STRATA™ STUDIO *Pro*

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MACINTOSH

User Manual

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STRATA

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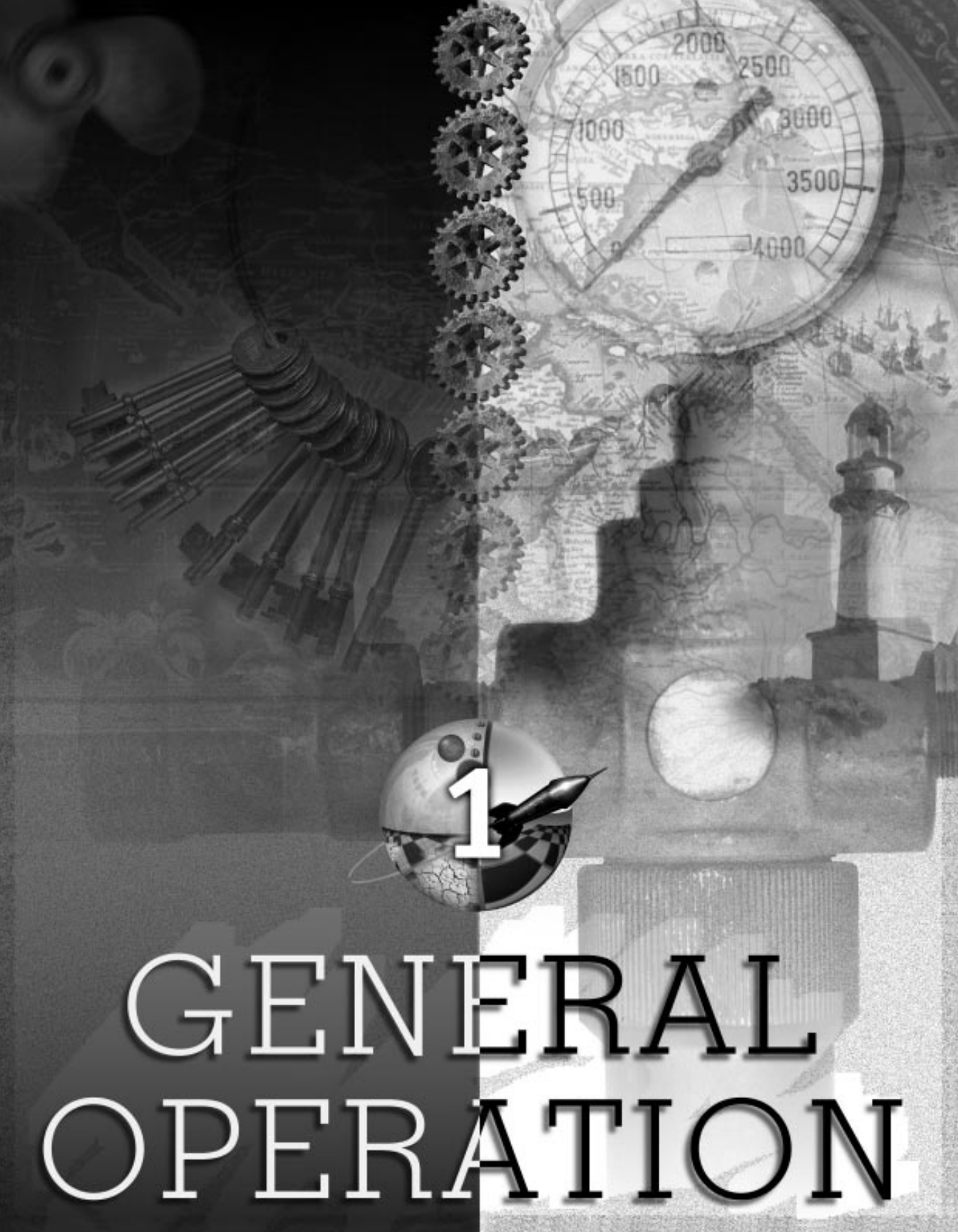

