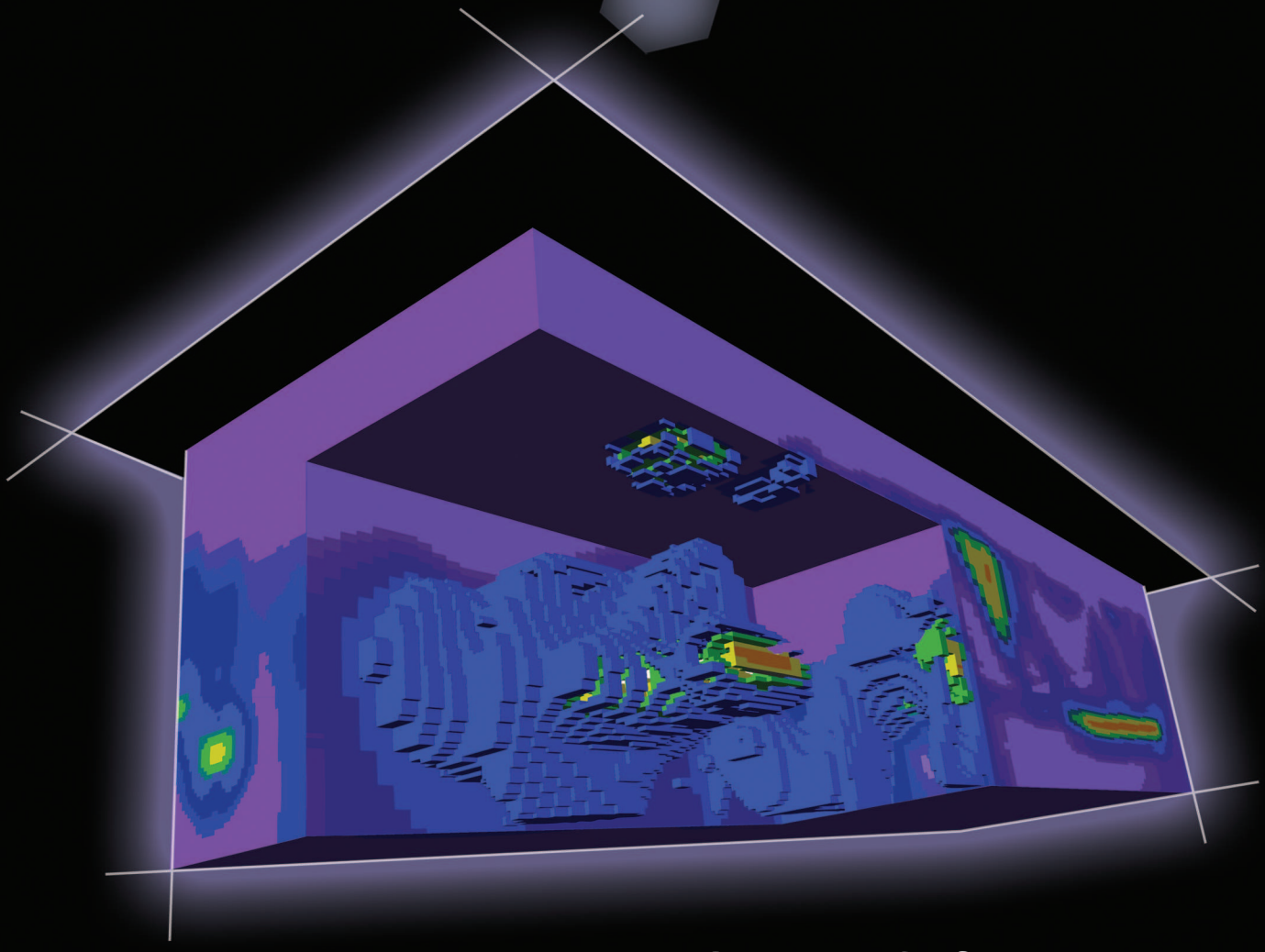
voxler® 3

Full User's Guide



Golden Software, Inc.

Voxler® Registration Information

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

Register your **Voxler** serial number online at www.GoldenSoftware.com. Or, complete the *Registration Form.PDF*, located in the main directory of the installation CD. Return the *Registration Form.PDF* by mail or fax. This information will not be redistributed.

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

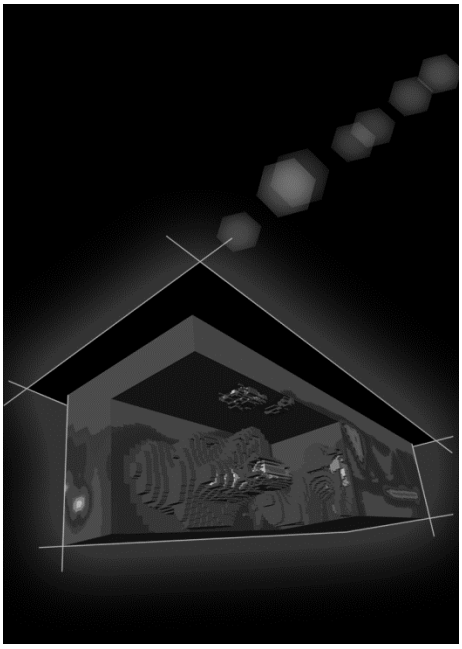
For future reference, write your serial number on the line below.

_____

Voxler®

User's Guide

3D Data Visualization



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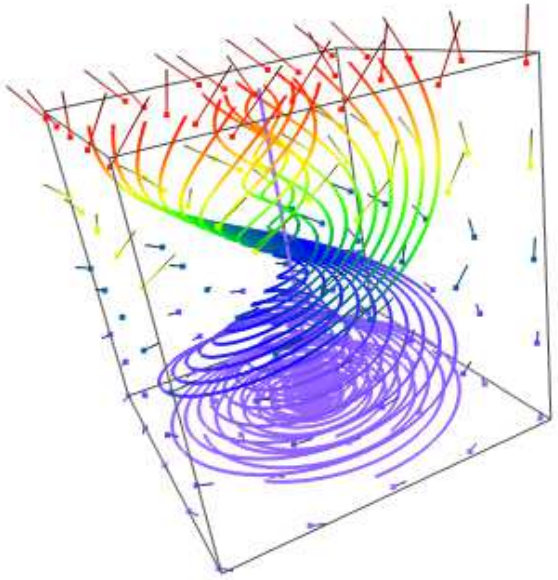
Chapter 1

Introducing Voxler

Introduction to Voxler®

Welcome to **Voxler**, a three-dimensional scientific visualization program oriented primarily toward volumetric rendering and three-dimensional data display. While the emphasis is on three-dimensional volumes, **Voxler** can also utilize two-dimensional grids including DEM files, images, and scattered point data. **Voxler** can display streamlines, vector plots, contour maps, isosurfaces, image slices, three-dimensional scatter plots, direct volume rendering, 3D blocks, well traces, and more. Computational modules include three-dimensional gridding, resampling, numerous lattice operations, and image processing. **Voxler** is designed for displaying XYZC data, where C is a variable at each X, Y, and Z location.

With **Voxler**, you can create stunning graphics output for your true three-dimensional models. Models can be sliced, displayed at any angle, and even animated with a simple mouse movement. Standard or custom colorization can be applied to the models.



Create stunning 3D graphics like this one by combining multiple map types. This example shows a vector plot, stream lines, and a bounding box.

Who Uses Voxler?

People from many different disciplines use **Voxler**. The geosciences generate large amounts of volumetric data from drill cores, seismic studies, ground penetrating radar, subsurface mapping, and remote sensing. Another source of data is from medical imaging generated by CT and MRI scans. Meteorological data, high-resolution microscopy, flow fields, and groundwater modeling are also sources for volumetric data. **Voxler** users include archeologists, climatologists, educators, engineers, doctors, hydrogeologists, geologists, geophysicists, medical researchers, students, and more. Anyone wanting to visualize the relationship of their three-dimensional data with stunning graphical output will benefit from **Voxler's** powerful features!

System Requirements

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

- Windows XP SP2 or higher, Vista, 7, or higher
- 512 MB RAM minimum for simple data sets, minimum 1 GB RAM recommended
- At least 100 MB free hard disk space
- 1024 x 768 or higher monitor resolution with a minimum 16-bit color depth
- Video card with OpenGL acceleration highly recommended

Installation Directions

Installing **Voxler 3** requires logging onto the computer with an account that has Administrator rights. Golden Software does not recommend installing **Voxler 3** over any previous version of **Voxler**. **Voxler 3** can coexist with older versions (i.e. **Voxler 2**) as long as they are installed in different directories. By default, the program directories are different. For detailed installation directions, see the Readme.rtf file.

Installing Voxler

To install **Voxler** from a CD:

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

To install **Voxler** from a download:

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

Updating Voxler

To update **Voxler**, open the program and click the **Help | Check for Update** command. This will launch the Internet Update program which will check Golden Software's servers for any free updates. If there is an update for your version of **Voxler** (i.e. **Voxler** 3.0 to **Voxler** 3.1), you will be prompted to download the update.

Uninstalling Voxler

Windows XP: To uninstall **Voxler**, go to the Windows Control Panel and double-click *Add/Remove Programs*. Select **Voxler 3** from the list of installed applications. Click the *Remove* button to uninstall **Voxler 3**.

Windows Vista and 7: To uninstall **Voxler** when using the *Regular Control Panel Home*, click the *Uninstall a program* link. Select **Voxler 3** from the list of installed applications. Click the *Uninstall* button to uninstall **Voxler 3**.

Windows Vista: To uninstall **Voxler** when using the *Classic View Control Panel*, double-click *Programs and Features*. Select **Voxler 3** from the list of installed applications. Click the *Uninstall* button to uninstall **Voxler 3**.

A Note About the Documentation

The **Voxler** documentation includes the online help and the quick start guide. Use the **Help | Contents** command in the program to access the detailed online help. Information about each command and feature in **Voxler** is included in the online help. In the event the information cannot be located in the online help, other sources of **Voxler** help include our support forum, frequently asked questions, knowledge base, and contacting our technical support engineers.

Various font styles are used throughout the **Voxler** quick start guide and online help. **Bold** text indicates menu commands, dialog names, and page names. *Italic* text indicates items within a dialog such as modules, group box names, options, and field names. For example, the **Import** dialog contains a *Look in* list. Bold and italic text may occasionally be used for emphasis.

In addition, menu commands appear as **File | Import**. This means, "click on the **File** menu at the top of the plot window and then click on **Import** within the **File** menu list." The first word is always the menu name, followed by the commands within the menu list.

Three-Minute Tour

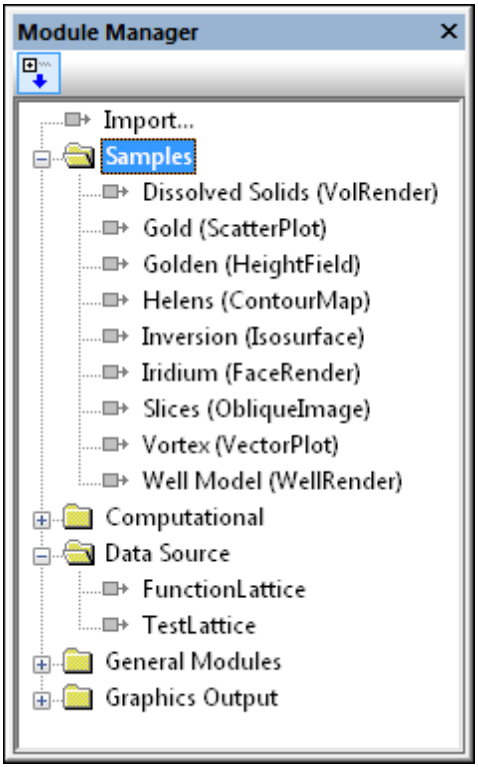
We have included several sample files with **Voxler** so that you can quickly see some of **Voxler's** capabilities. The sample files do not include all of **Voxler's** many data types, modules, and features. After opening a sample file, the **Network Manager** is a good source of information as to what is included in each file. Sample files are located at C:\Program Files\Golden Software\Voxler 3\Samples, by default.

