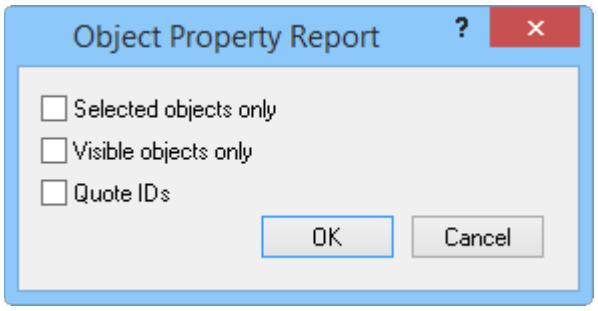
Object Property Report

A report containing the active layer's **Object Manager** contents can be created. Select **Analysis | Make Report | Object Reports | Properties** 

to create the report of **Object Manager** contents. The report can be edited, saved, and printed.

Object Property Report Dialog

When you choose the **Analysis | Make Report | Object Reports | Properties** command, the **Object Property Report** dialog appears.

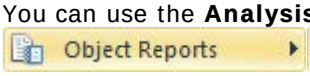


*Choose which objects' properties are reported and if IDs are quoted in the **Object Property Report** dialog*

Choose *Selected objects only* if you only want a report of the selected objects. Choose *Visible objects only* if you do not want a report containing information on invisible objects. If *Quote IDs* is selected, the primary ID and secondary ID/Text are quoted. This is important if you have spaces in the text and would like to save as a text file [.TXT] from the report window. If the text with spaces is quoted it appears in one cell. If the text is not quoted and contains spaces, each word is located in a separate cell.

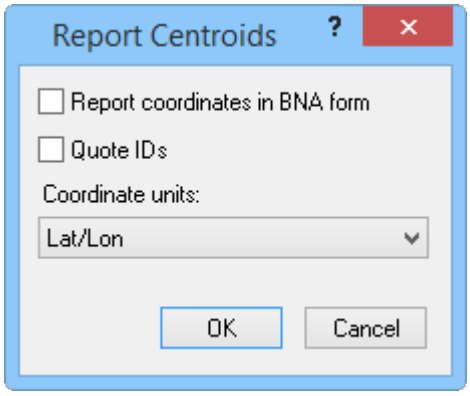
Object Centroids Report

You can use the **Analysis | Make Report | Object Reports | Centroids** command 



to display the active layer objects' coordinates in a report window. The primary ID, secondary ID, attribute 1, and attribute 2 for each centroid are also reported.

Report Centroids Dialog



Select the report form, coordinate units, and whether to quote IDs in the ***Report Centroids*** *dialog.*

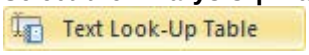
If you check the *Report coordinates in BNA form* check box in the **Report Centroids** dialog, the coordinates are automatically converted into the Atlas BNA format so you can use the results as a base map. If you do not create an Atlas BNA file you can always use the points in a pin map.

If *Quote IDs* is selected, the primary ID and secondary ID/Text are quoted. This is important if you have spaces in the text and would like to save as a text file [.TXT] from the report window. If the text with spaces is quoted it appears in one cell. If the text is not quoted and contains spaces, each word is located in a separate cell.

You can report the coordinates in latitude and longitude (*Lat/ Lon*) or in *Meters*. If your projection is Unknown, the XY coordinates are reported in the map coordinates.

Text Look-Up Table Report

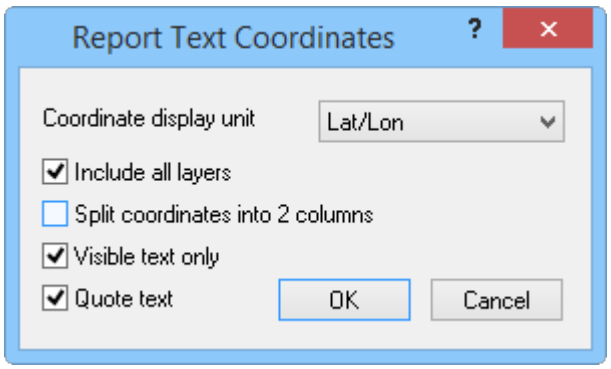
Select the **Analysis | Make Report | Text Look-Up Table** command 



to display text object coordinates in a report. You can edit, save, and print the report in the report window.

Report Text Coordinates Dialog

After selecting **Analysis | Make Report | Text Look-Up Table**, the **Report Text Coordinates** dialog appears.



Select which layers and text coordinates are reported, if the text is quoted, and coordinate units in the ***Report Text Coordinates*** *dialog.*

You can select a coordinate type from the *Coordinate display unit* list.

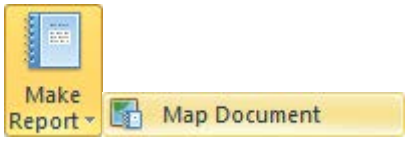
If you would like to include all the layers in the report, check the *Include all layers* box.

Check the *Split coordinates into 2 columns* box to create one column for the X coordinates and one column for Y coordinates, for example, -3642867.50 2541774.00. If this box is not checked, the coordinates appear in one column, for example, (-3642867.50, 2541774.00).

To include only visible text in the report, check the *Visible text only* box.

To include text strings in quotes, check the *Quote text* box. This is important if you have spaces in the ID fields and wish to import the information into a spreadsheet, such as **MapViewer's** worksheet.

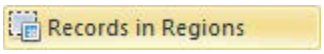
Map Document Report

The **Analysis | Make Report | Map Document** command 

creates a report containing general information about the map. The report includes projection information, map limits, layer information, data statistics, object ranking, data file used for each layer, and the number of objects.

In the **Map Report Options** dialog, check the *Include object ranking* box to include the object data ranking in the map document report.

Records in Regions

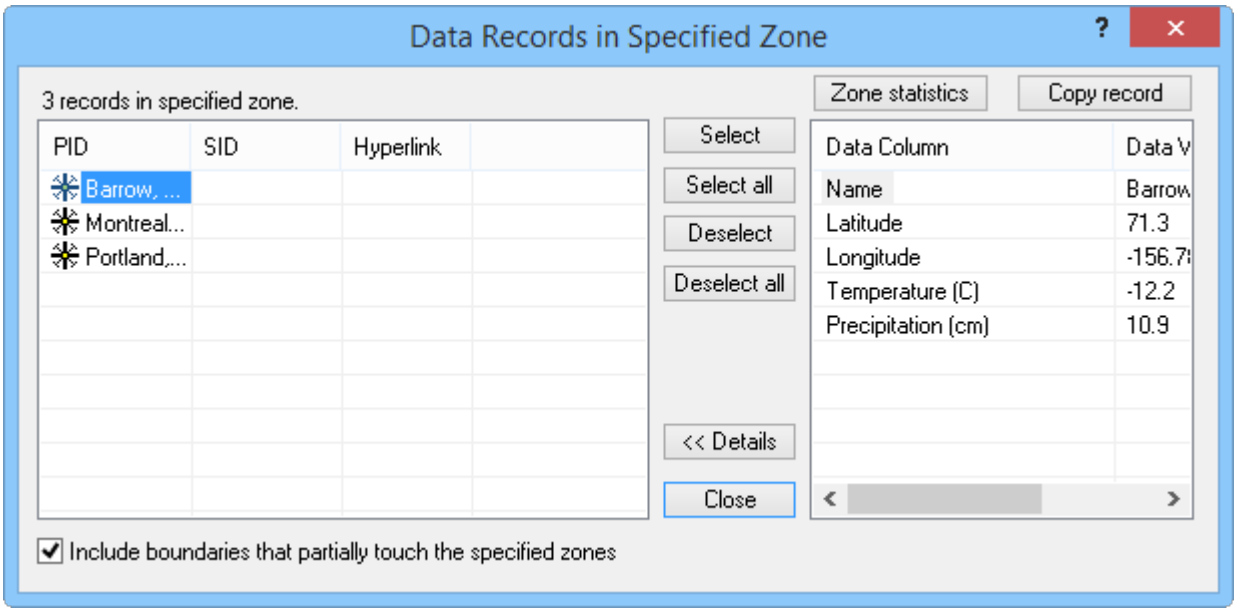
You can choose the **Analysis | Data | Records in Regions** command 

to display data associated with the boundary objects in the region after you have defined regions

with one of the **Draw | Region** commands. The report can be edited, saved, and printed in the report window.

Data Records in Specified Zone Dialog

The **Data Records in Specified Zone** dialog shows summary information about the selected boundary objects from the data file used to create the map.



Generate reports on records in a region or statistics reports on data values for an entire region in the
***Data Records in Specified Zone** dialog.*

Region Objects

The left side of the dialog displays a list of the records in the region(s) defined with the **Draw | Region** commands. This list shows the IDs for the selected boundary objects. The number of selected boundary objects is indicated above the list.

Selecting Objects

When you select a primary ID from the list, you can click the *Select* button to select that object on the map. This helps you to locate the position of individual boundary objects on the map after the **Data Records in Specified Zone** dialog is closed. If you select another boundary object from the list and click the *Select* button, the original boundary object remains selected and the next boundary object becomes selected as well.

The *Select All* button allows you to select all the boundary objects within the selection region. For example, you might want to assign symbol properties to all the pins in the selection region on a pin map. You can click the *Select All* button, click the *Close* button, and then use the **Property Manager** to set the symbol properties for all the selected boundary objects. You could also obtain the data associated with the selected objects using the Boundary Records command.

Deselecting Objects

Click on a primary ID name and then click the *Deselect* button to deselect the object when the dialog is closed. To deselect all objects, click the *Deselect All* button or click in the plot window anywhere outside the limits of selected boundary objects.

Details

Clicking the *Details* button expands the dialog so you can view data information for each of the selected boundary objects. Data are organized by showing the data file column header on the left, and the associated data value on the right. To view data for a particular boundary object, click on the primary ID for that boundary object. The data is displayed on the right side of the dialog. As you click different IDs, the data are updated to show information for the selected boundary object. If you need to change the data, select the boundary, click the *Close* button, and change the data in the Data Manager.

Statistics

When a particular data field is selected, you can click the *Zone Statistics* button to open the statistics report. This provides you with statistical information based on the selected field for all the selected boundary objects.

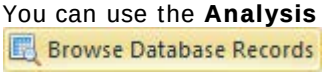
Copy Record

You can use the *Copy Record* button to display an object data report for the selected object. Once this report is generated, you can copy, save, or print the information for the selected boundary object.

Include Partial Boundaries

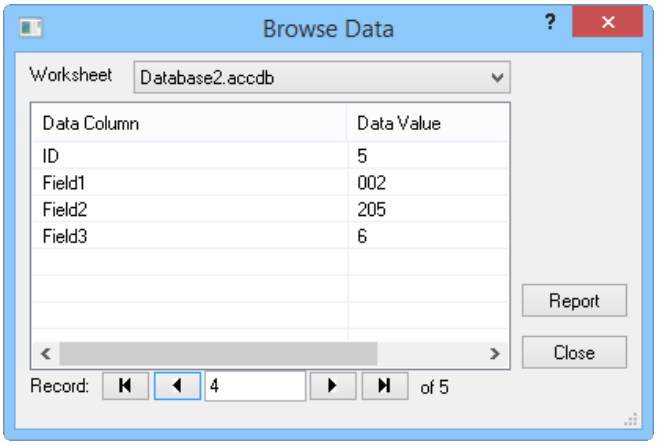
If the *Include boundaries that partially touch the specified zones* box is checked, objects that partially touch the region or zone are included in the record count and list.

Browse Database Records

You can use the **Analysis | Data | Browse Database Records** command 

to look at database records if you have created a map with an Access [.MDB, .ACCDB], Paradox [.DB], or dBase [.DBF] file.

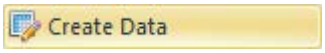
Browse Data Dialog



*Select data worksheet, browse data, and generate reports in the **Browse Data** dialog.*

- If a database contains multiple tables, click the list in the *Table* field to select the table to browse.
- The box below the table listing shows one table record.
- Click the start, forward, backward, and end buttons to browse the database, or type the record number to go to a specific record.
- Click the *Report* button to copy a record to the report window.

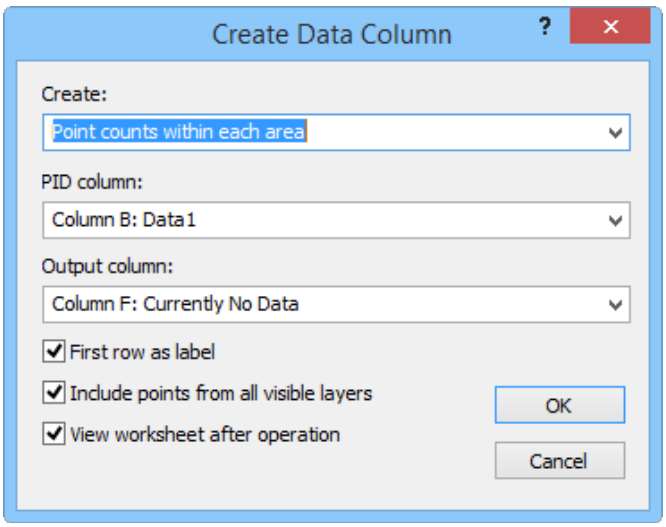
Create Data

The **Analysis | Data | Create Data** command 

creates counts of unique data or counts of data within areas. The new data is added to the existing data file. Use **Home | Data | View** to view the new data.

Create Data Column Dialog

When **Analysis | Data | Create Data** is selected, the **Create Data Column** dialog is opened.



*Select generated data type, PID or input column, Output column, and options in the **Create Data Column** dialog.*

Type of Data

Select *Counts of each unique data value from input data column* to create a counts of unique data. For example, if a data column contains two 37 values, the new data column would contain a "2" next to each 37 value.

Select *Point counts within each area* to return the number of data in each area. A new column of data is generated with the number of points for each area.

Input Column

When using *Counts of each unique data value from input data column*, select the data from the *Input column*.

PID Column

When using *Point counts within each area*, select the column containing area primary IDs from the *PID column*.

Output Column

Select a column for the new data from the *Output column* list. The default column is the first column without data in the data file.

Data Labels

Check the *First row as label* box to add a column header label to the newly created data.

Points from Visible Layers

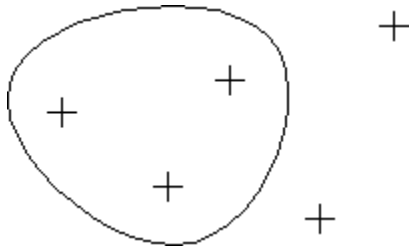
If you wish to use points from all layers with the *Point counts within each area* command, check the *Include points from all visible layers* command.

View Worksheet

Check the *View worksheet after operation* option to open the worksheet linked to the map after using the **Create Data** command.

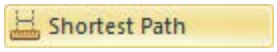
Example

This is an example of data and the results. Objects "a" through "e" are points and object "z" is a polygon.



PID	Data Value	Counts of Each Unique Data Value	Counts of Points within Each Area
a	37	2	
b	37	2	
c	16	2	
d	3	1	
e	16	2	
z	7	1	3

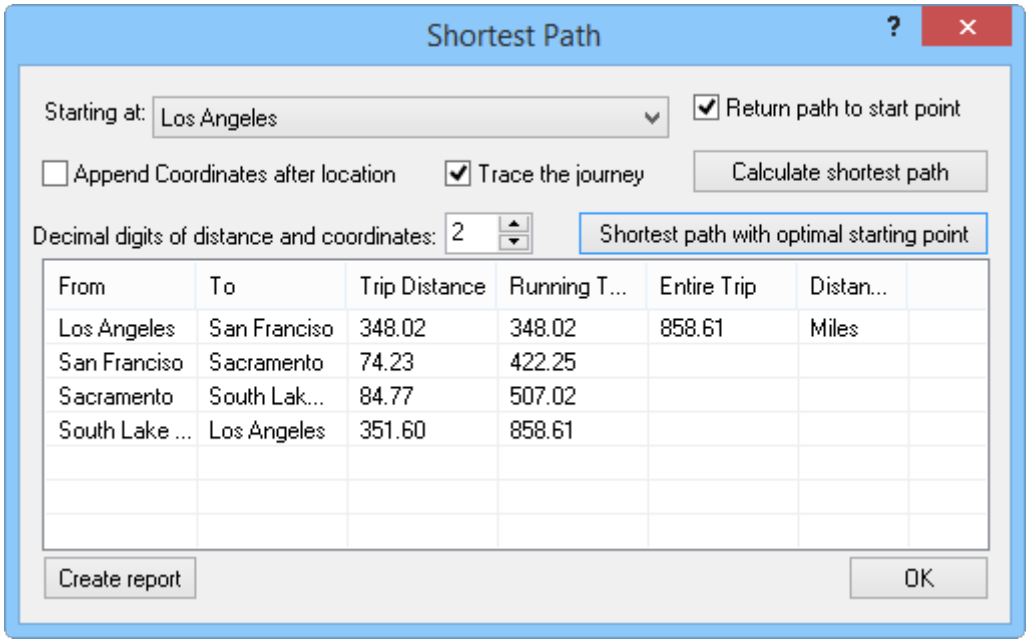
Shortest Path

The **Analysis | Evaluate | Shortest Path** command 

measures the shortest distance between selected points on the map. You can select a point to start the measurement, or **MapViewer** can determine the shortest path. A report of the total distance and distance traveled between points can be generated with this command. Before using **Analysis | Evaluate | Shortest Path**, select points on the map.

Shortest Path Dialog

You can specify the beginning point or shortest path, display of coordinates, and display of travel path using the **Shortest Path** dialog.



*Select the starting point and other options, generate reports, and view the shortest path between points in the **Shortest Path** dialog.*

- Select the *Starting at* point or click the *Shortest Path With Optimal Starting Point* button to generate the path.
- If the *Append coordinates after location* box is checked, the point's coordinates are reported next to the primary ID name in the distance of travel report.

- Set the number of digits to the right of the decimal place in the *Decimal digits of distance and coordinates* box.
- Check the *Trace the journey* check box to show a line on the map indicating the travel route. In the **Object Manager**, the travel route's secondary ID (SID) displays the starting point along with the total travel distance.
- Click the *Calculate Shortest Path* button to generate the distances between the primary IDs you have selected.
- The grid at the bottom of the dialog contains the *From* and *To* primary IDs for each travel segment, the segment *Trip Distance*, the *Running Total* distance, the *Entire Trip* distance, and the *Distance Units*. The units are set in the Units page in the **Property Manager**.
- Click the *Create Report* button to create a report of travel distances. The report contains a report time and date, the distance between points, the entire trip distance, and the units of the distance measurement. The units are set in the Units page in the **Property Manager**.

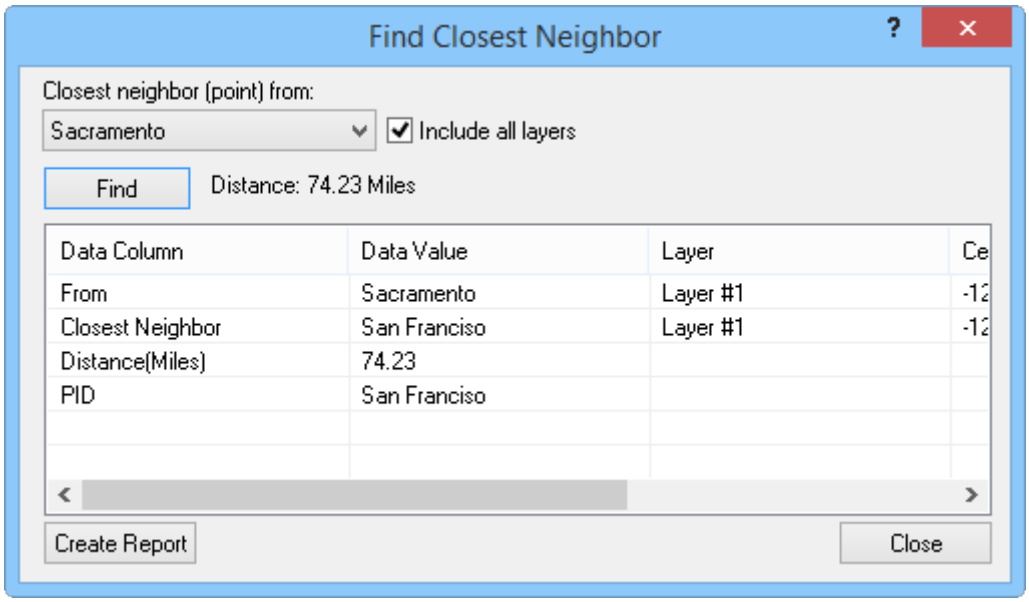
Closest Neighbor

The **Analysis | Evaluate | Closest Neighbor** command 

allows you to identify a point object and search for the closest neighboring point. This command is typically used on pin maps and other **MapViewer** maps created from point objects. In order for the **Closest Neighbor** command to be active, at least one point object must be present on the current map layer. Point objects must have an associated primary ID in order to be involved in the closest neighbor function.

Find Closest Neighbor Dialog

All the options required to locate the closest neighbor of a point object are located in the **Find Closest Neighbor** dialog.



*Find the closest neighbor, select starting point, choose whether to include all layers, and view point information in the **Find Closest Neighbor** dialog.*

- The *Closest neighbor (point) from* list contains all the points from which you can find the closest neighbor. The points are listed by primary IDs.
- To search for the closest neighbor across all the map layers, check the *Include all layers* box. If this option is disabled, the closest neighbor search is based on the active layer only.
- Once you have chosen a point from the *Closest neighbor (point) from* list, click the *Find* button to identify the closest neighbor. The closest neighbor is identified and the distance between the two points is reported to the right of the *Find* button. For known projections, the distance units are specified with the *Surface distance units* setting on the Units page in the **Property Manager**.
- The spreadsheet section of the **Find Closest Neighbor** dialog contains all of the available information about the point. The *Data Column* lists the type of data available for the identified closest neighbor. The corresponding values for the *Data Column* are listed in the *Data Value* column. The layer the point is located on is identified in the *Layer* column. If you wish to know the precise location of the closest neighbor, the point's centroid location is listed in the *Centroid (X)* and *Centroid (Y)* columns. The units of the centroid location are specified with the *Coordinate display units* setting on the Units page in the **Property Manager**. To create a report of the closest neighbor data, click the *Create Report* button.

Bordering Neighbors

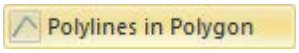
Click the **Analysis | Evaluate | Bordering Neighbors** command 

to find areas adjacent to a selected area. After selecting an area and clicking the **Analysis | Evaluate | Bordering Neighbors** command, the Areas and Neighbors dialog is opened.

Rectangles, rounded rectangles, and ellipses cannot be used with the **Bordering Neighbors** command. Use Symmetric Shape to Polygon to convert symmetric shapes to boundary objects.

The original polygon and its bordering neighbors remain selected after closing the Area and Neighbors dialog.

Polylines in Polygon

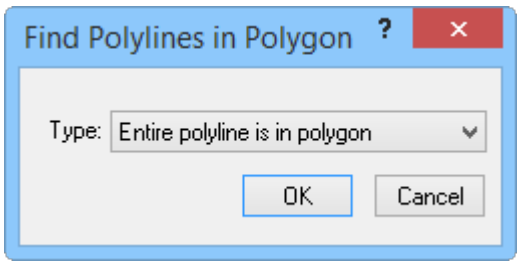
The **Analysis | Evaluate | Polylines in Polygon** command 

generates records and statistical reports for polylines partially or fully contained within the selected polygon. Select one polygon before using the **Analysis | Evaluate | Polylines in Polygon** command. Clicking the **Polylines in Polygon** command opens the **Find Polylines in Polygon** dialog.

Rectangles, rounded rectangles, and ellipses cannot be used with the **Polylines in Polygon** command. Use Symmetric Shape to Polygon to convert symmetric shapes to boundary objects.

Find Polylines in Polygon Dialog

Polylines are selected in the **Find Polylines in Polygon** dialog.



Choose the type of polyline selected in the ***Find Polylines in Polygon*** *dialog.*

Type

The *Type* options list contains criteria for polyline selection. Select *Entire polyline is in polygon* to find polylines that are completely contained within the selected polygon. Select *Any point of the polyline in polygon* to find all the polylines with any part of the polyline in the selected polygon. Select *Polyline is through polygon* to find polylines that cross the polygon border at least once.

Click *OK* to select polylines. Click *Cancel* to return to the plot window without selecting any polylines.

Clicking *OK* opens the Area and Neighbors Dialog

Touched by Polyline

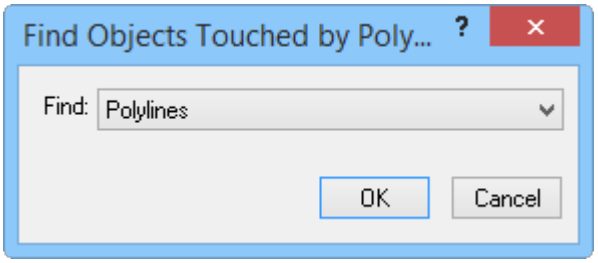
The **Analysis | Evaluate | Touched by Polyline** command 

generates records and statistical reports for objects that are touched or crossed by the selected polyline. Select one polyline before using the **Analysis | Evaluate | Touched by Polyline** command. Clicking the **Touched by Polyline** command opens the **Find Objects Touched by Polyline** dialog.

Rectangles, rounded rectangles, and ellipses cannot be used with the **Touched by Polyline** command. Use Symmetric Shape to Polygon to convert symmetric shapes to boundary objects.

Find Objects Touched by Polyline Dialog

The **Find Objects Touched by Polyline** dialog selects object types specified in the *Find* list.



Choose which type of object is selected in the ***Find Objects Touched by Polyline*** *dialog.*

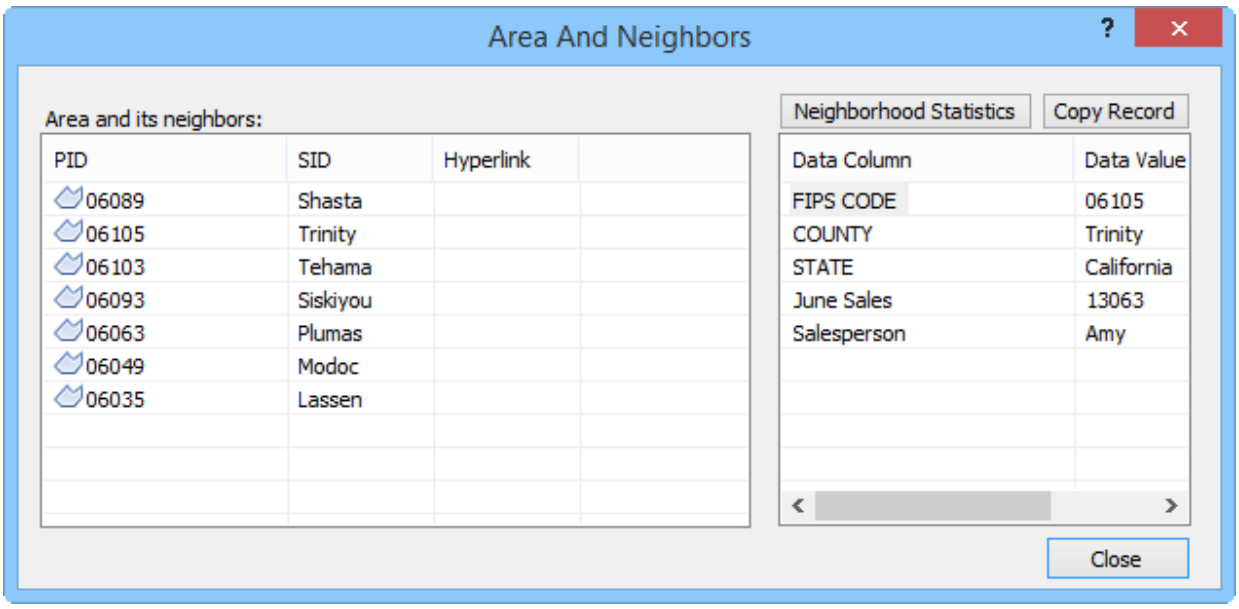
Find

The *Find* options list contains object types for finding and selecting. Select *Polylines* to find polylines that are touched or intersected by the selected polyline. Select *Polygons* to find polygons that are touched or intersected by the selected polyline. Select *Polylines and Polygons* to find both object types touched or intersected by the selected polyline.

Click *OK* to close the **Find Objects Touched by Polyline** dialog and select the specified objects. Click *Cancel* to return to the plot window without selecting any objects. Clicking *OK* opens the Area and Neighbors dialog.

Area And Neighbors Dialog

The **Area And Neighbors** dialog contains information about the selected object and neighboring polygons. The **Area And Neighbors** dialog is opened with the Bordering Neighbors command, the Find Polylines in Polygon dialog, and the Find Objects Touched by Polyline dialog.



*View records, statistics, and properties in the **Area And Neighbors** dialog.*

The object used with the Bordering Neighbors, Polylines in Polygon, or Touched by Polyline command is the first object listed in the *Area and its neighbors* list. The remaining objects were selected by the command. The *Area and its neighbors* list contains *PIDs*, *SIDs*, *Hyperlinks*, and *Attributes* for the selected objects.

Area Information

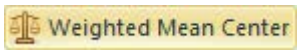
When an object is selected in the *Area and its neighbors:* list, the box on the right side of the dialog displays the column headers and data values from the data file for the selected object. Click the *Copy Record* button to display the object's information in a report window.

Area Statistics

To create a statistical report on a specific data column, click on a *Data Column* name and then click the *Neighborhood Statistics* button. Note that the selected column must contain numeric data.

After clicking *Close*, the objects listed under *Area and its neighbors:* remain selected.

Weighted Mean Center

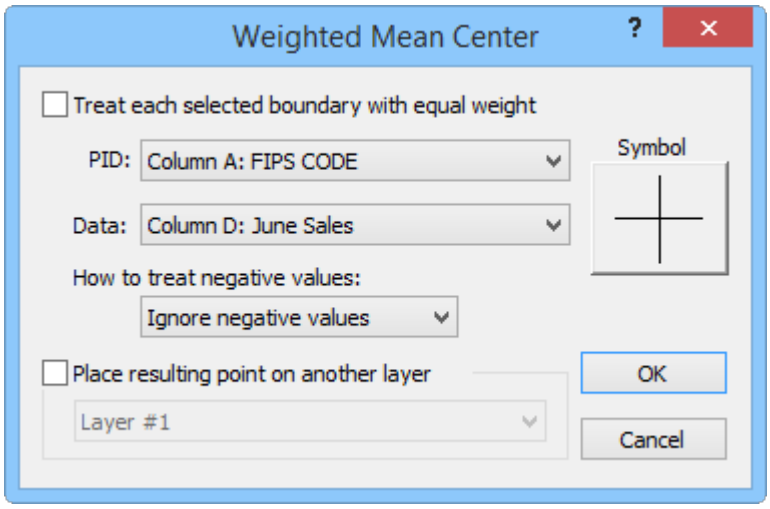
The **Analysis | Evaluate | Weighted Mean Center** command 

draws a point at the weighted mean center of an object or group of objects. Select objects and click the **Analysis | Evaluate | Weighted Mean Center** command to open the **Weighted Mean Center** dialog.

The selected objects must be boundary objects (polylines, polygons, or points) to use the **Weighted Mean Center** command. Use the Symmetric Shape to Polygon command to change rectangles, squares, rounded rectangles, ellipses, and circles to polygons.

Weighted Mean Center

The **Weighted Mean Center** dialog contains options for object weights, point placement, and symbol properties.



*Select the data column for object weighting and destination layer for the point, choose how to treat negative values, and edit symbol properties in the **Weighted Mean Center** dialog.*

<u>Boundary Weighting</u>

The objects used with the **Weighted Mean Center** command can have equal weights for the center calculation. Alternatively, they can be weighted by a user defined data value.

When *Treat each selected boundary with equal weight* is selected, **MapViewer** ignores linked data values for the weighted mean center calculation. Calculating the weighed mean center with equal weights places the mean center point at the average position of the object centroids.

If the selected objects do not have data linked when **Weighted Mean Center** is clicked the *Treat each selected boundary with equal weight* option is automatically checked. The *Treat each selected boundary with equal weight*, *PID*, *Data*, and *How to treat negative values* fields are grayed out to prevent editing.

If **Weighted Mean Center** is clicked and the selected objects have linked data:

The *Treat each selected boundary with equal weight* option can be selected or deselected by clicking on the check box. When *Treat each selected boundary with equal weight* is not selected the *PID, Data,* and *How to treat negative values* options are available. The objects are assigned proportional weights based on the data value in the selected *Data* column. The proportional weights are used to calculated a weighted average position of the objects' centroids.

The *PID* list contains columns in the linked data sheet that have data values. The column letter is followed by the item in the first row of the column if it is text data ("Column A: FIPS Code" in the image above). Select the column that contains the objects' PIDs.

The *Data* list contains columns in the linked data sheet that have data values. The data values to be used for object weighting are selected in the *Data* list. The column letter is followed by the item in the first row of the column if it is text data ("Column D: June Sales" in the image above).

The *How to treat negative values* list has options for negative values in the *Data* column. Select *Ignore negative values* to ignore the centroid for objects with negative data values in the weighted mean center calculation. Selecting *Ignore negative values* results in the same point placement as if the objects with negative data values were not included in the original selection. Selecting *Use absolute values* uses the magnitude of each data value in the weighted mean center calculation (i.e. a data set of -20, 20, -40, 25 is treated as 20, 20, 40, 25).

Weighted Mean Center Point Layer

To place the weighted mean center point on another layer, select *Place resulting point on another layer*. Click on the current option to select a destination layer for the point from the list of available layers. You can create a new layer for the weighted mean center point by selecting *[New Layer]*. If *Place resulting point on another layer* is unchecked, a point is placed at the weighted mean center of the object centroids on the active layer.

Symbol Properties

Click the *Symbol* button to open the Symbol properties dialog and edit the properties for the weighted mean center point.

Click *OK* to close the **Weighted Mean Center** dialog and generate a point with the selected options. Click *Cancel* to close the **Weighted Mean Center** dialog without placing a point.

Measure Distance

The **Analysis | Distance | Measure Distance** command 

allows you to measure the distance between points on a map. Once the **Measure Distance** command is selected, you can click multiple points on a map to measure distance or you can hold the left mouse button down and drag the mouse to measure distance. The distance is displayed near the cursor and in the status bar. Right-clicking the mouse removes the last point and subtracts the distance from the total.

Measure Distance *tracks distance as you move your cursor.*

Distance Units

The distance units are set on the *Units* page in the **Property Manager**. If your map has unknown units, page units will be displayed. You can use **Map | Plot | Calibrate** to change into known units.

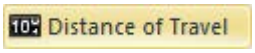
Multiple Measurements

You can continue making measurements while the **Measure Distance** command is selected. Press ENTER on your keyboard or double-click with your mouse to make a new measurement. When you start a new measurement, the distance line and distance measured are removed from the screen. When you are finished measuring, press ESC.

Saving the Distance Curve

To save the curve created with the **Measure Distance** command, check the *Save line after measuring distance* option in the User Interface page of the Options dialog.

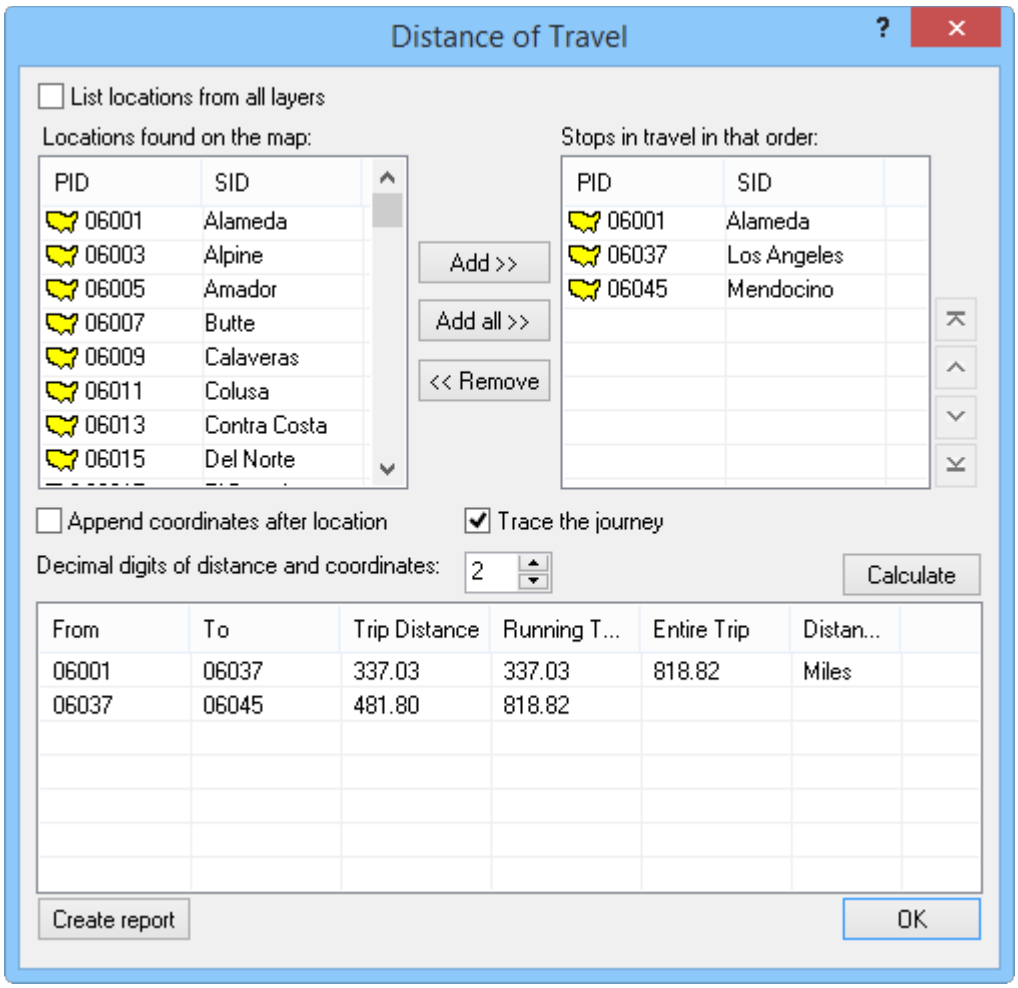
Distance of Travel

The **Analysis | Distance | Distance of Travel** command 

measures the distance between selected locations on the map. The locations are selected based on their primary IDs. The distance between polygons or polylines is measured based on the boundary object's centroid location. A report of the total distance and distance traveled between primary IDs can be generated with this command.

Distance of Travel Dialog

You can specify the travel locations, display of coordinates, and display of travel path using the **Distance of Travel** dialog.

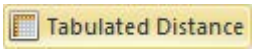


Select areas to calculate the distance of travel and generate reports in the ***Distance of Travel*** *dialog.*

- Select two or more primary IDs in the *Locations found on the map* list. You can select multiple primary IDs by holding down the CTRL key and clicking on multiple primary IDs. To select a contiguous group of IDs, hold down the SHIFT key click on the first primary ID and then click on the last primary ID.
- Once you have selected multiple primary IDs, click the *Add* button to add the IDs to the *Locations to travel to in that order* list. The order the items appear in the list is the order the distances are calculated.
- Click the *Add All* button to add all primary IDs to the *Locations to travel to in that order* list.
- If you need to change the order of travel, highlight a primary ID in the *Locations to travel to in that order* list and click the move to top, move up, move down, or move to bottom buttons.
- Select one or more primary IDs in the *Locations to travel to in that order list* and then click the *Remove* button to delete it from the list.
- If the *Append coordinates after location* box is checked, the boundary object's centroid coordinates are reported next to the primary ID name in the distance of travel report.

- Set the number of digits to the right of the decimal place in the *Decimal digits of distance and coordinates* box.
- Check the *Trace the journey* check box to show a line on the map indicating the travel route. In the **Object Manager**, the travel route's secondary ID (SID) displays the starting and ending primary IDs along with the total travel distance.
- Click the *Calculate* button to generate the distances between the primary IDs you have selected.
- The grid at the bottom of the dialog contains the *From* and *To* primary IDs for each travel segment, the segment *Trip Distance*, the *Running Total* distance, the *Entire Trip* distance, and the *Distance Units*. The units are set in the *Units* page of the **Property Manager**.
- Click the *Create Report* button to create a report of travel distances. The report contains a report time and date, the distance between adjacent primary IDs in the *Locations to travel to in that order* list, the entire trip distance, and the units of the distance measurement. The units are set in the *Units* page of the **Property Manager**.

Tabulated Distance

Use the **Analysis | Distance | Tabulated Distance** command 

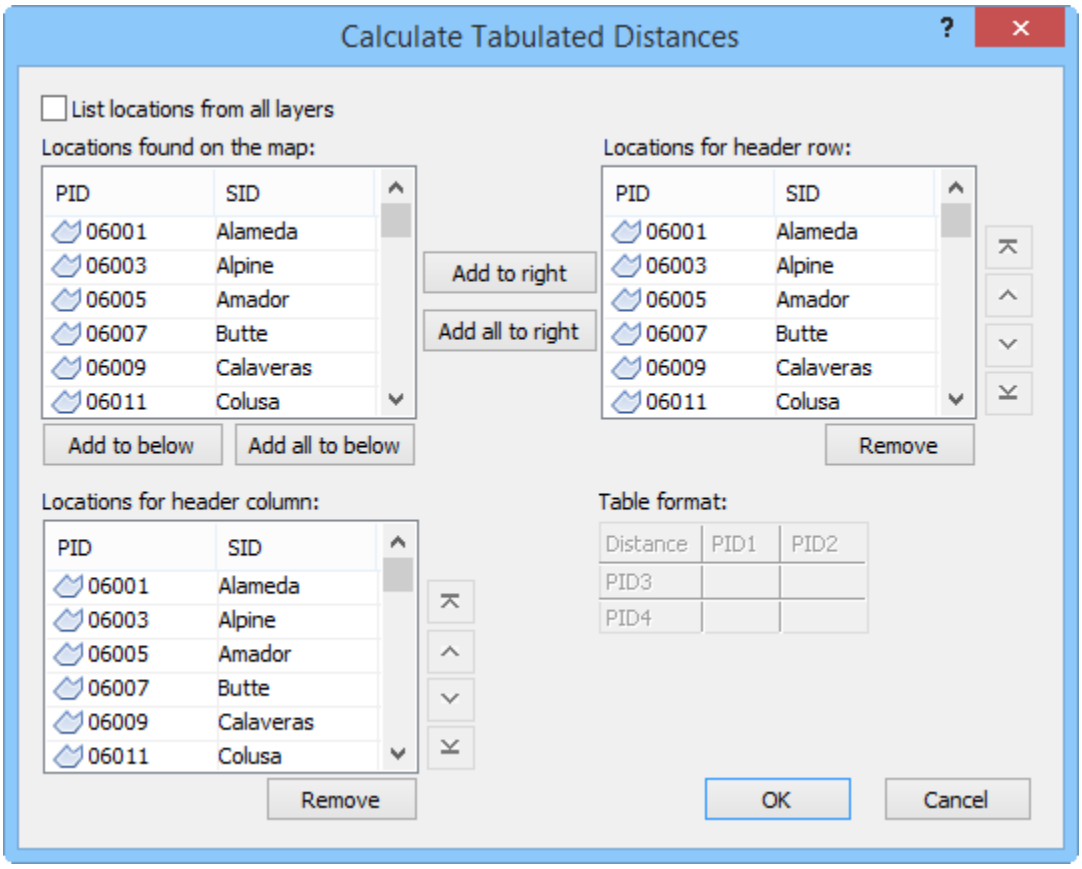
to create a table of distances, similar to the tables found in atlases. When using this command with polygons or polylines, the distance is calculated from the object's centroid.

Distance in Miles	Atlanta	Chicago	Dallas	Golden	New York	Phoenix	San Francisco	Seattle
Atlanta		588	721	1224	747	1590	2138	2181
Chicago	588		803	930	713	1452	1856	1735
Dallas	721	803		673	1372	885	1482	1681
Golden	1224	930	673		1641	579	936	1010
New York	747	713	1372	1641		2142	2569	2405
Phoenix	1590	1452	885	579	2142		654	1116
San Francisco	2138	1856	1482	936	2569	654		680
Seattle	2181	1735	1681	1010	2405	1116	680	

*The **Tabulated Distance** command creates a table of distances.*

Calculate Tabulated Distances Dialog

The **Calculate Tabulated Distances** dialog allows you to select which objects are used in the table of distances. It also lets you select the order of objects in the header row and header column.



Move objects into the header row, header column, or both and select their order in the ***Calculate Tabulated Distances*** *dialog.*

Information Source

Check the *List locations from all layers* box to display locations from all layers on the map.

Selecting Locations

The *Locations found on the map* list contains all locations on the layer or in the map document. Click on a location to select it. You can select multiple locations by holding down the CTRL key and clicking on multiple location names. To select a contiguous group of locations, hold down the SHIFT key click on the first location and then click on the last location.

Adding Locations to the Table

To add vertical locations to the table, select some locations as described in the previous section, and click the *Add To Right* button to add the locations to the header row. Click the *Add All To Right* button to add all locations to the header row.

To add horizontal locations to the table, select some locations as described in the previous section, and click the *Add To Below* button to add the locations to the header column. Click the *Add All To Below* button to add all locations to the header column.

Arranging Locations

If you need to change the order of the locations, highlight a location name in the *Locations for header row* or *Locations for header column* list and click the move to top, move up, move down, or move to bottom buttons.

Removing Locations

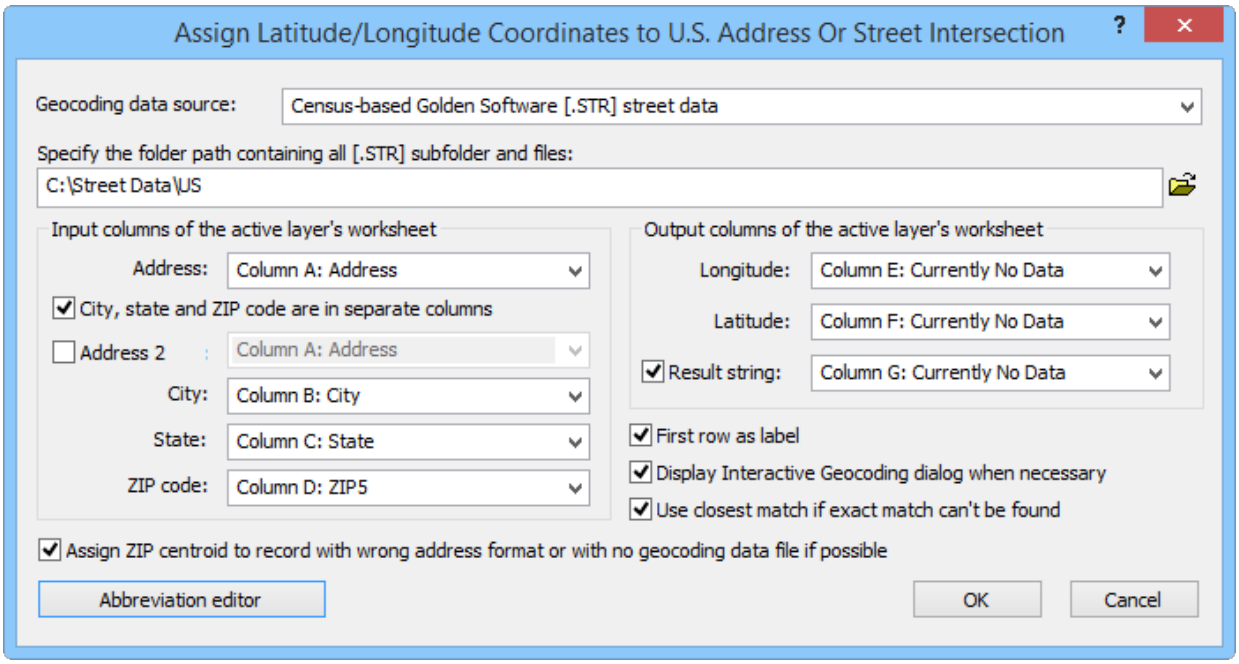
Select one or more location names in the *Locations for header row* or *Locations for header column* list and then click the *Remove* button to delete it from the list.

Geocode

The **Analysis | Geocoding | Geocode** command Geocode allows you to assign XY coordinates to known street addresses. To geocode in **MapViewer**, you need a location file and an address file. Selecting the **Geocode** command opens the **Assign Latitude/Longitude Coordinates to U.S. Address or Street Intersection** dialog.

Assign Latitude/Longitude Coordinates to U.S. Address or Street Intersection Dialog

The **Assign Latitude/Longitude Coordinates to U.S. Address or Street Intersection** dialog contains data source options, input format options, and output options for geocoding.



*Set options for geocoding in the **Assign Latitude/Longitude Coordinates to U.S. Address or Street Intersection** dialog.*

Geocode Data

Select the geocoding location file from the *Geocoding data source* list. The geocoding data file contains the coordinate locations of the addresses you wish to match.

If you purchased **MapViewer** on CD, the *Census-based Golden Software [.STR] street data* files are available on the United States Street Data CD. If you purchased **MapViewer** with the download-only option, contact Golden Software to order the United States Street Data CD.

You can also select *Dynamap/2000 in GDT format (ASCII) [.TS1] produced by Geographic Data Technology* or *Dynamap/2000 in ArcView format [.SHP] produced by Geographic Data Technology*. These location files are available for a fee from Tele Atlas via Tele-Mart. Please note that if you use files in the GDT format, all files including the [.TS1] and [.TS2] are needed.

Geocoding Data Path

Set the geocoding data path in the *Specify the folder path containing all [geocode data source type] subfolder and files* box. Type the path or use the  button to browse to the path.

This box should contain the root path. For example, if you have several states listed in a folder:

C:\ Data\Street Data\CO

C:\ Data\Street Data\NM

etc.

you can enter C:\ Data\Street Data as the folder path. This would allow you to geocode addresses in Colorado and New Mexico in one session.

Input Columns

Select the column containing addresses in the *Address* list. If the entire address is located in one column, do not check the *City, state, and ZIP code are in separate columns* box. The address must appear as <street number> <street name>, <city name>, <state name> <ZIP code>.

If the address, city, state, and ZIP code information are located in separate columns, check the *City, state, and ZIP code are in separate columns* box and select the columns in the *City*, *State*, and *ZIP code* lists.

If the address has two lines, check the *Address 2* box and select the appropriate column from the list.

Note that P.O. Box addresses are not supported.

Output Columns

Select the columns to place the latitude/longitude information from the *Longitude* and *Latitude* lists. Check the *Result string* box and then select a column to add a column containing information about the processing of each address such as Exact match, Street not found, etc.

Column Headers

Check the *First row as label* box if the data contain headers in the first row and if you would like the newly created columns to contain headers.

Interactive Geocoding Dialog

Check the *Display Interactive Geocoding dialog when necessary* to display the Interactive Geocoding dialog. This dialog is used to show "problem" addresses and resolve them.

Street Numbers

If there is not an exact match for the street number in the geocoding data source file, check the *Use closest address number if exact match can't be found* box to use the closest available street number.

ZIP Code Centroids

If an address cannot be matched because it is in an invalid format or the geocoding data file cannot be found and you would like to plot the address at the ZIP code's centroid, check the *Assign ZIP centroid to record with wrong address format or with no geocoding data file if possible* box.

Note that this option will not assign ZIP code centroids to addresses when the street name is not found. Use the *Geocode Above Records And Assign ZIP Centroid If No Match* button in the Interactive Geocoding dialog to assign ZIP code centroids to records with *Street not found* errors.

Address Abbreviations

Click the Address Abbreviation Editor button to add address variations, such as St for Street; remove punctuation from addresses; and truncate items such as suite numbers from addresses.

Address Abbreviation Lists

The **Address Abbreviation Lists** dialog is used to

- add address variations, such as St for Street,
- remove punctuation from addresses,
- and truncate items such as suite numbers from addresses when geocoding.

The actions above help avoid mismatched addresses. These modifications do not affect the original address file, the modifications are used by **MapViewer** when matching your addresses to the geocoding data source file.

Substituted Words

Addresses may appear with multiple forms of a word in your address files. For example, one address may have Street, another may have St, and yet another address may have Str. These variations can cause an address mismatch. To avoid this problem, the variations can be added to the list in the **Address Abbreviation Lists** dialog. *Original* words are words that may appear in your address files. *Substitution* words are words that should match the geocoding street address files.

For example, you can enter "Street" as an original word and "St" as the substituted word. Every time "Street" is encountered in the address file, it is replaced with "St" when matching the addresses to the geocoding data source files. Note that if your geocoding data source file uses "Str" as the abbreviation and the substituted word is "St," this will cause a mismatch. So, you may need to do some research to see what common abbreviations your geocoding data source files use.

Punctuation

If the address list contains punctuation such as "St." the punctuation can be removed by adding the punctuation to the **Address Abbreviation Lists** dialog. If a period (.) is added to the list, every time a period is encountered in your address file it is removed when matching the addresses to the geocoding data source files.

Truncation

Including items such as suite numbers or apartment numbers can cause address mismatches. For example, an office building can have several suites on each floor, but there is typically only one address for the building. Including the suites cause mismatches. To truncate addresses for these conditions, add these strings to the **Address Abbreviation Lists** dialog. The string and everything after it are truncated when matching the addresses to the geocoding data source files.

Modifying and Adding Entries

You can double-click existing entries to edit them. To add a new entry, hold down the CTRL button and click in a list.

Default Abbreviations

To return to the **MapViewer** default abbreviations, click the *Default Abbreviation List* button.

Interactive Geocoding

The **Interactive Geocoding** dialog is used to determine the problem with addresses that cannot be geocoded. The address that cannot be matched and its error are displayed in the grid on the left.

Streets

The grid on the right contains the streets for given address's ZIP code. If the *Error String* is *Street not found*, you can highlight the address on the left and scroll through the *Further Info* list to find the matching street manually. Either double-click on the street name or click on the street name and then click the *Geocode Selected Record with Updated Street* button to assign a new street to the address. If the address contains a ZIP code, you can check the Include streets from vicinities box to include all streets from the geocoding data source file. If this box is not checked, only streets within the address's ZIP code file are included.

Closest Address

Check the *Use closest address number if exact match can't be found* box to use the closest street number to the address's street number. For example, if your street number is 1453 and that street number does not exist in your file but 1455 does exist, 1455 will be used to locate the address.

If the *Use closest address number if exact match can't be found* box was not checked in the Assign Latitude/Longitude Coordinates to U.S. Address dialog, click the *Geocode Above Records* button after checking the *Use closest address number if exact match can't be found* box.

ZIP Code Centroid

Click the *Geocode Above Records And Assign ZIP Centroid If No Match* button if you would like to assign the ZIP code centroid coordinates to the address.

Chapter 33

Selecting and Arranging Objects

Selecting Objects

There are several ways to select objects in **MapViewer**. An object is selected if there is a bounding box with selection handles surrounding the object. The name of the selected object appears in the status bar. You can set the selection options in **File | Options**. By default, when multiple objects are selected a bounding box is displayed for an entire selection, and selection boxes are displayed for each selected object. The bounding box is represented by a solid blue line, and individual selection boxes are represented by blue dashed lines.

Selecting Objects

Several procedures are available to select objects in a plot window:

- Objects may be selected using the **Object Manager**. To display the **Object Manager**, use the **View | Managers | Object** command. Once displayed, click on the object you wish to select in the **Object Manager** list. The object is then selected in the plot window. If an object is not visible, it is not selected. Hold down the CTRL key while clicking on objects to select multiple objects in the **Object Manager** or hold down the SHIFT key to select adjacent objects.
- To select a single object in the plot window, move the pointer over the object using the mouse or the arrow keys. When the pointer is over the desired object, click the left mouse button or press the SPACEBAR on the keyboard. Eight rectangular selection handles appear indicating that the object is selected. If an object other than the one you want is selected, hold down the CTRL key and continue clicking with the mouse until the desired object is selected. Any objects that were previously selected become deselected. (The bounding boxes for the objects are most likely overlapping.)
- To select two or more objects in the plot window hold down the SHIFT key while making your selections. This retains previously selected objects and includes the newly selected objects. You can hold down both the CTRL and SHIFT keys to select several overlapping objects in the plot window.
- The block select mouse procedure allows you to select one or more objects contained in a user-defined rectangle. Press and hold the left mouse button on an empty portion of the plot window. Drag the mouse to form a rectangle around the group of objects you wish to select. Alternatively, you can use the arrow keys to position the pointer on an empty portion of the plot window, press and hold the SPACEBAR, and move the pointer with the arrow keys. If the *Rectangle must fully surround* check box is activated in **File | Options**, then only objects fully surrounded by the selection rectangle are selected. If the check box is not activated, then all objects with any portion of their bounding boxes within the block select rectangle are selected.
- The Block Select command allows you to select one or more objects. This command operates the same as the procedure above.
- The Select All command is used to select all the objects in the plot window. Pressing the CTRL+A keys performs the same command.
- The Invert Selection command selects all unselected objects and deselects all selected objects. This command is useful for selecting a large number of objects and leaving a few isolated objects unselected. Select the objects you do not want to select and use the **Invert Selection** command.
- The Select by Object command allows you to select objects based on type. For example, if you wish to select all areas check the *Areas* box in the **Select** dialog.
- Choose Select/Deselect from List to select objects based on their primary IDs.

- You can also select objects based on queries. See the Analysis tab for more information.

Select Tool

Click the **Draw | Tools | Select** command 

or press ESC to stop persistent commands and return the cursor to  . By default, the **Select** tool is also included on the Quick Access Toolbar. Use the **Select** tool to select, move, and resize objects.

Persistent commands include:

- All **Draw | Shape** commands
- **Draw | Region |** Ellipse, Rectangle, and Polygon commands
- **Draw | Tools | Reshape** or **Boundary | Edit Boundaries | Reshape** command
- **Arrange | Rotate | Free Rotate** and **Rotate Prism** commands
- **View | Display | Hyperlink** command
- **View | Zoom | In**, **Out**, **Rectangle**, **Realtime**, and **Pan** commands
- **Map | Layer | Move/Size All Layers** command

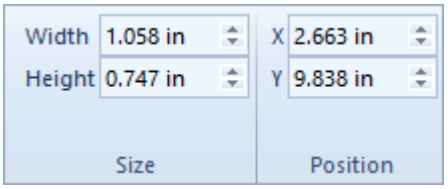
Arrange Tab Commands

The **Arrange** tab contains common commands, setting the size and position of objects, selecting, deselecting, or inverting the selection, arranging objects, grouping objects, and rotating objects.

Width or Height	Set the size of a selected object
X or Y	Set the object's position
Select by Object	Select objects by type
Select All	Select all objects in the document
Deselect All	Deselect all selected objects
Block Select	Select objects within a rectangle
Invert	Reverse the selection
Select/Deselect from List	Select from a list of polygon, polyline, and point objects
Select Hidden Objects	Selects all of the hidden objects in the plot
Move	Arranges drawing objects with To Front, To Back, Forward, or Backward commands
Align	Aligns objects to the left, right, center, top, bottom, or middle of the selection
Sort Objects	Sort objects on the current layer
Disperse Points	Spread out overlapped points
Auto Rearrange Text	Move overlapped text
Rotate	Rotates an object by specified degrees
Free Rotate	Rotates an object with the mouse
Rotate Prism	Rotates a prism map

Resize and Reposition Objects

You can resize or reposition objects graphically with the mouse or keyboard. Selected objects appear with selection handles at the corners and sides of the bounding box for the object. The size and position of a selected object is displayed in the status bar. The pointer changes to a two-headed arrow when it is moved over one of the selection handles. You can resize or reposition a single selected object or several selected objects using the following methods.



*Change the size or position of any object in the **Size** or **Position** group on the **Arrange** tab.*

Width and Height

NOTE: It is not a good idea to resize a map by stretching it with the selection handles because this destroys the coordinate system of the map. Use the Scale page in the **Property Manager** or **Map | Layer | Move/Size All Layers** to change the size of a map.

Use the *Width* and *Height* controls to set the width and height of the selected object. Some objects do not have a width or height. To change the size, highlight the existing value and type the desired value. Or, click the buttons to increase or decrease the size. Press ENTER on the keyboard to make the change.

Horizontal and Vertical Position

Use the horizontal position (X) and the vertical position (Y) to set the X, Y position on the page for most objects. To change the location, highlight the existing value and type the desired value. Or, click the buttons to increase or decrease the position. Press ENTER on the keyboard to make the change.

The X, Y location of the cursor is displayed in the status bar. This can be a good source of reference.

Resize and Reposition with the Mouse and Keyboard

- To drag a handle with the mouse, move the pointer over the handle and then press and hold the left mouse button. Move the pointer to a new position. Release the left mouse button and the object is resized.
- To drag a handle with the keyboard, move the pointer over the handle, press and hold the SPACEBAR, and use the ARROW keys to move the pointer to a new position. Release the SPACEBAR and the object is resized.
- Drag one of the four corner handles to size the object proportionally.
- Drag one of the side handles to stretch or compress the object in one dimension only.
- To move an object with the mouse, click and drag the object to the desired location. To move an object with the keyboard, move the pointer over the object, press and hold

SPACEBAR, and use the ARROW keys to move the object to a new position. Release SPACEBAR to move the object.

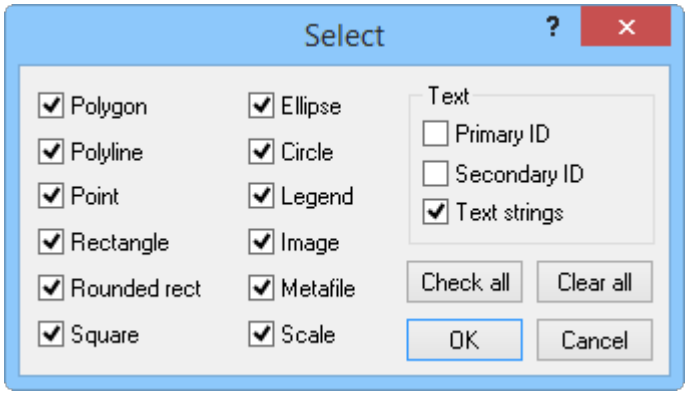
- To resize a map, use the Scale page in the **Property Manager** to size the map. **STRETCHING THE MAP DOES NOT PRESERVE THE INTERNAL MAP SCALE**. If you stretch a map, the coordinate structure is lost. This means that any new maps introduced to the plot window will not overlay the stretched map. If you have stretched a map, the only way to get the coordinate structure back is to use **Edit | Undo** immediately.

Select by Object

Click the **Arrange | Selection | Select by Object** command 

or press the F6 key to display the **Select** dialog and select objects based on the object type.

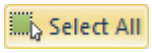
Select Dialog



*Click object types to select in the **Select** dialog.*

Check the desired object types (*Primary ID*, *Text*, etc.) and then click the *OK* button to select all objects of the specified types. For example, you can use this option to select all text in order to change the typeface, point size, and so on. Selections made with this command are additive so any previously selected objects are not deselected.

Select All

Click the **Arrange | Selection | Select All** command 

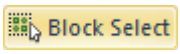
or press CTRL+A to select all objects in the document. A bounding box surrounds all selected objects.

Deselect All

Click the **Arrange | Selection | Deselect All** command 

or press CTRL+SHIFT+A to deselect all selected objects. This command is useful when zoomed in on objects. Alternatively, deselect objects by clicking in the white space outside the map.

Block Select

The **Arrange | Selection | Block Select** command 

selects items by dragging a rectangle around them. To avoid accidentally moving an object when block selecting, click the **Block Select** command from the **Arrange** menu. The block select command is available at all times in the program. Click outside one corner of the object, hold the left mouse button down, and then drag the mouse to the opposite corner of the object to select it. If an object is properly selected a bounding box surrounds the object. Set block select options in **File | Options**.

Invert Selection

The **Arrange | Selection | Invert** command 

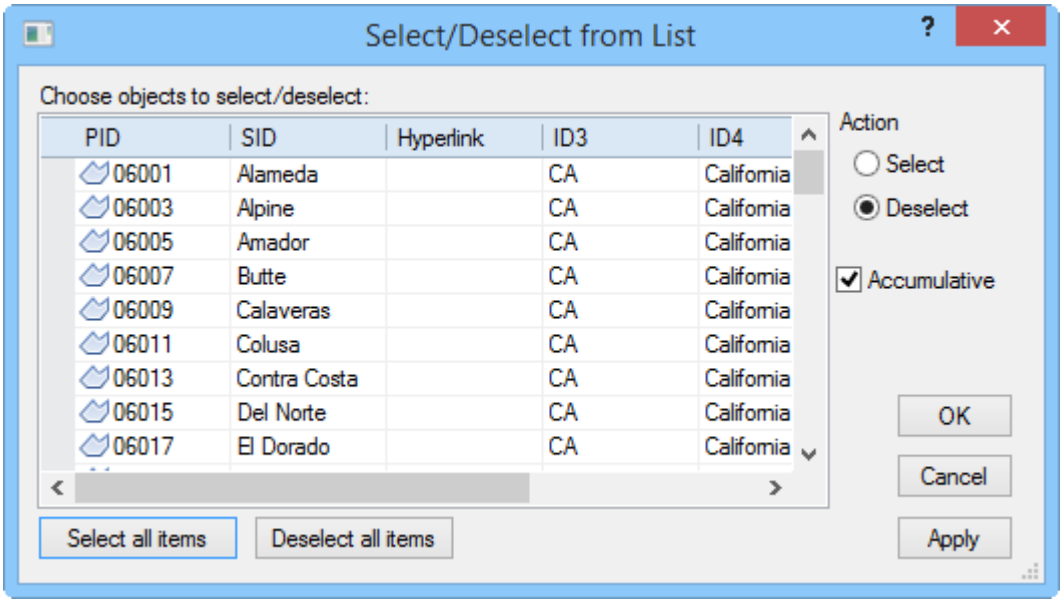
reverses the selected and deselected objects. A bounding box surrounds all selected objects.

Select / Deselect From List

Click the **Arrange | Selection | Select / Deselect From List** command 

to select or deselect polygons, polylines, and points by their IDs.

Select / Deselect from List Dialog



*Choose objects to select or deselect in the **Select / Deselect from List** dialog.*

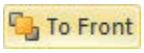
You can choose one or several object IDs (*PID*, *SID*, *Attributes,* and H*yperlink*) from the list. To choose several consecutive IDs, click on the first object's PID cell, hold down the SHIFT key, and then click on the last object's PID cell. To choose several non-consecutive IDs, click on each object's PID cell while holding down the CTRL key. Either click the *Select* or *Deselect* option depending on which action you would like to perform. If the *Accumulative* box is checked, selections made with this command are additive and will not deselect any previously selected objects.

Select Hidden Objects

Click the **Select Hidden Objects** command 

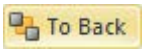
to select all the hidden objects on the active layer. Hidden objects cannot be selected with the other **Arrange | Selection** commands or by clicking in the plot window.

Move to Front

Click the **Arrange | Move | To Front** command 

or press SHIFT+PAGE UP to move the selected object to the front of the layer. The object appears on top of the other objects. You can also move objects forward or backward in the **Object Manager**.

Move to Back

Click the **Arrange | Move | To Back** command 

or press SHIFT+PAGE DOWN to move the selected objects to the back of the layer. The object appears behind the other objects. You can also move objects forward or backward in the **Object Manager**.

Move Forward

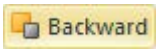
Click the **Arrange | Move | Forward** command 

or press CTRL+PAGE UP to move the selected objects forward one level on the layer. You can also move objects forward or backward in the **Object Manager**.

Example:

In the left drawing, the red square is located behind all the other objects. Click **Move Forward** to move the square forward one layer so that it appears between the circle and the triangle (middle drawing). Clicking **Move Forward** again places the square on top of the other objects (right drawing). Move to Front also places the square on top of the other objects.

Move Backward

Click the **Arrange | Move | Backward** command 

or press CTRL+PAGE DOWN to move the selected object backward one level on the layer. You can also move objects forward or backward in the **Object Manager**.

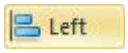
Example:

In the left drawing, the red square is located in front of all the other objects. Click **Move Backward** to move the square back one layer so that it appears between the circle and the triangle (middle drawing). Clicking **Move Backward** again places the square behind all of the other objects (right drawing). Move to Back also places the square behind the other objects.

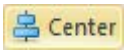
Align Objects

The **Arrange | Align |** command group is used to align selected objects relative to the bounding box surrounding the selected objects. The objects can be aligned both vertically and horizontally. More than one object must be selected to use an **Align** command.

To center the text in the rectangle, both objects were selected, and ***Center*** *and* ***Middle*** *were selected in the* ***Align*** *group.*

- **Left** 

aligns all selected objects along the left side of the bounding box.
- **Right** 

aligns all selected objects along the right side of the bounding box.
- **Center** 

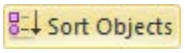
centers all selected objects between the left and right sides of the bounding box
- **Top** 

aligns all selected objects along the top of the bounding box.
- **Bottom** 

aligns all selected objects at the bottom of the bounding box.
- **Middle** 

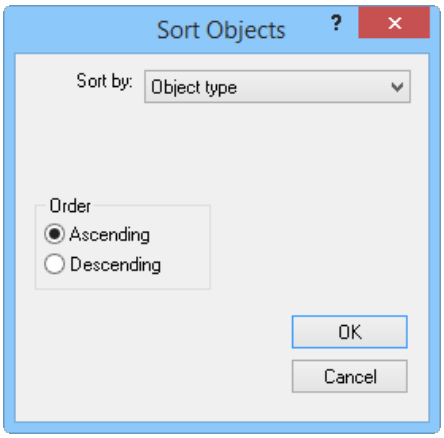
centers all selected objects between the top and bottom of the bounding box.

Sort Objects

To sort the current layer, click the **Arrange | Arrange | Sort Objects** 

command.

Sort Objects Dialog



Select order and object type for sorting in the ***Sort Objects*** *dialog.*

Sort by

Select the sort criteria in the *Sort by* list. You can sort on the *Object type*, *PID*, *SID*, *Attributes*, *Vertex count*, *Length*, *Area*, *Polygon directions, Number of subpolygons, Hyperlink*, or *Linked data*. The object *Length* is the length of a polyline or perimeter of a polygon.

Order

Click on *Ascending* or *Descending* to select the sort order.

Ignore Case

If you are sorting a field that may contain text such as *PID* or *SID/Text* fields, you can choose to exclude character case by clicking the *Ignore case* check box.

Label in First Row

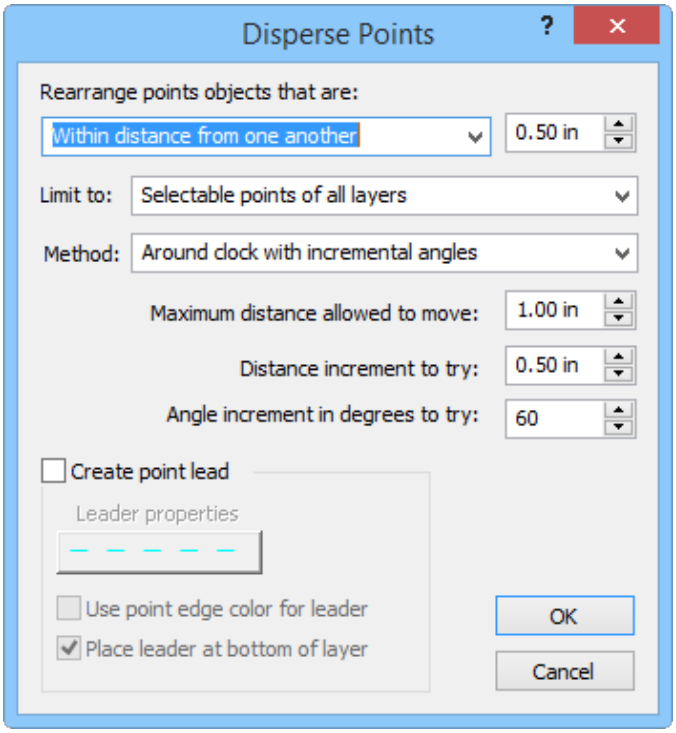
If *Linked data* is selected, select a column on which to sort in the *Data* list and check the *Labels in first row* box if there are labels in the first row.

Disperse Points

Click the **Arrange | Arrange | Disperse Points** command 

to separate overlapping points.

Disperse Points Dialog



*Select points, limits, methods, and whether to create a point lead in the **Disperse Points** dialog.*

Rearrange Points Objects That Are

Select *Within distance from one another* to separate points within a specified distance. The distance is set in the box to the right of the *Rearrange point objects that are* list. The distance must be between 0.00 and 5.00 inches. Select *Overlapped* to separate points when the symbol bounding boxes overlap.

Limit To

If you have selected points and want to limit the **Disperse Points** command to the selected points, choose *Selected points of the current layer* in the *Limit to* list. If you would like to disperse all points on all layers, choose *Selectable points of all layers*. *Selectable points of all layers* is the only option when no points are selected.

Method

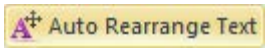
You can disperse points in two ways.

- Select *Around clock with incremental angles* to reposition the points at the specified *Angle increment in degrees to try* value. The points are moved according to alternate signs. For example, if the *Angle increment in degrees to try* value is 60, the points are moved at 0, 60, -60, 120, -120, etc. You can set the repositioning maximum distance in the *Maximum distance allowed to move* box. The *Distance increment to try* box sets the "ideal" distance to disperse points.
- Select *Random positions* to disperse the points in random directions within the specified *Maximum distance allowed to move* value.

Leader Lines

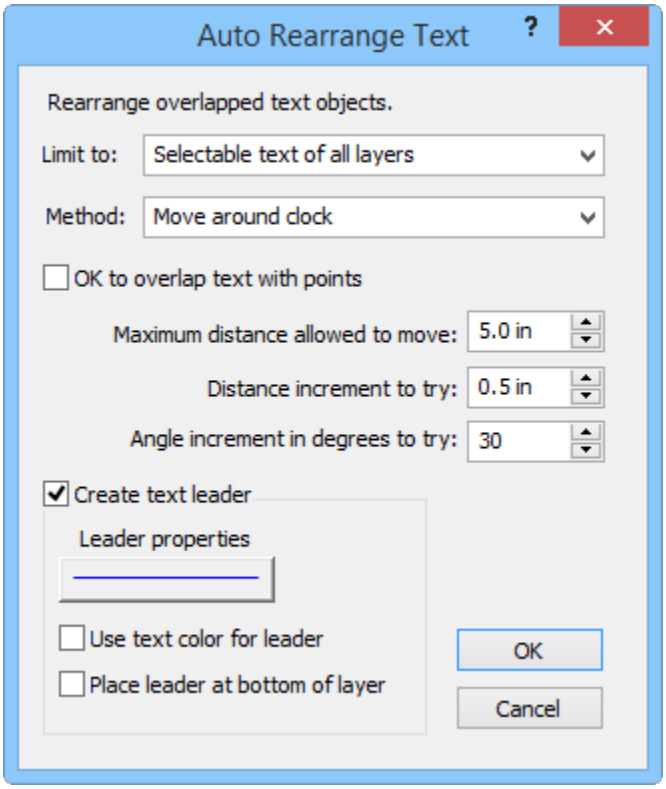
If you wish to draw leader lines from the original point location, check the *Create point leader* box. Click the *Leader properties* button to select the lead line properties. Check the *Use point edge color for lead* box to use the symbol edge color for the leader line. Check the *Place lead at bottom of layer* box to draw the leads at the bottom of the drawing order. If this box is not checked, the lines are drawn on top of the drawing order.

Auto Rearrange Text

Click the **Arrange | Arrange | Auto Rearrange Text** command 

to reposition overlapping text, such as displayed primary and secondary IDs and annotation drawn with **Draw | Shape | Text**.

Auto Rearrange Text Dialog



Select options for rearranging text objects in the ***Auto Rearrange Text*** *dialog.*

Limits

If you have selected text and want to limit the **Auto Rearrange Text** command to the selected text blocks, choose *Selected text of the current layer* in the *Limit to* list. If you would like to rearrange all text on all layers, choose *Selectable text of all layers*. *Selectable text of all layers* is the only option when no text blocks are selected.

Method

You can rearrange text in three ways.

- Select *Move around clock* to reposition the text at the specified *Angle increment in degrees to try* value. The text is moved according to alternate signs. For example, if the *Angle increment in degrees to try* value is 60, the text is moved at 0, 60, -60, 120, -120, etc. You can set the repositioning maximum distance in the *Maximum distance allowed to move* box. The *Distance increment to try* box sets the "ideal" distance to move text.
- The *Move in 4 directions* method moves the text in the shortest direction: up, down, left, or right.
- Select *Random positions* to arrange the text in random directions within the specified *Maximum distance allowed to move* value.

Text and Point Overlap

Check the *OK to overlap text with points* box if it is acceptable to have overlapping points and text. If this box is not checked, the text is rearranged so that it does not overlap points.

Leader Lines

If you wish to draw lead lines from the original text location, check the *Create text leader* box. Click the *Leader properties* button to select the lead line properties. Check the *Use text color for leader* box to use the text color for the leader line. Check the *Place leader at bottom of layer* box to draw the leaders at the bottom of the drawing order. If this box is not checked, the lines are drawn on top of the drawing order.

Rotate

The **Arrange | Rotate | Rotate** command Rotate rotates an object by a specified number of degrees. To rotate an object, select the object, click **Arrange | Rotate | Rotate**, and then type the number of degrees to rotate the object into the **Rotate** dialog. Positive numbers rotate the object in a counterclockwise direction and negative numbers rotate the object in a clockwise direction. Check the *Rotate objects about the group pivot point* box to rotate a group of selected objects around the center point. If this box is not checked, each object is rotated around its center point.

Free Rotate

Click the **Arrange | Rotate | Free Rotate** command Free Rotate to rotate an object with the mouse. After selecting the command, the pointer will have a small angle symbol next to it to indicate that the program is in rotate mode. To rotate an object click just inside the object's bounding box and hold the left mouse button while moving the pointer. As the object is rotated, the degrees of rotation are indicated in the status bar.

Rotate Prism

The **Arrange | Rotate | Rotate Prism** command Rotate Prism rotates a Prism Map or changes the prism map view distance.

Rotating a Prism Map:

The active layer must contain a Prism Map before **Rotate Prism** can be clicked.

1. Click **Arrange | Rotate | Rotate Prism**
2. The cursor changes to , indicating **Rotate Prism** mode is active.
3. Click and drag the left mouse button to rotate the map's bounding box. Drag the mouse up and down to change tilt, and drag the mouse left or right to change rotation. The rotation and tilt values are shown in status bar.
4. Release the left mouse button to rotate the Prism Map.
5. Click and drag the right mouse button to change the view distance of the bounding box. Dragging up increases the eye distance and changes the *Projection* to *Perspective*. Dragging down while right clicking decreases the eye distance, and the *Projection* changes to *Orthographic* if the eye distance is decreased to 100 percent. The eye distance value is shown in status bar.
6. Release the right mouse button to change the Prism Map view distance.
7. Press ESC or click another command to end **Rotate Prism** mode.

Chapter 34

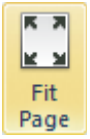
View Tab Commands

The **View** tab contains common commands to change the zoom, redraw, display managers, or arrange windows.

Fit Page	Shows the full page on screen
Fit to Window	Scales the screen so that all objects are visible
Zoom Selected	Zoom so the selected object fills the plot window
Realtime	Zoom in and out by clicking and dragging with the mouse
Actual Size	Zooms so objects are approximately the actual size
Full Screen	Turns off the display of ribbon and managers so the plot window fills the entire screen
In	Zooms in
Out	Zooms out
Rectangle	Zooms with a rectangle
Pan	Pans across the plot window
Redraw	Refreshes the image on screen
Auto Redraw	Check or uncheck to turn automatic redraw on and off
Hyperlink	View hyperlinks by hovering the cursor over boundary objects
Rulers	Show or hide rulers
Drawing Grid	Show or hide the drawing grid
Status Bar	Shows or hides the status bar
Show Objects	Select object types to show or hide in the Plot Window
Object Manager	Check or uncheck to show or hide the **Object Manager**
Inset Manager	Check or uncheck to show or hide the **Inset Manager**
Data Manager	Check or uncheck to show or hide the **Data Manager**
Property Manager	Check or uncheck to show or hide the **Property Manager**
Coordinates Manager	Check or uncheck to show or hide the **Coordinate Manager**
Show/Hide All	Shows or hides all five managers
New Window	Opens a duplicate window of the active document
Cascade	Arranges the windows so they overlap
Tile Horizontal	Arranges windows horizontally so there are no overlapping tiles

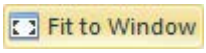
Tile Vertical	Arranges windows vertically so there are no overlapping tiles
Arrange Icons	Arranges icons at the bottom of the application window
Reset Windows	Resets manager display to the default layout

Fit Page

Click the **View | Zoom | Fit Page** command 

or press CTRL+G to see extents of the page. The page outline is visible if the *Show page rectangle* option is checked in User Interface page of the Options dialog.

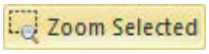
Fit to Window

Click the **View | Zoom | Fit to Window** command 

or press CTRL+D to zoom the window to fit the entire drawing or map.

Objects hidden with the **View | Display | Show Objects** command or hidden in the **Object Manager** are still included in the scaling calculations. This may result in a blank border around the window if one or more hidden objects extend past the visible objects.

Zoom Selected

Click the **View | Zoom | Zoom Selected** command 

or press CTRL+L to magnify selected objects to the maximum size possible in the window.

Zoom Realtime

The **View | Zoom | Realtime** command 

zooms in and out as the mouse is dragged up and down. Click the **View | Zoom | Realtime** command or press CTRL+SHIFT+V to enter realtime zoom mode. Hold down the left mouse button and then drag it up or down in the window to zoom in or out. As you drag the mouse up, the screen is zoomed in. As you drag the mouse down, the screen is zoomed out. Click another tool or press the ESC key to end zoom mode.

Actual Size

The **View | Zoom | Actual Size** command 

scales the drawing to the approximate size it will be when printed. The size is usually scaled up slightly on the display to allow an adequate size for displaying text.

Full Screen

The **View | Zoom | Full Screen** command 

scales the image to fit the monitor. Click **View | Zoom | Full Screen** or press the F11 key to enter full screen mode. The menus and toolbars are not accessible when viewing at **Full Screen**. Press the ESC key or click on the image to return to the **MapViewer** window.

Zoom In

The **Zoom In** command 

increases the magnification of the image. The command scrolls the window to keep the point of interest centered. To zoom in, click **View | Zoom | In**, and then click on the area on which to center the magnified image. Click on another tool button or press the ESC key to end zoom mode.

Zoom Out

The **Zoom Out** command 

decreases the magnification of the image. The command scrolls the window to keep the point of interest centered. To zoom out, click **View | Zoom | Out**, and then click on the area on which to center the magnified image. Click on another tool button or press the ESC key to end zoom mode.

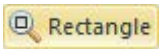
Zoom with a Wheel Mouse

You can use a wheel mouse to zoom in/out and pan in the plot window and grid window. Rotate the wheel forward to zoom in, or rotate the wheel backward to zoom out. Hold down the wheel button straight down, and the cursor will turn to a closed hand. When the cursor is a  , drag the mouse to pan the plot window. Be sure to click straight down with the scroll wheel. The zoom is changed so that the cursor location remains on the screen.

Zoom with the Keyboard

You can use keyboard commands to zoom in and out of the plot window. The default commands are CTRL + = to zoom in, and CTRL + - to zoom out.

Zoom Rectangle

The **View | Zoom | Rectangle** command 

allows magnification by drawing a rectangle around the area of interest. Click **View | Zoom | Rectangle** or press CTRL+R to magnify a portion of the window. Hold down the left mouse button and drag a rectangle around the area of interest to magnify it. Click another tool button or press the ESC key to end zoom mode.

Pan Realtime

Use the **View | Zoom | Pan** command 

to move the current view in the plot window.

To pan the current view:

1. Click **View | Zoom | Pan** 

2. Click on a portion of the current view
3. Hold the mouse button down while dragging the view to a new position.

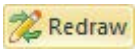
You can click on another tool button or press the ESC key to end pan mode.

Pan with a Wheel Mouse

You can use a wheel mouse to zoom in/out and pan in the plot window and grid window. Rotate the wheel forward to zoom in, or rotate the wheel backward to zoom out. Hold down the wheel button straight down, and the cursor will turn to a closed hand. When the cursor is a  , drag the mouse

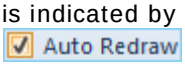
to pan the plot window. Be sure to click straight down with the scroll wheel. The zoom is changed so that the cursor location remains on the screen.

Redraw

Click the **View | Redraw | Redraw** command 

or press the F5 key to redraw the window. Redrawing the window will clean up viewing errors.

Auto Redraw

Auto Redraw is used to automatically redraw the image each time the window contents or view is changed. **Auto Redraw** is on by default, and this is indicated by a check mark beside the command. Click **View | Redraw | Auto Redraw** 

to toggle the command on and off. If **Auto Redraw** is disabled, use **View | Redraw | Redraw** or press the F5 key to redraw the image.

MapViewer provides an interruptible redraw feature. Click the mouse button or any key to stop the redraw. If the redraw was interrupted, you can choose to *Continue* or *Abort* the redraw.

Rulers

The **View | Display | Rulers** command 

toggles between showing and hiding the rulers on the top and left sides of the main plot window. The command button remains yellow to indicate the rulers are shown. Click **View | Display | Rulers** to toggle the command on and off. You can also right-click on a ruler to change the rulers and grid properties.

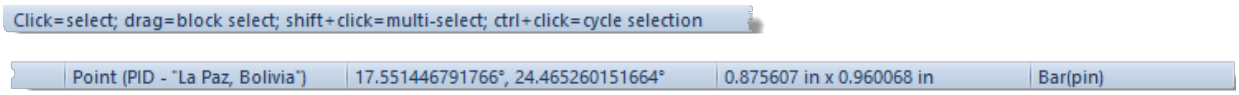
Drawing Grid

The **View | Display | Drawing Grid** command 

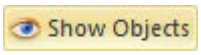
toggles between showing and hiding the drawing grid. The **Drawing Grid** button remains yellow to indicate the drawing grid is shown. Click **View | Drawing Grid** to toggle the grid on and off. Change the number of grid divisions per page unit in the Rulers and Grid page of the Options dialog. You can also display or hide the drawing grid by right-clicking in the plot window and clicking **Drawing Grid** in the context menu.

Status Bar

Click **View | Display | Status Bar** to show or hide the status bar. The status bar displays information about the current command or activity in **MapViewer**. A check mark next to **Status Bar** indicates that the status bar is displayed. The status bar is divided into four sections. Click on each section in the graphic to display more information about each pane. In the worksheet, the status bar displays ToolTips.

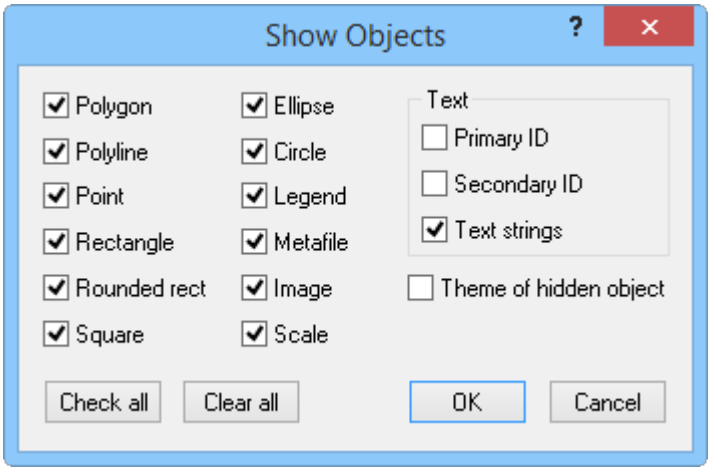


Show Objects

The **View | Display | Show Objects** command 

displays or hides all objects of a specified type (text, areas, points, etc.). Use this command to hide objects that may obscure other objects or take too long to redraw. When you select the **Show Objects** command the **Show**

Objects dialog with all the different object types appears. Check the objects you want to display or remove the check marks from objects you want to hide.



*Select objects to show in the **Show Objects** dialog*

Objects hidden by using the **View | Display | Show Objects** command are still included in the scaling calculations. This may result in a blank border around the window if one or more hidden objects extend past the visible objects. By default, primary and secondary IDs are switched off under **View | Display | Show Objects**.

After an object is hidden, it cannot be selected. The objects may be displayed again by rechecking the appropriate check box. Specific objects and map layers may be displayed or hidden in the **Object Manager**.