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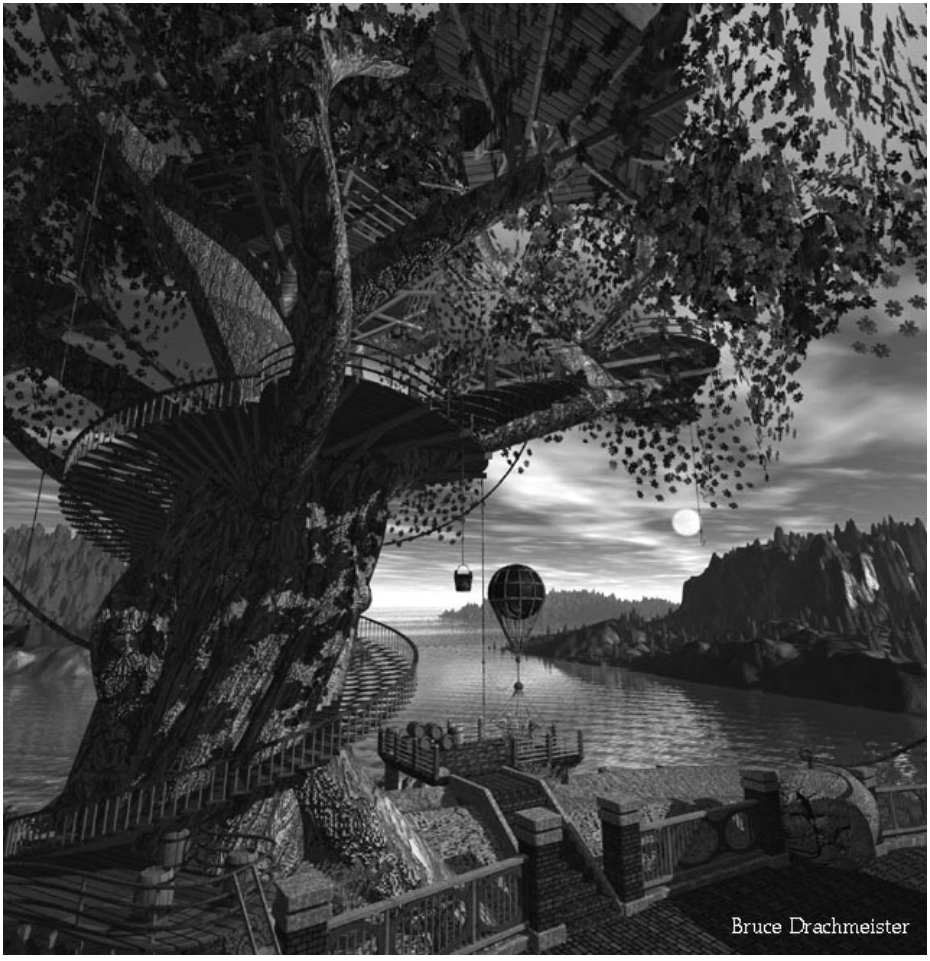
GENERAL OPERATION



INTRODUCTION

Welcome to the wonderful world of 3-D modeling and thank you for choosing Strata Inc.'s StudioPro. With the exciting new power tools of StudioPro, you will be able to easily create photo-realistic or stylized images and professional quality animations.

In this chapter you'll become acquainted with the general characteristics of the pro-

gram. You'll find that StudioPro follows all standard guidelines, is simple to learn, and that you can get amazing results quickly.

WHERE TO BEGIN

Each StudioPro project will require a certain number of steps. This will typically include:

- Opening a model
- Drawing one or more objects
- Applying textures and effects
- Positioning lighting
- Adding environmental effects
- Motion scripting
- Rendering an image

Experimenting with tools and techniques is a fun way to learn how to use StudioPro, but some pre-planning will make the serious project go smoother.

Plan from the top, start from the bottom. Know what you want the project to look like, then plan which components you will need to make possible all that you visualize. What will the background look like? The foreground? Just what objects will you need to animate? Remember, a storyboard is a great memory device and will save you time in the long run.

You've already started at a good place by picking up this manual. If you have a firm idea of how your hardware and software work, it will be easier to get where you want to be.

THE TOOLS OF STUDIOPRO

The Menu Bar

When using StudioPro, you can choose commands from numerous menus. Only commands that are relevant to the current situation are available for use, and a keyboard shortcut is displayed to the right of most commands.

NOTE *Existing keystroke equivalents can be changed using the* **CUSTOMIZE MENU** *command in the Edit menu. See the Reference Manual for complete instructions.*

When more than one model is open, the commands and tools apply to the active model only. This is true in every situation except the Windows menu. ALL open modeling windows from ALL models are listed at the bottom of the menu regardless of the active model. Selecting a window from that list makes it the active model.

When you select a command from one of the pull-down menus, StudioPro does one of three things:

- Performs an action directly.
- Displays a sub-menu.
- Opens a dialog box.

The Menus

Individual commands are not discussed here, rather you will get an overview of the organization of the individual menus. The commands are discussed in the chapters they relate to, and detailed information can be found in the *Reference Manual*.

Apple Menu

The **ABOUT STRATA STUDIOPRO™...** command is the only one that is different from the standard Mac Apple menu. It displays the StudioPro splash screen.

File Menu

The File menu is used for managing documents. It allows you to open, save, close, import, print, and quit.

Edit Menu

The Edit menu includes commands for documents. You can also set the units of measure, change the default specifications for the program, access the clipboard, hide and show grids, and customize menus.

Selection Menu

The commands in the Selection menu make the handling of complex objects easier. You can also hide selected objects and show all hidden objects.

Modeling Menu

The Modeling menu contains commands for working with modeled objects, construction objects, and for reshaping and converting these objects.

Rendering Menu

The Rendering menu allows access to the various options for rendering images. You can choose to render, which renderer to use, to suspend a rendering, and set rendering effects.

Windows Menu

The Windows menu allows you to control which windows are displayed on the screen, and which palettes are open or closed. You can adjust the view scale, and open camera, spotlight, and image windows.