Sample files are a great way to quickly display projects made in **Voxler** by Golden Software. Browse the sample files to get ideas and view different possibilities that **Voxler** has to offer. Sample files can be customized and saved to a new location.

View Sample Voxler Files

To view the example files using the **Module Manager**:

1. Open **Voxler**.
2. Choose the **View | Managers | Module Manager** command to display the **Module Manager**, if it is not already displayed. A check mark indicates the manager is visible. The **Module Manager** is located on the left side of the window by default. The sample files are located in the *Samples* folder at the top of the **Module Manager**.
3. Double-click on a sample file, such as *Well Model (WellRender)* to open the file and display the objects in the **Viewer** window. Each time you double-click on a file, the new file opens in the **Viewer** window and the previous file closes.



*The **Module Manager** is one location to access sample files.*

Alternatively, use the **File | Open** command to open example .VOXB files.

Using Voxler

To create a three-dimensional model in **Voxler**, you will need to start with data. **Voxler** supports several different data types. Modules are attached to data in order to display the data or make adjustments to the data. Alternatively, data can be gridded to be displayed as isosurfaces, height fields, and image slices. The type of data loaded determines what kind of operations can be performed on it. For detailed information about each type of data, refer to *Chapter 4 – Data Source Modules* chapter. Refer to the *Introduction to Modules* section for more information on the types of operations that can be performed.

1. Open **Voxler**.
2. Click the **File** | **Import** command.
3. In the **Import** dialog, select the data file and click *Open* .
4. In the **Data Import Options** dialog, set the file format options. You can select *Delimiters* and how to treat text. Click *OK*.
5. In the **Select Data Columns** dialog, set the *X*, *Y*, *Z*, and *Component* information. Set any additional *Options* and click *OK*.
6. The data loads into **Voxler** and is displayed as a data module in the **Network Manager**. If you do not see the **Network Manager**, click the **View** | **Managers** | **Network Manager** command. A check mark indicates the manager is open. Adding modules to the data set will create a visualization pipeline in the **Network Manager** that will allow you to create the output you desire.
7. Right-click the data module and select **Graphics Output** | **ScatterPlot**. The output is displayed in the **Viewer** window.
8. Select the *ScatterPlot* module in the **Network Manager** and the properties are displayed in the **Property Manager**. Adjust the properties as desired.
9. Choose the **File** | **Save As** command. Enter a *File name* in the **Save As** dialog and click the *Save* button to save your **Voxler** project.

The tutorial lessons in *Chapter 2* contain detailed instructions on using **Voxler**. It is highly recommended that you complete the tutorial before beginning work in **Voxler**.

Using Scripter

Tasks can be automated in **Voxler** 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 **Voxler**. You can do practically everything with a script that you can do manually with the mouse or from your keyboard. Scripts are useful for automating repetitive tasks and consolidating a sequence of steps. **Scripter**

is installed in the same location as **Voxler**. Refer to *Chapter 21 – Automating Voxler* for more information about **Scripter**. We have included several example scripts so that you can quickly see some of **Scripter's** capabilities.

Sample Script Files

A variety of automation examples are available. You can run the script as is or you can customize the script. Example scripts are located at C:\Program Files\Golden Software\Voxler 3\Samples\Scripts, by default.

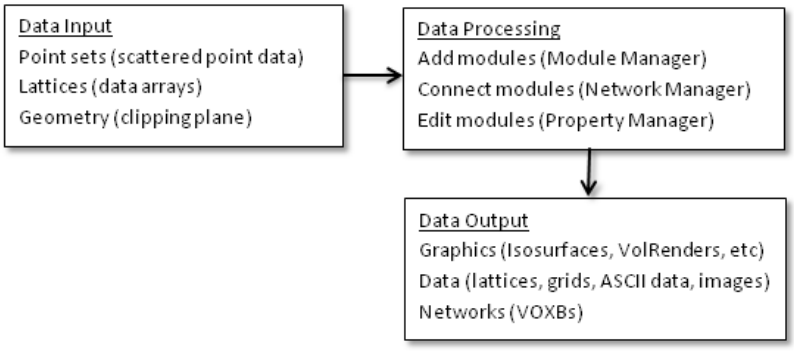
To run a sample script in Scripter:

1. Open **Scripter** by navigating to the installation folder, C:\Program Files\Golden Software\Voxler 3\Scripter. Double-click on the Scripter.EXE application file.
2. Click the **File** | **Open** command and select a sample script .BAS file in the C:\Program Files\Golden Software\Voxler 3\Samples\Scripts folder.
3. Use the **Script** | **Run** command and the script is executed.

Voxler User Interface

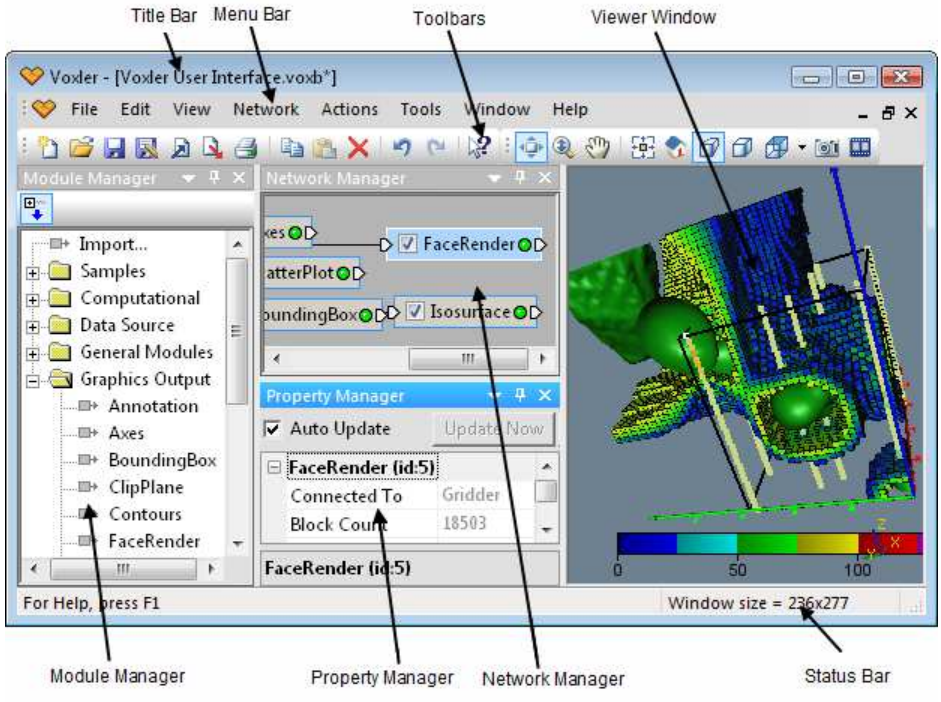
Voxler uses multi-threading to keep the user interface responsive, even with computationally intensive background tasks. The user interface architecture is based on a single-document, multi-view model. This allows a document to exist with any number of view windows open on the document. When the last view window is closed, the program prompts for a save of changes (if any) and the document is closed. When the **File** | **New** command is chosen, the existing document (if any) is closed to make room for the new document.

Voxler uses a visualization network to represent data, processing paths, and output. All data and modules for the current project are visible in the **Network Manager**. Select a module to modify the module properties in the **Property Manager**. The graphical output from a module is displayed in the **Viewer** window. **Voxler** files can be saved, exported to a variety of file formats, or recorded using the capture video command.



*Several data types can be loaded into **Voxler**. Once the data are loaded, you can select modules applicable to the data. The data can be visualized and exported.*

The **Voxler** user interface layout consists of the title bar, menu bar, toolbars, **Module Manager**, **Network Manager**, **Property Manager**, **Viewer** window, and status bar.



*The **Voxler** user interface includes several toolbars and windows.*

The following table summarizes the function of each component of the user interface.

Component Name	Component Function
Title Bar	The title bar lists the program name plus the saved **Voxler** .VOXB file name (if any). An asterisk (*) after the file name indicates the file has been modified.
Menu Bar	The menu bar contains the commands used to run **Voxler**.
Toolbars	The toolbars contain **Voxler** tool buttons, which are usually shortcuts to menu commands. Move the cursor over each button to display a screen tip describing the command. Toolbars can be docked or floating.
Module Manager	The **Module Manager** lists example files and provides quick access to modules. The **Module Manager** is initially docked on the far left side of the screen.
Network Manager	The **Network Manager** displays the visualization network, consisting of loaded data files, modules, and connections. The **Network Manager** is initially docked in the middle top position of the screen.
Property Manager	The **Property Manager** displays the properties of the module currently selected in the **Network Manager**. The **Property Manager** is initially docked in the middle bottom position on the screen.
Viewer window	The **Viewer** window contains the graphics output as directed by the modules in the **Network Manager**. The **Viewer** window is initially located to the far right side of the screen.
Status Bar	The status bar shows information about the activity in **Voxler**. The status bar is divided into three sections. The left section displays help messages and progress text. The middle section displays a progress gauge for various tasks, such as loading large data files. The right section displays the window size and the estimated time remaining for long tasks.

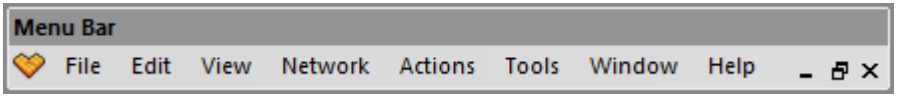
Title Bar

The title bar is the top portion of the **Voxler** application window or the top portion of a dialog. The file that is currently open in the **Viewer** window is listed in the program title bar. In a dialog, the dialog name is listed in the dialog title bar. Drag a window or dialog by its title bar to reposition it. Double-click the title bar to maximize or restore the window. When a document contains unsaved changes, an asterisk (*) appears next to its name in the title bar. The asterisk disappears once the unsaved changes have been saved.

The title bar contains the window or dialog name.

Menu Bar

The menu bar contains the menu commands used to run **Voxler**. The menu bar displays in a docked view by default; however, it can also be displayed as a floating window. See Changing the Window Layout for information on displaying the menu bar as either docked or floating.

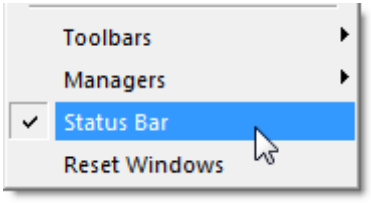


*The menu bar contains the **Voxler** menu commands.*

Status Bar

The status bar is displayed at the bottom of the **Voxler** window. The status bar displays additional information about selected items.

Click the **View** | **Status Bar** command to show or hide the status bar at the bottom of the **Voxler** window. A check mark appears next to **Status Bar** in the **View** menu when the status bar is visible. Click the **Status Bar** menu item to remove the check mark and hide the status bar.