To make map objects invisible, but still display the object's map theme, enable the *Theme of hidden object* check box. If primary IDs and secondary IDs are displayed through **Show Objects**, you can move the text locations individually by dragging the text to new locations.

Show / Hide All

The **Show All** and **Hide All** commands are context commands. If one or more managers are open in the **MapViewer** window, the **Hide All** command is displayed in the **View | Managers** section of the ribbon bar. When all five managers are hidden, the **Show All** command is displayed in the **View | Managers** section of the ribbon bar.

Click the **View | Managers | Hide All** command 

to hide the Object, Property, Inset, Data, and Coordinates managers. If any number of managers are visible, clicking the **Hide All** command closes the visible managers.

When no managers are visible, clicking the **View | Managers | Show All** command 

opens all five managers in their previous locations.

The **Show All** and **Hide All** commands are not available when viewing a worksheet window.

New Window

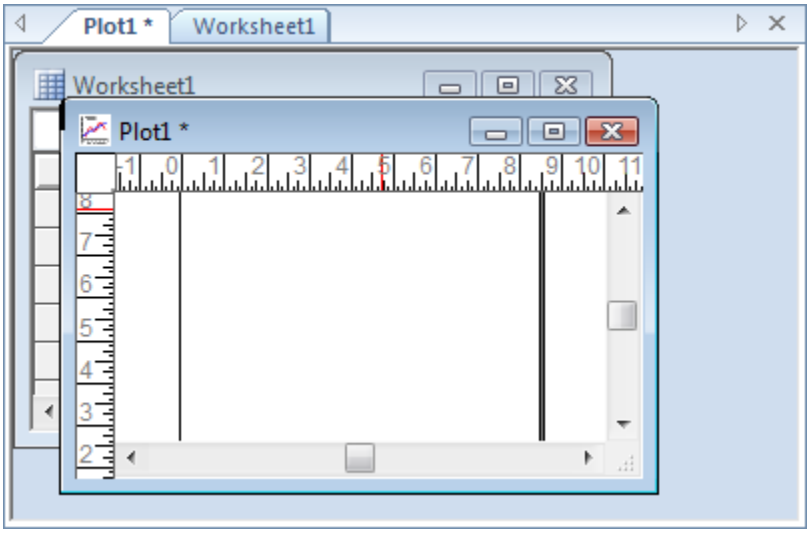
Click the **View | Window | New Window** command 

to create a duplicate window. You can display different views or different parts of the same document simultaneously by using **New Window**. Objects can be edited in either window and the changes appear in both windows.

Cascade

The **View | Window | Cascade** command 

is used to arrange multiple document windows in an overlapped fashion. Each window is offset a small amount from the previous window. Individual windows can be sized by dragging the window borders.

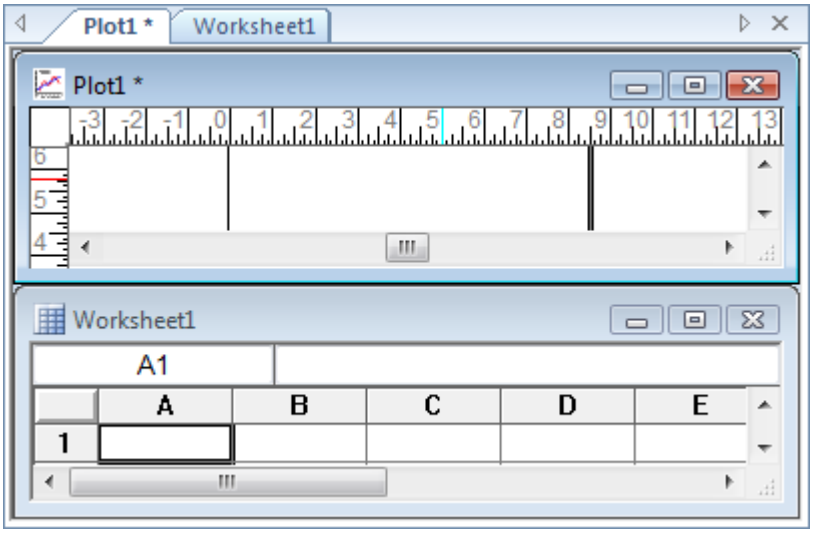


*The worksheet and plot windows are shown after the **Cascade** command was used.*

Tile Horizontal

Click the **View | Window | Tile Horizontal** command 

to arrange multiple document windows in a non-overlapped fashion such that the windows are oriented one above the other.

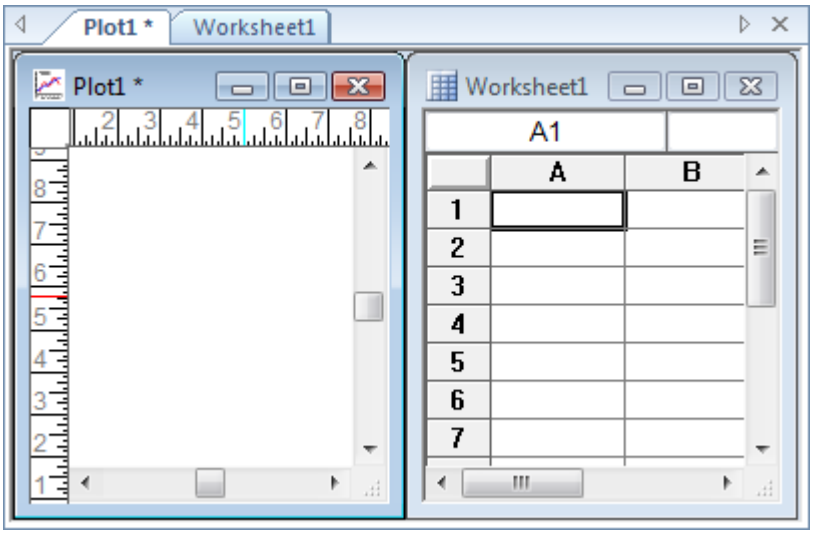


*The worksheet and plot windows are shown after the **Tile Horizontal** command was used.*

Tile Vertical

Click the **View | Window | Tile Vertical** command 

to arrange multiple windows in a non-overlapped fashion side by side.



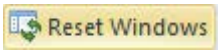
*The worksheet and plot windows are shown after the **Tile Vertical** command was used.*

Arrange Icons

Click the **View | Window | Arrange Icons** command 

to arrange the icons for minimized windows at the bottom of the main window. If a maximized window exists, then some or all of the icons may be located underneath the window.

Reset Windows

Click the **View | Display | Reset Windows** command 

to change the display of the program managers, keyboard shortcuts, and Quick Access Toolbar back to the default size, position, and settings. This command is especially handy if your managers become hidden by mistake.

You must restart **MapViewer** in order for this command to take effect. Click *OK* in the dialog, close the program, and reopen **MapViewer**. The default locations and settings are now used.

Chapter 35

Coordinate Systems

Introduction to Map Projections

Maps are usually seen in a flat, two-dimensional medium such as a drawing on paper or an image on a computer screen. Since the surface of the Earth is curved, or three-dimensional, the visual elements on the surface must somehow be transformed from three dimensions to two in order to display a map of the Earth's surface. Projections are a mathematical process by which the visual elements are transformed from three dimensions to two.

One of the simplest forms of projection is analogous to shining a light through a translucent globe onto a piece of paper and tracing the outlines. Other forms of projection may involve dozens of complex mathematical equations. Since no two-dimensional representation of a three-dimensional surface can be accurate in every regard, a variety of different projections have been developed to suit different purposes. Some projections are accurate in terms of area but not in scale, some are accurate in terms of scale but not in shape, and so on. The selection of an appropriate projection for a map depends on which characteristics of a map are most important or most desirable for a given project or audience. **MapViewer** supports several of the projections that are used most often in modern cartography and related fields.

There are many excellent textbooks and publications on this subject, and we do not attempt to explain projections in full detail here. If you need or want more information, you might consider reading the references that provide good introductory discussions of map projections.

Data distribution is represented visually on a thematic map. Probably the most important consideration for thematic maps is the relative size of land areas. If a data value is represented for an area, the relative size of the area is important in the visual representation of the data, because size and value together imply data density. When you do not use projections, land areas can become distorted in shape and size, so some areas might appear relatively larger or smaller than they actually are in relation to other land areas and visual representation of data can become somewhat misleading. However, these problems only become significant when you are plotting large land masses, such as an entire continent. For most **MapViewer** applications, you might only be plotting a single state or a group of states, so this problem is minimal.

Available Projections

Albers Equal Area Conic	Azimuthal Equidistant
Bonne	Cassini
Eckert IV	Eckert VI
Equidistant Conic	Equidistant Cylindrical
Geographic Coordinate System	Gnomonic
Hotine Oblique Mercator	Hotine Oblique Mercator 2-Point
Lambert Azimuthal Equal Area	Lambert Conformal Conic
Mercator	Miller Cylindrical
Mollweide	New Zealand Map Grid
Oblique Mercator	Orthographic
Polyconic	Robinson & Robinson-Sterling

Sinusoidal	State Plane Coordinate System
Stereographic	Transverse Mercator
Universal Transverse Mercator (UTM)	Van der Grinten

Map Coordinates

Map coordinates are the coordinates used to place objects on the map in their correct relative positions. **MapViewer** can make use of any type of coordinate system, although the latitude and longitude coordinate system is the most widely known and used. The boundary files included with **MapViewer** make use of the latitude and longitude coordinate system.

In a plot window, there are two coordinate systems in use at a time.

- Page coordinates mark the position of objects on the page. These are the coordinates indicated by the rulers along the top and left side of the plot window. Page coordinates are measured in inches or centimeters.
- Map coordinates (also referred to as boundary coordinates) control the position of boundary objects in relation to each other. When you import boundaries into a plot window, **MapViewer** defines the extent and position of the underlying map coordinate system in relation to the page coordinate system. The position of the map coordinates then remain fixed in relation to the page coordinates unless you import and append new boundaries to the existing boundaries, or you use the **Map | Plot | Move/Size All Layers** command to move a map and the map coordinate system on the page.

When you are looking at a map, you can determine the position of objects using the pointer. As you move the pointer over the map, the pointer position is indicated in the status bar at the bottom of the plot window. Pointer position can be reported in either page units or map units in the coordinates section of the **MapViewer** status bar. To control how the measurements are reported, use the **File | Options** command.

- Click the Units page and select the unit type in the *Coordinate display units* list for the pointer position map coordinates.
- Click the Units page and select the *Inches* or *Centimeters* option in the *Coordinate display units* group if you want to see the page coordinates for the pointer position.
- Change the coordinates display in the status bar by clicking the *Significant digits* button on the **Label** page of the Default Properties.

When you want to see the position of the map coordinate system relative to the page, you can use the **Map | Add | Graticule** command to place grid lines on the map.

Map Coordinates in a New Map Window

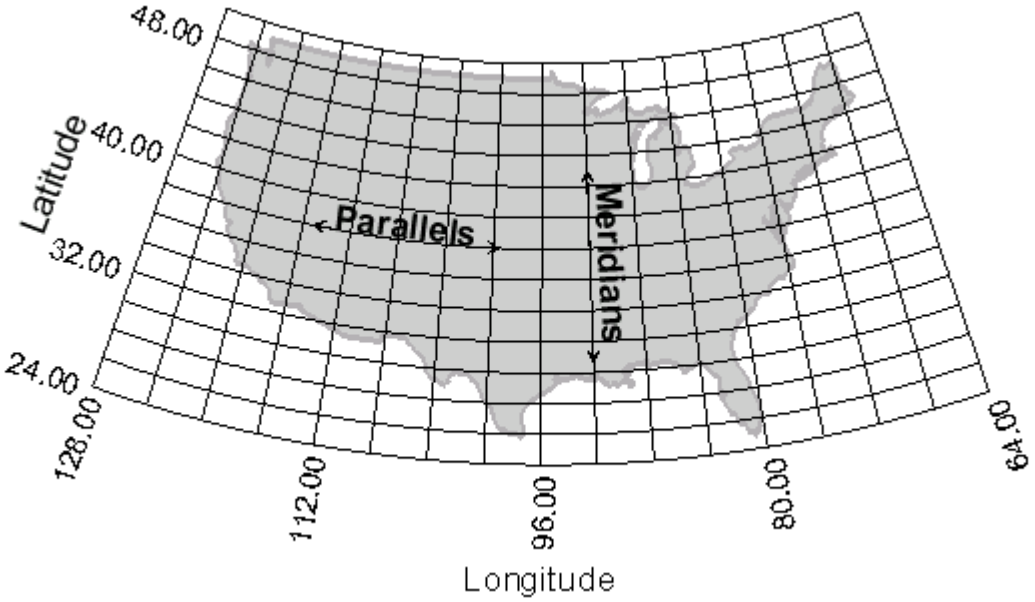
A default map coordinate system is imposed on the window when you open a new plot window,. If you are displaying boundary units in the status bar, the origin is the center of the page and the coordinates are based on 1,000,000 units per inch. If you begin to draw map boundaries in this new window, the boundary coordinates are based on this default map coordinate system. If you want to impose a new coordinate system on these new boundaries, you can use the **Map | Calibrate** command.

When you import boundaries into a new plot window, the window's map coordinate system is redefined to accommodate the incoming boundaries. In other words, the default map coordinate system described above is overridden. These coordinates remain imposed on this plot window, unless you select a command that changes the coordinate system.

When you want to produce a new map, open a new empty plot window (using the **File | New | Plot** command). When simply deleting all the boundary objects in a plot window, you are NOT removing the underlying map coordinate system. If you subsequently attempt to import different boundary files to this window, the imported boundary objects are placed using the old coordinate system.

Latitude and Longitude Coordinates

Latitude and longitude are spherical coordinates used to locate a point on the earth. Many maps do not need to take the curvature of the earth into account. For maps covering relatively small land areas, such as a state or small group of states, the earth can be assumed to be flat. In these cases, the latitude/longitude coordinates can be plotted on a Cartesian coordinate system. Maps plotted in this way must use different scaling in the two dimensions to minimize distortion on the map. **MapViewer** makes a simple adjustment when importing files containing latitude/longitude coordinates to compensate for the spherical to Cartesian coordinate conversion. This is referred to as an Unprojected Lat/Long map. The adjustment alters the aspect ratio slightly so the map does not appear stretched out horizontally. For more information, see Using Scaling to Minimize Distortion on Latitude/Longitude Maps. For larger areas, the curvature of the earth should be taken into account. For these purposes, the map can be plotted using a projection.



Parallels define lines of constant latitude, and meridians define lines of constant longitude. This Albers projected map makes use of graticule lines to indicate the relationship.

Latitude

Latitude is the Y coordinate and defines north-south global position measured from the equator. Lines of constant latitude are called parallels because they define a series of rings parallel to the equator. Parallels run east-west, but define north-south position on the globe. Parallels are designated in degrees from 0° at the Equator to 90° at the poles. **MapViewer** uses the convention that parallels are positive north of the equator (north latitudes), and negative south of the equator (south latitudes). Designations such as 45° indicate a position 45 degrees north of the equator, while -65° indicates a position 65 degrees south of the equator. At any position on the globe, the distance covered by a degree of latitude remains nearly constant.

Longitude

Longitude is the X coordinate and indicates east-west position on the globe. Lines of constant longitude are called meridians. Meridians lie at right angles to the parallels and are half-circles drawn from the North Pole to the South Pole. One meridian is designated as the prime meridian. The prime meridian most commonly in use in the United States runs through Greenwich, England, although there are several other prime meridians in use throughout the world. Longitude is measured 180° east and 180 degrees west from the prime meridian. In **MapViewer**, longitude is positive east (east longitude) of the prime meridian, and negative west of the prime meridian (west longitude). A designation such as -105° is used to indicate a location 105 degrees west of the prime meridian. Meridians converge at the poles so the distance covered by one degree of longitude decreases as you move north or south from the equator.

MapViewer only plots latitude and longitude coordinates in decimal degrees. You can see Latitude and Longitude Coordinates in Decimal Degrees for information on converting degrees-minutes-seconds to decimal degrees.

Latitude and Longitude in Decimal Degrees

Latitude and Longitude coordinates are often presented in degrees, minutes, and seconds, such as 39°45'30" (39 degrees, 45 minutes, 30 seconds). However, **MapViewer** can only plot values in decimal degrees. So, for example, 39°45' is referred to as 39.75° in **MapViewer**.

Converting from degrees, minutes, and seconds is actually quite easy. Consider the latitude value 39°25'30". This value needs to be converted to use it in **MapViewer**. There are 60 minutes in one degree and 3600 seconds in one degree. To convert minutes and seconds to decimal degrees, divide minutes by 60, divide seconds by 3600, and then add the results to obtain the decimal equivalent.

To convert 39°25'30" to decimal degrees

1. First, convert minutes and seconds to their degree equivalents and add the results.

   25'/60 = 0.4167; 30"/3600 = .0083; and 0.4167 + 0.0083 = 0.425

2. Then, add this number to the number of degrees.

   39 + 0.425 = 39.425

3. So, 39°25'30" = 39.425°

Other Ways the Map Coordinate System Can Be Redefined

When you display a map, **MapViewer** controls the correlation between the page position and the map coordinates. This correlation between page coordinates and map coordinates remains fixed unless you do one of the things listed below.

- You can use the **Map | Plot | Move/Size All Layers** command.
- You can use the *Append image* option during **File | Import**. When you import additional boundaries into your map, you have the option of appending the incoming boundaries to the existing boundaries. **MapViewer** redefines the map coordinate system to accommodate the incoming boundaries so the entire map fits on the page. When the map is recreated, all the boundaries and points are drawn in the correct relative positions.
- Using the Assign Coordinate System dialog redefines the projection for the map and the position of the coordinate system in the plot window.

- Using the **Map | Plot | Calibrate** command redefines the coordinate system on the page.

Projecting Maps in MapViewer

To project maps:

1. Once you have a map in the plot window, click the **Map | Plot | Plot Properties** command. Click the Coordinate System page in the **Property Manager**.
2. Click the *Change...* button in the *Coordinate system* field.
2. Select the projection you would like to use in the Assign Coordinate System dialog.
3. Click the *Settings* button to open the **Modify Projection Settings** dialog. Specify the parameters for the selected projection by entering the appropriate values into the controls in this dialog and then click the *OK* button. The controls in this dialog vary according to the projection selected in the previous step. Please see the projection type for the options. If you do not understand projections refer to one of the many textbooks on mapping. See also Projection References.
4. Click the *OK* button in the **Assign Coordinate System** dialog.

MapViewer modifies the coordinates of the drawing for the new projection. This may take a few minutes if the drawing is large.

Map Projection

The map projection options are available in several **MapViewer** commands such as Calibrate, Import (when projection is Unknown), Base Map, and Reproject Data File. The Coordinate System page of the plot properties also contains projection information and options.

Projection

Choose a projection in the Assign Coordinate System dialog. If the projection has options, click the *Settings* button to open the Modify Projection Settings dialog. The options in this dialog vary depending on which projection is selected. Refer to the specific projection in online help for more information on the specific options. If *State Plane 1927*, *State Plane 1983*, or *Universal Transverse Mercator* is selected, choose the appropriate zone in the *Zone* list.

Map Limits

The *Map limits* section displays the limits of the current map in the plot window. This information can be helpful when redefining a projection and its associated parameters.

Datum

See the Datum topic for detailed information on datum. In the **Map Projection** dialog, check the *Apply datum conversion* check box to activate the *Datum* list and then select the datum you wish to use. If you select the *User Defined* datum, click the Custom button to define the datum.

Apply Datum Conversion

When the *Apply datum conversion* check box is checked, the datum conversion is applied during the projection change. If this check box is not checked, the datum conversion is ignored.

To use a different datum:

1. Click the **Map | Plot | Plot Properties** command and click the *Change...* button in the Coordinate System page of the **Property Manager**.
2. Select a coordinate system in the Assign Coordinate System dialog. Click the *Modify...* button to change the datum.
3. Select the datum you wish to use in the *Datum* list of the Define Coordinate System dialog. If the datum selected is *User Defined Datum*, you also need to specify the parameters for the datum by clicking the *Custom* button and entering the appropriate parameter values in the **Custom Datum Definition** dialog that appears. Click the *OK* button to store the parameters and return to the **Map Projection** dialog.
4. Click the *OK* button.

MapViewer modifies the coordinates of the drawing for the new datum. This may take a few minutes if the drawing is large.

Importing Files

When you use **Map | Create Map | Base** or **File | Import** to import a file that does not contain projection information in it, you are prompted to select the projection information. If you know the projection, datum, and data units, use this dialog to set the file information. If you do not know all three pieces of information, leave the *Projection* set to *Unknown*. Do not use this dialog to change the projection, datum, or file units as this causes the map to import incorrectly. Use **Map | Plot | Calibrate** to change the map settings.

Input Data Units

When you initially import a file that does not contain projection information, an *Input data units* list appears in the **Import Options** dialog. Select the units contained in the file.

Characteristics of Projections

Some projections are imbued with characteristics that tell us if certain types of measurements (e.g. measurements of distance, area, etc.) are accurate on the projected map. Some of these characteristics include the following:

Equal Area	A projection is said to be *equal area* when the area of any given part of the map covers the same area on the Earth as any other part of the map of the same size. For example, if a one inch diameter circle on the map covers a 100 mile diameter circle on the Earth's surface, then we know that a one inch diameter circle anywhere else on the map is known to cover another 100 mile diameter circle on the Earth. In order for a projection to be equal area, however, consistency in the shapes, scales, and/or angles across the map must be sacrificed. Equal area projections include Albers Equal Area, Bonne, Eckert IV, Eckert VI, Lambert Azimuthal Equal Area, Mollweide, and Sinusoidal.
Conformal	A projection is said to be *conformal* when the local angles for points on the map are represented accurately. This means that the angles between any given point and any nearby points are accurate, but are not necessarily accurate for widely separated points on the map. A side effect is that

	conformal projections preserve the precise perpendicular intersections between parallels and meridians on the map. When mapping smaller areas, relative shape is preserved. In order for a projection to be conformal, however, consistency in the surface areas, shapes, and/or scales across the map must be sacrificed. Conformal projections include Gauss-Kruger / Gauss Conformal, Hotine Oblique Mercator, Lambert Conformal Conic, Mercator, Oblique Mercator, State Plane Coordinate System Projections, Transverse Mercator, and Universal Transverse Mercator.
Equidistant	A projection is said to be *equidistant* when the scale between at least one specific origin point on the map with respect to every other point on the map is represented accurately. In order for a projection to be equidistant, however, consistency in the surface areas, shapes, and/or angles across the map must be sacrificed. The Azimuthal Equidistant, Equidistant Cylindrical, Equidistant Conic, and Cassini projections are equidistant.
Azimuthal	With a projection of the *azimuthal* form, the direction of (or angle to) all points on the map are accurate with respect to the center point of the projection. Azimuthal projections include Azimuthal Equidistant, Gnomonic, Lambert Azimuthal Equal Area, Orthographic, and Stereographic.
None of the Above	Some projections try to minimize the effects of all distortions and as a result do not minimize any one distortion in particular. These projections include Polyconic, Robinson and Robinson-Sterling, Unprojected Lat/Long, and Van der Grinten.

In addition to the characteristics described above, some projections have highly specialized characteristics that may be useful in certain applications. For example, on maps made with a Mercator projection, all lines of constant direction (rhumb lines) are known to be straight, thereby making such maps very desirable as navigational charts.

Geometric Forms of Projection

Most forms of projection operate by projecting Earth coordinates onto a geometric shape that can be easily flattened to a two-dimensional image. Three geometric shapes are frequently used:

Cylinder

Earth coordinates may be projected onto a cylinder. The cylinder is cut lengthwise and unrolled to make a two-dimensional map. This type of projection is called a *cylindrical* projection. Some characteristics of cylindrical projections include the following:

- Lines of longitude are parallel to each other.
- Lines of latitude are parallel to each other.
- Lines of longitude are at right angles to lines of latitude.
- Regions near the equator or selected standard parallels are minimally distorted.
- Regions near the poles are highly distorted.

Cylindrical projections in **MapViewer** are: Cassini, Equidistant Cylindrical, Gauss-Kruger / Gauss Conformal, Hotine Oblique

Mercator, Mercator, Miller Cylindrical, Oblique Mercator, Transverse Mercator, and Universal Transverse Mercator.

Cone

Earth coordinates may be projected onto a cone. The point of the cone is usually directly above the pole and the sides of the cone pass through the globe at two user-defined latitudes, called the *Standard Parallels*. At the standard parallels, there is no difference between the east-west and north-south scales. The cone is cut from tip to base and unrolled to make a two-dimensional map. This type of projection is called a *conic* projection. Some characteristics of conic projections include the following:

- Lines of latitude form concentric arcs.
- Lines of longitude are straight and radiate outward from the tip of the imaginary cone.

Conic projections in **MapViewer** are: Albers Equal Area, Equidistant Conic, Lambert Conformal Conic, Polyconic, and Bonne.

Plane

Earth coordinates may be projected directly onto a flat plane. This type of projection is called an *azimuthal* projection. Projections of this type are recommended for maps of polar regions because cylindrical and conic projections generally either have severe distortion in polar regions or are unable to project coordinates in polar regions. The most notable characteristic of azimuthal projections is that the side of the Earth that is facing away from the center of the projection is not visible.

Plane projections in **MapViewer** are: Azimuthal Equidistant, Gnomonic, Orthographic, Stereographic, and Lambert Azimuthal Equal Area.

Other

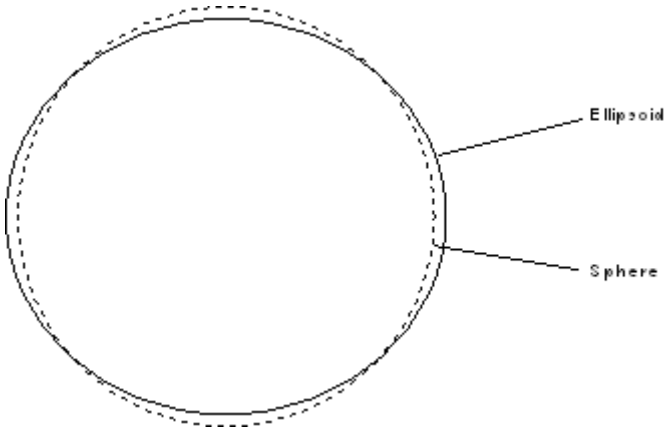
Projections in this category are pseudocylindrical, pseudoconic, or based on some other mathematical projection or mathematical tables.

These projections include: Eckert IV, Eckert VI, Mollweide, Robinson, Robinson-Sterling, Sinusoidal, State Plane, Unprojected Latitude/Longitude, and Van der Grinten.

* The State Plane Coordinate System uses Transverse Mercator, Lambert Conformal Conic, or Hotine Oblique Mercator, depending on the zone.

Ellipsoids

For maps of the Earth where accuracy is not of particular concern, we can safely assume that the Earth is perfectly spherical in shape. However, the Earth is actually somewhat ellipsoidal (or egg-shaped), approximately 1/300th wider than it is tall, assuming a vertical orientation with respect to the axis of rotation. This shape needs to be taken into account to produce maps of any significant accuracy.



This is an example of an ellipsoid (solid line) superimposed on a sphere (dashed line).

While an ellipsoid is a closer approximation of the Earth's shape than a sphere, the Earth's surface is not entirely uniform in curvature, so any ellipsoidal representation of the Earth is still only an approximation. This being the case, cartographers have historically used a number of slightly different ellipsoidal representations in attempts to produce more accurate maps of different regions of the Earth.

You can define the ellipsoids with the **Assign Coordinate System** dialog. Select a projection (other than State Plane 1927, State Plane 1983, Universal Transverse Mercator, or Unprojected Latitude/Longitude) then click the *Settings* button to access the ellipsoid options.

Ellipsoid Definition

You can choose an ellipsoid type from the *Ellipsoid* list. If you select *User Defined*, set the next three parameters in the *Ellipsoid definition* group box. The *Major axis* should be set in meters. Next, you can set either the *Minor axis* in meters or the *Flattening ratio* in meters. If you do not understand ellipsoids and datum definitions, please use the defaults. For more information on these subjects, see the references provided.

Datums

Since coordinates on the Earth's surface can be recorded under widely varying assumptions about the shape and size of the Earth and the locations of the poles and prime meridian, cartographers have developed a standard for identifying the frame of reference for a coordinate system. This standard is called the *datum*. Because the frames of reference differ, a coordinate recorded in one datum usually has slightly different latitude and longitude values from the same point recorded in any other datum.

Some datums are designed to provide a marginally accurate representation of coordinates spanning the entire Earth, while other datums are designed to provide more accurate results in a particular region at the expense of lesser accuracy in other parts of the world. For example, the *South American Datum of 1969 (SA69)* is tailored to provide good results for maps of the South American continent and surrounding areas, but, as a consequence, provides poor results for the rest of the world.

When combining data from multiple sources into a single map, it is important that all of the coordinate systems being combined specify the projection and datum accurately. Since each datum has slightly different latitude and longitude values for the same coordinates, mixing coordinates from multiple datums together without fully defining the datum introduces inaccuracies into the

map. **MapViewer** will automatically convert different source coordinate systems from different datums to the target coordinate system.

A *datum conversion* can be used to convert coordinates from one datum to another using the **Data | New Projected Coordinates** command. Click the ... next to the *Target Coordinate System* to open the **Assign Coordinate System** dialog. Click *New* to define a new projection and datum. The Define Coordinate System dialog has the *Conversion Method* and *Ellipsoid* parameters necessary to allow you to define a coordinate system with a custom datum.

Several different *Conversion Methods* may be used for converting coordinates from one datum to another:

Molodensky	The *Molodensky* method is the most widely used method of datum conversion. It adjusts latitude and longitude coordinates by taking into account the displacement between two datum's ellipsoids on all three axes. It does not take into account any rotational differences between the two ellipsoids.
Bursa-Wolfe	The *Bursa-Wolfe* method is similar to the *Molodensky* method, but in some instances it produces more accurate results because it takes into account both displacement and rotational differences between two ellipsoids. **MapViewer** supports the *Bursa-Wolfe* method for conversions from the WGS84 datum to the following datums: World Geodetic System 1972, DHDN-1, DHDN, Australian Geodetic 1984, ANS84, MRT - Everest Modified, Switzerland - CH1903, NTF France - Paris Meridian, and Pulkovo 1942 - Hungary.

MapViewer supports conversions for over 200 different predefined datums.

Custom Datum Definition

If you have selected the *User Defined* datum in the Map Projections dialog, you can specify the exact datum parameters and ellipsoid definition by clicking the *Custom* button. Clicking the *Custom* button opens the **Custom Datum Definition** dialog.

Datum Parameters

The *Datum parameters* group controls the method of datum conversion and the conversion parameters. The conversion methods include *Molodensky*, *Bursa-Wolfe*, and *Not Applicable*.

- The *Molodensky* method is the most widely used method of datum conversion. It adjusts latitude and longitude coordinates by taking into account the displacement between two datum's ellipsoids on all three axes. It does not take into account any rotational differences between the two ellipsoids.
- The *Bursa-Wolfe* method is similar to the *Molodensky* method, but in some instances it produces more accurate results because it takes into account both displacement and rotational differences between two ellipsoids. **MapViewer** supports the *Bursa-Wolfe* method for conversions between the WGS84 datum and the following datums: World Geodetic System 1972, DHDN-1, DHDN, Australian Geodetic 1984, ANS84, MRT - Everest Modified, Switzerland - CH1903, NTF France - Paris Meridian, and Pulkovo 1942 - Hungary.
- Choose *Not Applicable* if the predefined methods do not suite your purpose. If you select *User Defined* from the *Ellipsoid* list, you can specify your own ellipsoid model parameters.

You can edit the *WGS84 conversion parameters* directly by selecting the value you want to edit and typing a new value over it. Parameters vary depending on the selected conversion method. The possible WGS84 conversion parameters include:

- *Delta X*, *Delta Y*, and *Delta Z* are the axis displacements in meters.
- *X Rotation*, *Y Rotation*, and *Z Rotation* are the axis rotations in arc seconds.
- The *Scale Factor* is the scale factor for the datum.
- The *PM Shift* is the shift from the prime meridian, typically 0 degrees, in decimal degrees.

Ellipsoid Definition

The *Ellipsoid definition* group contains options for defining the ellipsoid. Use these settings to define the ellipsoid model that best approximates the curvature of the Earth's shape in the map region.

- The *Ellipsoid* list contains a collection of ellipsoid models that cartographers have historically used in attempts to produce more accurate maps of different regions of the Earth.
- If you select *User Defined* as the ellipsoid type, the *Major axis (meters)* definition is available. Once you define the major axis, you can either define the *Minor axis (meters)* or use a *Flattening ratio* to define the minor axis.

Supported Projections

Albers Equal Area Conic Projection

World Map
Albers Equal Area Conic Projection
Central Longitude: 0
Central Latitude: 0
Standard Parallel: 45
2nd Standard Parallel: 0

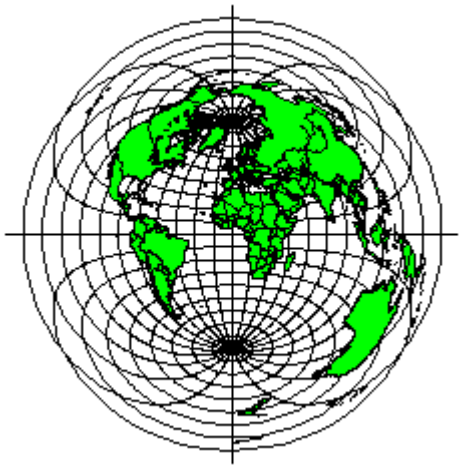
Projection Characteristics

The Albers Equal Area Conic projection scale is constant along any given parallel and accurate along the two specified standard parallels. This projection is used in the National Atlas of the United States. The Albers Equal Area Conic projection is useful for equal area maps of low-aspect regions (regions that are wider than they are tall).

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce. For example, the value -95.5 represents the geographic center of the United States, so the map of the U.S. is drawn upright.
Central Latitude	Specifies the central latitude of the projection in degrees. The *Central Latitude* value should be defined as the latitudinal center of the map you are going to produce. This value is only significant when you define *False Easting* and *False Northing* values.
Standard Parallel	Specifies the latitude of the first of two standard parallels, in degrees. The standard parallels typically are defined at approximately one-sixth of the distance inside the north and south limits of the map. For example, if your map latitude ranges from 30° to 36°, you could place your *Standard Parallels* at 31° and 35°. There are alternative methods for determining the best position of the standard parallels. Please see Snyder for more information.
2nd Standard Parallel	Specifies the latitude of the second of two standard parallels, in degrees. See above.

Azimuthal Equidistant Projection



World Map
Azimuthal Equidistant Projection
Standard Parallel: 0
Central Longitude: 0

Projection Characteristics

The Azimuthal Equidistant projection is a planar projection. Directions and scale are true from the center point of the map. Shapes are true at the center of the map, but are distorted the further you move from the center. When using a polar view of this projection, all meridians are straight lines. When using an equatorial view, the central longitude and equator are straight lines, otherwise, only the central longitude is a straight line. This projection is typically used in polar hemispheric maps.

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce. This value is only significant when you define *False Easting* and *False Northing* values, and has no apparent effect on the map.
Standard Parallel	Specifies the central latitude of the projection in degrees. The *Standard Parallel* value typically should be defined as the latitudinal center of the map you are going to produce.

Bonne Projection

North America Map
Bonne Projection
Central Longitude: -100
Standard Parallel: 40

Projection Characteristics

The Bonne projection is a pseudo-conical, equal area projection. The scale is constant along any given parallel, and accurate along the specified standard parallels. The Bonne projection is distortion-free along the central longitude and the parallels. This projection is used for continental and topographic mapping.

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce.
Standard Parallel	Specifies the central latitude of the projection in degrees. The *Standard Parallel* value typically should be defined as the latitudinal center of the map you are going to produce.

Cassini Projection

Map of North America
Cassini Projection
Central Longitude = -100
Central Latitude = 40

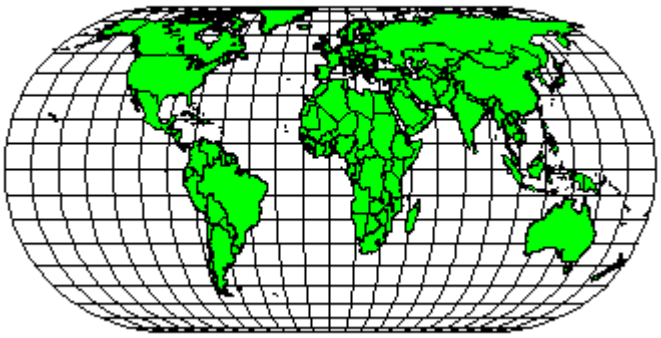
Projection Characteristics

The Cassini projection is a cylindrical projection. The scale is accurate along the central longitude and along latitude lines perpendicular to the central longitude. This projection is useful for high-aspect regions (regions taller than they are wide).

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Latitude	Specifies the central latitude of the projection in degrees. The *Central Latitude* value typically should be defined as the latitudinal center of the map you are going to produce.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce.

Eckert IV Projection



World Map
Eckert IV Projection
Central Longitude: 0

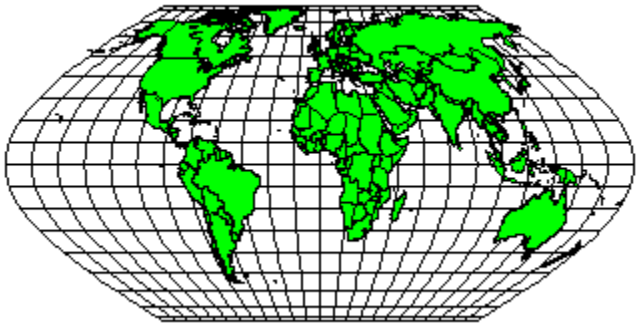
Projection Characteristics

The Eckert IV projection is a pseudo-cylindrical equal area projection. Scale is constant along any given parallel and accurate along the parallels 40°30' north and south. Shape is also accurate along 40°30' north and south and the central longitude. Direction is distorted along most of the map, with the exception of the local angles at 40°30' north and south and the central longitude. The central longitude is half the length of the equator. The poles are also represented by lines half the distance of the equator. The meridians are semi-ellipses. Eckert IV is designed to produce aesthetically pleasing world maps.

Projection Parameters

Parameter	Description
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce.

Eckert VI Projection



World Map
Eckert VI Projection
Central Longitude: 0

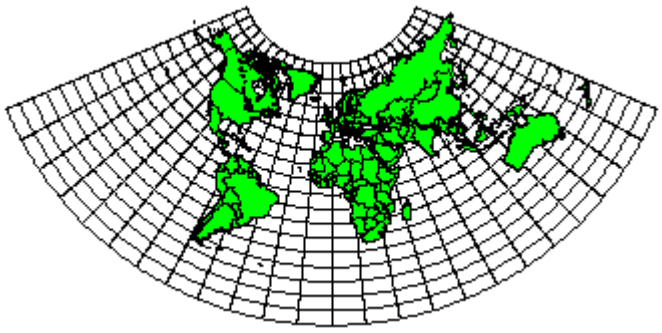
Projection Characteristics

The Eckert VI projection is a pseudo-cylindrical equal area projection. Scale is constant along any given parallel and accurate along the parallels 46°16' north and south. Shape is also accurate along 46°16' north and south and the central longitude. Direction is distorted along most of the map, with the exception of the local angles at 46°16' north and south and the central longitude. The central longitude is half the length of the equator. The poles are also represented by lines half the distance of the equator. The meridians are semi-ellipses. Eckert VI is designed to produce aesthetically pleasing world maps.

Projection Parameters

Parameter	Description
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce.

Equidistant Conic Projection (Simple Conic Projection)



World Map
Equidistant Conic Projection
Central Longitude: 0
Central Latitude: 0
Standard Parallel: 45
2nd Standard Parallel: 0

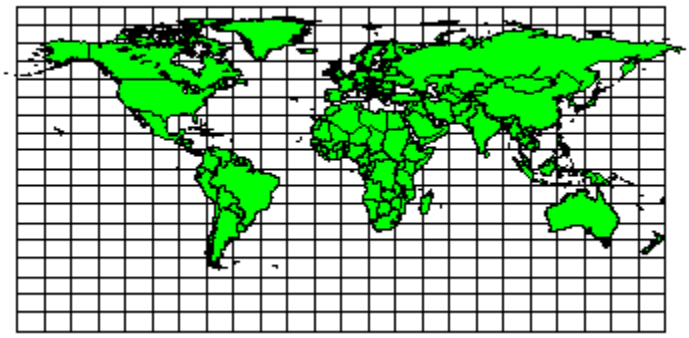
Projection Characteristics

There is no distortion in scale, shape, or area along the standard parallels in an Equidistant Conic projection. Scale is true along all meridians and along the standard parallels. Direction is locally true along the standard parallels. This projection is useful for maps of low-aspect regions (regions that are wider than they are tall).

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce. For example, the value -95.5 represents the geographic center of the United States, so the map of the U.S. is drawn upright.
Central Latitude	Specifies the central latitude of the projection in degrees. The *Central Latitude* value should be defined as the latitudinal center of the map you are going to produce. This value is only significant when you define *False Easting* and *False Northing* values.
Standard Parallel	Specifies the latitude of the first of two standard parallels, in degrees. The standard parallels typically are defined at approximately one-sixth of the distance inside the north and south limits of the map. For example, if your map latitude ranges from 30° to 36°, you could place your *Standard Parallels* at 31° and 35°. There are alternative methods for determining the best position of the standard parallels. Please see Snyder for more information.
2nd Standard Parallel	Specifies the latitude of the second of two standard parallels, in degrees. See above.

Equidistant Cylindrical Projection



World Map
Equidistant Cylindrical Projection
Central Longitude: 0
Standard Parallel: 0

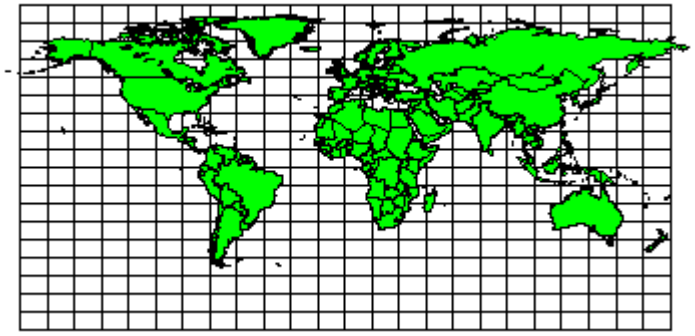
Projection Characteristics

The coordinates are equidistant with respect to the center of the Equidistant Cylindrical projection. Distortion is minimal at the specified standard parallel and increases dramatically with distance north or south from this parallel. Typically, this projection is used with maps covering small areas.

Projection Parameters

Parameter	Description
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce. This value is only significant when you define *False Easting* and *False Northing* values, and has no apparent effect on the map.
Standard Parallel	Specifies the central latitude of the projection in degrees. The *Standard Parallel* value typically should be defined as the latitudinal center of the map you are going to produce.

Geographic Coordinate System



World Map
Unprojected Lat/Long

Projection Characteristics

This is a simplistic cylindrical projection. If the coordinates in a **MapViewer** map are stored in a geographic coordinate system (also known as Unprojected Lat/Long or latitude/longitude), the map is displayed on the screen by simply treating the longitudes as horizontal offsets and the latitudes as vertical offsets.

When plotting latitude/longitude coordinates, **MapViewer** constructs the map coordinate system by first determining the latitude for the center of the map. Then the appropriate scale is determined for the east-west (longitude) relative to the north-south (latitude) dimension of the map. See latitude/longitude and Using Scaling to Minimize Distortion on Latitude/Longitude Maps for more information on relative scaling of latitude versus longitude.

The features of a geographic coordinate system (Unprojected Lat/Long) map are:

- Meridians (lines of constant longitude) are equally spaced and are drawn perpendicular to the parallels.
- Parallels (lines of constant latitude) are equally spaced over the entire map and are drawn perpendicular to the meridians. The further your map area is from the equator, the further apart the parallels are spaced.
- The spacing between meridians is different than the spacing between parallels except when the equator is at the north-south center of the map.
- At the center of the map, the scale is accurate in both the north-south and east-west direction.
- Scale is accurate in the north-south direction over the extent of the map.
- East-west scale increases towards the poles, and decreases towards the equator.

There are no parameters for this projection.

Gnomonic Projection

Antarctica
Gnomonic Projection
False Easting: 0
False Northing: 0
Central Longitude: 19.0
Standard Parallel: 2.4

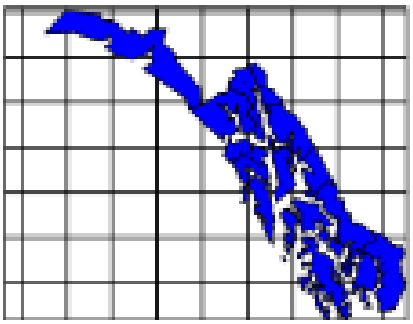
Projection Characteristics

The Gnomonic projection is an azimuthal projection. It is represented as a plane tangent to the globe. At this point of tangency, which is called the standard parallel, all major characteristics are retained. When you move away from the standard parallel in any direction the map is not conformal, not equal-area, and distances are not true to scale. Only areas of less than a hemisphere can be shown and distortion increases noticeably as you move further from the standard parallel.

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce. This value is only significant when you define *False Easting* and *False Northing* values, and has no apparent effect on the map.
Standard Parallel	Specifies the central latitude of the projection in degrees. The *Standard Parallel* value typically should be defined as the latitudinal center of the map you are going to produce.

Hotine Oblique Mercator Projection



Alaska Panhandle
Hotine Oblique Mercator Projection
Scale = 1
False Easting = 818676.73440112
False Northing = 575097.68887519
Central Scale Factor = .9999
Azimuth (Alpha) = -36.8698976
Central Latitude = 57
1st Meridian = -133.6667
Rotate U/V to X/Y = True
Offset by U = True

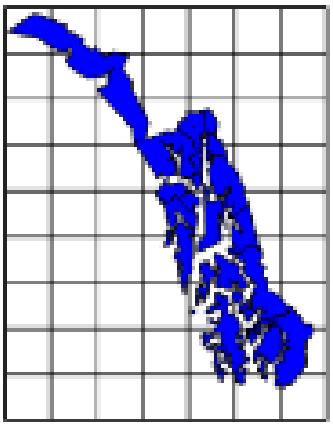
Projection Characteristics

The Hotine Oblique Mercator projection is a cylindrical, conformal projection. The scale is accurate along the chosen central line by the longitude/latitude settings below. This projection is useful for oblique areas (areas that do not follow lines of latitude and longitude), such as the Alaska panhandle because the central line does not have to follow a line of constant longitude. This projection is typically used with areas that are state or province sized and it is not suitable for maps of the world. There are two forms of the Hotine projection equation. The *Hotine Oblique Mercator* projection is defined by a point and an azimuth that defines a line (Alternate B, Snyder).

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Scale Factor (KO)	Specifies the central scaling factor for the projection. This value is often set to 1.0, but may be set to another value for specific applications.
Azimuth (Alpha)	The angle in degrees in which to rotate the central line. Zero is north, and rotation is clockwise. Value must be greater than -360 and less than +360. Value cannot equal 0, 360, or -360.
Central Latitude	Specifies the central latitude of the projection in degrees. The *Central Latitude* value typically should be defined as the latitudinal center of the map you are going to produce, and should typically be defined as the center of the map.
1st Meridian	Defines one end of the X extent for the central line.
Rotate U/V to X/Y	u,v are unrectified coordinates that follow the central line of the projection. x,y are rectified rectangular coordinates. When True, u,v are rotated to x,y. See Snyder page 70.
Offset by U	When True, u coordinates are offset to remove the *Us* center component, to normalize the origin of the u axis. This is typically required for State Plane coordinate systems that use the Hotine Oblique Mercator projection method.

Hotine Oblique Mercator 2-Point Projection



Aleutian Islands, Alaska
Hotine Oblique Mercator Projection
Scale = 1
False Easting = 0 False Northing = 0
Central Scale Factor = 1 Central Latitude = 0
Standard Parallel = 56 2nd Standard Parallel = 58
1st Meridian = -133 2nd Meridian = -135
Rotate U/V to X/Y = True
Offset by U = True

Projection Characteristics

The Hotine Oblique Mercator 2-Point projection is a cylindrical, conformal projection. The scale is accurate along the chosen central line by the longitude/latitude settings below. This projection is useful for oblique areas (areas that do not follow lines of latitude and longitude), such as the Alaska panhandle because the central line does not have to follow a line of constant longitude. This projection is typically used with areas that are state or province sized and it is not suitable for maps of the world. There are two forms of the Hotine projection equation. The *Hotine Oblique Mercator 2-Point* projection is defined by selecting two points to form a line (Alternate A, Snyder).

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Scale Factor (KO)	Specifies the central scaling factor for the projection. This value is often set to 1.0, but may be set to another value for specific applications.
Central Latitude	Specifies the central latitude of the projection in degrees. The *Central Latitude* value typically should be defined as the latitudinal center of the map you are going to produce, and should typically be defined as the center of the map.
Standard Parallel	Defines one end of the Y extent for the central line.
1st Meridian	Defines one end of the X extent for the central line.
2nd Standard Parallel	Defines the other end of the Y extent for the central line.
2nd Meridian	Defines the other end of the X extent for the central line.
Rotate U/V to X/Y	u,v are unrectified coordinates that follow the central line of the projection. x,y are rectified rectangular coordinates. When True, u,v are rotated to x,y. See Snyder page 70.
Offset by U	When True, u coordinates are offset to remove the *Us* center component, to normalize the origin of the u axis. This is typically required for State Plane coordinate systems that use the Hotine Oblique Mercator projection method.

Lambert Azimuthal Equal Area Projection

World Map
Lambert Azimuthal Equal Area Projection
Central Longitude: -90
Standard Parallel: 45

Projection Characteristics

Scale on a Lambert Azimuthal Equal Area projected map is accurate only from the center to any other point on the map. Distortion is minimal near the center and increases with distance from the center. This projection is useful for continents, polar regions (hemispheres), or smaller regions. The Lambert Azimuthal Equal Area projection is not generally used for world maps due to extreme distortion outside the center of the map.

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce.
Standard Parallel	Specifies the central latitude of the projection in degrees. The *Standard Parallel* value typically should be defined as the latitudinal center of the map you are going to produce.

Lambert Conformal Conic Projection

World Map
Lambert Conformal Conic Projection
Central Longitude: 0
Central Latitude: 0
Standard Parallel: 45
2nd Standard Parallel: 0

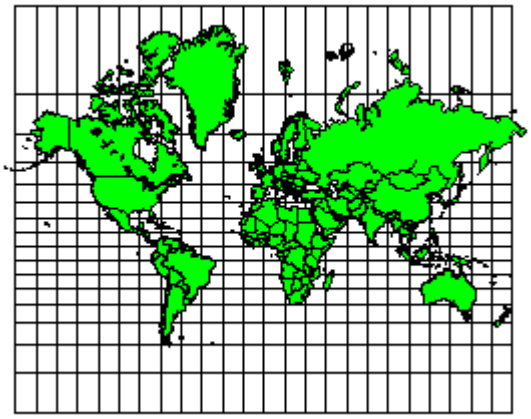
Projection Characteristics

In a Lambert Conformal Conic projection, scale is constant along any given parallel and accurate along the specified standard parallels. Scale is the same in all directions at any given point. This projection is useful for equal area maps of low-aspect regions (regions that are wider than they are tall). The pole is a point in the hemisphere containing the standard parallels and the graticules stretch to infinity in the other hemisphere. The Lambert Conformal Conic projection is used for many of the zones in the State Plane Coordinate System.

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce. For example, the value -95.5 represents the geographic center of the United States, so the map of the U.S. is drawn upright.
Central Latitude	Specifies the central latitude of the projection in degrees. The *Cetnral Latitude* value should be defined as the latitudinal center of the map you are going to produce. This value is only significant when you define *False Easting* and *False Northing* values.
Standard Parallel	Specifies the latitude of the first of two standard parallels, in degrees. The *Standard Parallels* typically are defined at approximately one-sixth of the distance inside the north and south limits of the map. For example, if your map latitude ranges from 30° to 36°, you could place your *Standard Parallels* at 31° and 35°. There are alternative methods for determining the best position of the standard parallels. Please see Snyder for more information.
2nd Standard Parallel	Specifies the latitude of the second of two standard parallels, in degrees. See above.

Mercator Projection



World Map
Mercator Projection
Central Longitude: 0
Central Latitude: 0

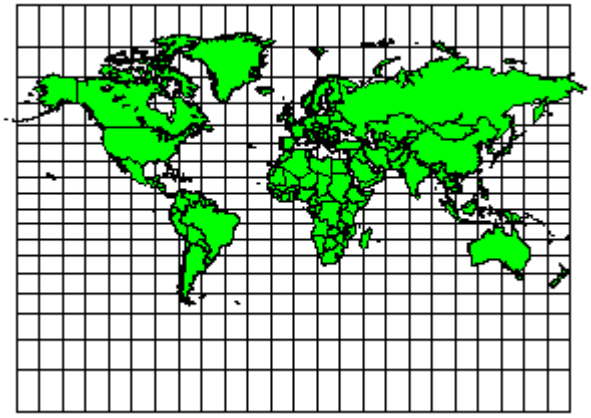
Projection Characteristics

The Mercator projection is a cylindrical projection and it is conformal. In a Mercator projection, scale is constant along any given parallel and accurate along the specified center latitude. Scale is the same in all directions near any given point. Distortion is minimal near the center parallel, but becomes extreme toward the poles. All lines of constant direction (rhumb lines) are known to be straight, thereby making this projection very desirable for producing navigational charts. A limitation of this projection is that coordinates at or near the poles cannot be projected due to constraints of the mathematical formulas used.

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce.
Central Latitude	Specifies the central latitude of the projection in degrees. The *Central Latitude* value typically should be defined as the latitudinal center of the map you are going to produce.

Miller Cylindrical Projection



World Map
Miller Cylindrical Projection
Central Longitude: 0

Projection Characteristics

Scale is constant along any given parallel and accurate along the equator in a Miller Cylindrical projection. Scale is the same in all directions near any given point. Miller Cylindrical projection maps use variable latitudinal scale as a way to minimize distortion as you move north or south from the equator. The method effectively corrects for the relative distances covered by one degree of longitude relative to one degree of latitude as you move away from the equator. Distortion is minimal near the equator, but becomes extreme toward the poles. Miller Cylindrical maps do not represent relative land areas accurately, but do approximate the relative shapes of individual land areas. Miller Cylindrical projection maps are useful for displaying the entire world.

Projection Parameters

Parameter	Description
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. This value should be defined as the longitudinal center of the map you are going to produce. This value is only significant when you define *False Easting* and *False Northing* values and it has no apparent effect on the map.

Mollweide Projection

World Map
Mollweide Projection
Central Longitude: 0

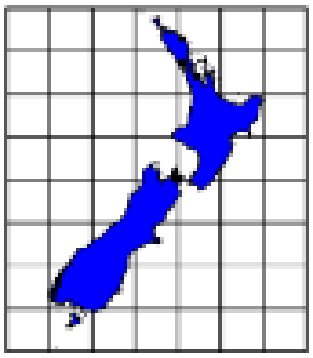
Projection Characteristics

The Mollweide projection is a pseudo-cylindrical, equal area projection. Scale is constant along any given parallel, and true along 40°44' north and south. The central longitude is half the length of the equator. This projection was designed to produce aesthetically pleasing world maps.

Projection Parameters

Parameter	Description
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce.

New Zealand Map Grid



New Zealand
New Zealand Map Grid Projection
False Easting: 2510000
False Northing: 6023150
Scale = 1

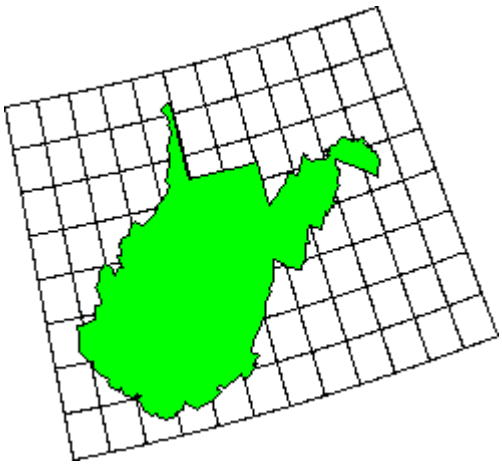
Projection Characteristics

The New Zealand Map Grid projection is a modified cylindrical projection and is conformal. It is a sixth-order conformal modification of the Mercator projection using the International spheroid. Scale is constant along any given parallel and is highly accurate for New Zealand. Scale is the same in all directions near any given point. Distortion is minimal near 173° East, 41° South, and becomes more distorted the further from this location. This projection should only be used for large-scale maps of New Zealand and is not useful outside of New Zealand.

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not change them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.

Oblique Mercator Projection



State of West Virginia
Oblique Mercator Projection
Scale = 1
Central Scale Factor (KO) = 1
1st Meridian = -132.27
Standard Parallel = 55.95
2nd Meridian = -177.22
2nd Standard Parallel = 52.45

Projection Characteristics

The Oblique Mercator projection is a cylindrical, conformal projection. The scale is accurate along the chosen central line by the longitude and latitude settings below (1st Point and 2nd Point). This projection is used for oblique areas which are areas that do not follow lines of latitude and longitude, such as the Alaska panhandle. This projection is usually used with areas that are state or province sized. This projection is not suitable for maps of the world.

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
1st Meridian	Defines one end of the X extent for the central line.
Standard Parallel	Defines one end of the Y extent for the central line.
2nd Meridian	Defines the other end of the X extent for the central line.
2nd Standard Parallel	Defines the other end of the Y extent for the central line.
Central Scale Factor (KO)	Specifies the central scaling factor for the projection. This value is often set to 1.0, but may be set to another value for specific applications.

Orthographic Projection

World Map
Orthographic Projection
Central Longitude: -90
Central Latitude: 45

Projection Characteristics

The Orthographic projection is an azimuthal projection. In an Orthographic projection, scale is accurate at the center and along any circle circumscribed around the center. Distortion is nil at the center, and increasingly extreme with increasing distance from the center. This projection is useful for "view of globe" or "view from space" pictures of the Earth. A limitation of this projection is that the hemisphere facing away from the center of the projection is not visible. Objects near the edge of the visible hemisphere may be clipped.

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce.
Central Latitude	Specifies the central latitude of the projection in degrees. The *Central Latitude* value typically should be defined as the latitudinal center of the map you are going to produce.

Polyconic Projection

World Map
Polyconic Projection
Central Longitude: 0
Central Latitude: 0

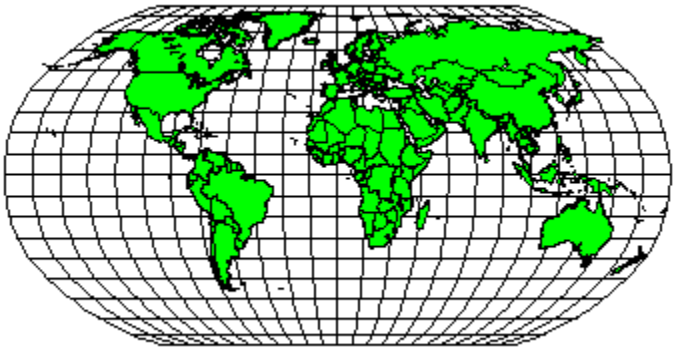
Projection Characteristics

The Polyconic projection is useful for maps of continental or smaller regions. Generally, this projection is not used for world maps due to extreme distortion at any significant distance from the center of the projection. Only the central meridian is distortion-free. Notice in the sample map shown above that Africa is relatively undistorted, but the rest of the world is barely recognizable. Scale is true along the central longitude and along each parallel.

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce.
Central Latitude	Specifies the central latitude of the projection in degrees. The *Central Latitude* value typically should be defined as the latitudinal center of the map you are going to produce.

Robinson and Robinson-Sterling Projections



World Map
Robinson-Sterling Projection
Central Longitude: 0

Projection Characteristics

These projections are pseudo-cylindrical. Scale and area are always distorted by the Robinson and Robinson-Sterling projections. These projections are designed to produce aesthetically pleasing world maps.

The Robinson and Robinson-Sterling projections produce visually similar results, but use two entirely different mathematical processes. As a result, the numeric values of the projected coordinates produced by these two methods are slightly different. For most applications, these differences are not significant.

Projection Parameters

Parameter	Description
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce. This option is available for the Robinson-Sterling projection.

Sinusoidal Projection

World Map
Sinusoidal Projection
Central Longitude: 0

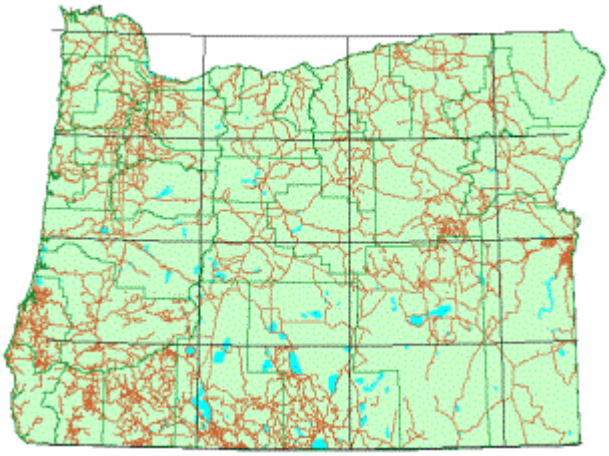
Projection Characteristics

The Sinusoidal projection is a pseudo-cylindrical, equal area projection. Scale is accurate along any given parallel and along the specified central longitude. This projection is useful for continental or world maps, particularly for high-aspect regions (regions taller than they are wide). To get good results with the Sinusoidal projection, the map must have coordinates between +/-180 degrees longitude and +/- 90 degrees latitude.

Projection Parameters

Parameter	Description
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce.

State Plane Coordinate System



State of Oregon
State Plane Coordinate System of 1983
Projection for Oregon North Zone

Projection Characteristics

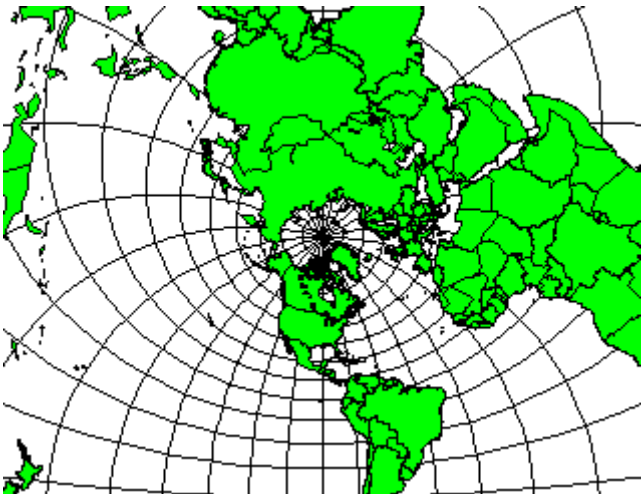
The State Plane Coordinate System (SPCS) divides the United States into a number of zones, and defines a different projection for each zone such that a suitable map of any given zone is plotted. SPCS is used mainly for intrastate views such as county or parish maps.

Unlike most forms of projection where the datum may be specified separately, the SPCS is tied to a specific datum. There are two State Plane Coordinate Systems commonly used. The State Plane Coordinate System of 1927 uses the North American Datum of 1927 (NAD27), while the State Plane Coordinate System of 1983 uses the North American Datum of 1983 (NAD83).

Projection Parameters

Parameter	Description
Zone	Specifies which one of the predefined zones to use for this coordinate system.
Feet or Meters	Most SPCS have both a meters and feet option available in the predefined list.

Stereographic Projection



North America
(Other continents included to show distortion of objects far away from projection center)
Stereographic Projection
Central Longitude: -90
Central Latitude: 45

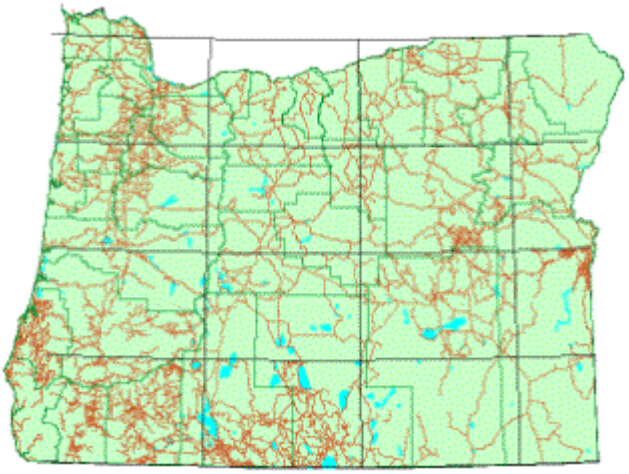
Projection Characteristics

The Stereographic projection is an azimuthal, conformal projection. In a Stereographic projection, scale is constant along any circle circumscribed around the center of the projection. Distortion is minimal at the center and becomes extreme with distance from the center. Generally, this projection is not used for regions larger than a continent or a hemisphere due to distortion effects. The Stereographic projection is often used for maps of the poles.

Projection Parameters

Parameter	Description
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Scale Factor (KO)	Specifies the central scaling factor for the projection. This value is often set to 1.0, but may be set to another value for specific applications.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce.
Central Latitude	Specifies the central latitude of the projection in degrees. The *Central Latitude* value typically should be defined as the latitudinal center of the map you are going to produce.

Transverse Mercator Projection



State of Oregon
Transverse Mercator Projection
Central Latitude: 41.75
Central Longitude: -120.5

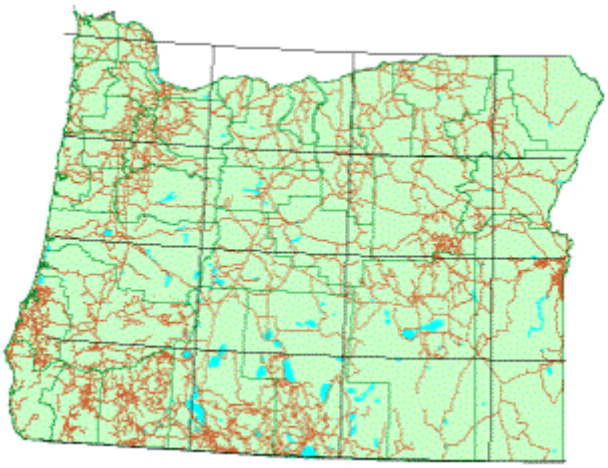
Projection Characteristics

The Transverse Mercator projection is also known as the Gauss-Kruger projection or the Gauss Conformal projection. This projection is cylindrical and conformal. In this projection, scale is constant along any straight line that is parallel to the specified central longitude. Scale increases with distance from the central longitude. Distortion is minimal near the center of the projection and increases dramatically with distance from the center. Distortion is considerable when projecting coordinates that fall within a few degrees of the poles. This projection is useful primarily for mapping small regions no more than a few degrees across, particularly high-aspect regions (regions taller than they are wide). A limitation of this projection is that coordinates at or near the poles cannot be projected. An additional limitation is that regions larger than a quadrant (e.g. having greater than 90 degrees extent either vertically or horizontally) result in portions of the projected image folding over each other due to constraints of the mathematical formulas used. The projection is best used with areas that are no greater than 30 degrees wide or tall, and preferably with areas that are much smaller.

Projection Parameters

Parameter	Description
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Scale Factor (KO)	Specifies the central scaling factor for the projection. This value is often set to 1.0, but may be set to another value for specific applications.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce.
Central Latitude	Specifies the central latitude of the projection in degrees. The *Central Latitude* value typically should be defined as the latitudinal center of the map you are going to produce.

Universal Transverse Mercator (UTM) Projections



State of Oregon
Universal Transverse Mercator Projection
Zone 11 North
Central Latitude: 41.75
Central Longitude: -120.5

Projection Characteristics

The Universal Transverse Mercator system, commonly known as UTM, divides the Earth into sixty discrete zones, each representing a vertical slice of the globe spanning six degrees of longitude. A Transverse Mercator projection is applied to each zone with the central longitude of the projection at the center of the given zone and the central latitude of the projection at the equator. This coordinate system is the basis for many standardized regional maps, such as tract or neighborhood maps by the US Census Bureau and topographic quadrangles by the US Geological Survey. UTM is not generally used for coordinates outside the range of -80 to +84 degrees latitude due to the distortion inherent in Transverse Mercator projections near the poles.

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
Central Scale Factor (KO)	Specifies the central scaling factor for the projection. This value is often set to 1.0, but may be set to another value for specific applications.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce. For example, the value -95.5 represents the geographic center of the United States, so the map of the U.S. is drawn upright.
Central Latitude	Specifies the central latitude of the projection in degrees. The *Central Latitude* value typically should be defined as the latitudinal center of the map you are going to produce.
Projection in Southern Hemisphere	Choose True if your map is in the southern hemisphere. Choose False if your map is in the northern hemisphere.

Van der Grinten Projection

World Map
Van der Grinten Projection
Central Longitude: 0

Projection Characteristics

This projection is typically used for maps of the world and the scale is accurate along the equator. This projection was used by the National Geographic for world maps. The central longitude and the equator are straight lines and the poles are greatly distorted.

To get good results with the Van der Grinten projection, the map must have coordinates between +/-180 degrees longitude and +/- 90 degrees latitude. **MapViewer** does not wrap around +/-180 degrees longitude. The example map is using world-proj.gsb as the base map. If you are using world-scale maps, the central longitude generally cannot be set far from 0 degrees since there is no wrap around in **MapViewer**.

Projection Parameters

Parameter	**Description**
Name	Specifies the units used in the map.
Scale	Specifies the unit scale of the projected map, relative to meters. For example, a scale of one means one unit in the projected map equals one meter; a scale of two means two units in the projected map equal one meter; etc.
False Easting	Specifies the false easting, or horizontal offset, of the projected coordinates, in meters. *False Eastings* and *False Northings* are added to the underlying "projected" coordinates as a way to arbitrarily offset their internal XY coordinates after the projection. Unless you have a reason for using these offset values, do not use them. These values do not affect the latitude/longitude coordinates for the map, only the internal coordinates used to plot the map on the screen. If you use *False Easting* and *False Northing* offsets for a map, any subsequent boundaries you append to the map must also use these same offsets if you want the imported boundaries to be drawn in the correct relative position to the existing boundaries.
False Northing	Specifies the false northing, or vertical offset, of the projected coordinates, in meters. See above.
Central Longitude	Specifies the central longitude of the projection in degrees. The *Central Longitude* value typically should be defined as the longitudinal center of the map you are going to produce.

Projection References

Dent, Borden D., *Cartography, Thematic Map Design*, Wm. C. Brown Publishers, Dubuque, 1990.

Greenhood, David, *Mapping*, The University of Chicago Press, Chicago, 1964, pp. 113-171.

Robinson, A.H., et al., *Elements of Cartography*, Fifth Edition, John Wiley & Sons, New York, 1984, pp. 75-105.

Snyder, John P., *Map Projections - A Working Manual*, U.S. Geological Survey Professional Paper 1395, Washington D.C., Department of the Interior, 1987.

Coordinate Systems Overview, http://www.colorado.edu/geography/gcraft/notes/coordsys/coordsys_f.html, July 2, 2001.

Map Projection Overview, http://www.colorado.edu/geography/gcraft/notes/mapproj/mapproj_f.html, July 2, 2001.

Map Projection Home Page, http://www.geography.hunter.cuny.edu/mp/, June 16, 2004.

Datums, Ellipsoids, Grids, and Grid Reference Systems, Defense Mapping Agency Technical Manual 8358.1, http://earth-info.nga.mil/GandG/tm83581/toc.htm, August 2, 2004.

Matching the Map Projection to the Need, http://www.gis.psu.edu/projection/, June 16, 2004.

Chapter 36

Importing, Exporting, and Printing

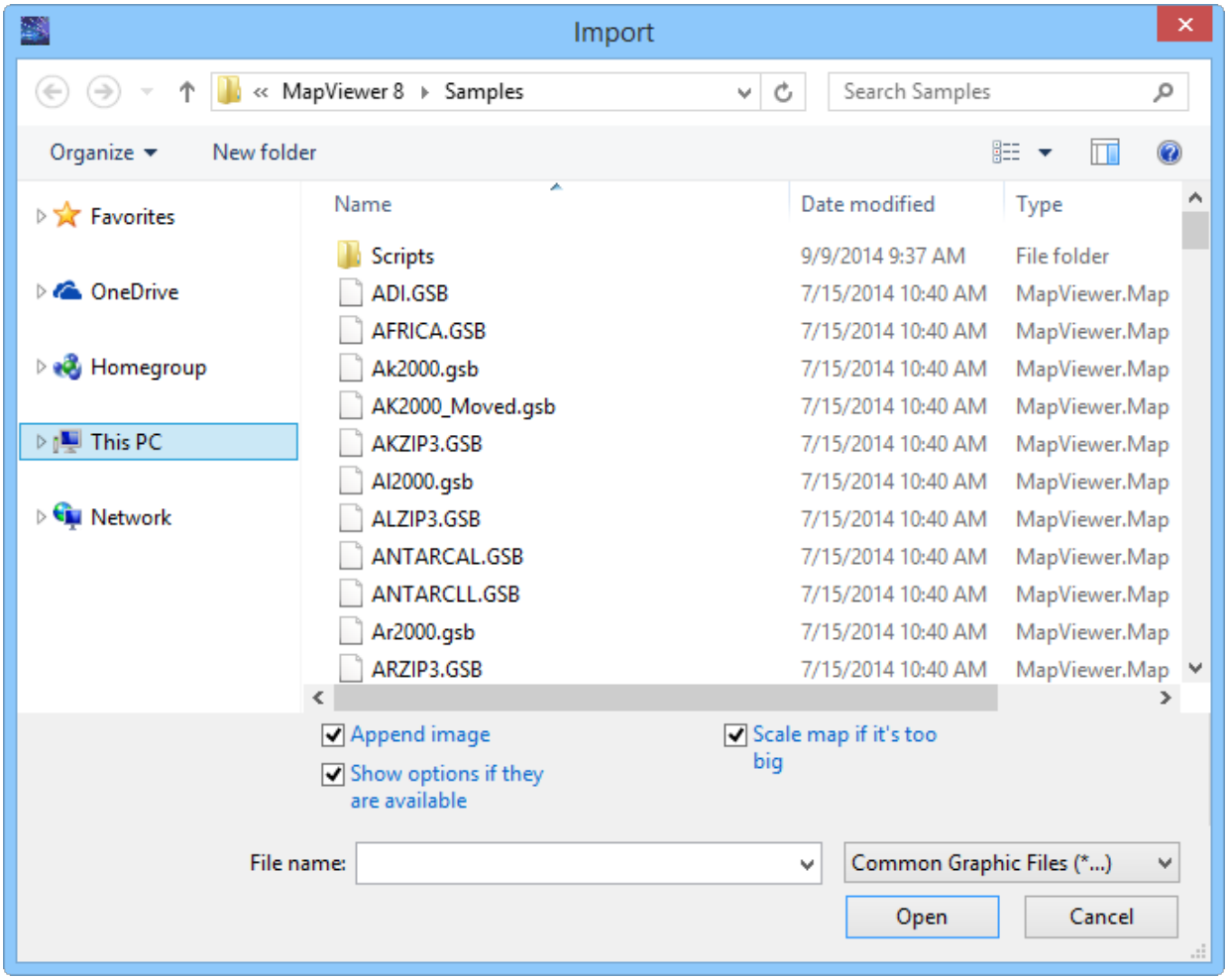
Import - Plot

You can import graphic files in **MapViewer** with the **File | Import** command. The **File | Import** command is similar to the **Map | New | Base Map** command except that the file is imported as a grouped graphic object rather than as a map.

Click the **File | Import** command, or click the button, to import graphic "trim" objects, background graphics, or some form of annotation. Use **Map | Create Map | Base** to import boundary information suitable for overlaying on top of other map types.

The Import Dialog

The **File | Import** command in the plot opens the **Import** dialog.



*Specify files to import using the **Import** dialog.*

Look In

The *Look in* field shows the current directory. Click the down arrow to see the directory structure. Click on the folders to change directories.

Creating New Folders and Changing the View

The buttons to the right of the *Look in* field allow you to create new folders and change the view of the file list.

File List

The file list displays files in the current directory. The current directory is listed in the *Look in* field. The *Files of type* field controls the display of the file list. For example, if *Golden Software Boundary (*.GSB)* is listed in the *Files of type* field only .GSB files appear in the files list. To see all files in the directory, choose *All Files (*.*)* from the *Files of type* list. Double-click on a file to open it or single-click the file and then click the *Open* button.

File Name

The *File name* field shows the name of the selected file. Also, a path and file name can be typed into the box to open a file.

Files of Type

The *Files of type* field shows the file format to be opened. To change the file format, click the down arrow and select the file type from the list.

The *Common Graphic Files (*...)* format type is selected by default. This displays all the file formats that can be imported with **File | Import** in the navigation pane. If a different format type is selected, **Surfer** will remember the setting until the end of the current session. When **Surfer** is restarted, the default format type will be used.

To see all files in the directory, choose *All Files (*.*)* from the *Files of type* list. Double-click on a file to open it or single-click the file and then click the *Open* button. The *All Files (*.*)* option shows all of the file formats in the current directory, even if the file type is not appropriate for the action chosen.

Import Format Types

The **File | Import** command in the plot document opens the **Import** dialog. In the **Import** dialog, select one of the following formats to import data into the worksheet.

- AN? ACR-NEMA Medical Image (*.an1, *.an2)
- BLN Golden Software Blanking (*.bln)
- BMP Windows Bitmap (*.bmp)
- BNA Atlas Boundary (*.bna)
- DICOm3 Medical Image (*.dic, *.dcm)
- DDF SDTS TVP (*.ddf, *.tar, *.tar.gz, *.zip, *.tgz)
- DLG USGS Digital Line Graph (*.dlg, *.lgo, *.lgs)
- DXF AutoCAD Drawing (*.dxf)
- E00 ESRI ArcInfo Export Format (*.e00)

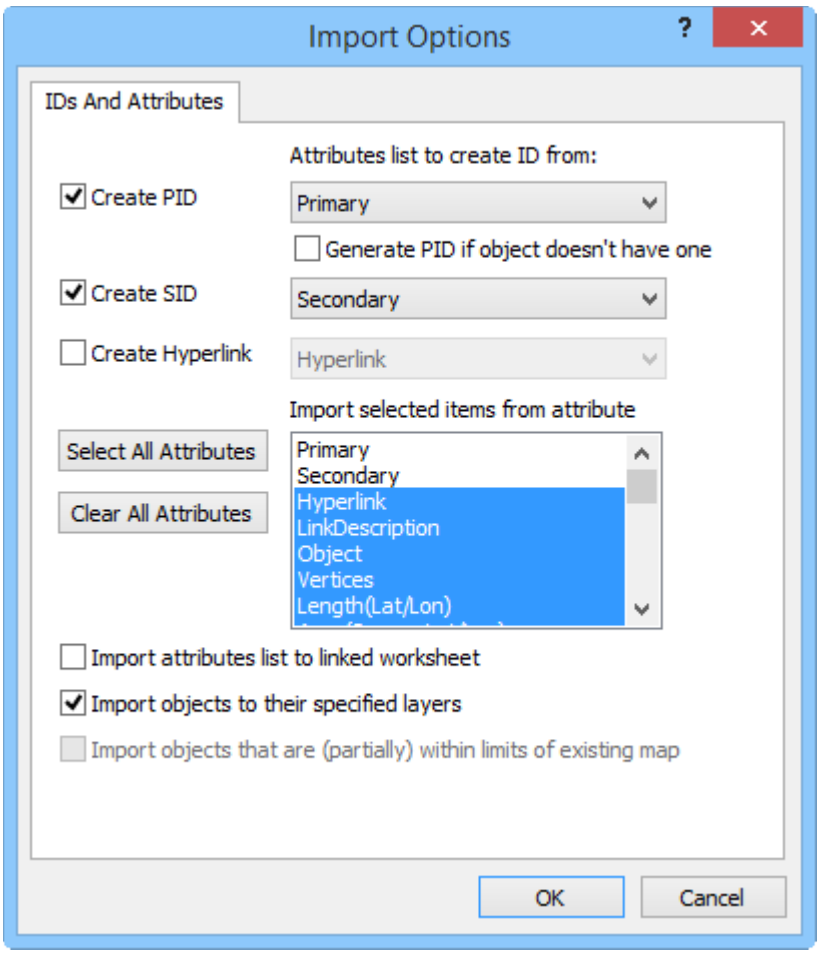
- ECW ERMapper (*.ecw)
- EMF Windows Enhanced Metafile (*.emf)
- GIF Image (*.gif)
- GSB Golden Software Boundary (*.gsb)
- GSI Golden Software Interchange (*.gsi)
- JPG Compressed BItmap (*.jpg, *.jpeg)
- JPEG-2000 Bitmap (*.jp2, *.j2k, *.jpc, *.jpt, *.jpeg2000, *.j2000)
- KML KMZ Google Earth Keyhole Markup (*.kml, *.kmz)
- MIF MapInfo Interchange Format (*.mif)
- PDF Adobe PDF (Raster) (*.pdf)
- PLT Golden Software PlotCall (*.plt)
- PLY Stanford PLY (*.ply)
- PNG Portable Network Graphics (*.png)
- PNM/PPM/PGM/PBM Image (*.pnm, *.ppm, *.pgn, *.pbm)
- RGB SGI-RGB Image (*.rgb, *.rgba, *.bw)
- SEG-P1 Exchange Format (*.sp1, *.seg)
- SHP ESRI Shapefile (*.shp)
- SID LizardTech MrSID Image (*.sid)
- SUN Sun Raster Image (*.ras, *.sun)
- TGA Targa (TrueVision) (*.tga)
- TIF Tagged Image (*.tif, *.tiff)
- WMF Windows Metafile (*.wmf)
- X AVS X-Image (*.x, *.ximg)

Remarks

- To open Golden Software Blanking .BLN and Atlas Boundary .BNA files in the worksheet use **File | Open** rather than **File | Import**.
- Images are typically imported into **MapViewer** as a base map.
- Where applicable, **MapViewer** automatically imports all available attribute information.

Import ID Options

The **Import Options** dialog lets you assign the primary IDs, secondary IDs, attributes, and hyperlinks for a boundary file. You must have the *Specify import options* box checked in the Import dialog to access the **Import Options** dialog.



Select IDs and attributes to import with the boundary file in the **Import Options Dialog**.

IDs and Hyperlinks

To assign IDs and hyperlinks, check the box and then use the lists to the right of the corresponding ID name. The lists include all the available IDs, which varies from boundary file to boundary file. Attributes are automatically deselected in the list when they are selected for the PID, SID, or Hyperlink.

Import to Worksheet

Check the *Import attributes list to linked worksheet* check box to include the attributes and their values for each object in the linked worksheet. This option is useful if the file was exported with the linked worksheet data as attributes.

Map Limits

Check the *Import objects that are (partially) within the limits of the existing map* box to import objects that are at least partially included within the existing map limits. This imports the entire object that touches the map limits so the map limits may be slightly adjusted after import.

Georeferenced Images

Georeferenced bitmaps can be imported into and exported from **MapViewer**.

Import

If you are importing a georeferenced bitmap, you must have the *Specify import options* box checked in the **Import Boundary File** dialog to utilize the georeferencing information. During the import, the **Bitmap Import Options** dialog appears. This dialog allows you to choose from the available spatial reference options for the particular bitmap file. If one or more sources of spatial reference information are available for the bitmap file, a *Spatial Reference* list is displayed, allowing you to choose the source to use.

Export

Most bitmap file storage formats do not have a way to store the spatial reference information in the same file as the bitmap. For these formats, the only way the spatial reference information can be saved is in a separate file. One bitmap storage format, GeoTIFF (Geographic Tagged Image File Format), allows the spatial reference information to be stored in one file along with the image.

If *Ignore Spatial Reference Information* is chosen, spatial reference information is saved. If *Save Spatial Information* is chosen, any available spatial reference information will be saved, depending on the selected export options.

Spatial Information

Recognized sources of spatial information include:

Option	Description
None	Choose this option if you do not want spatial reference information to be passed to the program, even if it is available. This option imports the bitmap with pixel coordinates. (Import)
Embedded GeoTIFF Parameters	This option is only available if a TIFF (Tagged Image File Format) file is selected. When this option is selected, the spatial reference information is extracted from GeoTIFF tags embedded within the file. GeoTIFF is a vendor-independent format that can be generated by a variety of geographic software packages.
Golden Software Reference [.GSR] File	This option is available upon import if a [.GSR] file of the same name as the selected bitmap is found in the directory. Golden Software supports a text-based format for storing spatial reference information in a separate file.
Blue Marble [.RSF] File	This option is available upon import if a [.RSF] file of the same name as the selected bitmap is found in the directory. Blue Marble Geographics supports a text-based format for storing georeference information in a separate file.
ESRI World File	This option is available upon import if a world file of the same name as the selected bitmap is found in the directory. Environmental Sciences Research Institute (ESRI) supports a text-based format for storing georeference information in a separate file. The world file extension is created with the first and third characters of the bitmap file extension plus a final " w." For example, BITMAP.TIF would have an associated world file of BITMAP.TFW.

Projecting Images

If you import a georeferenced image into **MapViewer** that contains projection-specific information, the image is projected in the plot window. It is also possible to change the projection of an image with the **Assign Coordinate System** dialog or **Map | Plot | Calibrate** command. However, there are certain limitations that apply to projecting bitmaps. The recommended maximum bitmap size for projection is 5000 pixels in the longest dimension. If you try to change the projection of a bitmap that is larger than the recommended size limit, the resulting bitmap will likely contain some distortion and loss of resolution.

The bitmap projecting process requires a very large amount of memory. Here is a rough memory calculation (in bytes): width resolution x height resolution x 3 x 2.7. For example, a bitmap with the

resolution 5000 x 6000 requires 5000 x 6000 x 3 x 2.7 = 243000000 bytes (about 230 MB) of extra memory during projection .

To disable the ability to project bitmaps, go to **File | Options** and uncheck the *Project bitmaps* option. This option is useful if you have large bitmaps (>5000 pixels in the longest dimension) in the plot window and you do not want the bitmap to become distorted or degraded. It is also recommended that you use this option if you have bitmaps in the plot window that compliment the map layout (such as a company logo). When the *Project bitmaps* option is disabled, these bitmaps are not projected when you change the map projection.

Data File Formats

MapViewer can open and save data in several data file formats. The File Format Chart shows file types supported by **MapViewer**. A variety of commands in the plot document and worksheet document can be used to open or save data. The commands are summarized below:

Open/Import Data File Commands

- **File | Open** in the plot or worksheet window
- Open button on the Quick Access Toolbar
- **Home | Data | Load** in the plot window
- **Data | Edit | Import** in the worksheet window

Save Data File Formats

- **File | Save As** in the worksheet document

When you import these files into the worksheet, **MapViewer** converts the data into a worksheet format. You cannot save these types of files in their native formats, but you can save the files in any of the available worksheet Save As formats.

Export

The **File | Export** command saves files as graphic files to use in other programs.

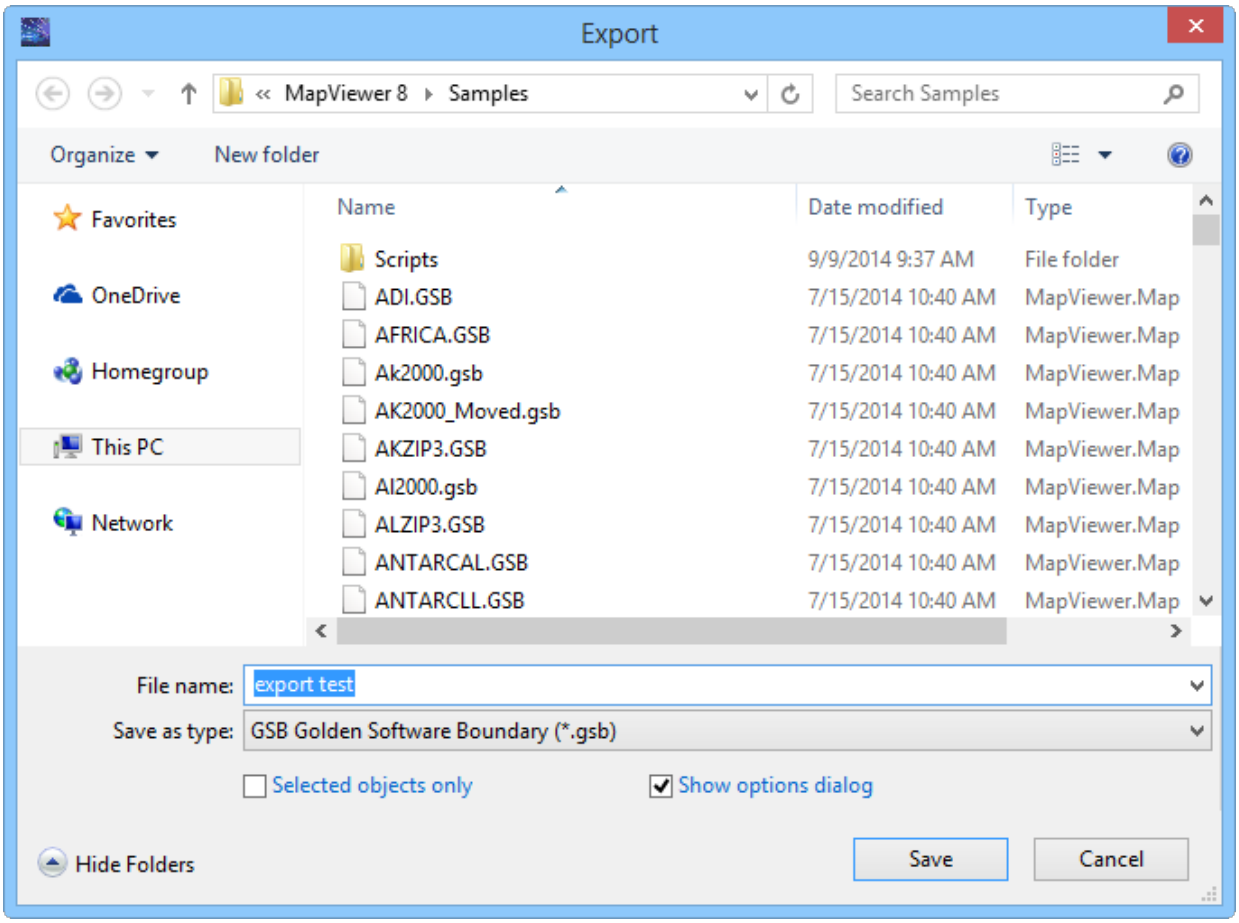
Click the **File | Export** command, or the  button, to open the **Export** dialog. The **File | Export** command is disabled if there are no objects in the **MapViewer** document.

Attribute Information

Where applicable, the export filter exports attribute information for lines, polygons, and symbols. With contour maps, the **File | Export** command can be used to export Z information to an attribute field for BLN, BNA, GSB, GSI, KML, KMZ, MIF, and SHP files.

The Export Dialog

Click the **File | Export** command to open the **Export** dialog.



*Specify the save location, file name, and file type in the **Export** dialog.*

Save In

The *Save in* field shows the current directory. Click the down arrow to see the directory structure and click on the folders to change directories. The buttons to the right of the *Save in* field allow you to create new folders and change the view of the file list.

File List

The file list displays the files using the extension specified in the *Save as type* box. A file can be overwritten by selecting it from the file list.

File Name

The *File name* box displays the name of the selected file, or type in the path and file name of the file to be exported.

Save As Type

The *Save as type* list box specifies the format of the file to be exported.

Selected Objects Only

Check the *Selected objects only* box to export selected objects rather than the entire plot.

Show Options Dialog

Check the *Show options dialog* option to display the **Export Options** dialog for the selected *Save as type.* If the *Show options dialog* option is selected when the *Save* button is clicked, the **Export Options** dialog appears. The Scaling page and Size and Color page of the **Export Options** dialog is uniform. Additional pages in the **Export Options** dialog may be available dependent on the export format type.

File Name

Export files typing a name into the *File name* box and then selecting the file type in the *Save as type* list. For example, typing MYPLOT in the *File name* box and choosing *Tagged Image (TIFF)* from the *Save as type* list results in MYPLOT.TIF. There is no need to type in an extension because it is automatically added. If a file extension is typed in the box along with the file name, the file type is determined by the typed extension. For example, if MYPLOT.DXF is typed in the *File name* box, the resulting file is in the AutoCAD DXF format, no matter what is set in the *Save as type* field.

Projected Coordinates

If the map that you are exporting is in a defined coordinate system, the Spatial References tab will appear after clicking *Save*. This dialog allows you to specify the file format to which you want to save the projected information. Check the desired file formats. It is recommend that *GS Reference (Version 2) file* option be checked to generate a .GSR2 file. Click *OK* and the file is saved.

Export Format Types

The file specific page in the **Export Options** dialog is specific to the export type you selected.

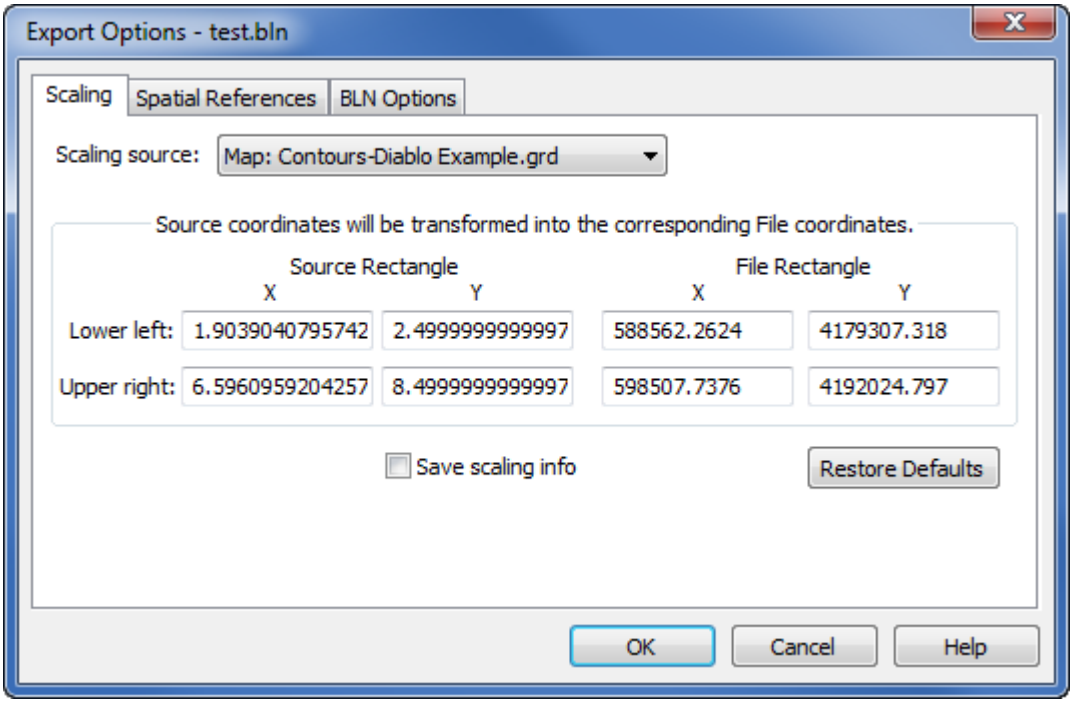
MapViewer supports the following export format types:

- BLN Golden Software Blanking (*.bln)
- BMP Windows Bitmap Image (*.bmp)
- BNA Atlas Boundary (*.bna)
- DXF AutoCAD Drawing (*.dxf)
- EMF Windows Enhanced Metafile (*.emf)
- EPS Encapsulated Postscript (*.eps)
- GIF Image (*.gif)
- GSB Golden Software Boundary (*.gsb)
- GSI Golden Software Interchange (*.gsi)
- JPG Compressed Bitmap Image (*.jpg, *.jpeg)
- JP2 JPEG2000 Interchange Format (*.jp2, *.jpeg2000)
- KML Google Earth KML (*.kml)
- KMZ Google Earth KMZ (*.kmz)
- MIF MapInfo Interchange Format (*.mif)
- PDF (Vector) (*.pdf)

- PDF (Raster) (*.pdf)
- PNG Portable Network Graphics (*.png)
- PNM Image (*.pnm)
- RGB SGI-RGB Image (*.rgb, *.rgba, *.bw)
- SHP ESRI Shapefile (*.shp)
- SUN Sun Raster Image (*.ras, *.sun)
- SVG Scalable Vector Graphics (*.svg)
- TGA Targa (TrueVision) (*.tga)
- TIF Tagged Image (*.tif, *.tiff)
- WMF Windows Metafile (*.wmf)
- X AVS X-Image (*.x, *.ximg)

Export Options Dialog - Scaling Page

Many of the file formats have a **Scaling** page in the **Export Options** dialog.



*Specify scaling options on the **Scaling** page of the **Export Options** dialog.*

Scaling Source

Scaling information can be retrieved from multiple sources: *Paper space (page units)*, all map frame names in the **MapViewer** file, any coordinate system for each image in the **MapViewer** file, and *Saved settings*. To select the appropriate map, click on the existing map name and select the desired map from the list. All objects are exported with the coordinates from the *Scaling source*.

MapViewer provides potentially useful scaling info whenever possible. If a single *Map* is selected in the plot window, the map coordinate system is used for the *Coordinate System*. If a single image is selected in the plot window, the coordinate system for the image is used for the *Coordinate System*. If more than one *Map* object is selected, the *Coordinate System* is set to *Paper space (page units)*. This can be changed to any of the *Map* coordinate systems in the list and all objects will be exported to this coordinate system.

If the application detects an unrotated 3-dimensional map object that is viewed from directly overhead (i.e., it is really a 2-D map object) and that map object is the only object being exported, it retrieves the (X,Y) data extents from the map and makes those the *Scaling source*. Otherwise, the application sets the *Scaling source* to *Paper space (page units)* so the coordinates will be the same as the document page units.

Paper Space

Paper space (page units) sets both the *Source Rectangle* and *File Rectangle* to page units.

Map Coordinates

Selecting any *map* or *image* from the *Scaling source* will load scaling info calculated by the application for the selected map or image.

Saved Settings

Saved settings will reload previously saved values.

Rectangle

Rectangle scaling is accomplished by specifying the corner points of a rectangle (in page units for the *Source Rectangle*) in the application document and the corner points of a rectangle (in *Scaling source* map units for *File Rectangle*). The document coordinates will be offset and/or scaled so the corner points of the document rectangle will have the desired coordinates.

The *Page Rectangle* lists two points on the page in the page coordinates. The *File Rectangle* lists the same two points on the page in the *Scaling source* coordinates.

Save Scaling Info

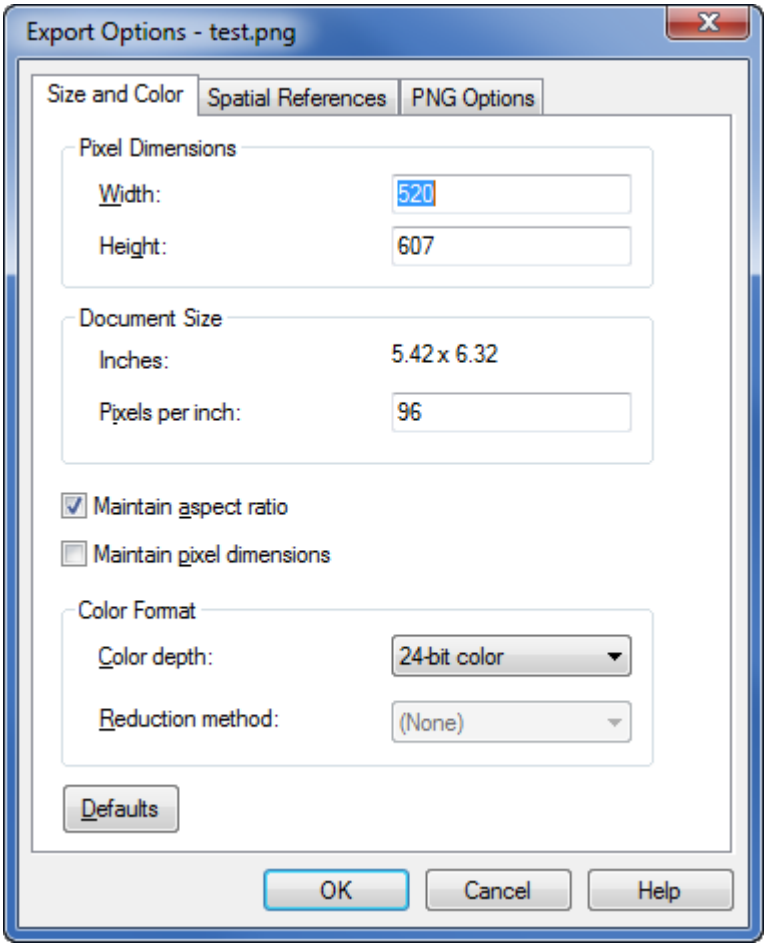
Check the box next to the *Save scaling info* option to save the scaling information to be stored for future use.

Defaults

Click the *Restore Defaults* button to set all options to default conditions. The scaling rectangles will, in turn, be reloaded with values from the default scaling source.

Export Options Dialog - Size and Color Page

All image export formats have a **Size and Color** page in the **Export Options** dialog.



*The **Size and Color** page of the **Export Options** dialog controls options for image export.*

Pixel Dimensions

Choose the *Width* and *Height* pixel settings for the image. The *Pixel Dimensions* indicate the number of pixels that are in the exported image. The larger the number of pixels, the larger the output image will be.

Document Size

The *Inches* displays the current selected image size in inches. The image size is updated when the *Pixel Dimensions* are adjusted. The size in inches is determined by dividing the number of *Pixel Dimensions* by the *Pixels per inch* and rounding to the hundredths.

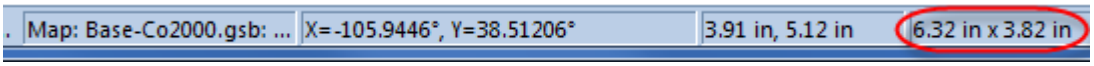
When the *Pixels dimensions* have not been changed, the *Inches* is approximately equal to the size of the objects being exported. To determine this size, click once on the object to select it or select all objects that are being exported. The status bar will list the size of the selected objects.

Pixels Per Inch

Choose the *Pixels per inch* to increase or decrease the resolution of the image being exported. If you choose to change the number of *Pixels per inch*, the *Width* and *Height* in the *Image Dimensions* changes accordingly. The *Pixels per inch* control how fine a resolution the output image will have. The larger the number of *Dots per inch*, the larger the *Pixel Dimensions* will be.

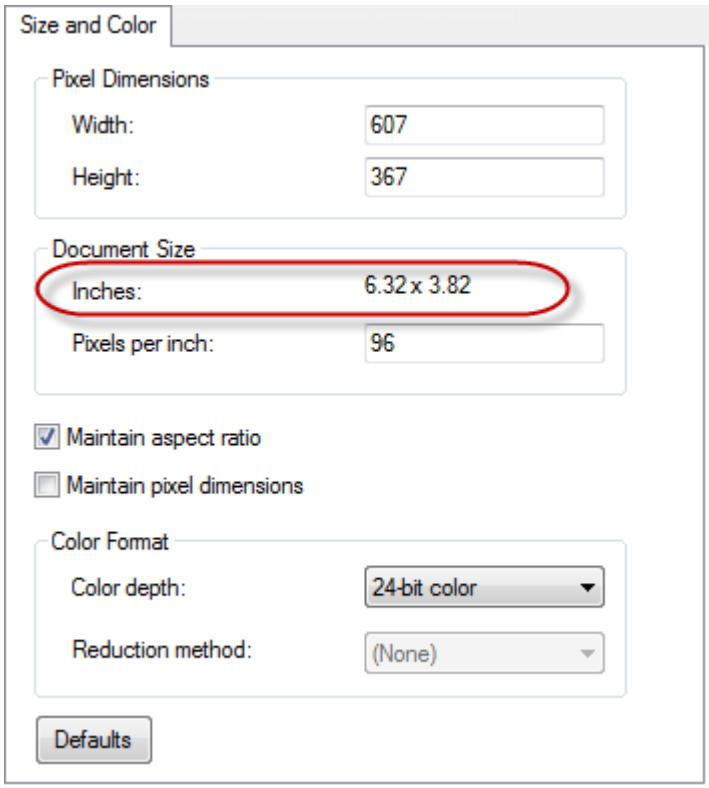
Example

For example, a base map is selected. The status bar reports that the size of the map is 6.32 in x 3.82 in.



The status bar shows the size of the objects being exported.

When this map is exported, the **Size and Color** tab shows the *Inches* as 6.32 by 3.82.



The size is approximately equal to the page size of the objects being exported.

Maintain Aspect Ratio

Check the *Maintain aspect ratio* box if you want the image to maintain an equal horizontal and vertical resolution. When unchecked, the output image may appear stretched in one of the directions.

Maintain Pixel Dimensions

Check the *Maintain pixel dimensions* box to export the image at the selected *Width* and *Height*, but with a different number of *Pixels per inch*. This results in the same number of pixels, but a different *Document Size*.

Color Format

The *Color Format* gives you the option to output your image with *Color depth.* The greater the color depth, the more faithfully the image will represent the colors assigned to objects in your document. Different output formats support different color depths. Some output formats support 256 colors only, while others also support True Color (16 million colors).

Select one of the options from the *Color Depth* list. The options are: *8-bit grayscale*, *16-bit grayscale*, *32-bit grayscale*, *1-bit color indexed*, *4-bit color indexed*, *8-bit color indexed*, *24-bit true color,* or *32-bit true color with alpha*.

For example, Windows .BMP format supports *monochrome*, *16 colors*, *256 colors* and *True Colo*r. Greater color depth will yield a better-looking image, but at the expense of requiring more memory and disk space to hold the image.

Reduction Method

If you select a color indexed *Color Depth*, you can choose a *Reduction method*. Select one of the options from the *Reduction method* list. The options are: *Ordered Dither*, *Diffuse Dither*, *Popularity*, *MedianCut555*, or *MedianCut888*.

If a *Color depth* of 256 or fewer colors is selected, you may specify the type of *Dithering* and the type of *Quantization* that is used to reduce the application's image to the selected number of colors.

Dithering determines how similar colors are distributed among clusters of pixels in the reduced image. Possible selections are *Diffuse* which uses a pseudo-random pattern, *Ordered* which uses a repeating pattern, or *None* which disables dithering.

Quantization determines how the colors for the exported image are selected from the palette of 16 million possible colors. Possible selections are *Popularity* which uses the most frequently occurring colors in the image, and *Median* which selects colors based on the 'median cut' method that tries to select the most even distribution of colors over the range of colors that appear in the image. The *Median* method can use either 5, 6, or 8 bits of sample data for each of the three color planes in the image, and the corresponding selections are *5:5:5 Median*, *6:6:6 Median*, and *8:8:8 Median*. Larger sample sizes require more memory to perform the conversion for export, so the smallest sample size that produces an acceptable image is recommended.

Defaults

Click the *Defaults* button to return the export options to the default selections.

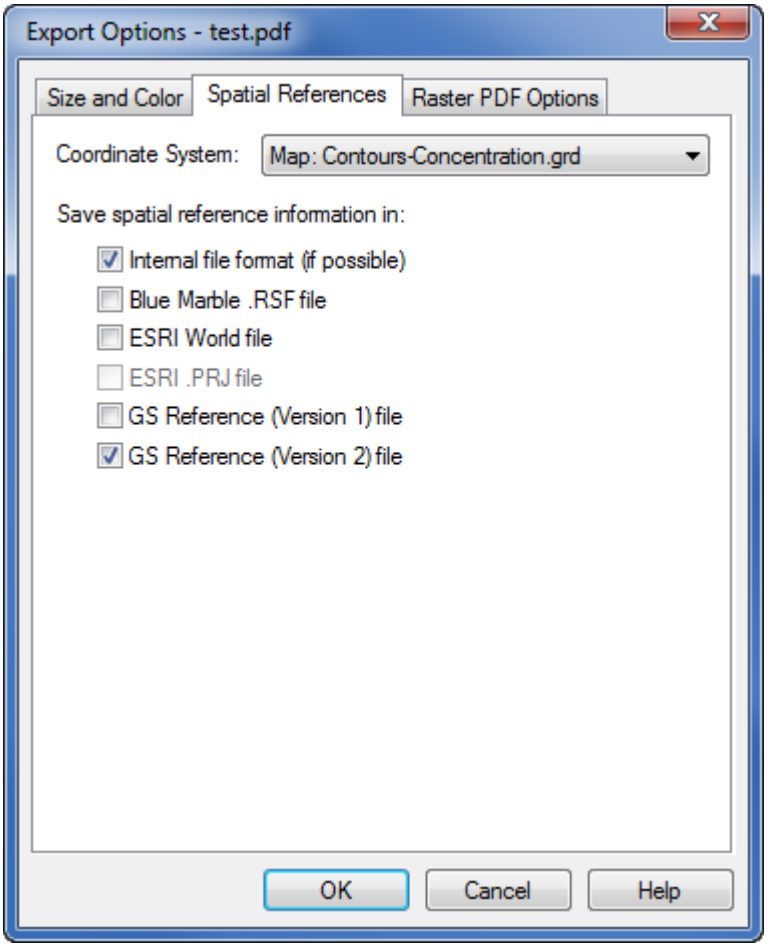
Transparency

Checking the transparency options on the PNG Options tab or the GIF Options tab can result in an error message when exporting if the Color depth option or Reduction method does not allow transparency. Click OK on the error and change the Color depth to 4-bit, 8-bit, or 32-bit for PNG images. For either PNG or GIF images, change the Reduction method to MedianCut555, MedianCut888, or Popularity.

Export Options Dialog - Spatial References Page

Some applications associate spatial reference information (such as projection, datum, and georeference parameters) with files, to link the file to a specific region of the Earth's surface. If the

map that you are exporting has a coordinate system defined, the **Spatial References** tab will appear in the **Export Options** dialog.



*The **Spatial References** page allows you to choose how to save the projection, datum, and georeference information.*

Coordinate System

Next to *Coordinate System*, select the appropriate coordinate system to use when exporting the file. Available options are *Paper space (page units),* all map frame names in the **MapViewer** file, and any coordinate system for each image in the **MapViewer** file. To select the appropriate map, click on the existing map name and select the desired map from the list. All objects are exported in the selected *Coordinate System*.

If a single *Map* is selected in the plot window, the map coordinate system is used for the *Coordinate System*. If a single image is selected in the plot window, the coordinate system for the image is used for the *Coordinate System*. If more than one *Map* object is selected, the *Coordinate System* is set to *Paper space (page units)*. This can be changed to any of the *Map* coordinate systems in the list and all objects will be exported to this coordinate system.

To export only some of the objects to the desired coordinate system, select the objects first and check the *Export selected objects only* option on the **Export** dialog.

The *Coordinate System* option is not available for all file formats. With most vector formats (DXF, SHP, etc.), the *Coordinate System* option is on the Scaling tab.

Reference File Format

Most bitmap file storage formats don't have a way to store the spatial reference information in the same file as the bitmap image. For these formats, the only way the spatial reference information can be saved is in a separate file. If the selected *Coordinate System* supports georeferencing information, the appropriate reference file options will be enabled. If the selected *Coordinate System* has a warp, only the reference file formats that support warp will be enabled.

Internal File Format (if Possible)

If the export format can internally store the georeference information, check this box. The spatial reference information will be stored (along with the image) in the selected format. One format that stores the coordinate reference is a TIF file, a vendor-independent format that can be imported into a variety of geographic software packages.

Blue Marble .RSF File

Blue Marble Geographics supports a text-based format for storing georeference information in a separate file. Various Blue Marble programs will import the information in this file when importing the bitmap file.

ESRI World file

Environmental Sciences Research Institute (ESRI) supports a text-based format for storing georeference information in a separate file. Various ESRI programs will import the information in this file when importing the bitmap file. The first and third characters of the image file's suffix, plus a final "w", are used for the world file suffix. Therefore, "mytown.tif" will have a world file called "mytown.tfw"; for "redlands.bmp", it will be "redlands.bpw".

ESRI .PRJ File

Environmental Sciences Research Institute (ESRI) supports a text-based format for storing georeference information in a separate file. Various ESRI programs will import the information in this file when importing vector files, such as .SHP files.

GS Reference (Version 1) File

Golden Software supports a text-based format for storing spatial reference information in a separate file. Projection, datum and georeference information can be stored in this format. The file will be created having the same name as the exported bitmap, with the suffix ".GSR" appended. The .GSR file is an older format Golden Software reference file.

GS Reference (Version 2) File

Golden Software's .GSR2 file is a newer georeference file format that includes spatial reference information in a separate file. Projection, datum and georeference information can be stored in this format. The file will be created having the same name as the exported file, with the suffix ".GSR2" appended.

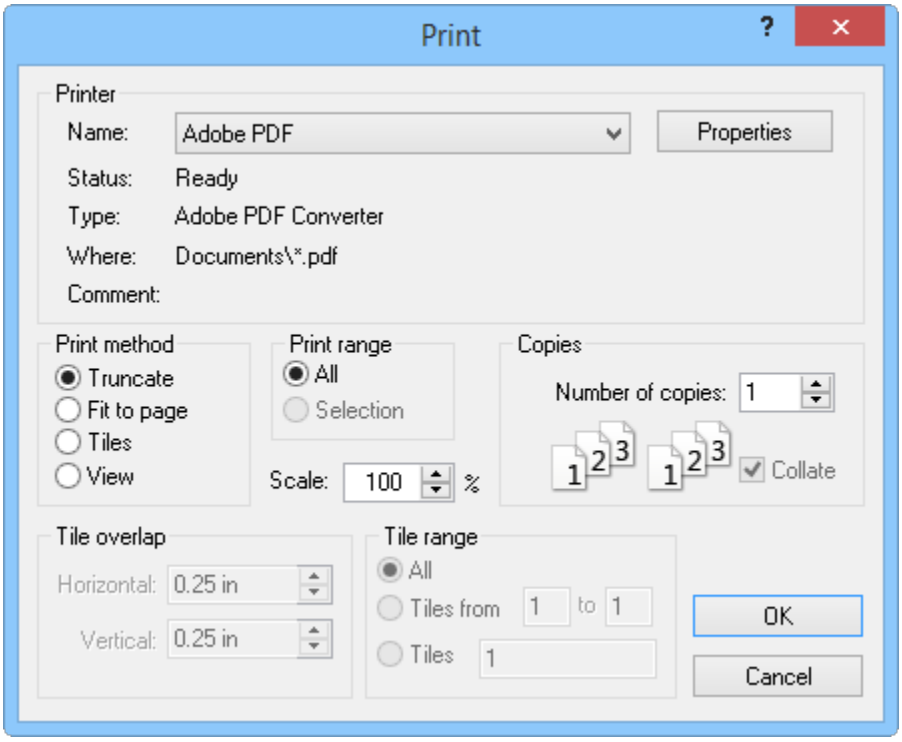
Print

Click the **File | Print** command or click the  button on the Quick Access Toolbar to print the active document.

The print command opens different dialogs depending on which window is active when the **Print** command is clicked. For printing a plot window, see the Print Dialog- Plot Window help page. For printing a worksheet, see the Print Dialog - Worksheet Window help page.

Print Dialog - Plot Window

Click the **File | Print** command or click the button on the Quick Access Toolbar to print the active document.



*This is the **Print** dialog.*

Printer

The *Printer* options specify which printer to use.

- The default printer is listed in the *Name* field. If more than one printer is installed on the computer, use the down arrow to the right of the name field to select a different printer.
- The *Properties* button controls the printer settings. For information on specific printer settings, see the owner's manual for the printer.

Print Range

The *Print range* options control how the document pages are printed.

- *All* prints all the pages that contain objects.
- *Selection* prints the selected objects.

Copies

Copies specify the number of copies to print. If two or more copies of multiple page documents are printed, check the *Collate* box to separate the copies into packets.

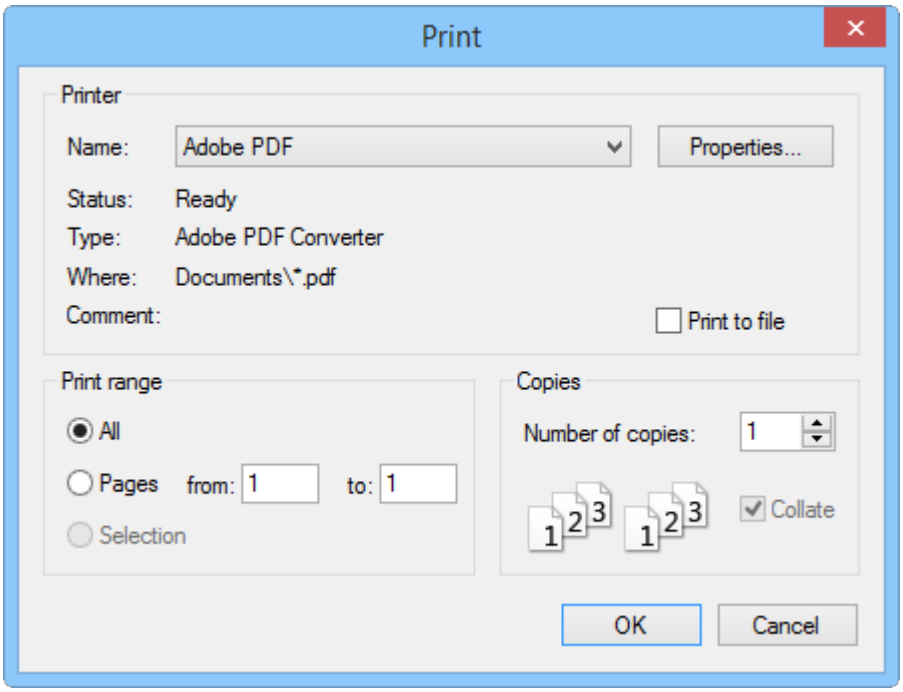
Printing Method

The *Printing Method* options control how the document is printed on the page.

- *Truncate* clips objects that extend past the margins.
- *Fit to Page* reduces the size of the plot so that it fits within the specified margins. Margins are set in **File | Page Setup**.
- *Tile* breaks the drawing into page size pieces and generates multiple pages of output. Each page overlaps adjacent pages by the amount specified in the horizontal and vertical *Overlap* fields.
- *Scale* is used with the *Truncate* and *Tile* print methods to reduce or increase the overall size of the drawing. 100 percent is actual size, 200 percent is twice as large, and 50 percent is half as large.

Print Dialog - Worksheet Window

Click the **File | Print** command in the worksheet, or the  button in the Quick Access Toolbar to open the **Print** dialog and print the contents of the worksheet to the active printer or to a .PRN file. To control the display of data on the printed page, refer to the **File | Page Setup** command. While the worksheet is spooling, a dialog appears indicating that printing is progressing.



*Set the printer properties in the **Print** dialog.*

Printer

The *Printer* group contains information about the printer and options to specify the printer.

- The default printer is listed in the *Name* field.

- Use the *Properties* button to specify a printer and the printer properties. For information on specific printer settings, see the owner's manual for the printer.
- The *Print to file* check box allows you to print the data to a .PRN file. .PRN files are ASCII text files. When this option is highlighted, and the *OK* button is pressed in the **Print** dialog, enter a path and file name in the **Print to File** dialog.

Print Range

The *Print range* options control how the worksheet pages are printed.

- *All* prints all the pages that contain data.
- *Pages* prints the pages specified.
- *Selection* prints the selected worksheet cells.

Number of Copies

The *Number of copies* option specifies the number of copies to print.

Collate

When printing multiple-page documents two or more times, check the *Collate* box to assemble the printed pages in proper order.

OK or Cancel

Click *OK* to print the worksheet. Click *Cancel* to abort the **Print** command and return to the worksheet window.

Page Setup

File | Page Setup refers to the drawing area on the screen. This can be set to any size up to 240 inches. In general, the page size should be set to the same size as your printer's page size.

When maps are originally imported, the scale of the map is set in relation to the page setup. In this way, the size of the map is optimized so it best fits on the specified page.

The outline of the page is normally shown in the plot window. If the page outline is not seen make sure the *Show page rectangle* option is checked in the User Interface page of the Options.

The Page Setup Dialog

The following options are available in the **Page Setup** dialog:

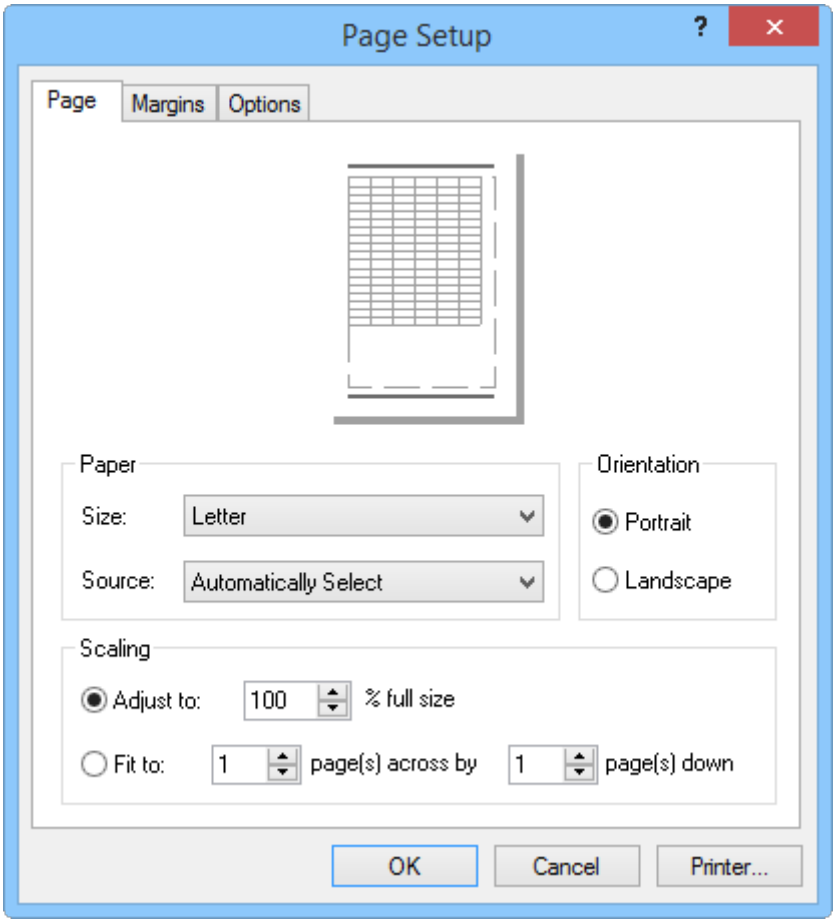
- The *Paper size* options control the size of the paper. Click the down arrow next to the paper size to select different paper dimensions. For custom paper sizes, change the paper size in the *Width* and *Height* boxes.
- *Orientation* sets the on-screen page in *Portrait* or *Landscape* mode.

Page Setup - Worksheet

The **File | Page Setup** command sets the page formatting and printing information for the worksheet. Set the printing options on the Page, Margins, and Options pages.

Page Setup Worksheet - Page

Use the **Page** options found in the worksheet's **File | Page Setup** command to set paper size, source, orientation, and scaling.



*Change page setup properties in the **Page Setup** dialog **Page** page.*

Paper

Use the *Paper* group to choose the paper *Size* and *Source* for the active printer.

- The *Size* option allows you to select the size of paper. Click the down arrow next to the paper *Size* to change the size of the paper. The paper size options available for your printer are listed in the drop-down list.
- The *Source* option allows you to select the paper source. If your printer has multiple print trays, choose the paper *Source* by clicking the down arrow.

Orientation

Orientation sets the page in either *Portrait* or *Landscape* mode.

- Select *Portrait* to have a vertical page.
- Select *Landscape* to have a horizontal page.

Scaling

Scaling controls the print size for the worksheet. There are two options with *Scaling*:

- The *Adjust to ___ % full size* option sets the percent of full size that worksheet prints. The arrow buttons are used to scroll up or down from 100 percent (full size), or values can be entered into the box.
- The *Fit to __ page(s) across by __ page(s) down* option tells the program to print the worksheet at 100 percent scale or less. This option does not automatically scale the printed worksheet at greater than 100 percent. This is most useful when the worksheet is large and the number of printed pages needs to be limited.

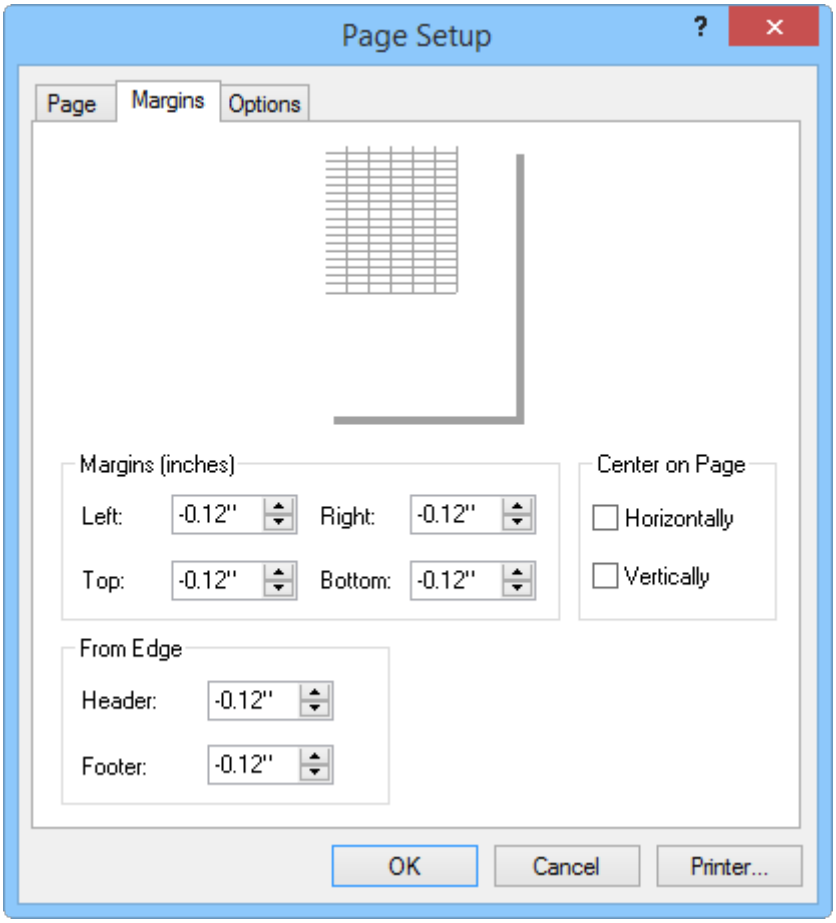
The amount of data in the worksheet determines how many pages are required to print the worksheet. This is independent of the *Fit to* option.

Printer

The active printer can be changed by clicking the *Printer* button.

Page Setup Worksheet - Margins

Use the **Margins** page found using the worksheet's **File | Page Setup** command to set page margins, header and footer positions, and centering.



*Change page margin properties in the **Page Setup** dialog **Margins** page.*

Margins

Use the *Margins (inches)* options to set the page margins for all sides of the printed page. Set the *Left*, *Right*, *Top*, and *Bottom* values in inches to any values the printer allows. The margins are for the worksheet printout and are independent of the settings used for *Headers* or *Footers*. If the *Top* or *Bottom* margins are set to a value lower than the header or footer it is possible that the text can be overwritten.

Center on Page

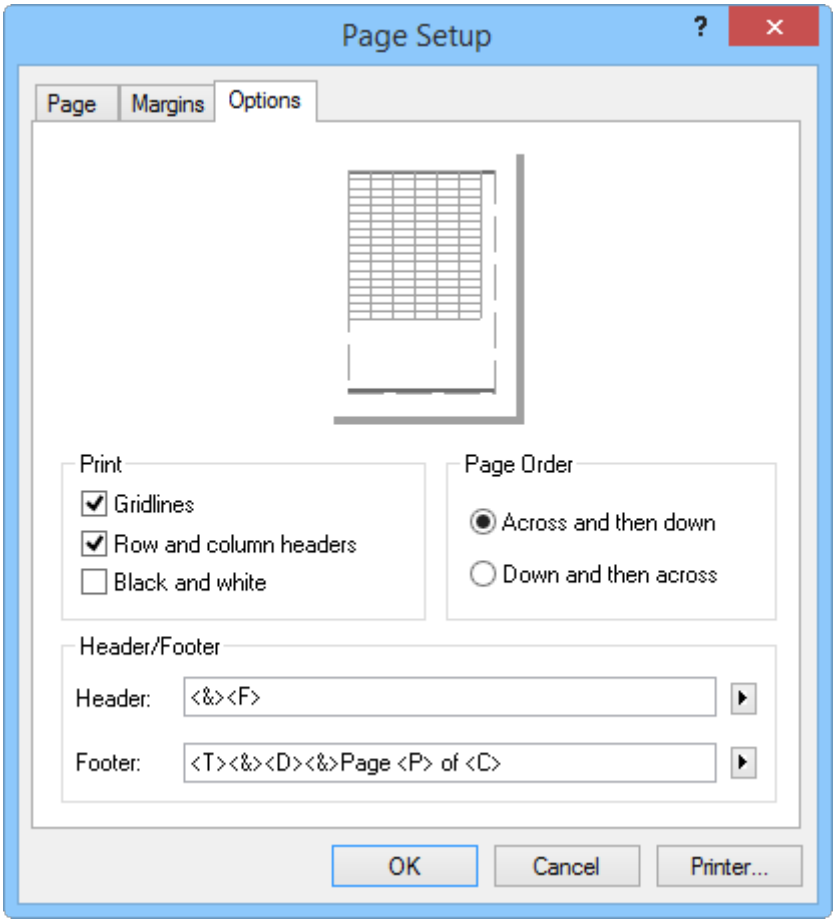
The *Center on Page* options automatically center the printout *Horizontally*, *Vertically*, or both. If this option is not used the worksheet prints in the upper left corner of the page.

From Edge (inches)

The *From Edge (inches)* options controls how far the *Header* or *Footer* is printed from the edge of the page. If these values are greater than the *Top* or *Bottom Margins* it is possible that the worksheet data can print over the header or footer. The text that is printed for the header and footer is controlled from the Options page.

Page Setup Worksheet - Options

Use the **Options** page found in the worksheet's **File | Page Setup** command to set gridlines, page order, and content of headers and footers on worksheet print outs.



*Change page option properties in the **Page Setup** dialog **Options** page.*

Print

The *Print* group controls how the worksheet information is printed.

- Check the *Gridlines* option to draw gridlines separating each column and row.
- Check the *Row and column headers* option to print the column letters and row numbers of the worksheet.
- If cells contain color backgrounds, set with the **Data | Format | Format Cells** command, use the *Black and white* option to print the worksheet in black-and-white on color printers.

Page Order

The *Page Order* group controls the order in which multiple pages are printed.

- The *Across and then down* option prints from left to right first and then moves down and prints left to right again.
- The *Down and then across* option prints the worksheet from top to bottom first and then moves to the right and prints top to bottom again.

Headers and Footers

The *Header/Footer* group controls the type of information included in the worksheet data print out. The *Header* appears at the top of the page, and the *Footer* appears at the bottom of the page. The header and footer are spaced from the edge of the page based on the *From Edge* option of the Margins page. Descriptive text can be typed in the *Header* and *Footer* boxes. Automatic text can be added to the *Header* or *Footer* boxes by clicking the arrows to the right of the boxes and clicking the items in the list.

Automatic header/footer codes:

- *File Name* (< F>) prints the name of the active file. The drive and path are not included.
- *Page Number* (<P>) prints the page number for each page. When several pages are printed the order of printing is controlled from the *Page Order* option.
- *Total Page Count* (< C>) prints the total number of pages that are required to print out the worksheet.
- *Current Date* (<D>) prints the current date.
- *Current Time* (< T>) prints the current time.
- *Left/Center/Right Separator* (<&>) separates the header and footer text so it is spread out across the page. Too many separators can actually push text off the page. If this happens, remove the <&> separator and use spaces instead.

Examples

For a six-page document, <&><&>Page <P> of < C> would print (on the right side of the first page):

```
                                        Page 1 of 6
```

Enter Joe Smith<&>< F><&><D> to print out a name, file name, and date:

```
 Joe Smith         COLORADO.DAT           01/05/10
```

To print centered text use the "&" operator one time, such as <&>< F>:

```
                    FILENAME.DAT
```

Cancel Printing

Click the *Cancel* button in the **Printing** dialog to cancel a print job.

Chapter 37

Options, Defaults, and Customizations

File | Options

Click the **File | Options** command to change the program options, such as ruler display or if back up files are created. The **File | Options** command also controls default line, fill, symbol, font, or digitize format properties. These properties are shared by all objects that use the specific format. For example, if you change the line color, all new axes, line/scatter plots, drawn polygons, lines, etc. will have the new line color. Use the **File | Defaults** command to change the default properties for basic objects, maps, and legends.

Options Dialog

MapViewer's default settings and advanced options are customized by selecting the **File | Options** command. By adjusting the settings in the **Options** dialog, you can customize **MapViewer** to suit your individual preferences and work habits. The settings are automatically saved and restored whenever **MapViewer** is restarted. Changes made in the **Options** dialog affect all subsequent documents.

The **Options** dialog contains the following pages:

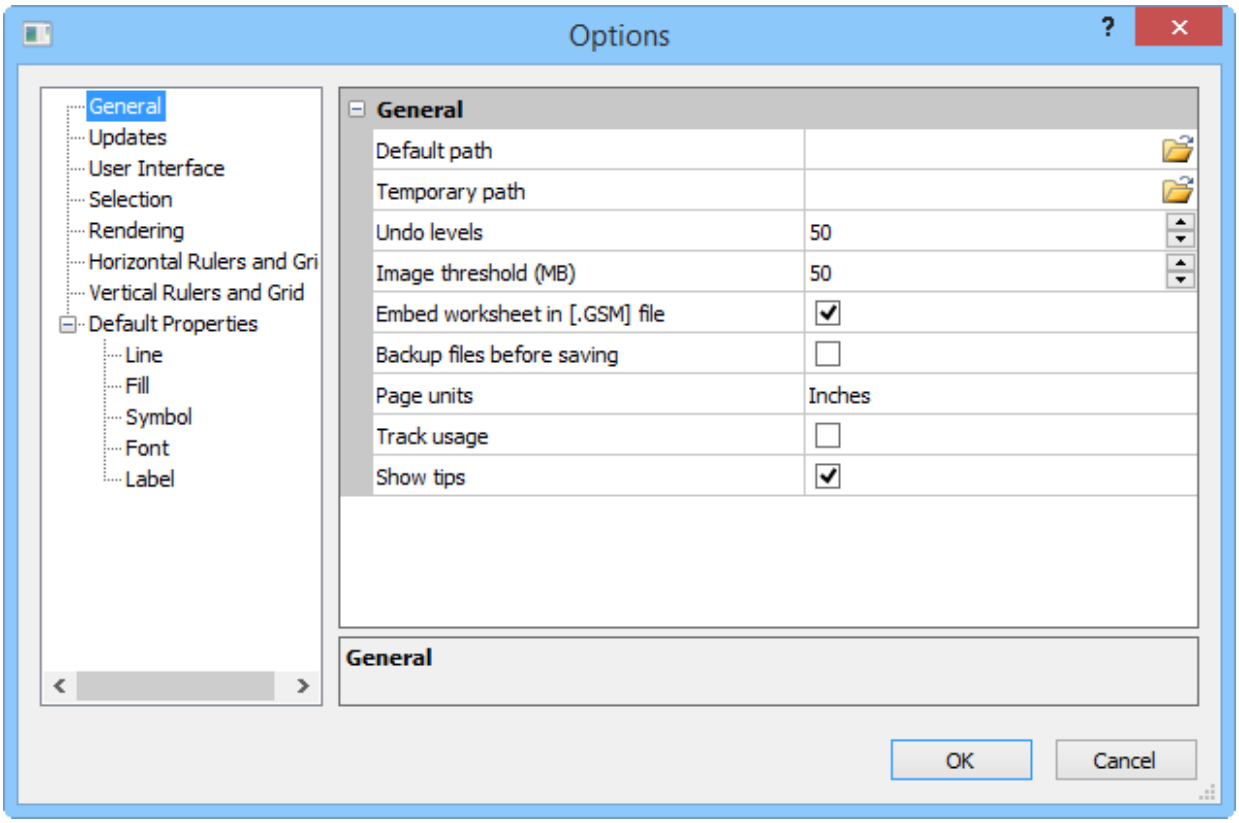
General	Set the basic window features such as file open/save paths, and undo levels.
Updates	Allow **MapViewer** to automatically check for updates.
User Interface	Set the interface and tab style and help in the **Property Manager**
Selection	Set the selection handle size and tolerance size for selecting objects.
Rendering	Set antialiasing properties.
Horizontal Rulers and Grid	Control the display of the horizontal rulers and grid.
Vertical Rulers and Grid	Control the display of the vertical rulers and grid.
Default Properties	Sets basic default properties for Line, Fill, Symbol, Font and Label.

General

You can set defaults such as selection preferences; default line, symbol, fill, and font attributes; undo levels; etc. on the **General** page accessed through **File | Options**.

The Options Dialog

Click the **File | Options** command to open the **Options** dialog. Click on the *General* option on the left side of the dialog to open the **General** page.



Customize General *options in the* ***Options*** *dialog*

Default File Path

Enter a path into the *Default path* box to set the default path for opening and saving files. Alternatively, click the button to browse for a path. This option sets the initial directory displayed in the **File | Open** and **Save** dialogs after starting **MapViewer**. To set this to the default path, delete the current path and leave the option blank. After *OK* is clicked, the default Windows path will be written to the *Default path*.

Temporary File Path

Enter a path into the *Temporary path* box to set the default path for temporary files. Alternatively, click the button to browse for a path. To set this to the default path, delete the current path and leave the option blank. After *OK* is clicked, the default Windows path will be written to the *Temporary path*.

Undo Levels

Set the number of commands to undo in the *Undo levels* box. The maximum number of Undo levels is 100. Once the maximum number of actions has been performed, the oldest action is dropped off the list as new actions are added. Undo can consume significant amounts of memory, so this option should probably be left between 3 and 10 if memory is at a premium. Set the undo levels to 0 to disable **Undo** completely. Use the to increase or decrease the number of undo levels or highlight the existing value and type a new value between zero and 100.

Image Threshold (MB)

The *Image threshold (MB)* option controls the number of megabytes that can be used before switching images to disk-based images. This option can be set to a value between 0 and 16384. If an imported image is larger than the image threshold, it will be stored in a tiled bitmap format which uses minimal internal memory but can result in some performance degradation. Increase this value if your computer has a lot of internal RAM. Lower this value if you are experiencing very sluggish performance, "Out of memory" errors, or crashes when using large images. Any images already imported must be re-imported to change their internal storage format. Use the to increase or decrease the number of megabytes used or highlight the existing value and type a new value between 0 and 16384.

Embed Worksheet in [.GSM] File

By default, linked data is embedded in [.GSM] files, and the *Embed worksheet in [.GSM] file* box is checked. When the worksheet data is embedded within a [.GSM] file, the file contains all of the information necessary to recreate the plot. If the data is not embedded, the data file must be saved in the same location as it was previously or imported into the [.GSM] again to update the link.

Backup Files Before Saving

If *Backup files before saving* is checked, a backup copy of an existing file is created before saving the document. The backup copy is saved with a .BAK extension. If an identically named backup file already exists, it will be overwritten.

Page Units

Page Units are the units used to measure distances on the printed page. Set *Page Units* to *Inches* or *Centimeters*. The location of the cursor on the page is listed in page units in the status bar.

Track Usage

If *Track Usage* is selected, **MapViewer** sends anonymous usage data to **Golden Software**. The data are used to improve the customer experience in **MapViewer** and other **Golden Software** applications.

Show Tips

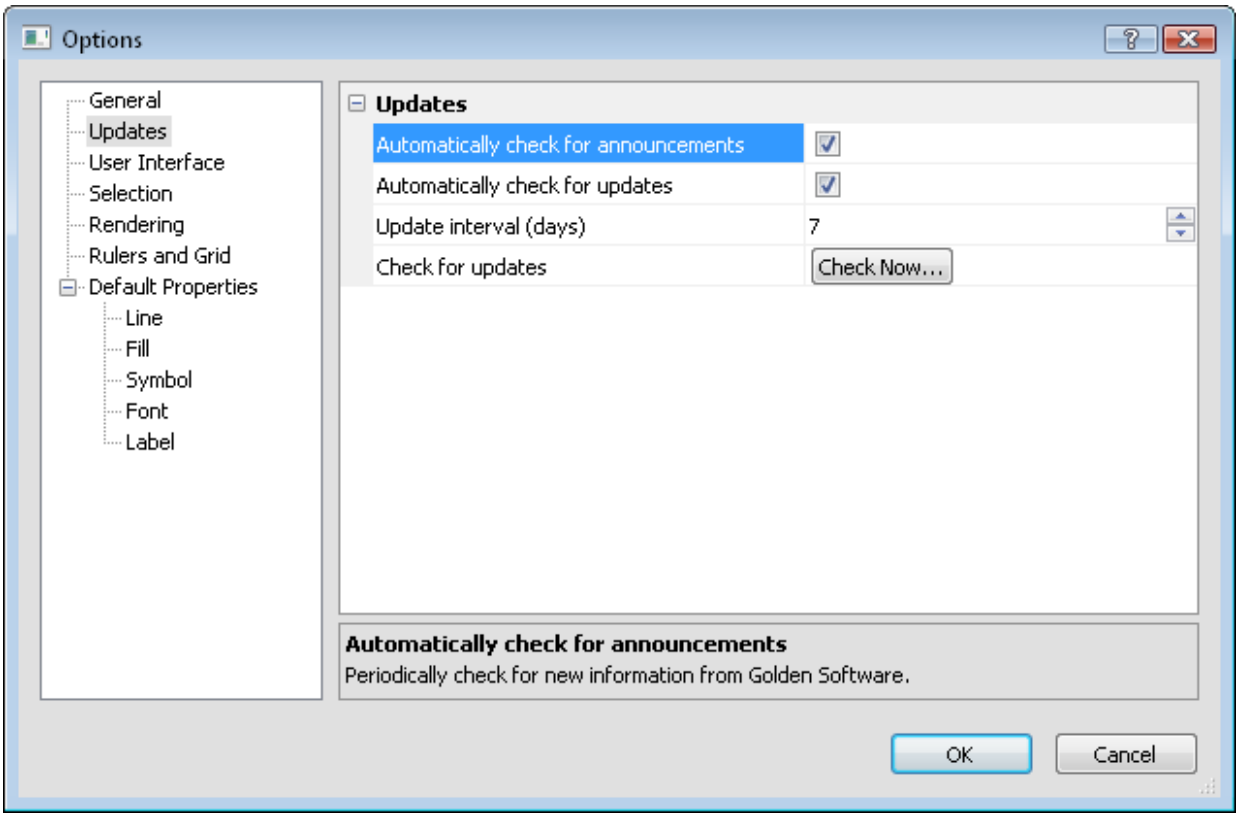
By default, the Tip of the Day dialog is shown on startup. Click the check box to show or hide the **Tip of the Day**.

Options - Updates

Set automatic update preferences on the **Updates** page in the Options dialog.

The Options Dialog

Click the **File | Options** command to open the **Options** dialog. Click on *Updates* on the left side of the dialog to open the **Updates** page.



Customize the Updates *options in the* ***Options*** *dialog.*

Automatically Check for Announcements

Check the *Automatically check for announcements* to allow Golden Software to automatically check for program and company announcements. This could include information about a new product release, tips for use of Golden Software programs, special offers, or an update to the program.

Automatically Check for Updates

Check *Automatically check for updates* to allow Golden Software to automatically check for program updates (i.e. **MapViewer** 8.0 to **MapViewer** 8.1) according to the user defined time interval. After the specified time, the program will link to the Golden Software server to see if any program updates are available. Program updates include fixes to errors or problems that are found in the program. It is recommended that you keep this box checked so that your version of **MapViewer** is always up to date.

Update Interval (days)

MapViewer will automatically check for updates after the specified interval of time has passed. Specify the update time interval in days by highlighting the existing value and typing a number in the *Update interval (days)* box or clicking the to increase or decrease the number of days. This option can be set to a value between one and 90.

Check For Updates

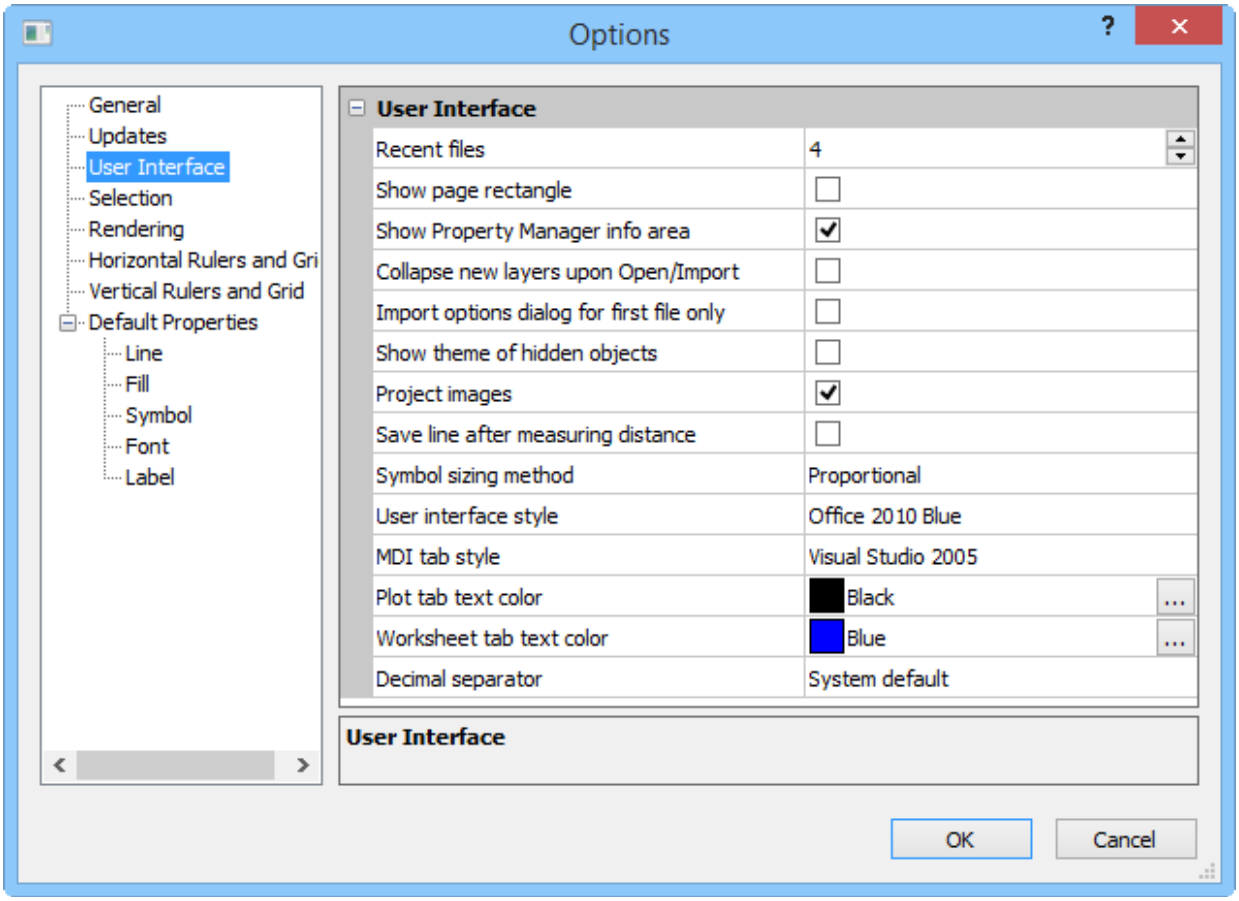
Click the Check Now... next to the *Check for updates* command to check for program updates. Before using this command, make sure your computer is connected to the Internet. Follow the directions in the **Internet Update** dialog to complete the update if an update is available.

Options - User Interface

Set the user interface environment on the **User Interface** page in the Options dialog.

The Options Dialog

Click the **File | Options** command to open the **Options** dialog. Click on the *User Interface* option on the left side of the dialog to open the **User Interface** page.



Customize the User Interface *options in the* ***Options*** *dialog.*

Recent Files

The *Recent files* option controls the number of recently used files listed to the right in the **File** menu. This option can be set to a value between 0 and 16. To change the number of files, click the to increase or decrease the value or highlight the value and type a new number.

Show Page Rectangle

Check the box next to the *Show page rectangle* option to turn on the display of the paper representation in the plot window. Uncheck this box to turn off the display of the paper representation. The page size is set by clicking the **File | Page Setup** command.

Show **Property Manager** Information Area

Check the box next to the *Show Property Manager info area* option to display a short help statement for each selected command in the **Property Manager**. Uncheck this box to turn off the help area in the **Property Manager**.

Collapse New Layers upon Open/Import

Check the box next to the *Collapse new layers upon Open/Import* option to force the **Object Manager** to collapse all new object hierarchies in the tree control. By default, when an object is imported or opened into the plot window, the **Object Manager** expands the new objects.

Show Theme of Hidden Objects

Click the *Show theme of hidden objects* check box to show thematic map properties even when the object is hidden. By default, applied properties of hidden objects are not visible. This option is superceded by Show Objects.

Project Images

By default, imported images are projected. **MapViewer**'s import automatically detects if there is any coordinate system that comes with the import file. The Assign Coordinate System dialog is opened when the image does not include any projection information. If you know the image projection, select it in the **Assign Coordinate System** dialog. If the image projection is unknown, select *Unreferenced*.

Save Line After Measuring Distance

By default, the lines generated with the Measure Distance command are not saved. Activate the *Save line after measuring distance* option to create polylines while measuring distance.

Symbol Sizing Method

Select *Exact* or *Proportional* for the *Symbol sizing method*. The *Exact* method sized symbols based on each symbol's size. The *Proportional* method sizes symbols based on the entire symbol set. For example when *Proportional* is selected, an asterisk * is smaller than a dollar sign $, but when *Exact* is selected, they are drawn the same size on the plot. The GS symbol sets included with **MapViewer** have uniform-sized symbols, so the *Symbol sizing method* has no effect on the drawn symbol size.

User Interface Style

Specify the interface style in the *User interface style* list. Available options are *Office 2010 Black, Office 2010 Blue*, and *Office 2010 Silver.* The default style is *Office 2010 Blue*.

MDI Tab Style

Specify the tabbed document view style in the *MDI tab style* list. The options are *None, 3D, One Note,* and *Visual Studio 2005.* The plot window, worksheet window, and grid node editor window have a tab appearance when multiple windows are open when the *MDI tab style* is set to any option other than *None*. The default style is *Visual Studio 2005*.

Tab Text Colors

By default, the file name or plot number displayed on a plot document's tab is black text. To change the color of the plot name, change the color selection in the *Plot tab text color* field. By default, the

file name or worksheet number displayed on a worksheet document's tab is blue text. To change the color of the worksheet name, change the color selection in the *Worksheet tab text color* field.

Decimal Separator

The *Decimal separator* controls which character is used to separate the whole number portion from the decimal portion in a number. To change the *Decimal separator*, click on the existing option and select the desired option from the list. Available options are: *System default, Period,* and *Comma*. The default is to use the *System default*. *System default* defers treatment of decimal separators to Windows. The *Period* option displays a period (.) to separate the numbers before and after the decimal. The *Comma* option display a decimal comma (,) to separate the numbers before and after the decimal. When this option is changed, all maps that are opened will display the selected character for the decimal separator.

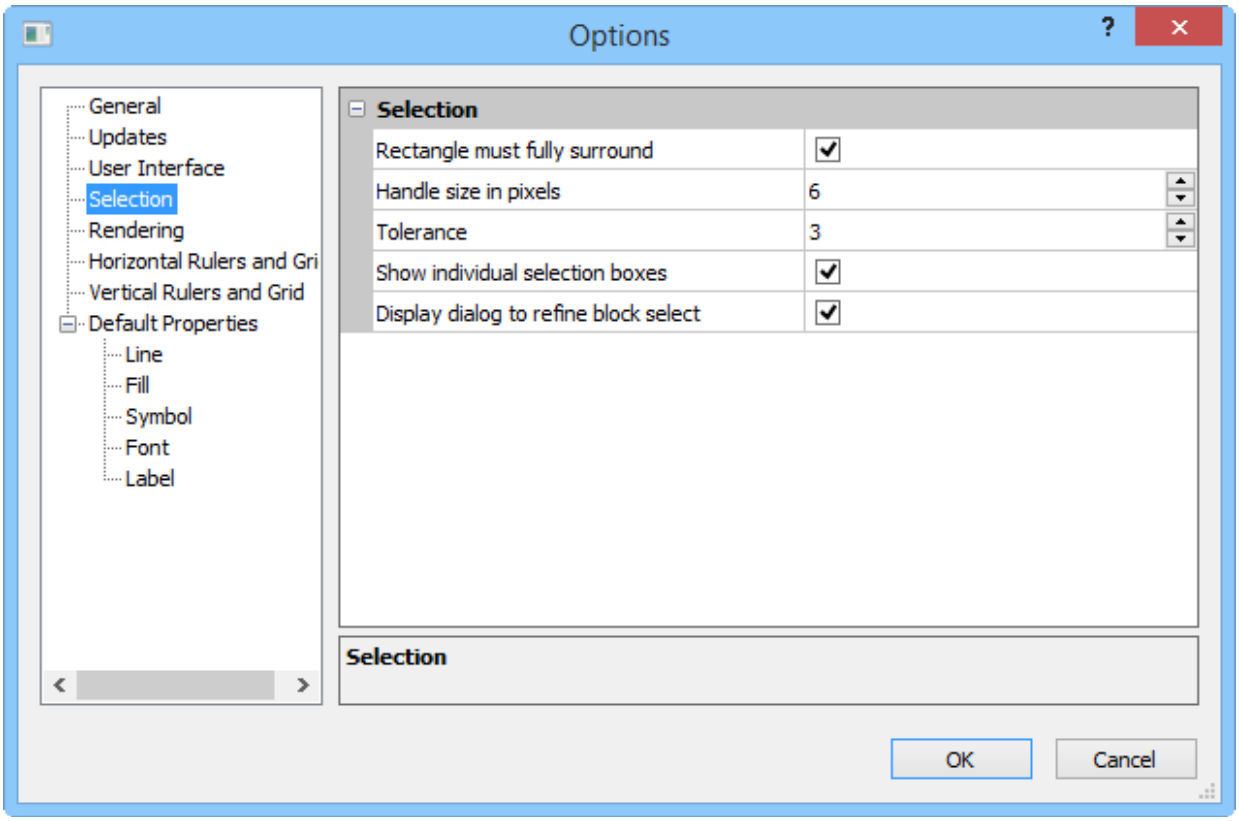
When using *System default*, the setting is controlled by Windows. To set the Windows local, in the Windows Control Panel, under *Region and Language*, set the *Format*. In locale's where the period is the separator, it will be used in **MapViewer**. In locale's where the comma is the separator, it will be used in **MapViewer**. All .GSM files will use the format specified by Windows. This means that older .GSM files may appear differently depending on the format. Some changes may be in axis labels.

Options - Selection

Set the options for how objects are selected on the **Selection** page in the Options dialog.

The Options Dialog

Click the **File | Options** command to open the **Options** dialog. Click on the *Selection* option on the left side of the dialog to open the **Selection** page.



Customize the Selection *options in the* ***Options*** *dialog.*

Rectangle Must Fully Surround

The *Rectangle must fully surround* option controls how the block select feature functions. If the box is checked, the block select rectangle must be drawn completely around the object to select it. If any portion of the object extends beyond the block select rectangle, the object is not selected. If this option is unchecked, the block select rectangle only needs to partially intersect an object to select it.

Handle Size

The *Handle size in pixels* option controls the width and height in pixels of the selection handles that appear around selected objects. The handle size setting range is from zero to 25 pixels. A setting of 25 will create large size selection handles. A setting of zero will create no selection handles. The default setting is a handle size of six pixels. The handle size scales with zoom. Click the to increase or decrease the value or highlight the existing value and type a new number to change the size.

Tolerance

The *Tolerance* option controls how far away the cursor can be from an object when clicking to select the object. The tolerance setting range is from zero to 25 pixels. When the tolerance size is zero, the cursor must be directly on the object to select it. The tolerance size does not affect the size of

the bounding box, it only controls the distance the cursor can be from the object to select it. The default tolerance setting is three pixels. The tolerance scales with zoom. Click the to increase or decrease the value or highlight the existing value and type a new number to change the tolerance.

Show Individual Selection Boxes

By default when multiple objects are selected, individual selection boxes are shown around each selected object. Unchecking the *Show individual selection boxes* check box displays only the bounding box for a selection of multiple objects.

Display Dialog to Refine Block Select

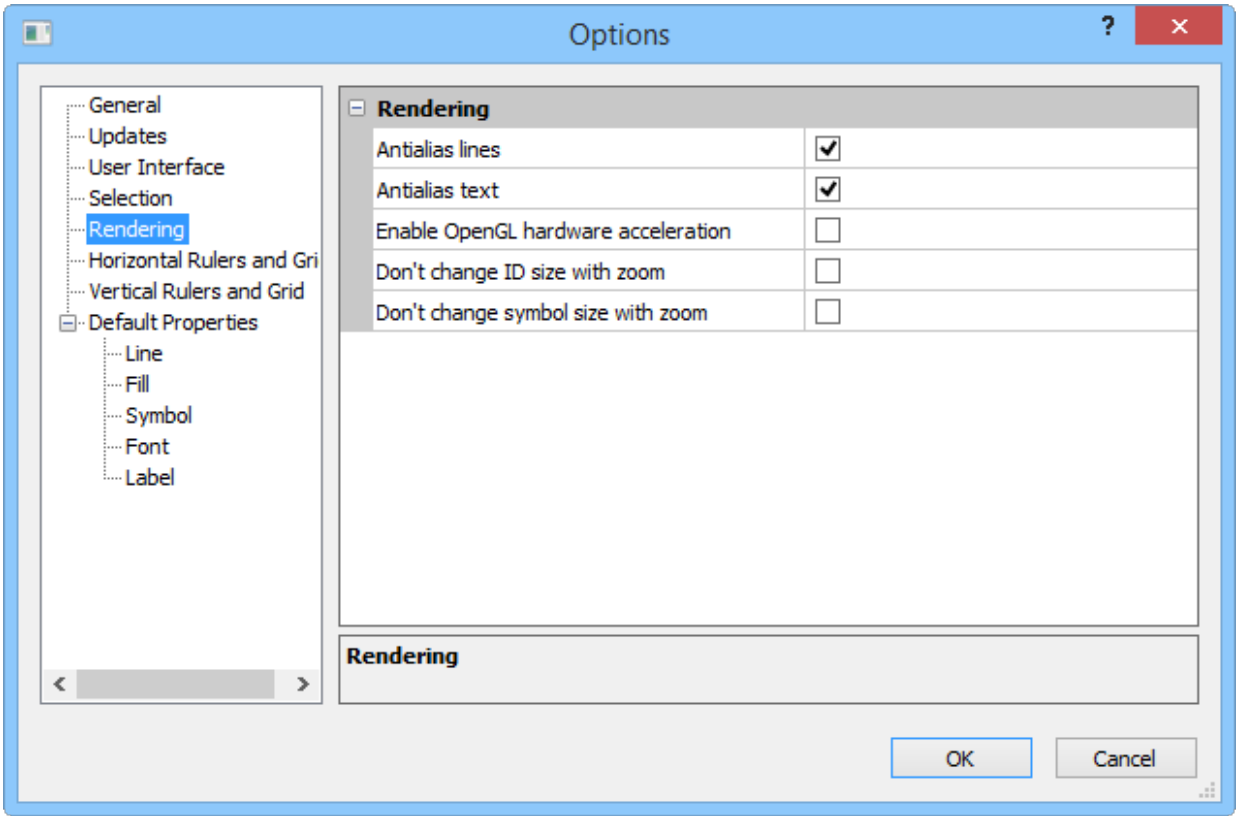
The *Display dialog to refine block select* option displays the Select/Deselect from List dialog after you use the Block Select command. Objects that were completely enclosed by the **Block Select** command populate the list. You can then refine the selection in the **Select / Deselect from List** dialog.

Options - Rendering

Set the antialias options on the **Rendering** page in the Options dialog.

The Options Dialog

Click the **File | Options** command to open the **Options** dialog. Click on the *Rendering* option on the left side of the dialog to open the **Rendering** page.



Set the Rendering *options in the* ***Options*** *dialog.*

Antialiased Lines

Check the box next to *Antialias lines* to allow redraw to diminish jagged edges and create a smooth appearance for all lines in the plot window. Uncheck this box to disable the smoothing and make lines crisper.

Antialiased Text

Check the box next to *Antialias text* to allow redraw to diminish jagged edges and create a smooth appearance for all text and symbols in the plot window. Uncheck this box to disable the smoothing and make text and symbols crisper.

Enable OpenGL Hardware Acceleration

Check the box next to *Enable OpenGL hardware acceleration* to use the OpenGL driver included with your video card. If you experience any difficulties when creating 3D surface maps or see errors or crashes when displaying the 3D surface map, uncheck the box. **MapViewer** must be restarted after making this change.

Don't Change ID Size with Zoom

Clicking the *Don't change ID size with zoom* check box makes ID text, shown with Show Objects, stay the same size when zooming in and out. Enabling this option is useful for keeping ID's readable when looking at a map at different zoom levels. This option does not lock the on-screen size of drawn text.

Don't Change Symbol Size with Zoom

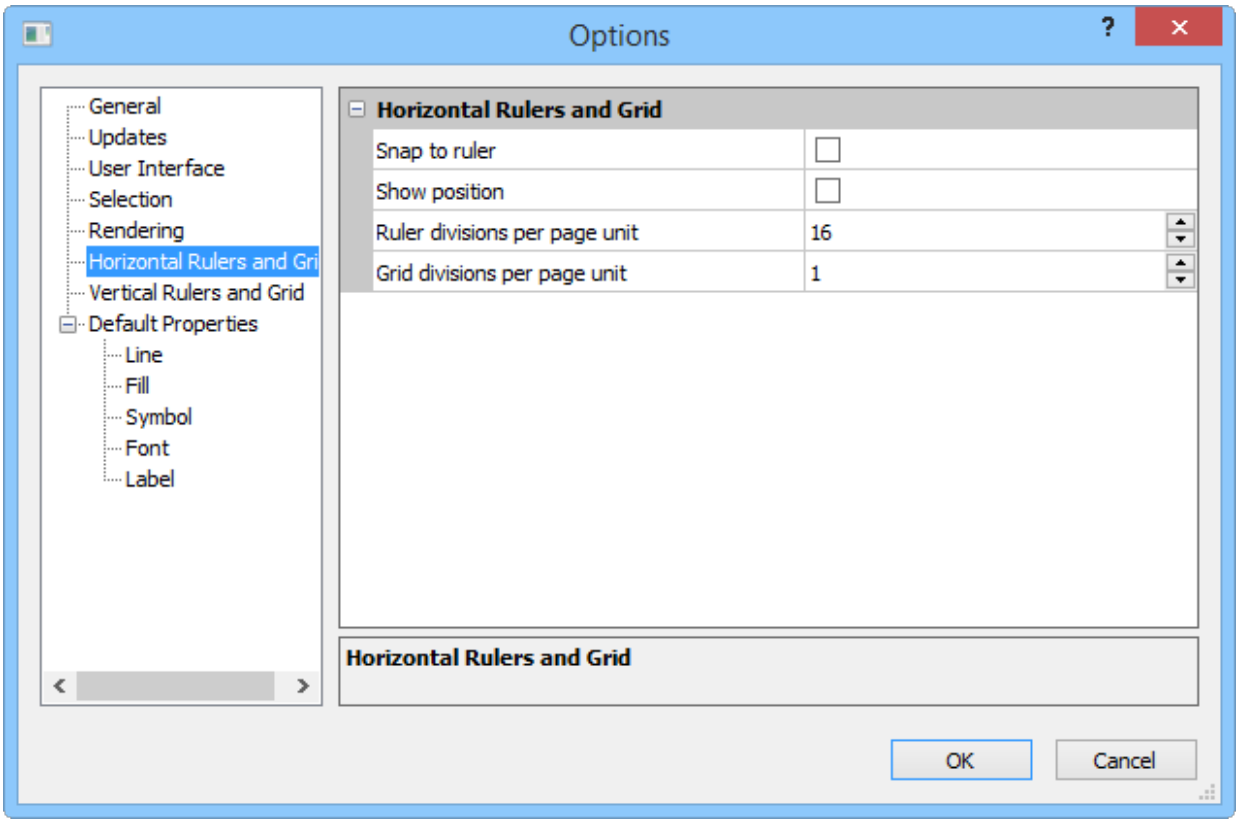
Clicking the *Don't change symbol size with zoom* check box makes point symbols stay the same size while zooming in and out. Enabling these options is useful for keeping symbols visually appealing when looking at a map at different zoom levels. This option does not lock the on-screen size of symbol map symbols.

Options - Rulers and Grid

Set ruler and grid properties on the **Horizontal Rulers and Grid** or **Vertical Rulers and Grid** page in the Options dialog. Rulers appear along the top and left edge of the plot window, and are used to position and align objects. Rulers use the current page units. To change the *Page units*, click on the **General** page.

The Options Dialog

Click the **File | Options** command to open the **Options** dialog. Click on the *Horizontal Rulers and Grid* or *Vertical Rulers and Grid* option on the left side of the dialog to open the **Rulers and Grid** page.



Specify Rulers and Grid *options in the* ***Options*** *dialog.*

Snap to Ruler

Snap to ruler causes the cursor to snap to the ruler divisions as objects are drawn or moved. This allows objects to be easily aligned with the ruler division marks. Check this box to snap the cursor to the ruler divisions. Uncheck this box to disable the automatic snapping.

Show Position

When the *Show position* option is checked, the current cursor position is displayed on the rulers. As the cursor is moved, the position indicator moves within the rulers to show the exact page position of the cursor. Uncheck this box to disable the cursor position in the rulers.

Ruler Divisions Per Page Unit

The *Ruler divisions per page unit* option controls the number of divisions per page unit on the ruler. Select a value between 1and 99. To change the value, highlight the existing value and type a new number or click the to increase or decrease the number of divisions. The number of divisions are in page units. Set the page units on the General page of the **Options** dialog.

Grid Divisions Per Page Unit

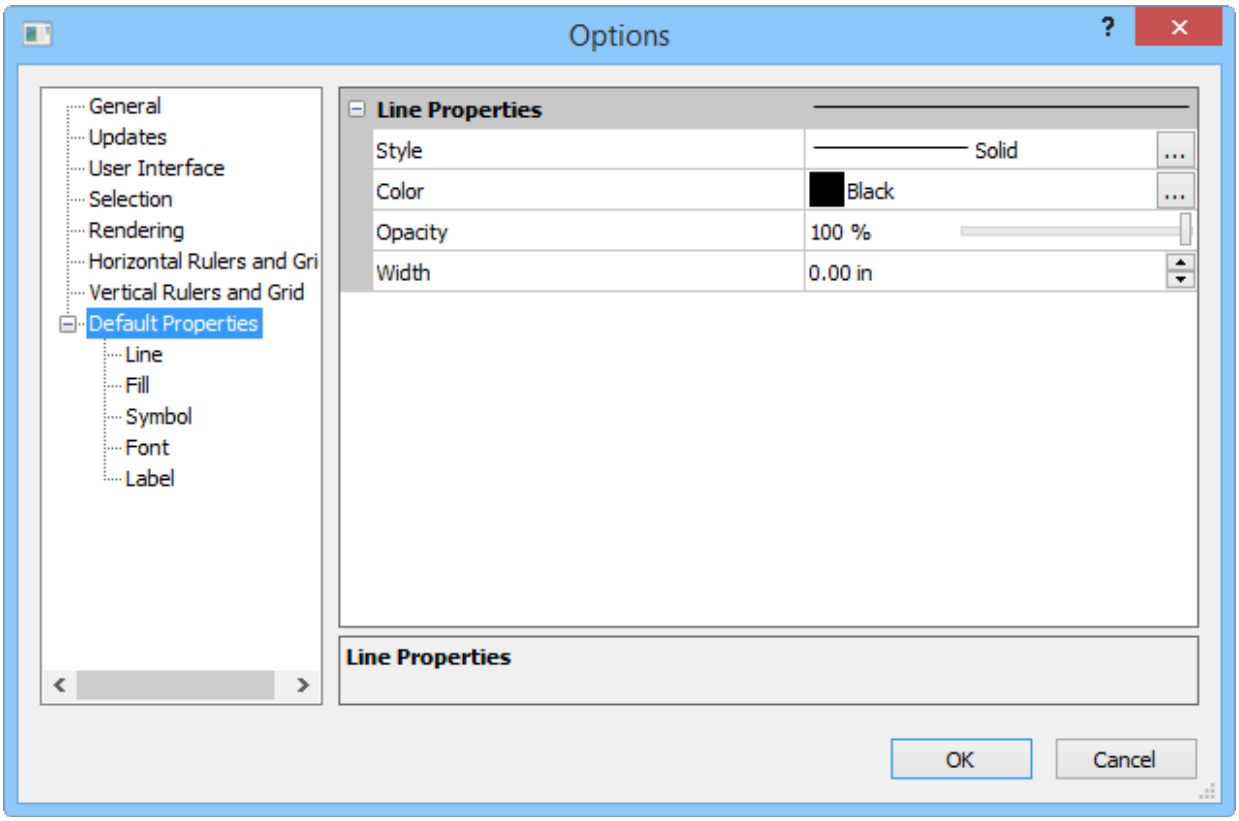
The *Grid divisions per page unit* option controls the number of divisions per page unit on the grid. Select a value between 1 and 99. To change the value, highlight the existing value and type a new number or click the to increase or decrease the number of divisions. The number of divisions are in page units. Set the page units on the General page of the **Options** dialog.

Options - Defaults Properties

Use the **Default Properties** pages in the Options dialog to specify the default line, fill, symbol, font, and label properties used when creating new objects.

The Options Dialog

Click the **Tools | Options** command to open the **Options** dialog. Click on the *Line, Fill, Symbol, Font,* or *Label* link under the *Default Properties* option on the left side of the dialog to open the appropriate default setting page.



Customize the Defaults *options in the* ***Options*** *dialog.*

Line

Line properties are used to specify the default line style, color, opacity, and width. Some examples of where this is used include axes, stand-alone lines, and the outer border of rectangles, ellipses, and polygons. Click the *Line* option on the left side of the dialog to open the **Line Properties** page. Make any changes and click *OK* to make the default line changes.

Fill

Fill properties specify the fill pattern, foreground and background colors, foreground and background opacity, and allow custom images to be imported in the file. The fill properties are used to color the interior of polygons, rectangles, and ellipses. Click the *Fill* option on the left side of the dialog to open the **Fill Properties** page. Make any changes and click *OK* to make the default fill changes.

Symbol

Symbol properties include the symbol, symbol set, fill color, fill opacity, line color, line opacity, and size. These properties are used for stand-alone symbols, post maps, and imported graphics that do not use a specific symbol. Click the *Symbol* option on the left side of the dialog to open the **Marker Properties** page. Make any changes and click *OK* to make the default symbol changes.

Font

Font properties specify the default face, style, size, color, opacity, and text alignment. Some examples of where this is used include stand-alone text, axis labels, post map labels, and contour labels. Click the *Font* option on the left side of the dialog to open the **Font Properties** page. Make any changes and click *OK* to make the default font changes.

Font - Code Page

Select the code page for translating ANSI text in the *ANSI Translated Using* field.

Label

Label properties specify numeric display for labels. The label type, prefix, suffix, number of significant digits, thousands symbol, and absolute value may be set. Click the *Label Format* option on the left side of the dialog to open the **Label Format** page. Make any changes and click *OK* to make the default label changes.

Default Settings

The **Default Settings** page accessed through **File | Options** controls most of the default settings used throughout **MapViewer's** dialogs. These settings are saved within a setting file [.SET], and are reloaded whenever **MapViewer** is started. Using the hierarchical list in the **Default Settings** page, you can customize each default setting independently. This is an advanced feature so the settings should not be changed indiscriminately. Minimal error checking is performed so it is possible to specify values completely inappropriate for some data sets.

- The *Current setting file* is the file **MapViewer** is currently using to extract the default settings. Any changes made to the default settings in the various dialogs are saved in the current setting file when **MapViewer** is shut down. By default, **MapViewer** uses a file named MAP.SET. It is also possible to specify a different setting file by clicking the  button.
- The *Settings* list displays the default settings organized hierarchically by dialog. To change a setting, click the + button next to the dialog you wish to modify. Individual settings can be highlighted by clicking on them or by using the up and down arrow keys. As each individual setting is highlighted, a brief description appears in the text box at the bottom of the dialog.
- Enter the new value of the default setting in the *Setting value* control. This control changes depending on the type of setting highlighted in the *Settings* list. Numeric values are entered into a box. Settings with a discrete number of choices are displayed in a list. The values entered in this control are not checked for errors so be sure to specify an appropriate value for the highlighted setting.
- All settings have a value called *Internal Default*. This is a special value which indicates that **MapViewer** should use whatever it thinks is best for the current setting. If the *Setting* control is a box you can specify the *Internal Default* value by deleting the contents of the box so it is empty.
- Several default settings require the value to be specified in a particular format. The type of format required is determined from the comments at the bottom of the **Default**

Settings page. See the Formats for Attribute Values topic for a list of these special values.

- The *Setting persistence* option specifies how the settings are updated when you change the setting during normal operation. The options are:

Always reset	Do not update the default setting when it is changed in a dialog. Every time the dialog is invoked, the setting is reset to the value in the setting file.
Current session only	This option saves changes made to the setting within the dialog during the current session only. The settings are not written to the setting file and are not used the next time **MapViewer** is started.
All sessions	This option saves the changes made to the setting within the dialog during the current session and writes the changes to the setting file to be used the next time **MapViewer** is started.

You must click the *OK* button in the dialog that uses the setting for the setting to be updated. If the *Cancel* button is clicked, the dialog the changes are not recorded in the setting file.

Using Custom Setting Files

Setting files are used to set dialog defaults in **MapViewer**.

Creating Custom Setting Files

To create a custom setting files:

1. Make a copy of the default MAP.SET file and rename it (use the .SET extension).
2. Click **File | Defaults**.
3. Open the renamed setting file by clicking the  button next to the *Current setting file* field.
4. Modify the setting file on the **Default Settings** page.
5. Save the changes to the file by clicking the *OK* button in the **Options** dialog.

Using SET Files

After the preferences are set, you can rename the set file, keeping the [.SET] extension. Each setting file can use a different set of defaults. You can manually change the setting file **MapViewer** uses in the **Default Settings** page by clicking the  button next to the *Current setting file*.

Alternatively, to use a different setting file with **MapViewer**, you can start **MapViewer** with the /SET switch on the command line, as in:

Map.exe /SET *SetFile*

where *SetFile* is the path and name of an existing setting file.

To make this entire process easier, you can create a new shortcut and specify the /SET switch in the *Target:* field of the shortcut properties dialog. See your Windows documentation for details on how to create shortcuts.

Formats for Attribute Values

Several settings use specially formatted values to specify all the required information when using Default Settings. When specifying the values for these settings, you must include all the parameters as discussed in colors, line properties, fill properties, font properties, symbol properties, and numeric label properties.

Colors

Colors are specified by name as they appear in the dialog color palette. The names must be enclosed in double quotes, for example, "Ocean Green"

Alternatively, a color is specified using the special syntax:

" Rxxx Gyyy Bzzz"

where xxx, yyy, and zzz specify a red, green, and blue color component respectively. Each color component can range from 0 to 255.

For example:

"R0 G0 B0"	All components are 0, resulting in black
"R0 G255 B0"	Pure green
"R255 G255 B255"	All components are at full intensity resulting in bright white

Line Property Syntax

Line properties are specified using the syntax:

"Color" "Style" Width

Parameter	Description
Color	The line color name. See Colors for details.
Style	The style of the line as it appears in the dialog line style palette. The name must be enclosed in double quotes.
Width	The width of the line in thousandths of an inch (mils). This should not be enclosed in quotes.

Example:

"R0 G255 B50" ".1 in. Dash" 10

Fill Property Syntax

Fill properties are specified using the syntax:

"ForeColor" "BackColor" "Pattern" Mode

Parameter	Description
ForeColor	The foreground color name. See Colors for details.
BackColor	The background color name. See Colors for details.
Pattern	The fill pattern name as it appears in the dialog fill pattern palette. The name must be enclosed in double quotes.
Mode	The background mode specifies whether vector fills should be opaque (1) or transparent (2). The background mode is specified as a value, and is not enclosed in quotes. Transparent backgrounds are only available for vector fills.