*Click the **View** | **Status Bar** command to show or hide the status bar. A check mark indicates the status bar is visible.*

The status bar is divided into three sections: left, middle, and right. The left side of the status bar displays a short description of the selected menu item. The left section is also used for help messages and progress text. The middle section is used for a progress gauge to show the amount of work accomplished and the amount left to do

for various tasks. The right section displays the window size of the last redraw in the **Viewer** window. During operations in progress, the right section displays the estimated time remaining for tasks. The window size shows the size of the window screen in pixel width by pixel height.

The status bar commonly appears with the help text on the left; no text in the middle (when there is no progress to report); and window size information on the right.

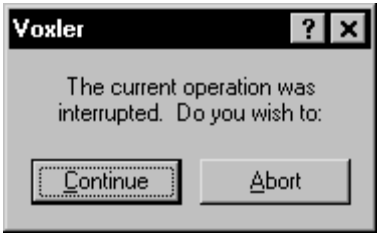
Import Progress

When **Voxler** is importing a data file, the status bar appears with the help message and progress text on the left; a progress gauge in the middle; and the time remaining on the right.

*When **Voxler** is importing a data file, the status bar displays the progress.*

Abort Import

Press the ESC key on the keyboard when the progress gauge is displayed to cancel the file import. A **Voxler** dialog appears with the message *The current operation was interrupted Do you wish to:* Continue or Abort. Click the *Abort* button to cancel the import. Click the *Continue* button to continue the import.



Press the ESC key to abort a file import.

Changing the Window Layout

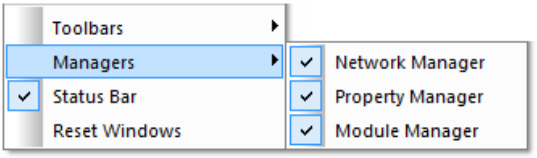
The **Voxler** managers, toolbars, and menu bar display in a docked view by default; however, they can also be displayed as floating windows. The visibility, size, and position of each item may also be changed.

Working with Voxler Windows

By default, the **Module Manager** is displayed docked to the left side of the **Voxler** application window, the **Network Manager** is displayed at the upper center, the **Property Manager** is displayed at the lower center, the status bar is displayed at the bottom, and the **Viewer** window is displayed at the right, as shown in the **Voxler** User Interface image on page 7. Use the **View | Toolbars**, **View | Status Bar**, **View | Managers | Network Manager**, **View | Managers | Property Manager**, and **View | Managers | Module Manager** commands to turn these components on or off.

Opening and Closing a Manager

If a window is not visible, click the appropriate **View** | **Managers** menu command. If there is not a check mark next to a particular manager name, **Voxler** does not display that window. Click the manager name to make that manager visible. If there is a check mark next to a manager name and the manager is not visible, the manager may be located off-screen or tabbed behind another window. Check or uncheck the manager name in the **View** | **Manager** menu to show or hide the manager.



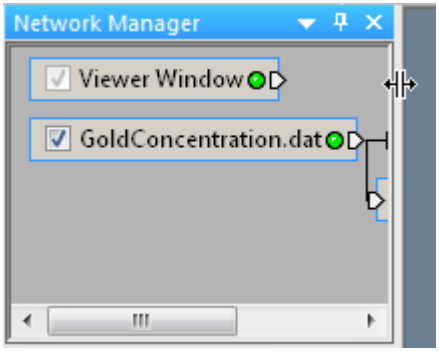
*If there is not a check mark to the left of a command name in the **View** menu, then the window is not displayed. A check mark indicates the window is displayed.*

To close a window, click the button or uncheck the manager name in the **View** | **Manager** menu. Right-click on the following objects to add or remove a check mark and show or hide any of the windows:

- the **Network Manager** title bar;
- the **Module Manager** title bar;
- the **Property Manager** title bar or any area outside the white list of properties;
- the toolbars; or
- the menu bar.

Resizing a Manager

Change the size of a window by moving the mouse to the edge of the window. The cursor changes to the horizontal ( ) or vertical ( ) resizing cursor. Click and drag the cursor to change the window size or shape.



The on the right side of this Network Manager indicates the window can be resized by dragging the cursor to the desired size.

Restore Original Manager Position

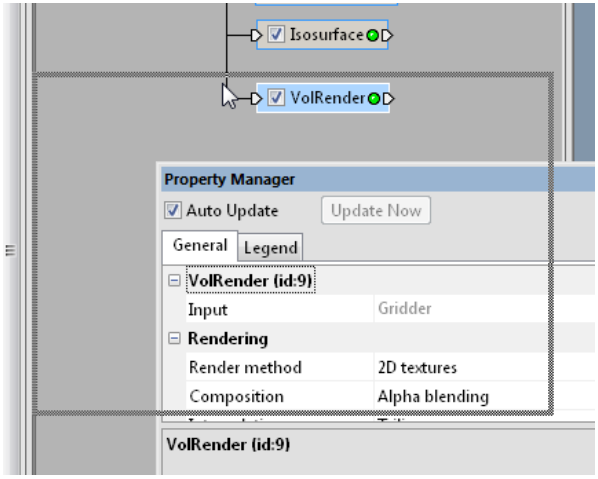
To restore the default size and position of all managers and toolbars, click the **View** | **Reset Windows** command. This command is especially handy if your windows or managers become hidden for any reason.

You must restart **Voxler** in order for this command to take effect. Click *Yes* in the dialog, close the program, and reopen **Voxler**. The managers are now in the default locations. To cancel the command, click *No* in the dialog.

Changing Manager from Docked to Floating Windows

Voxler windows display in a docked view by default. They can be detached to display as floating windows.

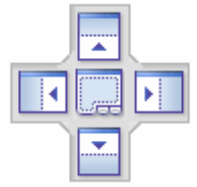
To dock a manager or toolbar in a new location, click the grip bar along the edge, hold down the left mouse button, and then drag to a new location. To display as a floating window, drag the bar away from a window edge. Alternatively, double-click on the window title to toggle between having the window docked and floating.



A dotted outline displays when a window's position is being changed.

To restore the original docked position, either double-click on the title bar or click and hold the left mouse button on the title bar and drag the window back to the desired docked location.

To change the position of a docked **Module Manager**, **Network Manager**, or **Property Manager**, click the window title bar and drag it to a new location. A thin solid black rectangle indicates that the window is docked in the new location when the **Tools** | **Options** *User Interface Style* setting is set to *Office 2000, Office 2003, Office XP,* or *Windows XP.* A thick light gray rectangle indicates that the window is floating. Alternatively, double-click the window's title bar to toggle between floating and docked modes.



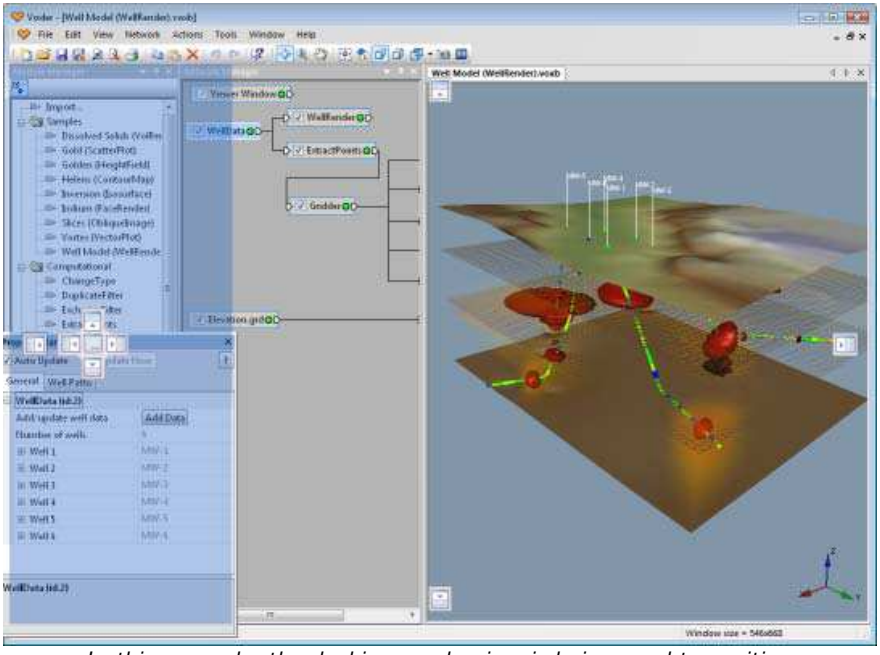
The docking mechanism allows easy docking of windows.

Docking Mechanism

Use the **Tools** | **Options** command and set the *User interface style* to *Visual Studio 2005* or *Visual Studio 2008* to activate the docking mechanism feature that allows for easy docking of windows. By default, the **Voxler** user interface style is set to Visual Studio 2005. With these visual looks, left-click the title bar of a window and drag it to a new

location while holding down the left mouse button. The docking mechanism displays with arrow indicators as you move the manager.

When the cursor touches one of the docking indicators in the docking mechanism, a blue rectangle shows the window docking position. Release the left mouse button to allow the window to be docked in the specific location.



*In this example, the docking mechanism is being used to position the **Property Manager** in a new location.*

Creating Stacked and Tabbed Windows

You can view the windows in a stacked or tabbed configuration.

If you want to "stack" the windows:

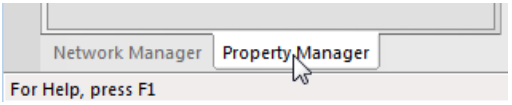
1. Drag one window on top of another window.
2. Position the cursor in either the top or bottom box in the docking mechanism. The screen will turn blue where the manager is to be positioned.

To create tabbed windows:

1. Drag one window on top of another window.
2. Position the cursor in the center of the docking mechanism. The screen will turn blue where the manager is to be positioned. You should see a small tab at the bottom of the managers.

To return to individual windows from tabbed view:

1. Click on the window's name on the tab.
2. Drag the tab to a new location.



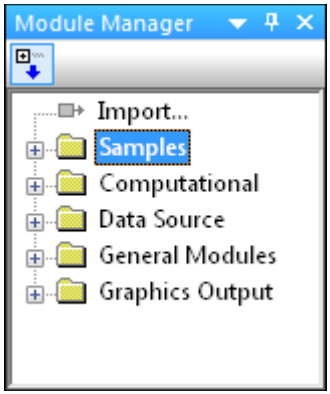
Hold down the left mouse button on a window's tab and drag the window to a new location to separate the tabbed windows.

Auto-Hide Windows

You can increase **Viewer** window space by minimizing the other windows with *Auto Hide*. To hide a docked window, click on the button in the upper right corner of the **Module Manager**, **Network Manager**, or **Property Manager** windows. Hold the CTRL key down and click the button to auto hide several docked windows in the same "container." The window hides on the left or right side of **Voxler** with a small tab containing the window name.

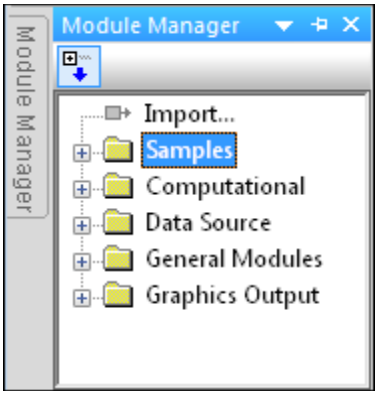
When hidden, the window slides under the left or right side of the **Voxler** main window where it is docked and a tab appears with the window name. Position the mouse pointer over the tab to view the contents of the window. Move your mouse away from the window and the window "hides" again. Click inside the window to anchor it at its current position. Click in another window to release the anchor and hide the window.