Example:

"Red" "Desert Blue" "Backward slash" 2

Font Property Syntax

Font properties are specified using the syntax:

"FaceName" "ForeColor" "BackColor" Style Size

Parameter	Description
FaceName	The font face name as it appears in the Text properties. The name must be enclosed in double quotes.
ForeColor	The font color name. See Colors for details.
BackColor	The background color for the text block. See Colors for details.
Style	Add the following values to get the style or alignment you want: None (style) or Top, or Left alignment = 0 Horizontal alignment = 1 Right alignment = 2 Baseline alignment = 4 Bottom alignment = 8 VCenter alignment = 12 Bold = 16 Italics = 32 Strikethrough = 64 Underline = 128 Add background color to text = 61440 The style and alignment flag is entered as a number and it is not enclosed in double quotes. Not all font settings have alignment options. Please check the dialog before using alignment numbers.
Size	The size of the text in points. This is entered as a number and it is not enclosed in double quotes.

Example:

"Braggadocio" "Black" "White" 0 6

Symbol Property Syntax

Symbol properties are specified using the syntax:

"SymSet" "FillColor" "LineColor" Index Size

Parameter	Description
SymSet	The symbol set or face name as it appears in the Symbol Properties. The name must be enclosed in double quotes.
FillColor	The symbol fill color name. See Colors for details.
LineColor	The symbol outline color name. See Colors for details.
Index	The 0-based index of the symbol to use as it appears in the Symbol Properties. This is entered as a number and it does not use double quotes.
Size	The size of the symbol in thousandths of an inch (mils). This is entered as a number and is not enclosed in double quotes.

Example:

"Default Symbols" "Purple" "Pale Yellow" 12 440

Numeric Label Property Syntax

Numeric label properties are specified using the syntax:

Type Digits Style "Prefix" "Suffix"

Parameter	Description
Type	The numeric format. This is entered as a number and it is not enclosed in double quotes. 0 = Fixed 1 = Exponential 2 = General
Digits	The number of decimal digits after the decimal place in the label. This value can range from 0 to 15. This is entered as a number and it is not enclosed in double quotes.
Style	This is entered as a number and it is not enclosed in double quotes. 0 = None (no styles) 1 = Thousands (separate thousands with a comma) 2 = Absolute Value (show numbers as absolute values) 3 = Thousands and Absolute Value (use thousands and absolute values)
Prefix	The Prefix text is text that appears at the beginning of every label. This must be enclosed in double quotes.
Suffix	The Suffix text is text that appears at the end of every label. This must be enclosed in double quotes.

Example:

0 8 0 "Pre" "Post"

Customizing Commands

The **Customize** dialog allows the Quick Access Toolbar, Ribbon, and keyboard shortcuts to be customized. Select the **File | Customize Ribbon** command to open the **Customize** dialog. You can also access the **Customize** dialog by right-clicking on the Ribbon or Quick Access Toolbar and selecting one of the *Customize...* options.

Customizing the Quick Access Toolbar

The Quick Access Toolbar is a customizable toolbar. One method that can be used to add commands to the Quick Access Toolbar is to right-click on the command in the ribbon and choose *Add to Quick Access Toolbar*. The command is automatically added to the end of the toolbar.

To customize the commands in the **Quick Access Toolbar** dialog, right-click on the ribbon and select *Customize Quick Access Toolbar*. In the **Quick Access Toolbar** dialog,

1. To add a command, select the command from the list on the left that you want to add. Click the *Add>>* button and the command is added to the list on the right.
2. To add a separator between commands, set the *Choose commands from* to Main on the left side of the dialog. Select *<Separator>* and click *Add>>*. Move the separator to the desired position.
3. To delete a command, select the command from the list on the right. Click the *<<Remove* button and the command is removed from the list on the right.
4. To rearrange commands or move separators, click on the command or separator name from the list on the right that you want to move. Click the up and down arrow buttons on the far right to move the command up or down the list. Commands are shown in the exact order that they are displayed in the Quick Access Toolbar.
5. To reset the Quick Access Toolbar to the default display, click the *Reset* button below the list on the right side of the dialog.
6. Click OK and all changes are made.

Note: to add individual plot types as buttons to the Quick Access Toolbar, set the *Choose commands from* to *Plot | Plot Menu*. Then on the left side of the dialog, select the appropriate plot type, such as *3D Bar Chart. Click Add>>* and the plot type is added with an icon to the right side. Click *OK* and the plot type is displayed in the Quick Access Toolbar.

Customizing the Ribbon

The ribbon is customizable in **MapViewer**. To customize the commands in the ribbon, right-click on the ribbon and select *Customize the Ribbon*.

In the **Customize Ribbon** dialog, you can add new tabs, add groups, hide existing tabs or custom groups, and add commands to any custom group. You can also rearrange the tabs into an order that fits your needs better.

To customize the commands in the **Customize Ribbon** dialog, right-click on the ribbon and select *Customize the Ribbon*. In the **Customize Ribbon** dialog, use the following options.

Tab options:

1. To add a custom tab, set the *Customize the Ribbon* section to *All Tabs*. Click in the list on the right side of the dialog where the custom tab should be located and click the *New Tab* button.
2. To delete custom tab, right-click on the tab name in the list on the right side of the dialog and select *Delete*.
3. To rename a default or custom tab, click on the tab name in the list on the right side of the dialog. Click the *Rename* button. Type the new name and press OK to make the change.
4. To hide a default or custom tab, uncheck the box next to the tab name on the right side of the dialog. Only checked tabs will be displayed.
5. To change the order of default or custom tabs, click on the tab name that should be moved in the list on the right side of the dialog. Click the up and down arrow buttons on the far right side of the dialog to move the selected tab up or down. Default tabs must remain in their major group.

Group options:

1. To add a custom group to a default or custom tab, click on the + next to the tab name. Click in the list of group names where the new group should be located and click the *New Group* button.
2. To delete a default or custom group on any tab, right-click on the group name in the list on the right side of the dialog and select *Delete*.
3. To rename a default or custom group on any tab, click on the group name in the list on the right side of the dialog. Click the *Rename* button. Type the new name and click OK to make the change.
4. To change the order of default or custom groups on any tab, click on the group name that should be moved in the list on the right side of the dialog. Click the up and down arrow buttons on the far right side of the dialog to move the selected group up or down in the list.
5. To replace a default group with a custom group, right-click on the default group name and select *Delete*. Click the *New Group* button. Add the desired commands to the new group that you want displayed. Rename the new group, if desired.

Command options:

Commands can only be added to or deleted from custom groups. Commands can only be rearranged or renamed in custom groups. If commands in default groups are desired to be edited, the default group should be deleted and a new custom group should be created with the same commands.

1. To add a command to a custom group, set the *choose commands from* list to *All Tabs* so that all commands are listed on the left side of the dialog. Select the desired command that should be added. On the right side of the dialog, click the + next to the custom group name. Click on the desired position in the list of commands. If no commands exist in the group yet, click on the group name. Click the *Add>>* button and the command is added to the custom group.
2. To delete a command from a custom group, right-click on the command name in the list on the right side of the dialog and select *Delete*. Only commands from custom groups can be deleted.
3. To rename a command in a custom group, click on the command name in the list on the right side of the dialog. Click the *Rename* button. Type the new name and click OK to make the change. Only commands in custom groups can be renamed.
4. To change the order of commands in a custom group, click on the command name that should be moved in the list on the right side of the dialog. Click the up and down arrow

buttons on the far right side of the dialog to move the selected command up or down in the list.

Customize the Keyboard

Keyboard shortcuts can be changed by right-clicking on the ribbon and selecting *Customize the Ribbon*. In the **Customize Ribbon** dialog, click the *Customize* button next to *Keyboard shortcuts.* On the left side of the dialog, select the tab name in the *Categories* list. This is the name of the tab where the command is located in the ribbon. On the right side of the dialog, click on the command name in the *Commands* list. Click in the *Press new shortcut key* box and press and hold the keys that should be used for the command. For instance, you might press and hold the CTRL, ALT, SHIFT, or any character key on the keyboard. The key names will be listed in the *Press new shortcut key* box.

If no other command uses the key combination, the *Assigned to* section lists [Unassigned]. When the keys are unassigned, click the *Assign* button at the bottom of the dialog to assign the key combination to the selected command.

If the key combination is currently assigned to another command, the command will be listed in the *Assigned to* section. If a key combination is currently assigned to another command, select the currently assigned command name. Click on the *Current Keys* combination that you want to reassign and click the *Remove* button at the bottom of the dialog. Click back on the original command. Click in the *Press new shortcut key* box and press the keys on the keyboard. Click the *Assign* button to assign the key combination to the new command.

Click *Close* to make the new commands effective. Click *Reset All* to reset all customizations to the defaults.

Sharing Customizations Between Computers

All of the **Grapher** Quick Access Toolbar, ribbon, and keyboard commands are stored in the registry. The registry key can be copied and pasted onto other computers to easily share customizations. Be very careful when editing the registry! A small mistake can cause the program or computer to become unresponsive.

1. Make any customizations to the ribbon, quick access toolbar, and any keyboard commands you desire.
2. When all customizations have been made, close **MapViewer**.
3. Open the registry. In Windows Vista and 7, you can do this by clicking the Windows Start button and typing *regedit* into the *Start Search* box.
4. Go to the *HKEY_CURRENT_USER\Software\Golden Software\MapViewer\8\BCGSettings\BCGRibbonBar-59398* key.
5. Click the **File | Export** command.
6. Type a name, such as *My Customizations*, and make sure that the *Selected range* is set to the *Selected branch*.
7. Click *Save*.
8. Locate the .REG file on your computer and copy it to a CD, USB drive, or network share location.
9. On another computer, close **MapViewer**.
10. Paste the .REG file in a place where it is easily found on the new computer.
11. Double-click on the .REG file.
12. Click *Yes* if you are prompted if you want to change the computer.
13. Open **MapViewer**. The customizations have been applied to the new machine.

Displaying Classic Menu Appearance

The **MapViewer** UI will look more similar to the classic menu appearance when the ribbon bar is minimized. Right-click on the ribbon bar and select *Minimize the Ribbon* or click the up arrow in the top right corner of the ribbon to minimize it.

Chapter 38

MapViewer Automation

Introducing Scripter

Golden Software's **Scripter**™ is a program for developing and running scripts. A script is a text file containing a series of instructions carried out when the script is run. Instructions are written in a Visual BASIC-like programming language.

Scripter offers many features to help you write, edit, and debug scripts. Its features include language syntax coloring, a list of the procedures defined in the script, an object browser for examining procedures available in external objects, a visual dialog editor, break points, single-step execution, a watch window for displaying the values of script variables, and others.

To start the **Scripter** program, select it from the Windows Start menu. **Scripter** is installed in the same program group as **MapViewer**.

Scripter Windows

When **Scripter** is first started, you are presented with a text editor window containing the lines Sub Main, followed by a blank line, and then End Sub. This is the code editor window where you type script instructions and where the contents of script files are displayed.

The code window acts as a text editor, similar to the Windows Notepad program, with a few enhancements to facilitate script writing:

- After you press the ENTER key, tabs or spaces are automatically inserted at the beginning of the next line to maintain the same indentation level as the previous line.
- Key words and symbols of the BASIC language are displayed in different colors. You can use the **View | Colors** command to modify the colors used to display the various elements of the programming language.
- A light horizontal divider line is automatically drawn between sections of your script. The divider lines help you to locate the start of subroutine and function definitions.

Above the code editor window is a bar containing the *Object* and *Proc* (procedure) lists. Selecting items from these lists moves the various sections of your script file into view. The object and procedure lists are useful when your script file becomes large.

Above the object and procedure lists, you may see a blank window area with a tab on top that reads **Immediate**. If this window is not visible, select the **View | Always Split** command to make it appear. The immediate window is used to execute one-line instructions immediately. When you type an instruction into this window and press the ENTER key, **Scripter** carries out the instruction.

In addition to being a scratch area for evaluating language statements, the immediate window shows debugging information. The output from the Debug.Print statement and the value of variables selected with the **Debug | Quick Watch** command are printed in the immediate window. While a script program is running, **Watch**, **Stack**, and **Loaded** tabs are added at the top of the immediate window area. Click these tabs for information that may be useful for debugging. See Debugging Scripts for more information on the immediate, watch, stack, and loaded windows.

Along the left edge of the code window are code sheet tabs. When you select either the **File | New** command or the **File | Open** command, **Scripter** creates a new code sheet and inserts a new sheet tab. Each tab corresponds to one of the code sheets. Clicking once on a tab makes that sheet the current sheet. Double-clicking a tab closes the sheet.

Between the sheet tabs and the code window is an area called the "break bar." When a script is paused, a yellow arrow in the break bar shows which line is next to execute. The break bar also shows which lines have break points. Set a break point by clicking on the break bar. A red dot appears in the break bar, and the adjacent line in the code window is highlighted. When a line marked as a break point is about to be executed, **Scripter** pauses program execution. To clear a break point, click on the red dot in the break bar. See Debugging Scripts for more information on break points.

A status bar along the bottom of the **Scripter** window shows information about the current state of the program. The **View | Status Bar** command hides or reveals the status bar. Before running a script, make sure that the status bar is visible because messages about typographical and syntax errors are displayed in the status bar.

Working with Scripts

This topic describes the general procedures for working with scripts in **Scripter**. See the Suggested Reading for additional information.

New Scripts

To create a new script, select the **File | New** command. A blank script sheet is created. You can start typing script instructions into this sheet. If you edit more than one sheet at a time, click the sheet tabs to switch between them or select the **Sheet | 1**, **Sheet | 2**, etc. menu commands. You can edit up to nine code sheets at the same time.

New Modules

To create a custom ActiveX object, select **File | New Module**, and choose either **Object Module** or **Class Module** (choosing **Code Module** is the same as the **File | New** command).

Existing Scripts and Modules

To open an existing script, select the **File | Open** command. To open a script you opened recently, click its name at the bottom of the **File** menu. To open other modules used by your script, select the **Sheet | Open Uses** command.

Saving Scripts

Once a script is complete, you can save the script by using the **File | Save** or **File | Save As** commands. If a script has not been changed since the last save, the **Save** command is disabled.

Closing Scripts

To close the active script, use **File | Close**, use **Sheet | Close**, or double-click the sheet tab of the sheet. Close all open scripts with **Sheet | Close All**.

Scripter BASIC Language

The online help describe the major elements of the **Scripter** BASIC programming language, but it does not explain the concepts of writing computer programs. Many good books on the subject of programming with BASIC (**B**eginner's **A**ll-purpose **S**ymbolic **I**nstruction **C**ode) have been written. If you are not moderately familiar with writing computer programs, we suggest that you refer to one of the books listed in the Suggested Reading topic.

Scripts are text files that contain a sequence of instructions to be carried out by the **Scripter** program. Each instruction specifies a task such as defining a variable or displaying a message on the screen. When the **Scripter** program processes the script, the instructions are carried out one at a time, from top to bottom.

Execution of a script begins with the first statement of the subroutine called Main. All scripts must therefore include the Sub Main and End Sub statements. Execution proceeds line-by-line until the end of the Main procedure, until an End statement is executed, or until an error occurs.

Visual BASIC Compatibility

The **Scripter** BASIC programming language is compatible with the Visual BASIC for Applications language (VBA). Scripts that run in **Scripter** work in a VBA environment with few or no modifications. **Scripter** programs also work under Microsoft Visual BASIC. Unlike most Visual BASIC programs, however, **Scripter** programs are not event-driven. **Scripter** programs are procedural. They start with the first statement of the Main procedure, and end when the Main procedure ends.

Some statements available in VBA are not supported in **Scripter** BASIC:

The VBA Collection object

The VBA Clipboard object

GoSub

On... GoSub

On... Goto

GoSub…Return

All Financial functions

Resume at current line

Erl

Option Compare

Conditional compilation

With Events

LinkExecute

LinkPoke

LinkRequest

LinkSend

Line numbers

LoadPicture

Multiple statements on one line (separated by ":")

Conversely, some features of the **Scripter** BASIC language are not supported by VBA. Do not use the following features if you want to transfer your scripts from **Scripter** into VBA:

Clipboard function

CallersLine

User dialogs

PortInt

MacroRunThis

MacroDir

Wait instruction

MacroRun

DDEExecute

DDEPoke

DDERequest

DDEInitiate

DDETerminateAll

DDETerminate

Running Scripts

Scripts are placed in the code window by typing a new script from scratch or by loading the script with the **File | Open** command. To run the script in the **Scripter** code window, select the **Script | Run** command, press the F5 key, or click the button. **Scripter** examines the script instructions, and, if all the instructions are recognized, it begins to perform each instruction in turn.

More often than not, however, a newly typed script will not work correctly the first time it is run. Even simple typographical errors will cause the script to fail. For information on finding and fixing errors in scripts, see the Debugging Scripts.

Select the **Script | End** command or click the button to stop executing a script. This may be necessary when you want to edit a script after a run-time error occurs, or when you accidentally start a script and you want to cancel the execution.

Running Scripts from the Command Line

You can run scripts from a command prompt without having to manually load and execute the script in **Scripter**. The same commands that you would type at a command prompt may also be entered as the "target" for a shortcut in order to link a shortcut button to a script. Enter the following to run a script from the command line or to link a shortcut to particular script file:

```
<Scripter path> -x filename.bas
```

where <Scripter path> represents the path to the **Scripter** program file. (for example, C:\ ProgramFiles\MapViewer\Scripter\Scripter.exe"), and filename.bas represents the name of the script to run. The space between the –x and the file name is required. This command opens the

Scripter window, loads the specified script file, and runs the specified script. When the script terminates - either successfully or unsuccessfully - the **Scripter** window closes.

To load a script file but not execute it, the following command can be used:

```
<Scripter path> filename.bas
```

This opens the **Scripter** window and automatically loads the specified script file. The **Scripter** window remains open.

Debugging Scripts

Bugs are errors in a script that keep it from performing as intended. Debugging is the process of locating and fixing these errors. The most common bugs are typographical errors in scripts or malformed instructions. **Scripter** detects these types of errors immediately when you try to run a script. The program beeps, highlights the line containing the error in red (or whatever color has been set with **View | Colors** command), and displays an error message on the status bar.

Viewing Errors

Before running a script, verify that the **View | Status Bar** command is enabled, otherwise you will not see the error message. To resolve the errors that **Scripter** immediately detects, you usually must interpret the error message and correct the indicated problem. Typical errors are typing mistakes, unbalanced parentheses, misuse of a BASIC language instruction, or failure to declare variables in a DIM statement (if you use the OPTION EXPLICIT statement). If you do not see an obvious problem, refer to the online BASIC language help to make sure you are using the right syntax.

Run-Time Errors

Scripts that encounter errors midway through script execution may be fixed much the same way as syntax errors. The error message should guide your actions. Some run-time errors cannot be detected until they are executed, such as when you try to open a file that does not exist. In these cases, you need to check for error conditions in your scripts. For example, use the DIR function to make sure a file exists before trying to open it. Alternatively, you can use the ON ERROR GOTO statement to specify an error handling section to execute when a procedure encounters a run-time error:

```
Sub OpenFile(mvApp As Object, filename As String)
      On Error Goto ErrLabel
      mvApp.Documents.Open filename
      Exit Sub

      ErrLabel:
      MsgBox "Unable to open file " & filename
      Exit ' Must use RESUME or EXIT at end of error handling code
End Sub
```

Script Runs Incorrectly

Most difficult to correct are scripts which run, but do not work as expected. Fixing these scripts is hard because you do not know which line or statement is causing the problem. **Scripter** provides a number of debugging features to help you locate the source of problems.

Debug.Print

Probably the simplest debugging technique is to insert instructions into your script to monitor the progress of the script and display the values of variables at various points throughout the script. Use the Debug.Print statement to display information in the **Scripter** immediate window:

```
Debug.Print "The value of variable X is "; X
```

To clear the contents of the immediate window, select the text in the window and press either DEL or BACKSPACE.

Stop or Pause

Insert the STOP instruction to pause script execution where you think there might be a problem. While the script is paused, you can examine and change the values of program variables. If a running script appears unresponsive, it may be stuck in an infinite loop. Select the **Script | Pause** command or click the button to pause the script. To resume executing a paused script, select the **Script | Run** command or click .

Viewing Variable Values

While a script is paused, there are several ways to view the value of a variable:

- In the immediate window, type a question mark followed by the variable name and press ENTER. The current value of the variable is displayed.
- In the code window, place the cursor on the variable name you want to examine (that is, click on the variable name in the code window). Press SHIFT+F9, select the **Debug | Quick Watch** command, or click the button on the toolbar. The current value of the variable is displayed in the immediate window.
- To continuously monitor a variable's value, click on the variable name in the code window, and press CTRL+F9 or select the **Debug | Add Watch** command. Alternatively, type the variable name in the watch window and press ENTER. The variable name and its value are displayed in the watch window. Every time script execution pauses, the variable value is automatically updated. To clear a variable from the watch window, highlight the line showing the variable value and press the DEL or BACKSPACE key.

Changing Variable Values

To change the value of a variable, type an assignment expression in the immediate window and press ENTER. For example, type "A=5" (without quotes) and press ENTER to assign a new value to the variable named "A."

Step

A powerful debugging technique is to watch **Scripter** execute your script one line at a time. This lets you check the effect of each instruction and verify that the script is doing what you expect. While stepping through a script, you can examine and change the values of script variables. Select

the **Script | Run** command or click  to resume script execution at full speed after stepping through script instructions.

To execute your script one line at a time press the F8 key or select the **Debug | Step Into** command. The first line of the script is executed (or, if the script was paused, the next highlighted line is executed). The next line is highlighted and a yellow arrow appears to the left of the next line. To execute the highlighted instruction, press F8 again.

If a statement calls a subroutine or function that is defined within your script, the highlight will move into the called procedure. To keep from tracing execution into a called procedure, press SHIFT+F8 or select the **Debug | Step Over** command. This executes the whole subroutine or function in a single step.

If you accidentally step into a procedure, press CTRL+F8 or select the **Debug | Step Out** command. This executes all remaining instructions in a procedure, and returns the highlight to the instruction that called the procedure.

If you do not see the next highlighted instruction, select the **Debug | Show Next Statement** command to scroll the highlighted line into view.

Sometimes you may want to skip the execution of some instructions or you may want to execute the same instructions several times without restarting the script. To change the next instruction line, click on the line you want to execute next and select the **Debug | Set Next Statement** command.

Breakpoint

Watching **Scripter** execute every line of the script may be too time consuming. In this case, a breakpoint pauses the script where you think there might be a problem. A breakpoint is a line of code that you mark. When **Scripter** encounters a line marked as a breakpoint, it pauses the script just as if it had executed a STOP instruction. Breakpoints are more convenient than STOP instructions because they may be set and cleared while a script is paused, whereas STOP instructions may be changed only after a script has ended.

To set a breakpoint, click in the break bar area next to the line you want to mark. The break bar is the area to the left of the code window, between the sheet tabs and the code window. Alternatively, click on the line you want to mark, and press F9 or select the **Debug | Toggle Break** command. The line becomes highlighted in red, and a round marker appears in the break bar area.

To clear a breakpoint, click on the round marker, or move the cursor to the marked line and press F9 or select the **Debug | Toggle Break** command again. You can clear all breakpoints by pressing SHIFT+CTRL+F9 or selecting the **Debug | Clear All Breaks** command.

A quick alternative to setting a breakpoint is the **Debug | Step To Cursor** command. This command has the same effect as setting a breakpoint on the current line, running the script, and then clearing the breakpoint after script execution has paused on the current line.

Trace

To check flow of execution through your script without having to watch each line of the script being executed, try using the TRACE function. To activate the trace function type "Trace" (without the

quotes) in the immediate window and press ENTER. Trace On is displayed in the immediate window. As the script is run, the location of every instruction being executed is printed in the immediate window. After the script finishes, the trace function is automatically disabled.

Stack

If you nest procedure calls (that is, one procedure calls another procedure, which calls yet another procedure, and so forth), the stack window may be useful. When a script is paused, the stack window lists the procedures that have been called, and the order in which they were called. For instance, if the Main procedure calls procedure "A" which in turn calls procedure "B," the stack window displays three lines, one for each of the called procedures. Clicking on a line in the stack window moves the corresponding procedure into view in the code window.

Module Files

Click the loaded window tab in the immediate window area to see which module files are currently being interpreted by **Scripter**. The loaded files include the current script file and any modules it includes with the '#Uses statement.

Overview of MapViewer Objects

Learning to use the **MapViewer** automation objects in a script may appear daunting at first. Most tasks, however, can be accomplished using just a few **MapViewer** objects. Once you become familiar with these primary objects and learn how to "drill through" the object hierarchy, you will be able to access most of **MapViewer's** features from your scripts.

The online help is the complete reference for all of the **MapViewer** automation objects, their properties, and their methods. The object model chart should serve as your guide for navigating through the object hierarchy.

This section shows how to access the **MapViewer** automation objects using the Scripter BASIC language. If you are not familiar with computer programming, you may benefit from a programming tutorial. See the Suggested Reading topic for recommendations.

Using MapViewer Objects

To access **MapViewer** commands from your script you must create a **MapViewer** Application object. To create an Application object, call the CreateObject function with " MapViewer.Application" as the argument.

Every object has properties and methods associated with it. Properties are values describing the state of an object. Methods are actions an object can perform. Access properties and methods by typing the name of an object variable, followed by a period, followed by the property or method name.

You can use object properties as you would use variables: assign values to properties, branch based on the value of a property, or use the value of a property in calculations. You call an object's methods as you would call subroutines and functions. Use the return values from methods the same as you would use return values from functions.

When you "drill through" the object hierarchy, you can store references to intermediate objects in variables, or you can string together long sequences of object references. For example, you can set the default font for a map document in a single line:

```
' Assume " mvApp" is a variable holding a reference to the Application object
mvApp.Documents.Item(1). DefaultFont.Bold = True
```

Alternatively, you can store each intermediate object in variables as you traverse the object hierarchy:

```
' Assume " mvApp" is a variable holding a reference to the Application object
Set docs = mvApp.Documents
Set plot = docs.Item(1)
Set font = plot.DefaultFont
font.Bold = True
```

The second form - storing intermediate objects - is more efficient if you are performing several actions with the same object. A third alternative is to use the WITH…END WITH statement:

```
' Assume " mvApp" is a variable holding a reference to the Application object
With mvApp.Documents.Item(1). DefaultFont
.Bold = True
.Size = 12
.Color = mvColorRed
End With
```

Using Collection Objects

MapViewer groups most objects in collections. Although these collections contain different types of data, they can be processed using similar techniques.

Count

All collection objects have a read-only property named Count which gives the number of objects in the collection.

Item

Every collection also has a method called Item which retrieves one of the objects contained in the collection. The Item method accepts a single argument specifying either an index number or (for most collections) the name of the object to retrieve. An index number is a value between 1 and the value returned from the collection's Count property. The name used to identify items in a collection varies:

- In a Documents collection, the individual Document objects are identified by the file name (or the caption, if the document has not been saved in a file yet).
- In a Windows collection, individual Window objects are identified by the window caption.
- In collections containing objects derived from the Shape object (Shapes, Selection, and Layers collection objects), the individual Shape objects are identified by the object ID assigned to the object.

A shorthand syntax for retrieving items from a collection is to enclose the index or name of the desired object in parentheses immediately following the name of a collection object (similar to accessing an element in an array). Thus, the following two instructions have the same effect:

```
' Assume "docs" is a variable holding a reference to the Documents collection
```

```
docs.Item(1) ' retrieves the first object in the collection
docs(1) ' shorthand, retrieves the first object in the collection
```

Type

Objects contained in collections are typically derived from a base object. When you use the Item method to retrieve an object from a collection, the method returns a reference to the base object. To determine the actual type of the returned object, most base objects contain a Type method. For example, the Windows collection may contain PlotWindow or WksWindow objects. When you retrieve a window from the Windows collection, a reference to a generic Window object is returned. Use the Window.Type property to determine if the returned object is a PlotWindow or WksWindow object.

Add

Many collections have one or more Add methods for creating new items and adding them to the collection. For example, to add a rectangle to the Shapes collection, you would use the AddRectangle method:

```
Shapes.AddRectangle 2, 2, 4, 4
```

Close and Delete

The objects contained by collections are automatically removed when the contained object is deleted or closed. For example, call a Document object's Close method to close a document or call the Shape object's Delete method to remove any Shape-derived object.

MapViewer Object Model

MapViewer provides ActiveX Automation objects that allow scripts to control practically every feature of **MapViewer**. These objects can be accessed from **Scripter** or from any Automation-enabled environment, such as Visual BASIC, Windows Scripting Host, or Excel.

The means of accessing **MapViewer** automation objects varies depending on the scripting tool and language being used. With the Golden Software **Scripter** program and other applications compatible with Visual BASIC, the CreateObject function creates a **MapViewer** Application object:

```
Set x = CreateObject(" MapViewer.Application")
```

In this sample, a variable named "x" is assigned the value returned by the CreateObject function. The CreateObject function finds the name MapViewer.Application in the system registry, automatically activates **MapViewer**, and returns a reference to the **MapViewer** Application object. For an introduction to the **Scripter** programming language, see Scripter BASIC Language.

After creating an Application object, you can access other **MapViewer** objects through the properties and methods (defined below) of the Application object. The object model chart shows you which objects provide access to other objects in the hierarchy. Although the Application object is at the top of the hierarchy, not all objects are directly accessible from the Application object. To access many objects you must traverse from the Application object through one or more layers of sub-objects. People often refer to "drilling" or "boring" through the object hierarchy to describe this traversal through several objects to obtain an object you want to use.

To "drill through" the object hierarchy you must know which properties and methods of an object provide access to the next level of objects. Overview of MapViewer Objects discusses the most

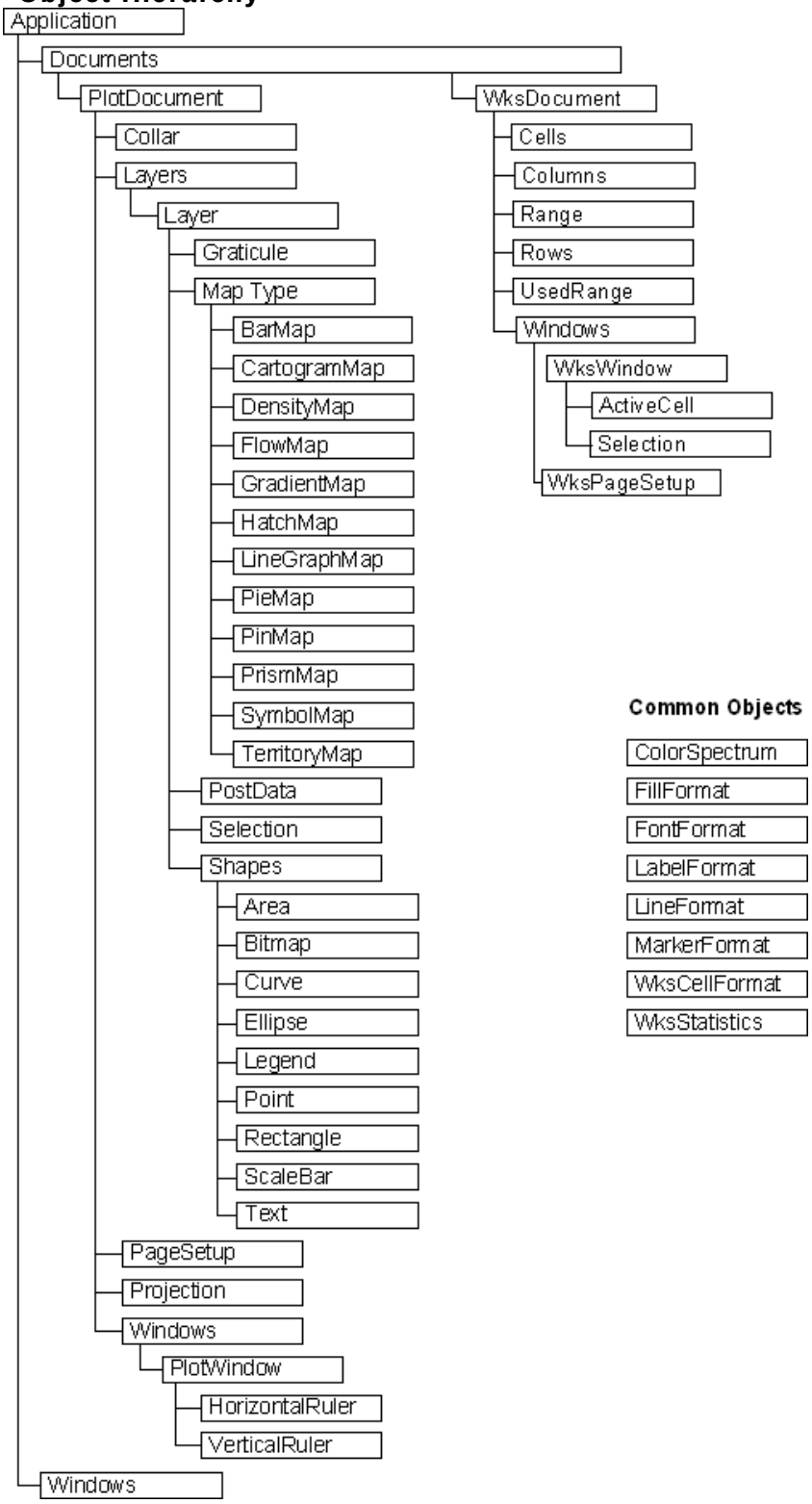
commonly used objects and the properties and methods that provide access to other objects in the hierarchy.

Every object represents a specific part of **MapViewer**. For example, the HatchMap object represents a hatch map, and the Graticule object represents a map graticule. Some objects do not represent a visible entity, but organize other objects into groups. The Shapes collection, for example, provides the means to create new drawing primitives (rectangles, points, polygons, etc.), but the Shapes collection itself is never visible.

Several non-visible objects, called collection objects, are used to organize the object hierarchy. Collection objects are containers for groups of other, related objects. For example, the Documents collection contains all the documents opened during a **MapViewer** session. All collection objects, regardless of what the collection contains, can be processed using similar techniques.

You can find all the properties and methods that are available for each of the automation objects, as well as a description of the objects themselves, in the online help. The **ActiveX Automation Members** dialog also shows you the available objects, properties, and methods. To view this dialog, select the **Debug | Browse** command in **Scripter**.

Object Hierarchy



Common Objects

- ColorSpectrum
- FillFormat
- FontFormat
- LabelFormat
- LineFormat
- MarkerFormat
- WksCellFormat
- WksStatistics

Object Variables

In **Scripter**, object variables contain references to ActiveX objects. Creating the program Application object is an example of declaring an object variable:

```
Dim mvApp As Object
Set mvApp = CreateObject(" MapViewer.Application")
```

In this example, a DIM statement declares that the variable named mvApp holds a reference to an object. The built-in CreateObject function returns a reference to a **MapViewer** Application object, and the SET statement assigns this object reference to the mvApp variable. Unlike variables of other types, which can be assigned new values simply with an equal sign (=), object variables must be assigned values with a SET statement.

Derived Objects

Several objects shown in the object chart share common features. For example, the PlotDocument object and WksDocument object each provide SaveAs, Activate, and Close methods. These common features are inherited from a predecessor Document object.

Derived objects inherit all the properties and methods of the predecessor object. In the online reference, the help topic for derived objects shows just the properties and methods unique to the object. The predecessor object is accessed through the *Derived from* link. Remember that all the properties and methods of a predecessor object are available as well. Derived objects and their predecessor objects include:

- The Document object is a predecessor of the PlotDocument and WksDocument objects.
- The Window object is a predecessor of the PlotWindow and WksWindow objects.
- The Shape object is a predecessor of all objects which can be moved and resized. These include the basic drawing objects (Area, Curve, Ellipse, Point, Text, and Rectangle) and various map component objects (Bitmap, Legend, and ScaleBar).
- The Map object is a predecessor of all map types including BarMap, DensityMap, FlowMap, HatchMap, LineGraphMap, PieMap, PinMap, PrismMap, and SymbolMap.

A full list of each object's methods and properties, including the derived methods and properties, can be viewed in **Scripter's** object browser, accessed through **Debug | Browse**.

Named and Positional Arguments

In **Scripter**, named arguments must have a colon plus equal sign (:=), not just an equal sign. The arguments can be named or you can use positional statements separated by commas. The following two examples show the same line written with the two different methods.

<u>Named arguments:</u>

```
Set PinMap = Plot.CreatePinMap( DataFileName:=mvapp.ApplicationFolder _
+ " Samples\Pin.dat", LocatingMethod:= mvPinLocCoordinates, PIDCol:=1, _
XCol:=3, YCol:=4, LabCol:=2)
```

Positional arguments:

```
Set Plot.CreatePinMap(mvapp.ApplicationFolder + " Samples\Pin.dat", , _
mvPinLocCoordinates, , , 1, 3, 4, 2, , , , , , )
```

Optional Arguments

Many procedures, especially the methods provided by **MapViewer** automation objects, accept a large number of arguments. Some of the arguments are required. Every required argument must be supplied or the script will fail to run. Some arguments are optional. Optional arguments may be omitted and the procedure will assume a default value for the missing arguments.

For example, the PlotDocument object's PrintOut method accepts up to seven arguments, all of which are optional:

```
plot.PrintOut(Method, SelectionOnly, NumCopies, Collate, _
xOverlap, yOverlap, Scale )
```

Since the arguments are optional, you can skip all or some of them when calling the procedure. To print three copies at fifty-percent scale, for example, you would supply just the NumCopies, and Scale argument values. These arguments must be listed in the correct position, separated by commas, as shown below:

```
Set mv = CreateObject("MapViewer.Application")
Set plot = mv.Documents.Add
plot.PrintOut , , 3, , , , 50
```

Although only two of the seven argument values are supplied in this example, the appropriate number of commas must be used to mark the positions of the missing arguments. Since inserting the right number of commas can be troublesome, you can supply the arguments by name rather than by position. Named arguments are specified by the argument name followed by a colon and an equal sign (":="), followed by the argument value:

```
Set mv = CreateObject("MapViewer.Application")
Set plot = mv.Documents.Add
plot.PrintOut Scale := 50, NumCopies := 3
```

Named arguments may be listed in any order without regard to the order they appear in the procedure's definition.

Parent and Application Properties

Every automation object provides a Parent and an Application property. The Application property returns a reference to the top-level Application object. This is a convenient way to access the Application object, particularly when passing automation objects as arguments to subroutine and function calls.

The Parent property returns a reference to the collection object that an object is contained in, or the controlling object. If an object is not contained by a collection object, the Parent property typically returns a reference to the Application object.

Comments

Writing comments in your scripts to explain how they work can save you time and frustration when you later need to modify the script. The apostrophe character (') signals the start of a comment. **Scripter** ignores all text following the apostrophe up to the end of the line. Comments can be placed on their own line, or they may be placed at the end of a line. For example:

mvApp.Left = 60 'Set the Left location of the **MapViewer** window

In addition, you can use the REM statement to add a remark in the script. However, REM statements can only be used at the beginning of a line.

Double Quotes and Text

In **Scripter**, text strings must be enclosed in double quotes. File names, for example, must be surrounded by double quotes. If quotes are missing, the text may be mistaken for a variable name.

Debug.Print "This text string is printed in **Scripter's** immediate window"

Line Continuation

To break a line into two lines in **Scripter**, use a space followed by an underscore " _". You must include the space for the continuation to work properly in the script. Comments are not allowed after the continuation character.

Example

```
Function ComputeSomething( filename As String, _
value_array() As Double) As Double
```

Operators

Operators are symbols that direct a script to perform basic calculations, such as addition, exponentiation, string concatenation, number comparison, and others. The language supports several arithmetic, comparison, and logical operators. In **Scripter**, select **Help | BASIC Language Help** command and search for "Operators" to see a complete list.

Coordinate Arrays

Coordinates are passed to and from **MapViewer** as arrays of doubles or longs with alternating X and Y coordinates. For example, the triangle specified by the coordinates (x1,y1), (x2,y2), (x3,y3) would be passed in an array with the elements arranged like so: x1,y1,x2,y2,x3,y3. **MapViewer** is flexible about the dimension of the array so long as the X and Y coordinates are contiguous (no empty elements) and alternating. To use arrays in **MapViewer** from within VB:

1. Singly dimensioned array:

```
Dim coordinates(1 to 6) As Double
coordinates(1)=x1
coordinates(2)=y1
```

```
coordinates(3)=x2
coordinates(4)=y2
coordinates(5)=x3
coordinates(6)=y3
```

2. Doubly dimensioned array:

```
Dim Points(1 To 2,1 To NumPoints) As Double
Points(1,1) = x1: Points(2,1) = y1
Points(1,2) = x2: Points(2,2) = y2
Points(1,3) = x3: Points(2,3) = y3
```

The first dimension is used for the X and Y coordinate, the second dimension refers to the vertex index.

3. You can use the Array statement for initialization, and then copy the results to a double array:

```
coordinates = Array(x1,y1,x2,y2,x3,y3)
dim Points(1 to 6) As Double
For i=1 to 6
Points(i) = coordinates(i)
Next
```

Getting User Input

The **Scripter** language provides several predefined functions for prompting the script user for information. The GetFilePath function displays a standard Windows file open dialog. This allows the script user to select a file. The name of the selected file is returned by the function. The InputBox function allows the user to enter an arbitrary line of text. This function returns the line of text entered.

```
UserText$ = InputBox("Enter something here:") 'show prompt
Debug.Print UserText$ 'show line in Immediate window
```

In addition to these simple input routines, **Scripter** supports user-defined dialog boxes. You can design your own dialog boxes and process their input in any manner you choose.

Creating Dialog Boxes

Scripter contains a dialog box editor that you can use to design customized dialog boxes. Select **Edit | UserDialog Editor** to visually design a dialog. You can control the size and placement of the components of the dialog, as well as customize the text included in the dialog.

To add a component to a dialog, first select from the palette of components at the left side of the dialog editor. After clicking a palette button, drag the mouse pointer diagonally in the dialog design area where you want to place the component. As you design the dialog, you can edit the properties of components you have placed in the dialog. To edit the properties of a component, double-click the item, click the right mouse button on the item, or select the component and click the  button. Every dialog must include an OKButton or a CancelButton, or both.

When you have finished designing the dialog, click the  button. The code for the dialog is inserted into the script. To edit the dialog template after it has been inserted into the script, first move the cursor in the code window to any line between the BEGIN DIALOG statement and the END DIALOG statement. Next, select the **Edit | UserDialog Editor** command. The previously saved state of the dialog is shown in the dialog editor. When you save the dialog again, the previous dialog template is replaced with your changes.

To show your custom dialog in a script, first use the DIM statement to declare a variable as the UserDialog type, and then call the DIALOG function to display the dialog (see the example). The DIALOG function takes a user dialog variable as its argument and returns a number indicating which button was clicked to end the dialog. The DIALOG function returns -1 if the OK button was clicked, 0 if the cancel button was clicked, or an integer greater than zero if a push button was clicked (1 for the first push button listed in the dialog template, 2 for the second push button in the dialog template, and so forth).

If the return value is not needed, the DIALOG instruction may be called as a subroutine rather than as a function. In this case, do not enclose the dialog variable in parentheses. If the DIALOG instruction is called as a subroutine, however, the script will end with a run-time error if a cancel button is clicked.

To define more than one custom dialog in a script, you must place each dialog template in its own subroutine or function. If you try to define more than one custom dialog in the same procedure, **Scripter** will show an error indicating that the UserDialog type has already been defined.

The values contained by dialog controls are accessed the same the way the fields of user-defined variable types are accessed. Type the dialog variable name, followed by a period, followed by the field name of the dialog component. Option button values cannot be accessed directly, but are accessed via the field name of their associated option group. The value of an OptionGroup is the number of the selected option button (the first option button in the group is 0, the second option button is 1, and so forth). You can initialize the values contained by dialog controls prior to showing the dialog, and retrieve the values entered in the dialog after it has been invoked.

Program Statements

Statements are individual instructions to **Scripter** that carry out a specific operation. Statements are case insensitive and are typically written one to a line. To enter two or more statements on the same line, separate the statements with colons. For example:

```
a = 5 : b = 5 * a
```

Scripter BASIC requires flow control statements (IF, WHILE, DO, etc.) and declaration statements (DIM, PUBLIC, TYPE, SUB, etc) to be placed on a line by themselves.

Global Variables

In **Scripter**, variables declared in the body of a subroutine or function are available only within that procedure. If you want to share the same variable throughout a script file, then you can define it at the top of the file, before any subroutine definitions. Variables declared at the top of the file are available to all subroutines in the file; hence, they are called "global" variables.

The PUBLIC keyword may be substituted for the DIM keyword to allow a global variable to be used in other modules.

Specifying Cell Coordinates

Cell ranges can be specified in various ways for the worksheet Cells and Range methods:

1. Cells("A1") is a one argument single cell
2. Cells("A1:C5") is a one argument range of cells
3. Cells("A: E") is a one argument range of whole-columns
4. Cells("1:5") is a one argument range of whole-rows
5. Cells(Range object) is a one argument range of cells
6. Cells(1,"A") -or- Cells(1,1) is a two argument single cell
7. Cells("A1","C5") is a two argument range of cells
8. Cells(1,"A",5," C") -or- Cells(1,1,5,3) is a four argument range of cells

Column ranges can be specified in various ways for the worksheet Columns method:

1. Columns(1,5) or ("A"," E") is a two argument range of columns
2. Columns("A: E") is a one argument range of columns
3. Columns("A1:E1") is a one argument range of columns [the row coordinates are ignored]
4. Columns(Range object) is a one argument range of columns [the row coordinates are ignored]
5. Columns("A5") is a one argument single column [the row coordinate is ignored]
6. Columns(1) is a one argument single column

Row ranges can be specified in various ways for the Worksheet Rows method:

1. Rows(1,5) is a two argument range of rows
2. Rows("1:5") is a one argument range of rows
3. Rows("A5:A10") is a one argument range of rows [the column coordinates are ignored]
4. Rows(Range object) is a one argument range of rows [the column coordinates are ignored]
5. Rows("A5") is a one argument single row [the column coordinate is ignored]
6. Rows(1) is a one argument single row

Also, the Cells, Columns, and Rows methods work slightly differently when invoked on a WksRange object than when invoked on a Worksheet object. When invoked on a WksRange object, the coordinates are relative to the upper-left corner of the range. For example, Range.Cells("A1") refers to whatever the upper-left corner of the range happens to be, like so:

```
Set Wks = MapViewer.Documents.Add(mvWksDoc)
Set RangeObject1 = Wks.Cells("C5:E10")
' RangeObject2 now contains the cell "C5"
Set RangeObject2 = RangeObject1.Cells("A1")

' RangeObject3 now contains the cell "C5"
Set RangeObject3 = RangeObject1.Cells(1,1)
```

```
' RangeObject4 now contains the cell "D6"
Set RangeObject4 = RangeObject1.Cells(2,2)
```

In addition, you can use a single numeric argument in the Range.Cells() method to sequentially access each cell in the range, like so:

```
' Note: RangeObject1 equals C5:E10
Set RangeObject5 = RangeObject1.Cells(1) ; cell "C5"
Set RangeObject6 = RangeObject1.Cells(2) ; cell "D5"
Set RangeObject7 = RangeObject1.Cells(3) ; cell "E5"

' There are three cells in the first row of RangeObject1.
' Cell #4 is in the second row…
Set RangeObject8 = RangeObject1.Cells(4) ; cell "C6"
Set RangeObject9 = RangeObject1.Cells(5) ; cell "D6"
Set RangeObject10 = RangeObject1.Cells(6) ; cell "E6"

' Cell #7 is in the third row…
Set RangeObject11 = RangeObject1.Cells(7) ; cell "C7"
```

There are some special cases when the WksRange objects' Cells, Columns, and Rows methods are called. The behavior for these special cases is explained in these notes:

WksRange.Cells() method:

1. Coordinates are relative to the top, left of the current (base) range
2. The returned range can extend beyond the original range
3. Rows are limited to the original range if a whole-column sub-range is specified
4. Columns are limited to the original range if a whole-row sub-range is specified
5. Cells are indexed across and then down

Examples:

Item	Base Range	Specified Sub-Range	Range returned
1	Wks.Range("B10:C20").	Cells("A1")	"B10"
2	Wks.Range("B10:C20").	Cells("A1:C30")	"B10:D39"
3	Wks.Range("B10:C20").	Cells("A: C")	"B10:D20"
4	Wks.Range("B10:C20").	Cells("1:5")	"B10:C14"
5	Wks.Range("B10:C20").	Cells(n)	n=1 "B10", n=2 "C10", n=3 "B11", etc.

WksRange.Rows method

Columns are limited to the original range (the same as if a whole-row sub-range were supplied to the Range.Cells method).

Example:

Base Range	Specified Sub-Range	Range returned
Wks.Range("B10:C20").	Rows("1:5")	"B10:C14"

WksRange.Columns method

Rows are limited to the original range (the same as if a whole-column sub-range were supplied to the Range.Cells method)

Example:

Base Range	Specified Sub-Range	Range returned
Wks.Range("B10:C20").	Columns("A: C")	"B10:D20"

Variables

In **Scripter**, a variable is a symbolic name for a value. A variable name starts with a letter and may contain digits. Variable names cannot be the same as a reserved word. Because the **Scripter** code window displays variable names in black and reserved words in color, you can see when you have selected a variable name that conflicts with a reserved word.

Variables may be one of several types. The type of a variable determines what kind of data it may contain. See the following table for the possible variable types. In addition to the built-in data types, the **Scripter** language supports user-defined compound data types, user-defined enumeration types, and user-defined objects (defined in object modules and class modules).

The type of a variable is declared in a DIM statement. The syntax of a DIM statement is:

```
Dim varname As type
```

where varname is the name of the variable being declared and type is the variable's data type. Variables not declared in a DIM statement are a variant type, unless the variable name ends with one of the type-definition characters. If a variable name ends with one of the special type-definition characters, listed below, its type is recognized based on this character.

Type	Type-Definition Character	Description of Type
Integer	%	A 16-bit integer value
PortInt (Portable Integer)	?	A 16- or 32-bit integer value
Long	&	A 32-bit integer value
Single	!	A 32-bit floating-point value
Double	#	A 64-bit floating-point value
Currency	@	A 64-bit fixed-point value
String	$	A text string of any length
Byte	(none)	An 8-bit unsigned integer value
Boolean	(none)	A true or false value
Date	(none)	A 64-bit floating-point value
Object	(none)	A reference to an object
Variant	(none)	Capable of holding any type of value

Using the DIM statement to declare the variable type is optional. Variables can be used without first being declared in a DIM statement, but this practice is not recommended for any script longer than a few dozen lines. To enforce this policy, an OPTION EXPLICIT statement should be placed at the top of long scripts. The OPTION EXPLICIT statement makes it an error to use any variable without first declaring it. Using this option lets you find typographical errors in variable names before a script is run. Without this option, typographical errors in variable names are usually detected only when the script fails to produce the expected results.

User-Defined Types

A collection of related variables can be grouped together under one name. The TYPE statement defines the elements of a user-defined type.

```
Type measurement
julianday As Integer
level As Double
End Type
```

The TYPE definitions must appear at the top of a script file, before any subroutines. The TYPE...END TYPE statement defines a new type; it does not create a variable of that type. Variables of the user-defined type must be declared in a DIM statement. The elements of a user-defined type variable are accessed by using the variable name followed by a period and the element name:

```
Dim m As measurement
m.julianday = 192
m.level = 12.3
Debug.Print m.julianday ' prints 192 in the Immediate window
```

```
Debug.Print m.level ' prints 12.3 in the Immediate window
```

Improve Automation Performance

Turning off screen updating can greatly increase the performance of automation when you want to perform a number of actions that cause screen redraws. You can achieve this efficiency by setting ScreenUpdating to false, performing the repetitive operations, and then turning ScreenUpdating back on. When ScreenUpdating is turned back on, all windows are redrawn in the new state.

Examples

Automation Examples

In addition to the examples found in the Table of Contents *Examples* book within the *MapViewer Automation* book, there are many more examples for your use.

- The SAMPLES folder in the **MapViewer** directory contains sample [.BAS] files to use in **Scripter**.
- In addition, each object, method, and property contains an example in the automation help. The methods and properties contain only a few lines for the example.
- You can click on the *Used By* link for an example on how to tunnel through the hierarchy to the method or property.
- Some methods and properties contain a link showing a full example of the object.

Creating and Printing a Hatch Map - Automation

This example automates the process of creating and printing a hatch map.

```
Sub Main
   ' Declare object and string variables used in the script
   Dim mvApp, Doc, Hatch As Object
   Dim BFile, Dfile As String

   ' Create the MapViewer Application object and assign it
   ' to the "mvApp" variable
   Set mvApp = CreateObject("MapViewer.Application")
   mvApp.Visible = True    ' Make MapViewer visible

   ' Prompt the user for the name of the boundary file.
   BFile = GetFilePath("",,CurDir(), _
   "Select boundary file", 0)
   If BFile = "" Then End  ' Cannot continue: no file was selected

   ' Prompt the user for the name of the data file.
   DFile = GetFilePath("",,CurDir(), "Select data file", 0)
   If DFile = "" Then End  ' Cannot continue: no file was selected

   ' Create a map document in MapViewer and assign it to a
```

```
   ' variable named "Doc"
   Set Doc = mvApp.Documents.Add(mvDocPlot)

   ' Create a hatch map.  Assign the map to the Hatch
   ' variable
   Set Hatch = Doc.CreateHatchMap(BoundaryFileName:=BFile, _
DataFileName:=DFile, PIDCol:=1, VarCol:=6, NumClasses:=6, _ NoData:=0, AllOther:=1)

   ' Set the hatch map data classification method to Jenks'
   ' Natural Breaks
   Hatch.ClassificationMethod = mvClassificationNaturalBreak
   Doc.PrintOut ' Print the page on the default printer
   Doc.SaveAs("Hatchmap.GSM") ' Save the map
End Sub
```

Opening, Saving, and Closing Documents

The Documents collection provides access to the **MapViewer** file commands. Use the Document object's Open method to open an existing map or worksheet. Use the Add method to create a blank map or worksheet. The SaveAll method saves all open documents, and the CloseAll method closes all open documents. To save or close an individual document, use the Document object's Save, SaveAs, and Close methods.

```
Sub Main
Set mvApp = CreateObject(" MapViewer.Application")
mvApp.Visible = True

' Create a blank plot
  mvApp.Documents.Add mvDocPlot
' Create a blank worksheet
  mvApp.Documents.Add mvDocWks

' Open an existing plot
  filename$ = GetFilePath(," GSM")
  if filename$ <> "" Then
  mvApp.Documents.Open filename$
  End If

' Open the sheet named "Sheet1" from an Excel file
  filename$ = GetFilePath(," XLS")
  If filename$ <> "" Then
  mvApp.Documents.Open filename$, "Sheet=Sheet1"
  End If

' Close the active document
  mvApp.ActiveDocument.Close
```

```
' Save the active document using its current name
  If Not mvApp.ActiveDocument.Saved Then
  mvApp.ActiveDocument.Save
  End If

' Save the document whose window caption is "Plot1"
  mvApp.Documents("Plot1"). SaveAs " MyDocument"

' Close all documents
  mvApp.Documents.CloseAll
  End Sub
```

DensityMap Object Script Example

This script demonstrates all the properties in the DensityMap object. If you wish to run the script, open Scripter and then open DensityMapObject.bas from the **MapViewer 8** SAMPLES folder.

```
Sub Main
'Declare the variable that will reference MapViewer
 Dim mvapp As Object

'Creates an instance of the MapViewer Application object
'and assigns it to the variable named "mvapp"
 Set mvapp = CreateObject("MapViewer.Application")

'Make MapViewer visible
 mvapp.Visible = True

'Declare Plot as Object
 Dim Plot As Object

'Creates a new plot window
 Set Plot = mvapp.Documents.Add(mvDocPlot)

'Declare DensityMap as object
 Dim DensityMap As Object

'Create a density map
 Set DensityMap= Plot.CreateDensityMap(BoundaryFileName:= _
 mvapp.ApplicationFolder + "\Samples\tx2010.gsb", DataFileName:= _
 mvapp.ApplicationFolder + "\Samples\tx2010.dat", _
 BoundaryFileOptions:="AreasToCurves=0", PIDCol:=1, VarCol:=3)
```

```
'==============================================================
' Density Map Properties
'==============================================================
'DiffPos Property
'----------------
'Return the DiffPos setting, true means the dots are randomly
'positioned each time the map is redrawn
 Debug.Print "Redraw points randomly? "; DensityMap.DiffPos

'Redraw dots in random positions each time the map is redrawn
 DensityMap.DiffPos=True


'DotSum Property
'---------------
'This example returns the dot sum value for a density map.
 Debug.Print "Dot sum value = "; DensityMap.DotSum

'This example sets the dot sum value to 250. Note that the
'Method property must be mvDensityMethodDotSum to use this value.
 DensityMap.Method = mvDensityMethodDotSum
 DensityMap.DotSum = 250


'DotValue Property
'-----------------
'This example returns the value for each symbol in a density map.
 Debug.Print "Dot value = "; DensityMap.DotValue

'This example sets the value for each symbol in a density map to 3500.
'Note that the Method property must be mvDensityMethodDotRatio to use
'this value. Some rounding will occur depending on data values.
 DensityMap.Method = mvDensityMethodDotRatio
 DensityMap.DotValue = 3500


'GlobalData Property
'-------------------
'This example returns the state of using global data.
 Debug.Print "Using global data? "; DensityMap.GlobalData

'This example shows how to use global data.
 DensityMap.GlobalData = True
```

```
'MaxDot Property
'---------------
'This example returns the maximum symbol value for a density map.
 Debug.Print "Maximum dot value = "; DensityMap.MaxDot

'This example sets the density map maximum symbol value to 3,000.
 DensityMap.MaxDot = 3000


'Method Property
'---------------
'This example returns the density map method.
 Debug.Print "Density map method = "; DensityMap.Method

'This example sets the density map method to dot sum.
 DensityMap.Method = mvDensityMethodDotSum


'PIDCol Property
'---------------
'This example returns the primary ID column.
 Debug.Print "Primary ID column (column A = 1) = "; DensityMap.PIDCol

'This example sets the primary ID column to column A.
 DensityMap.PIDCol = 1


'Symbol Property
'---------------
'This example changes the symbol outline color.
 DensityMap.Symbol.LineColor = mvColorBlue


'UseAbsoluteValue Property
'-------------------------
'This example returns the state of using absolute values.
 Debug.Print "Use absolute values? "; DensityMap.UseAbsoluteValue

'This example uses absolute values in a density map.
 DensityMap.UseAbsoluteValue = True


'VarCol Property
```

```
'---------------
'This example returns the variable column.
 Debug.Print "Variable column (column A = 1) = "; DensityMap.VarCol

'This example sets the variable column to column F.
 DensityMap.VarCol = 6

End Sub
```

UserDialog Example

The following function demonstrates how to define, display, and extract the values entered in a user dialog.

```
Function MyInputBox As String
' Define the dialog template. This definition
' is inserted by the UserDialog editor.
Begin Dialog UserDialog 250,112,"Caption"
TextBox 10,14,230,28,.Text1
CheckBox 20,49,160,14,"Check Box",.Check1
OKButton 20,77,90,21
CancelButton 130,77,90,21
End Dialog

' Declare a dialog variable
Dim dlgvar As UserDialog

' Initialize the dialog controls
dlgvar.Text1 = "This is the initial text to display"
dlgvar.Check1 = True ' start with check box checked

' Display the dialog and wait for the OK or Cancel button to be pressed
result = Dialog(dlgvar)

' Extract the information entered into the dialog
If result = -1 Then ' check to see if OK button was clicked
MyInputBox = dlgvar.Text1
If dlgvar.Check1 Then Debug.Print "The Check Box was Checked!"
End If
End Function
```

To perform processing while a user dialog is active, define a special "dialog function." The dialog function is called when various dialog events occur. To define a dialog function:

1. While designing the dialog, double-click in a blank portion of the dialog design area to activate the **Edit UserDialog Properties** dialog.

2. Enter a name for the Dialog Function property of the dialog. This property gives the name of a function that is called when dialog events occur.
3. When you save the dialog, **Scripter** asks you if it should create a skeleton dialog function. Click the *Yes* button, and **Scripter** inserts the basic instructions for a dialog function into your script.

Refer to the DialogFunc help topic in the **Help | BASIC Language Help** for more information about how to process dialog events in a dialog function.

Suggested Reading - Scripter

For additional help in learning how to program or for more information about the Visual BASIC for Applications (VBA) language (which is nearly identical to the **Scripter** BASIC language) we recommend the following books:

Harris, Matthew (1997), *Teach Yourself Visual BASIC 5 for Applications in 21 Days*, Third Edition, SAMS Publishing, Indianapolis, IN, 1248 pp.

Lomax, Paul (1998), *VB and VBA in a Nutshell: The Languages*, O'Reilly & Associates, Inc., Sebastapol, CA, 633 pp.

Wang, Wallace (1998), *Visual BASIC 6.0 for Windows for Dummies*, IDG Books Worldwide, Foster City, CA, 477 pp.

Chapter 39

MapViewerTM Help

There are several ways to get help in **MapViewer**:

Getting Help from the Help Menu

Within **MapViewer**, the online help file is opened by clicking the **Home | Help | Contents** , **Home | Help | Commands**, **Home | Help | Automation**, or **Home | Help | Tutorial** commands. You can navigate help using the **Contents**, **Index**, and **Search** pages in the navigation pane to the left of the topic page. The navigation pane can be displayed with the 

button and hidden with the 

button. Note that the **Search** page offers advanced search options including phrases, wildcards, Boolean, and nested searching.

Getting Help from the Golden Software Web Site

You can connect to various Web pages within the Golden Software Web site directly from **MapViewer** by selecting one of the following commands listed under **File | Online**.

- **Golden Software Home Page** - For information regarding Golden Software and its products.
- **MapViewer Product Page** - For the latest information about **MapViewer**.
- **Frequently Asked Questions** - For answers to the most common **MapViewer** questions.
- **Knowledge Base** - For a variety of articles discussing troubleshooting, program tips, and common procedures.

Help is also available through the **MapViewer** support forum located at www.goldensoftware.ws/forum/. You can click the *Forums* button at the top of the help window to access the support forums. You can post questions to the support forum or you can read the existing questions to see if your question has been answered.

Getting Help by E-Mail

Use the **File | Feedback** commands to send a problem report, suggestion, or information request by e-mail.

MapViewer Features

The features list provides an overview of **MapViewer's** new features.

Obtaining Information on Dialogs and Commands

To obtain information about dialogs or highlighted commands:

- Press F1 at anytime to open help.
- Click the 

button in dialogs to open the help topic pertaining to that dialog.

- Find out the function of highlighted menu commands or open dialogs by pressing F1.
- Click the button, or press SHIFT+F1 on your keyboard, then click a ribbon command, toolbar button, or screen region to view information regarding that item.

Automation Help

Each object, method, and property has a help topic in **MapViewer**. Use the object hierarchy or **Debug | Browse** in **Scripter** to determine how to access each object. Also, each method and property contains some sample code lines with the command. To find out how a particular method or property is accessed click the object name in the *Used by* list. In some cases, you may need to change some words to work with the particular object if the sample was not specifically written for the object. Additional examples are located in **MapViewer's** SAMPLES folder.

MapViewer Overview

For general information on **MapViewer** go to Introduction to MapViewer, What is a Thematic Map?, Map Window, Tutorial, and Creating and Editing Thematic Maps.

Context Sensitive Help

Click the button or use SHIFT+F1 on your keyboard for help on menu commands, tool buttons, and screen regions. Click the help button and then click on the area for which you wish to obtain help. Alternatively, you can obtain help for open dialogs and highlighted menu commands by pressing the F1 key on the keyboard.

Technical Support

Golden Software's technical support is free to registered users of our products. Our technical support staff is trained to help you find answers to your questions quickly and accurately. We are happy to answer any of your questions about any of our products, both before and after your purchase. We also welcome suggestions for improvements to our software and encourage you to contact us with any ideas you may have for adding new features and capabilities to our programs. To allow us to support all customers equitably, an individual user's daily support time may be limited.

Technical support is available Monday through Friday 8:00 AM to 5:00 PM Mountain Time, excluding major United States holidays. We respond to e-mail and fax technical questions within one business day. When contacting us with your question please have the following information available:

- Your **MapViewer** serial number
- Your **MapViewer** version number, found in **File | About MapViewer**
- The operating system you are using (Windows 98, ME, 2000, or XP)
- The steps taken to produce your problem
- The exact wording of the any error messages that appear

If you cannot find the answer to your question in online help, on our web page FAQs, or in our support forums please do not hesitate to contact us:

Phone: 303-279-1021

Fax: 303-279-0909

E-mail: mapviewersupport@goldensoftware.com

Web: www.goldensoftware.com

Mail: Golden Software, LLC, 809 14th Street, Golden, Colorado, 80401-1866, USA

Check for Update

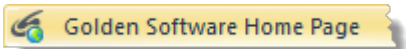
Use the **File | Online | Check for Update** link 

to download and install an update for **MapViewer** if you do not have the most current version. An update contains minor changes to the program. There are no new features added in updates. A list of changes is located at http://www.goldensoftware.com/MapViewer-Version-Info.

Before using this command, make sure your computer is connected to the Internet. Follow the directions in the dialog to complete the update if an update is available.

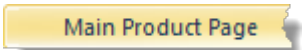
To obtain an upgrade when available (i.e. **MapViewer** version 7 to **MapViewer** version 8), contact Golden Software.

Golden Software Home Page

Use the **File | Online | Golden Software Home Page** link 

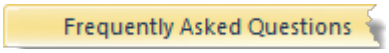
to connect to Golden Software's home page. Open a connection to the Internet before selecting this command. Golden Software's home page is located at: www.goldensoftware.com.

MapViewer Product Page

Use the **File | Online | Main Product Page** link 

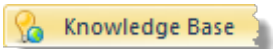
to connect to **MapViewer's** product page. Open a connection to the Internet before selecting this command. **MapViewer's** product page is located at: www.goldensoftware.com/products/mapviewer. This page contains links to the **MapViewer** FAQs and technical support.

Frequently Asked Questions

Use the **File | Online | Frequently Asked Questions** link 

to access the most current **MapViewer** FAQs. Open a connection to the Internet before selecting this command. **MapViewer's** FAQs are located at: http://www.goldensoftware.com/products/mapviewer#faqs.

Knowledge Base

Click the **File | Online | Knowledge Base** link 

to access the Golden Software knowledge base. The knowledge base is a repository of constantly updated product frequently asked questions, troubleshooting suggestions, program tips, and common procedures. The knowledge base page is located at http://www.goldensoftware.com/knowledge-base/5-mapviewer.

You can also access the knowledge base directly by clicking the 

button at the top of online help.

MapViewer Software User Forums

The online forums are located on the Golden Software website. The forums are moderated by Golden Software, but also allow peer interaction. Once you create a free user name, you can post new questions, or comment on current questions or discussion. No question goes unanswered.

Find answers to your technical questions and interact with our technical support staff and fellow Golden Software users through the online **MapViewer** forum.

Click the 

button at the top of the online help to access the Golden Software user forums, click the **File | Online | Forums** command, or go to www.goldensoftware.com/forum/ in your browser.

Problem Report

If you are experiencing a problem with **MapViewer**, you can click on **File | Feedback | Problem Report** to report the problem to Golden Software. Please be as detailed as possible in describing the problem.

When reporting the problem include a description of the problem and the steps to reproduce the problem. If you need to send any files to help illustrate the problem, please zip them first. Our mail program does not allow files over 4 MB, so contact technical support for other arrangements if you have very large zipped attachments to send.

Suggestions

We welcome suggestions for improvements to our software and encourage you to contact us with any ideas you may have for adding new features and capabilities to our programs. If you have a suggestion you would like to share with us, please send it to us by clicking **File | Feedback | Suggestions**.

Information Request

If you need more information about a procedure in **MapViewer** or if you would like information about any other Golden Software product (**Surfer**, **Didger**, **Grapher**, **Voxler**, or **Strater**), click on **File | Feedback | Information Request**.

Sales Information

For questions about pricing, upgrades, or purchasing software, please contact our sales department:

Phone: 303-279-1021 or 800-972-1021 (U.S. only)

Fax: 303-279-0909

E-mail: info@goldensoftware.com

Web: www.goldensoftware.com (includes a secure online order form)

Mail: Golden Software, LLC, 809 14th Street, Golden, Colorado, 80401-1866, USA

For pre-sales technical questions, please contact our technical support staff.

About MapViewer

Use the **File | About MapViewer** command to display **MapViewer's** version number, copyright date, your serial number, system information, and Golden Software, LLC contact information. Click the *Register* button to register **MapViewer**. Click the *License Agreement* button to review the license.

Appendix A

Mathematical Functions

Mathematical Functions are used to modify data with the **Data | Data | Transform** command in the worksheet or create function plots in the plot window.

Data Types

The expression evaluator supports 32-bit signed integer numbers, double-precision floating-point numbers, a Boolean value, a text string of 0 to 256 characters, and time stamp values.

Variable Names

Variable names must begin with a column letter (i.e. A), row number (i.e. _1), or cell location (i.e. A2), which may be followed by other letters, numbers, or underscores (_), up to a maximum of 256 characters per variable name.

The variable names are not case sensitive. For example, **sum(a..z)**, **sum(A..z)**, and **sum(A..Z)** all refer to the same variable.

Precedence

The mathematical expression can consist of constants, variables (such as column letters), or functions (outlined below). The formulas follow standard precedence rules. Spaces are used in the equation for clarity.

Operators of equal precedence are evaluated from left to right within the equation. Parentheses are used to override precedence, and expressions within parentheses are performed first.

Operators, in order of decreasing precedence are:

( )	parentheses
-	minus (or negative sign)
* /	multiplication and division
+ -	addition and subtraction

The expression evaluator treats operators with the following precedence:

1. !, NOT, ~
2. *, /, %
3. +, -
4. <<, >>
5. <, >, <=, >=
6. ==,!=,<>
7. &
8. ^, XOR
9. |

10. &&, AND
11. ||, OR
12. ?:
13. IF

Built-in Functions

The following built-in functions are supported:

Trigonometric Functions

All trigonometric functions are carried out in radians. If the data are in degrees, use the d2r(x) conversion function (in the *Miscellaneous Functions* section below) to convert degree data to radians and then use the trigonometric functions.

sin(x)	sine of angle x
cos(x)	cosine of angle x
tan(x)	tangent of angle x, the value of x must not be an odd multiple of Π/2.
asin(x)	Arcsine in the range -Π /2 to Π/2, x must be between -1 and 1
acos(x)	Arccosine in the range 0 to Π, x must be between -1 and 1
atan(x)	Arctangent in the range -Π/2 to Π/2
atan2(y,x)	Arctangent in the range -Π to Π

Bessel Functions

j0(x) j1(x) jn(n,x)	Bessel functions of the first kind at x of orders 0, 1, and n, respectively
y0(x) y1(x) yn(n,x)	Return the Bessel functions of the second kind at x, of orders 0, 1, and n, respectively. For y0, y1, and yn, the value of x must not be negative.

Exponential Functions

exp(x)	exponential function of x (e to the x)
sinh(x)	hyperbolic sine of angle x
cosh(x)	hyperbolic cosine of angle x
tanh(x)	hyperbolic tangent of angle x
ln(x)	natural logarithm of x, x must be positive
log10(x)	base 10 logarithm of x, x must be positive
pow(x,y)	x raised to the yth power Error conditions result if x is zero and y is negative or zero, x is negative and y is not an integer, an overflow results.

Miscellaneous Functions

min(x,y)	smaller of x and y
max(x,y)	larger of x and y
randn(x,y)	an approximately normally (Gaussian) distributed real random number with mean x and standard deviation y
randu(x)	a uniformly distributed real random number from the interval [0,x]
row()	row number
ceil(x)	smallest integer that is greater than or equal to x
floor(x)	largest integer less than or equal to x
pi()	returns the value of Pi. To limit to a specific number of digits, use Round(Pi(),y) where Y is the number of digits after the decimal point
round(x,y)	X rounded to the nearest number with Y digits after the decimal point
sqrt(x)	square root of x, x must not be negative
fabs(x)	absolute value of x
fmod(x,y)	floating point remainder of x/y, if y is zero, fmod returns zero
d2r(x)	convert argument in degrees to radians, for example: sin(d2r(30)) computes the sine of 30 degrees, sin(30) computes the sine of 30 radians
r2d(x)	convert argument in radians to degrees

Statistical Functions of an Interval

sum(a..z)	calculates the sum of a range of columns in a row
sum(_1.._5)	calculates the sum of a range of rows in a column
avg(a..z)	calculates the average of a range of columns in a row
avg(_1.._5)	calculates the average of a range of rows in a column
std(a..z)	calculates the (population) standard deviation of a range of columns in a row
std(_1.._5)	calculates the (population) standard deviation of a range of rows in a column
rowmin(a..z)	finds the minimum value of a range of columns in a row
rowmin(_1.._5)	finds the minimum value of a range of rows in a column
rowmax(a..z)	finds the maximum value of a range of columns in a row
rowmax(_1.._5)	finds the maximum value of a range of rows in a column

The statistical functions of an interval of columns operate row-wise on an interval of columns. For example, SUM(A..Z) computes the sum of the twenty-six columns A, B, C, ..., Z separately for each row. You can replace A..Z with any valid interval of columns, e.g., C..H or W..AC. There must be exactly two periods between the column labels. Columns may be given in reverse order, i.e., SUM(Z..A).

The statistical functions of an interval of rows operate column-wise on an interval of rows. For example, SUM(_1.._5) computes the sum of the 5 rows 1, 2, 3, 4, 5 separately for each column. You can replace _1.._5 with any valid interval of rows, e.g., _3.._12 or _34.._413. There must be exactly two periods between the row labels. Rows may be given in reverse order, i.e., SUM(_5.._1).

String Comparison

atof(x)	converts string to floating-point number
atoi(x)	convert a string x to an integer value
strlen(x)	length of string x in characters
strcmp(x,y)	compare string x with y and return 1 if x>y, -1 if x<y, or 0 if x=y
stricmp(x,y)	compare string x with y without regard to the case of any letters in the strings
strncmp(x,y,z)	compare the first z character of string x with y
strnicmp(x,y,z)	compare the first z characters of string x with y without regard to the case of any letters in the strings

String comparison functions work with strings, not numbers. Any rows or columns containing numbers result in blanks.

The comparisons are based on the standard ASCII table:

1. numeric values (disregarded in string comparisons as mentioned above)
2. cells starting with a space character
3. common punctuation
4. numeric text (numbers entered as text)
5. less common punctuation
6. uppercase letters
7. even less common punctuation
8. lower case letters
9. uncommon punctuation
10. blank cells (disregarded in string comparisons)

0	1	2	3	4	5	6	7	8	9
space	!	"	#	$	%	&	'	(	)
*	+	,	-	.	/	"0"	"1"	"2"	"3"
"4"	"5"	"6"	"7"	"8"	"9"	:	;	<	=
>	?	@	A	B	C	D	E	F	G
H	I	J	K	L	M	N	O	P	Q
R	S	T	U	V	W	X	Y	Z	[
\	]	^	_	`	a	b	c	d	e
f	g	h	i	j	k	l	m	n	o
p	q	r	s	t	u	v	w	x	y
z	{	|	}	~	blank				

This is the ASCII table order. The table is read left to right, top to bottom. Items appearing toward the upper left corner are less than the items appearing toward the lower left corner.

Boolean Expressions

Boolean expressions, include:

- **logical operators** (and, or, xor, not)
- **comparison operators** (=, <>, <, >, <=, >=)
- the **IF function**, i.e., IF(condition,true_value,false_value)

The words AND, OR, XOR, NOT, and IF are reserved keywords and may not be used as variable names.

Logical Operators (and, or, xor, not)

SYMBOL	NAME	DESCRIPTION
AND	AND	The result is true if both operands are true
&&	AND	The result is true if both operands are true
!	Logical NOT	Inverts the Boolean value. True becomes false, false becomes true
NOT	Logical NOT	Inverts the Boolean value. True becomes false, false becomes true
&	AND	The result is true if both operands are true
|	OR	The result is true if either of the two operands are true
^	Exclusive-OR (XOR)	
XOR	Exclusive-OR (XOR)	Same as ^
||	OR	The result is true if either of the two operands are true
OR	OR	The result is true if either of the two operands are true

Comparison Operators (=, <>, <, >, <=, >=)

SYMBOL	NAME	DESCRIPTION

~	Bitwise NOT	Inverts the bits in an integer
*	Multiple	Multiplies the two operands
/	Divide	Divides the first operand by the second
%	Remainder	Integer remainder of the first operand divided by the second
+	Add	Adds the two operands
-	Subtract	Subtracts the second operand from the first
<<	Shift Left	Shifts the operand to the left
>>	Shift Right	Shifts the operand to the right
<	Less Than	Result is true if the value of p1 is less than the value of p2
<=	Less Than or Equal To	Result is true if the ordinal value of p1 is less than or equal to p2
>	Greater Than	Result is true if the ordinal value of p1 is greater than p2
>=	Greater Than or Equal To	Result is true if the ordinal value of p1 is greater than or equal to p2
==	Equal To	Result is true if the operands have identical values
!=	Not Equal To	Result is true if the operands do not have identical values
<>	Not Equal To	Result is true if the operands do not have identical values

IF Function IF(condition, true_value, false_value)

SYMBOL	NAME	EXAMPLE	DESCRIPTION
IF	Conditional Evaluation	IF(p1,p2,p3)	IF(condition,true_value,false_value) If p1 is true, the result will be p2. If p1 is false, the result will be p3
IF	Conditional Evaluation	p1?p2:p3	condition?true_value:false_value If p1 is true, the result will be p2. If p1 is false, the result will be p3

Examples

The following are examples of mathematical function syntax. If you use **Data | Data | Transform** in the worksheet, replace X, Y, and Z with column letters (A is column A), row numbers (_1 is row 1), or cell locations (A1).

Equation	Mathematical Function Syntax
x^2	pow(x,2)
$\ln(x)$	ln(x)
$\log_{10} x$	log10(x)

$1-e^{-x}$	(1-exp(-X))
$1-e^{-x^2}$	(1-exp(-(pow(x,2))))
$1-\frac{\sin(x)}{x}$	1-(sin(x)/x)
$\frac{x^2}{1+x^2}$	pow(x,2)/(1+(pow(x,2)))
$2x-x^2$	(2 * X)-pow(x,2)
$(x^2+y^2)(\sin(8\times\tan^{-1}xy))$	(pow(x,2)+pow(y,2))*(sin(8*atan(x*y)))

95% and 99% Confidence Interval for the Mean

If CI is the value of the confidence interval reported by the worksheet, the range of values between the sample mean minus CI and the sample mean plus CI is expected to include the true mean of the underlying population 95% of the time (for the 95% confidence interval) or 99% of the time (for the 99% confidence interval). This formula assumes that the data set is sufficiently large for the central limit theorem to apply.

95% Confidence Interval for the Mean

$$\pm t_{(n-1),\alpha=.05}(SE)$$

99% Confidence Interval for the Mean

$$\pm t_{(n-1),\alpha=.01}(SE)$$

where

tv,α = the value of the Student's t distribution with v degrees of freedom such that difference between the cumulative probability function evaluated at tv,α and - tv,α is equal to 1- α.

SE = Standard Error of the Mean

Average Deviation

The average deviation is the average of the difference between the absolute values of data points and the mean.

Population Mean Deviation (MD)

$$MD = \frac{1}{N}\sum_{i=1}^{N}\left|(x_i - \mu)\right|$$

Sample Mean Deviation (MD)

$$MD = \frac{1}{n}\sum_{i=1}^{n}\left|(x_i - \bar{x})\right|$$

where

μ = Population Mean

$\bar{x}$ = Sample Mean

N = number of data values (for a population)

n = number of data values (for a sample)

x_i = i^{th} data value

Coefficient of Kurtosis

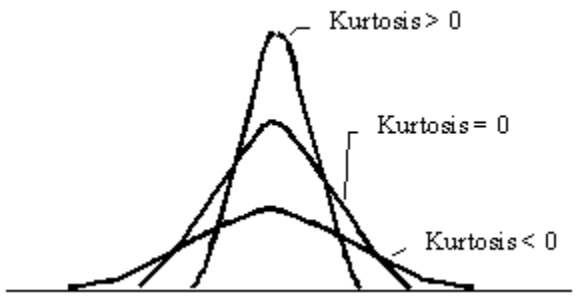
Kurtosis is a measure of the sharpness of the data peak. Traditionally the value of this coefficient is compared to a value of 0.0, which is the coefficient of kurtosis for a normal distribution (i.e. the bell-shaped curve). A value greater than 0 indicates a peaked distribution and a value less than 0 indicates a flat distribution. Without a very large sample size, the use of this coefficient is of questionable value.

Population Kurtosis (γ_2)

$$\gamma_2 = \left(\frac{1}{N\sigma^4}\sum_{i=1}^{N}(x_i - \mu)^4\right) - 3$$

Sample Kurtosis (g_2)

$$g_2 = \left(\frac{1}{ns^4}\sum_{i=1}^{n}(x_i - \bar{x})^4\right) - 3$$



(adapted from King and Julstrom, 1982)

where

σ	= Population Standard Deviation
S	= Sample Standard Deviation
μ	= Population Mean
$\bar{x}$	= Sample Mean
N	= number of data values for a population
n	= number of data values for a sample
x_i	= i^{th} data value

Coefficient of Skewness

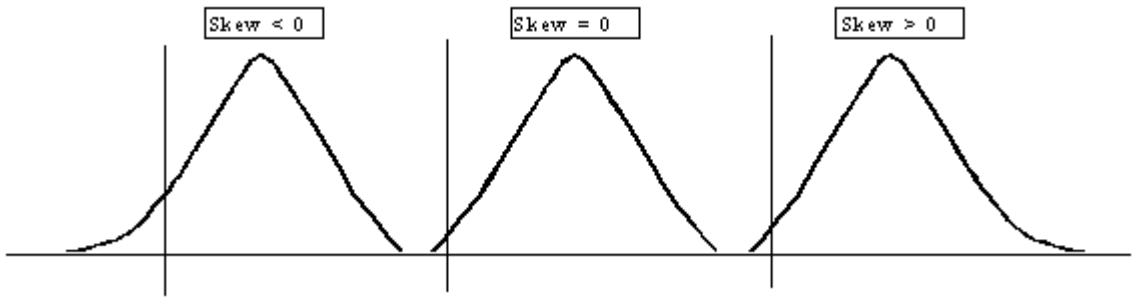
Skew is a measure of asymmetry in the distribution. A positive skew indicates a longer tail to the right, while a negative skew indicates a longer tail to the left. A perfectly symmetric distribution, like the normal distribution, has a skew equal to 0. For small data sets this measure is unreliable.

Population Skew (γ_1)

$$\gamma_1 = \frac{1}{N\sigma^3}\sum_{i=1}^{N}(x_i - \mu)^3$$

Sample Skew (g_1)

$$g_1 = \frac{1}{ns^3}\sum_{i=1}^{n}(x_i - \bar{x})^3$$



(adapted from King and Julstrom, 1982)

where

σ = Population Standard Deviation

S = Sample Standard Deviation

μ = Population Mean

$\bar{x}$ = Sample Mean

N = number of data values for a population

n = number of data values for a sample

x_i = i^{th} data value

Coefficient of Variation

It is the standard deviation divided by the mean (the worksheet reports the quotient, it does not convert the value to a percentage). The coefficient of variation is a dimensionless measure of variation. This statistic is not defined for the case of a zero mean. In fact, this measure is only useful when dealing with strictly positive data.

Population Coefficient of Variation (V)

$$V = \sigma / \mu$$

Sample Coefficient of Variation (V)

$$V = s / \bar{x}$$

where

σ = Population Standard Deviation

S = Sample Standard Deviation

μ = Population Mean

$\bar{x}$ = Sample Mean

Critical Value of K-S Statistic at 90%, 95%, and 99% Significance Level

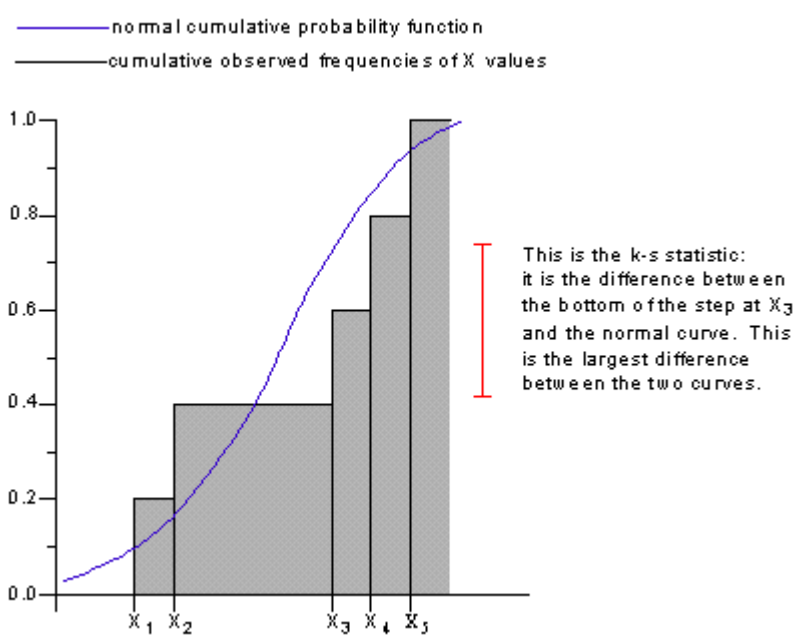
The critical value of K-S statistic at 90, 95, or 99 percent significance level are indicators of normal distributions. For example, if a sample collected from a population has a normal frequency distribution, the K-S statistic for that sample is less than the critical value 90, 95, or 99 percent of the time. If the K-S statistic is larger than the critical value, the hypothesis that the underlying population is distributed normally with a mean of $\bar{x}$ and a standard deviation of s should be rejected.

Kolmogorov-Smirnov Goodness of Fit Statistic for Normal Distribution

The Kolmogorov-Smirnov statistic is the largest difference between an expected cumulative probability distribution and an observed frequency distribution. The expected distribution used here is the normal probability distribution with mean and variance equal to the mean and variance of the sample data. The observed frequency distribution is a stepped function that increases by 1/n with each step, where n is the number of values in the data set.

For example, suppose that there are five values in a data set. The observed frequency distribution is 0 to the left of the first data point. At the first data point the observed distribution function jumps to 0.2 (since there are five data values, the size of the step at each value is one divided by five). At each successive data value the observed frequency distribution jumps by 0.2.

The K-S statistic is calculated as the largest difference (in absolute value) between the normal cumulative probability function and the observed frequency distribution, as shown below. Note that at each step it is necessary to compute the difference between bottom of the step and the normal curve and between the top of the step and the normal curve.



Mean

The mean is the arithmetic average of the data values. It is the sum of the data values divided by the number of data values.

Population Mean (μ)

$$\mu = \frac{1}{N}\sum_{i=1}^{N} x_i$$

Sample Mean ($\bar{x}$)

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

where

N = number of data values (for a population)

n = number of data values (for a sample)

x_i = i^{th} data value

Standard Deviation

The standard deviation is the square root of the variance.

Population Standard Deviation (σ)

$$\sigma = \sqrt{\sigma^2}$$

Sample Standard Deviation (*S*)

$$s = \sqrt{s^2}$$

where

σ^2 = Population Variance

S^2 = Sample Variance

Standard Error of the Mean

The standard error of the mean is an estimate of the standard deviation of means that would be found if many samples of *n* items were repeatedly collected from the same population.

An alternate description: Suppose many samples of size *n* were repeatedly collected from the same population and the means of these many samples were calculated. The means of the samples would themselves form a data set. The standard error of the mean is an estimate of the standard deviation of this theoretical sample of means.

Standard Error of the Mean (SE)

$$SE = s \Big/ \sqrt{n}$$

Where

S = Sample Standard Deviation

n = number of data values (for a sample)

Variance

The population variance is the average of the squared deviations from the mean. The sample variance is the sum of the squared deviations from the mean divided by one less than the number of data values.

Population Variance (σ^2)

$$\sigma^2 = \frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2$$

Sample Variance (s^2)

$$s^2 = \frac{1}{(n-1)}\sum_{i=1}^{n}(x_i - \bar{x})^2$$

where

μ = Population Mean

$\bar{x}$ = Sample Mean

N = number of data values (for a population)

n = number of data values (for a sample)

x_i = i^{th} data value

Statistics References

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Appendix B

Math Text Instructions

Math Text Instruction Syntax

The math text instruction set offers advanced formatting of text in the plot window. Math text instructions can be used to change the typeface, size, color, weight, and style of text on a character-by-character basis. Greek letters and mathematical symbols can be written in the plot window using math text instructions. The math text instructions also allow for the detailed placement of characters and symbols; thus, superscripts, subscripts, and the superposition of characters are possible.

All text within the plot window can be controlled by math text instructions. For example, text blocks can include math text instructions via the Text dialog. The worksheet cells used as pin map labels can contain math text instructions. In general, the clipboard can be used to cut and paste math text instructions.

Unless otherwise indicated, all math text instructions begin with a backslash ("\"), and end with a single space. For example, the instruction "\up50 " shifts the baseline of the text up 50 percent of the current text height. All characters from the beginning backslash through the ending single space are interpreted as instructions by the math text interpreter and are not included in the resulting label.

Each line in a text block starts with the default text properties such as typeface, size, color, and style. (Note that some typefaces, such as Symbol, do not support bold or italicized text.) A line of text within a text block uses the current properties until a math text instruction is encountered. All text following an instruction is modified according to the instruction. For example, if the typeface is changed in the middle of a text string, the text following the instruction uses the new typeface until the end of the line of text is reached or until another instruction affecting the typeface is encountered.

Math text instructions can also be encapsulated so they are not carried out over an entire line. A left curly brace ("{") instructs the math text system to remember all of the text properties in effect at that point. A right curly brace ("}") restores the properties to what they were at the matching left curly brace. This allows the insertion of special text in the middle of an otherwise uniform text block. The only instructions this does not apply to are text baseline instructions (\dnX and \upX), and the position instructions (\rpX and \spX). Curly braces can be nested.

To incorporate a backslash, right curly brace, or left curly brace as a text character in a text block, precede them with a backslash when entering the text string. For example, "\\" produces "\", and "\{" produces "{".

Instructions based on a percentage, such as font size, are cumulative. This means that a second percentage change within a text block is interpreted as a percentage of the first percentage change. For example, if the font is scaled by 50 percent, and later in the same text block the font is scaled by 50 percent again, the font size after the second percentage would be 25 percent of the original font size.

Math text instructions are not case sensitive except for typeface names. Typeface names must appear exactly as they are named, including capitalization.

Example

```
\sp1 {\fs200 \ f"Symbol" \a229 \sp2 }{\rp1 \dn90 \fs75 i=1\rp1 \up220 n}\rp2 \up25 X\dn50
{\fs75 i}\up50 Y\dn50 {\fs75 i}\up50 = S{\dn50 {\fs75 XY}\up50 }
```

$$\sum_{i=1}^{n} X_i Y_i = S_{XY}$$

List of Math Text Instructions

Note: Instruction names are case insensitive (`\fs50`, `\FS50`, `\Fs50` or `\fS50` are all valid).

`\aX` Insert an ANSI character with code given by X (0 to 255).
`\b` Embolden text.
`\date` Inserts the date when text is output.
`\dnX` Moves text baseline down X% of current font size.
`\f"X"` Change to the typeface named X.
`\fsX` Change font size to X% of current size.
`\i` Italicize text.
`\plain` Set "plain" text (normal weight, no italic, underlining or strikethrough).
`\rpX` Restore current position to position #X (1-20) on the current line.
`\spX` Save current position as position #X (1-20) on the current line.
`\strike` Strikethrough text.
`\time` Inserts the time when text is output.
`\upX` Moves text baseline up X% of current font size.
`\ul` Underline text.

[**Note:** The `\sp` and `\rp` instructions only refer to positions on the same line.]

The following instructions allow the text color to be set to an arbitrary RGB (Red,Green,Blue) value:

`\rgbrX` Sets amount of red in an RGB text color (X=0 to 255).
`\rgbgX` Sets amount of green in an RGB text color (X=0 to 255).
`\rgbbX` Sets amount of blue in an RGB text color (X=0 to 255).

The following instructions are provided to make it easy to set basic text colors:

`\black` Sets text color to black.
`\blue` Sets text color to blue.
`\green` Sets text color to green.
`\cyan` Sets text color to cyan.
`\red` Sets text color to red.
`\magenta` Sets text color to magenta.
`\yellow` Sets text color to yellow.
`\white` Sets text color to white.
`\gray` Sets text color to gray.

Appendix C

File Format Chart

There are a number of important distinctions that can be made for different file types because each file format uses a unique set of characteristics. The important file format characteristics are outlined in the following table:

File Format	File Name	Import	Export	Coordinate Type[1]	Content Type[4]
ACCDB	Microsoft Access	X [10]			D
AN?	ACR-NEMA Medical Image	X [9]		P	R
ASCII Data	ASCII Data Files	X [10]	X [7]	R	D
BLN	Golden Software Blanking	X [9, 10]	X [7, 8]	R	V
BMP	Windows Bitmap	X [9]	X [8]	P	
BNA	Atlas Boundary	X [9, 10]	X [7, 8]	R	V, D
BW	SGI-RGB Image	X [9]		P	G
CLP	Windows Clipboard	Paste	Copy	O	R and V
CSV	Comma Separated Variable	X [10]	X [7,8]		D
DAT	Data	X [10]	X [7,8]		D
DBF	Database	X [10]			D
DCM	DICOM 3 Medical Image	X [9]		P	
DDF	SDTS Topological Vector Profile	X [9]		R	V
DIC	DICOM3 Medical Image	X [9]		P	R and V
DLG	USGS Digital Line Graph	X [9]		R	V

DXF	AutoCAD DXF	X [9]	X [8]	R O	V
E00[6]	ESRI ArcInfo Export Format	X [9]		R	V
ECW	ER Mapper	X [9]		R	R
EMF	Windows Enhanced Metafile	X [9]	X [8]	O	R and V
EPS	Encapsulated Postscript		X [8]	P	R
GIF	Image	X [9]	X [8]	P	R
GSB	Golden Software Boundary	X [9,10]	X [8]	R	V
GSI	Golden Software Interchange	X [9,10]	X [8]	R	R and V
GPX	GPS Exchange	X [9]		R	
HTM	HTML Image Map		X [8]	P	
HTML	HTML Image Map		X [8]	P	
JPG	JPG Compressed Bitmap	X [9]	X [8]	P, R	R
JP2	JPEG2000 Compressed Bitmap	X [9]	X [8]	P, R	R
KML	Google Earth KML	X [9]	X [8]	P, R	
KMZ	Google Earth KMZ	X [9]	X [8]	P, R	
LAS	LiDAR LAS Binary Data	X [10]		R	D
LGO	USGS Digital Line Graph	X [9]		R	V
LGS	USGS Digital Line Graph	X [9]		R	V
MDB	Microsoft Access	X [10]			D
MIF	MapInfo Interchange	X [9]	X [8]	R	V
PBM	Image	X [9]		P	R

PDF	Portable Document File (Raster)	X [9]	X [8]	P	R
PDF	Portable Document File (Vector)		X [8]	O, R	V
PGM	Image	X [9]		P	
PLT	Golden Software PlotCall	X [9]		O	V
PLY	Stanford Polygon	X [9]		R	V
PNG	Portable Network Graphics	X [9]	X [8]	P	
PNM	Image	X [9]	X [8]	P	
PPM	Image	X [9]		P	
RAS	Sun Raster Image	X [9]	X [8]	P	R and V
RGB	SGI-RGB Image	X [9]	X [8]	P	
RGBA	SGI-RGB Image	X [9]	X [8]	P	
SEG	SEG-P1 Exchange Format	X [9, 10]		R	D V
SHP	ESRI Shapefile	X [9]	X [5, 8]	R	V
SID	LizardTech MrSID Image	X [9]		P, R	
SLK	Sylk Spreadsheet	X [10]	X [7]	R	D
SP1	SEG-P1 Exchange Format	X [9, 10]		R	D V
SUN	Sun Raster Image	X [9]		P	R
SVG	Scalable Vector Graphics		X [8]	R	R and V
TAR	SDTS Topological Vector Profile	X [9]		R	V
TAR.GZ	SDTS Topological	X [9]		R	V

	Vector Profile				
TGA	Targa (TrueVision)	X [9]	X [8]	P	
TGZ	SDTS Topological Vector Profile	X [9]		R	V
TIF	Tagged Image	X [9]	X [8]	P, R	
TXT	Text Data	X [10]	X [7]		D, G
WK#	Lotus 123	X [10]			D
WMF	Windows Metafile	X [9]	X [8]	O	R and V
WRK	Lotus Symphony	X [10]			D
X	AVS X-Image	X [9]	X [8]	P	R
XIMG	AVS X-Image	X [9]	X [8]	P	R
XLS	Excel Spreadsheet	X [10]	X [7]		D
XLSM	Excel Spreadsheet 2007	X [10]			D
XLSX	Excel Spreadsheet 2007	X [10]	X [7]		D
ZIP	SDTS Topological Vector Profile	X 9		R	V

1 When imported with **Map | Create Map | Base** (Import column above must contain 9) or when exported (Export column above must contain 8):

R = real world coordinates such as latitude/longitude, UTM, etc.

P = pixel coordinates

O = other (i.e. page coordinates, metafile coordinates, etc.)

2 Contains properties such as line color, fill, etc.

3 Text blocks are editable. (When the *All text as lines* option is chosen in the export options, the text is not editable.)

4 Files can contain raster (image) information, vector (lines) information, or both. There is no raster to vector conversion in **MapViewer**. If you have an image on screen and try to export it as a vector format, such as a DXF, the resulting file will be blank. If you have an image on the screen and have drawn polylines or polygons and export as a vector format, only the drawing objects are included in the file.

V = contains vector information only

R = contains raster information only

R and V = contains raster and vector information

D = contains data information

G = contains grid information

5 Each .SHP file is usually accompanied by files with the same name, but with the .SHX and .DBF extensions. These files are not used in **MapViewer**.

6 The .E00 file format is not publicly documented by ESRI. Although Golden Software has tested this .E00 import filter software with a number of publicly available .E00 files, it may not be compatible with all .E00 files created by all versions of ESRI application programs. Golden Software is not affiliated with ESRI, and this import filter software is not a product of, nor endorsed by, ESRI.

7 The **File | Save As** command in the worksheet can be used to save this format.

8 The **File | Export** command in the plot window can be used to save this format.

9 The **File | Import** command in the plot window or Import dialog (i.e. **Map | New | Base Map**) can be used to open this format.

10 The **File | Open** command in the plot window or worksheet can be used to open this format.

MapViewer GSM Files

MapViewer Files [.GSM] contain all information displayed in a plot window. This includes boundaries, drawing objects, graticules, associated data files, and window settings. All layers and thematic information are also stored. These files are binary and cannot be edited.

To load a [.GSM] file into the current document window, use the **File | Open** command. To save the current document window as a [.GSM] file, use the **File | Save** or **File | Save As** command.

Occasionally, you may want to merge two [.GSM] files together. To do so, use the **File | Import** command. When a [.GSM] file is imported, all layers of the file are inserted before the active layer in the current document. Therefore, if you want the map in the file to be placed behind the map in the current document, use the **Object Manager** and make the bottom layer active before performing the import. If you want the map in the file to be placed in front of the layer in the current map, use New Layer to create a new layer (which is placed on top of all existing layers). Then import the [.GSM] file (which is placed before this top layer), and delete the new layer.

Microsoft Access .MDB and .ACCDB File Description

Microsoft Access .MDB is a binary database file format used by pre-2007 versions of Microsoft Access. The .ACCDB format is used in Access 2007 and 2010. **MapViewer** can import data from tables and queries in both Access .MDB and .ACCDB formats.

Import Options

See Database Tables and Fields Dialog.

Import Automation Options

Import Automation Options

Export Options

MapViewer does not currently export Microsoft Access .MDB or .ACCDB files.

Export Automation Options

N/A

Microsoft Access (MDB) Import Options Dialog

If the .MDB file contains multiple tables, you can select which table to load in the *Choose Table To Load* list. The other controls in the dialog show previews of the data that will be imported. See Microsoft Access .MDB Import Options Dialog.

64-Bit Access Driver

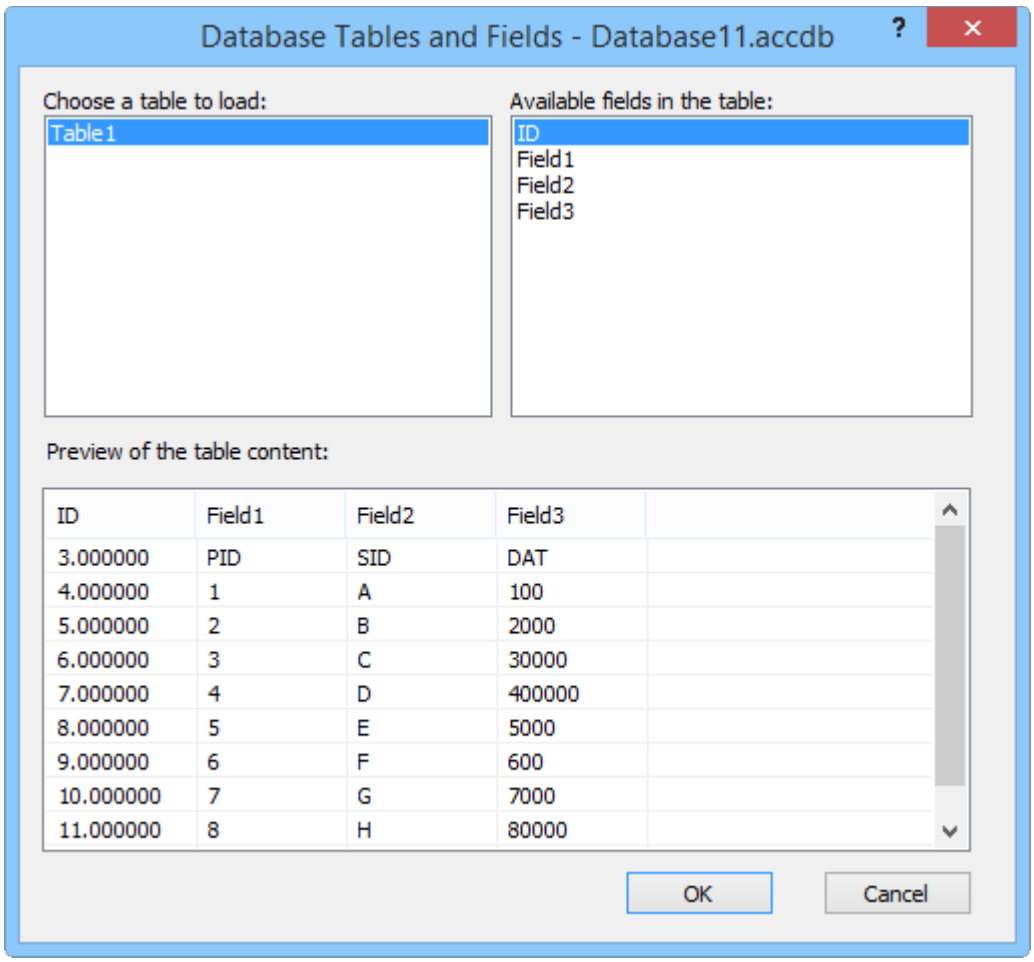
In order to import Microsoft Access Database (*.mdb, *.accdb) files, you must have the Microsoft Access Database driver installed on your machine. It's shipped as part of the Microsoft Office suite and comes in 32-bit and 64-bit versions. Installing the 32-bit Microsoft Office suite will install the 32-bit Access Database driver. Installing the 64-bit Microsoft Office suite will install the 64-bit Access Database driver. Unfortunately, Microsoft doesn't allow BOTH to be installed simultaneously on a 64-bit Windows platform. If you need to import data from Microsoft Access Database files into Golden Software products, you must install the 32-bit version of our product if you have a 32-bit Access Database driver. You must install the 64-bit version of our product if you have a 64-bit Access Database driver. If you don't need to import Access Database data with our product, you may install either version on a 64-bit Windows platform.

Microsoft Access .MDB and .ACCDB Import Options Dialog

Microsoft Access .MDB is a binary database file format used by pre-2007 versions of Microsoft Access. The .ACCDB format is used in Access 2007 and 2010. **MapViewer** can import data from tables and queries in both Access .MDB and .ACCDB formats.

Database Tables and Fields Dialog

In the worksheet, select **File | Import** to load a .MDB or .ACCDB file. The **Database Tables and Fields** dialog allows you to choose what table or query to load and preview the data that will be imported.



Specify .MBD or .ACCDB import options in the ***Database Tables and Fields*** *dialog.*

Choose a Table to Load

If the .MDB or .ACCDB file contains multiple tables and queries, you can select which table or query to load in the *Choose Table To Load* list.

Available Fields in the Table

The *Available fields in the table* displays all of the available fields in the table.

Preview of the Table Content

A preview of the selected table content is shown in the *Preview of the table content* section.

AN? ACR-NEMA Medical Image

Digital **I**maging and **Co**mmunications in **M**edicine (**DICOM**) is a standard for handling, storing, printing, and transmitting information in medical imaging. It includes a file format definition and a network communications protocol. The communication protocol is an application protocol that uses TCP/IP to communicate between systems. DICOM files can be exchanged between two entities that are capable of receiving image and patient data in DICOM format. The National Electrical Manufacturers Association (NEMA) holds the copyright to this standard. It was developed by the *DICOM Standards Committee*, whose members are also partly members of NEMA.

DICOM enables the integration of scanners, servers, workstations, printers, and network hardware from multiple manufacturers into a picture archiving and communication system (PACS). The different devices come with DICOM conformance statements which clearly state the DICOM classes they support. DICOM has been widely adopted by hospitals and is making inroads in smaller applications like dentists' and doctors' offices.

MapViewer imports images and lattices from DICOM 3 medical image data sets. This filter is also able to read some files written in the obsolete ACR-NEMA format (from which the DICOM format was derived); however, Golden Software does not officially support the ACR-NEMA format.

DICOM File Format

DICOM differs from other data formats in that it groups information into data sets. That means that a file of a chest X-Ray image, for example, actually contains the patient ID within the file, so that the image can never be separated from this information by mistake.

A DICOM data object consists of a number of attributes, including items such as name, ID, etc., and also one special attribute containing the image pixel data (i.e. logically, the main object has no "header" as such - merely a list of attributes, including the pixel data). A single DICOM object can only contain one attribute containing pixel data. For many modalities, this corresponds to a single image. But note that the attribute may contain multiple "frames", allowing storage of cine loops or other multi-frame data.

DICOM uses three different Data Element encoding schemes. With Explicit VR Data Elements, for VRs that are not OB, OW, OF, SQ, UT, or UN, the format for each Data Element is: GROUP (2 bytes) ELEMENT (2 bytes) VR (2 bytes) LengthInByte (2 bytes) Data (variable length). For the other Explicit Data Elements or Implicit Data Elements, see section 7.1 of Part 5 of the DICOM Standard.

The same basic format is used for all applications, including network and file usage, but when written to a file, usually a true "header" (containing copies of a few key attributes and details of the application which wrote it) is added.

File name extensions: DICOM .DIC, .DCM and ACR-NEMA .AN1, AN2.

Format(s) Supported for Import

- device-independent bitmap; 8, 24, 32 bit per pixel
- uniform lattice; 8-, 16-, 32-bit integer, float, double

Import Options Dialog

See DICOM Import Options Dialog.

Import Automation Options

See DICOM Medical Image File .DIC, .DCM Import Automation Options

Export Options Dialog

MapViewer does not currently export .DIC, .DCM, .AN? files.

Loading Files

AN? ACR-NEMA medical image files can be imported using the **File | Import** command or the **Map | Create Map | Base** command.

Import Restrictions/Limitations

The DICOM specification allows an unusually wide variety of different formats and encodings within the same file format. While this software can read most of the common variants of DICOM, it would not be practical to develop software to read every possible variant. Some of the known deficiencies in this implementation include:

- DICOM images that contain bit per pixel counts other than 8, 12, 16, 24 or 32 may not be readable depending on the encoding and alignment of the data.
- DICOM images that are encoded with photometric interpretation models other than RGB, grayscale, or monochrome may not be readable. In particular, some YUV encodings cannot be imported.
- Some lossless JPEG images embedded in DICOM data sets do not import. In particular, images encoded with the "Cornell" JPEG codec are not always readable.
- Some of the obscure compression algorithms allowable under the DICOM specification are not supported by this software.
- Some ACR-NEMA files do not import. Golden Software does not officially support the obsolete ACR-NEMA file formats; however, Voxler does import many ACR-NEMA files successfully.

ASCII .DAT, .TXT, .CSV Data Files

ASCII files are generic format files that can be read or produced by most applications. There are three common ASCII data formats: .DAT, .CSV, and .TXT. ASCII files are generic format files read or produced by most applications. These files can also be imported into most applications, including word processors, spreadsheets, and ASCII editors.

Worksheet Formatting

ASCII files do not contain any worksheet formatting information such as row height, column width, or cell formatting. When ASCII files are loaded into the worksheet, the default column formatting parameters are applied to the data. This does not result in any change to data, but might result in rounding of values in the data display. There is no limitation on the number of rows or columns in an ASCII format. ASCII formats save and load slowly because there is a conversion from binary numbers to character representation.

Format

There are some distinctions in formatting of ASCII files. Here are some brief notes that outline the usefulness of the ASCII file features.

- *Delimiters* control the separation between cell entries in a file. Spaces, tabs, semi-colons, or commas can be used to separate cells. If cell entries contain spaces in text, the comma or semi-colon delimiters are necessary if quotes are not used to qualify the text. Otherwise, the text string would be interpreted as two cell entries rather than a single entry.
- *Placing Quotes Around Text* - There are two types of entries in an ASCII file, values and text. Values are actual numbers, while text can be any type of character, including numbers and text characters. Single or double quotes can be placed around text strings. If a number should be interpreted as text, surround it with double quotes. When text strings contain spaces, it is recommended to use single or double quotes around text cell entries.

- *Using Commas or Semicolons in Addition to Quotes* - Although double quotes are not required around text strings, they are useful when creating a space-delimited file that contains text. Often there are text strings that contain spaces, as in a date containing month name, day and year. With space delimited files this single entry is interpreted as more than one cell when loading this file into the worksheet. The safest way to eliminate this problem is to place double quotes around all text strings and use comma delimiting between variables.

Comma Separated Variables

Comma separated variable .CSV files are comma delimited with double-quotes around text strings (non-numeric or mixed alpha numeric).

ASCII Text

ASCII text files .TXT are normally tab delimited ASCII text files with no quotes around the text strings. After selecting .TXT as the format, the **Data Export Options** dialog is displayed.

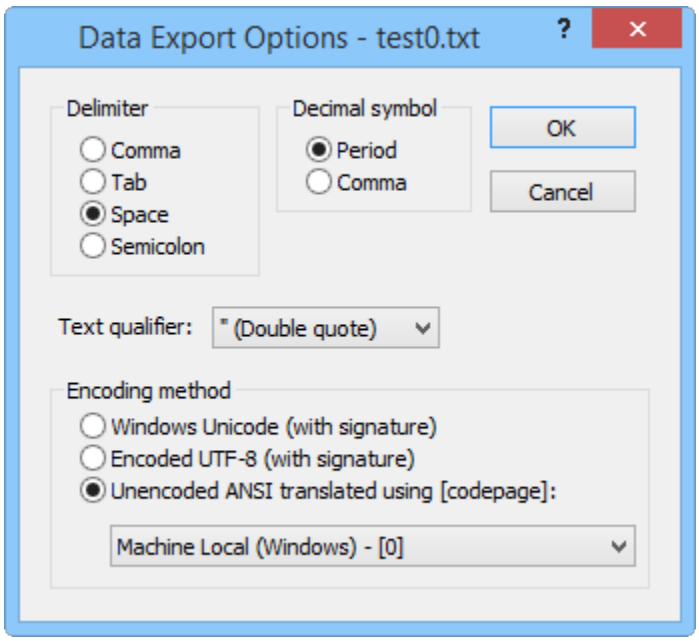
Golden Software DAT Files

ASCII .DAT files are ASCII files with no set format. Any delimiter or text qualifier can be set. When a file is saved in the .DAT format, the **Data Export Options** dialog is displayed.

Data Export Options Dialog

The **Data Export Options** dialog is displayed when saving a .TXT file or .DAT file.

- *Delimiters* are the characters used between cells in a single row (fields in a record), and can be commas, spaces, semicolons, or tabs.
- *Text Qualifiers* are double-quotes, single-quotes, or none. For example, if double-quotes are chosen all non-numeric or mixed alpha numeric cell entries are surrounded by double-quotes in the file.
- *Decimal symbol* is the symbol used as the decimal point. This can be a comma or period. This option is only available with .TXT files.
- *Encoding method* determines the format of the data. *Windows Unicode* and *Encoded UTF-8* data are often referred to as international data. It would include character sets from Russia, Israel, China, Greece, Hungary, among others. If the data does not appear correctly in the exported file, the *Encoding method* may be specified incorrectly. *ANSI* encoding contains characters within the first 256 characters of a font. These are normally in English. After selecting *Unencoded ANSI translated using [codepage]*, select the codepage from the list that will read the data correctly.



*Choose one Delimiter and a Text Qualifier for .TXT files in the **Data Export Options** dialog.*

Import Options Dialog

Data Import Options Dialog

Import Automation Options

Data Import Automation Options

Export Options Dialog

Data Export Options Dialog

Export Automation Options

Data Export Automation Options

DAT and CSV XYZ Points Export

MapViewer plots can be exported to a DAT or CSV data file including XYZ coordinates, attributes, and linked data information. The first three columns are always X, Y, and Z coordinates, followed by attributes, and then linked data. Exporting a CSV file will include column headers as the first line of the CSV file. In **MapViewer**, the Z column will be populated with zeroes.

Export Options

There is no export options dialog for DAT XYZ points or CSV XYZ points export formats.

Golden Software Data Export Automation Options

Since the **GSI Data Export Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options. A typical example would be:

```
" Delimiter=comma; TextQualifier=singlequote "
```

This would set the delimiter character to a comma and the text qualifier character to the single-quote mark (').

Option	Action	Default
Delimiter	Character that separates data cell values. You can use more than one delimiter in the string. For example, " Delimiter=comma,%,tab"	comma
TextQualifier	Specifies the character that surrounds cells containing text.	doublequote

Delimiter values:

tab	Enter the word "tab"
comma	Enter the word "comma"
semicolon	Enter the word "semicolon"
space	Enter the word "space"
other	Enter the delimiter character in the delimiter list. For example, if your file uses percent signs to delimit data, add a " Delimiter=%" to the export options string.

TextQualifier values:

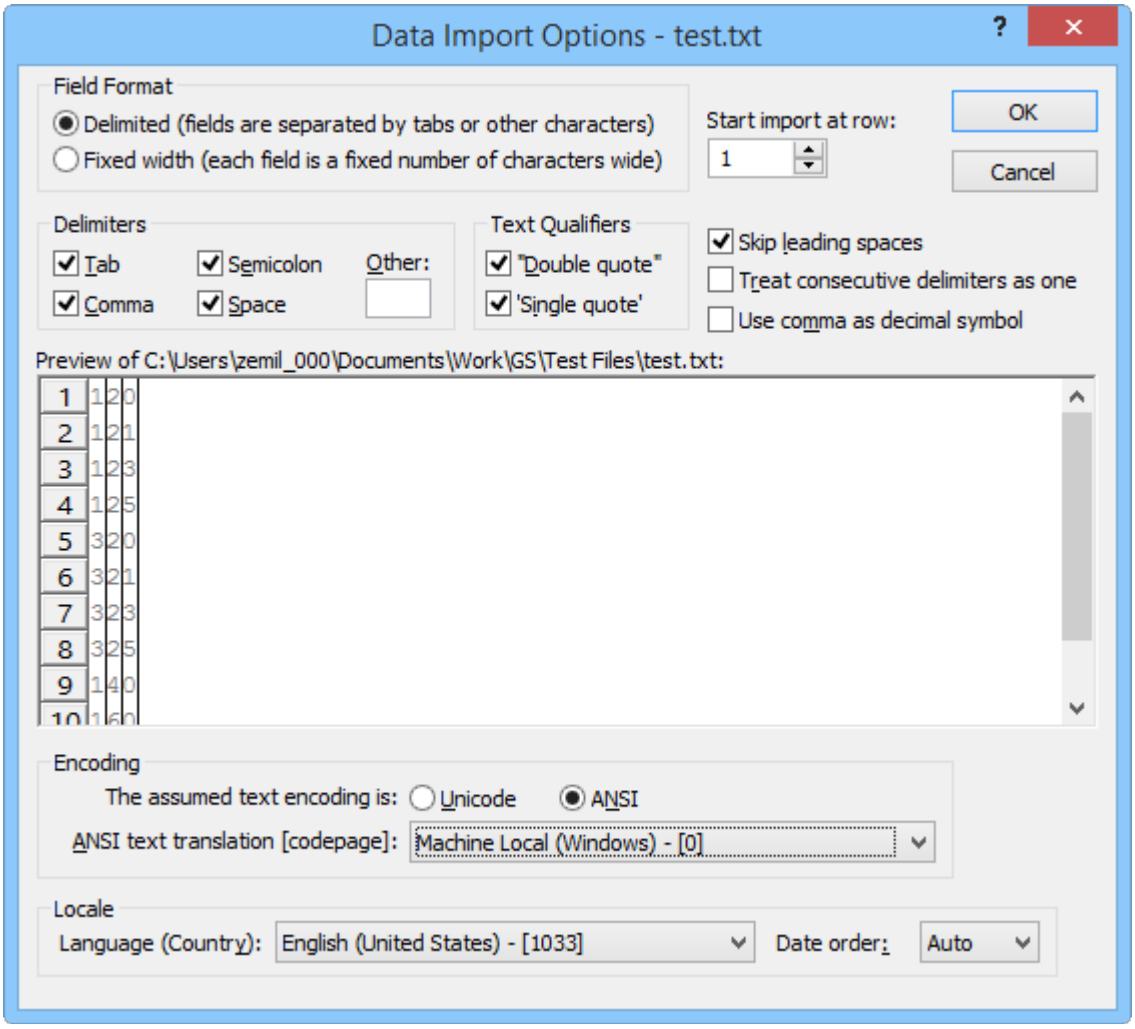
doublequote	Enter the word " doublequote"
singlequote	Enter the word " singlequote"
none	Enter the word "none"
other	Enter the text qualifier in the qualifier list. For example, if your file uses percent signs to qualify text, add a " TextQualifier=%" to the export options string.

Data Import Options

If a file is in an ASCII text format with an unrecognized file extension, the **Data Import Options** dialog appears when opening the file. Choose the *Delimiters* used in the file (*Tab*, *Comma*, *Semicolon*, *Space*, or *Other*), and the *Text Qualifiers* used in the file (*Double Quote* or *Single Quote*).

The Data Import Options Dialog

The **Data Import Options** dialog may appear when importing tabular data from delimited text files (i.e. .DAT, .CSV, .TXT). These file formats are assumed to have one record per line in which each record contains a fixed number of numeric data fields.



*The **Data Import Options** dialog allows you to specify import options.*

Field Format

Specify the format of the input fields in the *Field Format* group. The options are *Delimited* or *Fixed Width*.

Delimited

Choose *Delimited (fields are separated by tabs or other characters)* if the imported data uses delimiters (tab, semicolon, comma, space, other) to separate data fields. The *Delimiters* group is used to specify how the fields are separated if *Delimited (fields are separated by tabs or other characters)* is the selected *Field Format*.

Fixed Width

Choose *Fixed Width (each field is a fixed number of characters wide)* if the imported data uses a fixed width to separate data fields.

Start Import at Row

Specify the row number at which to start the data import in the *Start import at row* box. To change the first row to import, highlight the existing value and type a new value or click the buttons to increase or decrease the value. For example, a value of one will start the data import at row one. A value of five will start the data import at row five and ignore the data in rows one through four.

Delimiters

Choose the desired delimiters to be used during the import process by checking the box next to *Tab*, *Comma*, *Semicolon*, or *Space*. You may also enter a custom delimiter in the *Other* box. More than one delimiter may be checked.

Text Qualifiers

Check the box next to *Double Quote* or *Single Quote* in the *Text Qualifiers* group to indicate the correct qualifier to identify text values in the data file. Everything between the selected characters will be interpreted as a single value, and any delimiter characters between text qualifiers are ignored and treated as part of the text.

Double Quote

Check the box next to *"Double Quote"* to specify that everything between those marks should be interpreted as a single value, and any delimiter characters between any two quote characters are not treated as a delimiter.

For example, if *Space* is chosen as the delimiter and *Double Quote* is chosen as the text qualifier, the string "Aspen Park" is treated as a single data value due to the double quotes surrounding it, and the space delimiter between the words is treated as part of the value.

Single Quote

Check the box next to *'Single Quote'* to specify that everything between those marks should be interpreted as a single value, and any delimiter characters between any two quote characters are not treated as a delimiter.

For example, if *Space* is chosen as the delimiter and *Single Quote* is chosen as the text qualifier, the string 'Aspen Park' is treated as a single data value due to the single quotes surrounding it, and the space delimiter between the words is treated as part of the value.

Skip Leading Spaces

Check the box next to *Skip leading spaces* to tell the software to ignore spaces that appear before initial text.

Treat Consecutive Delimiters as One

Check the box next to *Treat consecutive delimiters as one* to instruct the software to interpret any consecutive delimiters into a single delimiter rather than breaking to a new column for each consecutive delimiter.

Use Comma as Decimal Symbol

Check the box next to *Use comma as decimal symbol* to interpret every comma as the decimal symbol. The number 123,45 in the file would be displayed as 123.45 in the program worksheet with this option checked.

Preview

The parsed data are shown in the *Preview* section.

Encoding

The *Encoding* section allows the choice of *Unicode* data or *ANSI* data when importing or opening an ASCII data file. Unicode data is often referred to as international data. It would include character sets from Russia, Israel, China, Greece, Hungary, among others. After selecting *Unicode*, select the *ANSI text translation [codepage]* option that will read the data correctly. If the data does not appear correctly in the *Preview* window, the *Encoding* may be specified incorrectly.

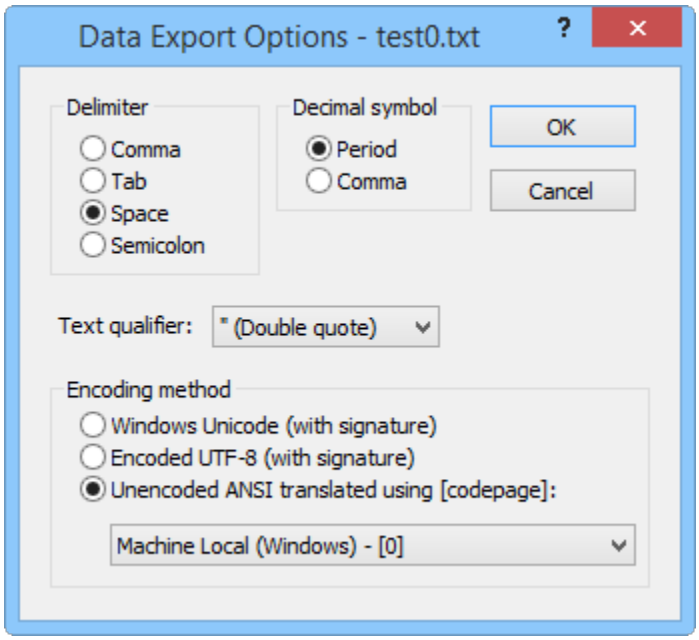
ANSI encoding contains characters within the first 256 characters of a font. These are normally in English.

OK or Cancel

Click *OK* to proceed with the import process. Click *Cancel* to close the dialog without importing the data set.

Data Export Options Dialog

The **Data Export Options** dialog may appear when exporting tabular data from delimited text files (i.e. .DAT, .TXT). These file formats are assumed to have one record per line in which each record contains a fixed number of numeric data fields.



*Specify the delimiter and text qualifier in the **Data Export Options** dialog.*

Delimiter

Choose *Comma*, *Tab*, *Space*, or *Semicolon* as the character to use to delimit fields in the saved .DAT, or .TXT file.

Decimal Symbol

Select the option in the *Decimal symbol* group that should be used to as the decimal symbol. When comma is selected, the number 123 and 45 thousands would appear in the file as 123,45. When *Period* is selected, the number would appear in the file as 123.45. This option is only available with .TXT files.

Text Qualifier

Select *(none)* for no qualifiers in the export file. Select *Double quotes* to place double quote characters “” around fields in the export file. Select *Single quotes* to place single quote characters ‘’ around fields in the export file.

Encoding Method

The *Encoding method* section allows the choice of *Windows Unicode* data, *Encoded UTF-8* data, or *Unencoded ANSI translated using* data when exporting or saving an ASCII data file. *Windows Unicode* and *Encoded UTF-8 data* are often referred to as international data. It would include character sets from Russia, Israel, China, Greece, Hungary, among others. If the data does not appear correctly in the exported file, the *Encoding method* may be specified incorrectly.

ANSI encoding contains characters within the first 256 characters of a font. These are normally in English. After selecting *Unencoded ANSI translated using [codepage]*, select the *codepage* from the list that will read the data correctly.

OK and Cancel Buttons

Click the *OK* button to proceed with the export process, or click the *Cancel* button to close the dialog without exporting the data set.

ASCII [.DAT, .TXT] Data File Export Automation Options

Since the **Export Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

" Delimiter=comma,tab; TextQualifier=singlequote"

This would export the worksheet using commas and tabs as the column delimiter, and the single quote mark as the text qualifier.

Option	Action	Default
Delimiter	Comma-separated list of named delimiter characters. Valid names are: “comma”	“comma,tab”

	“space” “tab” "semicolon"	
`TextQualifier`	Comma-separated list of named text-qualifying characters. Valid names are: “singlequote” “doublequote” “none”	"none"
`DecimalSymbol`	This is available only with .TXT files. Valid names are: "comma" "period"	set by File | Options

Remarks

When specifying a delimiter and text-qualifier a semicolon is placed between the option pair, i.e.

"Delimiter=semicolon,; TextQualifier=singlequote "

Golden Software Blanking .BLN File Description

MapViewer imports and exports Golden Software Blanking Files .BLN.

Golden Software Blanking File .BLN is an ASCII format file used to store geographic information including areas, curves, and points. Spatial information is only concerned with the location of objects in space (i.e., their coordinates) and not with their attributes (i.e. line or fill style, marker symbol used, text labels, etc.). Even though the primary use of GS Blanking files is to indicate regions to be "blanked-out", they can also be used for simple boundaries and decorative illustrations.

File Format

The general format of the file is:

length,flag "Pname 1"

x1,y1

x2,y2

...

xn,yn

length,flag "Pname 2"

x1,y1

x2,y2

...

xn,yn

Length

The *length* value is an integer which indicates the number of X, Y coordinate pairs that follow.

Flag

The *flag* value is 1 if the region inside areas is to be blanked and 0 if the region outside areas is to be blanked.

Pname

Pname is optional and is the name of a primary ID to be associated with the object. The primary ID is used to link the object to external data.

X, Y Coordinates

Following lines contain the actual X, Y coordinate pairs that make up the object. These can be integers or real numbers, and are stored 1 pair per line.

Type of Object

The type of object is determined as follows:

- If the *type/length* field is 1, the object is considered a point. One coordinate pair follows.
- If the *type/length* field is greater than 1 and the first and last coordinate pairs are equal, the object is considered a simple closed area. Otherwise, the object is considered a curve.

Attributes

The first ID attribute for all polyline, polygon, and symbol objects are automatically exported to all .BLN files. For contour maps, the elevation is exported as the "STD_ID1" attribute for all polylines in the contour map. If a different attribute other than the first listed attribute for objects is desired, rename the desired attribute to "STD_ID1". This named attribute will be used instead of the first attribute listed on the Info tab.

Example 1

This example shows a simple .BLN file, with a single area:

```
5 0
1 1
1 3
4 3
4 1
1 1
```

Example 2

This example shows a complex .BLN file, with an island:

```
13 0
48 99
52 20
57 19
56 8
29 0
27 71
```

48 99
40 70
50 60
48 55
34 40
40 70
48 99

Import Options Dialog
No import options dialog is displayed.

Import Automation Options
See BLN Golden Software Blanking Import Automation Options

Export Options Dialog
See BLN Golden Software Blanking Export Options Dialog

Export Automation Options
See BLN Golden Software Blanking Export Automation Options

Loading a BLN
Use the **File | Open**, **File | Import**, or the **Open Data** dialog (i.e. **Map | New | Base Map**, **Map | New | Post Map**) to load a .BLN file.

Golden Software Blanking .BLN Import Options Dialog

The **Import Options** dialog does not display when importing a .BLN file into **MapViewer**.

Golden Software Blanking [.BLN] Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

"Defaults=1,AreasToCurves=1"

This would first set all import options to their default values, then set the *AreasToCurves* option value to one, which would specify that any areas imported be converted to closed curves.

Option	Action	Default
`Defaults=1`	Set all options to their default values	No

`ForgetOptions=1`	Don't remember options for later use	No
`AreasToCurves=1`	Convert area objects to closed curves	No

Golden Software Blanking .BLN Export Options Dialog

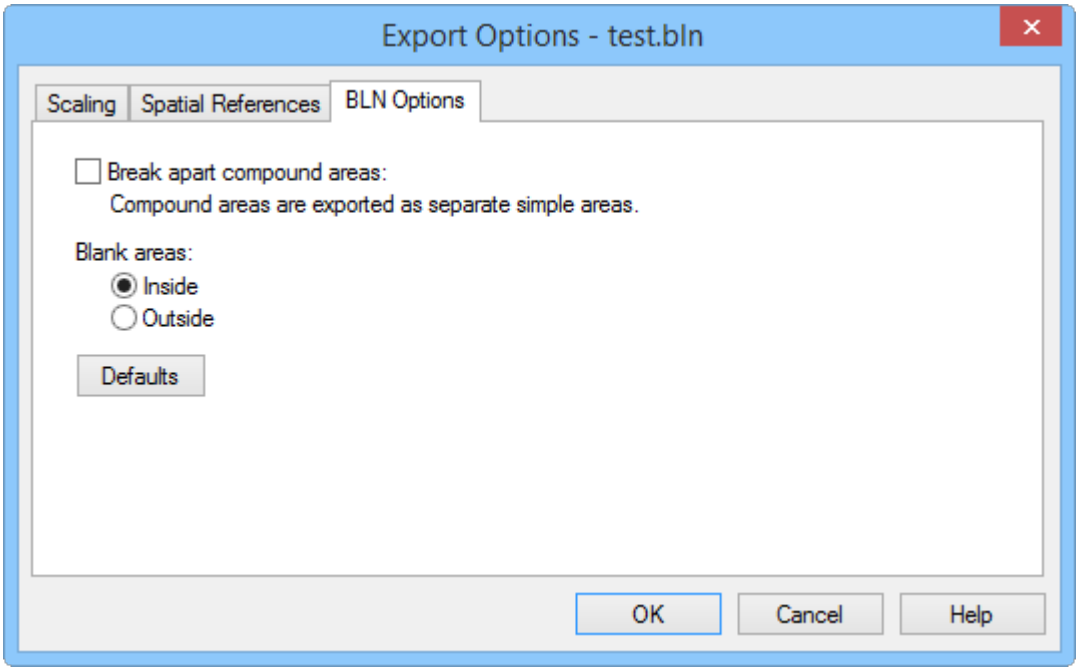
The **Export Options** dialog allows you to specify options which determine how information in the file is exported.

When exporting, the application specifies coordinates in *Page Units* (inches or centimeters) as indicated on the document rulers. You may want these values offset and/or scaled back to original map coordinates in the Golden Software Blanking .BLN file.

Attributes

The first ID attribute for all polyline, polygon, and symbol objects are automatically exported to all .BLN files. For contour maps, the elevation is exported as the "STD_ID1" attribute for all polylines in the contour map. If a different attribute other than the first listed attribute for objects is desired, rename the desired attribute to "STD_ID1". This named attribute will be used instead of the first attribute listed on the *Info* tab. The color, size, symbol shape, width, and other properties are not exported.

BLN Options Page



*Specify the BLN export options in the **Export Options** dialog.*

Break Apart Compound Areas

Choose *Break apart compound areas* to have compound areas (those containing islands or lakes) output as separate area entities. This option should be chosen if the .BLN file is to be used as a boundary file. Do not choose this option if the .BLN file is to be used as a blanking file.

Defaults

The *Defaults* button sets all options to default conditions.

Scaling Page

See the Scaling Page for detailed information.

Golden Software Blanking [.BLN] Export Automation Options

Since the **Export Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options. A typical example would be:

"Defaults=1,ScalingSourceApp=0"

This would set all export options to their default values, then indicate the scaling source information should not be taken from the application, but from previously saved values.

Option	Action	Default	Description
BreakApartCompoundAreas	0 = No 1 = Yes	0	Compound areas (multi-ring polygons) will be split apart into multiple non-compound areas (simple polygons) during export.
ScalingSource	0 = previously saved 1 = application-supplied	1	Use previously saved or application-supplied scaling source
SaveScalingInfo	0 = No 1 = Yes	0	Save scaling parameters for later use.
PageLLX	N.N		Set application page rectangle lower left X value.
PageLLY	N.N		Set application page rectangle lower left Y value.
PageURX	N.N		Set application page rectangle upper right X value.
PageURY	N.N		Set application page rectangle upper right Y value.
FileLLX	N.N		Set scaling rectangle lower left X value.
FileLLY	N.N		Set scaling rectangle lower left Y value.

FileURX	N.N		Set scaling rectangle upper right X value.
FileURY	N.N		Set scaling rectangle upper right Y value.

Remarks

Scaling rectangle parameters have changed between **MapViewer 8** and **MapViewer 9 and newer versions**. For example:

Use `FileURX` instead of `BLNUpperRightX`.

Use `PageLLY` instead of `APPLowerLeftY`.

Older rectangle-coordinate parameters are still supported, but in new scripts use of the current parameter names is recommended.

Boolean values within options strings are not equivalent to Booleans in **Scripter** BASIC. Use “1” instead of “True” and “0” instead of “False”.

Image (Bitmap) File Descriptions

A bitmap is an image displayed as an array of dots or "bits." In **MapViewer**, images are typically imported as a base map.

Device-independent bitmaps and BMP file format

A typical BMP file usually contains the following blocks of data:

BMP File Header	Stores general information about the BMP file
Bitmap Information (DIB header)	Stores detailed information about the bitmap image.
Color Palette	Stores the definition of the colros being used for indexed color bitmaps.
Bitmap Data	Stores the actual image, pixel by pixel

The following sections discuss the data stored in the BMP file or DIB in details. This is the standard BMP file format.[2] Some bitmap images may be stored using a slightly different format, depending on the application that creates it. Also, not all fields are used; a value of 0 will be found in these unused fields.

DIBs in memory

A BMP file is loaded into memory as a DIB data structure, an important component of the Windows GDI API. The DIB data structure is the same as the BMP file format, but without the 14-byte BMP header.

BMP file header

This block of bytes is at the start of the file and is used to identify the file. A typical application reads this block first to ensure that the file is actually a BMP file and that it is not damaged. Note that the first two bytes of the BMP file format (thus the BMP header) are stored in big-endian order. This is the magic number 'BM'. All of the other integer values are stored in little-endian format (i.e. least-significant byte first).

Offset#	Size	Purpose
0	2	the magic number used to identify the BMP file: 0x42 0x4D (Hex code points for **B** and **M**)
2	4	the size of the BMP file in bytes
6	2	reserved; actual value depends on the application that creates the image
8	2	reserved; actual value depends on the application that creates the image
10	4	the offset, i.e. starting address, of the byte where the bitmap data can be found.

Bitmap information (DIB header)

This block of bytes tells the application detailed information about the image, which will be used to display the image on the screen. The block also matches the header used internally by Windows and OS/2 and has several different variants. All of them contain a dword field, specifying their size, so that an application can easily determine which header is used in the image. The reason that there are different headers is that Microsoft extended the DIB format several times. The new extended headers can be used with some GDI functions instead of the older ones, providing more functionality. Since the GDI supports a function for loading bitmap files, typical Windows applications use that functionality. One consequence of this is that for such applications, the BMP formats that they support match the formats supported by the Windows version being run. See the table below for more information.

Size	Header	Identified by	Supported by the GDI of
40	Windows V3	BITMAPINFOHEADER	all Windows versions since Windows 3.0
12	OS/2 V1	BITMAPCOREHEADER	OS/2 and also all Windows versions since Windows 3.0
64	OS/2 V2		
108	Windows V4	BITMAPV4HEADER	all Windows versions since WIndows 95/NT4
124	Windows V5	BITMAPV5HEADER	WIndows 98/2000 and newer

For compatibility reasons, most applications use the older DIB headers for saving files. With OS/2 being obsolete, for now the only common format is the V3 header.

Color Palette

The palette occurs in the BMP file directly after the BMP header and the DIB header. Therefore, its offset is the size of the BMP header plus the size of the DIB header.

The palette is a block of bytes (a table) listing the colors available for use in a particular indexed-color image. Each pixel in the image is described by a number of bits (1, 4, or 8) which index a

single color in this table. The purpose of the color palette in indexed-color bitmaps is to tell the application the actual color that each of these index values corresponds to.

A DIB always uses the RGB color model. In this model, a color is terms of different intensities (from 0 to 255) of the additive primary colors red (R), green (G), and blue (B). A color is thus defined using the 3 values for R, G and B (though stored in backwards order in each palette entry).

The number of entries in the palette is either 2n or a smaller number specified in the header (in the OS/2 V1 format, only the full-size palette is supported).[2][4] Each entry contains four bytes, except in the case of the OS/2 V1 versions, in which case there are only three bytes per entry.[4] The first (and only for OS/2 V1) three bytes store the values for blue, green, and red, respectively,[2] while the last one is unused and is filled with 0 by most applications.

As mentioned above, the color palette is not used when the bitmap is 16-bit or higher; there are no palette bytes in those BMP files.

Bitmap Data

This block of bytes describes the image, pixel by pixel. Pixels are stored "upside-down" with respect to normal image raster scan order, starting in the lower left corner, going from left to right, and then row by row from the bottom to the top of the image.[2] Uncompressed Windows bitmaps can also be stored from the top row to the bottom, if the image height value is negative.

RGB color (24-bit) pixel values are stored with bytes in the same order (blue, green, red) as in the color table.[2]

If the number of bytes matching a row (scanline) in the image is not divisible by 4, the line is padded with one to three additional bytes of unspecified value (not necessarily 0) so that the next row will start on a multiple of 4 byte location in memory or in the file. (the total number of bytes in a row can be calculated as the image size/bitmap height in pixels) Following these rules there are several ways to store the pixel data depending on the color depth and the compression type of the bitmap.

File Formats

The term image (bitmap) includes the following file formats:

- BMP Bitmap .BMP
- ECW ERMapper Images .ECW
- EPS Encapsulated Postcript .EPS
- GIF Graphics Interchange Format .GIF
- JPEG Compressed Bitmap .JPG
- PICT MacIntosh .PCT
- PNG Portable Network Graphics .PNG
- PNM Portable Any Map Image .PNM, .PPM, .PGM, .PBM
- RAS Sun Raster Image .RAS, .SUN
- RGB Silicon Graphics RGB Image .RGB, .RGBA, .BW
- SID LizardTech MrSID Image .SID
- TGA TrueVision Targa .TGA
- TIF Tagged Image File Format .TIF, .TIFF

Import Options Dialog

No import options dialog is displayed for most image file formats.

See MrSID Import Options Dialog.

See .ECW Image Import Options Dialog.

Import Automation Options

No import automation options are available for most image file formats.

See MrSID Import Automation Options.

See ER Mapper .ECW Import Automation Options.

Export Options Dialog

See Image (Bitmap) Export Options Dialog

Export Automation Options

See Image (Bitmap) Export Automation Options

Loading a BMP

Use the **File | Import** or **Map | New | Base Map** to load a .BMP file.

Bitmap Format Files

Bitmap files consist of raster images that can be effective background images for other maps. Raster images are displayed as an array of dots called pixels. After a bitmap file is loaded as a base map, you can scale the bitmap and change some bitmap properties using the Image menu commands.

Bitmap Coordinates

Bitmap format files use coordinates that, under some circumstances, do not match the coordinate systems used on other types of maps. If the bitmap is not georeferenced, the coordinates are usually the number of pixels in the X and Y directions. **MapViewer** does support georeferenced bitmaps (GeoTIFFs). If a bitmap is not georeferenced, you can use the **Map | Plot | Calibrate** command to impose a new coordinate system on a bitmap.

Loading Bitmaps

To load a bitmap file, use the **File | Import** command. Bitmaps obscure any objects behind the bitmap image. If this happens, select the bitmap and choose the **Arrange | Move to Back** command. This moves the bitmap behind all other objects in the plot window. You can show or hide bitmaps with the **View | Show Objects** command.

Encapsulated Postscript Bitmap EPS File Information

An Encapsulated Postscript Bitmap [.EPS] file can contain a bitmap preview along with the vector information. The bitmap preview portion of the file is the only portion of the [.EPS] file that **MapViewer** can read. If the file does not contain a bitmap preview an *Import Error. File not in correct format.* error appears.

Image (Bitmap) Export Options Dialog

The **Export Options** dialog allows you to specify options which determine how the image will be exported to a bitmap file. There are different page options depending on the type of bitmap file being exported.

Size and Color Page

JPEG Options Page

Spatial References Page

Other

You may specify the output bitmap size in pixels (by modifying the *Width* and *Height* controls), or you may specify a resolution in dots per inch (by modifying the *Horizontal* and *Vertical* controls) and let the application calculate the output bitmap size for you. To maintain an aspect ratio of 1:1 in the output image, you may check *Maintain Aspect Ratio*. Higher resolution will yield a better-looking image, but at the expense of requiring more memory and disk space to hold the bitmap.

JPEG

There are extra options when exporting to a .JPG (JPEG) file. If *Automatic Compression* is checked, the image will be exported to .JPG file using a compression ratio the program thinks is appropriate. If the *Automatic Compression* is not checked, you can enter a quality value (0 - 100) in the *Quality* edit box. Specifying 0 yields the most compression, but the lowest quality. Specifying 100 yields the highest quality, but the least compression.

Spatial Reference Information

Some applications associate spatial reference information (such as projection, datum, and georeference parameters) with bitmap images representing a region of the Earth's surface. If the program you're running has spatial reference information to export, additional controls will appear in the Bitmap **Export Options** dialog.

Most bitmap file storage formats don't have a way to store the spatial reference information in the same file as the bitmap image. For these formats, the only way the spatial reference information can be saved is in a separate file. One bitmap storage format, GeoTIFF (Geographic Tagged Image File Format), allows the spatial reference information to be stored in one file, along with the image.

If no boxes are checked, no spatial reference information will be saved.

Image (Bitmap) Export Automation Options

Since the **Export Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options. A typical example would be:

"Defaults=1,Width=640,Height=480,ColorDepth=4"

This would set all export options to their default values, then set the bitmap width to 640 pixels, the bitmap height to 480 pixels and the color depth to 4 (i.e., 256 colors).

Note: A script writer is allowed to change the size of a bitmap, even if it has associated georeference parameters. New (but possibly not minimal RMS) georeference parameters will be automatically calculated and saved. Avoid using the "Width=", "Height=", "HDPI=" or "VDPI=" automation options if you do not want associated georeference parameters recalculated.

Option	Action	Default	Description
Width	N		Sets the width of the exported image in pixels. Either a Width or an HDPI option may be specified, but not both.
Height	N		Sets the height of the exported image in pixels. Either a Height or a VDPI option may be specified, but not both
HDPI	N	96	Sets the number of horizontal pixels in the exported image that corresponds to a distance one horizontal inch on the MapViewer plot. Either a Width or an HDPI option may be specified, but not both. The default HDPI is the resolution of the display device driver on your computer (this is 96 dots per inch on many Windows display devices, but number can very from device to device).
VDPI	N	96	Sets the number of vertical pixels in the exported image that corresponds to a distance of one vertical inch on the MapViewer plot. Either a Height or a VDPI option may be specified, but not both. The default VDPI is the resolution of the display device driver on your computer (this is 96 dots per inch on many Windows display devices, but number can very from device to device)
KeepAspect	0 = No 1 = Yes	1	If set to 1, KeepAspect ajusts the aspect ratio (the width versus height) of the exported image to match the aspect ratio of the MapViewer plot that is being exported. If an option is given to set the Width or HDPI of an image, KeepAspect automatically assigns the appropriate Height or VDPI to maintain the same aspect ratio as the MapViewer plot. Likewise, if an option is given to set the Height or VDPI of

			an image, KeepAspect automatically assigns the appropriate Width or HDPI to maintain the same aspect ratio of the MapViewer plot. Note that the KeepAspect option is ignored if both the Width and Height options or the HDPI and VDPI options are specified. If set to 0, the aspect ratio of the exported image is determined solely by the Width and Height or HDPI and VDPI options. The size is not adjusted to match the aspect ratio of the MapViewer plot.
KeepPixelSize	0 = No 1 = Yes		Locks the pixel dimension width and height. Changes to the VDPI and HDPI will only affect the document size when this is set to 1.
ColorDepth	-32 = 32-bit grayscale -16 = 16-bit grayscale -8 = 8-bit grayscale -4 = 4-bit grayscale -1 = Monochrome 1 = 1-bit color indexed 4 = 4-bit color indexed 8 = 8-bit color indexed 24 = 24-bit true color 32 = 32-bit true color with alpha	24 for most formats 8 if the format doesn't support 24-bit true color	Specifies the color depth (or pixel format) of the exported image. The greater the color depth, the more faithfully the image will represent the colors assigned to objects in your document. Note that not all color depths are supported by all export filters. In cases where the requested format is not supported by a particular export filter, the export procedure will automatically select an alternate format that is compatible with the export filter.
ColorReductionMethod	1 = Ordered Dither 2 = Diffuse Dither 3 = Popularity 4 = MedianCut555 5 = MedianCut888	5	In cases where an indexed ColorDepth has been selected for the exported image, the ColorReductionMethod option selects which algorithm is used to reduce the 16 million possible colors in the MapViewer plot down to the actual number of colors available in the image's color table.

Quality	N	100	For JPG and JPG2 export only. Set compression quality 0 - 100. A value of 100 is highest quality.
Compress	0 = No compression 1 = Packbits 2 = Deflate	0	For TIF export only. Set the compression type of an exported TIF file.
Format	0 = Monolithic (one strip) 1 = One row per strip 2 = 16 rows per strip 3 = 64 rows per strip 4 = 64x64-pixel tiles 5 = 256x256-pixel tiles	3	For TIF export only. Choose from a variety of strip and tile output formats when exporting TIF files. The option In one strip containing the entire image is the least efficient option but has the highest degree of compatibly with other software.
SaveRefInfoAsInternal	0 = No 1 = Yes	0	Save spatial references to internal format (if possible)
SaveRefInfoAsBlueMarbleRSF	0 = No 1 = Yes	0	Save spatial references as Blue Marble .RSF file
SaveRefInfoAsESRIWorld	0 = No 1 = Yes	0	Save spatial references as ESRI World file
SaveRefInfoAsGSIREF	0 = No 1 = Yes	0	Save spatial references as Golden Software Reference (version 1) file
SaveRefInfoAsGSIREF2	0 = No 1 = Yes	0	Save spatial references as Golden Software Reference (version 2) file
FormatJ2K	0 = JP2 container 1 = J2K container	0	Sets the Container Format for JPG-2000 export only.

Atlas Boundary .BNA File Description

MapViewer imports and export Atlas Boundary files .BNA.

The Atlas Boundary File .BNA is an ASCII format file used to store spatial information including areas, curves, ellipses and points. Spatial information is only concerned with the location of objects in space (i.e., their coordinates) and not with their attributes (such as line or fill style, marker symbol used, text labels, etc.).

File Format

The general format of the file is:

"Pname 1", "Sname 1", type/length

```
x1,y1
x2,y2
...
xn,yn
"Pname 2", "Sname 2", type/length
x1,y1
x2,y2
...
xn,yn
```

Pname

Pname is the name of the primary ID. The primary ID is used to link the object to external data.

Sname

Sname is the name of the secondary ID. The secondary ID is optional.

Type/Length

The *type/length* is an integer which identifies the object as an area, curve, ellipse or point.

X, Y

Following the *type/length* are the actual X,Y coordinate pairs that make up the object. These can be integers or real numbers, and are stored 1 pair per line.

The *type/length* field indicates the number of coordinate pairs to follow and also indicates the type of object as follows:

- Areas have a *type/length* value greater than 2. The value indicates the number of coordinate pairs to follow. Islands and lakes are concatenated to the coordinate list.
- Curves have a *type/length* value less than -1. The absolute value is the number of coordinates to follow for the curve.
- Ellipses have a *type/length* value 2. The first pair of coordinates describe the center of the ellipse. The major and minor radii are stored in the second pair of coordinates. If the minor radius is 0, the ellipse is a circle.
- If the *type/length* field is 1, the object is considered a point. One coordinate pair follows.

Attributes

The first two ID attributes for all polyline, polygon, and symbol objects are automatically exported to all .BNA files. For contour maps, the elevation is exported as the "STD_ID1" attribute for all polylines in the contour map. If other attributes are desired instead of the first two, rename those attributes to "STD_ID1" and "STD_ID2". These named attributes will be used instead of the first and second attributes listed on the Info tab. The color, size, symbol shape, width, and other properties are not exported.

Simple and Compound Areas

Two kinds of areas exist, simple and compound. A simple area contains a starting point, a series of points specifying the area's boundary and a closing point with the same coordinate as the starting

point. A compound area contains one or more subareas, such as islands or lakes. Atlas Boundary files use a special technique to specify the subareas comprising compound areas.

Example 1

A simple area with 5 points is shown in the Atlas Boundary file format:

```
"name" "attrib" 6
2.15, 3.25
3.75, 5.15
6.5, 4.3
5.5, 1.7
4.25, 3.4
2.15, 3.25
```

Example 2

A compound area consisting of a closed outer area and two islands. Here is how the coordinates should be specified in an Atlas Boundary file:

```
AX1,AY1      Starting point of area "A"
AX2,AY2      Points specifying boundary of area "A"
.
.
AXn,AYn      Ending point of area "A"
BX1,BY1      Starting point of subarea "B"
BX2,BY2      Points specifying boundary of subarea "B"
.
.
BXn,BYn      Ending point of subarea "B"
AX1,AY1      Starting point of area "A" (Flag Point)
CX1,CY1      Starting point of subarea "C"
CX2,CY2      Points specifying boundary of subarea "C"
.
.
CXn,CYn      Ending point of subarea "C"
AX1,AY1      Starting point of area "A" (Flag Point)
```

Each area's ending point must have the same coordinate as its starting point. The staring point of area "A" is used as a marker (called a Flag Point) to indicate the end of each subarea. This means the first area point's coordinate must be unique and cannot appear as a coordinate within any subarea.

And, an example of what the actual file may look like:

```
""pname"" ""attrib"" 13
```

48 99
52 20
57 19
56 8
29 0
27 71
48 99
40 70
50 60
48 55
34 40
40 70
48 99

Import Options Dialog
No import options dialog is displayed.

Import Automation Options
See Atlas Boundary .BNA Import Automation Options.

Export Options Dialog
See Atlas Boundary .BNA Export Options Dialog.

Export Automation Options
See Atlas Boundary .BNA Export Automation Options.

Atlas BNA Examples

The Atlas BNA file is used to store geographic information including areas, curves, points, and IDs.

Alternate BNA Format

" Pname 1", " Sname 1", type/length, x1, y1, x2, y2, x3, y3, ... xn, yn
" Pname 2", " Sname 2", type/length, x1, y1, x2, y2, x3, y3, ... xn, yn

Examples
The follow examples show the format for different objects.

Example 1:
This is an example of an **area**. The area has both a primary and secondary ID.
"CO","Colorado",7
-102.073,37.0033
-103.015,37.01
-103.106,37.01

-109.064,37.0033
-109.08,41.0091
-102.081,41.0157
-102.073,37.0033

Example 2:

This is an example of a **curve**. In this example, this curve does not have a primary or secondary ID, although they can be assigned for curves by typing the information in the BNA file.

"","",-10
535.954,1681.83
541.209,1241.31
1166.1,1466.83
672.581,1723.87
604.268,1351.66
1260.25,1089.36
1260.25,1571.92
535.954,1792.18
132.202,1262.33
1260.25,837.565

Example 3:

This is an example of a **point**. The point has both a primary and secondary ID.

"Well HA-11"," Hansford Field",1
-104.351,37.847

Atlas Boundary [.BNA] Import Options Dialog

The **Import Options** dialog does not display in **MapViewer**.

Atlas Boundary [.BNA] Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

"Defaults=1,AreasToCurves=1"

This would first set all import options to their default values, then set the *AreasToCurves* option value to one, which would specify that any areas imported be converted to closed curves.

Option	Action	Default
`Defaults=1`	Set all options to their default values	No

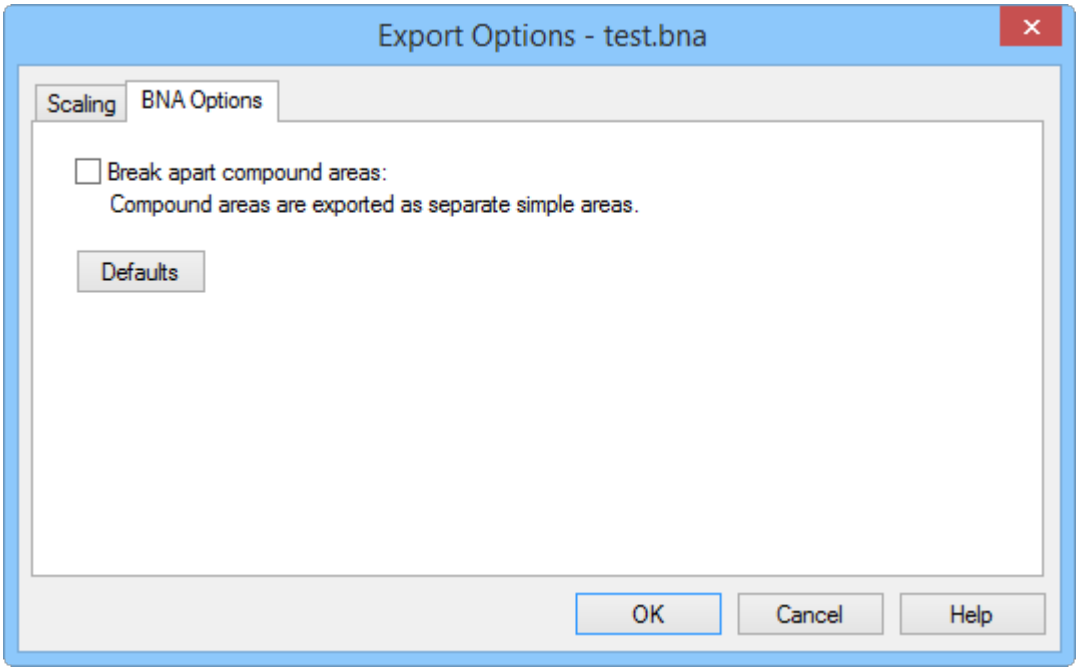
`ForgetOptions=1`	Don't remember options for later use	No
`AreasToCurves=1`	Convert area objects to closed curves	No

Atlas Boundary [.BNA] Export Options Dialog

The **Export Options** dialog allows you to specify options which determine how information in the file is exported.

Attributes

The first two ID attributes for all polyline, polygon, and symbol objects are automatically exported to all .BNA files. For contour maps, the elevation is exported as the "STD_ID1" attribute for all polylines in the contour map. If other attributes are desired instead of the first two, rename those attributes to "STD_ID1" and "STD_ID2". These named attributes will be used instead of the first and second attributes listed on the Info tab. The color, size, symbol shape, width, and other properties are not exported.



*The **Export Options** dialog controls the BNA export options.*

The BNA Options Page

Check the *Break apart compound areas* option to export compound areas as separate simple areas.

The Scaling Page

See the Scaling Page for detailed information.

Atlas Boundary [.BNA] Export Automation Options

Since the **Export Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options. A typical example would be:

"Defaults=1,ScalingSourceApp=0"

This would set all export options to their default values, then indicate the scaling source information should not be taken from the application, but from previously saved values.

Option	Action	Default	Description
BreakApartCompoundAreas	0 = No 1 = Yes	0	Compound areas (multi-ring polygons) will be split apart into multiple non-compound areas (simple polygons) during export.
ScalingSource	0 = previously saved 1 = application-supplied	1	Use previously saved or application-supplied scaling source.
SaveScalingInfo	0 = No 1 = Yes	0	Save scaling parameters for later use.
PageLLX	N.N		Set application page rectangle lower left X value.
PageLLY	N.N		Set application page rectangle lower left Y value.
PageURX	N.N		Set application page rectangle upper right X value.
PageURY	N.N		Set application page rectangle upper right Y value.
FileLLX	N.N		Set scaling rectangle lower left X value.
FileLLY	N.N		Set scaling rectangle lower left Y value.
FileURX	N.N		Set scaling rectangle upper right X value.
FileURY	N.N		Set scaling rectangle upper right Y value.

Remarks

Scaling rectangle parameters have changed between **MapViewer 8** and **MapViewer 9 and newer versions**. For example:

Use `FileURX` instead of `BNAUpperRightX`.

Use `PageLLY` instead of `APPLowerLeftY`.

Older rectangle-coordinate parameters are still supported, but in new scripts use of the current parameter names is recommended.

Boolean values within options strings are not equivalent to Booleans in **Scripter** BASIC. Use “1” instead of “True” and “0” instead of “False”.

ASCII Database .DBF File Description

MapViewer imports data from dBase/xBase database .DBF files.

Xbase is a complex of data files .DBF, indexes .NDX, .MDX, .CDX, etc. and eventually note files .DBT for storing large amounts of formatted data in a structured form.

DBase's database system was one of the first to provide a header section for describing the structure of the data in the file. This meant that the program no longer required advance knowledge of the data structure, but rather could ask the data file how it was structured. Note that there are several variations on the .DBF file structure, and not all dBase-related products and .DBF file structures are necessarily compatible.

A second file type is the .DBT file format for memo fields. While character fields are limited to 254 characters each, a memo field is a 10-byte pointer into a .DBT file which can include a much larger text field. DBase was very limited in its ability to process memo fields, but some other xBase languages treat memo fields as strings just like character fields for all purposes except permanent storage.

DBase uses .NDX files for indexes. Some xBase languages include compatibility with .NDX files while others use different file formats.

Import Options Dialog

No import options dialog is displayed.

Import Automation Options

Import Automation Options

Export Options

MapViewer does not currently support .DBF export.

ASCII Database .DBF Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

```
"ImportCodePage=1252"
```

This would set the Unicode Language ID value to code page 1252, or the Western European (Windows) code page.

Option	Action	Default
ImportCodePage	The name of the ANSI code page to use when importing Unicode data. Valid code page number in the range 0 through 65535.	""

Note: If a companion .SHP file with the same name exists in the folder containing the .DBF file, the .DBF file is assumed to be part of an ESRI-compatible Shapefile set and the defaults as described for the *ImportCodePage* option in the ESRI Shapefile .SHP Import Automation Options section apply.

Otherwise, the Language ID value stored in the .DBF file's header determines the code page used. However, if the Language ID value is zero or invalid, the OEM DOS code page determined by the machine's Control Panel locale setting will be used.

SDTS Topological Vector Profile and Raster Profile (TVP, DDF) File Description

MapViewer can import USGS SDTS Topological Vector Profile .TVP or .DDF data sets.

SDTS File Information

The Spatial Data Transfer Standard, or SDTS, is a robust way of transferring earth-referenced spatial data between dissimilar computer systems with the potential for no information loss. It is a transfer standard that embraces the philosophy of self-contained transfers, i.e. spatial data, attribute, georeferencing, data quality report, data dictionary, and other supporting metadata all included in the transfer.

The purpose of the SDTS is to promote and facilitate the transfer of digital spatial data between dissimilar computer systems, while preserving information meaning and minimizing the need for information external to the transfer. Implementation of SDTS is of significant interest to users and producers of digital spatial data because of the potential for increased access to and sharing of spatial data, the reduction of information loss in data exchange, the elimination of the duplication of data acquisition, and the increase in the quality and integrity of spatial data. SDTS is neutral, modular, growth-oriented, extensible, and flexible--all characteristics of an "open systems" standard.

The SDTS provides a solution to the problem of spatial data transfer from the conceptual level to the details of physical file encoding. Transfer of spatial data involves modeling spatial data concepts, data structures, and logical and physical file structures. To be useful, the data to be transferred must also be meaningful in terms of data content and data quality. SDTS addresses all of these aspects for both vector and raster data structures.

There are two separate types of SDTS files: topological vector profile SDTS and raster profile SDTS files.

TVP

The topological vector profile SDTS files contain boundary line information and can be used as a base map (use with **File | Import** or **Map | Create Map | Base**).

DDF

An uncompressed SDTS contains several files with the .DDF extension. All of the .DDF files are necessary to produce a map (i.e. you cannot copy just one .DDF file and create a map from it). DDF files can be two file formats, TVP and DEM. DEM (Digital Elevation Model) files are grid files and cannot be opened in **MapViewer**.

Remarks

It is not necessary to unzip the .TAR.GZ, .TAR, .ZIP, or .TGZ file. **MapViewer** can read the information in the various files directly from the compressed file.

If you do unzip the .TAR.GZ, .TAR, .ZIP, or .TGZ file containing the DDF files, there is an option in WinZip (or other unzipping software) that needs to be disabled. Use the WinZip settings to disable this option. All .DDF files must be extracted into the same directory.

1. In WinZip, use the **Options | Configuration** command to open the **Configuration** dialog.
2. Click on the *Miscellaneous* tab.
3. In the *Other* category, un-check *TAR file smart CR/LF conversion.*
4. Click the *OK* button.
5. The Tar.GZ file will now properly unzip the files.

Import Options Dialog

SDTS TVP Import Options Dialog

Import Automation Options

SDTS TVP Import Automation Options

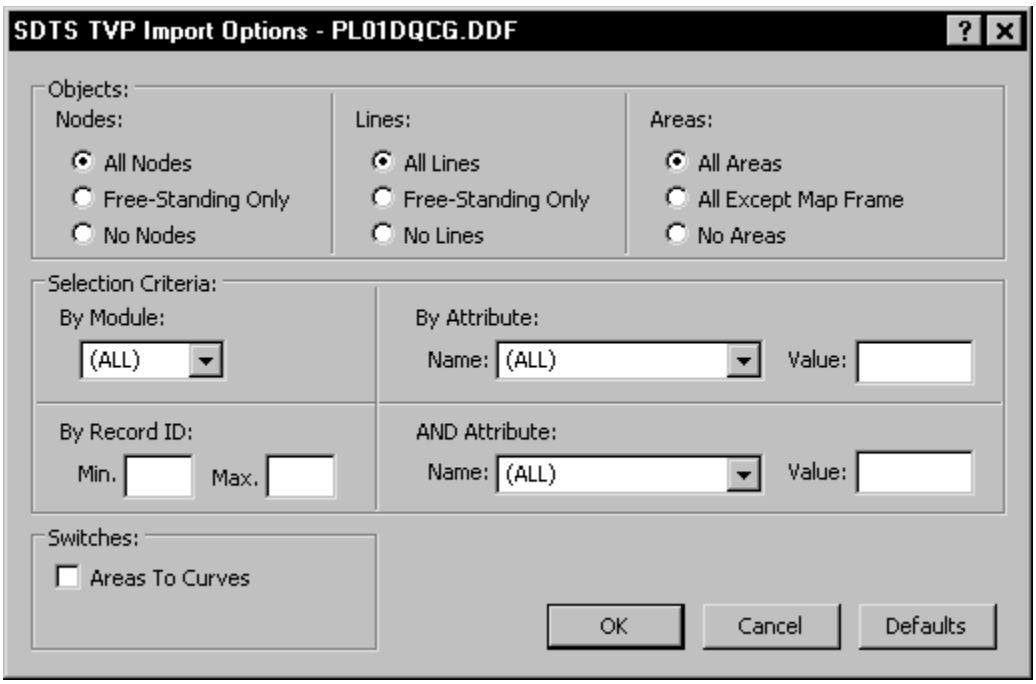
Export Options Dialog

MapViewer does not export SDTS .DDF files.

SDTS Topological Vector Profile .TVP Import Options Dialog

SDTS TVP Import Options Dialog

Select any .DDF file to open the **Import Options** dialog.



*Customize the import options in the **SDTS TVP Import Options** dialog.*

Nodes Options

These options determine which Node items are imported. If *All Nodes* is selected, all nodes in the SDTS data set are imported. If *Free-Standing Only* is selected, only those nodes that are not associated with an area or line are imported. If No Nodes is selected, none of the nodes are imported.

Lines Options

These options determine which Line items are imported. If *All Lines* is selected, all lines in the SDTS data set are imported. If *Free-Standing Only* is selected, only those lines that are not associated with an area are imported. If *No Lines* is selected, none of the lines are imported.

Areas Options

These options determine which Area items are imported. If *All Areas* is selected, all areas in the SDTS data set are imported. If *All Except Map Frame* is selected, the areas that make up the outline of the map will not be imported. If *No Areas* is selected, none of the areas are imported.

Some SDTS data sets supplied by USGS contain a map frame that is expressed in the data set as a normal polygon instead of an "invisible" polygon (i.e. a "PC" entity instead of a "PW" or "PX" entity in SDTS terminology). In such cases, the All Except Map Frame control will have no effect.

By Module List Box

If the name of a specific module is selected, imported items will be limited to those that reside in the specified module. If *(ALL)* is selected, items will be imported from all modules in the SDTS data set.

By Record ID Edit Boxes

Each item in the SDTS data set has a unique record ID number. To import only those items within a specific range of record IDs, enter the lowest desired record ID number in the *Min* edit box, and the highest desired record ID number in the *Max* edit box.

By Attribute, AND Attribute Controls

Application-specific attributes are associated with some items in an SDTS data set. To import only those items that have a specific attribute, select the name of the desired attribute in the *Name* list box and enter the value of the desired attribute in the *Value* edit box. If *(ALL)* is selected in the list box, items will be imported without regard to attributes. If both *By Attribute* and *AND Attribute* are specified, only those items that have both of the specified attributes will be imported.

Areas To Curves Check Box

If this is checked, any areas in the data set will instead be imported as lines (curves) instead of polygonal areas.

Defaults Button

The *Defaults* button resets the Import Options to default values. The default options direct the Import Filter as follows: Import free-standing nodes, import free-standing lines, import all areas, don't limit by module, record ID, or attribute, don't import areas as curves, and don't synthesize Ids.

SDTS Topological Vector Profile Import Filter Messages

The following messages may appear while importing SDTS Topological Vector Profile files.

Expected SDTS TVP data. Found SDTS DEM or raster

This error message:

> The import file appears to be in an unrecognized format. Make sure the file is a properly formatted SDTS Topological Vector Profile file.

may appear if the selected .DDF file is in the incorrect format. If you receive this message, you likely have a SDTS DEM file. **MapViewer** does not read grid files. if you need to use SDTS DEM files, try Golden Software's **Surfer**.

SDTS Topological Vector Profile [.TVP] Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

```
"Defaults=1,AreasToCurves=1"
```

This would first set all import options to their default values, then set the *AreasToCurves* option value to one, which would specify that any areas imported be converted to curves (lines).

Option	Action	Default	Description
AreasToCurves	0 = No 1 = Yes	0	Convert all polygons to polylines.
WhichLines	0 = Import all lines 1 = Import only freestanding lines 2 = Import no lines	0	Specifies which lines from the file are to be imported.
WhichNodes	0 = Import all nodes 1 = Import no nodes	0	Specifies whether nodes (points) from the file are to be imported.
WhichAreas	0 = Import all areas 1 = Import no areas	0	Specifies whether ares from the file are to be imported.
WhichText	-2 = Import all text -1 = Import no text N = any other value indicates which specific text group number to import	-2	Specifies which text group from the file is to be imported. For example, use WhichText=3 to import only the text from group 3.

DICOM3 Medical Image .DIC, .DCM File Description

Digital Imaging and Communications in Medicine (DICOM) is a standard for handling, storing, printing, and transmitting information in medical imaging. It includes a file format definition and a network communications protocol. The communication protocol is an application protocol that uses TCP/IP to communicate between systems. DICOM files can be exchanged between two entities that are capable of receiving image and patient data in DICOM format. The National Electrical Manufacturers Association (NEMA) holds the copyright to this standard. It was developed by the *DICOM Standards Committee*, whose members are also partly members of NEMA.

DICOM enables the integration of scanners, servers, workstations, printers, and network hardware from multiple manufacturers into a picture archiving and communication system (PACS). The different devices come with DICOM conformance statements which clearly state the DICOM classes they support. DICOM has been widely adopted by hospitals and is making inroads in smaller applications like dentists' and doctors' offices.

MapViewer imports images and lattices from DICOM 3 medical image data sets. This filter is also able to read some files written in the obsolete ACR-NEMA format (from which the DICOM format was derived); however, Golden Software does not officially support the ACR-NEMA format.

DICOM File Format

DICOM differs from other data formats in that it groups information into data sets. That means that a file of a chest X-Ray image, for example, actually contains the patient ID within the file, so that the image can never be separated from this information by mistake.

A DICOM data object consists of a number of attributes, including items such as name, ID, etc., and also one special attribute containing the image pixel data (i.e. logically, the main object has no "header" as such - merely a list of attributes, including the pixel data). A single DICOM object can only contain one attribute containing pixel data. For many modalities, this corresponds to a single image. But note that the attribute may contain multiple "frames", allowing storage of cine loops or other multi-frame data.

DICOM uses three different Data Element encoding schemes. With Explicit VR Data Elements, for VRs that are not OB, OW, OF, SQ, UT, or UN, the format for each Data Element is: GROUP (2 bytes) ELEMENT (2 bytes) VR (2 bytes) LengthInByte (2 bytes) Data (variable length). For the other Explicit Data Elements or Implicit Data Elements, see section 7.1 of Part 5 of the DICOM Standard.

The same basic format is used for all applications, including network and file usage, but when written to a file, usually a true "header" (containing copies of a few key attributes and details of the application which wrote it) is added.

File name extensions: DICOM .DIC, .DCM and ACR-NEMA .AN1, AN2.

Format(s) Supported for Import

- device-independent bitmap; 8, 24, 32 bit per pixel
- uniform lattice; 8-, 16-, 32-bit integer, float, double

Import Options

See DICOM Import Options Dialog.

Import Restrictions/Limitations

The DICOM specification allows an unusually wide variety of different formats and encodings within the same file format. While this software can read most of the common variants of DICOM, it would not be practical to develop software to read every possible variant. Some of the known deficiencies in this implementation include:

- DICOM images that contain bit per pixel counts other than 8, 12, 16, 24 or 32 may not be readable depending on the encoding and alignment of the data.
- DICOM images that are encoded with photometric interpretation models other than RGB, grayscale, or monochrome may not be readable. In particular, some YUV encodings cannot be imported.
- Some lossless JPEG images embedded in DICOM data sets do not import. In particular, images encoded with the "Cornell" JPEG codec are not always readable.
- Some of the obscure compression algorithms allowable under the DICOM specification are not supported by this software.
- Some ACR-NEMA files do not import. Golden Software does not officially support the obsolete ACR-NEMA file formats; however, Voxler does import many ACR-NEMA files successfully.

Export Options Dialog

N/A

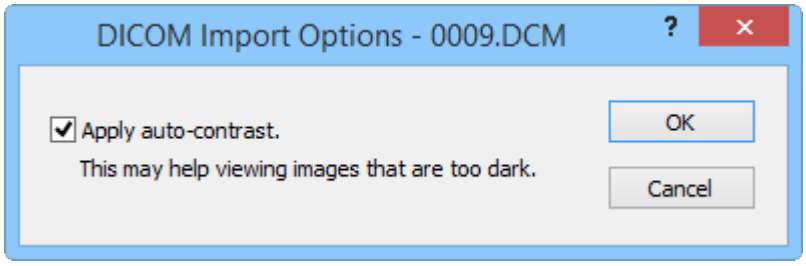
Export Automation Options

N/A

DICOM Import Options Dialog

The DICOM Import Options Dialog

Import a DICOM [.AN?], [.DCM], file into **MapViewer** and the **DICOM Import Options** dialog opens.



*Customize import options in the **DICOM Import Options** dialog.*

Apply Auto-Contrast

Check the *Apply auto-contrast* box to expand the dynamic range of the import data to fit the maximum extents of the import data type. This can improve visibility (contrast) on images recorded with low dynamic range.

DICOM Medical Image File .DIC, .DCM, AN? Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

"Defaults=1,AutoContrast=1"

This would first set all import options to their default values, then set the AutoContrast option value to one, which would specify that the dynamic range of the imported data will be expanded to improve the contrast of the image.

Option	Action	Default	Description
AutoContrast	0 = No 1 = Yes	0	When set to 0, the data will be imported as-is, without adjustment. When set to 1, the dynamic range of the imported data will be expanded to improve the contrast of the image.

USGS Digital Line Graph .DLG File Description

The United States Geological Survey (USGS) provides digitized base map data in "line graph" form. It is available in two formats ("standard" and "optional") on either 9-track magnetic tape or CD-ROM. The CD-ROM with 1:2,000,000-scale DLG files contains data in both standard and optional formats, as well as a "graphic" format. The definitive guide to these file formats is the USGS document: "Digital Line Graphs from 1:24,000-Scale Maps: Data Users Guide 1", "Digital Line Graphs from 1:100,000-Scale Maps: Data Users Guide 2" and "Digital Line Graphs from 1:2,000,000-Scale Maps: Data Users Guide 3".

File Information

Imported DLG files are read in the "standard" and "optional" formats, and provides point, area, and curve objects.

For the 1:2,000,000-scale files, the USGS has divided the U.S. into 21 sections. On the CD-ROM, the files associated with each section are stored in a separate subdirectory.

The 21 subdirectories use the following naming convention:

SECT00

Each subdirectory starts with the letters "SECT" followed by the section number (01 to 21). The sections correspond to the following regions:

SECT01	Northeastern States
SECT02	Middle Atlantic States
SECT03	Southeastern States
SECT04	Florida
SECT05	Southern Mississippi Valley States
SECT06	Central Mississippi Valley States
SECT07	Northern Great Lakes States
SECT08	Southern Texas
SECT09	Southern Plains States
SECT10	Central Plains States
SECT11	Northern Plains States
SECT12	Arizona and New Mexico
SECT13	Southern California
SECT14	Central Pacific States
SECT15	Northwestern States
SECT16	Southeastern Alaska
SECT17	Central Alaska
SECT18	Northern Alaska
SECT19	Southwestern Alaska
SECT20	Aleutian Islands
SECT21	Hawaiian Islands

Each section has one or more data files associated with it. The file naming convention used is as follows:

S00_XX.YYY

Each file starts with the letter "S", followed by the section number (01 to 21) and an underscore (_). The XX stands for the feature code (sometimes referred to as Overlay or Base Category). Feature codes are:

PB = Political Boundaries CF = Cultural Features

AB = Administrative Boundaries ST = Streams and Rivers

RD = Roads and Trails WB = Water Bodies

RR = Railroads HP = Hypsography (Continental Divide Only)

The YYY indicates the data format:

LGS = Line Graph Standard Format

LGO = Line Graph Optional Format

GRF = Graphic Format

If a section has more than one file for a feature, an underscore (_) and a letter are used to uniquely name the files. Examples:

S01_WB_A.LGO

S01_WB_B.LGO

LGO File

An .LGO file contains 15 records of general "header" information, followed by a series of Node, Area and Line entries, in that order. Each Node is assigned a unique ID number (1,2,...). A Node entry contains the node's ID, its coordinate (all coordinates in "optional" format files are in UTM or Albers Equal Area Ellipsoid projection) and the IDs of each line segment that begins at, ends at, or passes through the node. A "free-standing" node is one that has no line segments associated with it (i.e., the node is an isolated point).

Area ID Number

Each Area is assigned a unique ID number (1,2,...) called an area ID. An Area entry contains the area's ID, the coordinate of its "reference point", a list of the IDs of each line segment that forms the area's boundary (including islands and lakes) and a list of attribute codes assigned to the area. An area's reference point is that point on a map where a textual identifier for the area was placed (such as the name of a county).

Line ID Number

Each Line is also assigned a unique ID number (1,2,...). A Line entry contains the line's ID, the Node ID of the node it starts at, the Node ID of the node it ends at, the Area ID of the area to the left of the line, the Area ID of the area to the right of the line, a list of coordinates of the line vertices and a list of attribute codes assigned to the line segment. (Left and right are relative to the line's direction. The line was digitized from the start point to the end point) . A "free-standing" line is one that is not part of an area boundary.

Attribute Codes

Attribute codes are assigned to areas and line segments for the purpose of identifying and/or grouping them. An attribute code consists of two positive integers, a Major code value and a Minor code value. For example, USGS Section 15 contains data for Washington, Oregon, Idaho and part of Montana. In the Political Boundaries file (S15_PB.LGO), each county boundary area contains two attribute codes. One indicates which state the county was associated with (Major code = 91, Minor code = two-digit FIPS code for the state) and the other indicates which county it is (Major code =

92, Minor code = three-digit FIPS code for the county). For a list of attribute codes, see Major and Minor Attributes.