To view the window, place the cursor directly over the tab. Click in the displayed window to keep it open for use. Move the mouse away from the window or click outside the window to return the window to the hidden position. Click on the button in the upper right corner of a window to return it to the normal display mode and disable the auto hide feature.



*This example shows The **Module Manager**. Notice the pin button is vertical indicating "show" mode.*

*When the button is pressed, the window (**Module Manager** in this example) is hidden on the left side of the screen.*



When a window is hidden, place the cursor over the title on the tab to display the full window. Notice the pin button is horizontal indicating "hide" mode.

Tabbed Documents

All open **Viewer** windows are displayed as tabbed documents when the **Tools** | **Options** *Tab style* is set to a style other than *None.* When more than one window is open, tabs appear at the top of the **Viewer** window area, allowing you to click on a tab to switch to that window.

The style of the tab can be changed by clicking the **Tools** | **Options** and setting the *Tab style*. Select a new tab style from the *Tab style* drop-down list. Tabs can be turned off by clicking the **Tools** | **Options** and setting the *Tab style*. Select *None* from the *Tab style* drop-down list.

Tab Behavior

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, 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.

Click the  button to the right of the tabs to close the selected document.

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.

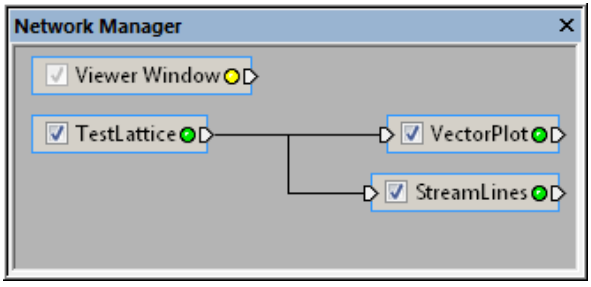
The Gold (ScatterPlot).voxb file has unsaved changes, indicated by the (*) asterisk.

The Visualization Network

Voxler uses a collection of modules and their connections to create a visualization network to represent data and process one or more modules in the **Network Manager**.

Modules

Modules are the building blocks from which the final output is constructed. They consist of input data sets and processes to be applied to the data sets. Modules accept data on their input ports, modify the data, and pass it along through the output ports. The modules link together in an infinite number of ways to form a pipeline that passes the processed data from one module to the next. The final output from the network is usually a graphical representation of the data. This architecture is commonly called a "data flow" model.



*Modules are display in the **Network Manager**. In this example, the* VectorPlot *and* StreamLines *modules are attached to the* TestLattice *data set.*

Modules have inputs, outputs, and properties. The inputs and outputs are the data types described in the Data Types page. Modules are displayed in the **Network Manager**. The properties of a selected module appear in the **Property Manager**. When a module's input or properties have changed, it automatically updates in the **Viewer** window. After the module has updated and recomputed its outputs, the framework ensures that all downstream modules are updated as well.

Data Sets

Multiple data sets can be loaded into a single **Voxler** project. Each data set can be connected to any number of visualization or computational modules to produce a single scene. Data sets are automatically loaded into source modules. The scene can be interactively manipulated in the three-dimensional **Viewer** window and saved to a file or printed.

Data Flow Model

Voxler's data flow model allows for incredible flexibility and power. Here are some of the specific advantages:

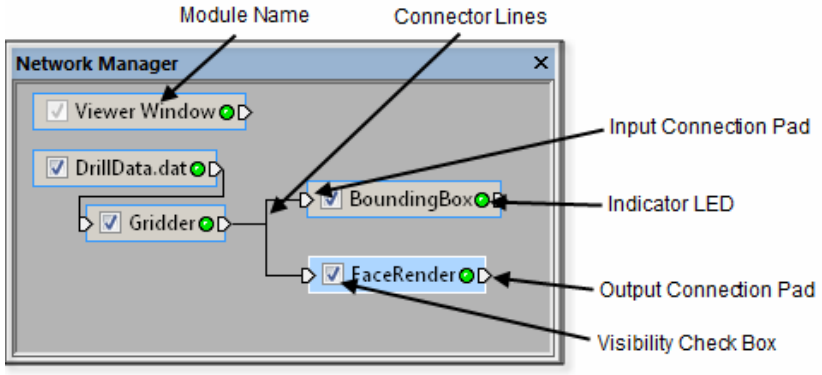
- The modules can be dynamically connected and edited to see the effect of different parameters on the data. For example, a point set can be loaded, connected to a Gridder module, and output to an isosurface. The gridding parameters can be altered to see the new output in the Isosurface without having to save grid files. The Isosurface automatically recognizes that the grid has changed and automatically updates.
- Multiple modules can be connected to a single input module in order to "stack" the effects. For example, a Contours module, Isosurface module, and ClipPlane module could all be connected to a single lattice module. The output from all three modules is correctly combined in the final scene.
- Network updates execute on a separate work thread. This allows the user interface to stay responsive even while the network is being updated. If a changing property threatens to invalidate the currently updating network, Voxler detects and aborts the update in progress. A new update to include the changed properties is then requested.
- There is no need for intermediate files, i.e., grid files. The data are loaded once and need not be resaved in an intermediate form for later reloading.
- Execution through the network can be optimized so only those modules that actually need to execute are triggered. Paths that do not change are cached and do not contribute to the overall execution time. If data or parameters are altered in the middle of the module network, only the downstream modules need to re-execute.
- The Network Manager allows the user to easily select modules in the two-dimensional interface.

Introduction to Modules

A module is a data set or a process to be applied to a data set or process. Modules are the building blocks from which the final **Voxler** output is constructed. Modules are connected to perform a desired task. A module is a data set or process to be applied to a data set. The module is displayed as a small rectangle. The rectangle can be

selected and dragged with the mouse. Modules accept data on their input connection pads ▷, modify the data, and pass it along through the output connection pad ▷. The final output from the pipeline is usually a graphical representation of data, such as a *BoundingBox* or *FaceRender*.

Modules are displayed in the **Network Manager**. You can connect and disconnect modules to create a visualization network representing the flow of data. Modules need to be connected in order to generate an output. The current geometry output of the modules in the **Network Manager** are displayed in a three-dimensional view in the **Viewer** window. If the data is not connected to a graphics output module, nothing is displayed in the **Viewer** window.



The **Network Manager** *displays the visualization network, which includes all loaded modules and their connections.*

☑	**Visibility Check Box**	The visibility check box indicates whether a module's output is visible in the **Viewer** window. Check the box to display a module and all "downstream" (connected) modules. Uncheck the box to hide a module and all downstream modules. A gray check mark indicates that a module is disabled because of a hidden upstream module.
(Name)	**Module Name**	Each module is named with the loaded data file name or by the function performed by the module. You can change the name with the **Edit | Rename** command. Alternatively, right-click the module and select **Rename** or press F2 on the keyboard.

	**Indicator LED**	The indicator LED is a small round "light" showing module status. • Green : the module is up to date • Yellow : the module has been modified and needs to be updated • Red : the module is in an error state
	**Connection Pads**	An input connection pad is located on the left side of the module. An output connection pad is located on the right side of the module. The presence of connection pads indicates that a module may be connected to other modules. Only modules with the appropriate type of data may be connected.
	**Connector Lines**	Connector lines are drawn between connected modules. Lines or pipes may be displayed. See the **Tools** | **Options** dialog to change the display of connector lines.

Module Types

There are four types of modules: *computational*, *data source*, *general*, and *graphics output.* Each module type is discussed below.

Computational Modules

Computational modules alter the data by changing the data type, filtering, creating a gradient, gridding, performing mathematical transformations, merging, resampling, slicing, creating a subset, or transforming coordinates.

Data Source Modules

Data source modules serve as a source of raw data. The data can be imported or created from mathematical functions.

General Modules

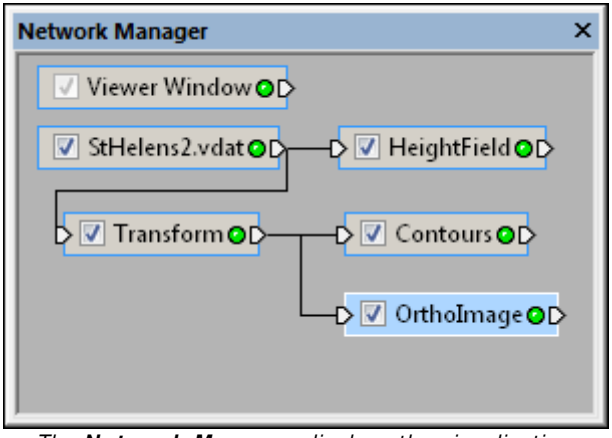
General modules display module information and provide custom lighting in the **Viewer window**.

Graphics Output

Graphics output modules create graphics in the **Viewer window**. Typically, these modules require data input.

The Network Manager

Voxler uses a **Network Manager** to show a graphical representation (also referred to as a visualization network) of data and processes performed in the project. All data, modules, and processing paths for the current project are visible in the **Network Manager**. Modules are connected to perform a desired task. A module is a data set or process to be applied to a data set. Modules accept data on their input connection pads, modify the data, and pass it along through the output connection pads. The final output from the pipeline is usually a graphical representation of data, such as a HeightField or OrthoImage.



*The **Network Manager** displays the visualization network, which includes all loaded modules and their connections.*

Selecting and Deselecting Modules

To move a module, save a module, or change any of the module properties, select it by clicking the module rectangle in the **Network Manager**. The selected module is highlighted and its properties are displayed in the **Property Manager**. Note that only a single module may be selected at a time. Click in the **Network Manager** outside all modules to deselect all modules.

Connecting and Disconnecting Modules

Module connections display the flow of data from one module to another. There are several ways to connect or disconnect two modules. After you have selected a module:

- Right-click on a module in the **Network Manager** and select **Connect** from the context menu
- Click on the connection pad of a module in the **Network Manager**
- Click the **Network** | **Connect** command

The procedure is the same whether you are connecting or disconnecting two modules. Once a **Connect** command is initiated, the cursor snaps to the **Network Manager** and **Voxler** enters graphical connect mode. Move the mouse until the blue connection line touches the compatible module you want to connect to or disconnect from and the connection line turns yellow. Click the mouse on the module to make or break the connection. The blue connection line turns yellow if the modules are compatible.

The **Connect** command menu text differs depending on which module is selected.

Connect a module to other compatible modules by dragging a connection line from a connection pad ▷ on one module to another. The line is initially blue, but turns yellow when the cursor touches a compatible module. Release the mouse button to complete the connection. The line turns black when the connection is complete.

Alternatively, you can click on a connection pad, release the mouse button, and move the mouse without dragging. A blue connection line is drawn. The connection line turns yellow when the cursor is over a compatible module. Click the mouse button a second time to connect the two modules.

Arranging Modules

Modules can be rearranged in the **Network Manager**. You may need to move modules to see some connections clearly. Click on a module and drag it to a new location to move it or use the ARROW keys for fine adjustment.