Import Options Dialog

See USGS Digital Line Graph Boundary Import Options Dialog.

Import Automation Options

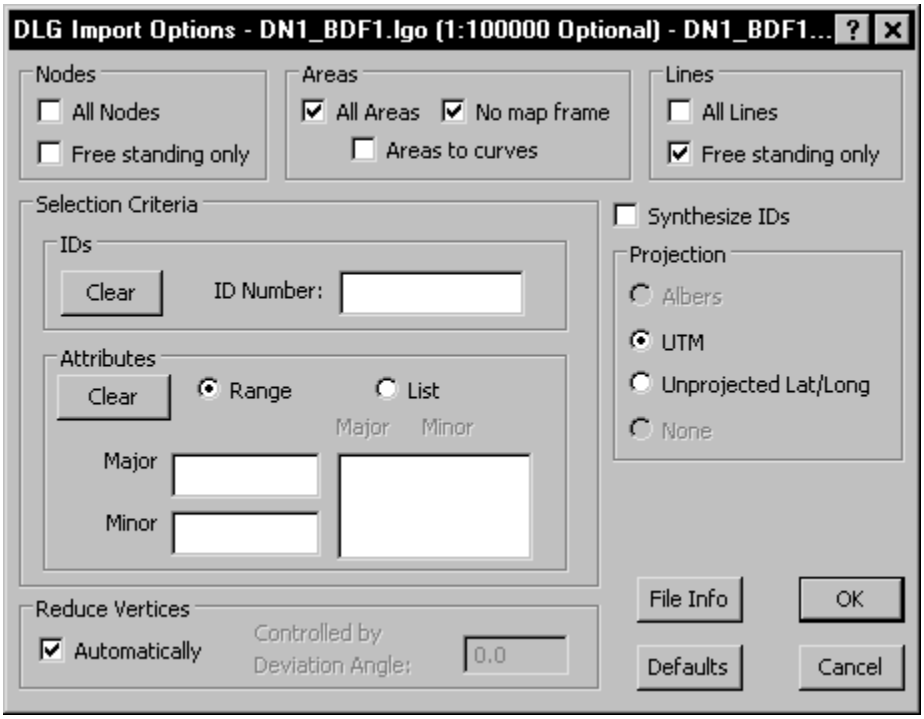
See USGS Digital Line Graph Boundary Import Automation Options.

Export Options Dialog

MapViewer does not currently export .DLG files.

USGS Digital Line Graph .DLG Import Options Dialog

Import Options



*The **Import Options** dialog controls what is imported from the USGS DLG files.*

Nodes, Areas, Lines

The *NodesAn intersection, start, or end point of a line, or a free standing point. , AreasA closed, bounded region whose interior may be filled with a color or pattern.*
, and Lines*A series of connected points which always begin at a node and end at a node.*
groups of check boxes control how the Import Filter handles the Node, Area and Line entries in the DLG (Digital Line Graph) file.

Nodes

All Nodes - If checked, consider all nodes. If they meet the selection criteria, they will be passed to the application as points.

Free standing only - If checked, consider only free-standing nodes. If they meet the selection criteria, they will be passed to the application as points. The only free-standing nodes are the map reference points.

Areas

All Areas - If checked, consider all area items. If they meet the selection criteria, they will be passed to the application.

No Map Frame - If checked, the area that makes up the map frame won't be imported.

Areas to curves - If checked, any selected areas passed to the application will be passed as a series of "curve" objects (lines), as opposed to the usual "area" objects (polygons).

Lines

All Lines - If checked, consider all line items. If they meet the selection criteria, they will be passed to the application as "curve" objects.

Free standing only - If checked, consider only free-standing line segments. This is the normal case, since one usually wants line segments that are area boundaries to be passed to the application as part of one or more "area" objects.

Selection Criteria

The *Selection Criteria* edit boxes allow you to specify a value (like 140) or range of values (like 6001-6009 inclusive) which limit the items considered. Leave an edit box empty to place no limit.

ID Number

Only items with the specified ID or IDs within the specified range will be passed back to the application. This is useful for importing a single item (or group of items) of one type. For example, to import just Area 100, make sure no Nodes or Lines boxes are checked, the All Areas box is checked and 100 is entered in the ID Number edit box. The Import Filter considers no nodes or lines and, within areas, only those with ID 100, and passes back one area, Area 100.

Major and Minor Attribute

Range

If the *Range* radio button in the *Attributes* group is turned on, the edit controls for the Major and Minor attributes are enabled. Only items that have at least one attribute code whose Major attribute falls within the specified range and whose corresponding Minor attribute falls within its specified range will be passed to the application. For example, to import reservoirs only, open the appropriate water bodies file (S??_WB.LGO), check only All Areas, enter nothing in the ID Number edit box (means any ID), turn on the Range radio button and enter 40 in the Major Attribute edit box (Water Bodies) and 106 (Reservoir) in the **Minor Attribute** edit box.

List

If the *List* radio button in the *Attributes* group is turned on, the list box is enabled. Only items that have at least one attribute code whose *Major* and *Minor* attributes match one of the attribute pairs in the list box will be passed to the application. To add attribute pairs into the list box, click *File Info* button to bring up the **File Info** dialog, and double-click the attribute pairs in the Attributes group in the **File Info** dialog. To remove an item from the list box select that item and then click the *Clear* button. You may remove multiple items at one time by selecting multiple items in the list box.

Projections

The Projection radio buttons control how coordinates are returned to the application. DLG files have coordinates calculated using a Universal Transverse Mercator (UTM) or Albers Equal Area Ellipsoid projection. UTM is used in 1:24,000-scale maps and 1:100,000-scale maps, while Albers is used in 1:2,000.000-scale maps.

UTM

The native file coordinates of 1:24,000-scale maps or 1:100,000-scale maps are returned to the application, but the application is also given the parameters used in the UTM projection. Use of this option makes sense only if the application understands how to handle a UTM projection.

Albers

The native file coordinates of 1:2,000,000-scale maps are returned to the application, but the application is also given the parameters used in the Albers projection. Use of this option makes sense only if the application understands how to handle an Albers projection.

Unprojected Lat/Long

The file coordinates are converted from their native form to Lat/Long and the application is informed that it is receiving Lat/Long coordinates. This can lengthen the import time considerably, since substantial computation is involved.

None

The native file coordinates are returned to the application, but the application is told that the projection is unknown.

DLG files typically have many vertices in each line segment, often more than are needed for many tasks. The DLG Import Filter provides two methods for reducing the number of vertices.

Automatically

When you check *Automatically*, the import filter applies an algorithm which requires no further input. This algorithm reduces the number of vertices on most DLG line segments by about 50-80%.

Use Deviation Angle

Achieve finer control over vertex reduction by unchecking the *Automatically* box and entering a *Deviation Angle* (in degrees). Use small angles (5-10 degrees) to eliminate a few points, somewhat larger angles (15-25 degrees) to eliminate more points and use larger angles (30-60 degrees) to eliminate the greatest possible number of points.

USGS DLG files have no text ID items associated with Nodes, Areas or Lines. The line segments that make up the Pecos River, for example, are stored as free-standing line segments with river

attribute codes, but there is no way to distinguish those line segments from any other line segments with river attributes. Sometimes, it is useful for investigation purposes to know the numeric ID of imported items. When the Synthesize IDs box is checked, the Import Filter synthesizes a Primary ID for each item using the item's type and numeric ID value. (Examples are "N14" for Node 14, "A237" for Area 237 and "L1067" for Line 1067.)

Defaults

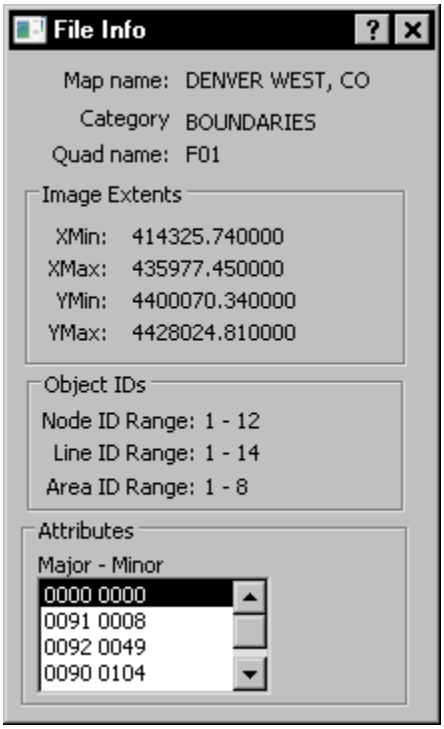
The *Defaults* button resets the Import Options to default values. The default options direct the DLG Import Filter as follows: ignore all Nodes, consider all Areas (selected areas are returned as polygons), consider free-standing lines, place no limiting selection criteria, use UTM or Albers projection and do not synthesize text IDs.

File Info

When the *File Info* is clicked, the File Info dialog appears. The base file information is displayed, such as *Image Extents*, *Object IDs*, and *Major/Minor Attributes*.

USGS Digital Line Graph [.DLG] File Info Dialog

File Info Dialog



*The **File Info** box displays additional information about the DLG file.*

When the *File Info* button is clicked in the DLG Import Options dialog, the **File Info** dialog opens. The base file information is displayed, such as *Image Extents*, *Object IDs*, and *Major/Minor Attributes*.

USGS Digital Line Graph Boundary [.DLG] Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. Parameters for the *Attributes* list box, *Range* and *List* radio buttons are not available. If the program is driven from a script, use *MajorSel* and *MinorSel* parameters instead. A typical example would be:

"Defaults=1,AreasToCurves=1"

This would first set all import options to their default values, then set the *AreasToCurves* option value to one, which would specify that any areas imported be converted to closed curves.

Option	Action	Default	Description
AllNodes	0 = No 1 = Yes	0	Import all nodes (point entities).
FreeNodes	0 = No 1 = Yes	0	Import only free-standing nodes (points that aren't part of another entity).
AllAreas	0 = No 1 = Yes	1	Import all areas (polygons).
NoMapFrame	0 = No 1 = Yes	1	Don't import the entities that make up the map frame.
AreasToCurves	0 = No 1 = Yes	0	Convert areas (polygons) to curves (polygons).
AllLines	0 = No 1 = Yes	0	Import all lines.
FreeLines	0 = No 1 = Yes	1	Import only free-standing lines (lines that aren't part of another entity).
Synthesize	0 = No 1 = Yes	0	If 1, a unique object ID is synthesized for each object form the object's type, record number, an d name (if applicable).
Projection	0 = Coordinates in the file are projected (UTM or Albers Equal Area projection, depending on the file) 1 = Coordinates in the file are projected, but are to be converted to latitude/longitude during import 2 = Coordinates in the file are unknown or not projected	Varies according to the DLG header information	Specify what type of coordiantes are contained in the import file.

IDSel	M-N		Only consider entities with IDs matching M, or in the range of M-N. For example, "IDSel=1-5".
MajorSel	M-N		Only consider entities whose Major Attribute is M, or in the range of M-N. For example, "MajorSel=1-5".
MinorSel	M-N		Only consider entities whose Minor Attribute is M, or in the range of M-N. For example, "MinorSel=1-5".
ThinAuto	0 = No 1 = Yes	1	Automatically thin vertices.
Deviation	N.N	0.0	If ThinAuto (above) is 0, you can manually specify the amount of thinning. The Deviation value in degrees determines how aggressively vertices are thinned during import. For N.N, use small angles (5 to 10 degrees) to eliminate just a few points, larger angles (15 to 25 degrees) to eliminate more points, and even larger angles (30 to 60 degrees) to thin points very aggressively.

AutoCAD .DXF File Description

AutoCAD .DXF files are ASCII files (i.e., they can be edited with a text editor, word processor, or worksheet) or binary files (cannot be edited) containing records indicating graphical entities and their attributes. They provide a medium of exchange with AutoDesk's **AutoCAD** program. The format of .DXF files is complex and a detailed discussion is beyond the scope of a Help file. Many books describing the .DXF file format are widely available.

Graphics

Graphical information may be stored in the **AutoCAD** Drawing Exchange Format (.DXF). Many programs, including AutoDesk Inc.'s AutoCAD (Computer Aided Design) program can import .DXF files, allowing one to display and/or further manipulate the images. **MapViewer** supports MTEXT (multi-line text block) background color in .DXF import filter.

Data

AutoCAD .DXF files can contain point data that includes X, Y, and Z data. DXF files can be opened in a worksheet, used for gridding, or used for post map or classed post map display. When the DXF file is opened in the worksheet, the X and Y coordinates are displayed in columns A and B. If the DXF file contains Z values, the Z values are displayed in column C. If no Z value is included, column C contains a zero (0). When used for post map, classed post map, and gridding, the X, Y, and Z (if any) are automatically read into the appropriate locations.

ASCII or Binary Format

.DXF files can be stored in either ASCII or Binary format. ASCII .DXF files are the most versatile, since they can be displayed, edited, printed and transported to non-IBM machines (such as

mainframes, minicomputers or Macintosh). However, they are somewhat bigger and take longer to read back into another application.

Table and Entities Sections

.DXF files have two important sections.

- The *Tables* section contains definitions of the various line styles and other attributes.
- The *Entities* section contains specific information about each graphical entity (line, polygon, etc.) including coordinates and references to the attributes in the defined in the Tables section. All exported graphical entities are assigned to a layer named GSLAYER.

Text

Text can be imported and exported in .DXF files.

Text can also be exported as **AutoCAD** text entities (*All text as areas* unchecked). No matter what typeface is specified in the application document, all text entities are assigned **AutoCAD's** STANDARD font. Once inside **AutoCAD**, the text entities can be edited in the normal **AutoCAD** fashion. As long as there is no shear or perspective, .DXF text entities will be sized and oriented similar to the text objects in the application document. Shear occurs when the character glyphs are not perpendicular to the text baseline. Perspective occurs when the height of glyphs in the text string are not all the same, as in a 3D view where the glyphs are smaller the farther they are from the observer.

Line Styles

Lines styles are exported with equivalent **AutoCAD**-compatible line types. The document's internal line styles are assigned the following **AutoCAD** line type names:

Document	**AutoCAD**
Solid	CONTINUOUS
Internal Dash	GSDASHED
Internal Dot	GSDOTTED
Internal Dash-Dot	GSDASHDOT
Internal Dash-Dot-Dot	GSDASHDOTDOT

Custom line styles in the document are assigned AutoCAD line type names of the form GSCUSTOM0, GSCUSTOM1, GSCUSTOM2, etc.

Color Numbers

Indexed .DXF color numbers are assigned to each entity. Color numbers (1,2,3,…,255) are indices into **AutoCAD's** internal color table. By convention, the first 7 color numbers are guaranteed to have known colors assigned to them by **AutoCAD**. They are:

1	Red
2	Yellow
3	Green
4	Cyan

5	Magenta
7	Black (Default for GSLAYER)

AutoCAD has a default association of colors to color numbers, but the **AutoCAD** user is free to change the colors associated with color numbers 8 through 255. When exporting to .DXF format, the color number of the color from the default **AutoCAD** color table closest to the actual color of the object is assigned to the entity in the .DXF file. Unless you use only the seven colors listed above, the color of objects inside **AutoCAD** may be different than those in the application document.

AutoCAD 2004 and later versions support true colors. When user chooses *AutoCAD 2004 or later* in the **Export Options** dialog, true colors are written to the export file.

Import Options

See AutoCAD .DXF Import Options Dialog.

Import Automation Options

See AutoCAD .DXF Import Automation Options.

Open Options

DXF files can be opened in the worksheet using the **File | Open** command, used for gridding, or post map or classed post map display.

Export Options

See AutoCAD .DXF Export Options Dialog.

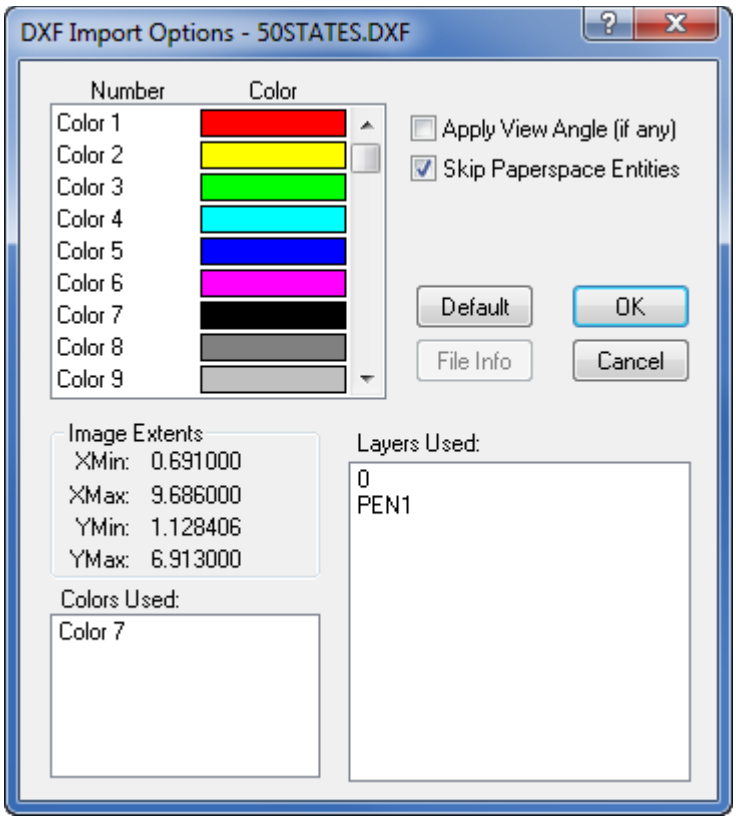
Export Automation Options

See AutoCAD .DXF Export Automation Options.

AutoCAD DXF Import Options Dialog

The **Import Options** dialog allows you to specify options which determine how information in the file is imported.

AutoCAD-compatible Drawing Exchange Format .DXF files contain information describing graphical objects, such as areas, curves, points and text. The DXF Import Filter reads DXF files and structures the information in a form usable by the application.



*Customize import options in the **DXF Import Options** dialog.*

Color Number

DXF files contain no direct color information, but use color numbers (1-255) instead. There is an adhoc standard association of colors with the first 7 color numbers: Red, Yellow, Green, Cyan, Blue, Magenta and Black. By double-clicking on items in the COLOR list box, you can change the color associated with a specific color number.

Default

Pressing the *Default* button will assign a default set of colors to each color number.

Apply View Angle

If any viewing angles have been applied in AutoCAD, check *Apply View Angle* to preserve these settings. The unrotated coordinates will not be preserved if this box is checked.

Skip Paperspace Entities

To import only graphical entities from AutoCAD's 'modelspace' and skip importing entities from 'paperspace', check the *Skip Paperspace Entities* option. If this option is not selected, entities from both 'paperspace' and 'modelspace' are imported. This option is checked, by default.

File Info

Click the *File Info* button to display the file information concerning the image extents, color numbers used and layers used in the .DXF file. The dialog extends to show this information, as shown above.

Colors Used

Selecting a color number displayed in the *Colors Used* list box automatically selects that color number in the *Color* list box.

Layers Used

Double-clicking on a layer displayed in the *Layers Used* list box displays the Layer Name dialog, showing the graphical entities present in the layer and a check box showing whether the layer is marked frozen (invisible) or not.

AutoCAD Entities

The point, line, and polygon AutoCAD entities are currently supported.

Import Messages

The following messages may appear while attempting to import [.DXF] files.

Incomplete Entity

Some vital groups are missing from an entity in the DXF file. Make sure the layer and other required groups are present.

Couldn't find a block to insert

The program attempted to insert a block while the latter couldn't be found. Make sure the format of the BLOCKS section is correct, and the appropriate block is available.

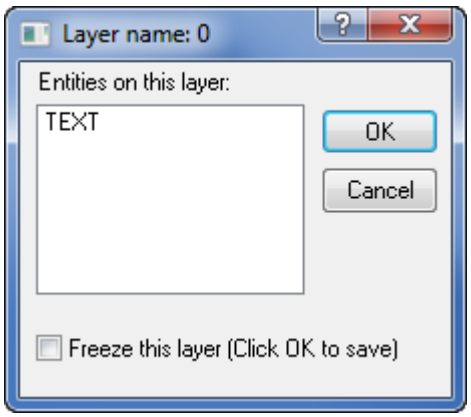
Warning: 3-D extrusion not supported

The imported drawing contains one or more extruded objects which may not display properly after import. The DXF import filter software does not support the extrusion of two-dimensional objects to three dimensions within a DXF file. Click *Yes* to import the objects. Objects may appear incorrectly. Click *No* to import the .DXF file without any objects that contain an extrusions.

AutoCAD DXF Import Options - Layer Name Dialog

Layer Name Dialog

Double-clicking on a layer displayed in the *Layers Used* list box of the DXF Import Options dialog displays the **Layer Name** dialog, showing the graphical entities present in the layer and a check box showing whether the layer is marked frozen (invisible) or not.



Specify the layer name for the DXF import in the ***Layer Name*** *dialog..*

Entities on this Layer

Select a option from the *Entities on this layer* box. Left-click to select an option. The selected option will be highlighted. Only one entity can be selected at once.

Freeze this Layer

Check the *Freeze this layer (Click OK to save)* option to freeze/unfreeze layers prior to importing. Objects in layers that are marked frozen will not be imported into the application.

AutoCAD DXF Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

"Defaults=1,Color3=0;0;255"

This would first set all import options to their default values, then set the color associated with DXF Color Table entry #3 to Blue. All entities associated with Color Table entry #3 will be Blue. The DXF Color Table contains 255 entries (1-255).

Option	Action	Default	Description
ApplyViewAngle	0 = No 1 = Yes	0	Apply the view angle from the DXF file (if any) to the coordinates during import. Only applies if the DXF file being imported has a defined view angle.
SkipPaperspace	0 = No, import "paper space" entities 1 = Yes, skip "paper space" entities	0	Skip importing any "paper space" entities in the DXF drawing. "Model space" entities are always imported.
Color	N=R;G;B	See below for default	Any color in the DXF color table may be altered by using a ColorN option where N is the color number of the

		color table	color to be changed. The R, G, and B values specify the color channel saturations for each of the red, green, and blue channels respectively, and each must be between 0 and 255. For example: To set color number 2 to white, the option would be Color2=255;255;255. Multiple ColorN options may be given, one for each color.

The first seven colors in the default Color Table are:

Color #	R;G;B Values	Color
1	255;0;0	Red
2	255;255;0	Yellow
3	0;255;0	Green
4	0;255;255	Cyan
5	0;0;255	Blue
6	255;0;255	Magenta
7	0;0;0	Black

Import Messages

The following messages may appear while attempting to import [.DXF] files.

Incomplete Entity

Some vital groups are missing from an entity in the DXF file. Make sure the layer and other required groups are present.

Couldn't find a block to insert

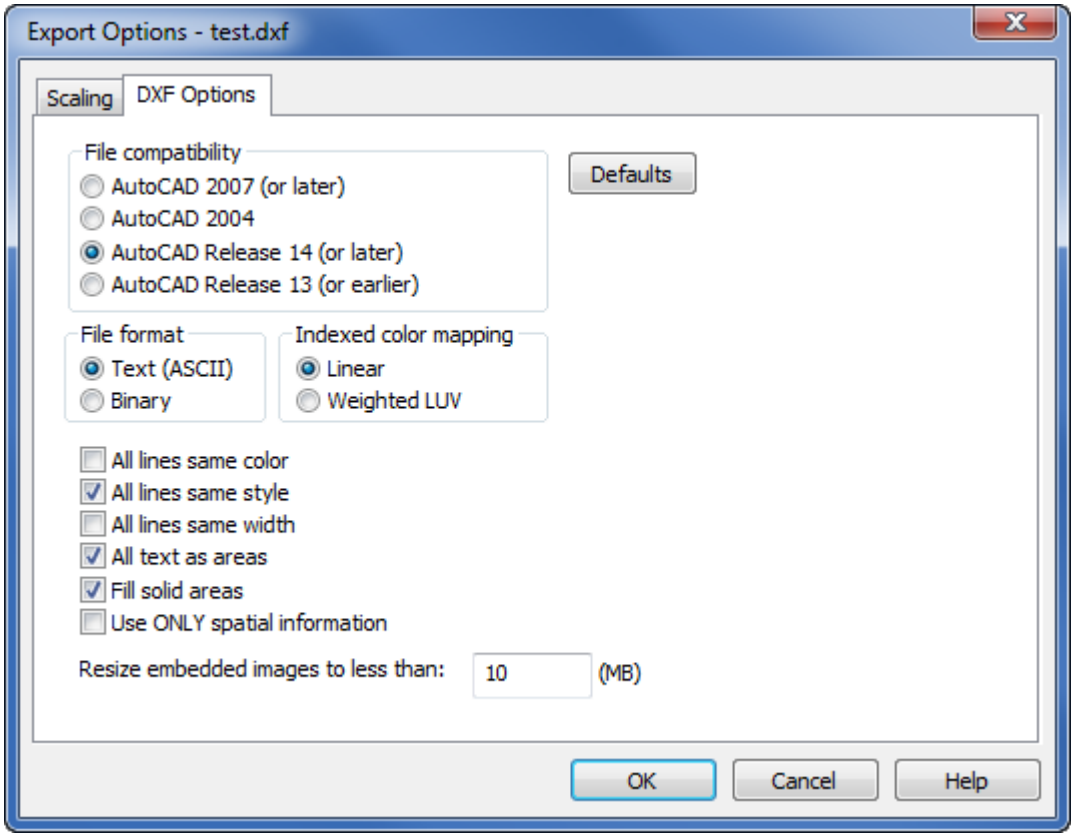
The program attempted to insert a block while the latter couldn't be found. Make sure the format of the BLOCKS section is correct, and the appropriate block is available.

Warning: 3-D extrusion not supported

The imported drawing contains one or more extruded objects which may not display properly after import. The DXF import filter software does not support the extrusion of two-dimensional objects to three dimensions within a DXF file. Click *Yes* to import the objects. Objects may appear incorrectly. Click *No* to import the .DXF file without any objects that contain an extrusions.

AutoCAD DXF Export Options Dialog

The **Export Options** dialog allows you to specify options which determine how information in the file is exported.



*Customize DXF export options in the **Export Options** dialog, **DXF Options** page.*

File Compatibility

Select the appropriate file compatibility. Available options are *AutoCAD 2007 (or later)*, *AutoCAD 2004*, *AutoCAD Release 14 (or later)*, and *AutoCAD Release 13 (or earlier)*.

AutoCAD 2007 (or later)

Choose *File compatibility* of *AutoCAD 2007 (or later)* if the DXF file needs to be imported into AutoCAD 2007 or later. The 2007 version supports Unicode character encoding in the UTF-8 format.

AutoCAD 2004

Choose *File compatibility* of *AutoCAD 2004 (or later)* if the DXF file needs to be imported into AutoCAD 2004 or later. The 2004 version supports Unicode character encoding in the \U+XX format. The 2004 version (and all newer versions) also support RGB color support.

AutoCAD Release 14 (or later)

Choose *File compatibility* of *AutoCAD Release 14 (or later)* if the DXF file needs to be imported into AutoCAD Release 14 or later. The version 14 and previous versions support indexed color mapping.

AutoCAD Release 13 (or earlier)

Choose *File compatibility* of *AutoCAD Release 13 (or earlier)* if the DXF file needs to be imported into an earlier release of AutoCAD.

File Format

Choose *Text (ASCII)* or *Binary* to specify the format of the exported DXF file. See the AutoCAD DXF File Description for information on the organization of DXF files.

Indexed Color Mapping

Select the *Linear* or *Weighted LUV* option when either *AutoCAD Release 14 (or later)* or *AutoCAD Release 13 (or earlier)* is selected as the *File compatibility.* Note: Even though the older file formats can be imported into AutoCAD Release 14 and AutoCAD 2004 or later, the AutoCAD Release 14 or later file format uses several features that result in smaller, faster loading DXF files, and AutoCAD 2004 or later supports true color in addition to the indexed color.

All Lines Same Color

Choose *All lines same color* if you don't want an AutoCAD color number (1-255) assigned to each of your lines. The default color for the layer will be used instead. All exported graphical entities are assigned to a layer named GSLAYER.

All Lines Same Style

Choose *All lines same style* if you want exported lines to be assigned the default style (for the GSLAYER) when imported into **AutoCAD**. Otherwise, exported lines will retain their style (solid, dashed, etc.).

All Lines Same Width

Choose *All lines same width* if you want exported lines to be assigned the default width (for the GSLAYER) when imported into **AutoCAD**. Otherwise, exported lines will be the width assigned in the application document.

All Text As Areas

Text can be exported as DXF solid polygons (*All text as areas* checked). These polygons will always be oriented properly. Whether or not these solid polygons (like all solid polygons) will be filled or not is controlled by the *Fill solid areas* option (see below).

Text can also be exported as **AutoCAD** text entities (*All text as areas* unchecked). No matter what typeface is specified in the application document, all text entities are assigned **AutoCAD's** STANDARD font. Once inside **AutoCAD**, the text entities can be edited in the normal **AutoCAD** fashion. As long as there is no shear, perspective, or clipping, DXF text entities will be exported as text. This means that the DXF text entities will be sized and oriented similar to the text objects in the application document. When shear, perspective, or clipping occur, the text is exported as solid polygons. Shear occurs when the character glyphs are not perpendicular to the text baseline. Perspective occurs when the height of glyphs in the text string are not all the same, as in a 3-D view where the glyphs are smaller the farther they are from the observer. Clipping occurs when part of the text object is partially inside and partially outside the map limits.

Fill Solid Areas

Choose *Fill solid area*s if you want the interior of solid areas (polygons) to be filled. Otherwise, the areas will be exported as AutoCAD CLOSED POLYLINE entities.

Use ONLY Spatial Information

Choose *Use ONLY spatial information* if you want to export only spatial information and not object attributes or text labels. Spatial information is only concerned with the location of objects in space (i.e., their coordinates) and not with their attributes (such as line or fill style, marker symbol used, text labels, etc.) For example, if this option is chosen, all text will be ignored, markers will be exported as point entities instead of polygonal glyphs and coordinates output to the DXF file will be stored in map units instead of inches. This is useful when exporting base maps when only the spatial information is desired.

The AutoCAD program's behavior when importing DXF files (via the DXFIN command) is different depending on whether the **AutoCAD** drawing file [.DRW] is brand new or already contains drawing entities. If the file is brand new, attributes (such as line style) are loaded from the Tables section, so lines encountered in the Entities section will have the proper line style (solid, dash, dash-dot, etc.). However, if an old drawing file is already open, **AutoCAD** will ignore the Tables section and only read the Entities section. If the DXF file contains lines with styles not already defined, **AutoCAD** will issue an error message and abort the DXF import. It is recommended you choose the All lines same style option when exporting DXF files that will be imported into existing **AutoCAD** drawings. **AutoCAD** will then assign the default style to all lines in the imported layer (named GSLAYER).

Resize Embedded Images to Less Than

The *Resize embedded images to less than* option specifies the maximum size (in megabytes) an embedded image is allowed to be. If an exported image exceeds this size, its resolution will be reduced so it doesn't exceed the designated maximum size. Increase this value to get better looking images at the expense of larger export files.

Defaults

The *Defaults* button sets all buttons and check boxes to default conditions.

The Scaling Page

See the Scaling Page for detailed information.

AutoCAD DXF Export Automation Options

Since the **Export Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options. A typical example would be:

"Defaults=1,FormatASCII=0,AllColorsSame=1"

This would set all export options to their default values, then indicate the DXF file will be written in binary format and that all colors will be the mapped to the default AutoCAD color.

Option	Action	Default	Description
FileCompatibility	13 = AutoCAD Release 13 (or earlier) 14 = AutoCAD Release 14 (or later)	14	Specifies which version of the DXF format is to be used for export.

	18 = AutoCAD 2004 (or later)		
FormatASCII	0 = Binary 1 = Text (ASCII)	1	File format of exported DXF file. The ASCII file format is larger than the DXF binary format, but is compatible with a wider variety of software programs.
MaxBitmapSizeInMB	N	10	For AutoCAD 2004 format, this option specifies the largest size allowed for an individual bitmap in the DXF file, in Megabytes. Any exported bitmap larger than this size, will have its resolution reduced so it does not exceed the maximum size.
AllColorsSame	0 = No 1 = Yes	0	Convert all colors to the default color.
AllStylesSame	0 = No 1 = Yes	0	Convert all line styles to the default line style.
AllWidthsSame	0 = No 1 = Yes	0	Convert all line widths to the default line width.
AllTextToAreas	0 = No 1 = Yes	0	Convert all text entities in the exported document to solid areas
FillSolidAreas	0 = No 1 = Yes	0	Fill solid area interiors.
UseSpatialInfo	0 = No 1 = Yes	0	Use ONLY spatial information. Only the basic geometry (lines, areas, text) will be written to the DXF file, and all line styles, colors, fills, and other attributes will be discarded.
ColorMapping	0 = Linear 1 = Weighted LUV	0	Choose the indexed color mapping as either weighted LUV export color mapping, or linear export color mapping.
ScalingSource	0 = previously saved 1 = application-supplied	1	Use previously saved or application-supplied scaling source.
SaveScalingInfo	0 = No 1 = Yes	0	Save scaling parameters for later use.
PageLLX	N.N		Set application page rectangle lower left X value.
PageLLY	N.N		Set application page rectangle lower left Y value.
PageURX	N.N		Set application page rectangle upper right X value.
PageURY	N.N		Set application page rectangle upper right Y value.

FileLLX	N.N		Set scaling rectangle lower left X value.
FileLLY	N.N		Set scaling rectangle lower left Y value.
FileURX	N.N		Set scaling rectangle upper right X value.
FileURY	N.N		Set scaling rectangle upper right Y value.

Remarks

Scaling rectangle parameters have changed between **MapViewer 8** and **MapViewer 9 and newer versions**. For example:

Use `FileURX` instead of `CGMUpperRightX`.

Use `PageLLY` instead of `APPLowerLeftY`.

Older rectangle-coordinate parameters are still supported, but in new scripts use of the current parameter names is recommended.

Boolean values within options strings are not equivalent to Booleans in **Scripter** BASIC. Use “1” instead of “True” and “0” instead of “False”.

ESRI ArcInfo Export Format .E00 File Description

ESRI ArcInfo Export Format .E00 files are ASCII files containing topological entities and their attributes. They provide a medium of exchange between ESRI application programs on different hardware and operating system platforms (Windows, UNIX, etc.).

Import Options

See ESRI ArcInfo Export Format .E00 Import Options Dialog

ESRI ArcInfo Export Format .E00 files can be imported with the **File | Import** command or the **Map | New | Base Map** command.

Import Automation Options

See ESRI ArcInfo Export Format .E00 Import Automation Options

Export

MapViewer does not currently export .E00 files.

Disclaimer

The E00 file format is not publicly documented by ESRI. Although Golden Software has tested this E00 import filter software with a number of publicly available E00 files, it may not be compatible with all E00 files created by all versions of ESRI application programs. Golden Software is not affiliated with ESRI, and this import filter software is not a product of, nor endorsed by, ESRI.

ESRI ArcInfo Export Format [.E00] Import Options Dialog

The **Import Options** dialog allows you to specify options which determine how information in the file is imported. Each of the controls in this dialog is described below.

*Select the E00 import options in the **Import Options** dialog.*

Nodes

These options determine which *Node* items are imported.

- If *All Nodes* is selected, all nodes in the drawing are imported.
- If *No Nodes* is selected, none of the nodes are imported.

Areas

These options determine which *Area* items are imported.

- If *All Areas* is selected, all areas in the file are imported.
- If *No Areas* is selected, none of the areas are imported.

Lines

These options determine which *Line* items are imported.

- If *All Lines* is selected, all lines in the file are imported.
- If *Free-Standing Only* is selected, only those lines that are not associated with an area are imported.
- If *No Lines* is selected, none of the lines are imported.

Text

The selection in this list determines which groups of text items are imported.

- If *All Text Groups* is selected, all text items from the import file are imported.
- If *No Text* is selected, no text items from the import file are imported.
- If the name of a specific group is selected in the list, only the text items from that group are imported. Some import files don't contain any named groups of text items, in which case the only selections possible will be *All Text Groups* or *No Text*.

Import Areas as Curves

Check the *Import Areas as Curves* box to convert each area object into one or more curve (line) objects.

Preview Objects To Import Display

This area of the dialog displays a rough preview of the items that are selected for import from the import file. Any lines selected for import are displayed in black. Any areas selected for import are displayed in light gray with a black border. Any nodes selected for import are displayed as black crosses. Any text items selected for import are displayed as dark gray rectangles. Any changes to the dialog controls that effect which objects are selected for import will be reflected in the preview display.

ESRI ArcInfo Export Format [.E00] Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

"Defaults=1,AreasToCurves=1"

This would first set all import options to their default values, then set the *AreasToCurves* option value to one, which would specify that any areas imported be converted to closed curves.

Option	Action	Default	Description
AreasToCurves	0 = No 1 = Yes	0	Convert all polygons to polylines during import.
AllLines	0 = No 1 = Yes	0	Consider all lines.
WhichLines	0 = Import all lines 1 = Import only freestanding lines 2 = Import no lines	0	Specifies which lines from the file are to be imported
WhichNodes	0 = Import all nodes 1 = Import no nodes	0	Specifies whether nodes (points) from the file are to be imported.
WhichAreas	0 = Import all areas 1 = Import no areas	0	Specifies whether ares from the file are to be imported.
WhichText	-2 = Import all text -1 = Import no text	-2	Specifies which text group from the file is to be imported. For example,

	N = any other value indicates which specific text group number to import		use WhichText=3 to import only the text from group 3.

ER Mapper .ECW File Description

MapViewer imports ERMapper .ECW files.

Enhanced Compression Wavelet .ECW is an open standard wavelet compression image format developed by Earth Resource Mapping. The file format is optimized for aerial and satellite imagery, and efficiently compresses very large images with fine, alternating contrast. This is a lossy compression format.

The .ECW file format has the following properties:

- Embeds map projection information
- Fast compression (about 1.5 MB of compressed file per second on 1 GHz processor)
- Typical compression ratios between 1:10 and 1:100
- Possible decompression of selected regions without the need to decompress the whole file
- Data flow compression allows for compression of big files with small RAM requirements

Import Options

See .ECW Image Import Options Dialog.

Import Automation Options

See ER Mapper .ECW Import Automation Options.

Export Options

MapViewer does not currently support .ECW export.

Remarks

When loading a very large .ECW file, it may load with poor resolution. To save on loading and processing time, it was necessary to design **MapViewer** to automatically reduce the resolution of very large .ECW files, even when choosing a *Pixel Reduction* of 1/1 during import. If the .ECW file is larger than 8192 x 8192 pixels, then **MapViewer** will automatically scale it down by halving the number of pixels until the largest dimension is under 8192 pixels.

For example, your .ECW file is 28000 x 14000 pixels. Divide that in half to get 14000 x 7000 pixels. Since the largest dimension is still over 8192 pixels, divide it again to get the pixel dimensions of 7000 x 3500 pixels (with a Pixel Reduction of 1/1).

There is currently not a way to change this. If you would like to add your vote for more user control over the maximum pixel dimensions when importing .ECW files, please email MapViewersupport@goldensoftware.com.

ER Mapper [.ECW] Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

"Scale=16"

This would reduce the scale of the map to 1/16th .

Option	Action	Default	Description
Scale	1 = 1/1 (uses most memory, best quality) 2 = 1/2 4 = 1/4 8 = 1/8 16 = 1/16 32 = 1/32 (uses least memory, lowest quality)	1	Since some images can be extremely large once expanded into memory, the import filter allows the image to be reduced in dimensions by 1/2 to 1/32 of the original size.

.EMF Windows Enhanced Metafile File Description

Windows can store graphical objects (i.e. pictures) in a special form called an Windows Enhanced Metafile .EMF file. Such pictures can be stored on disk or in the Windows Clipboard. When these pictures are imported (or pasted from the Clipboard), the objects can be optionally separated and stored individually.

Windows Metafiles are intended to be portable between applications and may contain both vector and image components. In contrast to raster formats such as .JPEG and .GIF which are used to store image (bitmap) graphics such as photographs, scans and graphics, Windows Metafiles generally are used to store line-art, illustrations and content created in drawing or presentation applications. Most Windows clipart is in the .EMF or .WMF format.

Windows Metafile .WMF is a 16-bit format introduced in Windows 3.0. It is the native vector format for Microsoft Office applications such as Word, PowerPoint, and Publisher. A newer 32-bit version with additional commands is called Enhanced Metafile .EMF. .EMF is also used as a graphics language for printer drivers.

Import Options

See Windows Enhanced Metafile Import Options Dialog.

Import Automation Options

See Windows Enhanced Metafile Import Automation Options.

Export Options Dialog

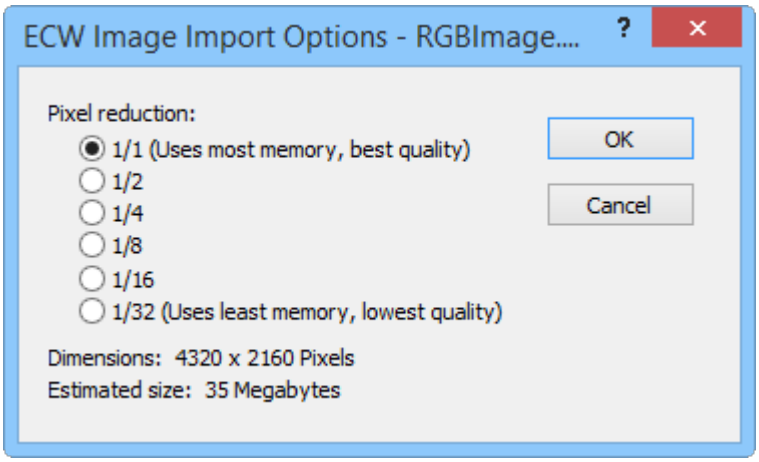
See Windows Enhanced Metafile Export Options Dialog.

Export Automation Options

See Windows Enhanced Metafile Export Automation Options.

ER Mapper .ECW Import Options Dialog

ECW Import Options Dialog



*Select the ECW pixel reduction in the **ECW Image Import Options** dialog.*

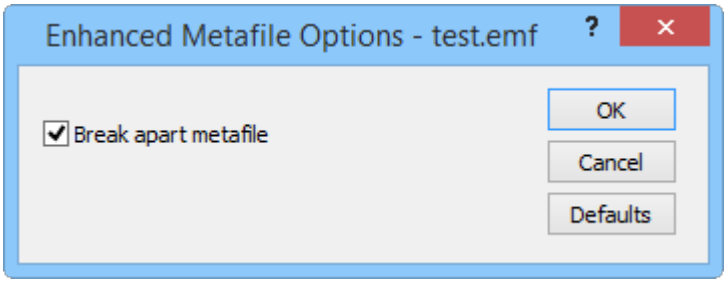
Pixel Reduction

Since some ECW images can be extremely large once expanded into memory, the import filter allows the image to be reduced in dimensions by 1/2 to 1/32 of the original size via the radio buttons in the **Import Options** dialog. Choose from *1/1 (Uses the most memory, best quality)*, *1/2*, *1/4*, *1/8*, *1/16*, to *1/32 (Uses the least memory, lowest quality)*.

Windows Enhanced Metafile .EMF Import Options Dialog

The **Enhanced Metafile Options** dialog allows you to specify options which determine how information in the file is imported.

A Windows Enhanced Metafile .EMF is a collection of objects combined together to produce an image.



*Specify the EMF import options in the **Enhanced Metafile Options** dialog.*

Break Apart Metafile

Check the *Break apart metafile* option to break the metafile into its constituent graphical objects during import. Uncheck the option to leave the metafile as a single group object.

Windows Enhanced Metafile .EMF Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

"Defaults=1,BreakApart=0"

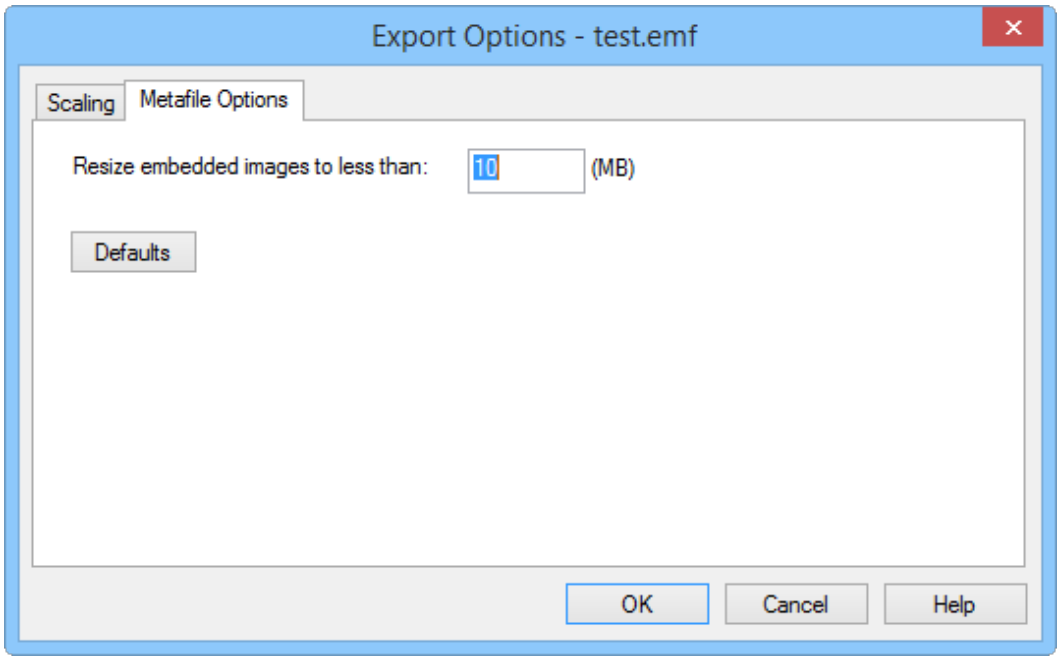
This would first set all import options to their default values, then set the BreakApart option value to zero, which specifies the metafile contents are to remain together as a single unit.

Option	Action	Default	Description
BreakApart	0 = No 1 = Yes	1	Break metafile apart into individual graphical objects during import.

Windows Enhanced Metafile .EMF Export Options Dialog

The **Export Options** dialog allows you to specify options which determine how information in the file is imported.

A Windows Enhanced Metafile [.EMF] is a collection of objects combined together to produce an image.



*Specify the EMF file export options in the **Export Options** dialog.*

Each Image Resized

The *Resize embedded images to less than* option specifies the maximum size (in megabytes) an embedded image is allowed to be. If an exported image exceeds this size, its resolution will be reduced so it doesn't exceed the designated maximum size. Increase this value to get better looking images at the expense of larger export files.

Defaults

The *Defaults* button sets all options to default conditions.

The Scaling Page

See the Scaling Page for detailed information.

Windows Enhanced Metafile [.EMF] Export Automation Options

Since the **Export Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options. A typical example would be:

"Defaults=1,AllTextToPolygons=0"

This would set all export options to their default values, then indicate that all text is not to be exported as polygons (i.e., it is to remain as text).

Option	Action	Default	Description
MaxBitmapSizeInMB	N	10	This option specifies the largest size allowed for an individual bitmap in the EMF file, in Megabytes. Any

			exported bitmap larger than this size will be downscaled to this size during export.
ScalingSource	0 = previously saved 1 = application-supplied	1	Use previously saved or application-supplied scaling source.
SaveScalingInfo	0 = No 1 = Yes	0	Save scaling parameters for later use.
PageLLX	N.N		Set application page rectangle lower left X value.
PageLLY	N.N		Set application page rectangle lower left Y value.
PageURX	N.N		Set application page rectangle upper right X value.
PageURY	N.N		Set application page rectangle upper right Y value.
FileLLX	N.N		Set scaling rectangle lower left X value.
FileLLY	N.N		Set scaling rectangle lower left Y value.
FileURX	N.N		Set scaling rectangle upper right X value.
FileURY	N.N		Set scaling rectangle upper right Y value.

Remarks

Boolean values within options strings are not equivalent to Booleans in **Scripter** BASIC. Use “1” instead of “True” and “0” instead of “False”.

Encapsulated PostScript .EPS File Description

MapViewer exports Encapsulated PostScript files .EPS files.

EPS File Format

At a minimum, an EPS file contains a *BoundingBox DSC comment*, describing the rectangle containing the image described by the EPS file.

Identifying EPS files

Because of the different ways in which EPS previews are handled, there is no one way to identify an EPS file.

- A Windows-format EPS file containing a TIFF or WMF preview must start with the four bytes containing, in hexadecimal, C5 D0 D3 C6. Bear in mind these files are widespread on all platforms.
- In all other cases an EPS file must start with a line %!PS-Adobe-a.b EPSF-c.d where a, b, c and d are all single digit numbers.

- A Mac-format EPS file is accompanied by a resource fork. The preview is a PICT resource with ID 256. An EPS file on the Mac is expected to have a file type code of "EPSF", whether or not it has a preview.
- An EPSI file will contain a line starting %%BeginPreview: in the DSC prolog.
- In many cases no preview is present at all.

Import Options Dialog

MapViewer does not support .EPS file import.

Export Options Dialog

See Encapsulated PostScript .EPS Export Options Dialog, Size and Color, and Spatial References

Export Automation Options

See Encapsulated PostScript Automation Export Options

Creating EPS Files

Encapsulated PostScript files [.EPS] can be exported with **MapViewer**. **MapViewer** can export a vector or bitmap representation of an [.EPS] file.

Vector Export

A vector representation of an [. EPS] file is generated by printing the map to a file using a PostScript driver.

To create an [.EPS] file with a printer driver:

1. Click the Windows **Start** button.
2. Select **Settings** then **Printers**.
3. Click the **Add Printer** icon. Follow the directions and add any PostScript printer (usually PS appears in the printer driver's title).
4. Select FILE for the printer port.
5. Open the printer properties by right-clicking on the printer and choosing **Properties** from the menu. PostScript printer drivers usually contain a **PostScript** page. Under *PostScript output format* on the **PostScript** page, choose *Encapsulated PostScript (EPS)*.
6. To create an EPS file from **MapViewer** choose **File | Print** and select the PostScript printer from the *Name* list.
7. The **Print to File** dialog is displayed. Enter the path and file name to use for the [.EPS] file. If the printer driver did not contain a PostScript page, make sure to use the .EPS extension in the file name. Click the *OK* button and the map is written to the [.EPS] file.

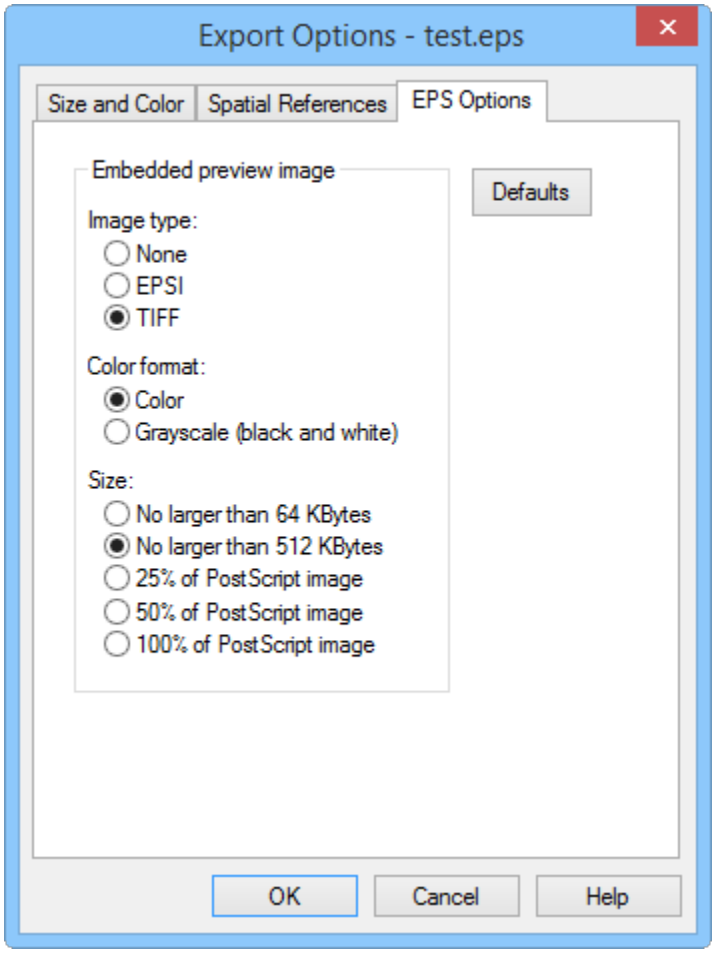
The [.EPS] file produced in this manner does not contain a bitmap preview. **MapViewer** and other graphics programs need a bitmap preview to import [.EPS] files. Note that these steps may vary slightly depending on the printer driver and operating system.

Bitmap Export

You can export a bitmap representation of an [.EPS] file from **MapViewer** using **File | Export** and selecting Encapsulated PostScript in the *Save as type* list.

Encapsulated PostScript [.EPS] Export Options Dialog

The **Export Options** dialog allows you to specify options which determine how information in the file is exported.



*Specify the EPS options in the **EPS Options** page of the **Export Options** dialog.*

Image Type

The *Image type* controls determine how the EPS preview image is encoded in the export file. Possible selections are *EPSI*, *TIFF*, or *None*. Choosing *EPSI* or *TIFF* inserts an image into the beginning of the EPS file. Selecting *None* inserts no preview image. Some programs need the preview image in the file so that the file imports correctly.

Color Format

The *Color Format* controls determine whether the preview image is exported in *Color* or *Grayscale (black and white)*. Setting the *Color Format* to *Grayscale (black and white)* does not affect the colors in the EPS file. On the image preview colors are changed.

Size

The *Size* controls determine what size of EPS preview image is encoded in the export file. The selections are *No larger than 64KBytes, No larger than 512Kbytes, 25% of PostScript Image, 50% of PostScript Image,* or *100% of PostScript Image.* Selecting a smaller size will give less precision on the image preview, but will not affect the EPS file.

Default

Click the *Default* button to return the EPS options to the default settings.

Encapsulated PostScript .EPS Export Automation Options

Since the **Export Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options. A typical example would be:

"Defaults=1,ScalingSourceApp=0"

This would set all export options to their default values, then indicate the scaling source information should not be taken from the application, but from previously saved values.

Option	Action	Default	Description
Width	N		Sets the width of the exported image in pixels. Either a Width or an HDPI option may be specified, but not both.
Height	N		Sets the height of the exported image in pixels. Either a Height or a VDPI option may be specified, but not both.
HDPI	N	96	Sets the number of horizontal pixels in the exported image that corresponds to a distance one horizontal inch on the MapViewer plot. Either a Width or an HDPI option may be specified, but not both. The default HDPI is the resolution of the display device driver on your computer (this is 96 dots per inch on many Windows display devices, but number can very from device to device).
VDPI	N	96	Sets the number of vertical pixels in the exported image that corresponds to a distance of one vertical inch on the MapViewer plot. Either a Height or a VDPI option may be specified, but not both. The default VDPI is the resolution of the display device

			driver on your computer (this is 96 dots per inch on many Windows display devices, but number can very from device to device).
KeepAspect	0 = No 1 = Yes	1	If set to 1, KeepAspect ajusts the aspect ratio (the width versus height) of the exported image to match the aspect ratio of the MapViewer plot that is being exported. If an option is given to set the Width or HDPI of an image, KeepAspect automatically assigns the appropriate Height or VDPI to maintain the same aspect ratio as the MapViewer plot. Likewise, if an option is given to set the Height or VDPI of an image, KeepAspect automatically assigns the appropriate Width or HDPI to maintain the same aspect ratio of the MapViewer plot. Note that the KeepAspect option is ignored if both the Width and Height options or the HDPI and VDPI options are specified. If set to 0, the aspect ratio of the exported image is determined solely by the Width and Height or HDPI and VDPI options. The size is not adjusted to match the aspect ratio of the MapViewer plot.
IgnoreRefInfo	0 = Save spatial references 1 = Ignore spatial references	1	Ignore any spatial reference information.
SaveRefInfoAsInternal	0 = No 1 = Yes	0	Save spatial references to internal format (if possible).
SaveRefInfoAsBlueMarbleRSF	0 = No 1 = Yes	0	Save spatial references as Blue Marble .RSF file.
SaveRefInfoAsESRIWorld	0 = No 1 = Yes	0	Save spatial references as ESRI World file.
SaveRefInfoAsGSIREF	0 = No 1 = Yes	0	Save spatial references as Golden Software Reference (version 1) file.
SaveRefInfoAsGSIREF2	0 = No 1 = Yes	0	Save spatial references as Golden Software Reference (version 2) file.
PreviewType	0 = None 1 = EPSI	2	Specifies whether an embedded preview image is to be included in the EPS file, and in what

	2 = TIFF		format the embedded preview image is to be stored.
PreviewColor	0 = Grayscale 1 = Color	1	Choose whether the preview image is exported in Color or Grayscale.
PreviewSize	0 = < 64 KB 1 = < 512 KB 2 = 25% of PostScript Image 3 = 50% of PostScript Image 4 = 100% of PostScript Image	1	Choose what size of EPS preview image is encoded in the export file.

Graphics Interchange Format .GIF File Description

The Graphics Interchange Format .GIF is an image format that was introduced by CompuServe in 1987 and has since come into widespread usage on the World Wide Web due to its wide support and portability.

File Format

The format supports up to 8 bits per pixel, allowing a single image to reference a palette of up to 256 distinct colors chosen from the 24-bit RGB color space. It also supports animations and allows a separate palette of 256 colors for each frame. The color limitation makes the GIF format unsuitable for reproducing color photographs and other images with continuous color, but it is well-suited for simpler images such as graphics or logos with solid areas of color.

GIF images are compressed using the Lempel-Ziv-Welch (LZW) lossless data compression technique to reduce the file size without degrading the visual quality. This compression technique was patented in 1985. Controversy over the licensing agreement between the patent holder, Unisys, and CompuServe in 1994 inspired the development of the Portable Network Graphics (PNG) standard; since then all the relevant patents have expired.

Usage

- Sharp-edged line art (such as logos) with a limited number of colors. This takes advantage of the format's lossless compression, which favors flat areas of uniform color with well defined edges (in contrast to JPEG, which favors smooth gradients and softer images).
- Used to store low-color sprite data for games.
- Used for small animations and low-resolution film clips.
- In view of the general limitation on the GIF image palette to 256 colors, it is not usually used as a format for digital photography. Digital photographers use image file formats capable of reproducing a greater range of colors, such as TIFF, RAW or the lossy JPEG, which is more suitable for compressing photographs.
- The PNG format is a popular alternative to GIF images since it uses better compression techniques and does not have a limit of 256 colors, but PNGs do not support animations.

Import Options Dialog

No import options dialog is displayed.

Import Automation Options

No import options are available.

Export Options Dialog

See Size and Color, Spatial References, and GIF Export Options

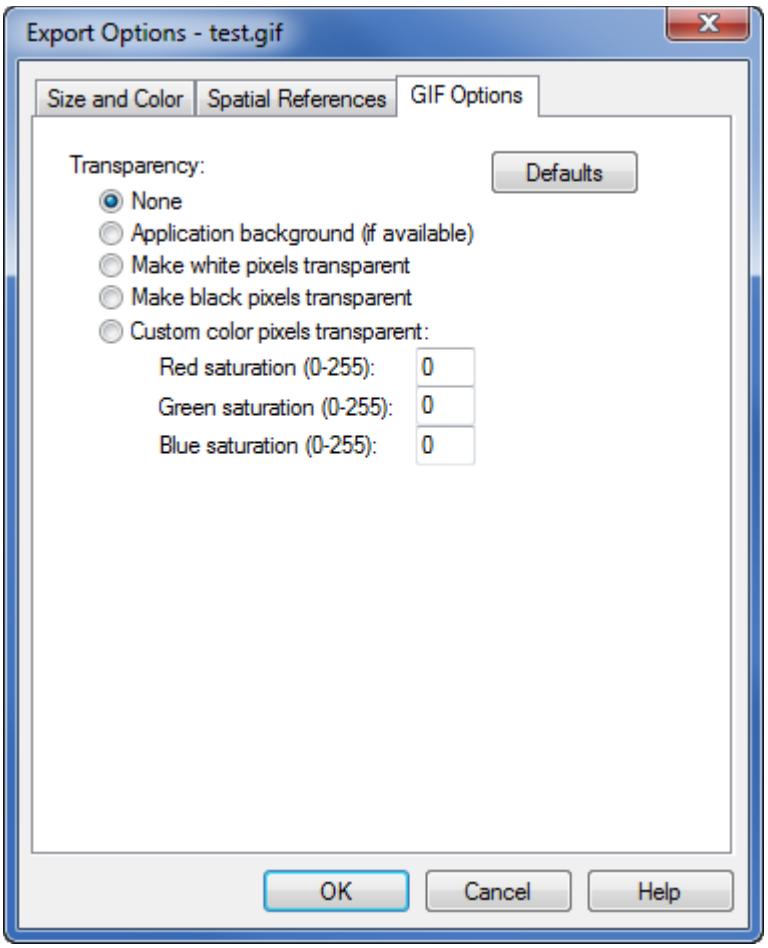
Export Automation Options

See Image (Bitmap) Export Automation Options

.GIF Export Options Dialog

The Graphics Interchange Format .GIF is an image format that was introduced by CompuServe in 1987 and has since come into widespread usage on the World Wide Web due to its wide support and portability. GIF files support transparency.

Use the **Export Options** dialog to specify the Size and Color, Spatial References options and the transparency options for the .GIF file. To export the .GIF file with transparency, click on the **GIF Options** tab in the **Export Options** dialog.



*Specify the transparency setting on the **GIF Options** page in the **Export Options** dialog.*

Select *None* to export the image with no transparency.

Select *Application background (if available)* option to export any background areas as transparent. The .GIF file will have transparent background areas. All drawn parts in the plot window are exported solid.

Select *Make white pixels transparent* to make all white areas of the image transparent. Select *Make black pixels transparent* to make all black areas of the image transparent. Select *Custom color pixels transparent* to select a specific color by *Red saturation (0-255)*, *Green saturation (0-255)*, and *Blue saturation (0-255)* in the image to be transparent. When any of these options are selected, pixels with this color in the foreground of the image can be transparent.

Golden Software Boundary .GSB File Description

The .GSB format is a proprietary Golden Software file format. There are several different versions of GSB files, so older Golden Software applications may not be able to read .GSB files exported from newer applications.

Golden Software Boundary files contain boundary objects including areas, curves and points. Primary and Secondary IDs are usually associated with each object. The objects have no attributes (such as color or line style) associated with them.

GS Boundary files are binary files (i.e., they can't be created or modified with a text editor or word processor) that are usually used as base maps. Information indicating the type of projection used (if any) is also stored in the file.

Attributes

All ID attributes for polylines, polygons, and symbol objects are automatically exported to all .GSB files. For contour maps, the Z value is exported as the "ZLEVEL" attribute for all polylines in the contour map. The color, size, symbol shape, width, and other properties are not exported.

Import Options Dialog

See Golden Software .GSB Import Options

Golden Software Boundary .GSB files can be imported with the **File | Import** command, or more commonly the **Map | New | Base Map** command.

Import Automation Options

See Golden Software GSB Import Automation Options

Export

See Golden Software .GSB Export Options

Export Automation Options

See Golden Software .GSB Export Automation Options

Golden Software Boundary .GSB Import Options Dialog

The Import Options dialog selects which IDs and attributes to import.

A .GSB file specific import options dialog does not display when importing a .GSB file into **MapViewer**.

Golden Software Boundary .GSB Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

"Defaults=1,AreasToCurves=1"

This would first set all import options to their default values, then set the *AreasToCurves* option value to one, which would specify that any areas imported be converted to closed curves.

Option	Action	Default
`Defaults=1`	Set all options to their default values	No
`ForgetOptions=1`	Don't remember options for later use	No
`AreasToCurves=1`	Convert area objects to closed curves	No

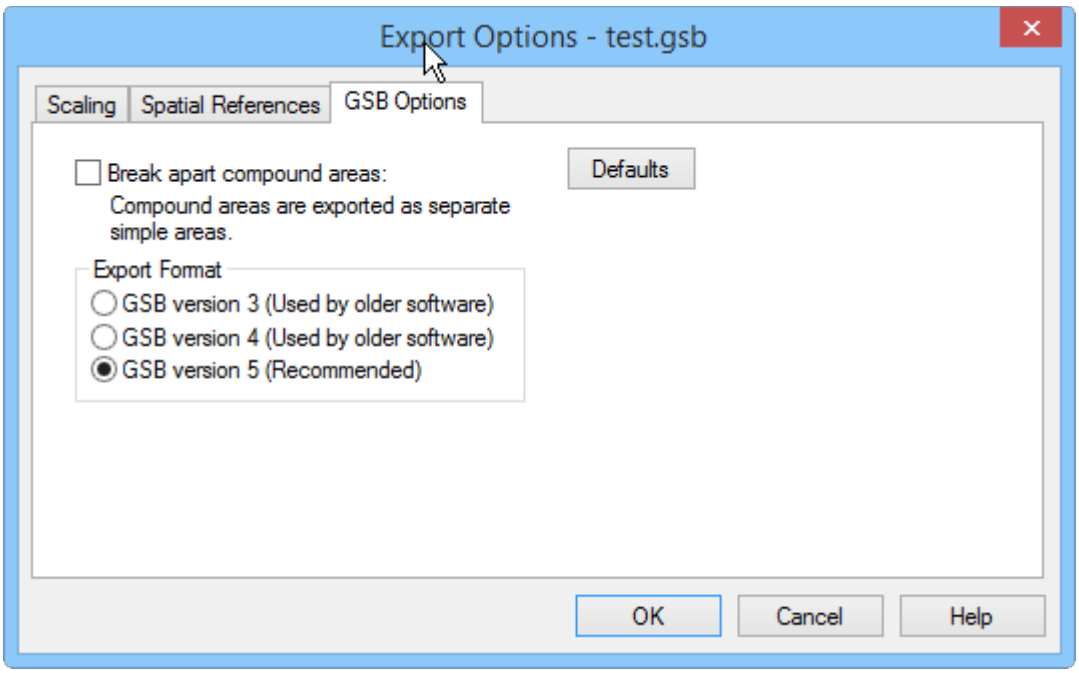
Export Options Dialog

When exporting a GSB, GSI, MIF, SHP, or SVG file, the first **Export Options** dialog specifies which attribute and other information is exported. The PID is always exported for GSB, GSI, MIF, SHP, and SVG files. You can also select other attributes and information to export to the file.

- *Export basic object IDs* exports object SIDs and Hyperlinks.
- *Export object attribute list* exports the user-defined attributes list.
- *Export extended object info* exports extended object information to attributes, such as Object, Vertices, Length (units), Area (units), and Subpolygons. These attributes are generated during the export and do not need to be specified beforehand in the attributes list.
- *Export all worksheet data if PIDs match* exports all worksheet data to attributes for each data column. These attributes are generated during the export and do not need to be specified beforehand in the attributes list.

Golden Software Boundary .GSB Export Options Dialog

The **Export Options** dialogs specify options that determine how information in the file is exported. Select the file version and whether or not to break apart compound areas.



*Select the GSB export options in the **Export Options** dialog.*

Break Apart Compound Areas

Check the *Break apart compound areas* option to export compound areas as separate simple areas.

Export Format

- Choose *GSB Version 3* or *GSB Version 4* if you require an export file that can be imported by certain older versions of Golden Software application software.
- Otherwise, choose *GSB Version 5*.

Defaults

The *Defaults* button sets all controls to default conditions.

Golden Software Boundary [.GSB] Export Automation Options

Since the **Export Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options. A typical example would be:

"Defaults=1,AreasToCurves=1"

This would first set all export options to their default values, then specify that all areas be output as lines.

Option	Action	Default	Description
BreakApartCompoundAreas	0 = No 1 = Yes	0	Compound areas (multi-ring polygons) will be split apart into multiple non-compound

			areas (simple polygons) during export.
GsbVersion	3 = GSB version 3 4 = GSB version 4 5 = GSB version 5	5	Specify the version of the exported GSB file.
ScalingSource	0 = previously saved 1 = application-supplied	1	Use previously saved or application-supplied scaling source.
SaveScalingInfo	0 = No 1 = Yes	0	Save scaling parameters for later use.
PageLLX	N.N		Set application page rectangle lower left X value.
PageLLY	N.N		Set application page rectangle lower left Y value.
PageURX	N.N		Set application page rectangle upper right X value.
PageURY	N.N		Set application page rectangle upper right Y value.
FileLLX	N.N		Set scaling rectangle lower left X value.
FileLLY	N.N		Set scaling rectangle lower left Y value.
FileURX	N.N		Set scaling rectangle upper right X value.
FileURY	N.N		Set scaling rectangle upper right Y value.

Golden Software Interchange .GSI File Description

Golden Software Interchange .GSI files are binary files containing records indicating graphical entities and their attributes. They provide a medium of exchange between Golden Software application programs.

Attributes

All ID attributes for all polyline, polygon, and symbol objects are automatically exported to all .GSI files. For contour maps, the Z value is exported as the "ZLEVEL" attribute for all polylines in the contour map.

Import Options Dialog

No import options dialog is displayed.

Import Automation Options

See Golden Software .GSI Import Automation Options

Export Options Dialog

See Golden Software .GSI Export Options

Export Automation Options

See Golden Software .GSI Export Automation Options

Golden Software Interchange .GSI Import Options Dialog

The **Import Options** dialog does not display when importing a .GSI file into **MapViewer**.

Golden Software Interchange .GSI Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

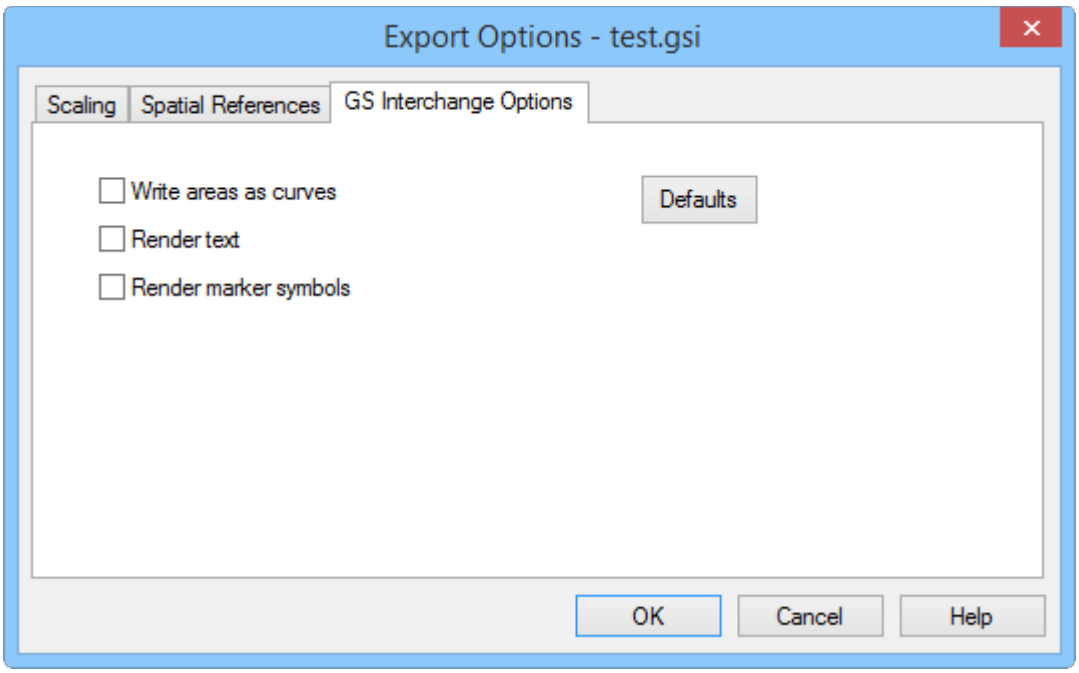
"Defaults=1,AreasToCurves=1"

This would first set all import options to their default values, then set the *AreasToCurves* option value to one, which would specify that any areas imported be converted to closed curves.

Option	Action	Default
`Defaults=1`	Set all options to their default values	No
`ForgetOptions=1`	Don't remember options for later use	No
`AreasToCurves=1`	Convert area objects to closed curves	No
`PrimaryIDField=n`	Specify that field number n of each attribute ID record will be assigned to the primary ID string of each graphical object that is imported from the interchange file.	0
`SecondaryIDField=`*n*	Same as above, except applies to the secondary ID.	0

Golden Software Interchange .GSI Export Options Dialog

The **Export Options** dialogs specify options which determine how information in the file is exported. Choose to write areas as curves, render text, and/or render marker symbols in the second **Export Options** dialog.



*Select the GSI export options in the **Export Options** dialog.*

Write Areas to Curves

Check *Write Areas As Curves* to cause all area (polygonal) objects to be exported as curve (polyline) objects.

Render Text

Check *Render Text* to cause all text objects to be exported as areas and lines. When *Render Text* is unchecked, text is exported as text.

As long as there is no shear, perspective, or clipping, GSI text entities will be exported as text. This means that the GSI text entities will be sized and oriented similar to the text objects in the application document. When shear, perspective, or clipping occur, the text is exported as solid polygons. Shear occurs when the character glyphs are not perpendicular to the text baseline. Perspective occurs when the height of glyphs in the text string are not all the same, as in a 3-D view where the glyphs are smaller the farther they are from the observer. Clipping occurs when part of the text object is partially inside and partially outside the map limits.

Render Marker Symbols

Check *Render Marker Symbols* to cause markers to be exported as areas and lines.

Defaults

The *Defaults* button sets all controls to default conditions.

Golden Software Interchange .GSI Export Automation Options

Since the **Export Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options. A typical example would be:

"Defaults=1,AreasToLines=1"

This would first set all export options to their default values, then specify that all areas be output as lines.

Option	Action	Default	Description
AreasToLines	0 = No 1 = Yes	0	Output polygons to exported GSI file as polylines.
RenderMarkers	0 = No 1 = Yes	0	If set to 0, marker symbols will be output to the export file as marker objects. If set to 1, marker symbols will be output to the export file as lines and areas to retain the shape and look of the symbol.
RenderText	0 = No 1 = Yes	0	If set to 0, text will be output to the export file as text objects. If set to 1, text will be output to the export file as lines and areas to retain the shape and look of the font face.
ScalingSource	0 = previously saved 1 = application-supplied	1	Use previously saved or application-supplied scaling source.
SaveScalingInfo	0 = No 1 = Yes	0	Save scaling parameters for later use.
PageLLX	N.N		Set application page rectangle lower left X value.
PageLLY	N.N		Set application page rectangle lower left Y value.
PageURX	N.N		Set application page rectangle upper right X value.
PageURY	N.N		Set application page rectangle upper right Y value.
FileLLX	N.N		Set scaling rectangle lower left X value.
FileLLY	N.N		Set scaling rectangle lower left Y value.
FileURX	N.N		Set scaling rectangle upper right X value.
FileURY	N.N		Set scaling rectangle upper right Y value.

GPX GPS Exchange Format File Format Description

GPS exchange files, .GPX files, are created from GPS devices.

File Structure

The .GPX files can contain way points, routes, and tracks.

- Way points describe an unrelated group of points. For instance, this can be a collection of place names. Each way point is imported and displayed as the default symbol.
- Routes are a series of connected way points. Typically a route is a plan on where to go. Routes are imported and displayed as polylines. One point routes are imported and displayed as the default symbol.
- Tracks are a series of connected way points. A track is where the device has actually been. Tracks are imported and displayed as polylines. One point tracks are imported and displayed as the default symbol.

Way point, route, and track names are imported for each object.

.GPX files are always in World Geodetic System 1984.

Import Options

No import options dialog is displayed.

Export Options

MapViewer does not currently export this file type.

HTML Image Map [.HTM] [.HTML] File Description

MapViewer exports HTML Image Map files. An HTML Image Map is a PNG image with click-able, hyperlinked areas.

A **MapViewer** plot is exported to a PNG image, and the polygons are also exported to an HTML document overlaid on the PNG image. When the HTML file is opened in a web browser, the polygons retain the hyperlinks assigned in **MapViewer**. Users can manually edit the HTML file to add or edit the hyperlink URLs.

Export Options Dialog

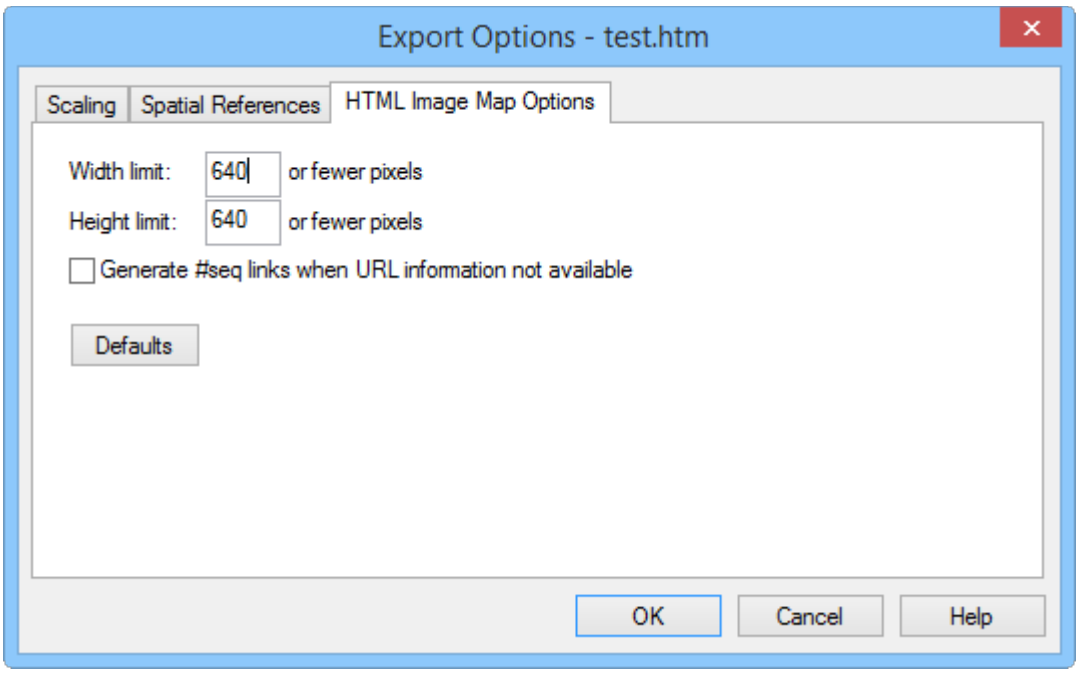
See Scaling, Spatial References, and HTML Image Map Options

Export Automation Options

See HTML Image Map Export Automation Options

Export Options Dialog - HTML Image Map Page

The **HTML Image Map Options** page is located in the **Export Options** dialog.



*Set image height and width limits and generate #seq links for polygons without URL information in the **HTML Image Map Options** page.*

Size Limits

Enter a value in pixels into the *Width limit* and *Height limit* fields to specify the maximum size of the PNG image and image map.

Links

Click the *Generate #seq links when URL information not available* check box to manually edit links in the HTM or HTML file after the export is completed. Links are generated, #seq1, #seq2, etc., for any polygons without a hyperlink specified in **MapViewer**.

Default Settings

Click the *Defaults* button to return the options to their default values: *Width limit* 640 *or fewer pixels*, *Height limit* 640 *or fewer pixels*, and *Generate #seq links when URL information not available* is not selected.

HTML Image Map .HTM .HTML Export Automation Options

Since the **Export Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options. A typical example would be:

"Defaults=1,AllAreas=1"

This would first set all export options to their default values, then specify that all polygons without URL information have #seq links in the HTM file.

Option	Action	Default	Description
WidthLimit	N	640	A value in pixels to specify the maximum image width.
HeightLimit	N	640	A value in pixels to specify the maximum image height.
AllAreas	0 = No 1 = Yes	0	When the value is 0, links are not generated for polygons without a specified hyperlink. When the value is 1, links are generated, in the form of #seq1, #seq2, etc., for polygons without hyperlinks.
IgnoreRefInfo	0 = Save spatial references 1 = Ignore spatial references	1	Ignore any spatial reference information.
SaveRefInfoAsInternal	0 = No 1 = Yes	0	Save spatial references to internal format (if possible).
SaveRefInfoAsBlueMarbleRSF	0 = No 1 = Yes	0	Save spatial references as Blue Marble .RSF file.
SaveRefInfoAsESRIWorld	0 = No 1 = Yes	0	Save spatial references as ESRI World file.
SaveRefInfoAsGSIREF	0 = No 1 = Yes	0	Save spatial references as Golden Software Reference (version 1) file.
SaveRefInfoAsGSIREF2	0 = No 1 = Yes	0	Save spatial references as Golden Software Reference (version 2) file.
ScalingSource	0 = previously saved 1 = application-supplied	1	Use previously saved or application-supplied scaling source.
SaveScalingInfo	0 = No 1 = Yes	0	Save scaling parameters for later use.
PageLLX	N.N		Set application page rectangle lower left X value.
PageLLY	N.N		Set application page rectangle lower left Y value.
PageURX	N.N		Set application page rectangle upper right X value.
PageURY	N.N		Set application page rectangle upper right Y value.
FileLLX	N.N		Set scaling rectangle lower left X value.
FileLLY	N.N		Set scaling rectangle lower left Y value.

FileURX	N.N		Set scaling rectangle upper right X value.
FileURY	N.N		Set scaling rectangle upper right Y value.

JPG File Interchange Format .JFIF, .JPG, .JPEG File Description

MapViewer imports and exports JPEG JFIF raster image files.

The JPEG File Interchange Format, .JFIF, is a image file format standard. It is a format for exchanging JPEG encoded files compliant with the JPEG Interchange Format .JIF standard. It solves some of JIF's limitations in regard to simple JPEG encoded file interchange. As with all JIF compliant files, image data in JFIF files is compressed using the techniques in the JPEG standard, hence JFIF is sometimes referred to as "JPEG/JFIF".

JFIF defines a number of details that are left unspecified by the JPEG standard (ISO/IEC IS 10918-1, ITU-T Recommendation T.81):

Resolution and aspect ratio

The JPEG standard does not include any method of coding the resolution or aspect ratio of an image. JFIF provides resolution or aspect ratio information using an application segment extension to JPEG. It uses Application Segment #0, with a segment header of 'JFIF\x00', and specifies that this must be the first segment in the file, hence making it simple to recognise a JFIF file. Exif images recorded by digital cameras generally do not include this segment, but typically comply in all other respects with the JFIF standard.

Color Space

JPEG does not define which color encoding is to be used for images. JFIF defines the color model to be used: either Y for greyscale, or YCbCr as defined by CCIR 601. Since this is not an absolute color space — unless an ICC profile, colorspace metadata, or an sRGB tag is provided and interpreted – a decoded JFIF image will be in a device-dependent RGB colorspace. Hence, JFIF does not by itself provide a mechanism for accurately transporting color-managed images across the Internet.

File Format

The JFIF meta data resides in the JPEG Application Segment APP0, having the zero-terminated ASCII string "JFIF" as segment header.

Import Options Dialog

No import options dialog is displayed.

Import Automation Options

No import options are available.

Export Options Dialog

See Bitmap Export Options Dialog for additional information.

Export Automation Options

See Bitmap Export Automation Options for additional information.

Legal Notice

This software is based in part on the work of the Independent JPEG Group.

JP2 JPG 2000 File Interchange Format .JP2, J2K, .JPC, .JPT, .JPEG2000, .J2000 File Description

MapViewer imports and exports JP2 JPEG 2000 raster image files. The JPEG 2000 File Interchange Format, .JP2, is a image file format standard with additional wavelet compression techniques. It is a format for exchanging JP2 encoded files compliant with the JPEG Interchange Format standard. This format is based on the ISO standard (ISO 15444/6). JPEG2000 offers both lossless and lossy compression and creates smaller file sizes than JPG exports. The image is also better quality than the traditional JPG format.

Spatial Reference Information

Some applications associate spatial reference information (such as projection, datum, and georeference parameters) with bitmap images representing a region of the Earth's surface. If the program you're running has spatial reference information to export, the option to save the information will appear on the **Spatial References** tab when exporting. The GeoJP2 format allows the spatial reference information to be stored in one file, along with the image.

Import Options Dialog

No import options dialog is displayed.

Import Automation Options

No import options are available.

Export Options Dialog

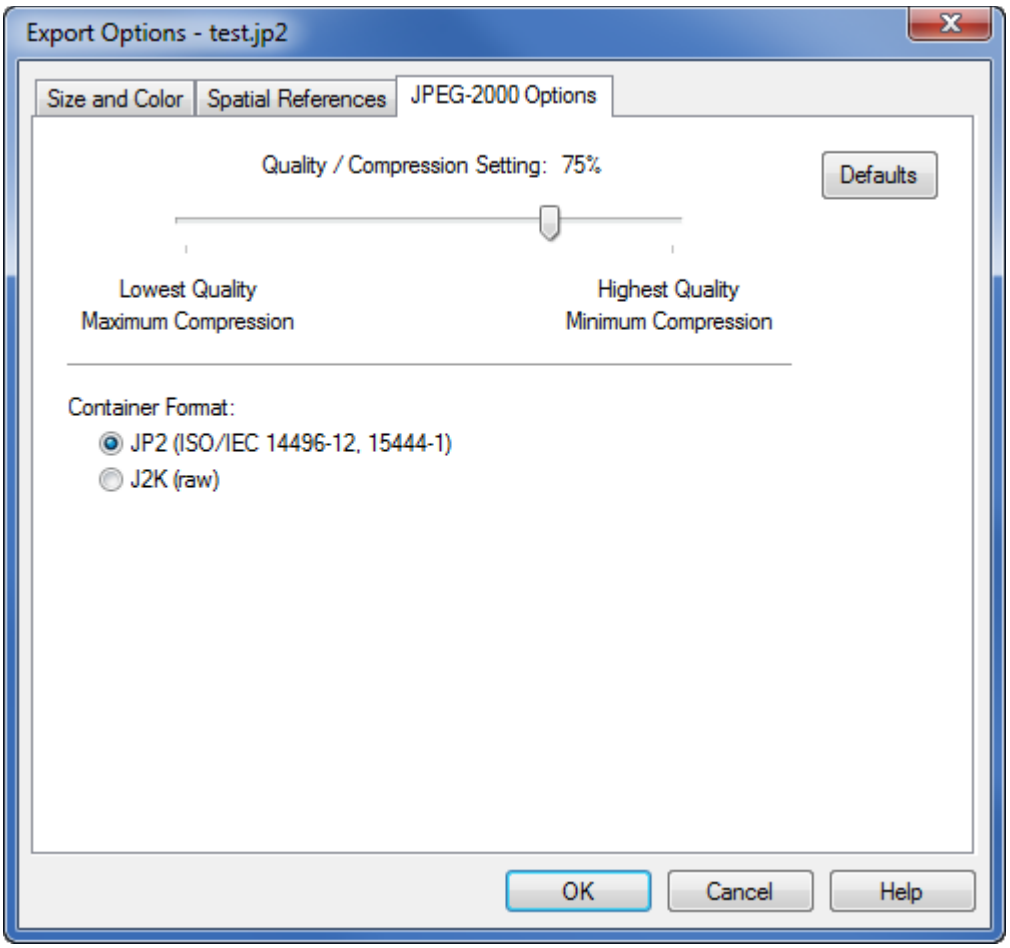
See Size and Color, Spatial References, and JPEG-2000 Options

Export Automation Options

See Image Bitmap Export Automation Options for additional information.

Export Options Dialog - JPEG-2000 Options Page

The **JPEG-2000 Options** page is located in the **Export Options** dialog.



Specify the Quality/Compression Setting *on the* ***JPEG Options*** *page of the* ***Export Options*** *dialog.*

Quality/Compression Settings

Adjust the slider for the desired compromise between image compression and image quality. Move the slider to the left for *Lowest Quality/Maximum Compression.* Move the slider to the right for *Highest Quality/Minimal Compression.*

Container Format

The *Container Format* controls the export format. Select *JP2 (ISO/IEC 14496-12, 15444-1)* to export the image in the ISO JP2 compliant format. This format exports the image data, and organization and contents of the file. Select *J2K (raw)* to export only the image data.