Moving an Existing Connection

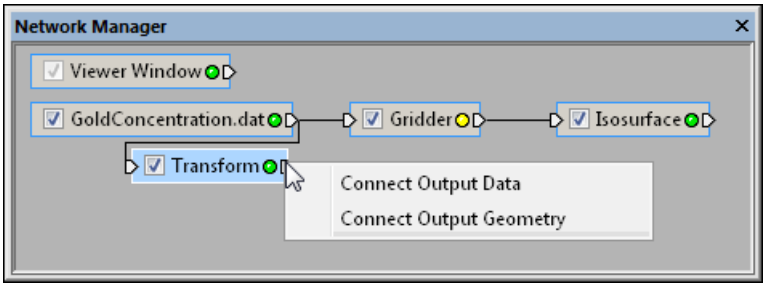
Move an existing connection by left-clicking on a connection line, holding down the left mouse button, and dragging the line to a new connection pad.

Cancelling In-Progress Connection

Press the ESC key or click in an empty portion of the **Network Manager** to cancel a connection in progress.

Multiple Input or Output Connections

Some modules accept more than one input connection or provide more than one output connection. In these cases, a context menu is displayed when you click on the connection pad. Select the connection you want and proceed as previously described.



The Transform *module provides output connections for data and geometry. Select* ***Connect Output Data*** *to connect to the* Isosurface *module.*

Right-Click Menu

Right-click a module to display a context menu containing various commands that can be applied to the module. The commands include:

- A list of modules that may be connected to the selected module. This is the fastest and easiest way to build a network. Simply right-click an existing module and select a module to connect.
- A *Connect* command, which allows you to connect existing modules interactively. The command name changes depending on the selected module type.
- A *Save Data* command, which allows you to save the module's data output.
- A *Copy* command, which copies all properties of the selected module. This is useful for creating an exact duplicate of an existing module.
- A *Rename* command, which allows you to rename the selected module to any other name.
- A *Delete* command, which removes the selected module from the **Network Manager**. Deleting a module removes the links to other modules.

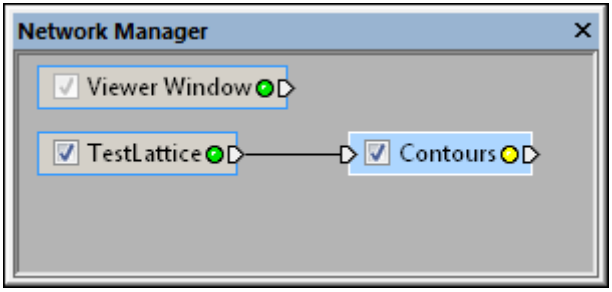
Right-click in the **Network Manager** without a module selected to display a different context menu that includes commands to import a new file, create standalone

modules, or paste a copied module. Standalone modules, such as *Annotation*, do not require an input connection. When right-clicking to add modules, the module appears in the location where you right-clicked.

When an icon is dragged outside the limits of the **Network Manager**, scroll bars are added to allow scrolling to the portions of the network that are not visible.

Updating the Network

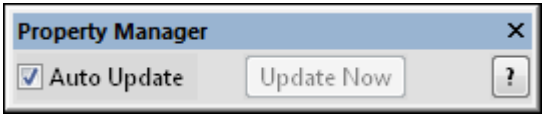
Click the **Network** | **Update Network** command or press the F9 key on the keyboard to refresh the network if it is out of date. A network is out of date when one of the modules in the **Network Manager** displays a yellow indicator LED. Some modules require action in the **Property Manager** before an update can occur. One example is the *Gridder* module, which requires clicking the *Begin Gridding* button in the **Property Manager** in order to update. Until the properties have been updated, the network does not update, even if the **Network** | **Update Network** command is used. A green indicator LED indicates the module is up to date.



The yellow indicator LED on the Contours *module indicates that the module is out of date. The green indicator LED on the* TestLattice *module indicates the module is up to date.*

Auto Updating the Network

The **Network** | **Update Network** command is useful if the *Auto Update* option in the **Property Manager** is disabled and changes have been made to one or more modules.



Check the Auto Update *box in the* ***Property Manager*** *to automatically update the network as changes are made.*

When the *Auto Update* box is not checked, changes made to the modules do not update the network until the **Network | Update Network** menu command is chosen, the *Update Now* button in the **Property Manager** is clicked, or the F9 key is pressed.

This command is disabled (grayed out on the **Network** menu) when the network is up to date.

Network Manager Keyboard Commands

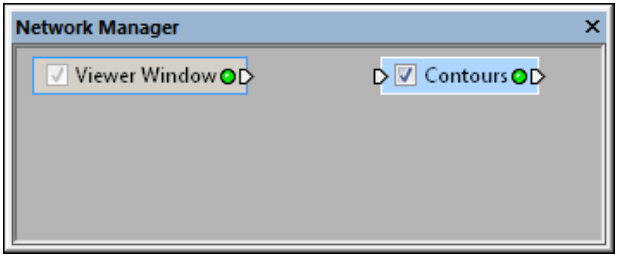
The following keyboard commands are available in the **Network Manager**:

- The DELETE key deletes the selected module if the **Network Manager** is active.
- The TAB key cycles through the modules in the order they were added.
- SHIFT+ TAB cycles through the modules in the reverse order.
- The ARROW keys move the selected module.

Connecting Modules Example

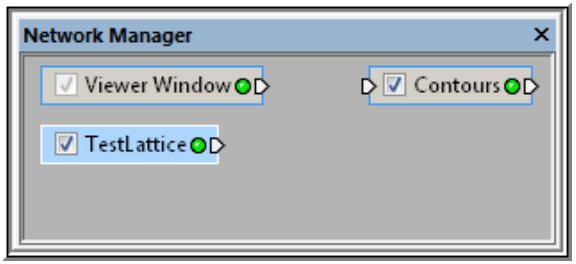
This example demonstrates how to add modules and connect them.

1. Start with a new window. If a **Voxler** file is already open, click the **File | New** command to open a new blank window.
2. In the **Module Manager**, press the  button. Expand the *Graphics Output* folder. Double-click on the *Contours* module in the **Module Manager** to load the module in the **Network Manager**.



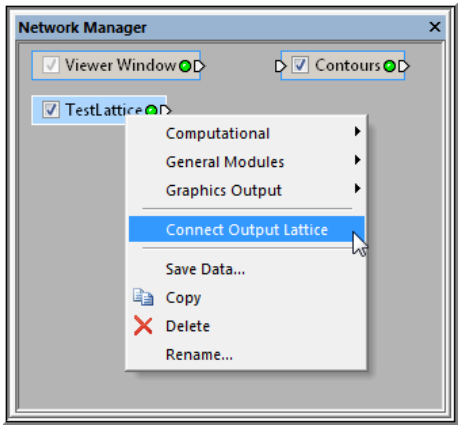
*A module can be added to the **Network Manager** without being connected to any data.*

3. In the **Module Manager**, expand the *Data Source* folder. Double-click on the *TestLattice* module to load a test lattice. The test lattice is automatically selected in the **Network Manager**.



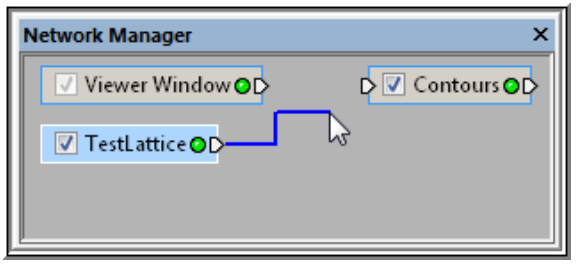
Additional modules can be added to the ***Network Manager*** *without being connected.*

4. Right-click on the *TestLattice* module and choose **Connect Output Lattice**.



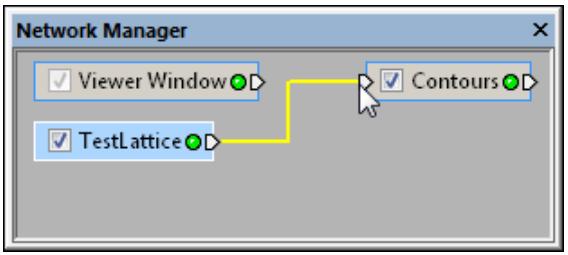
Choose the ***Network*** *|* ***Connect Output Lattice*** *command to connect the* Contours *module to the* TestLattice *module.*

5. The blue connection line appears in the **Network Manager**.



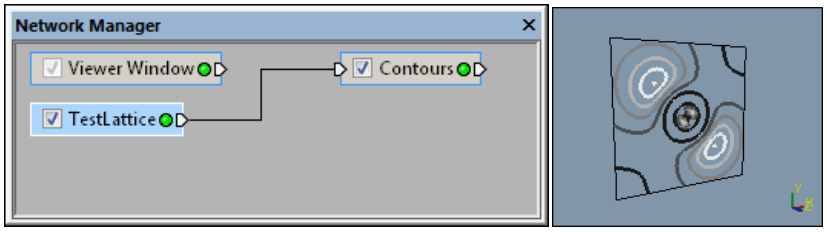
When the ***Network*** *|* ***Connect Output Lattice*** *command is selected, a blue connection line appears.*

6. Move the cursor to the *Contours* module and the blue line changes to yellow.



The connection line changes to yellow when it is over a module that can be connected to the selected module.

7. When the connection line changes to yellow, left-click to make the connection. The connection line becomes a black line and the contour map displaying the *TestLattice* data appears in the **Viewer** window.



*The contour map is displayed in the **Viewer** window when the* Contours *module is connected to the* TestLattice *module.*

8. To disconnect the two modules, right-click on the *Contours* module and choose the **Connect Input Lattice (TestLattice)** item.
9. A blue line appears between the *Contours* module and the cursor. Move the cursor over the *TestLattice* module and the connection line turns yellow. Left-click on the *TestLattice* module in the **Network Manager** to break the connection.

Tips on Working with Modules

Modules can be connected and edited to see the effect of different parameters on the data. For example, a point set can be loaded, connected to a *Gridder* module, and displayed as an *Isosurface* module. You can experiment with the gridding parameters and immediately see the new output in the isosurface. The *Isosurface* module automatically recognizes that the lattice has changed and updates itself.

Multiple modules can be connected to a single module output connection to stack effects in the **Viewer window**. For example, *Contours*, *Isosurface*, and *OrthoImage* modules could all be connected to a single lattice module. The output from all three modules is correctly combined in the scene.

Change to the module location, visibility, and connection status can be undone using the **Edit** | **Undo** command.

The style of the connection lines can be customized using the **Tools** | **Options** command.

Mismatch Error

When attaching a module that is not compatible, the **Voxler Error** dialog appears.

*The **Voxler Error** dialog appears when a non compatible module is attached to another module.*

Click the *OK* button to remove the newly added incompatible module from the network.

The Module Manager

The **Module Manager** displays a list of available modules and other commands. You can add the modules to the **Network Manager** by double-clicking on the module in the **Module Manager** or by clicking on the module name and dragging it into the **Network Manager**. The item is added to the **Network Manager**. Depending on how the module is added, the module may appear in the **Network Manager** already connected to other modules. The **Module Manager** is a quick display of the Network Menu commands. This can be useful to see all of the modules or only the modules compatible with the currently selected module.