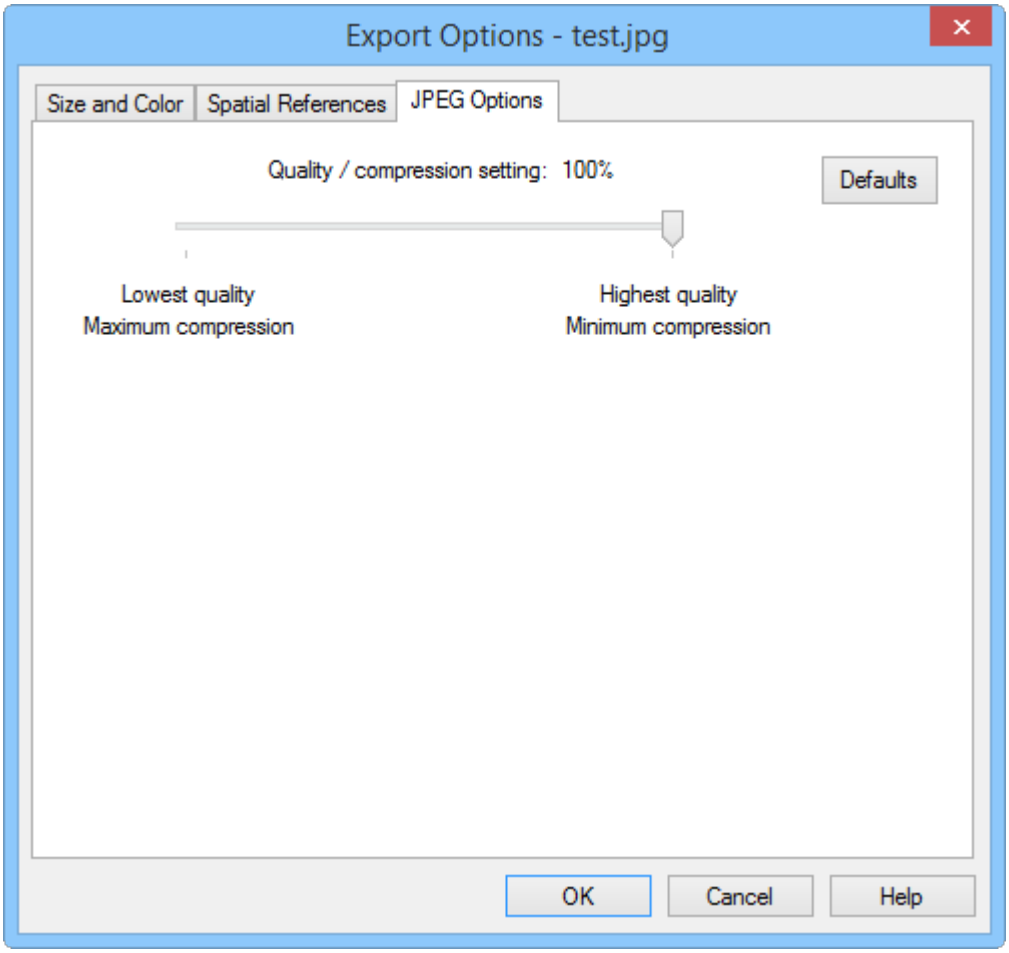
Defaults

The *Defaults* button sets all controls to their default values.

Export Options Dialog - JPEG Options Page

JPEG Options Page

The **JPEG Options** page is located in the **Export Options** dialog.



Specify the Quality/Compression Setting *on the* ***JPEG Options*** *page of the* ***Export Options*** *dialog.*

Quality/Compression Settings

Adjust the slider for the desired compromise between image compression and image quality. Move the slider to the left for *Lowest Quality/Maximum Compression.* Move the slider to the right for *Highest Quality/Minimal Compression.*

Defaults

The *Defaults* button sets all controls to their default values.

Google Earth Keyhole Markup .KML and. KMZ File Description

MapViewer can import and export .KML and .KMZ files.

.KML and .KMZ files are imported into Google Earth to display information, such as contour maps or point locations, on Google Earth maps. Both .KML and .KMZ files contain the same information. The difference is that .KMZ files are compressed versions of .KML files. When exporting to .KML or .KMZ files, images are exported to the same directory specified by the Export dialog.

Coordinate System

.KML and .KMZ files require that the coordinates be in latitude and longitude degrees. This means that the *Map* object in the **Object Manager** is converted to lat/long (WGS84) when exporting. The program does this conversion internally. No change is needed to the *Map*.

Attributes

The first and second attributes for polyline, polygon, and symbol objects are automatically exported to all .KML and .KMZ files. The first attribute is used for object names. The second attribute is used for an object's description. For contour maps, the elevation is exported to the polyline object name for all polylines in the contour map.

Import Options Dialog

No Import Options Dialog is displayed.

Export Options Dialog

See KML Export Options Dialog

Export Automation Options

See KML Export Automation Options, Scaling, Spatial References

Google Earth .KML and .KMZ Export Options Dialog

When using the **File | Export** command to export to a .KML or .KMZ file, the **Export Options** dialog allows you to specify the Scaling options and Spatial Reference options. In addition, the **KML Options** page is available to control how exported objects are created in the .KML or .KMZ file.

Coordinate System

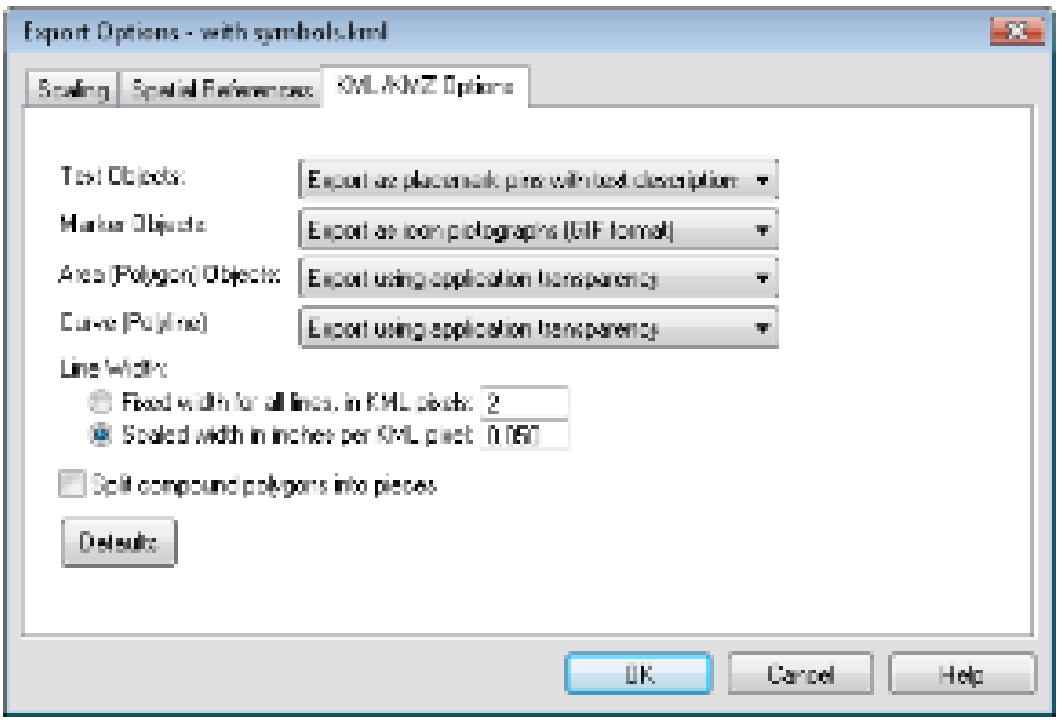
.KML and .KMZ files require that the coordinates be in latitude and longitude degrees. This means that the *Map* object in the **Object Manager** is converted to lat/long (WGS84) when exporting. The program does this conversion internally. No change is needed to the *Map*.

Attributes

The first and second attributes for polyline, polygon, and symbol objects are automatically exported to all .KML and .KMZ files. The first attribute is used for object names. The second attribute is used for an object's description. For contour maps, the elevation is exported to the polyline object name for all polylines in the contour map.

The Export Options Dialog

The **Export Options** dialog is displayed when exporting a Google Earth .KML or .KMZ file. The dialog controls determine how text, symbols, polygons, and polylines are treated when exporting these files.



Set the KML options in the **Export Options** dialog.

Text Objects

When the *Text Objects* is set to *Export as placemark pins with text descriptions*, text is output as point placemarks with the text as the object name. These appear in Google Earth as yellow pushpins. This is the default.

Changing the *Text Objects* option to *Export as rendered curves/areas* converts all text to polylines and/or polygons, as appropriate. Changing the *Text Objects* to *Don't export text objects* removes all text from the .KML or .KMZ file.

Marker Objects

When the *Marker Objects* is set to *Export as icon pictographs (GIF format)*, symbols are saved to .GIF files. A .GIF file is created for each unique symbol in the **MapViewer** file. When sending the .KML or .KMZ file to other users, be sure to include all .GIF files, as well. Otherwise, symbols will not appear. Small red boxes will appear at the locations in Google Earth, indicating the symbols are not found. This is the default *Marker Objects* setting.

Changing the *Marker Objects* to *Export as placemark pins*, converts all symbols to Google Earth yellow pushpins. Changing the *Marker Objects* to *Export as rendered curves/areas,* converts all symbols to polylines and polygons, as appropriate. Changing the *Marker Objects* to *Don't export marker symbols* removes all symbols from the .KML or .KMZ file.

Area (Polygon) Objects

When the *Area (Polygon) Objects* is set to *Export using application transparency*, the polygons are exported with the transparency option set in the **Property Manager**. This is the default option.

Changing the *Area (Polygon) Objects* to *Export all areas as opaque*, makes all polygons in the .KML or .KMZ file 100% opaque. No transparency is shown for any objects. Changing the *Area (Polygon) Objects* to *Export all areas with 50% transparency* makes all polygons 50% transparent, regardless of the transparency level in the **MapViewer** file. Changing the *Area (Polygon) Objects* to *Don't export areas* removes all polygons from the .KML or .KMZ file.

Curve (Polyline) Objects

When the *Curve (Polyline) Objects* is set to *Export using application transparency,* the polylines are exported with the transparency option set in the **Property Manager**. This is the default option.

Changing the *Curve (Polyline) Objects* to *Export all curves as opaque* makes all polylines in the .KML or .KMZ file 100% opaque. No transparency is shown for any objects. Changing the *Curve (Polyline) Objects* to *Don't export curves* removes all polylines from the .KML or .KMZ file.

Line Width

When the *Line Width* is set to *Fixed width for all lines, in KML pixels*, the line width for all lines in the .KML or .KMZ file are the same width. Set the width by highlighting the existing value and typing a new value. The smaller the number, the thinner the line. The default value is 2, which makes the lines 2 pixels wide in the .KML or .KMZ file.

When the *Line Width* is set to *Scaled width in inches per KML pixel*, the line width for each line is individually determined. The line width in **MapViewer**, is multiplied by the number in the box to determine how many pixels are used for each line. The default value is 0.050 which means that a line in **MapViewer**that is 0.050 inches is equivalent to 1 pixel in the .KML or .KMZ file. The *Scaled width in inches per KML pixel* is the default setting for *Line Width*.

Split Compound Polygons

Check the box next to *Split compound polygons into pieces* to break complex polygons into smaller polygons. Uncheck this box to export the complex polygons as a single object. The default is unchecked. Checking this box does make the .KML or .KMZ file size larger, due to the large number of small polygons being created. When unchecked, some very complex polygons may appear as unfilled in Google Earth.

KML Layers

When exporting KML files, each map layer is exported to a separate folder in the KML. In Google Earth, this shows as separate folders under the KML file name when imported and displayed on the map. To turn on or off each map layer separately, click on the check box next to the map layer name.

Defaults

The *Defaults* button sets all options to default conditions.

Scaling Page

Scaling information can be set on the Scaling page.

Spatial References

The spatial reference information can be set on the Spatial References page. Check the desired file formats. It is recommend that *GS Reference (Version 2) file* and/or the *ESRI .PRJ file* option be checked. Click *OK* and the file is saved.

Limitations

- All line styles are exported as solid lines.
- All fill styles are exported as solid fill.
- Transparency of all objects is controlled on the **KML/KMZ Options** page in the **Export Options** dialog.
- Image transforms are limited to 2D displacement, scaling, and Z rotation.

Google Key Markup .KML and .KMZ Export Automation Options

Since the **Export Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options. A typical example would be:

"Defaults=1,RenderText=1"

This would first set all export options to their default values, then convert the text to lines.

Option	Action	Default	Description
RenderMarkers	0 = No 1 = Yes	0	If set to 0, marker symbols will be output to the export file as marker objects. If set to 1, marker symbols will be output to the export file as lines and areas to retain the shape and look of the symbol.
RenderText	0 = No 1 = Yes	0	If set to 0, text will be output to the export file as text objects. If set to 1, text will be output to the export file as lines and areas to retain the shape and look of the font face.
ScalingSource	0 = previously saved 1 = application-supplied	1	Use previously saved or application-supplied scaling source.
SaveScalingInfo	0 = No 1 = Yes	0	Save scaling parameters for later use.

PageLLX	N.N		Set application page rectangle lower left X value.
PageLLY	N.N		Set application page rectangle lower left Y value.
PageURX	N.N		Set application page rectangle upper right X value.
PageURY	N.N		Set application page rectangle upper right Y value.
FileLLX	N.N		Set scaling rectangle lower left X value.
FileLLY	N.N		Set scaling rectangle lower left Y value.
FileURX	N.N		Set scaling rectangle upper right X value.
FileURY	N.N		Set scaling rectangle upper right Y value.
Kml_Opt_DecomposeCompoundPolygons	0 = No 1 = Yes	0	If set to 0, complex polygons are created as complex polygons. Some large polygons may appear unfilled in Google Earth with this setting. If set to 1, complex polygons are split into multiple smaller polygons. This increases the .KML or .KMZ file size.

LAS LiDAR Binary File Description

The ASPRS LiDAR LAS binary file format stores 3D point data. LiDAR stands for Light Detection and Ranging data. This data is generally created by software which combines GPS, IMU, and laser pulse range data to produce X, Y, and Z point data. To use binary LiDAR data, click **File | Open** and select the LAS file in the worksheet window.

File Format

The format contains binary data consisting of a header block, variable length records, and point data. All data is in little-endian format. The header block consists of a public block followed by variable length records. The public block contains generic data such as point numbers and coordinate bounds. The variable length records contain variable types of data including projection information, metadata, and user application data.

Currently, **MapViewer** imports 1.0, 1.1, 1.2, and 1.3 format LAS files. These can contain up to 32 codes.

Classification Number	Meaning
0	Created, never classified
1	Unclassified
2	Ground
3	Low Vegetation
4	Medium Vegetation
5	High Vegetation
6	Building
7	Low Point (noise)
8	Model Key-point
9	Water
10	Rail
11	Road Surface
12	Reserved
13	Wire - Guard (Shield)
14	Wire - Conductor (Phase)
15	Transmission Tower
16	Wire - Structure Connector (e.g. Insulator)
17	Bridge Deck
18	High Noise
19-32	Reserved

Import Options Dialog
See LiDAR Import Filtering Dialog

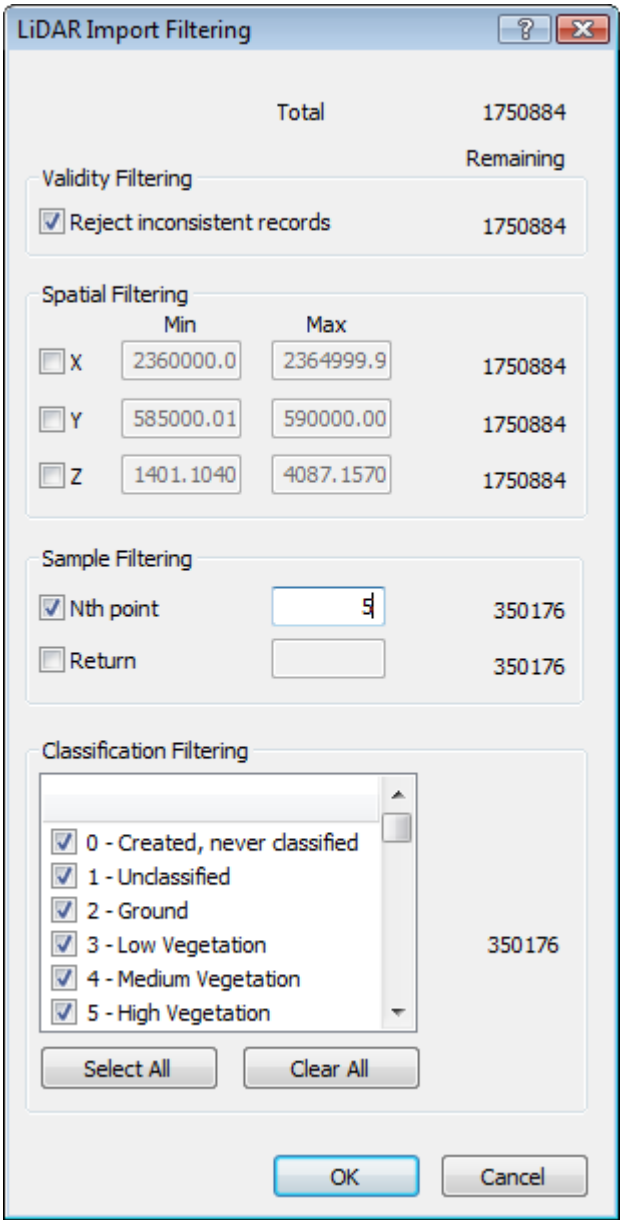
Import Automation Options
No import options are available.

Export Options Dialog
MapViewer does not currently export LiDAR LAS data

Export Automation Options
MapViewer does not currently export LiDAR LAS data

LiDAR Import Filtering Dialog

Click the **File | Open** command to load a .LAS file. The **LiDAR Import Filtering** dialog allows you to specify options which determine how information in the file is imported.



*Customize import options in the **LiDAR Import Filtering** dialog.*

Total Points

The total number of points in the data file are listed at the top right of the dialog. As LiDAR data is typically extremely large, it is recommended that either *Spatial Filtering* or *Sample Filtering* be applied to the data.

Validity Filtering

Check the box next to the *Reject inconsistent records* option to remove all invalid or inconsistent data from import. When this box is unchecked, all data are passed to the import filter when importing a .LAS file.

Spatial Filtering

Check the boxes next to *X, Y,* or *Z* to filter the data based on the X, Y, or Z data limits. This is useful for selecting only a portion of the data based on geographic extents. After checking the box, highlight the value next to *X, Y,* or *Z* in either the *Min* or *Max* column. Type a new value. The number of points in the *Remaining* column will update to show how many points will exist in the data table after the filtering has been done on the data.

Sample Filtering

Check the box next to *Nth point* or *Return* to filter the data further. The *Nth point* removes every nth point, as set by the value *N*. If you want every other point, type 2 in the box next to *Nth point*. If you want every third point, type 3 in the box.

The *Return* value filters the data based on the laser return. Type the value of the laser return in the box next to *Return*. The return is the filter applied directly to the LAS data detecting waveform peaks. The timing of the peaks is given in the LAS file as a distinct *Return*. Most LiDAR systems designed for topographic mapping are optimized to record 3 return pulses. First returns can be used to create digital surface models that include features above the ground surface, such as buildings, bridges, and tree canopy. Intermediate returns are helpful in separating vegetation from solid objects among the above ground features. Final returns are normally the first approximation of the bare ground surface. If you only want the data from the ground surface, you might type in 3 for the *Return* value.

Classification Filtering

To import only data with a certain classification, check the box next to the classification type. For instance, if you only want to import data that is classified as LiDAR class *2-Ground*, uncheck all other boxes in the *Classification Filtering* section and check the box next to *Ground*.

Select All or Clear All

Click the *Select All* button to check all of the classes in the *Classification Filtering* section. Click the *Clear All* button to uncheck all of the classes in the *Classification Filtering* section. After clicking the *Clear All* button, one or more individual classes should be checked. Otherwise, no information will be imported.

OK or Cancel

Click *OK* to close the **LiDAR Import Filtering** dialog and import the .LAS file. Click *Cancel* to close the **LiDAR Import Filtering** dialog and not import the .LAS file.

MapInfo Interchange Format .MIF File Description

MapInfo Interchange Format .MIF files contain boundary objects including areas, curves and points. The objects optionally have attributes (such as color or line style) associated with them.

.MIF files are text files that are usually used as base maps.

MID File

Each. MIF file is usually accompanied by a file with the same name, but with the .MID file name extension. The .MID file contains attribute information about the objects in the map. This information is imported in the objects' attributes.

Limitations

The MIF file format limits attribute values to 254 characters. If an attribute value has more than 254 characters, a warning message will be issued. MapInfo may be unable to read the exported MIF file. It is suggested that the attribute values be limited to only 254 characters.

The MIF file format limits all attributes for a single object to a total of 4000 characters. This includes all attribute names and attribute values. If an object has more than 4000 characters, a warning message will be issued. MapInfo may be unable to read the exported MIF file. It is suggested that the number of characters be reduced so that all attribute names and values are limited to less than 4000 characters.

The MIF file format requires that all attribute names start with a character other than a number. When an attribute name starts with a number in **MapViewer**, the attribute name will automatically be renamed to start with an underscore. For example, the attribute name *1table* will be renamed to *_1table*.

Attributes

All attributes for all polyline and polygon objects are automatically exported to all .MIF files. For contour maps, the Z value is exported as the "ZLEVEL" attribute for all polylines in the contour map.

Import Options Dialog

No import options dialog is displayed.

Import Automation Options

See MapInfo Interchange Format (MIF) Import Automation Options

Loading .MIF Files

MapInfo .MIF files can be loaded with the **File | Import** and **Map | Create Map | Base** commands.

Export Options Dialog

See MapInfo Interchange Format (MIF) Export Options Dialog

Export Automation Options

See MapInfo Interchange Format (MIF) Export Automation Options

MapInfo Interchange Format .MIF Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

"Defaults=1,AreasToCurves=1"

This would first set all import options to their default values, then set the *AreasToCurves* option value to one, which would specify that any areas imported be converted to closed curves.

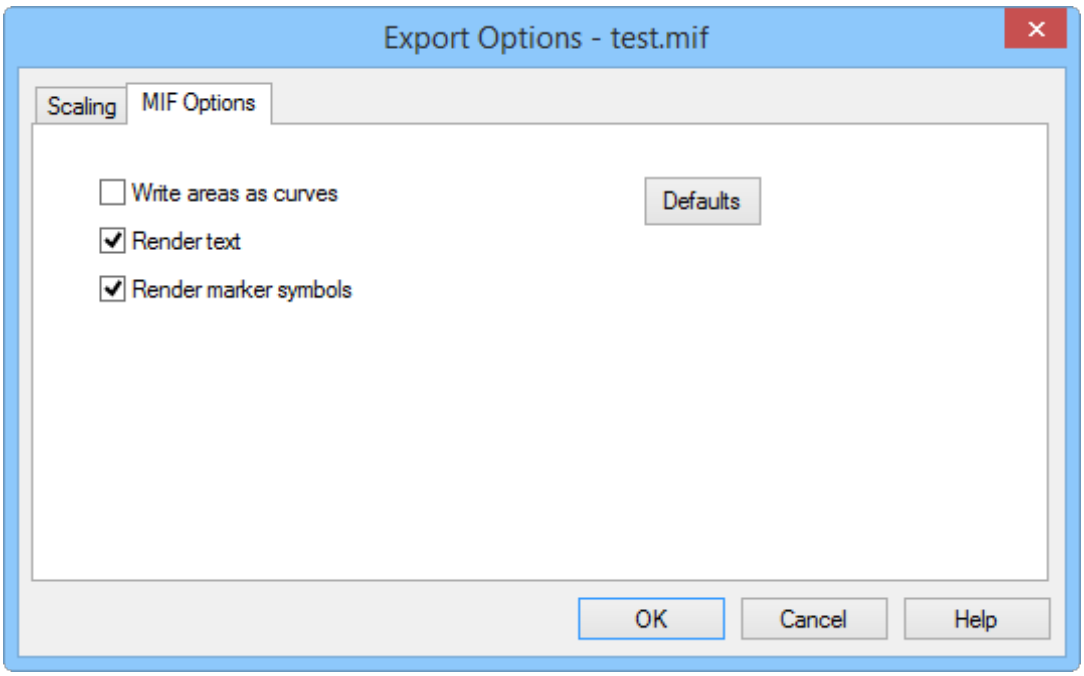
Option	Action	Default
`Defaults=1`	Set all options to their default values	No
`ForgetOptions=1`	Don't remember options for later use	No
`AreasToCurves=1`	Convert area objects to closed curves	No
`IgnoreStyles=1`	Import as base map (ignore styles, colors and fill)	No
`PrimaryIDField=`*n*	Specify that field number n of each record in the optional MID database will be assigned to the primary ID string of each object that is imported from the MIF input file. If the MIF file is not accompanied by a MID file, this option has no effect.	0
`SecondaryIDField=`*n*	Same as above, except applies to the secondary ID.	0

MapInfo Interchange Format .MIF Export Options Dialog

The **Export Options** dialog allows you to specify options which determine how information in the file is exported.

Attributes

All attributes for all polyline and polygon objects are automatically exported to all .MIF files. For contour maps, the Z value is exported as the "ZLEVEL" attribute for all polylines in the contour map.



*Specify the MIF export options in the **Export Options** dialog, **MIF Options** page.*

Write Areas to Curves

Check *Write Areas As Curves* to cause all area (polygonal) objects to be exported as curve (polyline) objects.

Render Text

Check *Render Text* to cause all text objects to be exported as areas and lines. When *Render Text* is unchecked, text is exported as text.

As long as there is no shear, perspective, or clipping, MIF text entities will be exported as text. This means that the MIF text entities will be sized and oriented similar to the text objects in the application document. When shear, perspective, or clipping occur, the text is exported as solid polygons. Shear occurs when the character glyphs are not perpendicular to the text baseline. Perspective occurs when the height of glyphs in the text string are not all the same, as in a 3-D view where the glyphs are smaller the farther they are from the observer. Clipping occurs when part of the text object is partially inside and partially outside the map limits.

Render Marker Symbols

Check *Render Marker Symbols* to cause markers to be exported as areas and lines.

MapInfo Interchange Format .MIF Export Automation Options

Since the **Export Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options. A typical example would be:

```
"Defaults=1,AreasToLines=1"
```

This would first set all export options to their default values, then specify that all areas be output as lines.

Option	Action	Default	Description
AreasToCurves	0 = No 1 = Yes	0	Output polygons to exported MIF file as polylines.
RenderMarkers	0 = No 1 = Yes	0	If set to 0, marker symbols will be output to the export file as marker objects. If set to 1, marker symbols will be output to the export file as polylines and polygons to retain the shape and look of the symbol.
RenderText	0 = No 1 = Yes	0	If set to 0, text will be output to the export file as text objects. If set to 1, text will be output to the export file as polylines and polygons to retain the shape and look of the font face.
ScalingSource	0 = previously saved 1 = application-supplied	1	Use previously saved or application-supplied scaling source.
SaveScalingInfo	0 = No 1 = Yes	0	Save scaling parameters for later use.
PageLLX	N.N		Set application page rectangle lower left X value.
PageLLY	N.N		Set application page rectangle lower left Y value.
PageURX	N.N		Set application page rectangle upper right X value.
PageURY	N.N		Set application page rectangle upper right Y value.
FileLLX	N.N		Set scaling rectangle lower left X value.
FileLLY	N.N		Set scaling rectangle lower left Y value.
FileURX	N.N		Set scaling rectangle upper right X value.
FileURY	N.N		Set scaling rectangle upper right Y value.

Adobe Portable Document Format .PDF File Description

Portable Document Format, .PDF, is a file format used for document exchange. PDF is used for representing two-dimensional documents. PDF was created by Adobe Systems.

File Structure

A .PDF. file consists primarily of eight object types.

- *Boolean* values, representing true or false

- *Numbers*
- *Strings*
- *Names*
- *Arrays*, ordered collections of objects
- *Dictionaries*, collections of objects indexed by *Names*
- *Streams*, usually containing large amounts of data
- The *Null* object

Import

See PDF Import Options Dialog

Export

Use the **File | Export** command to export as a PDF (Raster) (*.PDF) file or a PDF (Vector) (*.PDF) file. Alternately, you can use the **File | Print** command to print to a PDF driver if you have one installed.

GeoPDF

When a map with a defined coordinate system is exported to a vector PDF file format, a GeoPDF file is created. The georeference options for the GeoPDF are changed on the Scaling and Spatial References tabs in the **Export Options** dialog. The *Internal file format* option must be checked on the **Spatial References** page to create the GeoPDF.

Only a single map object can be exported to a GeoPDF. If multiple map objects exist in the **MapViewer** file, all maps should be overlaid before exporting. If other drawn objects (legends, scale bars, text, etc.) exist in the **MapViewer** file, these objects should be temporarily deleted before exporting.

An add-on, such as TerraGo toolbar, may be needed to view the GeoPDF options in Adobe's Acrobat or PDF Reader programs. The map layer and map must have an assigned coordinate system in **MapViewer** prior to the export.

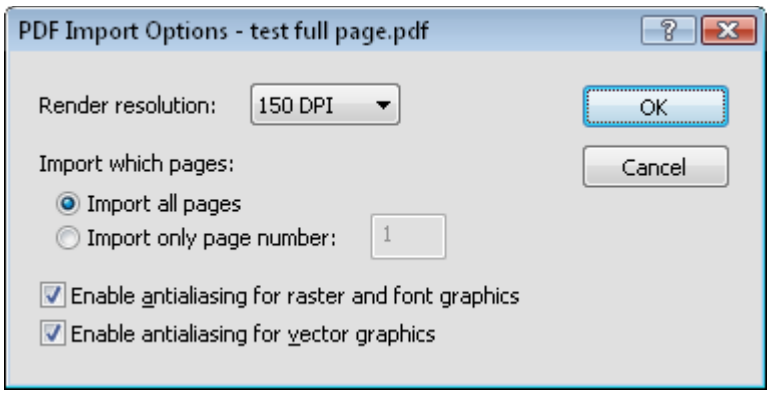
GeoPDF files can be imported as a base map in **MapViewer**.

PDF Import Options Dialog

The **PDF Import Options** dialog is displayed when importing PDF files. All objects from the PDF file are imported as images.

GeoPDF

When the PDF file is a GeoPDF file and contains coordinates, the PDF is imported with the coordinates.



*The **Import Options** dialog controls what is imported from the PDF file.*

Render Resolution

The *Render resolution* option controls the resolution of the imported images. Available options are 50, 75, 100, 125, 150, 200, 250, or 300 DPI. The higher the DPI, the clearer the image is when imported, but the larger the file size. The default is 150 DPI.

Import Which Pages

When a PDF contains more than one page, the *Import which pages* allows control over which page is imported into the program. *Import all pages* imports each page in the PDF as a separate image. *Import only page number* imports only the specified page number into the program. To change the page number imported, select the *Import only page number* option and highlight the current value and type the page number to import.

Antialiasing

Check the box next to *Enable antialiasing for raster and font graphics* to smooth text and images in the PDF file. Check the *Enable antialiasing for vector graphics* to smooth lines, polygons, and other vector elements in the PDF. Checking these boxes results in a smoother appearance to the imported PDF. Unchecking these boxes can result in objects in the images appearing pixelly.

PDF Adobe Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

"Resolution=150, WhichPage=7"

This would set the resolution of the images in the PDF file to 150 DPI and imports only page 7.

Option	Action	Default	Description
WhichPages	0 = all pages > 1 = specific page	0	The page number of the page to import. 0 imports all pages. Type the specific page number to import only that page.
Resolution	50, 75, 100, 125, 150, 200, 250, 300	150	The resolution of the imported PDF in DPI.

AntialiasVector	0 = false 1 = true	1	Turns on/off the smoothing of vector objects in the imported PDF file, such as lines and polygons.
AntialiasRaster	0 = false 1 = true	1	Turns on/off the smoothing of text and images in the imported PDF file.

Adobe Acrobat .PDF Vector Export Options Dialog

Adobe Acrobat Portable Document Format .PDF is a file format used for document exchange. PDF is used for representing two-dimensional documents. PDF was created by Adobe Systems. The vector .PDF export supports solid pattern, image, and gradient patterns.

Use a vector .PDF to export the vector objects in the project (lines and text) as vector objects in the PDF. This makes the objects clear and sharp. Vector objects do not lose quality when you zoom in. It doesn't matter how much you zoom in, the line and text will always look crisp.

The images in your project will also export as images in the vector .PDF. Vector .PDF files are smaller than Raster .PDF files and are usually higher quality. The drawback is that some fill patterns are not supported, so the output may not look exactly the same as your original project.

Objects that are transparent or partially transparent in **MapViewer** are exported with the transparency enabled in the .PDF, with a few exceptions. If the object is filled with an image fill pattern, the object is always exported as 100% opaque, regardless of the opacity setting. If the object is filled with a stock fill pattern, the object's *Foreground Opacity* and *Background Opacity* are averaged and the object is exported with a single average opacity.

Scaling Page

See Scaling

Spatial References Page

See Spatial References

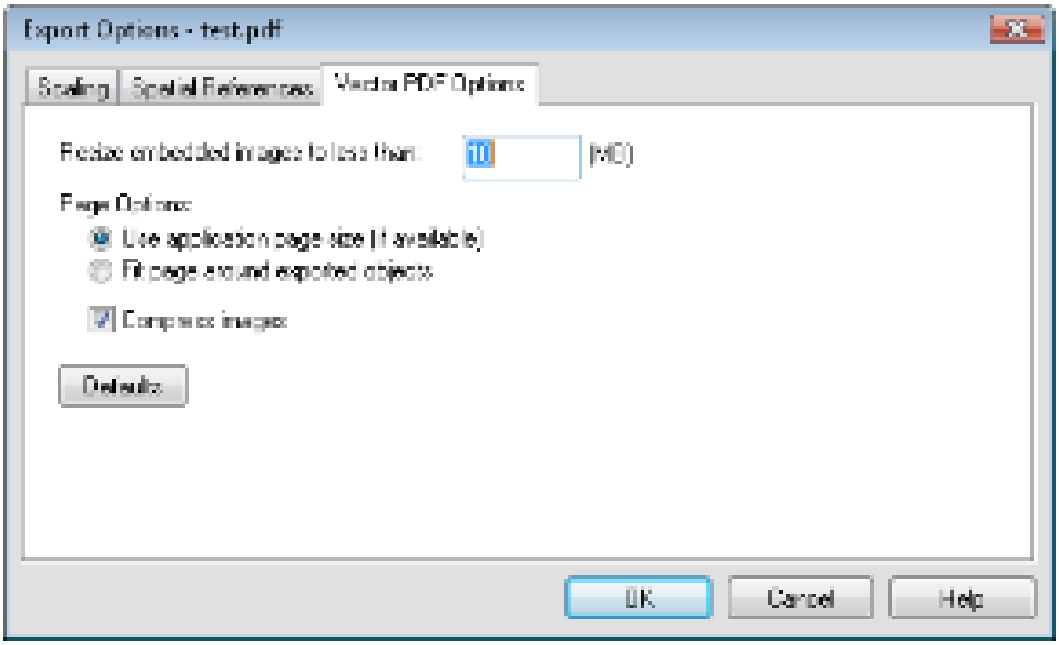
When using the **File | Export** command to export to a PDF (Vector) file, the **Export Options** dialog allows you to specify the Scaling options and Spatial Reference options to create a GeoPDF file. To create a GeoPDF, check the *Internal File Format* option on the **Spatial References** tab.

Only a single map object can be exported to a GeoPDF. If multiple map objects exist in the **MapViewer** file, all maps should be overlaid before exporting. If other drawn objects (legends, scale bars, text, etc.) exist in the **MapViewer** file, these objects should be temporarily deleted before exporting.

An add-on, such as TerraGo toolbar, may be needed to view the GeoPDF options in Adobe's Acrobat or PDF Reader programs. The map layer and map must have an assigned coordinate system in **MapViewer** prior to the export.

Vector PDF Options Page

In addition, the **Vector PDF Options** page is available to resize and compress image and to include the page size in the .PDF file.



Set image compression and page size options
*on the **Vector PDF Options** page in the **Export Options** dialog.*

Resize Embedded Images

The *Resize embedded images to less than* option specifies the size in megabytes that an embedded image is resized to during export. Enter a value in the *MB* box. If an exported image exceeds this size, its resolution will be reduced so it doesn't exceed the designated maximum size. Increase this value to get better looking images at the expense of larger export files. The default value of *Resize embedded images to less than* option is 10MB.

As long as there is no shear, perspective, or clipping, PDF text entities will be exported as text. This means that the PDF text entities will be sized and oriented similar to the text objects in the application document. When shear, perspective, or clipping occur, the text is exported as solid polygons. Shear occurs when the character glyphs are not perpendicular to the text baseline. Perspective occurs when the height of glyphs in the text string are not all the same, as in a 3-D view where the glyphs are smaller the farther they are from the observer. Clipping occurs when part of the text object is partially inside and partially outside the map limits.

Page Options

The *Page Options* section controls the page size in the exported .PDF file. Select the *Use application page size (if available)* to use the paper size defined in the Page Setup dialog. If *Fit page around exported objects* is selected, the page size in the .PDF file will be only as large as the objects being exported.

When the *Use application page size (if available)* is selected and objects extend beyond the page defined in the **Page Setup** dialog, the objects are clipped and not displayed in the PDF file.

Compress Images

Check the box next to *Compress images* to apply .PDF compression to the images in the .PDF file. This produces smaller vector .PDF files with no loss in quality. When this option is unchecked, .PDF files will be larger.

Defaults

Click the *Defaults* button to return the options to the default values.

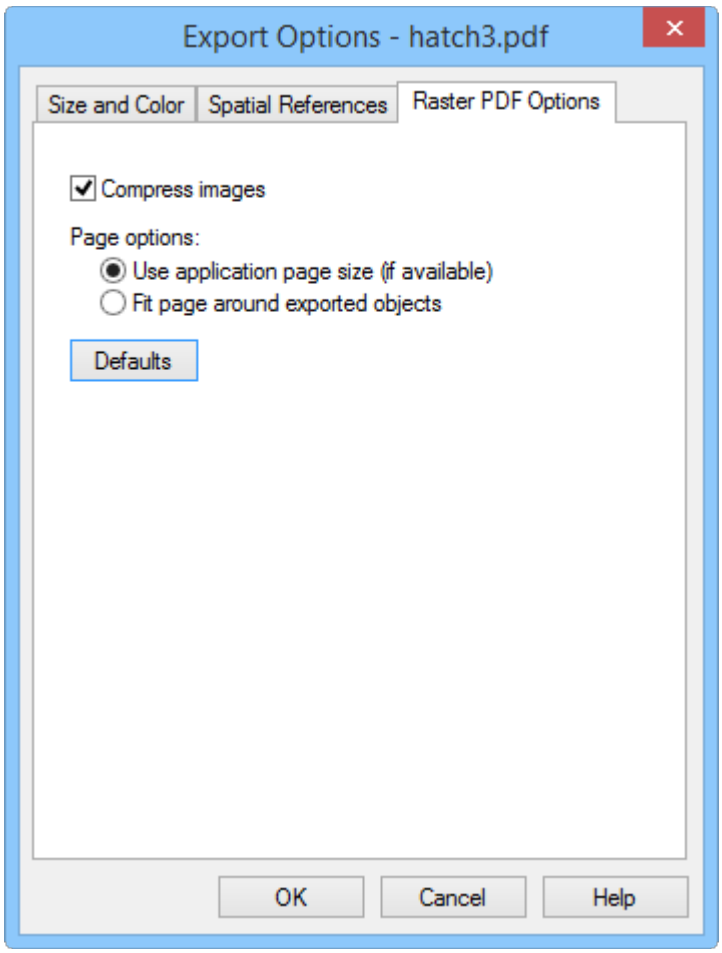
Adobe Acrobat .PDF Raster Export Options Dialog

Adobe Acrobat Portable Document Format .PDF is a file format used for document exchange. PDF is used for representing two-dimensional documents. PDF was created by Adobe Systems.

Use a raster .PDF to export the entire **MapViewer** project as an image in .PDF format. Use the **Export Options** dialog to specify the *Image size in pixels, Dots per inch, Color format*, and to *Maintain aspect ratio*. The higher resolution image you select, the larger the .PDF file will be. All images, lines, text, maps, etc. will be exported into the single image object in the raster .PDF file. Raster objects lose quality at low resolutions or when you zoom in. The raster .PDF output will look exactly like your original project.

The Export Options Dialog (for Raster PDF)

When using the **File | Export** command to export to a PDF (Raster) file, the **Export Options** dialog allows you to specify the Size and Color options and Spatial Reference options. In addition, the **Raster PDF Options** page is available to compress the image in the .PDF file.



Check the Compress images *option on the* ***Raster PDF Options*** *page to make the file size for raster .PDF files smaller.*

Compress Images

Check the box next to *Compress images* to apply .PDF compression to the images in the .PDF file. This produces smaller raster .PDF files with no loss in quality. When this option is unchecked, .PDF files will be larger.

Page Options

Select *Use application page size (if available)* to use **MapViewer's** page size for the PDF export. Select *Fit page around exported objects* to fit the exported PDF page size to the exported objects.

Adobe Acrobat Portable Document Format .PDF (Vector) Export Automation Options

Since the **Export Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options.

Option	Action	Default	Description

MaxBitmapSizeInMB	N	10	This option specifies the largest size allowed for an individual image in the PDF file, in Megabytes. Any exported bitmap larger than this size, will have its resolution reduced so it does not exceed the maximum size.
ScalingSource	0 = previously saved 1 = application-supplied	1	Use previously saved or application-supplied scaling source.
SaveScalingInfo	0 = No 1 = Yes	0	Save scaling parameters for later use.
PageLLX	N.N		Set application page rectangle lower left X value.
PageLLY	N.N		Set application page rectangle lower left Y value.
PageURX	N.N		Set application page rectangle upper right X value.
PageURY	N.N		Set application page rectangle upper right Y value.
FileLLX	N.N		Set scaling rectangle lower left X value.
FileLLY	N.N		Set scaling rectangle lower left Y value.
FileURX	N.N		Set scaling rectangle upper right X value.
FileURY	N.N		Set scaling rectangle upper right Y value.

Portable Network Graphic .PNG File Description

MapViewer imports and exports Portable Network Graphic .PNG files.

Portable Network Graphics .PNG is an image format that employs lossless data compression. PNG was created to improve upon and replace GIF (Graphics Interchange Format) as an image-file format not requiring a patent license.

PNG supports palette-based, greyscale, or RGB images. PNG does not support CMYK color spaces.

Import Options Dialog

No import options dialog is displayed.

Import Automation Options

No import automation options are available.

Export Options Dialog

See Size and Color, Spatial References, and PNG Options

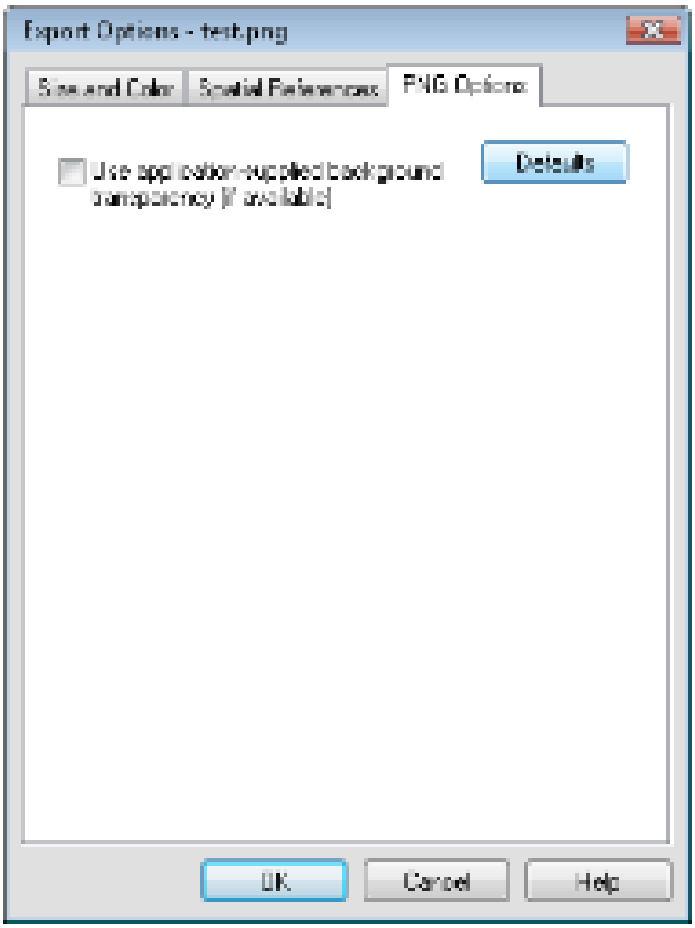
Export Automation Options

See Bitmap Export Automation Options

.PNG Export Options Dialog

Portable Network Graphics .PNG is an image format that employs lossless data compression. PNG files support transparency.

Use the **Export Options** dialog to specify the Size and Color and Spatial References options. Set the transparency options on the **PNG Options** page. To export the .PNG file with all background areas transparent, click on the **PNG Options** tab in the **Export Options** dialog. Check the *Use application-supplied background transparency (if available)* option. The .PNG file will have transparent background areas.



*Specify the transparency setting on the **PNG Options** page in the **Export Options** dialog.*

Portable Any Map .PNM File Description

MapViewer imports Portable Any Map .PNM, Portable Pixel Map .PPM, Portable Gray Map .PGM, and Portable Bitmap .PBM files. **MapViewer** exports .PNM files.

Although there are both binary and ASCII variants of this file format, the current version of the filter always writes binary files when exporting.

The portable pixmap file format .PPM, the portable graymap file format .PGM and the portable bitmap file format .PBM specify rules for exchanging graphics files. They provide very basic functionality and serve as a least-common-denominator for converting pixmap, graymap, or image files between different platforms. Several applications refer to them collectively as the PNM format (portable anymap).

The .PGM and .PPM formats (both ASCII and binary versions) have an additional parameter for the maximum value in a line between the X and Y dimensions and the actual pixel data.

Import Options Dialog

No import options dialog is displayed.

Import Automation Options

No import automation options are available.

Export Options Dialog

See Size and Color and Spatial References

Export Automation Options

See Bitmap Export Automation Options

Golden Software PlotCall .PLT File Description

MapViewer can import Golden Software PlotCall .PLT files.

PlotCall files .PLT contain line graphics designed to be output on pen plotters. The curve, point and text objects of a PlotCall file are imported into **MapViewer** with the **File | Import** command. There is no capability to export PlotCall files.

In the PlotCall file, each pen used is assigned a number. There can be up to 16 pens used in a PlotCall file.

PlotCall files can be either ASCII files (i.e., they can be edited with a text editor or word processor) or binary files (can't be edited) containing commands. Each command occupies one record and begins with a two-letter operation code (op-code) to determine its function. The currently supported op-codes are:

Op-code	Function
MA	Move Absolute
PA	Plot Absolute
TR	Translate
SC	Scale

PS	Plot String
SS	Set Symbol Set
RO	Rotate
PI	Pivot
SP	Select Pen

The general format of most commands is "op-code X,Y" where X and Y are coordinate values measured in inches. See Golden Software's PlotCall manual for a detailed description of each command. PlotCall files are usually produced by Golden Software's DOS applications, or by special user-written programs on PCs or mainframes.

Import Options Dialog

No import options dialog is displayed.

Import Automation Options

No import options are available.

Export Options Dialog

MapViewer does not export .PLT files.

Golden Software PlotCall .PLT Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

"Defaults=1,Pen3=0;0;255;1;0.05"

This would first set all import options to their default values, then set the parameters for lines which are drawn with Pen #3. The lines will be Blue, dashed and 0.05 inches wide.

Option	Action	Default
`Defaults=1`	Set all options to their default values	No
`ForgetOptions=1`	Don't remember options for later use	No
`PenN=R;G;B;S;W;N`	Lines drawn with Pen #N are: Red intensity "R" (0-255) Green intensity "G" (0-255) Blue intensity "B" (0-255) Style "S" (See below) Width "W" inches Contain "N" custom segments	See below 0

PlotCall files can specify up to 16 pens (1-16). The default width is 0.0 (thinest line possible but still visible). The default line attributes associated with each pen are shown in the following table:

Pen #	R;G;B Values	Color	Style
1	0;0;0	Black	0 (Internal Solid)
2	0;0;255	Blue	0 (Internal Solid)
3	0;255;0	Green	0 (Internal Solid)
4	0;255;255	Cyan	0 (Internal Solid)
5	255;0;0	Red	0 (Internal Solid)
6	255;0;255	Magenta	0 (Internal Solid)
7	255;255;0	Yellow	0 (Internal Solid)
8	255;255;255	White	0 (Internal Solid)
9	0;0;0	Black	1 (Internal Dashed)
10	0;0;255	Blue	1 (Internal Dashed)
11	0;255;0	Green	1 (Internal Dashed)
12	0;255;255	Cyan	1 (Internal Dashed)
13	255;0;0	Red	1 (Internal Dashed)
14	255;0;255	Magenta	1 (Internal Dashed)
15	255;255;0	Yellow	1 (Internal Dashed)
16	255;255;255	White	1 (Internal Dashed)

The different line styles are:

Style	Line
-1	Custom (See below)
0	Internal Solid
1	Internal Dashed

2	Internal Dotted
3	Internal Dash-Dot
4	Internal Dash-Dot-Dot

Internal Style

The five internal styles indicate a generic style and leave it to the display device to decide how best to render the line.

Custom Style

A custom style allows (and requires) you to specify the length of the strokes and gaps used when rendering the line.

Stanford Polygon .PLY File Description

PLY is a computer file format known as the *Polygon File Format* or the *Stanford Triangle Format*. The format was designed to store three dimensional data from 3D scanners. It supports a relatively simple description of a single object as a list of nominally flat polygons. A variety of properties can be stored including: color and transparency, surface normals, texture coordinates and data confidence values. The format permits one to have different properties for the front and back of a polygon.

File Format

Files are organized as a header, that specifies the elements of a mesh and their types, followed by the list of elements itself, usually vertices and faces eventually other entities such as edges, samples of range maps, and triangle strips can be encountered.

The header of both ASCII and binary files is ASCII text. Only the numerical data that follows the header is different between the two versions. The header always starts with the line 'ply'. The header helps to identify this as a genuine 'PLY' file.

```
ply
```

The second line indicates which variation of the PLY format this is. It should be one of:

```
format ascii 1.0
format binary_little_endian 1.0
format binary_big_endian 1.0
```

Future versions of the standard will change the revision number at the end - but 1.0 is the only version currently in use.

Comments may be placed in the header by using the word 'comment' at the start of the line. Everything from there until the end of the line should then be ignored. eg:

```
comment This is a comment!
```

The 'element' keyword introduces a description of how some particular data element is stored and how many of them there are. Hence, in a file where there are 12 vertices, each represented as a floating point (X,Y,Z) triple, one would expect to see:

```
element vertex 12
property float x
property float y
property float z
```

Other 'property' lines might indicate that colours or other data items are stored at each vertex and indicate the data type of that information. Regarding the data type there are two variants, depending on the source of the ply file, the type can be specified with one of *char uchar short ushort int uint float double*, or one of *int8 uint8 int16 uint16 int32 uint32 float32 float64*. For an object with ten polygonal faces, one might see:

```
element face 10
property list uchar int vertex_index
```

The word 'list' indicates that the data are a list of values - the first of which is the number of entries in the list (represented as a 'uchar' in this case) and each list entry is (in this case) represented as an 'int'.

At the end of the header, there must always be the line:

```
end_header
```

In the ASCII version of the format, the vertices and faces are each described one to a line with the numbers separated by white space. In the binary version, the data are simply packed closely together at the 'endianness' specified in the header and with the data types given in the 'property' records. For the common "property list..." representation for polygons, the first number for that element is the number of vertices that the polygon has and the remaining numbers are the indices of those vertices in the preceding vertex list.

Import

Stanford Polygon (.PLY) files can be imported into **MapViewer**. The geometry (shape) information from PLY models is the only item imported. Any surface/material properties of the PLY model are ignored. No import options dialog is displayed.

Import Automation Options

No import options are available.

Export Options Dialog

MapViewer does not currently support exporting .PLY files.

Export Automation Options

N/A

Reference

This implementation is based on the file format described in Greg Turk's 1998 "The PLY Polygon File Format" document, which can be found on the Internet.

Sun Raster Image .RAS, .SUN File Description

MapViewer imports and exports Sun Raster .RAS and .SUN image files.

The Sun Raster .RAS and .SUN file format originated at Sun Microsystems and is a common file format for storing bitmap images on UNIX and Solaris workstations.

Import Options Dialog

No import options dialog is displayed.

Import Automation Options

No import automation options are available.

Export Options Dialog

See Size and Color and Spatial References

Export Automation Options

See Bitmap Export Automation Options

Silicon Graphics .RGB Image File Description

MapViewer imports and exports Silicon Graphics Image .RGB, .RGBA, and .BW files.

This file format .RGB, .RGBA, .BW originated on Silicon Graphics workstations and is/was used in a variety of high-end imaging applications, both Unix- and Windows-based. The file name extension is sometimes used to indicate the format of the image contained in the file, but is not required to do so. The extensions are typically .BW for black and white images, .RGB for 24-bit color images, and .RGBA for 32-bit color images with an alpha channel.

Import Options Dialog

No import options dialog is displayed.

Import Automation Options

No import automation options are available.

Export Options Dialog

See Size and Color and Spatial References

Export Automation Options

See Bitmap Export Automation Options

.SP1 SEG Standard Data Exchange File Description

The .SP1 SEG standard data exchange file format is a format widely used in the geophysical industry to exchange data for shotpoint locations for seismic surveying. **MapViewer** currently imports and exports version SP1 file formats. Shotpoint locations are usually those computed locations which are the best estimates of where actual data points are located in the field. The locations are derived from a variety of complex field data. This format is applicable for both land and marine locations and has sufficient flexibility for use in 3D seismic surveys. This can include gravity, magnetic data, or other data about each shotpoint. For additional information on specifics about each file format, refer to the Society for Exploration Geophysicists.

SP1 files can be opened by clicking the **File | Open** command in a worksheet window. Alternatively, the SP1 format can be used to create a base map or post map in the plot window. When importing into **MapViewer**, the line name, shotpoint number, and non-zero Z value is imported and displayed in attribute columns for each point.

The SEG and SP1 file formats are fairly flexible and can include data in latitude and longitude or in easting, northing, and depth/elevation formats. When loading latitude/longitude data, the WGS84 datum is assumed.

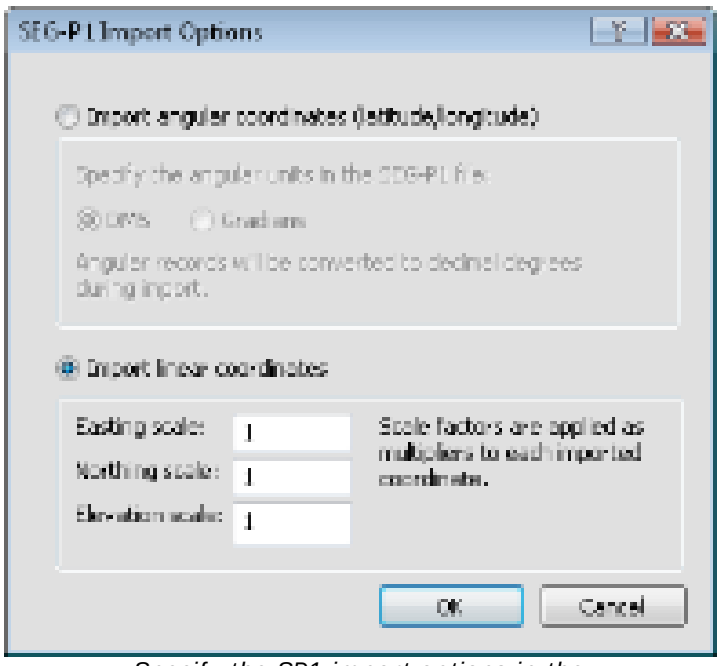
Import Options Dialog

See SEG SP1 Import Options

SEG P1 Import Options Dialog

The **SEG-P1 Import Options** dialog allows you to specify options which determine how information in the file is imported.

A SEG P1 file is a collection of point locations, usually used in geophysical shotpoints.



Specify the SP1 import options in the ***SEG-P1 Import Options*** *dialog.*

Coordinate Format

Select *Import angular coordinates (latitude/longitude)* if the data in the SP1 or SEG file is in latitude and longitude. Select *Import linear coordinates* if the data in the SP1 or SEG file is in a Cartesian coordinate system or an unknown linear coordinate system. Units can be in degrees, gradians, meters, feet, or any unknown units.

DMS or Gradians

When the *Import angular coordinates (latitude/longitude)* is selected, the *Specify the angular units in the SEG-P1 file* option becomes available. If the file contains degrees, minutes, and seconds, select *DMS*. If the file contains gradians, select *Gradians*.

Scale Factors

When the *Import linear coordinates* is selected, the *Easting scale, Northing scale,* and *Elevation scale* options are available. Highlight the existing value and type the new scale factor value in the box. Scale factors are multiplied by the values in the import file to get appropriate coordinates. This might be necessary if the *Easting* and *Northing* are in one set of units and the *Elevation* is in another set of units.

OK or Cancel

Click *OK* to continue importing the tabular SP1 data into a new table or the vector format SP1 file into a new base map. Click *Cancel* to quit importing the file.

ESRI Shapefile .SHP File Description

ESRI Shapefiles are typically usually used in **MapViewer** as base maps.

ESRI Shapefiles are in a binary file format (i.e., they can't be created or modified with a text editor or word processor) that is compatible with Arc/Info, Arc/View, and other ESRI application programs. This format is used to store spatial information including boundary objects such as areas, curves, and points. Spatial information is only concerned with the location of objects in space (i.e., their coordinates) and not with their attributes (such as line or fill style, marker symbol used, text labels, etc.).

Four types of files are produced with each export:

Filename Extension	**Description**
.SHP	Contains the coordinates of each object in the drawing.
.SHX	Contains the file offset of each object in the .SHP file.
.DBF	Contains the attribute text associated with each object in the .SHP file.
.CPG	Contains the Unicode code page number.

In each of the .SHP, .SHX, and .DBF files, the shapes in each file correspond to each other in sequence. That is, the first record in the .SHP file corresponds to the first record in the .SHX and .DBF files, and so on. The .SHP and .SHX files have various fields with different endianness, so as an implementor of the file formats you must be very careful to respect the endianness of each field and treat it properly.

Overview

A shapefile is a digital vector storage format for storing geometric location and associated attribute information. This format lacks the capacity to store topological information. The shapefile format was introduced with ArcView GIS version 2 in the beginning of the 1990s. It is now possible to read and write shapefiles using a variety of free and non-free programs.

Shapefiles are simple because they store primitive geometrical data types of points, lines, and polygons. These primitives are of limited use without any attributes to specify what they represent. Therefore, a table of records will store properties/attributes for each primitive shape in the shapefile. Shapes (points/lines/polygons) together with data attributes can create infinitely many representations about geographical data. Representation provides the ability for powerful and accurate computations.

While the term "shapefile" is quite common, a "shapefile" is actually a set of several files. Three individual files are normally mandatory to store the core data that comprises a shapefile. There are a further eight optional files which store primarily index data to improve performance. Each individual file should conform to the MS DOS 8.3 file nameing convention (8 character file name prefix, fullstop, 3 character file name suffix such as shapefil.shp) in order to be compatible with past applications that handle shapefiles. For this same reason, all files should be located in the same folder.

Shapefiles deal with coordinates in terms of X and Y, although they are often storing longitude and latitude, respectively. While working with the X and Y terms, be sure to respect the order of the terms (longitude is stored in X, latitude in Y).

Mandatory files

.SHP - shape format; the feature geometry itself

.SHX - shape index format; a positional index of the feature geometry to allow seeking forwards and backwards quickly

.DBF - attribute format; columnar attributes for each shape, in dBase III format

Optional files

.PRJ - projection format; the coordinate system and projection information, a plain text file describing the projection using well-known text format

.SBN and .SBX - a spatial index of the features

.FBN and .FBX - a spatial index of the features for shapefiles that are read-only

.AIN and .AIH - an attribute index of the active fields in a table or a theme's attribute table

.IXS - a geocoding index for read-write shapefiles

.MXS - a geocoding index for read-write shapefiles (ODB format)

.ATX - an attribute index for the .dbf file in the form of shapefile.columnname.atx (ArcGIS 8 and later)

.SHP.XML- metadata in XML format

.CPG - file containing the single value code page to be used for ANSI to Unicode translation of attribute text in associated .DBF files.

Attributes

All attributes for all polyline, polygon, and symbol objects are automatically exported to all .SHP files. For contour maps, the Z value is exported as the "ZLEVEL" attribute for all polylines in the contour map. All attributes are automatically imported.

Shapefile shape format .SHP

The main file [.SHP] contains the primary geographic reference data in the shapefile. The file consists of a single fixed length header followed by one or more variable length records. Each of the variable length records includes a record header component and a record contents component. A detailed description of the file format is given in the ESRI Shapefile Technical Description.[1] This format should not be confused with the AutoCAD shape font source format, which shares the .shp extension.

The main file header is fixed at 100 bytes in length and contains 17 fields; nine 4-byte (32-bit signed integer or int32) integer fields followed by eight 8-byte (double) signed floating point fields:

Bytes	Type	Endianness	Usage
0-3	int32	big	File code (always hex value 0x0000270a)
4-23	int32	big	Unused; five uint32
24-27	int32	big	File length (in 16-bit words, including the header)
28-31	int32	little	Version
32-35	int32	little	Shape type (see reference below)
36-67	double	little	Minimum bounding rectangle (MBR) of all shapes contained within the shapefile; four doubles in the following order: min X, min Y, max X, max Y

68-83	double	little	Range of Z; two doubles in the following order: min Z, max Z
84-99	double	little	Range of M; two doubles in the following order: min M, max M

The file then contains any number of variable-length records. Each record is prefixed with a record-header of 8 bytes:

Bytes	Type	Endianness	Usage
0-3	int32	big	Record number
4-7	int32	big	Record length (in 16-bit words)

Following the record header is the actual record:

Bytes	Type	Endianness	Usage
0-3	int32	big	Shape type (see reference below)
4-	-	-	Shape content

The variable length record contents depend on the shape type. The following are the possible shape types:

Value	Shape Type	Fields
0	Null shape	None
1	Point	X, Y
3	Polyline	MBR, Number of parts, Number of points, Parts, Points
5	Polygon	MBR, Number of parts, Number of points, Parts, Points
8	MultiPoint	MBR, Number of points, Points
11	PointZ	X, Y, Z, M
13	PolylineZ	*Mandatory*: MBR, Number of parts, Number of points, Parts, Points, Z range, Z array *Optional*: M range, M array
15	PolygonZ	*Mandatory*: MBR, Number of parts, Number of points, Parts, Points, Z range, Z array *Optional*: M range, M array
18	MultiPointZ	*Mandatory*: MBR, Number of points, Points, Z range, Z array *Optional*: M range, M array
21	PointM	X, Y, M
23	PolylineM	*Mandatory*: MBR, Number of parts, Number of points, Parts, Points *Optional*: M range, M array
25	PolygonM	*Mandatory*: MBR, Number of parts, Number of points, Parts, Points *Optional*: M range, M array

28	MultiPointM	*Mandatory*: MBR, Number of points, Points *Optional Fields*: M range, M array
31	MultiPatch	*Mandatory*: MBR, Number of parts, Number of points, Parts, Part types, Points, Z range, Z array *Optional*: M range, M array

In common use, shapefiles containing Point, Polyline, and Polygon are extremely popular. The "Z" types are three-dimensional. The "M" types contain a user-defined measurement which coincides with the point being referenced. Three-dimensional shapefiles are rather uncommon, and the measurement functionality has been largely superseded by more robust databases used in conjunction with the shapefile data.

Shapefile shape index format (.shx)

The shapefile index contains the same 100-byte header as the [.SHP] file, followed by any number of 8-byte fixed-length records which consist of the following two fields:

Bytes	Type	Endianness	Usage
0-3	int32	big	Record offset (in 16-bit words)
4-7	int32	big	Record offset (in 16-bit words)

Using this index, it is possible to seek backwards in the shapefile by seeking backwards first in the shape index (which is possible because it uses fixed-length records), reading the record offset, and using that to seek to the correct position in the [.SHP] file. It is also possible to seek forwards an arbitrary number of records by using the same method.

Shapefile attribute format .DBF

Attributes for each shape are stored in the xBase (dBase) format, which has an open specification.

Shapefile attribute format .CPG

file containing the single value code page to be used for ANSI to Unicode translation of attribute text in associated .DBF files.

Shapefile projection format .PRJ

The projection information contained in the [.PRJ] file is critical in order to understand the data contained in the [.SHP] file correctly. Although it is technically optional, it is most often provided, as it is not necessarily possible to guess the projection of any given points. The file is stored in well-known text (WKT) format.

Some typical information contained in the [.PRJ] file is:

- Geographic coordinate system
- Datum (geodesy)
- Spheroid
- Prime meridian
- Map projection
- Units used

- Parameters necessary to use the map projection, for example:
- Latitude of origin
- Scale factor
- Central meridian
- False northing
- False easting
- Standard parallels

Shapefile spatial index format (.sbn)

This is a binary spatial index file, which is used only by ESRI software. The format is not documented, and is not implemented by other vendors. The [.SBN] file is not strictly necessary, since the [.SHP] file contains all of the information necessary to successfully parse the spatial data.

Limitations

Topology and shapefiles

Shapefiles do not have the ability to store topological information. ArcInfo coverages and Personal/File/Enterprise Geodatabases do have the ability to store feature topology.

Spatial representation

The edges of a polyline or polygon are defined using points, which can give it a jagged edge at higher resolutions. Additional points are required to give smooth shapes, which requires storing quite a lot of data compared to, for example, bézier curves, which can capture complexity using smooth curves, without using as many points. Currently, none of the shapefile types support bézier curves.

Data storage

Unlike most databases, the database format is based on older xBASE standard, incapable of storing null values in its fields. This limitation can make the storage of data in the attributes less flexible. In ArcGIS products, values that should be null are instead replaced with a 0 (without warning), which can make the data misleading. This problem is addressed in ArcGIS products by using ESRI's Personal Geodatabase offerings, one of which is based on Microsoft Access.

Mixing shape types

Each shapefile can technically store a mix of different shape types, as the shape type precedes each record, but common use of the specification dictates that only shapes of a single type can be in a single file. For example, a shapefile cannot contain both Polyline and Polygon data. Thus, well (point), river (polyline) and lake (polygon) data must be kept in three separate files.

Import Options Dialog

No import options dialog is displayed.

Import Automation Options

See ESRI Shapefile Import Automation Options

Export Options Dialog

See ESRI Shapefile Export Options Dialog

Export Automation Options

See ESRI Shapefile Export Automation Options and Scaling

ESRI Shapefile [.SHP] Import Options Dialog

The **Import Options** dialog does not display in **MapViewer**.

ESRI Shapefile .SHP Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

"Defaults=1,AreasToCurves=1"

This would first set all import options to their default values, then set the *AreasToCurves* option value to one, which would specify that any areas imported be converted to closed curves.

Option	Action	Default
`Defaults=1`	Set all options to their default values	No
`ForgetOptions=1`	Don't remember options for later use	No
`AreasToCurves=1`	Convert area objects to closed curves	No
`PrimaryIDField=`*n*	Specify that field number *n* of each record in the optional DBF database will be assigned to the primary ID string of each object that is imported from the SHP input file. If the SHP file is not accompanied by a DBF file, this option has no effect.	0
`SecondaryIDField=`*n*	Same as above, except applies to the secondary ID.	0
`ImportCodePage`	The number of the ANSI code page to use when importing Unicode data. Valid code page number in the range 0 through 65535. If a .CPG file exists in the directory with the same name as the .SHP file, the code page stored in the .CPG file will be used. If a .DBF file exists in the directory with the same name as the .SHP file, the .DBF file attribute data must be translated from ANSI text to Unicode representation. If no .CPG file exists, the Language ID value stored in the .DBF file's header determines the code page used. However, if the Language ID	""

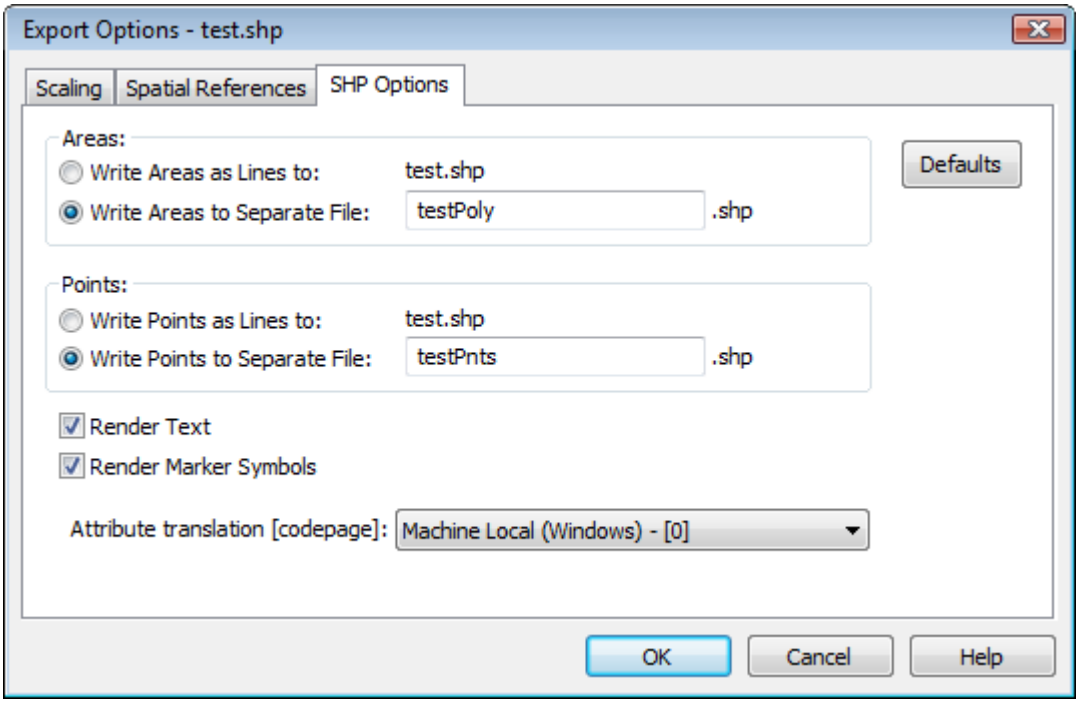
	value is zero or invalid, the “Western European (Windows)” code page (1252) will be used.	

ESRI Shapefile .SHP Export Options Dialog

The **Export Options** dialog, **SHP Options** page allows you to specify options which determine how information in the file is exported.

Attributes

All attributes for all polyline, polygon, and symbol objects are automatically exported to all .SHP files. For contour maps, the Z value is exported as the "ZLEVEL" attribute for all polylines in the contour map.



*Specify the SHP file export options in the **Export Options** dialog.*

SHP Options Page

Note that an ESRI Shapefile (.SHP) file may contain either line objects, area objects, or point objects, but not a combination of different object types.

Write Objects as Lines

All objects can be written as line objects if the *Write Areas as Lines* and *Write Points as Lines* options are both selected, or either of the aforementioned controls may be selected individually to write only the corresponding objects as lines. Alternatively, areas and/or points can be written to separate files by selecting the *Write Areas to Separate File* and/or *Write Points to Separate File* controls, in which case valid file name(s) must be typed into the adjacent edit control(s).

Render Text

By default, text is not output. Selecting the *Render Text* control will instead cause text to be rendered as lines and/or areas as appropriate. If this box is not checked, text will not be output as the .SHP format does not support text.

Render Marker Symbols

By default, marker symbols in the drawing are output as points. Selecting the *Render Marker Symbols* control will instead cause marker symbols to be rendered as lines and/or areas as appropriate.

Attribute Translation

By default, the “Western European (Windows)” code page (1252) will be used to translate 16-bit Unicode attribute text to 8-bit ANSI text stored in the companion .DBF file. This can be changed by selecting a different code page from the drop down list. This code page will be stored in a companion .CPG file and also in the .DBF file header. If characters from multiple languages are present, consider selecting “UTF-8 - [65001]”.

Defaults

The *Defaults* button sets all options to default conditions.

Scaling Page

Scaling information can be set on the Scaling page.

Spatial References

The spatial reference information can be set on the Spatial References page. By default, if the map is in a defined coordinate system, the ESRI .PRJ file is automatiocally created for this ESRI file type.

ESRI Shapefile .SHP Export Automation Options

Since the Export Options dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options. A typical example would be:

"Defaults=1,AreasToLines=1"

This would first set all export options to their default values, then specify that all areas be output as lines.

Option	Action	Default	Description
AreasToFile	0 = No, write areas as lines 1 = Yes, write areas as separate file	0	Write areas to separate file.
PointsToFile	0 = No, write areas as lines	0	Write points to separate file.

	1 = Yes, write areas as separate file		
RenderMarkers	0 = No, export as points 1 = Yes, render markers	0	Any marker objects will be converted to areas for export; otherwise markers are exported as points.
RenderText	0 = No, discard text 1 = Yes, render text	0	Any text objects will be converted to areas for export; otherwise text is discarded.
ScalingSource	0 = previously saved 1 = application-supplied	1	Use previously saved or application-supplied scaling source.
SaveScalingInfo	0 = No 1 = Yes	0	Save scaling parameters for later use.
PageLLX	N.N		Set application page rectangle lower left X value.
PageLLY	N.N		Set application page rectangle lower left Y value.
PageURX	N.N		Set application page rectangle upper right X value.
PageURY	N.N		Set application page rectangle upper right Y value.
FileLLX	N.N		Set scaling rectangle lower left X value.
FileLLY	N.N		Set scaling rectangle lower left Y value.
FileURX	N.N		Set scaling rectangle upper right X value.
FileURY	N.N		Set scaling rectangle upper right Y value.
ExportCodePage	Numeric value	Western European (Windows) = 1252	The number of the ANSI code page to use when exporting Unicode data. Valid code page number in the range 0 through 65535. The *ExportCodePage* value is stored in the .CPG file and .DBF file in the same directory with the same name as the .SHP file. If characters from multiple languages are present, consider using code page 65001 (UTF-8).

Note that if *Shp_AreasToFile* is set to 1, the file name used for the areas file will be the same as the specified export file name with the suffix *Poly* added to the basename. For example, if the specified export file name is *ColoradoHydrography.SHP*, the areas file will be *ColoradoHydrographyPoly.SHP*.

Likewise, if *Shp_PointsToFile* is set to 1, the file name used for the points file will be the same as the specified export file name with the suffix *Pnts* added to the basename.

LizardTech MrSID .SID File Description

The MrSID (pronounced Mister Sid) is an acronym that stands for *multiresolution seamless image database*. It is a file format developed and patented by LizardTech for encoding of georeferenced raster graphics.

Import Options Dialog

See MrSID Import Options Dialog.

Import Automation Options

See MrSID Import Automation Options.

Export Options

MapViewer does not currently have the ability to export MrSID .SID files.

Third Party Notice

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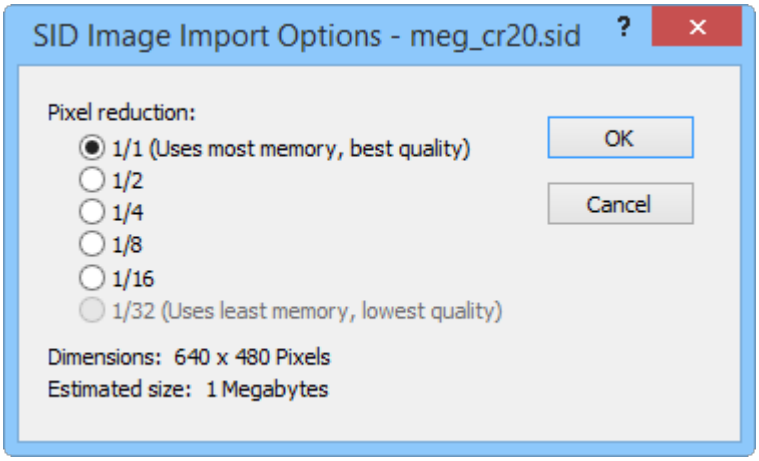
LizardTech MrSID .SID Import Options Dialog

SID Image Import Options Dialog



*Customize the SID pixel reduction in the **SID Image Import Options** dialog.*

Pixel Reduction

Since some SID images can be extremely large once expanded into memory, the import filter allows the image to be reduced in dimensions by 1/2 to 1/32 of the original size via the radio buttons in the **SID Image Import Options** dialog. Choose from *1/1 (Uses the most memory, best quality), 1/2, 1/4, 1/8, 1/16,* to *1/32 (Uses the least memory, lowest quality)*.

LizardTech MrSID .SID Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

"Scale=16"

This would reduce the scale of the image to 1/16th .

Option	Action	Default	Description
Scale	1 = 1/1 (uses most memory, best quality) 2 = 1/2 4 = 1/4 8 = 1/8 16 = 1/16 32 = 1/32 (uses least memory, lowest quality	1	Since some images can be extremely large once expanded into memory, the import filter allows the image to be reduced in dimensions by 1/2 to 1/32 of the original size.

.SVG Scalable Vector Graphics File Description

SVG files are an XML based vector image format designed for use with two-dimensional graphics. SVG files can contain raster graphics, vector polylines and polygons, and text. When exported from Golden Software programs, SVG files contain text that is drawn as vector polylines and polygons. Objects are typically grouped in the .SVG file.

SVG is an open standard available for import and export from many programs. SVG is intended to be portable between applications. The SVG file format is maintained by the W3C SVG Working Group.

Import Options

MapViewer does not currently import this file format.

Export Options Dialog

See Export Options - Spatial References Page

Truevision Targa .TGA File Description

TARGA is an acronym for Truevision Advanced Raster Graphics Adapter; TGA is an initialism for Truevision Graphics Adapter. Today, most people refer to the format as the "TARGA File Format".

File Format

Truevision's (now AVID) TGA file format, often referred to as TARGA file format, is a raster graphics file format. It was the native format of Truevision Inc.'s TARGA and VISTA boards, which were the first graphic cards for IBM-compatible PCs to support Highcolor/truecolor display. This family of graphic cards was intended for professional computer image synthesis and video editing with PCs; for this reason, usual resolutions of TGA image files match those of the NTSC and PAL video formats.

TGA files commonly have the extension .TGA on PC DOS/Windows systems. The format can store image data with 8, 16, 24, or 32 bits of precision per pixel, the maximum 24 bits of RGB and an extra 8-bit alpha channel. Color data can be color-mapped, or in direct color or truecolor format; optionally, a lossless PackBits RLE compression can be employed.

Uncompressed 24-bit TGA images are relatively simple compared to several other prominent 24-bit storage formats: A 24-bit TGA contains only an 18-byte header followed by the image data as packed RGB data. In contrast, BMP requires padding rows to 4-byte boundaries, TIFF and PNG are metadata containers that do not place the image data or attributes at a fixed location within the file.

Import Options

No import options dialog is displayed.

Import Automation Options

No import automation options are available.

Export Options

See Size and Color and Spatial References

Export Automation Options

See Bitmap Export Automation Options

Tagged Image File Format .TIF File Description

The tagged image file format .TIF or .TIFF is a file format for storing images, including photographs and line art. The TIFF format is widely supported by a variety of applications.

MapViewer can import and export .TIF and .TIFF files.

When a .TIF or .TIFF file contains attribute information, **MapViewer** imports this information and stores it on the Info tab. For a full list of the available attributes in a .TIF or .TIFF file, refer to the online reference guide.

The TIFF specification allows an unusually wide variety of different formats and encodings within the same file format. While the filter can read most of the common variants of TIFF, it would be impractical to develop software to read every possible variant. The TIFF filter supports a wide variety of TIFF files that use the PlanarConfiguration 2 encodings.

TIFF images that contain bit per pixel counts other than 1, 4, 8, 16, 24, or 32 may not be readable depending on the encoding and alignment of the data.

TIFF images that are encoded with photometric interpretation models other than RGB, grayscale, or monochrome may not be readable. In particular, some YUV encodings cannot be imported.

Some of the compression algorithms allowable under the TIFF specification are not supported by **MapViewer**.

GeoTIFF

Only a single map object can be exported to a GeoTIFF. If multiple map objects exist in the **MapViewer** file, all maps should be overlaid before exporting. If other drawn objects (legends, scale bars, text, etc.) exist in the **MapViewer** file, these objects should be temporarily deleted before exporting.

Import Options

No import options dialog is displayed.

Import Automation Options

No import automation options are available.

Export Options

See Tagged Image File Format .TIF Export Options Dialog.

Export Automation Options
See Bitmap Export Automation Options

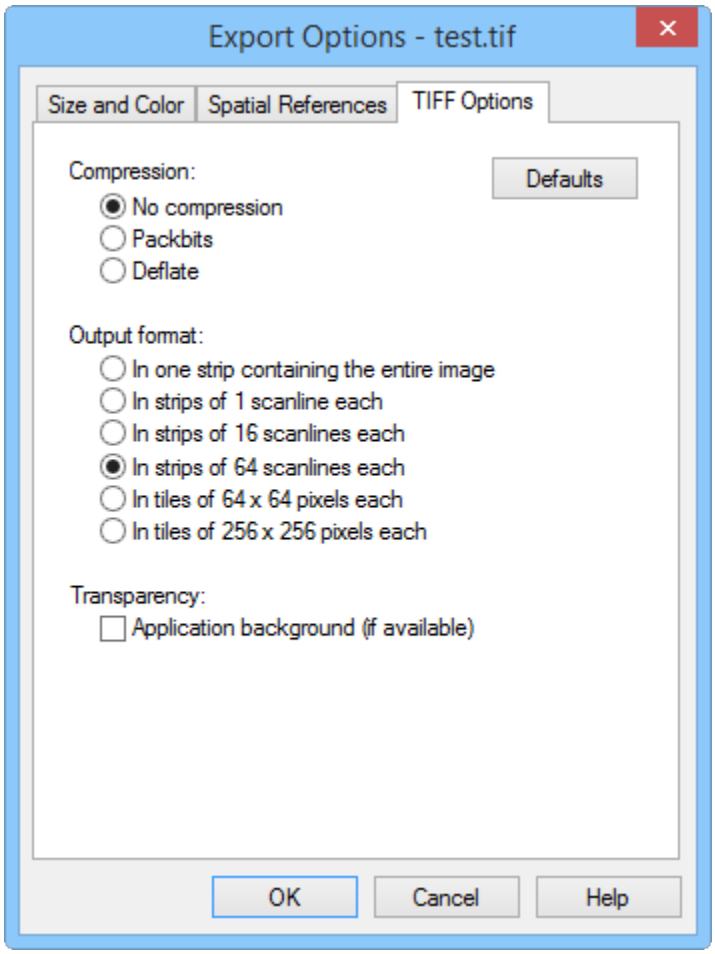
Tagged Image .TIF Export Options Dialog

MapViewer can import and export .TIF, .TIFF files.

Size and Color Page
See Size and Color

Spatial References Page
See Spatial References

TIF Options Page



*Specify TIF export options in the **Export Options** dialog.*

<u>Compression</u>

- *No compression* results in a very large output file size.

- *Packbits* compression involves finding repeated data values; as a result, it is a good choice for images without large color ranges.
- *Deflate* is a dictionary encoding method that produces significant reduction in file size for most images without losing any image information.

Output Format

Choose from a variety of *strip* and *tile* output formats. The option *In one strip containing the entire image* is the least efficient option but has the highest degree of compatibly with other software.

Transparency

Click the *Application background (if available)* check box to export transparencies to the .TIF image.

Lotus (WKx) Data Files

These are files produced from Lotus programs including 1-2-3 and Symphony. The worksheet can import these files but cannot save in any Lotus format. WKS, WK1, WK2, WK3, WK4, WR1, and WRK files can be read into the worksheet. The Lotus import filter does not import formatting information or formulas. Also, the newest Lotus file formats cannot be imported into the worksheet.

.WMF Windows Metafile File Description

Windows stores graphical objects (i.e., pictures) in a special form called a metafile. Such pictures can be stored on disk or in the Windows Clipboard. When these pictures are imported (or pasted from the Clipboard), the objects can be optionally separated and stored individually.

Windows Metafiles are intended to be portable between applications and may contain both vector and image components. In contrast to raster formats such as .JPEG and .GIF which are used to store image (bitmap) graphics such as photographs, scans and graphics, Windows Metafiles generally are used to store line-art, illustrations and content created in drawing or presentation applications. Most Windows clipart is in the .WMF or .EMF format.

Windows Metafile .WMF is a 16-bit format introduced in Windows 3.0. It is the native vector format for Microsoft Office applications such as Word, PowerPoint, and Publisher. A newer 32-bit version with additional commands is called Enhanced Metafile (EMF). EMF is also used as a graphics language for printer drivers.

The Windows metafile formats are Windows Clipboard (Picture) .CLP, Windows Metafile (Enhanced) .EMF, and Windows Metafile .WMF.

Import Options

See Windows Enhanced Metafile Import Options Dialog.

Import Automation Options

See Windows Enhanced Metafile Import Automation Options.

Export Options Dialog

See Windows Enhanced Metafile Export Options Dialog.

Export Automation Options

See Windows Enhanced Metafile Export Automation Options.

Windows Metafile .WMF and .EMF Import Automation Options

Since the **Import Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various import options. A typical example would be:

"Defaults=1,BreakApart=0"

This would first set all import options to their default values, then set the BreakApart option value to zero, which specifies the metafile contents are to remain together as a single unit.

Option	Action	Default	Description
BreakApart	0 = No 1 = Yes	1	Break metafile apart into individual graphical objects during import.

Windows Metafile .WMF and .EMF Export Automation Options

Since the **Export Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options.

Option	Action	Default	Description
MaxBitmapSizeInMB	N	10	This option specifies the largest size allowed for an individual bitmap in the EMF file, in Megabytes. Any exported bitmap larger than this size, will have its resolution reduced so it does not exceed the maximum size.
ScalingSource	0 = previously saved 1 = application-supplied	1	Use previously saved or application-supplied scaling source.
SaveScalingInfo	0 = No 1 = Yes	0	Save scaling parameters for later use.
PageLLX	N.N		Set application page rectangle lower left X value.
PageLLY	N.N		Set application page rectangle lower left Y value.
PageURX	N.N		Set application page rectangle upper right X value.

PageURY	N.N		Set application page rectangle upper right Y value.
FileLLX	N.N		Set scaling rectangle lower left X value.
FileLLY	N.N		Set scaling rectangle lower left Y value.
FileURX	N.N		Set scaling rectangle upper right X value.
FileURY	N.N		Set scaling rectangle upper right Y value.

AVS X-Image .XIMG File Description

MapViewer can import and export AVS X-Image .X and .XIMG files.

The AVS X-Image format originated on UNIX workstations and is typically used to store true-color images containing an alpha channel, a feature that most other image file formats lacked at the time this file format was developed. An AVS X-Image file is a binary file containing a raster image with 8-bits each for the red, green, blue, and alpha channels (32 bits total per pixel).

Import Options Dialog

No import options dialog is displayed.

Import Automation Options

No import options are available.

Export Options Dialog

See Size and Color and Spatial References pages.

Export Automation Options

See Image Bitmap Export Automation Options

Excel Data File Description

Microsoft Excel .XLS, .XLSX, and .XLSM files contain data and retain some cell formatting in **MapViewer**. Some information, such as formulas, is ignored. Excel files can preserve all formatting information available in the Golden Software worksheet.

MapViewer supports the import of .XLS, .XLSX, and .XLSM Excel files. **MapViewer** supports the export of .XLS and .XLSX files.

Excel .XLS

Excel .XLS files are Microsoft Excel documents. Worksheet cell data and some cell formatting are retained with this format. Other types of information, such as formulas, are ignored.

Excel .XLS format files can preserve all formatting information available in the Golden Software worksheet. This format has a 65,536-row limit and a 256-column limit in Excel 97 and greater. Therefore, this format cannot be used to store very large data sets.

Excel .XLSX

Excel .XLSX files are Microsoft Excel 2007 XML spreadsheets. Worksheet cell data and some cell formatting are retained with this format. Other types of information, such as formulas, are ignored.

Excel .XLSX format files can preserve all formatting information available in the Golden Software worksheet. This format has a 1,048,576-row limit and a 16,384-column limit in Excel 2007 and greater.

Excel .XLSM

Excel .XLSM files are Microsoft Excel 2007/2010 XML spreadsheets. XLSM files can contain macros and VBA scripts. Worksheet cell data and some cell formatting are retained with this format. Other types of information, such as formulas, are ignored.