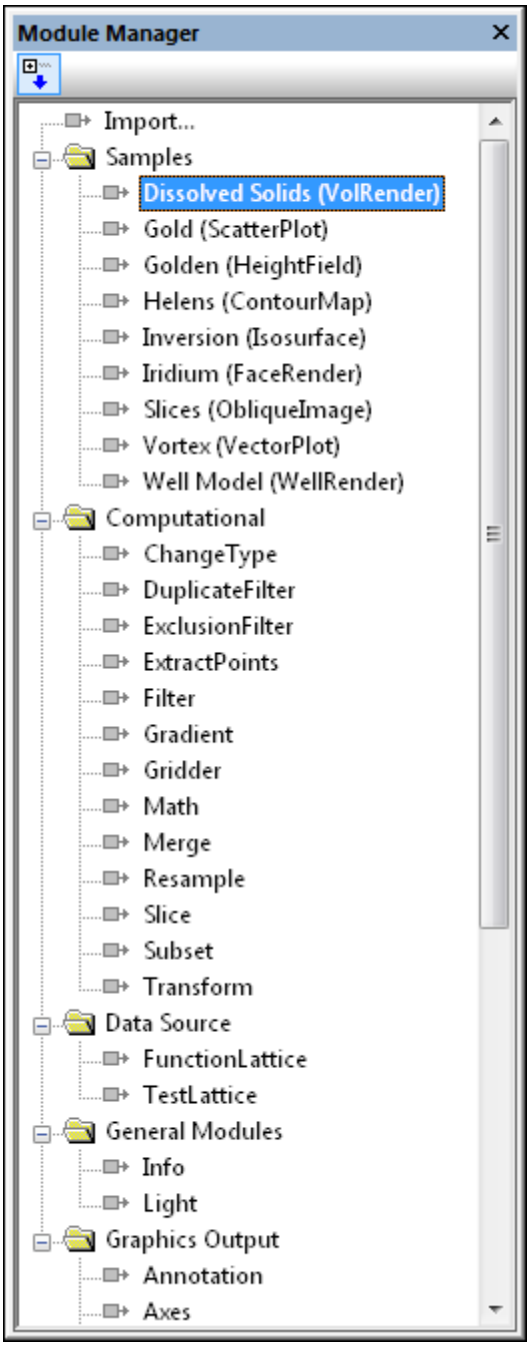
The **Module Manager** consists of five sections, displayed as folders: *Import, Samples, Computational, Data Source, General Modules,* and *Graphics Output* sections. Depending on which module is currently selected and your settings, you may not have all of these sections available.

Show/Hide All Modules

The toolbar at the top of the **Module Manager** window contains a *Show All Modules* button  . If the button is depressed, all modules are listed. If the button is not depressed, only those modules that are compatible with the currently selected module are displayed.

Click the *Show All Modules* button  at the top of the **Module Manager** to expand all folders and list all sample .VOXB files and modules in the tree view list. The button is depressed when this option is enabled. When this option is enabled, all modules are shown in the **Module Manager**. If a module is selected in the **Network Manager** and a compatible module is added, it is automatically connected to the selected module. If the module being added is not compatible with the currently selected module in the **Network Manager**, the new module is added to the **Network Manager** without any connections to existing modules.

If the  button is not depressed, only those modules that are compatible with the currently selected module are displayed. If you double-click on a module, it is automatically connected automatically to the selected module. If no modules are selected in the **Viewer** window, only the *Import, Samples, Data Source, Light, Annotation*, and *Text* modules are displayed.



Import

Double-click *Import* to load any file that **Voxler** can import in the **Network Manager**. Select any data file and click the *Open* button to add the file as a new module in the **Network Manager**.

Samples

Several simple sample files are displayed in the *Samples* folder. Double-click an item in the *Samples* folder to open the corresponding .VOXB file in **Voxler**. This is another way of choosing the **File | Open** menu command. If you have an existing **Voxler** project open, you will be prompted to save changes if you open a new sample project. Click the *Yes* button to save the changes to the existing .VOXB file before opening the sample project. Click the *No* button to discard the changes to your existing project and then open the sample project. Click the *Cancel* button to keep the current file open and not open the example project.

Add Modules to the Network Manager

Double-click a module in the *Graphics Output, Computational, Data Source*, or *General Modules* folders in the **Module Manager** to add that module type to the **Network Manager**. If a module is selected in the **Network Manager** and the module in the **Module Manager** is compatible, the two are connected. Otherwise, the module is loaded in the **Network Manager** without connections to any existing modules. You can also click and drag a module from the **Module Manager** to the **Network Manager** to add it without making a connection to the selected module.

Expand and Collapse Folders

The ⊞ and ⊟ buttons indicate the folder can be expanded or collapsed to show or hide additional information. This applies to any situation where you see a ⊞ and ⊟ in **Voxler**. There are several ways to expand a folder and see all the items in the folder:

- Click the ⊞ button to the left of the folder name.
- Select the item and press the + key on the numeric keypad.
- Press the right ARROW key on your keyboard.
- Double-click the item.

There are several ways to collapse the folder and view just the folder name:

- Click the ⊟ button to the left of the folder name.
- Select the item and press the - key on the numeric keypad.
- Press the left ARROW key.

- Double-click the item.

Voxler remembers the expanded or collapsed state of the list within a given session and stores the state of the list when you close the program.

Module Manager Keyboard Commands

When working in the **Module Manager**,

- Press the up and down arrow keys to move up and down in the list.
- Press the right arrow key to expand collapsed sections or the left arrow key to collapse the expanded sections.
- Press the PAGE UP key to go to the item currently displayed at the top of the list without scrolling.
- Press the PAGE DOWN key to go to the item currently displayed at the bottom of the list without scrolling.
- Press the HOME key to go to the first item in the list.
- Press the END key to go to the last item in the list.
- To go to a specific line item, press the first letter of the name of the item on your keyboard.
- Click in the **Module Manager** or press ALT+F6 until the **Module Manager** is highlighted. The **Module Manager** must have the focus in order for keyboard commands to apply to its contents.

The Property Manager

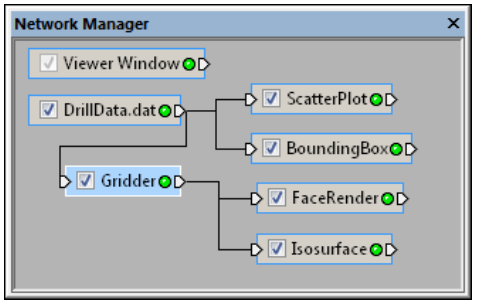
The **Property Manager** displays the properties of the module currently selected in the **Network Manager**. A property is a setting or parameter used by the module to control its behavior. Each property is displayed in a list within the window with one property per line. Properties are split onto multiple tabs. Left-click on a module in the **Network Manager** to display its properties in the **Property Manager**.

Property Manager Tabs

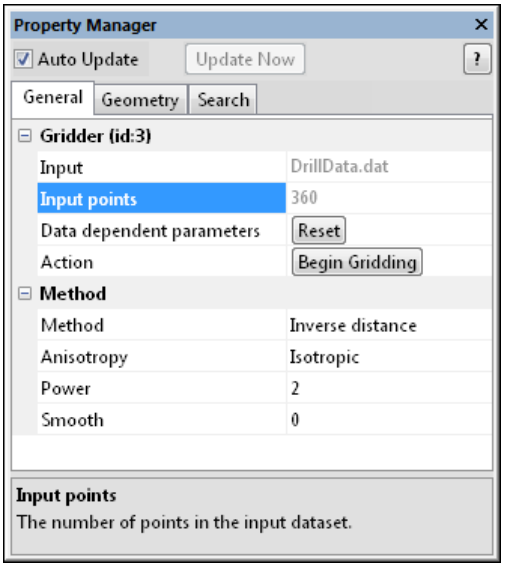
The **Property Manager** displays module properties, which are settings or parameters used by a module to control its behavior. The window itself consists of several tabs with similar properties, on a single tab.

Detailed Help for Properties

Click the  button to obtain information about the module currently displayed in the **Property Manager**. The **Voxler** help window is displayed with the relevant help page.



The Gridder *module is selected in the* ***Network Manager****. The selected module is highlighted in blue.*



The properties of the selected module are displayed in the ***Property Manager****.*

Applying Property Changes with Auto Update and Update Now

The *Auto Update* check box and *Update Now* button below the title bar allow you to choose whether to update the **Viewer** window automatically or manually. The *Auto Update* check box is checked, by default. If a process takes a long time or you want to make a large number of changes to different modules that take a long time to redraw, then uncheck the *Auto Update* box. Make all changes to all modules. After all changes have been made, press the *Update Now* button to update the network manually. When the *Auto Update* box is checked, the module properties automatically update after you change an object. Uncheck the *Auto Update* box at the top of the **Property Manager** to disable this feature and make multiple changes without updating the **Viewer** window.

The 

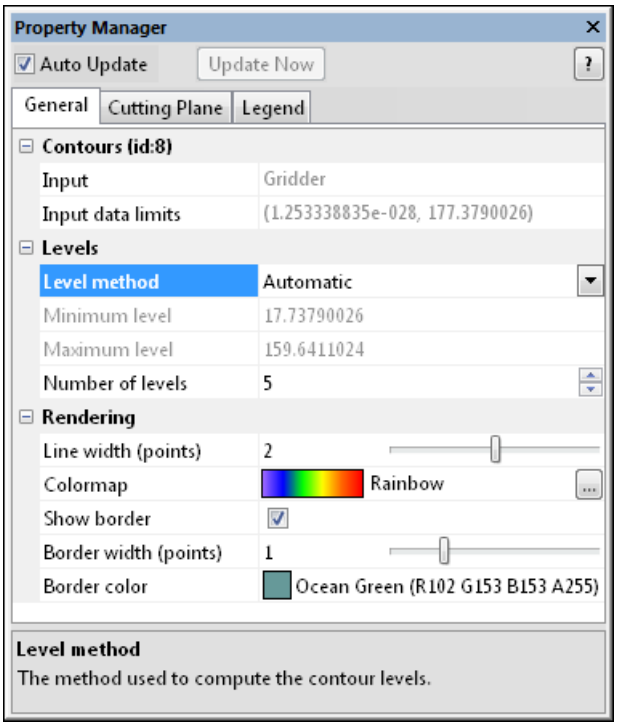
button manually updates the network and any modified modules when *Auto Update* is unchecked. The *Update Now* button is enabled whenever there are pending changes to the network. Click the *Update Now* button to manually update the module properties in the **Viewer** window. Alternatively, choose the **Network** | **Update Network** command or press the F9 key on the keyboard to update the **Viewer** window with all changes.

Properties

The main component of the **Property Manager** is a list of properties used by the selected module, separated by tabs. This list has two columns: the left column contains the property name. The right column contains the controls used to change the property. Click on the property control in the right column to change the property's value. Drag the vertical line between the left and right column to adjust the column width. If a module's properties contain subsections, a ⊞ or ⊟ is located to the left of the name. Click on ⊞ or ⊟ to expand or collapse the list. For example, a *Contours* module contains three tabs: **General, Cutting Plane,** and **Legend**. The **General** tab contains three sections: *Contours, Levels,* and *Rendering*. Additional properties, such as the *Level method*, can be changed by clicking on the tab and opening these sections.

A short description of the selected property displays at the bottom of the window. If this area is not visible, click the Tools | Options command and check the box next to *Show property help* on the General page of the **Options** dialog.

Each property is displayed in a list within the window. Use the scroll wheel on the mouse to scroll through the list.



*Click on an item in the **Property Manager** to edit the properties visible in the **Viewer** window.*

Expand and Collapse Features

Features with multiple options appear with a ⊞ or ⊟ to the left of the name. To expand a group, click on the ⊞ icon, select the item and press the + key on the numeric keypad, press the right arrow key on the keyboard, or double-click the item. To collapse the group, click on the ⊟ icon, press the - key on the numeric keypad; press the left arrow key; or double-click the item. For example, the expanded *Rendering* section in the above image contains four options: *Line width (points), Colormap, Show border, Border width (points),* and *Border color*.

Resize Columns

To change the size of either column of the **Property Manager**, position the cursor over the center vertical line to change the cursor into a two-headed arrow  . Drag the arrow left or right to resize the viewable area on either size of the line.

To resize the help area at the bottom of the **Property Manager**, position the cursor just above the help area and drag the cursor  up or down to create more or less viewable help area.

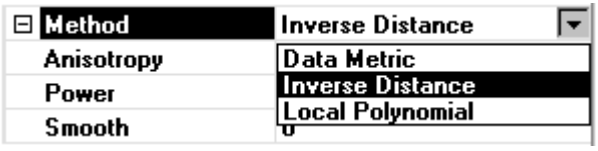
Property Help

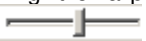
A simple help section is available at the bottom of the **Property Manager** for help on the selected property. The help area is turned on or off with the **Tools | Options** command. The horizontal dividing line at the top of this section can be dragged up or down. Click the  button at the top of the **Property Manager** to display more detailed information in the online help file about the module currently displayed in the **Property Manager**.

Property Manager Controls

Voxler provides several different types of controls in the right column of the **Property Manager** that allow you to customize the behavior of a selected module. These controls include buttons, check boxes, drop down lists, edit boxes, sliders, and spin buttons. The focus is automatically set to the object when it is clicked or selected via the keyboard TAB or arrow keys. The focus is indicated by a dotted rectangle on the control or by a change in color. Some property list items only provide information. These items are disabled (grayed) to indicate they cannot be changed. Occasionally, some properties may not be valid due to other selections or data restrictions. These options are disabled as well.

The following controls are available:

Button	Click the button with the mouse or press the SPACEBAR when the button has the focus to perform the action indicated by the button text. Click the  button to obtain more information about a property. The resulting action varies depending on the module, but can open a dialog for loading a file into an existing data input module, allow you to edit multi-line text, display a Colormap Editor or other actions.
Check Box	A check box toggles the state between one of two possible outcomes. Click the check box with the mouse or press the SPACEBAR when the box has the focus to change the state of the check box.
Color	The color control displays a sample and the name of the current color. If the color cannot be found in the predefined colors list, then the name takes the form "r, g, b" (the amounts of red, green, and blue, 0 to 255 each). To change the color, click the color to the right of the *Color* property to open the color palette.
Drop Down List	A drop down list of options displays when the corresponding property value is selected. To display the drop down list, click the value with the mouse or press the SPACEBAR when the control is selected. To select an item in the drop down list, click the item in the list or use the up or down arrow keys on your keyboard to highlight the item and press ENTER.  *An unselected list item with a text value does not display a drop down arrow.*  *A selected list item with a text value does display a drop down arrow.*  *When a list item with a text value is selected, click the drop down arrow to display the list of options.*

Edit Boxes	Edit boxes allow the input of text or numeric values. Edit boxes are commonly linked to an associated slider  or spin button  (see below) when entering a number, or may include the  button for multiline text or other functions. Drag the borders of the **Multiline Text** dialog to resize it. Press the ESC key to cancel your changes and restore the original text.
Slider	A slider appears to the right of a property that requires a numeric entry. Drag the slider  left or right to decrease or increase the number. Click anywhere on the slider to immediately move the slider to that position. When the slider has the focus, the arrow, PAGE UP, PAGE DOWN, HOME, and END keys can be used to change the value. The slider can be very short or not visible if the column width is small. Increase the column width by dragging the left or right edge of the column. The slider is set to reasonable limits, but **Voxler** accepts a larger range of values from the edit field for some properties. In such a case, enter the number directly in the edit field.
Spin Button	A spin button  may appear to the right of a property that requires a number. Use the up and down arrows to increase or decrease the value in the edit control. When the value has reached the maximum or minimum allowed value, it will either stop changing or wrap around to the beginning or end of the range. The spin button is set to reasonable limits, but there is sometimes a need to exceed those limits. If necessary, enter the desired value directly into the edit boxes.
Static (Grayed-Out) Text	Static text is informational and cannot be edited, as indicated by the grayed-out color of the text.

Property Manager Keyboard Commands

Use the following keys when working in the **Properties** window when the property name is selected:

- The UP ARROW key selects the previous property.
- The DOWN ARROW key selects the next property.
- The LEFT ARROW key selects the previous property or collapses the list of a parent property.

- The RIGHT ARROW key selects the next property or expands the list of a parent property.
- The PAGE UP key moves the selection up by the height of the window, scrolling if necessary.
- The PAGE DOWN key moves the selection down by the height of the window, scrolling if necessary.
- The HOME key selects the first property.
- The END key selects the last property.
- The TAB key selects the next property that accepts keyboard input (similar to a dialog). It skips collapsed items as indicated by the (+) button to the left of the item. Use the arrow keys to navigate to a collapsed item.
- SHIFT+ TAB selects the previous property that accepts keyboard input (similar to a dialog).

Modules

A module is a data set or process to be applied to a data set. Modules are the building blocks from which the final output is constructed. Modules accept data on their input connection pads, modify the data, and pass it along through the output connection pads. There are four types of modules: *computational, data source, general*, and *graphics output*.

Computational Modules

Computational modules alter the data by changing their type, filtering, creating a gradient, gridding, performing mathematical transformations, merging, resampling, slicing, creating a subset, or transforming coordinates.

ChangeType

The *ChangeType* module changes the lattice or point set data type from one primitive type (e.g. integer, float, etc.) to another. Smaller types save memory at the expense of reduced numeric precision. All components of the input data set are converted. The *ChangeType* module changes the data components type only, not the coordinates. Use the *Transform* module to change the coordinates.

DuplicateFilter

The *DuplicateFilter* module removes duplicate data points in a point set. Duplicate data are two or more data points having nearly identical X, Y, and Z coordinates. The *DuplicateFilter* properties control the definition of a duplicate point. Several options are

available for determining which point, if any, to keep when points are considered duplicates.

ExclusionFilter

The *ExclusionFilter* module excludes data points in a point set according to a user-specified Boolean function. Some functions available are IF, AND, OR, NOT, and several comparison operations (=, <, >, etc). See the complete list of functions and operators in the online help on the *Mathematical Functions* page.

ExtractPoints

The *ExtractPoints* module converts points on well paths into points to use for gridding. It will also convert a lattice to a point data set. The number of output components, based on the number of input components or log items in the original data, can be set.

Filter

The *Filter* module applies a digital filter to a uniform lattice. The lattice may be two-dimensional (images) or three-dimensional (volumes). Each filter reads the input lattice, performs a particular filtering operation on the data values in the lattice nodes, and sends the results to the output lattice. The input and output lattices are always the same size and type. *Filter* module computations include data statistics such as local minimum, maximum, median, average, standard deviation; and image modification such as brightness and contrast.

Gradient

The *Gradient* module computes a gradient field from a single component of a two- or three-dimensional lattice. A gradient is a three-dimensional vector pointing in the direction of greatest slope. The output lattice contains three-component data at each lattice node. A centered difference algorithm is used to calculate the gradient. The output lattice geometry is identical to the input lattice geometry.

Gridder

The *Gridder* module interpolates scattered point data onto a uniform lattice. The output lattice range, resolution, interpolation method, and associated parameters are set. Since gridding can take quite a while to execute, it is necessary to click the *Begin Gridding* button in the **Property Manager** to start the process.

Math

The *Math* module creates a new output lattice by applying a numeric expression to one or more input lattices. The output lattice is calculated one node at a time by applying the numeric expression to the input lattice nodes.

Merge

The *Merge* module combines two or more input lattices into a single uniform output lattice. You can specify the output lattice range and resolution.

Resample

The *Resample* module allows the resolution of a lattice to be changed. This is performed by computing new data values at each output lattice node by interpolating the data values from the input lattice. The *Resample* module does not perform extrapolation.

Slice

The *Slice* module creates a two-dimensional slice through a three-dimensional input lattice. The plane orientation may be preset to one of the local axis planes or in an arbitrary direction.

Subset

The *Subset* module extracts a particular region of interest for further analysis. You can specify the geometric range, sampling frequency, and data components of the subset.

Transform

The *Transform* module transforms the X, Y, and Z coordinates of an input point set or lattice using a standard 4x4 transformation matrix. The order of transformations is: scaling, rotation, and translation. Rotation and scaling are performed around the object's *Origin.* The *Origin* can be the lower left corner, the upper right corner, the center, or a custom position.

Data Source Modules

Data source modules serve as the source of raw data. The data may be imported from a file or created from mathematical functions. **Voxler** supports several different file types. See the *File Format Chart* in the online help (**Help** | **Contents**) for a detailed list of supported file formats. Data are passed from one module to another to accomplish tasks such as gridding, slicing, or displaying graphics.

The four main types of imported data include: point sets, lattices, geometry, and well data.

Point Sets

Point sets contain one or more three-dimensional point locations. Each location has an X, Y, and Z coordinate along with optional data components. Occasionally, this is called "XYZC data" where XYZ represent the three-dimensional position and C represents one or more data component values at that position. Any ASCII data file, Excel files, and many database files can be imported with the **File** | **Import** command to create a point set. Data are normally in columns in points sets, with each column containing a separate variable.

Lattices

A lattice consists of a one-, two-, or three-dimensional data array. An array is a regular, structured matrix of points. A one-dimensional lattice is a line of data. Examples of two-dimensional lattices include bitmaps or **Surfer** grid files. A three-dimensional lattice defines a three-dimensional volume. Each node (or point) in the lattice can contain one or more components or data values. Lattices are further categorized by the node geometry: uniform, rectilinear, and curvilinear. Detailed information about the lattice geometry and components are found in the online help. Some types of lattices that can be imported into **Voxler** using the **File** | **Import** command include **Surfer** grid files, DEM files, images, P3D files, LAT files, and many other formats.

Geometry

Geometry consists of triangles, texture maps, line segments, and other objects. Geometry is collected at the end of the pipeline and displayed in the **Viewer** window. Geometry is usually represented internally using integer or single precision floating point. Some geometry data types that **Voxler** can import using the **File** | **Import** command include DXF, SHP, E00, BLN, and many other formats.

WellData

The *WellData* module is a container for well data imported into the project. Each well is imported into the *WellData* module using the **File** | **Import** command. A *WellData* module can have any number of wells, with each well containing information specific to that well. Each well can contain X, Y, Z, MD (Measured Depth), Azimuth, Inclination, and any number of Logs. The log is the data variable associated with the downhole location, and is usually the variable to be modeled. Data for wells can be imported from ASCII text files, Excel files, database files, and LAS files.

FunctionLattice

The *FunctionLattice* module creates a new uniform lattice from a user-defined function. You can specify the output lattice range, resolution, number of components, and mathematical equations for defining each component.

TestLattice

The *TestLattice* module generates a variety of lattices for testing and experimenting with various modules. You can specify the output lattice range, resolution, and data type.

General Modules

General modules display module information and provide custom lighting in the **Viewer** window.

Info

The *Info* module displays information about the connected module, such as data limits, number of components, and component type.

Light

The *Light* module creates a new directional, point, or spot light and adds it to the scene. Lights are cumulative. Every time a new light is added, it makes the scene a little brighter. You can add approximately eight lights to the scene. To view a scene with only light modules, uncheck the **View** | **Headlight** command to turn off the global light.