Excel .XLSM format files are not saved in **MapViewer**.

Use Caution when Saving Excel Files!

A file can be saved in an Excel format from **MapViewer** worksheet, ***but only one worksheet can be saved***. **MapViewer** does not allow for saving multiple worksheets in a single Excel document. If a multi-worksheet Excel file is opened and saved as an .XLS or .XLSX file from the **MapViewer** worksheet, be aware that only the single worksheet is saved in the document. If the existing file is overwritten, all the unused worksheets are destroyed. In this case, a warning message is issued. The message reads: *Saving this worksheet will destroy all but one of the sheets in the existing *.xls, *.xlsx file. To overwrite the file, click OK. To choose a different file name, click Cancel.*

Special Characters Used in Excel Files

There are a number of special characters that can be contained in an Excel file that the worksheet cannot handle in the same way as Excel. For these characters, **MapViewer** substitutes a reasonable representation so the value displayed in the cell will look similar to what was displayed in Excel.

Import Options Dialog

See Excel XLS Import Options Dialog and Excel XLSX Import Options Dialog

Import Automation Options

See Import Automation Options String.

Export Options

See Excel Export Options Dialog.

Export Automation Options

See Export Automation Options String

Sheet Names

The sheet name of an Excel file is listed in the gridding report, cross validation report, and data statistics report.

Special XLS Characters

Excel files can contain numeric cell formatting (codes like "#,###.00", for example). When an Excel file is imported into the worksheet, the worksheet stores the Excel number formatting internally so that the same formats are preserved when the file is saved. The worksheet only understands a subset of the codes. When it finds a character that it does not understand, the worksheet prints the literal format character. The worksheet displays a reasonable representation of the unsupported Excel characters so the value displayed in the cell looks similar to what was displayed in Excel.

Here is a summary of all the Excel number format characters that the worksheet understands:

Character	Character Value	Definition
\	Escape	The character following the escape is treated as a literal character. It is not interpreted as formatting character.
"	Quote	All characters between the first quote and the next quote are printed exactly as they appear. Quote characters themselves can printed by using the escape sequence \"
#	Digit placeholder	If the number has more digits to the right of the decimal point than there are number of characters, the number is rounded to as many decimal places as there are number of characters. If the number being printed has more digits to the left of the decimal point than there are number of characters, all the digits are printed.
0	Digit placeholder (Force a digit)	This is the same as the # character except that if there are fewer digits in the number than there are 0 format characters then a 0 is printed in the same place it appears in the format string.
?	Digit or space digit place holder	This is the same as the 0 character except that this prints a space instead of 0. In Excel, this is also used for formatting fractions but this meaning is not supported by the worksheet.
.	Decimal point (print a decimal point)	This determines how many digits are printed to the right and left of the decimal point depending on how many digit formatting characters, # or 0, appear on either side of the decimal point in the format string. The actual character printed may not be a period '.' depending on the number format preferences set in the control panel.
,	Comma separate	If this format character appears anywhere in a format string, except the exponent, then the number is printed with thousands separators or whatever primary digit grouping is specified in the control panel.
%	Percent	If this format character appears anywhere in a format string, except the exponent, then the number is multiplied by 100. The percent character is printed in the same place as it appears in the format string.
e+	Exponent	Exponents specify scientific notation. The e+ or e- specification must be followed by one or more of the digit

		formatting characters (# or 0). The number of digit formatting characters after the e+ or e- determines how many exponent digits are printed. The E+ or e+ notation prints a minus sign in front of negative exponents and a plus sign in front of positive exponents. The E- or e- notation prints a minus sign in front of negative exponents. The exponent values displayed are an even multiple of the number of digit formatting characters to the left of the decimal point. For example, in the format string "##0.0e+###" there are three digit formatting characters left of the decimal point. This means that possible exponent values are e-06, e-03, e+00, e+03, e+06, etc.
E+	Exponent	See above
e-	Exponent	See above
E-	Exponent	See above
$	Currency	This character is replaced with the local currency character.
_	Variable width	The underscore and the character that follows it are replaced with a space. In Excel, the space is the same width as the character after the underscore.
*	Repeat	The character after the asterisk is printed. In Excel the character after the asterisk is printed enough times to fill the cell width.
;	Terminator	Marks the end of the format string. Nothing after the semicolon is used for formatting. In Excel, a format string can have several parts separated by semi-colons: "positive fmt;negative fmt;zero fmt;text fmt."
[color]	Specifies the color to print the number	One of the recognized color names must appear between the square brackets. It is invalid to use square bracket anywhere else in the format string. Recognized color names are BLACK, WHITE, RED, GREEN, BLUE, YELLOW, MAGENTA, and CYAN.
m, d, h, etc	Date/time formatting	The worksheet recognizes standard date/time formatting. Custom date/time formatting are read as strings, not as dates and times

Characters Not Currently Supported

All other characters are printed exactly as they appear in the format string. Excel format characters not currently supported include:

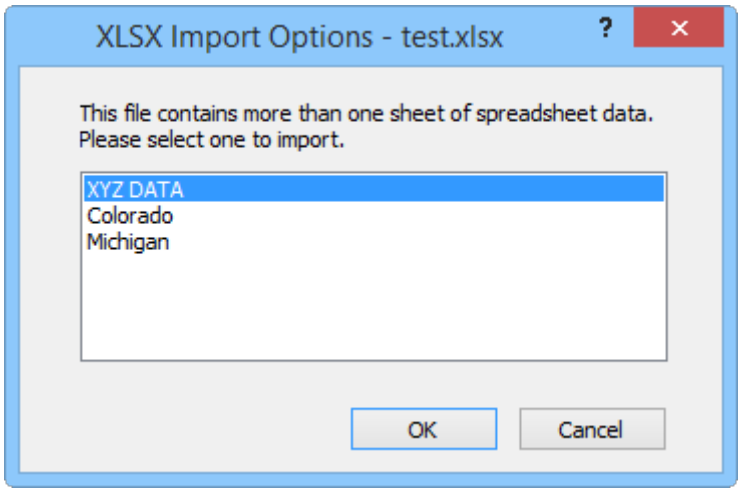
- ; Excel allows several different formats per cell depending on whether the number is positive, negative, or zero. The worksheet only uses the positive portion of the Excel format string.
- [*condition*] Excel allows numbers to be formatted according to their value (i.e. if the number is greater that 100 use one format, otherwise use a different format). The worksheet does not support these options.
- @ Text place holder (text in the cell replaces this character)

Excel .XLSX Import Options Dialog

MapViewer can import .XLS and .XLSX file types.

Importing an Excel File with Multiple Sheets

MapViewer can import one sheet of Excel spreadsheet data at a time. If you are importing an Excel file with multiple sheets, the **XLS Import Options** dialog will appear. Select one sheet to import and click the *OK* button.



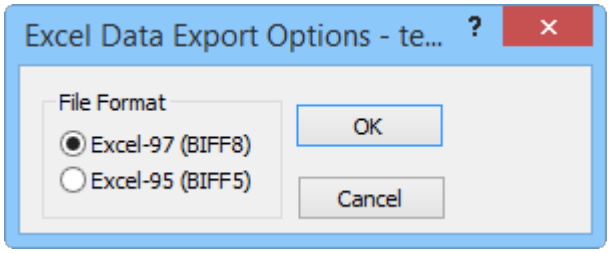
*Select the sheet to import in the **XLSX Import Options** dialog.*

Excel .XLS Export Options Dialog

MapViewer can export .XLS and .XLSX files.

Excel Data Export Options Dialog

The **Excel Data Export Options** dialog allows you to specify if the Excel file will be written in *Excel 97* or *Excel 95* format.



Select the File Format *to use when exporting in the **Excel Data Export Options** dialog.*

File Format

XLS Files can be saved in either *Excel 97 (BIFF 8)* or *Excel 95 (BIFF 5)* formats.

Use Caution when Saving Excel Files!

A file can be saved in an Excel format from the **MapViewer** worksheet, but only one worksheet can be saved. **MapViewer** does not allow for saving multiple worksheets in a single Excel document. If a multi-worksheet Excel file is opened and saved as an .XLS or .XLSX file from the **MapViewer** worksheet, be aware that only the single worksheet is saved in the document. If the existing file is

overwritten, all the unused worksheets are destroyed. In this case, a warning message is issued. The message reads: *Saving this worksheet will destroy all but one of the sheets in the existing *.xls , *.xlsx file. To overwrite the file, click OK. To choose a different file name, click Cancel.*

The **Export Options** dialog does not appear when saving XLSX format files. **MapViewer** does not save Excel .XLSM format files.

Microsoft Excel Export Automation Options

Since the **Excel Export Options** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options. A typical example would be:

"FileFormat=biff5"

This would set the file format to BIFF5 (i.e., Excel 95).

Option	Action	Default
FileFormat	Determines the file format. Valid values: biff8 (Excel 97) biff5 (Excel 95)	biff8

Microsoft Excel Merge Automation Options

If there are multiple sheets in an Excel workbook, **MapViewer** prompts you to choose one sheet when opening or importing (merging) Excel files. Since the **Worksheets Found** dialog is not displayed when the program is driven from an automation script, an options string can be specified in the script. The string consists of comma-separated parameters, which specify the behavior of the various export options. A typical example would be:

" Sheet=XX"

Where XX is the name of the Excel sheet to open.

Option	Action	Default
Sheet	Select which sheet in an XLS file to open	open first sheet if a sheet is not specified

SYLK Spreadsheet [.SLK] File Description

MapViewer imports and exports data to SYLK spreadsheet [.SLK] files.

Symbolic Link SYLK is a Microsoft file format typically used to exchange data between applications, specifically spreadsheets. SYLK files conventionally have a [.SLK] suffix. From within a spreadsheet

data can be exported in the SYLK format. Composed of only displayable ANSI characters, it can be easily created and processed by other applications, such as databases.

Microsoft does not publish a SYLK specification. Variants of the format are supported by Multiplan, Microsoft Excel, Microsoft Works, OpenOffice.org, and Gnumeric.

Note that even if a SYLK file is created by an application that supports Unicode (for example Microsoft Excel), the SYLK file will be encoded in the current system's ANSI code page, not in Unicode. If the application contained characters that were displayable in Unicode but have no codepoint in the current system's code page, they will be converted to question marks ('?') in the SYLK file.

Sample SYLK code

As an example, the following SYLK code in a text file with the [.SLK] extension:

```
ID;P
C;Y1;X1;K"Row 1"
C;Y2;X1;K"Row 2"
C;Y3;X1;K"Total"
C;Y1;X2;K11
C;Y2;X2;K22
C;Y3;X2;K0;ER1C2+R2C2
E
```

would be displayed like this when read by an appropriate spreadsheet:

Row 1	11
Row 2	22
Total	33

Import Options Dialog

No import options dialog is displayed.

Import Automation Options

No import options are available.

Loading .SLK Files

.SLK files can be loaded with the **File | Open** command.

Export Options Dialog

No export options dialog is displayed.

Export Automation Options

No export options are available.

Saving .SLK Files

.SLK files can be saved from a worksheet using the **File | Save As** command.

Custom File Extensions

Files with unrecognized file extensions are scanned and automatically opened into the worksheet if they are ASCII files. If you have an ASCII file format with a specific extension that you would like to include in the *Files of type* list, you can add them to the list by editing the gsio.INI file.

Appendix D

Date/Time Formats

Date/Time Formatting

In addition to numbers and text, dates and times are format types in **MapViewer**.

Using Date/Time Formatting

To use dates and times in **MapViewer**, the data need to be formatted as dates and times. One way to format data in **MapViewer** is to use the worksheet. The worksheet can be accessed with the **File | New | Worksheet**, **File | Open**, and **Home | Data | View**. Highlight the column containing dates and times and then select Data | Format | Format Cells to set the column as date/time in the worksheet.

Once the formatting is set to date/time, you can use the date/time information just as you would use numbers in **MapViewer**:

- you can plot the data using date/time without converting the dates and times into serial numbers
- you can set the axis limits using dates and times
- you can set plot clipping using dates and times

Date/time information can also be used asLabels.

Date/Time Formatting Tips

- In the worksheet, save data files containing date/time formatting as Excel files to preserve the date time formatting as seen in the worksheet.
- You can save date/time-formatted data files as ASCII files (.DAT, .CSV, .TXT, .BNA, or BLN). Sometimes this is necessary if you exceed the Excel row or column limits. When opening the file in **MapViewer's** worksheet, you can make the serial numbers appear as dates by using **Data | Format | Format Cells**.
- If you have formatted the data as date/time in another spreadsheet program such as Excel, the data are formatted as date/time in **MapViewer**.
- Whenever possible, enter and display dates and times in one of the many calendar formats, e.g., "6/14/2009" or “14-June-2009”, and let the software handle converting to/from internal numeric representations.
- If dates/times occur before 1/1/0000, use the BC or BCE suffix after the date. So, Alexander III of Macedon's birthday would be listed as 20-July-356 BCE in the worksheet. Using AD or CE is not necessary and the worksheet will automatically remove these in dates after 1/1/0000.
- The year 0 is defined, according to the ISO 8601:2004 standard.
- When a two digit year is input in the worksheet (00 to 99), it means the year in the current century. For instance, inputting 11/4/13, indicates that the year is 2013, not 0013. In order to have the year 0013, the full four digits (0013) must be input for the date. So, the date would be input as 11/4/0013 CE for November 4, 0013 CE or 11/4/0013 BCE for November 4, 0013 BCE.

- When inputting date/time values in the **Property Manager**, date/times must always be entered as MM/dd/yyyy hh:mm:ss. No other formats are permitted in the date/time edit boxes in the **Property Manager.**

Date Time Formats

Date and time formats can be set from the worksheet and from many locations in **MapViewer**. Date and time options are case sensitive. Months always need to be entered with upper case M and minutes must always be entered with lower case m.

When dates are parsed during input/import, the month and day of week names must match those of the local language as set in the Windows Control Panel, otherwise the entry will not be recognized as a valid date and will be treated as a text string.

Date/Time Formats

These are the defined date and time formats. These can be used in the worksheet Format Cells dialog, in the plot window label format section, or from the Text Editor Insert Date/Time dialog. Any combination of these formats can be used in any of the locations.

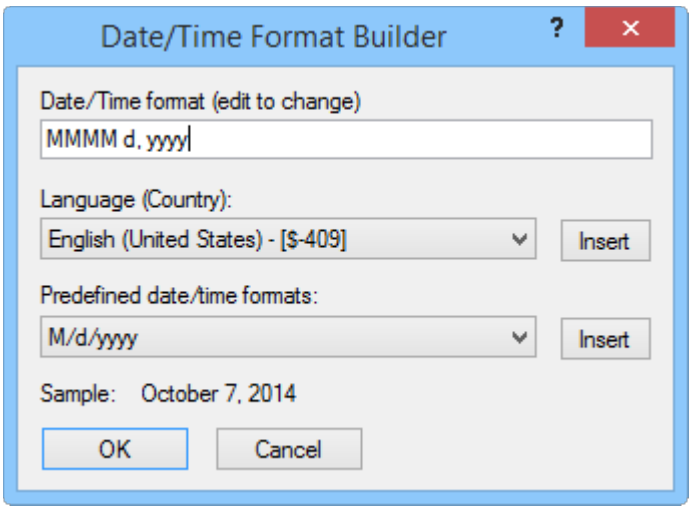
All rows below use the date July 9, 2014 at 6:45:44.12345 in the evening for the *Example*.

Date/Time Code	Example	Description
d	9	Single digit day, excluding leading zero
dd	09	Double digit day, including leading zero
ddd	Wed	Shortened day of week name
dddd	Wednesday	Full day of week name
M	7	Single digit month, excluding leading zero
MM	07	Double digit month, including leading zero
MMM	Jul	Shortened month name
MMMM	July	Full month name
MMMMM	J	First letter of month name
yy	98	Two digit year
yyyy	1998	Full year
g		Before Common Era designator - Includes space and bce or nothing if ce, lower case
gg	ad	BC/AD designator - Includes space and bc or ad, lower case
ggg	ce	Before Common Era designator - Includes space and bce or ce, lower case
G		Before Common Era designator - Includes space and BCE or nothing if CE, upper case
GG	AD	BC/AD designator - Includes space and BC or AD, upper case

GGG	CE	Before Common Era designator - Includes space and BCE or CE, upper case
h	6	Single digit hours - 1-12, excluding leading zero
hh	06	Double digit hours - 01-12, including leading zero
H	18	Hours - 0-23 military, excluding leading zero
HH	18	Hours - 00-23 military, including leading zero
[h]	1003914	Hours portion of total time, excludes leading zeros
m	45	Minutes - 0-60, excluding leading zero
mm	45	Minutes - 00 to 60, including leading zero
[mm]	45	Minutes portion of total time, includes leading zeros
ss	44	Seconds - 0-60, rounded to the nearest second
ss.0	44.1	Seconds - 0-60, rounded to the nearest tenth of a second
ss.00	44.12	Seconds - 0-60, rounded to the nearest hundredth of a second
ss.000	44.123	Seconds - 0-60, rounded to the nearest millisecond
ss.0000	44.12345	Seconds - 0-60, maximum precision
[ss]	44	Seconds portion of total time, includes leading zeros
tt	pm	am or pm designator, lower case
TT	PM	AM or PM designator, upper case
\		escape character - output next character verbatim
'...'		output ALL characters between single quotes verbatim, including escape character
[$-xxxx]	[$-409]	xxxx is an up to four hex digit representation of a locale ID

Date/Time Format Builder Dialog

In the Text Editor dialog, click the 1/1-AM button to open the **Insert Date/Time** dialog. From the worksheet, click the ... button in the Format Cells dialog Number page. The date/time will update every time the project updates.



*The **Date/Time Format Builder** dialog is used to insert or create date/time formats for worksheet cells or text objects.*

Date/Time Format

Type a Date/Time Format into the *Date/Time format (edit to change)* field to set the date/time format. You can also use the *Language (Country)* and *Predefined date/time formats* lists to insert multiple date/time formats and languages.

Language (Country)

By default, the program will use the computer's default language settings for displaying the date/time options in the worksheet. The computer default is controlled by the Windows Control Panel. Refer to your Windows documentation for information about setting the locale. The *Language (Country)* uses the same codes to override the display. For instance, if the date/time values should always be displayed in English, regardless of locale, you could select *English (United States) - [$-409]* and click the *Insert* button. Insert the locale setting first in the *Date/Time format* box. Any cells with the specified language will appear in that language. In addition, the options in the *Predefined date/time formats* will change to show the common formats for that locale. Locale IDs are input as [$-####] in the *Date/Time format* field, where the #### is the locale identifier.

Note: The *Insert* button must be clicked after selecting the *Language (Country)* option. Simply selecting the *Language (Country)* does not change the *Date/Time format*. The *Date/Time format* does not change until *Insert* is clicked.

Predefined Date/Time Formats

The *Predefined date/time formats* list contains the common formats for the selected *Language (Country)* option or for your Windows locale. Available formats are made of combinations of year, month, day, hours, minutes, seconds, and AM/PM designation. Years are shown as yy or yyyy. Months are shown as M, MM, MMM, MMMM, or MMMMM. Days are shown as d, dd, ddd, or dddd. Hours are shown as h, hh, H, HH, or [h]. Minutes are shown as m, mm, or [mm]. Seconds are shown as ss, ss.0, ss.00, ss.000, ss.0000, or [ss]. AM/PM designation is shown as tt or TT. BC/AD or BCE/CE designation is shown as g, gg, ggg, G, GG, or GGG. Refer to formats for information about each specific option.

Note: The *Insert* button must be clicked after selecting the *Predefined date/time formats* option. Simply selecting the *Predefined date/time formats* does not change the *Date/Time format*. The *Date/Time format* does not change until *Insert* is clicked.

Sample

The *Sample* text updates to show a sample of the current entry in the *Date/Time format (edit to change)* field.

Appendix E

Gridding Methods

Grid method parameters control the interpolation procedures. You can usually accept the default gridding method and produce an acceptable map. Different gridding methods provide different interpretations of your data because each method calculates grid node values using a different algorithm. If you are not satisfied with the map of your data, you might consider producing maps using several different gridding methods and comparing the results.

Because contour, gradient, and vector maps are created from gridded data, the original data are not necessarily honored in the grid. If you post the original data on the map, some of the color levels might be positioned "wrong" relative to the original data. This happens because the locations of the color level boundaries are determined solely by the interpolated grid node values and not directly by the original data. Some methods are better than others in preserving your data, and sometimes some experimentation (i.e. increasing grid density) is necessary before you can determine the best method for your data.

Gridding methods are selected in the map's Gridding page . Gridding methods include Data Metrics, Inverse Distance to a Power, Kriging, Local Polynomial, Minimum Curvature, Modified Shepard's Method, Moving Average, Natural Neighbor, Nearest Neighbor, Polynomial Regression, Radial Basis Function, Triangulation with Border Color Interpolation, and Triangulation with Linear Interpolation.

Anisotropy

Natural phenomena are created by physical processes. Often these physical processes have preferred orientations. For example, at the mouth of a river the coarse material settles out fastest, while the finer material takes longer to settle. Thus, the closer one is to the shoreline the coarser the sediments while the further from the shoreline the finer the sediments. When interpolating at a point, an observation 100 meters away but in a direction parallel to the shoreline is more likely to be similar to the value at the interpolation point than is an equidistant observation in a direction perpendicular to the shoreline. Anisotropy takes these trends in the data into account during the gridding process for some gridding methods.

Usually, points closer to the grid node are given more weight than points farther from the grid node. If, as in the example above, the points in one direction have more similarity than points in another direction, it is advantageous to give points in a specific direction more weight in determining the value of a grid node. The relative weighting is defined by the anisotropy ratio. The underlying physical process producing the data as well as the sample spacing of the data are important in the decision of whether or not to reset the default anisotropy settings.

Anisotropy is also useful when data sets use fundamentally different units in the X and Y dimensions. For example, consider plotting a flood profile along a river. The X coordinates are locations, measured in miles along the river channel. The Y coordinates are time, measured in days. The Z values are river depth as a function of location and time. Clearly in this case, the X and Y coordinates would not be plotted on a common scale, because one is distance and the other is time. One unit of X does not equal one unit of Y. While the resulting map can be displayed with changes in scaling, it may be necessary to apply anisotropy as well.

Another example of when anisotropy might be employed is an isotherm map of average daily temperature over the upper Midwest. Although the X and Y coordinates (Easting and Northing) are

measured using the same units, along the east-west lines (X lines) the temperature tends to be very similar. Along north-south lines (Y lines) the temperature tends to change more quickly (getting colder as you head north). When gridding the data, it would be advantageous to give more weight to data along the east-west axis than along the north-south axis. When interpolating a grid node, observations that lie in an east-west direction are given greater weight than observations lying an equivalent distance in the north-south direction.

The anisotropy settings include a *Ratio* and an *Angle* setting. The *Ratio* is the maximum range divided by the minimum range. An anisotropy ratio less than two is considered mild, while an anisotropy ratio greater than four is considered severe. Typically, when the anisotropy ratio is greater than three its effect is clearly visible on grid-based maps. The *Angle* is the preferred orientation (direction) of the major axis in degrees.

NOTE: Unless there is a good reason to use an anisotropy ratio, you should accept the default value of 1.0.

For each different gridding method, anisotropy might be specified in a slightly different manner. In the most general case, anisotropy can be visualized as an ellipse. The ellipse is specified by the lengths of its two orthogonal axes and by an orientation angle. In **MapViewer**, the lengths of the axes are called Radius 1 and Radius 2. The orientation angle is defined as the counterclockwise angle between the positive X axis and Radius 1. Since the ellipse is defined in this manner, an ellipse can be defined with more than one set of parameters. For example,

Radius 1 = 2

Radius 2 = 1

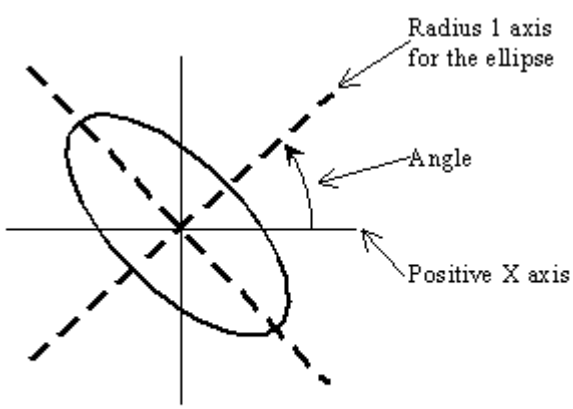
Angle = 0

is the same ellipse as

Radius 1 = 1

Radius 2 = 2

Angle = 90



The anisotropy angle is the angle between the positive X axis and the ellipse axis associated with Radius 1.

For most of the gridding methods in **MapViewer**, the relative lengths of the axes are more important than the actual length of the axes. The relative lengths are expressed as a *Ratio* in the *Anisotropy* group. The ratio is defined as Radius 1 divided by Radius 2. Using the examples above, the ratios are 2 and 0.5. The ratio of 2 indicates that Radius 1 is twice as long as Radius 2. The *Angle* is the counter clockwise angle between the positive X axis and Radius 1. This means that:

Ratio = 2

Angle = 0

is the same ellipse as

Ratio = 0.5

Angle = 90

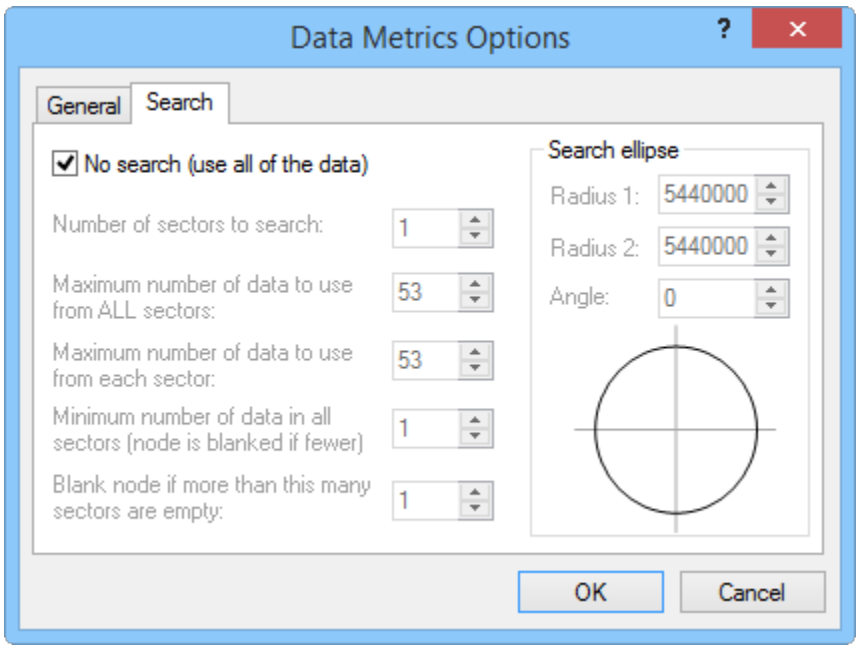
The small picture in the *Anisotropy* group displays a graphic of the ellipse to help describe the ellipse.

Search

In gridding method dialogs, search options control which data points are considered by the gridding operation when interpolating grid nodes. To access the search options, if available with the gridding method, click the *Advanced Options* Edit... button on the Gridding page. If searching is available with the selected gridding method, a **Search** page appears in the gridding options dialog. If search options are not available for a gridding method this means that all the data points from the boundary file must be used when calculating the grid.

Search rules define the number of points included in interpolating a grid node value. Uncheck the *No Search (use all of the data)* option to enable the search rules edit controls. Search rules limit the number of data points to include in the interpolation at each grid node. Search rules work in concert with the *Search Ellipse*. The *Search Ellipse* specifies the size of the local neighborhood in which to look for data, and the *Search Rules* specify the number of points to actually consider within the neighborhood.

If the number of data points defined by the *Minimum number of data in all sectors* is not found within the *Search Ellipse* distance, a blanking value (special null value) is assigned at the grid node. Blanking values indicate that insufficient data existed to satisfy the search criteria at that particular location.



Use the Search tab in the gridding method options dialog to select which data are included in grid calculations.

Search Options

The No Search (use all of the data) option tells **MapViewer** to use all data when interpolating each grid node. Uncheck the *No Search* box to activate the search during the gridding process.

The *Number of sectors to search* option divides the search area into smaller sections to which you can apply the following search rules. You can specify up to 32 search sectors.

- The *Maximum number of data to use from ALL sectors* value limits the total number of points used when interpolating a grid node.
- The *Maximum number of data to use from EACH sector* value specifies the number of points to be used from each sector.
- The *Minimum number of data in all sectors (node is blanked if fewer)* value assures that the specified number of points are encountered when interpolating a grid node. If the minimum number of points is not found, the blanking value is assigned at the grid node. Data points beyond the nearest points in a quadrant are ignored even if the data points in another quadrant are farther from the grid node being calculated.
- *Blank node if more than this many sectors are empty* assures that if more empty sectors than this value are encountered, the blanking value is assigned at the grid node.

Search ellipses are specified by defining the ellipse radii and the angle for the ellipse.

- *Radius 1* and *Radius 2* are positive values indicating the distance in data units.
- *Angle* is the inclination between the positive X axis and the ellipse axis associated with *Radius 1*. This can be any value between -360 and +360 degrees.

Search Ellipse

The *Search Ellipse* defines the local neighborhood of points to consider when interpolating each grid node. This defines the distance in data units from the grid node that **MapViewer** looks to find data points when calculating grid nodes. Data points outside the search ellipse are not considered during grid node interpolation.

Elliptical searches do not impart extra weight to data points in the various directions, but do search farther along one ellipse axis. The default *Search Ellipse* is circular; meaning that **MapViewer** looks the same distance in all directions.

Search ellipses are specified by defining the ellipse radii and the angle for the ellipse.

- *Radius 1* and *Radius 2* are positive values indicating the distance in data units.
- *Angle* is the inclination between the positive X axis and the ellipse axis associated with *Radius 1*. This can be any value between -360 and +360 degrees.

Blanking values indicate that insufficient data existed to generate a grid node value at that particular location based on the specified search rules. For example, if you inadvertently set your search ellipse size to be smaller than half the distance between your data points, a significant number of grid nodes may be blanked.

Although not required, in most cases it works well to set the search ellipse ratio and direction to coincide with the anisotropy ratio and direction. For more information on anisotropy, see Anisotropy. Note that not all gridding methods contain anisotropy options.

No Search

The search options tell **MapViewer** how to find data points during the calculation of grid node values. The *No Search (use all of the data)* option tells **MapViewer** to use all data when interpolating each grid node. Uncheck the *No Search* box to activate the search during the gridding process.

For small data sets (up to 250 points) the *No Search* option is usually the most appropriate. This type of search increases gridding speed. *No Search* uses all data points in the calculation of every grid node. The distance weighting factors are still applied. Therefore, although a point far removed from the grid node is still used when calculating the grid node value, it carries relatively little weight compared to data points close to the grid node.

When data points are evenly distributed over the map area, the *No Search* option is adequate. When observations are heavily clustered within the map area, a four-sector or eight-sector search is recommended. These types of searches are also appropriate when you have data collected on widely spaced traverses. A one-sector search might attempt to estimate grid nodes using data points from a single direction. This might generate unrealistic slopes between traverses, and unrealistic polygonal shaped plateaus across the map area. Four- or eight- sector searches should eliminate or reduce this effect. Up to 32 sectors can be specified.

Some gridding methods construct an internal matrix based on the number of search points such as *Kriging* and *Radial Basis Function*. This matrix can consume a large amount of memory if too many search points are used. For these methods, the default cut off for using all data (*No Search*) versus searching is 250 data points. If there are more than 250 points, **MapViewer** defaults to performing a search. If there are 250 or fewer data points, **MapViewer** selects the *No Search (use all of the data)* option by default. The absolute maximum number of data points that can be used with the *No Search (use all of the data)* option with these methods is 750. If you have more than 750 points the *No Search (use all of the data)* option is disabled.

Data Metrics

Data metrics is an available gridding method. The collection of data metrics gridding methods creates grids of information about the data on a node-by-node basis. The data metrics gridding methods are not, in general, weighted average interpolators of the variable. For example, you can obtain information such as:

- the number of data points used to interpolate each grid node. If the number of data points used are fairly equal at each grid node, then the quality of the grid at each grid node can be interpreted.
- the standard deviation, variance, coefficient of variation, and median absolute deviation of the data at each grid node. These are measures of the variability in space of the grid, and are important information for statistical analysis.

The local data set is defined by the search parameters. These search parameters are applied to each grid node to determine the local data set. In the following descriptions, when computing the value of a grid node (r, c), the local data set S(r, c) consists of data within the specified search parameters centered at the specific grid node only. The set of selected data at the current grid node (r,c), can be represented by S(r,c), where

$$S(r,c) = \{(x_1, y_1, z_1), (x_2, y_2, z_2), \ldots, (x_n, y_n, z_n)\}$$

where *n* = number of data points in the local data set

The Z(r,c) location refers to a specific node within the grid.

There are five groups of data metrics, *Z Order Statistics*, *Z Moment Statistics*, *Other Z Statistics*, *Data Location Statistics*, and *Terrain Statistics*.

Z Order Statistics

The data at a grid node within the search parameters are sorted for the Z order statistics.

$$\{z_{[1]}, z_{[2]}, \ldots, z_{[n]}\}$$

where $z_{[1]} \le z_{[2]} \le \ldots \le z_{[n]}$. Square brackets indicate ordered Z values.

Data Metric	Definition	Equation
Minimum	each nodal value is the minimum Z value of data selected by the specified sector search centered at that node	$Z(r,c) = \min(z_1, z_2, \ldots, z_n) = z_{[1]}$
Lower Quartile	each nodal value is the 25th percentile Z value of data selected by the specified sector search centered at that node	$Z(r,c) = z_{\left[\frac{n}{4}\right]}$

Median	each nodal value is the median Z value of data selected by the specified sector search centered at that node	$Z(r,c) = z_{\left[\frac{n}{2}\right]}$
Upper Quartile	each nodal value is the 75th percentile Z value of data selected by the specified sector search centered at that node	$Z(r,c) = z_{\left[\frac{3n}{4}\right]}$
Maximum	each nodal value is the maximum Z value of data selected by the specified sector search centered at that node	$Z(r,c) = \max(z_1, z_2, \ldots, z_n) = z_{[n]}$
Range	each nodal value is the difference between the maximum Z value and the minimum Z value for the data selected by the specified sector search centered at that node	$Z(r,c) = z_{[n]} - z_{[1]}$
Midrange	each nodal value is the average of the maximum Z value and the minimum Z value, for the data selected by the specified sector search centered at that node	$Z(r,c) = \frac{z_{[n]} + z_{[1]}}{2}$
Interquartile Range	The *Interquartile Range* data metric generates a grid for which each nodal value is the difference between the 75th percentile Z value and the 25th percentile Z value, for the data selected by the specified sector search centered at that node. This data metric shows the spatial variation of variability of the data, but it focuses on the middle fifty percent of the data only. Thus, it is insensitive to variations in the tails of the local distributions	$Z(r,c) = z_{\left[\frac{3n}{4}\right]} - z_{\left[\frac{n}{4}\right]}$

Z Moment Statistics

Data Metric	Definition	Equation
Mean	each nodal value is the arithmetic average of the data selected by the specified	$Z(r,c) = \frac{1}{n}\sum_{i=1}^{n} z_i$

	sector search centered at that node	
Standard Deviation	each nodal value is the standard deviation of the data selected by the specified sector search centered at that node	$Z(r,c) = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(z_i - \bar{z})^2}$ where $\bar{z}$ is the mean of the selected data
Variance	each nodal value is the variance of the data selected by the specified sector search centered at that node	$Z(r,c) = \frac{1}{n}\sum_{i=1}^{n}(z_i - \bar{z})^2$ where $\bar{z}$ is the mean of the selected data
Coef. of Variation	The *Coef. of Variation* data metric generates an output grid for which each nodal value is the local standard deviation divided by the local mean of the data selected by the specified sector search centered at that node. Note that this measure is useless for data whose local mean values are close to zero; this includes data that changes sign within the domain of interest.	$Z(r,c) = \frac{\text{standard deviation}(z)}{\text{mean}(z)}$

Other Z Statistics

Data Metric	Definition	Equation
Sum	The *Sum* data metric generates an output grid for which each nodal value is the sum of the Z values of the data selected by the specified sector search centered at that node.	$Z(r,c) = \sum_{i=1}^{n} z_i$
M.A.D.	The Median Absolute Deviation (*M.A.D.*) data metric generates an output grid for which each nodal value is the median absolute deviation of the data selected by the specified sector search centered at that node.	$Z(r,c) = d_{\left[\frac{n}{2}\right]}$ where $d_i = \left\lvert z_i - z_{\left[\frac{n}{2}\right]} \right\rvert$ These d_i are sorted into ascending order and indexed as $\{d_{[1]}, d_{[2]}, \ldots, d_{[n]}\}$
R.M.S.	The Root Mean Square (*R.M.S.*) data metric generates an output grid for which each nodal value is the root mean square of the data	$Z(r,c) = \sqrt{\frac{1}{n}\sum_{i=1}^{n} z_i^2}$

	selected by the specified sector search centered at that node.	

Data Location Statistics

The separation distances between the current grid node and each of the selected data are used in the computation of the data location statistics. In the following discussion, let the location of the current grid node be represented as (x_0, y_0). The list of separation distances are defined as

$$R_i = \sqrt{(x_i - x_0)^2 + (y_i - y_0)^2}$$

The R_i are sorted in ascending order and indexed as

$$\{R_{[1]}, R_{[2]}, \ldots, R_{[n]}\}$$

Data Metric	Definition	Equation
Count	The *Count* data metric generates an output grid for which each nodal value is the number of data selected by the specified sector search centered at that node. Under most circumstances, the best interpolation results occur when the *Count* is approximately homogeneous throughout the area of interest.	$Z(r,c) = n$
Approximate Density	The *Approximate Density* data metric generates an output grid for which each nodal value is the number of data selected by the specified sector search centered at that node, divided by πR_n^2, where $R_{[n]}$ is the distance from the node to the farthest selected datum. The area over which the density is computed is bounded by the distance to the farthest selected datum. As such, when the data are relatively sparse, the computed density is slightly over-stated.	$Z(r,c) = \frac{n}{\pi R_{[n]}}$
Distance to Nearest	each nodal value is the distance to the nearest datum selected by the specified sector search centered at that node	$Z(r,c) = R_{[1]}$

Distance to Farthest	each nodal value is the distance to the farthest datum selected by the specified sector search centered at that node	$Z(r,c) = R_{[n]}$
Median Distance	each nodal value is the median separation distance between the node and all of the data selected by the specified sector search centered at that node	$Z(r,c) = R_{\left[\frac{n}{2}\right]}$
Average Distance	each nodal value is the average separation distance between the node and all of the data selected by the specified sector search centered at that node	$Z(r,c) = \frac{1}{n}\sum_{i=1}^{n} R_i$
Offset Distance	each nodal value is the distance between the node and the centroid of all of the data selected by the specified sector search centered at that node	$Z(r,c) = \sqrt{(x_0 - x_c)^2 + (y_0 - y_c)^2}$ where the centroid coordinates (x_c, y_c) are $x_c = \frac{1}{n}\sum_{i=1}^{n} x_i$ and $y_c = \frac{1}{n}\sum_{i=1}^{n} y_i$

Terrain Statistics

Terrain statistics are all based upon a locally fitted planar surface. For each grid node, the specified sector search is performed. Then, using ordinary least squares, the following equation is fitted to the selected data:

$$z_i = Ax_i + By_i + C + \varepsilon_i$$

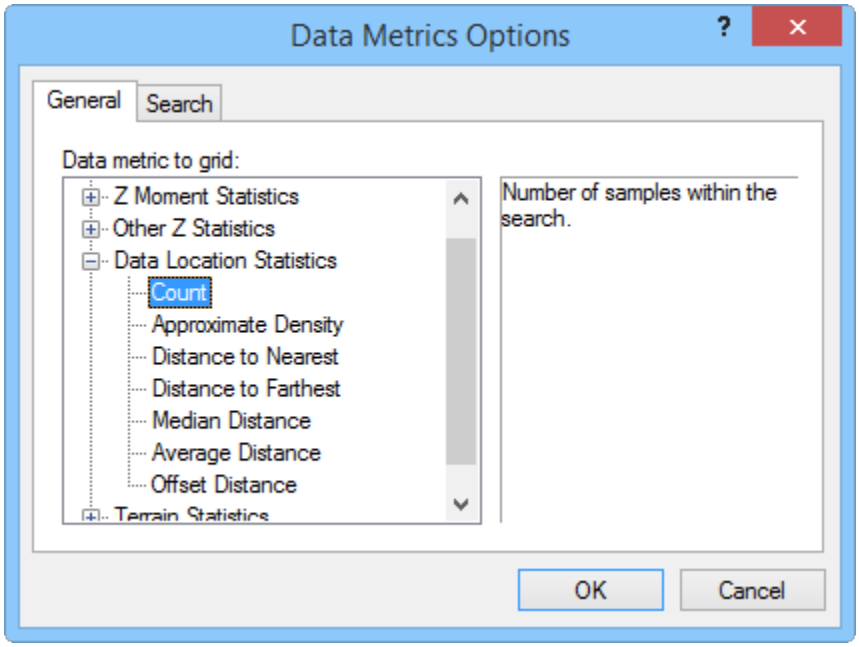
Least squares fitting is carried out using the data coordinates and it ignores faults. A sector search and the subsequent least squares fit are carried out for each grid node.

Data Metric	Definition	Equation
Terrain Slope	each nodal value is the terrain slope of the least-squares-fit plane of the data selected by the specified sector search centered at that node	$Z(r,c) = RadiansToDegrees(atan(hypot(A,B)))$
Terrain Aspect	each nodal value is the terrain aspect, as an angle from zero to 360	$Z(r,c) = 270.0 - RadiansToDegrees(atan2(A,B))$

	degrees, of the least-squares-fit plane of the data selected by the specified sector search centered at that node	

Specifying Data Metrics Options

In the **Property Manager Gridding** page, select *Data Metrics* as the *Gridding method* and then click the *Advanced Options* Edit... button to display the **Data Metrics Options** dialog.



*Select the data metric to grid in the **Data Metrics Options** dialog.*

Planar Grids

Data metrics is used to provide information about your data. After information is obtained from data metrics, it is likely you will grid the data again using one of the other gridding methods. When using data metrics, you will usually want to use the same grid line geometry and search parameters as when you grid the data using another gridding method.

When using some data metrics, a horizontal planar or sloping planar grid is generated. This is usually a result of the selected search method. For example, consider using a boundary with 47 area centroids and the *Count* data metric. The *Count* data metric determines the number of data points used in determining the grid node value. Since the boundary contains 47 data points, *No search (use all of the data)* is the default search method. Using *No search (use all of the data)* means for each calculated grid node, all 47 points are used in determining the grid node value. The resulting data metric grid is horizontal planar because all grid nodes have a Z value of 47. The grid report shows both the Z minimum and the Z maximum as 47.

Other data metrics can yield similar results. For example, if the search radius is large enough to include all of the data using *Terrain Statistics*, the moving average is computed with such a large

search radius that the resulting grid will be a planar surface at the data average. When interpreting data metrics results, keep the gridding parameters and the data metrics calculation approach in mind.

Inverse Distance to a Power

The *Inverse Distance to a Power* gridding method is a weighted average interpolator, and can be either an exact or a smoothing interpolator. Gridding methods are used with **MapViewer's** contour, gradient, and vector maps.

With *Inverse Distance to a Power*, data are weighted during interpolation such that the influence of one point relative to another declines with distance from the grid node. Weighting is assigned to data through the use of a weighting power that controls how the weighting factors drop off as distance from a grid node increases. The greater the weighting power, the less effect points far from the grid node have during interpolation. As the power increases, the grid node value approaches the value of the nearest point. For a smaller power, the weights are more evenly distributed among the neighboring data points.

Normally, *Inverse Distance to a Power* behaves as an exact interpolator. When calculating a grid node, the weights assigned to the data points are fractions, and the sum of all the weights are equal to 1.0. When a particular observation is coincident with a grid node, the distance between that observation and the grid node is 0.0, and that observation is given a weight of 1.0, while all other observations are given weights of 0.0. Thus, the grid node is assigned the value of the coincident observation. The *Smoothing* parameter is a mechanism for buffering this behavior. When you assign a non-zero *Smoothing* parameter, no point is given an overwhelming weight so that no point is given a weighting factor equal to 1.0.

One of the characteristics of *Inverse Distance to a Power* is the generation of "bull's-eyes" surrounding the position of observations within the gridded area. You can assign a smoothing parameter during *Inverse Distance to a Power* to reduce the "bull's-eye" effect by smoothing the interpolated grid.

Inverse Distance to a Power is a very fast method for gridding. With less than 500 points, you can use the *All Data* search type and gridding proceeds rapidly.

Inverse Distance to a Power Math

The equation used for *Inverse Distance to a Power* is:

$$\hat{Z}_j = \frac{\sum_{i=1}^{n} \frac{Z_i}{h_{ij}^{\beta}}}{\sum_{i=1}^{n} \frac{1}{h_{ij}^{\beta}}}$$

$$h_{ij} = \sqrt{d_{ij}^2 + \delta^2}$$

where:

h_{ij} is the effective separation distance between grid node "j" and the neighboring point "i."

$\hat{Z}_j$ is the interpolated value for grid node "j";

Z_i are the neighboring points;

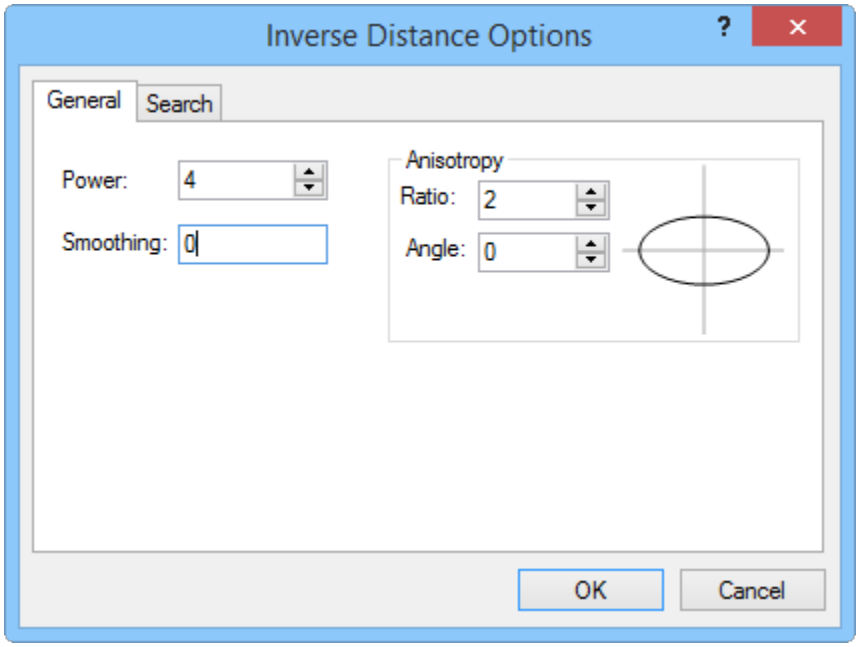
d_{ij} is the distance between the grid node "j" and the neighboring point "i";

β is the weighting power (the *Power* parameter); and

δ is the *Smoothing* parameter.

Specifying Inverse Distance to a Power Options

In the **Property Manager Gridding** page, select *Inverse Distance to a Power* as the *Gridding method* and then click the *Advanced Options* Edit... button to display the **Inverse Distance Options** dialog.



*Specifiy the power, smoothing, and anisotropy in the **Inverse Distance Options** dialog.*

- On the **General** page, the weighting *Power* parameter determines how quickly weights fall off with distance from the grid node. As the power parameter approaches zero, the generated surface approaches a horizontal planar surface through the average of all observations from the data. As the power parameter increases, the generated surface is a "nearest neighbor" interpolator and the resultant surface becomes polygonal. The polygons represent the nearest observation to the interpolated grid node. Power values between 1.2e-038 and 1.0e+038 are accepted, although powers should usually fall between one and three.
- The *Smoothing* factor parameter allows you to incorporate an "uncertainty" factor associated with your input data. The larger the smoothing factor parameter, the less

overwhelming influence any particular observation has in computing a neighboring grid node.

- You can also set the *Anisotropy* parameters on the **General** page. For more information about anisotropy options, see the Anisotropy.
- Specify the search options on the Search page.

Inverse Distance to a Power References

Davis, John C. (1986), *Statistics and Data Analysis in Geology*, John Wiley and Sons, New York.

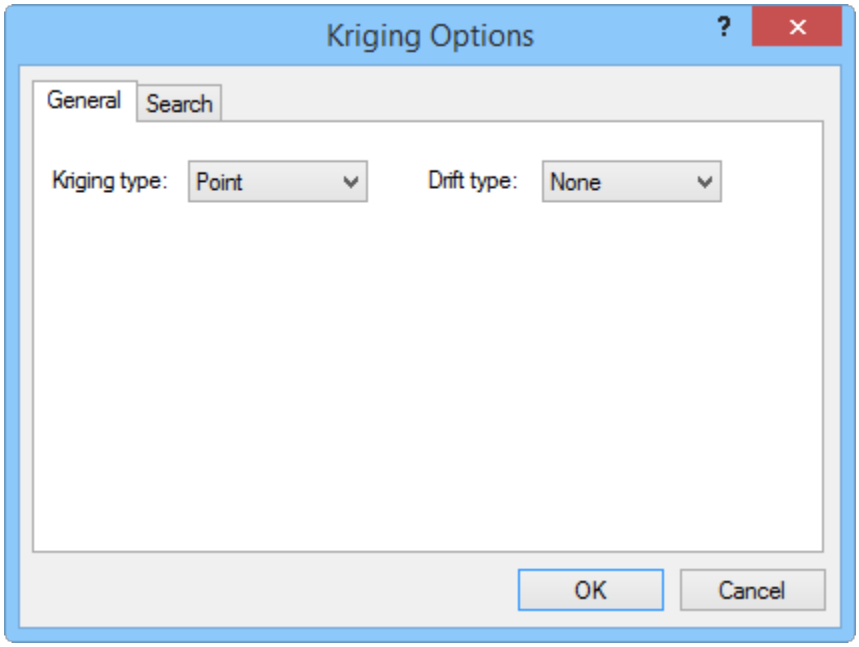
Franke, R. (1982), Scattered Data Interpolation: Test of Some Methods, *Mathematics of Computations*, v. 33, n. 157, p. 181-200.

Kriging

Kriging is an available gridding method. Kriging is a geostatistical gridding method that has proven useful and popular in many fields. This method produces visually appealing maps from irregularly spaced data. *Kriging* attempts to express trends suggested in your data, so that, for example, high points might be connected along a ridge rather than isolated by bull's-eye type contours.

Specifying Kriging Options

In the **Property Manager Gridding** page, select *Kriging* as the *Gridding method* and then click the *Advanced Options* Edit... button to display the **Kriging Options** dialog.



*Select the Kriging and Drift type in the **Kriging Options** dialog.*

- Choose *Point* or *Block Kriging* from the *Kriging type* list box. For more information on *Point* or *Block Kriging*, see Kriging Type.
- You can select a *Linear* or *Quadratic* drift type. A *Drift type* set to *None* is *Ordinary Kriging*, while *Linear* or *Quadratic* drift type is *Universal Kriging*.

- Specify the search options on the Search page.

Kriging Type

MapViewer includes two *Kriging* types for the Kriging gridding method: *Point Kriging* and *Block Kriging*. A detailed discussion of the two methods can be found in Isaaks and Srivastava (1989, Chapters 12 and 13). *Ordinary* (no drift) and *Universal Kriging* (linear or quadratic drift) algorithms can be applied to both *Kriging* types.

Both *Point Kriging* and *Block Kriging* generate an interpolated grid. *Point Kriging* estimates the values of the points at the grid nodes. *Block Kriging* estimates the average value of the rectangular blocks centered on the grid nodes. The blocks are the size and shape of a grid cell. Since *Block Kriging* is estimating the average value of a block, it generates smoother data (block averaging smooths). Furthermore, since *Block Kriging* is not estimating the value at a point, *Block Kriging* is not a perfect interpolator. That is even if an observation falls exactly on a grid node, the *Block Kriging* estimate for that node does not exactly reproduce the observed value.

Reference

Abramowitz, M., and Stegun, I. (1972), *Handbook of Mathematical Functions*, Dover Publications, New York.

Kriging References

For a detailed derivation and discussion of the kriging gridding method used with gradient maps, see Cressie (1991) or Journel and Huijbregts (1978). Journel (1989) is, in particular, a concise presentation of geostatistics (and *Kriging*). Isaaks and Srivastava (1989) offer a clear introduction to the topic, though it does not cover some of the more advanced details. For those who need to see computer code to really understand an algorithm, Deutsch and Journel (1992) includes a complete, well-written, and well-documented source code library of geostatistics computer programs in FORTRAN. Finally, a well-researched account of the history and origins of *Kriging* can be found in Cressie (1990).

Abramowitz, M., and Stegun, I. (1972), *Handbook of Mathematical Functions*, Dover Publications, New York.

Cressie, N. A. C. (1990), The Origins of Kriging, *Mathematical Geology*, v. 22, p. 239-252.

Cressie, N. A. C. (1991), *Statistics for Spatial Data*, John Wiley and Sons, Inc., New York, 900 pp.

Deutsch, C.V., and Journel, A. G. (1992), *GSLIB - Geostatistical Software Library and User's Guide*, Oxford University Press, New York, 338 pp.

Isaaks, E. H., and Srivastava, R. M. (1989), *An Introduction to Applied Geostatistics*, Oxford University Press, New York, 561 pp.

Journel, A.G., and Huijbregts, C. (1978), *Mining Geostatistics*, Academic Press, 600 pp.

Journel, A.G. (1989), *Fundamentals of Geostatistics in Five Lessons*, American Geophysical Union, Washington D.C.

Local Polynomial

The *Local Polynomial* gridding method assigns values to grid nodes by using a weighted least squares fit with data within the grid node's search ellipse.

Local Polynomial Math

For each grid node, the neighboring data are identified by the user-specified sector search. Using only these identified data, a local polynomial is fit using weighted least squares, and the grid node value is set equal to this value. Local polynomials can be order 1, 2, or 3.

The form of these polynomials are:

Order 1

$$F(X,Y) = a + bX + cY$$

Order 2

$$F(X,Y) = a + bX + cY + dXY + eX^2 + fY^2$$

Order 3

$$F(X,Y) = a + bX + cY + dXY + eX^2 + fY^2 + gX^2Y + hXY^2 + iX^3 + jY^3$$

The weighted least squares function weights data closer to the grid node higher and data further away lower. The weighting function depends on the search ellipse, the power, and the specific data geometry. The actual calculations for the weights are somewhat involved. Define T_{XX}, T_{XY}, T_{YX}, and T_{YY} by

$$T_{XX} = \frac{\cos(\phi)}{R_1}$$

$$T_{XY} = \frac{\sin(\phi)}{R_1}$$

$$T_{YX} = \frac{-\sin(\phi)}{R_2}$$

$$T_{YY} = \frac{\cos(\phi)}{R_2}$$

where

ϕ	is the angle of the search ellipse
R_1	is search radius 1
R_2	is search radius 2

Define A_{XX}, A_{XY}, and A_{YY} by

$$A_{XX} = T_{XX}^2 + T_{YX}^2$$

$$A_{XY} = 2(T_{XX}T_{XY} + T_{YX}T_{YY})$$

$$A_{YY} = T_{YY}^2 + T_{XY}^2$$

Note that these values (A_{XX}, A_{XY}, and A_{YY}) are function of the search ellipse parameters only. They are the same for all data and for all grid nodes.

Next, consider a datum at location (X_i, Y_i) and a grid node at location (X_0, Y_0). Let

$$dX = X_i - X_0$$
$$dY = Y_i - Y_0$$

then

$$R_i = \sqrt{A_{XX}dX^2 + A_{XY}dXdY + A_{YY}dY^2}$$

and finally,

$$W_i = (1 - R_i)^p$$

where W_i is the weight for datum i and *p* is the specified power.

Let the collection of neighboring data be enumerated as

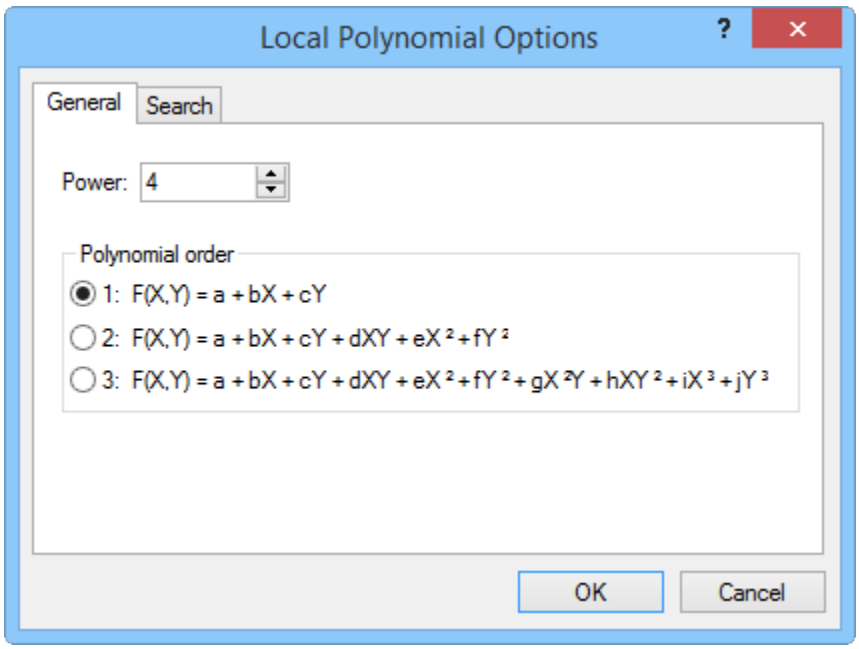
$$\{(x_i, y_i, z_i) \text{ for } i = 1, 2, \ldots, N\}$$

The local least squares parameters are computed by minimizing the weighted sum of the squared residuals:

$$Minimize \sum_{i=1}^{N} W_i \left[F(x_i, y_i) - z_i\right]^2$$

Specifying Local Polynomial Options

In the **Property Manager** Gridding page, select *Local Polynomial* as the *Gridding method* and then click the *Advanced Options* Edit... button to display the **Local Polynomial Options** dialog.



Change the power and polynomial order in the ***Local Polynomial Options*** *dialog.*

On the **General** page, set the *Power* to a number between 0 and 20 and then select a *Polynomial order*, 1, 2, or 3.

Specify the search options on the Search page.

Minimum Curvature

Minimum Curvature is widely used in the earth sciences. The interpolated surface generated by *Minimum Curvature* is analogous to a thin, linearly elastic plate passing through each of the data values with a minimum amount of bending. *Minimum Curvature* generates the smoothest possible surface while attempting to honor your data as closely as possible. *Minimum Curvature* is not an exact interpolator, however. This means that your data are not always honored exactly.

Minimum Curvature produces a grid by repeatedly applying an equation over the grid in an attempt to smooth the grid. Each pass over the grid is counted as one iteration. The grid node values are recalculated until successive changes in the values are less than the *Maximum Residuals* value, or the maximum number of iterations is reached (*Maximum Iteration* field).

Minimum Curvature Math

The **MapViewer** code fully implements the concepts of tension as described and detailed in Smith and Wessel (1990). Also, as recommended by Smith and Wessel (1991), this routine first fits a simple planar model using least squares regression:

$$AX + BY + C = Z(X,Y)$$

Thus, there are four steps to generate the final grid using the minimum curvature method.

1. The least squares regression model is fit to the data.
2. The values of the planar regression model at the data locations are subtracted from the data values; this yields a set of residual data values.

3. The minimum curvature algorithm is used to interpolate the residuals at the grid nodes.
4. The values of the planar regression model at the grid nodes are added to the interpolated residuals, yielding a final interpolated surface.

Unlike Smith and Wessel (1990), the fixed nodes are defined as the average of the neighboring observed values. That is, consider a rectangle the size and shape of a grid cell. The neighborhood of a grid node is defined by this rectangle centered on the grid node. If there are any observed data within the neighborhood of a grid node, the value of that grid node is fixed equal to the arithmetic average of contained data.

The *Minimum Curvature* algorithm generates the surface that interpolates the available data and solves the modified biharmonic differential equation with tension:

$$(1 - T_i)\nabla^2(\nabla^2 Z) - (T_i)\nabla^2 Z = 0$$

There are three sets of associated boundary conditions:

On the edges: $$(1 - T_b)\frac{\partial^2 Z}{\partial n^2} + (T_b)\frac{\partial Z}{\partial n} = 0$$

On the edges: $$\frac{\partial(\nabla^2 Z)}{\partial n} = 0$$

At the corners: $$\frac{\partial^2 Z}{\partial x \partial y} = 0$$

where:

∇^2 is the Laplacian operator

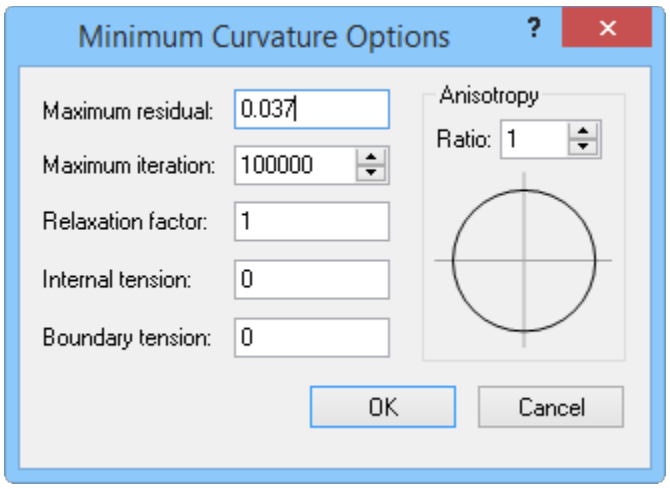
n is the boundary normal

T_i is the internal tension

T_b is the boundary tension

Specifying Minimum Curvature Options

In the **Property Manager Gridding** page, select *Minimum Curvature* as the *Gridding method* and then click the *Advanced Options* Edit... button to display the **Minimum Curvature Options** dialog.



*Change gridding options in the **Minimum Curvature Options** dialog.*

You can control the convergence criteria for *Minimum Curvature* on the **General** page:

- The *Maximum residual* parameter has the same units as the data, and an appropriate value is approximately 10 percent of the data precision. If data values are measured to the nearest 1.0 units, the *Maximum residual* value should be set at 0.1. The iterations continue until the maximum grid node correction for the entire iteration is less than the *Maximum residual* value. The default *Maximum residual* value is given by:

  Default Max Residual = 0.001 (Z*max* - Z *min*)

- The *Maximum iteration* parameter should be set at one to two times the number of grid nodes generated. For example, when generating a 50 by 50 grid using *Minimum Curvature*, the *Maximum iteration* value should be set between 2,500 and 5,000.
- For more information on the *Relaxation factor*, see Relaxation Factor.
- For more information on *Internal tension* and *Boundary tension*, see Internal and Boundary Tension.
- You can set *Anisotropy* parameters in this dialog. For more information about anisotropy options see Anisotropy.

Minimum Curvature References

Briggs, I. C. (1974), Machine Contouring Using Minimum Curvature, *Geophysics*, v. 39, n. 1, p. 39-48.

Press, W.H., Flannery, B.P., Teukolsky, S.A., and Vetterling, W.T. (1988), *Numerical Recipes in C*, Cambridge University Press.

Smith, W. H. F., and Wessel, P. (1990), Gridding with Continuous Curvature Splines in Tension, *Geophysics*, v. 55, n. 3, p. 293-305.

Internal and Boundary Tension

Qualitatively, the *Minimum Curvature* gridding algorithm for gradient maps is attempting to fit a piece of sheet metal through all of the observations without putting any creases or kinks in the surface. Between the fixed observation points, the sheet bows a bit. The *Internal tension* is used to

control the amount of this bowing on the interior: the higher the tension, the less the bowing. For example, a high tension makes areas between observations look like facets of a gemstone. The *Boundary tension* controls the amount of bowing on the edges. The range of values for *Internal tension* and *Boundary tension* are 0 to 1. By default, the *Internal tension* and the *Boundary tension* are set to 0.

Convergence

As mentioned in Briggs (1974), and strongly recommended in Smith and Wessel (1990), **MapViewer** uses a "multiple lattice strategy" with the Minimum Curvature gridding method with gradient maps. It starts with a coarse grid and then incrementally refines the grid until the final density is achieved.

The relaxation approach is a local smoothing process and, consequently, short-wavelength components of Z are found quickly. On the other hand, the relaxation process does not propagate the effects of the data constraints to longer wavelengths efficiently.

As recommended by Briggs (1974) and Smith and Wessel (1990), this routine determines convergence by comparing the largest magnitude nodal change in one iteration to the specified tolerance (*Maximum Residual*).

The status of the algorithm is reflected on the status line. For example: *pass 2 of 4, iteration 360 (0.1234 > 0.08)*

This says that there are four levels of grids considered (the fourth is the final grid), and the algorithm is currently working on the second. The algorithm is currently on iteration 360. If the iteration number exceeds the *Maximum Iterations* parameter, the algorithm terminates without generating the grid and provides a failure-to-converge warning. The numbers in the parentheses are the current largest residual and the largest allowed residual. The largest allowed residual equals the *Maximum Residual* parameter on the final pass.

The *Minimum Curvature* method requires at least four data points.

Relaxation Factor

The *Minimum Curvature* gridding algorithm for gradient maps solves the specified partial differential equation using a successive over-relaxation algorithm. The interior is updated using a "chessboard" strategy, as discussed in Press, et al. (1988, p. 868). The only difference is that the biharmonic equation must have nine different "colors," rather than just black and white.

The *Relaxation factor* is as described in Press et al. (1988). In general, the *Relaxation factor* should not be altered. The default value (1.0) is a good generic value. Roughly, the higher the *Relaxation factor* (closer to two) the faster the *Minimum Curvature* algorithm converges, but the more likely it will not converge at all. The lower the *Relaxation factor* (closer to zero) the more likely the *Minimum Curvature* algorithm will converge, but the algorithm is slower. The optimal *Relaxation factor* is derived through trial and error.

Modified Shepard's Method

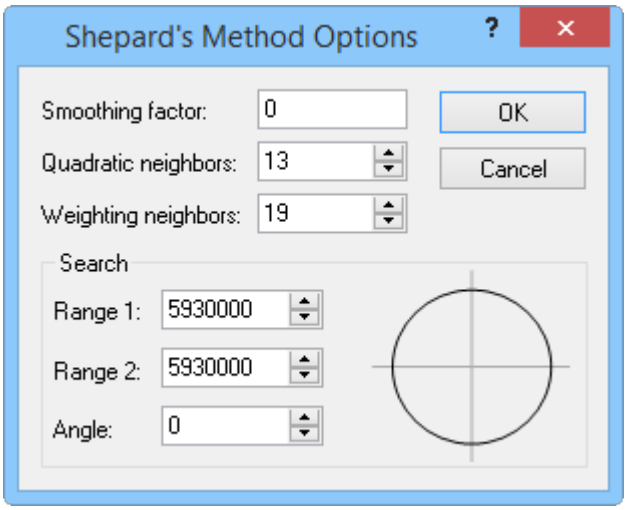
Modified Shepard's Method uses an inverse distance weighted least squares method for gridding. As such, *Modified Shepard's Method* is similar to the Inverse Distance to a Power interpolator, but the

use of local least squares eliminates or reduces the "bull's-eye" appearance of the generated data. *Modified Shepard's Method* can be either an exact or a smoothing interpolator.

The **MapViewer** algorithm implements Franke and Nielson's (1980) Modified Quadratic Shepard's Method with a full sector search as described in Renka (1988).

Specifying Modified Shepard's Method Options

In the **Property Manager Gridding** page, select *Modified Shepard's Method* as the *Gridding method* and then click the *Advanced Options* Edit... button to display the **Shepard's Method Options** dialog.



*Change gridding options in the **Shepard's Method Options** dialog.*

Quadratic Neighbors

The *Modified Shepard's Method* starts by computing a local least squares fit of a quadratic surface around each observation. The *Quadratic neighbors* parameter specifies the size of the local neighborhood by specifying the number of local neighbors. The local neighborhood is a circle of sufficient radius to include exactly this many neighbors. The default value follows the recommendation of Renka (1988).

Weighting Neighbors

The interpolated values are generated using a distance-weighted average of the previously computed quadratic fits associated with neighboring observations. The *Weighting neighbors* parameter specifies the size of the local neighborhood by specifying the number of local neighbors. The local neighborhood is a circle of sufficient radius to include exactly this many neighbors. The default value follows the recommendation of Renka (1988).

Smoothing Factor

You can assign a smoothing parameter to the gridding operation. The *Smoothing factor* parameter allows *Modified Shepard's Method* to operate as a smoothing interpolator. Greater smoothing occurs as you increase the value of the smoothing parameter. In general, values between zero and one are most reasonable.

Search

For more information about the search options, see Search.

Modified Shepard's Method References

Franke, R., and Nielson, G. (1980), Smooth Interpolation of Large Sets of Scattered Data, *International Journal for Numerical Methods in Engineering*, v. 15, p. 1691-1704.

Renka, R. J. (1988), Multivariate Interpolation of Large Sets of Scattered Data, *ACM Transaction on Mathematical Software*, v. 14, n. 2, p. 139-148.

Shepard, D. (1968), A two dimensional interpolation function for irregularly spaced data, *Proc. 23rd Nat. Conf. ACM*, p. 517-523.

Moving Average

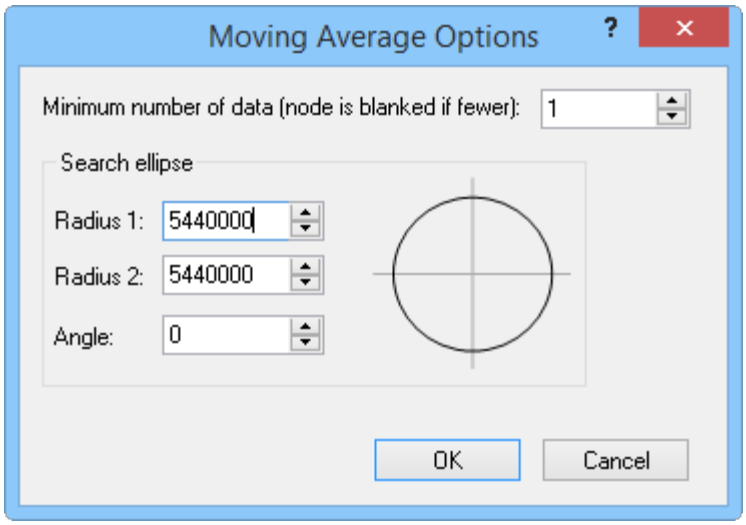
The *Moving Average* gridding method assigns values to grid nodes by averaging the data within the grid node's search ellipse. This gridding method is not recommended for generating maps from small and moderate-sized data sets. It is, however, a useful tool for characterizing and investigating large and very large spatial data sets.

Search Ellipse

To use *Moving Average*, define a search ellipse and specify the minimum number of data to use. For each grid node, the neighboring data are identified by centering the search ellipse on the node. The output grid node value is set equal to the arithmetic average of the identified neighboring data. If there are fewer than the specified minimum number of data within the neighborhood, the grid node is blanked.

Specifying Moving Average Options

In the **Property Manager Gridding** page, select *Moving Average* as the *Gridding method* and then click the *Advanced Options* Edit... button to display the **Moving Average Options** dialog.



*Set gridding options in the **Moving Average Options** dialog.*

- The *Minimum number of data (node is blanked if fewer)* value sets the specified number of points when interpolating a grid node. If the minimum number of points is not found, the blanking value is assigned to the grid node.
- Search ellipses are specified by defining the ellipse radii and the angle for the ellipse. *Radius 1* and *Radius 2* are positive values indicating the distance in data units. *Angle* is the inclination between the positive X axis and the ellipse axis associated with *Radius 1*. This can be any value between -360 and +360 degrees.

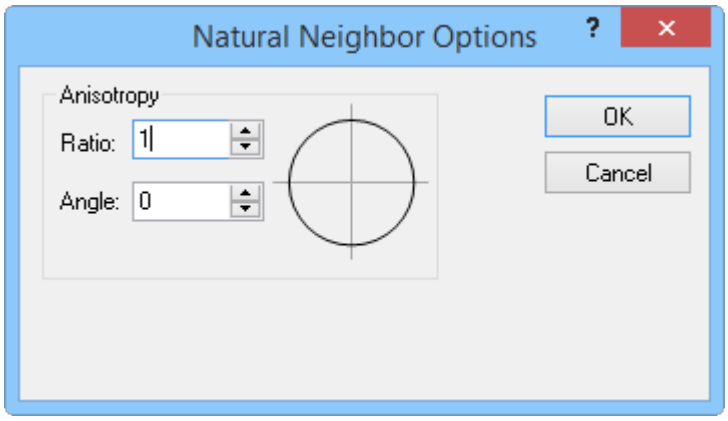
Natural Neighbor

The *Natural Neighbor* gridding method is quite popular in some fields. What is *Natural Neighbor* interpolation? Consider a set of Thiessen polygons (the dual of a Delaunay triangulation). If a new point (target) were added to the data set, these Thiessen polygons would be modified. In fact, some of the polygons would shrink in size, while none would increase in size. The area associated with the target's Thiessen polygon that was taken from an existing polygon is called the "borrowed area." The *Natural Neighbor* interpolation algorithm uses a weighted average of the neighboring observations, where the weights are proportional to the "borrowed area."

The *Natural Neighbor* method does not extrapolate data beyond the convex hull of the data locations (i.e. the outline of the Thiessen polygons).

Specifying Natural Neighbor Options

In the **Property Manager Gridding** page, select *Natural Neighbor* as the *Gridding method* and then click the *Advanced Options* Edit... button to display the **Natural Neighbor Options** dialog. For more information about anisotropy options see Anisotropy.



*Set Anisotropy options in the **Natural Neighbor Options** dialog.*

Natural Neighbor References

The main reference for this method is Sibson (1981), however, also refer to Sibson (1980) and Watson (1994). Watson (1994) discusses the *Natural Neighbor* gridding technique in some detail, though **MapViewer** does not use any of Watson's source code.

Sibson, R. (1980), A Vector Identity for the Dirichlet Tesselation, *Math. Proc. Cambridge Phil. Soc.*, v. 87, p. 151-155.

Sibson, R. (1981), A Brief Description of Natural Neighbor Interpolation, *Interpreting Multivariate Data*, V. Barnett editor, John Wiley and Sons, New York, p. 21-36.

Watson, Dave (1994), *Nngridr - An Implementation of Natural Neighbor Interpolation*, David Watson, P.O. Box 734, Clarement, WA 6010, Australia.

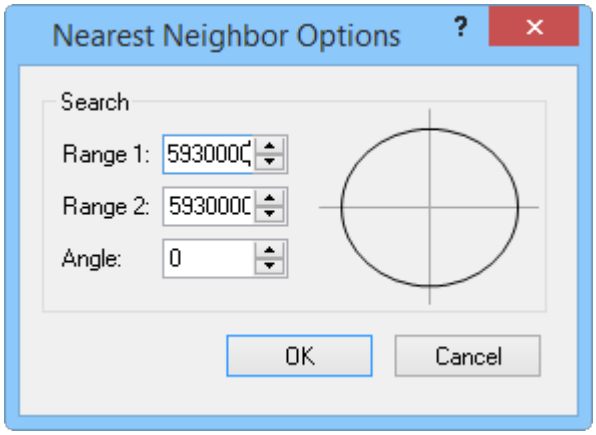
Nearest Neighbor

The *Nearest Neighbor* gridding method assigns the value of the nearest point to each grid node. In cases where the data are nearly on a grid with only a few missing values, this method is effective for filling in the holes in the data.

Sometimes with nearly complete grids of data, there are areas of missing data that you want to exclude. In this case, you can set the Search Ellipse to a value so the areas of no data are assigned the blanking value. By setting the search ellipse radii to values less than the distance between data values in your file, the blanking value is assigned at all grid nodes where data values do not exist.

Specifying Nearest Neighbor Options

In the **Property Manager Gridding** page, select *Nearest Neighbor* as the *Gridding method* and then click the *Advanced Options* Edit... button to display the **Nearest Neighbor Options** dialog.



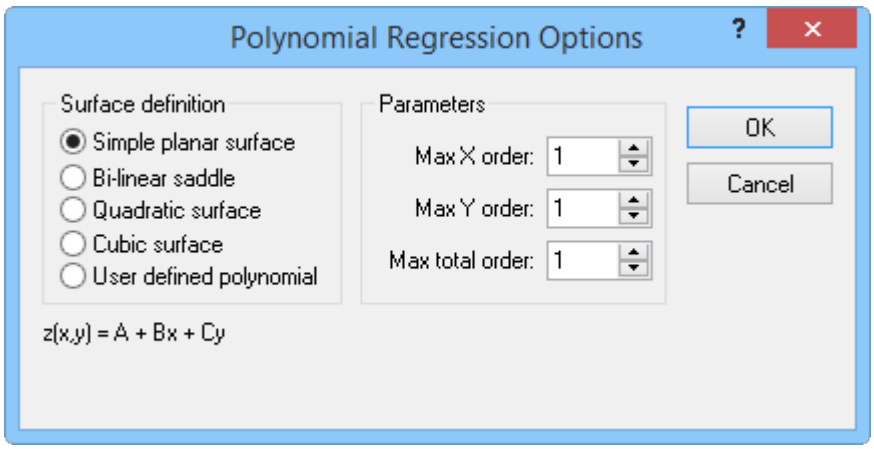
You can set the search range and angle in the ***Nearest Neighbor Options*** *dialog.*

Polynomial Regression

Polynomial Regression is used to define large-scale trends and patterns in your data. *Polynomial Regression* is not really an interpolator because it does not attempt to predict unknown Z values. There are several options you can use to define the type of trend surface.

Specifying Regression Options

In the **Property Manager Gridding** page, select *Polynomial Regression* as the *Gridding method* and then click the *Advanced Options* Edit... button to display the **Regression Options** dialog.



Change gridding options in the ***Polynomial Regression Options*** *dialog.*

You can select the type of polynomial regression to apply to your data in the *Surface definition* group. As you select the different types of polynomials, a generic polynomial form of the equation is presented in the dialog, and the values in the *Parameters* group change to reflect the selection. The available choices are: *Simple planar surface*, *Bi-linear saddle*, *Quadratic surface*, *Cubic surface*, and *User defined polynomial*.

The *Parameters* group allows you to specify the maximum powers for the X and Y component in the polynomial equation. As you change the *Parameters* values, the options are changed in the *Surface definition* group to reflect the defined parameters.

- The *Max X order* specifies the maximum power for the X component in the polynomial equation.
- The *Max Y order* specifies the maximum power for the Y component in the polynomial equation.
- The *Max total order* specifies the maximum sum of the *Max X order* and *Max Y order* powers. All of the combinations of the X and Y components are included in the polynomial equation as long as the sum of the two powers does not exceed the *Max total order* value.

Polynomial Regression Reference

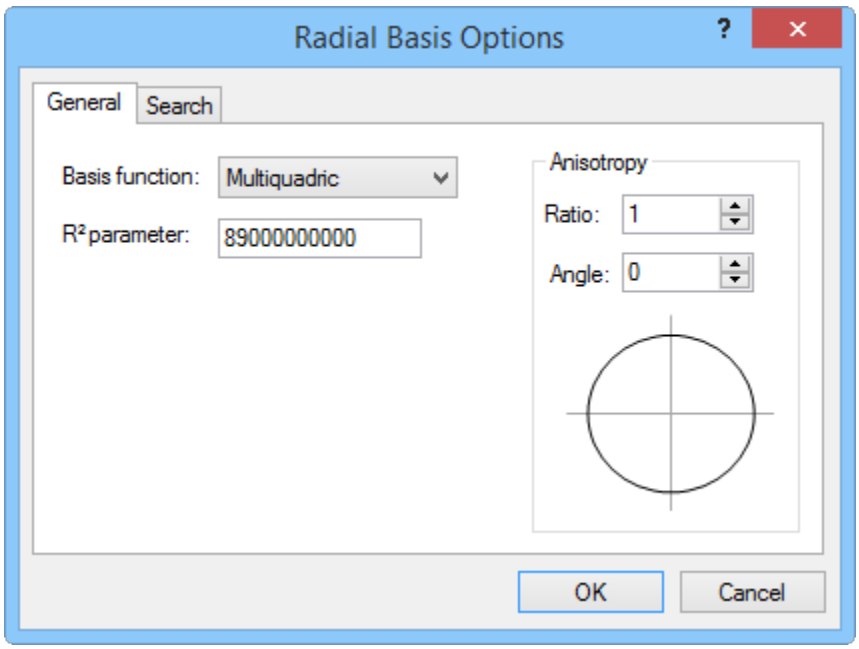
Draper, N., and Smith, H. (1981), *Applied Regression Analysis*, second edition, Wiley-Interscience, 709 pp.

Radial Basis Function

Radial Basis Function interpolation is a diverse group of data interpolation methods. All of the *Radial Basis Function* methods are exact interpolators, so they attempt to honor your data. You can introduce a smoothing factor to all the methods in an attempt to produce a smoother surface.

Specifying Radial Basis Function Options

In the **Property Manager Gridding** page, select *Radial Basis Function* as the *Gridding method* and then click the *Advanced Options* Edit... button to display the **Radial Basis Options** dialog.



Select the basis function, R^2 parameter, and anisotropy options in the ***Radial Basis Options*** *dialog.*

Function Types

The *Basis function* list specifies the basis kernel function to use during gridding. This defines the optimal weights applied to the data points during the interpolation. In terms of the ability to fit your data and to produce a smooth surface, the *Multiquadric* method is considered by many to be the best. Successful use of the *Thin Plate Spline* basis function is also reported regularly in the technical literature.

The basis kernel functions define the optimal set of weights to apply to the data points when interpolating a grid node. The available basis kernel functions are listed in the *Basis function* drop-down list in the **Radial Basis Function Options** dialog.

Type	**Equation**
Inverse Multiquadric	$B(h) = \frac{1}{\sqrt{h^2 + R^2}}$
Multilog	$B(h) = \log(h^2 + R^2)$
Multiquadric	$B(h) = \sqrt{h^2 + R^2}$
Natural Cubic Spline	$B(h) = \left(h^2 + R^2\right)^{3/2}$
Thin Plate Spline	$B(h) = \left(h^2 + R^2\right)\log\left(h^2 + R^2\right)$

where:

h is the anisotropically rescaled, relative distance from the point to the node

R^2 is the smoothing factor specified by the user

R^2 Value

The *R^2 parameter* is a shaping or smoothing factor. The larger the *R^2 parameter* shaping factor, the rounder and smoother the results. There is no universally accepted method for computing an optimal value for this factor. A reasonable trial value for *R^2 parameter* is between the average sample spacing and one-half the average sample spacing.

The default value for R^2 in the Radial Basis Function gridding algorithm is calculated as follows:

(length of diagonal of the data extent)2 / (25 * number of data points)

Anisotropy

For more information about anisotropy options see Anisotropy.

Radial Basis Function References

A concise and readable introduction to *Radial Basis Function* interpolation can be found in Carlson and Foley (1991a). Given the clarity of presentation and the numerous examples, Hardy (1990) provides an excellent overview of the method, although this paper focuses exclusively on the special case of multiquadrics.

Carlson, R.E., and Foley, T.A. (1991a), *Radial Basis Interpolation Methods on Track Data*, Lawrence Livermore National Laboratory, UCRL-JC-1074238.

Carlson, R. E., and Foley, T. A. (1991b), *The Parameter R^2 in Multiquadric Interpolation*, Computers Math. Applic, v. 21, n. 9, p. 29-42.

Franke, R. (1982), *Scattered Data Interpolation: Test of Some Methods*, Mathematics of Computations, v. 33, n. 157, p. 181-200.

Hardy, R. L. (1990), *Theory and Applications of the Multiquadric-BiHarmonic Method*, Computers Math. Applic, v. 19, n. 8/9, p. 163-208.

Powell, M.J.D. (1990), *The Theory of Radial Basis Function Approximation in 1990*, University of Cambridge Numerical Analysis Reports, DAMTP 1990/NA11.

Triangulation with Border Color Interpolation

The *Triangulation with Border Color Interpolation* method uses triangles to determine data values. The data are extrapolated within the triangles using the Triangulation with Linear Interpolation algorithm.

The *Triangulation with Border Color Interpolation* gridding method is only available for gradient maps.

This method differs from the Triangulation with Linear Interpolation gridding method, in that the rectangular boundary drawn around the outside edge of all data is included in the data. With *Triangulation with Linear Interpolation*, the algorithm does not extrapolate beyond the data limits. The data are extrapolated beyond the data limits with *Triangulation with Border Interpolation*. Also,

the data are not projected on to a grid with this method. The base color for the region of no data is set through the *Undefined border color* on the Gridding page.

There are no special options for this method.

Triangulation with Linear Interpolation

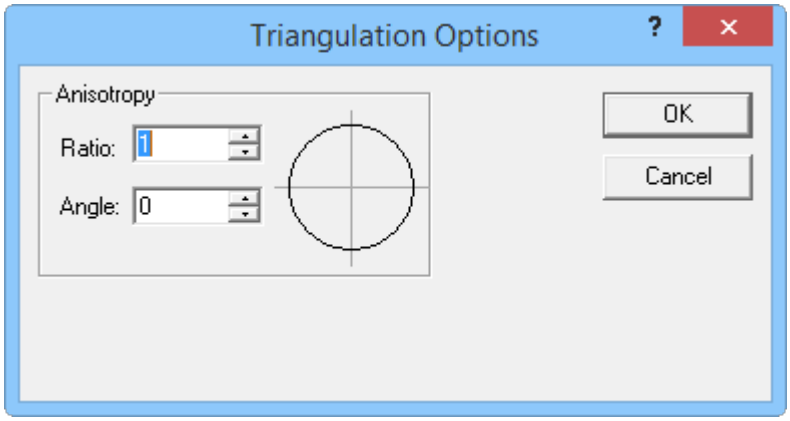
The *Triangulation with Linear Interpolation* method uses the optimal Delaunay triangulation. The algorithm creates triangles by drawing lines between data points. The original points are connected in such a way that no triangle edges are intersected by other triangles. The result is a patchwork of triangular faces over the extent of the grid. This method is an exact interpolator.

Each triangle defines a plane over the grid nodes lying within the triangle, with the tilt and elevation of the triangle determined by the three original data points defining the triangle. All grid nodes within a given triangle are defined by the triangular surface. Because the original data are used to define the triangles, the data are honored very closely.

Triangulation with Linear Interpolation works best when your data are evenly distributed over the grid area. Data sets that contain sparse areas result in distinct triangular facets on the map.

Specifying Triangulation with Linear Interpolation Options

In the **Property Manager Gridding** page, select *Triangulation with Linear Interpolation* as the *Gridding method* and then click the *Advanced Options* Edit... button to display the **Triangulation Options** dialog.



*Change anisotropy options in the **Triangulation Options** dialog.*

For more information about anisotropy options see Anisotropy.

Triangulation with Linear Interpolation References

The **MapViewer** implementation of *Triangulation with Linear Interpolation* is based upon three papers. Lee and Schachter (1980) present a complete discussion of (Delaunay) triangulation, including the details of two algorithms and the underlying mathematical proofs. Lawson (1977) is equally informative. The algorithm presented in Guibas and Stolfi (1985) form the basis for the **MapViewer** implementation.

Guibas, L., and J. Stolfi (1985), Primitives for the Manipulation of General Subdivisions and the Computation of Voronoi Diagrams, ACM *Transactions on Graphics*, v. 4, n. 2, p. 74-123.

Lawson, C. L. (1977), Software for C1 surface interpolation, *Mathematical Software III*, J. Rice (ed.), Academic Press, New York, p. 161-193.

Lee, D. T., and Schachter, B. J. (1980), Two Algorithms for Constructing a Delaunay Triangulation, *International Journal of Computer and Information Sciences*, v. 9, n. 3, p. 219-242.

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Customer Service Resources

Before calling, please check the following available resources as your question may already be answered.

Registration: Register online at www.goldensoftware.com or fax to the number below
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Forums: www.goldensoftware.com/forum or in the **MapViewer** program using the **File | Online | Forums** command
Frequently Asked Questions: In the **MapViewer** program using the **File | Online | Frequently Asked Questions** command
Tutorial: Complete the tutorial section in this quick start guide or in the **MapViewer** program using the **Home | Help | Tutorial** command
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