Viewer Window

The *Viewer Window* module contains various properties that affect the entire scene, such as background color. The *Viewer Window* module is automatically created. The *Viewer Window* module is displayed in the **Network Manager**; it is not listed in the

Module Manager since it always exists and cannot be deleted. The *Viewer Window* module only controls the options for the current **Viewer** window. To change the default **Viewer** window settings, click the **Tools** | **Options** command and click on the **Colors** tab. The *New viewer window background* controls the color of future **Viewer** windows.

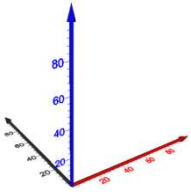
Graphics Output

Graphics output modules create graphics in the **Viewer** window. Typically, these modules require data input.

Annotation

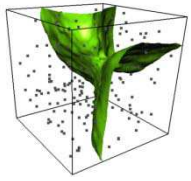
The *Annotation* module creates a text string that is always parallel to the screen. By default, the current date and time is used as the text string. You can enter your own text in the **Property Manager**. Use the *Text* module to anchor the text to the scene.

Axes



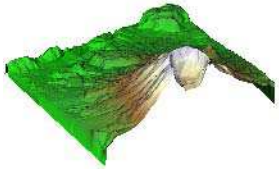
The *Axes* module creates a set of axes. The axes are attached to an input point set or lattice. The axis labels are planar, although the plane orientation can be changed in the **Property Manager**. A grid can also be displayed between any two axes. By default, the X axis is red, the Y axis is green, and the Z axis is blue. These colors can be changed in the **Property Manager** for the existing axes or in the **Tools** | **Options** dialog for default conditions for future axes.

BoundingBox



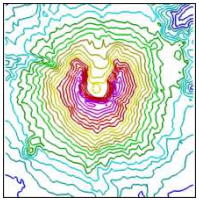
The *BoundingBox* module draws a bounding box around the input module extents. Additionally, labels can be displayed for the minimum and maximum corners. The labels are displayed as screen-aligned text centered on the minimum and maximum corners.

ClipPlane



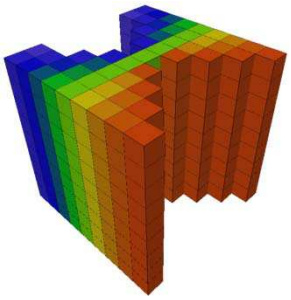
The *ClipPlane* module clips input geometry according to a user-defined clipping plane. All geometry on one side of the plane is drawn. The geometry on the other side of the plane is removed (clipped). The side that is clipped and the location of clipping can be altered in the **Property Manager**. Multiple modules can be attached to the same clipping plane.

Contours



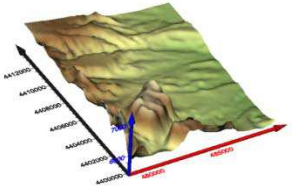
The *Contours* module generates contour lines for a two-dimensional data set or for slices of a three-dimensional data set. Contour lines represent the boundary between data less than a given level (threshold) and data greater than the level. For three-dimensional data sets, the *Contours* module creates a planar slice through the lattice and contours the two-dimensional slice. Contour lines are colored by mapping data values to colors through a *Colormap*.

FaceRender



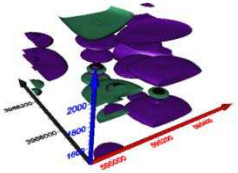
The *FaceRender* module displays uninterpolated cubes of an input lattice. A *FaceRender* cube represents one unit in each of the X, Y, and Z directions. Component values are represented by different colors in the *FaceRender*. To determine the component value and color for each cube, **Voxler** calculates the average component value by summing the values at each of the eight corner points and dividing by eight. If one or more of the corner points has a null (blank) value, that cube is not displayed. Additionally, the cube is not displayed if the color map value for the average data value for that cube is partially or fully transparent.

HeightField



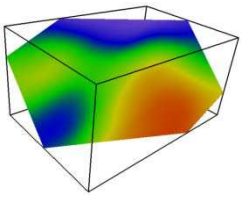
The *HeightField* module displays a lattice slice in three-dimensions. The slice is scaled in the perpendicular direction by a user-specified data component and scale factor. The surface is colored by mapping the data values through a *Colormap*.

Isosurface



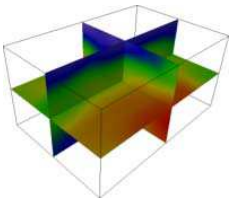
The *Isosurface* module creates an isosurface through an input lattice. An isosurface is a surface of constant value in a three-dimensional volume. The isosurface value is set in the *Isovalue* property in the **Property Manager**. The isosurface separates regions less than the selected *Isovalue* from regions greater than the selected *Isovalue*. All points on the isosurface have the same value (the isovalue).

ObliqueImage



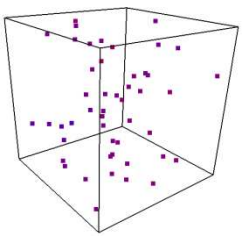
The *ObliqueImage* module displays a color image on a two-dimensional cutting plane through a lattice. In medical terminology, this is known as a multi-planar reconstruction (MPR). The slice is represented using colors mapped through a *Colormap* for scalar data, or as direct RGBA colors for lattices containing color data.

OrthoImage



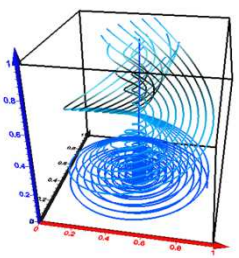
The *OrthoImage* module displays an orthogonal slice through a lattice parallel to one of the three axial planes (XY, XZ, or YZ). Orthogonal indicates elements are perpendicular or at right angles. The slice is represented by mapping data to a *Colormap* for scalar data, or as direct RGBA colors if the lattice already contains color data. The scalar to color mapping may be specified with a linear gray mapping function with contrast enhancement or with a *Colormap*.

ScatterPlot



The *ScatterPlot* module displays a set of symbols at each point of a point set or each node of a lattice. The symbols are screen-aligned and do not scale or “tilt” as the camera is changed. The symbol positions, however, are maintained in three dimensions. Labels can be added to points in a *ScatterPlot*.

StreamLines



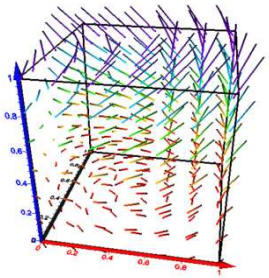
The *StreamLines* module computes streamlines through a velocity field. Streamlines are lines within a volume of space that indicate flow direction and magnitude. The technique injects massless particles at specified seed points and traces their paths through the field. The particles stop when the new velocity is zero, the maximum stream length is exceeded, or when the stream intersects the bounds of the field.

Text

The *Text* module creates a two-dimensional text string aligned with the camera plane. The text has a three-dimensional anchor point that is transformed with the scene. The text is not scaled according to the distance from the camera, nor is it influenced by rotation or scaling. It is, however, still obscured by graphics lying in front of it. The text is positioned according to the current transformation: the X origin is the first pixel of the leftmost character of text and the Y origin is the baseline of the first line of text

with the baseline being the imaginary line on which all upper case characters are standing. Use the *Annotation* module to create text that is not anchored to the scene.

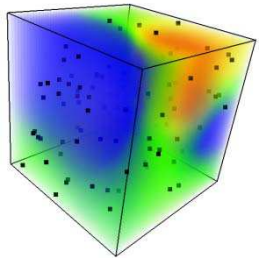
VectorPlot



The *VectorPlot* module displays vectors on a three-dimensional lattice or point set. It is often useful to combine the *VectorPlot* module with another module, such as *StreamLines*.

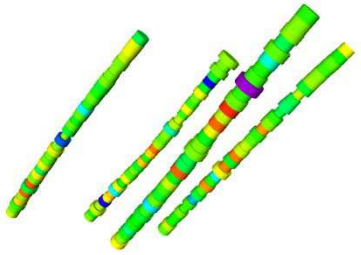
VolRender

Most visualization techniques convert volume data to surfaces. This module uses an alternative technique called *direct volume rendering* to render voxels directly. A voxel is short for **vo**lume pi**xel**, the smallest distinguishable box-shaped part of a three-dimensional image.



Volume rendering is a three-dimensional display of data that simulates the transmission and absorption of light through the points in the volume. Light rays are cast through the volume, where particles within the volume simultaneously emit and absorb light. The color of an individual pixel on the screen is computed by compositing the contributions from each particle that intersects the ray. This allows visualization of inhomogeneity inside objects with appropriate opacity adjustment.

WellRender



The *WellRender* module displays well traces from well data. Wells are displayed as tubes. Thickness and color can vary down the well. In addition, direction data and interval data can be displayed on the well.

Getting Help

Within **Voxler**, the online help file is opened with the **Help | Contents** or **Help | Tutorial** commands. Alternatively, press F1 at anytime to open the **Voxler Help** window and access the help books and help pages.

Online Help

You can navigate the **Voxler Help** window using the **Contents**, **Index**, **Search**, and **Favorites** pages. See Help Contents for details on navigating the **Voxler Help** window.

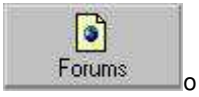
Context-Sensitive Help

To obtain information about dialogs or highlighted commands:

- Press the F1 button to find out the function of the highlighted menu command or open dialogs.
- Click the  button in dialogs to open the help topic pertaining to that dialog.
- Determine the function of highlighted menu commands or open dialogs by pressing F1.
- Click the  button or press SHIFT+F1 on your keyboard, and click a menu command, toolbar button, or screen region to view information about that item.
- Click the  button at the top of the **Property Manager** to obtain specific information about the selected object type.

Internet Resources

There are several Internet help resources.

- Click the 

or 

buttons at the top of the online help to research a question or to post a question.
- Use the **Help | Feedback** commands to send a Problem Report, Suggestion, or Information Request by email.
- Search our website at www.goldensoftware.com or use the **Help | Golden Software on the Web** commands for additional help, including training videos.
- The Golden Software website has a variety of resources including training videos, a support forum, a newsletter, a user image gallery, and a variety of free downloads.

Technical Support

Golden Software's technical support is free to registered users of Golden Software products. Our technical support staff is trained to help you find answers to your questions quickly and accurately. We are happy to answer all 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.

Technical support is available Monday through Friday 8:00 AM to 5:00 PM Mountain Time, excluding major United States holidays. We respond to email and fax technical questions within one business day. When contacting us with your question, have the following information available:

- Your **Voxler** serial number (located on the CD shipping cover or in the **Help | About Voxler** dialog)
- Your **Voxler** version number, found in **Help | About Voxler**, including whether it is the 32-bit or 64-bit version of **Voxler**
- The operating system you are using (Windows XP, Vista, 7, or higher), including whether it is a 32-bit or 64-bit operating system

If you encounter problems with **Voxler**, you are welcome to send an email message to Golden Software using the **Help | Feedback | Problem Report** command. This message is delivered directly to voxlersupport@goldensoftware.com. Report the steps you perform when the problem occurs and include the full text of any error messages that are displayed. You are welcome to attach a .ZIP file (10 MB maximum) containing the .VOXB file that illustrates the problem. Contact technical support for other arrangements if you have very large zipped attachments to send.

Contact Information

Telephone: 303-279-1021

Fax: 303-279-0909

Email: voxlersupport@goldensoftware.com

Web: www.goldensoftware.com (includes FAQs, knowledge base, support forum, training videos, newsletters, blog, downloads, and more!)

Mail: Golden Software, Inc., 809 14th Street, Golden, Colorado 80401-1866, USA