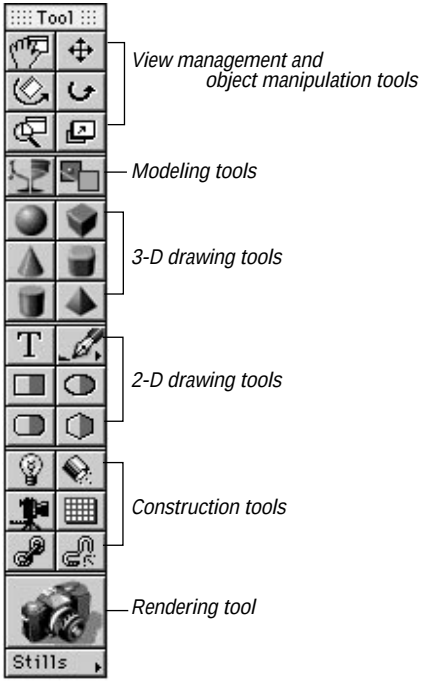
PALETTES AND BUTTONS

In addition to the menus and commands that make up the Menu bar, StudioPro uses special purpose palettes with functions that are grouped according to their uses. They are:

- **Tool Palette**
- **Extension Tool Palette**
- **Button Bar**
- **Resource Palette**
- **Environment Palette**
- **Object Properties Palette**

Nearly everything you can do in StudioPro can be done from the Menu bar, but the buttons and palettes often make the process easier. While a description of the Button Bar and individual palettes follows, their operations will not be discussed in detail until the specific chapter which covers their functions is presented.

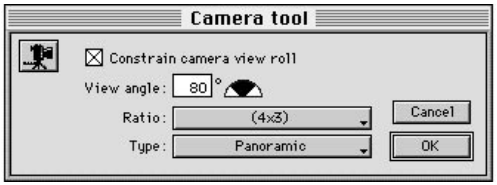
Tool Palette



The Tool Palette contains all of StudioPro's drawing, rendering, and object management tools.

The tools are grouped according to their function, whether it's moving views and objects, 2-D and 3-D drawing, manipulating lighting, creating links, or inserting camera objects.

Many of the tools will have a Tool Settings dialog. This is available when you double-click the tool button. The following illustration is for the Camera Object tool settings.



Extension Tool Palette

The Extension Tool Palette contains special tools that assist in modeling and animation. StudioPro ships with several extension tools. The Plus menu entries are: **COLLAPSE PALETTE** and **ABOUT TOOL**.

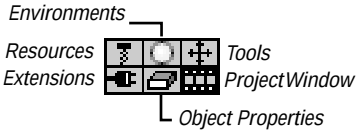
Button Bar

The Button Bar is positioned below the menu bar and can't be moved.

Just like menu commands, buttons are grayed out when they are not relevant.

Feedback is displayed directly below the Button Bar.

SHOW/HIDE toggle buttons allow you access to all of the palettes.



Resource Palette

The tabs on the Resource Palette allow you to introduce special resources into your model.

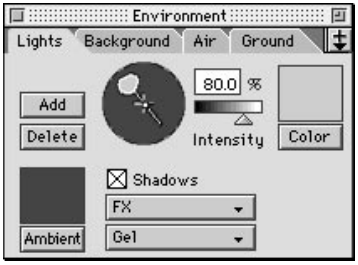
The Palette can be displayed as loaded resources only, or as showing all resources from that tab which are on disk.

There is also an entry in the **Plus menu**, **COLLAPSE PALETTE**, which allows you to display the tabs only.

Commands in the Plus menu apply to all tabs of the palette. They are: **COLLAPSE PALETTE, NEW, SAVE, DELETE SELECTED,**

DELETE UNUSED, INSERT/APPLY, EDIT, HIDE.

Environment Palette

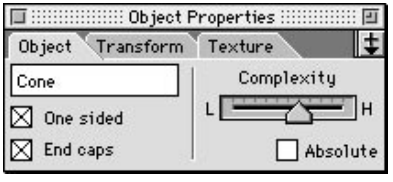


Each tab on the Environment Palette can be accessed independently. These tabs allow you to create unique environments for your model.

To conserve space, these palettes can also be shown as tabs only through an entry in the **Plus menu**, **COLLAPSE PALETTE**.

Object Properties Palette

Once an object is drawn into the modeling window with one of these tools, you have access to its Object Properties Palette. Click the resize box in the title bar to expand the palette for further editing.



The commands in the Object Properties Palette Plus menu are: **COLLAPSE PALETTE** and **EDIT OBJECT**.

WINDOWS AND VIEWS

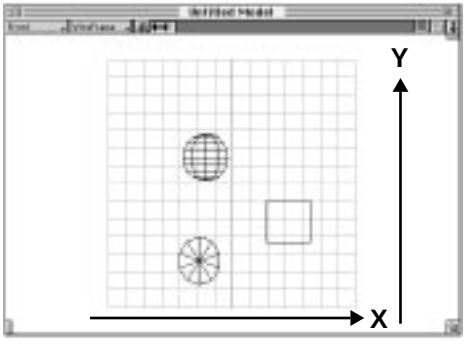
Because objects must be projected onto the flat surface of a monitor, working with 3-D images is much more challenging than working with 2-D images. But, StudioPro is capable of showing every object in a model as it appears from any viewing position.

You have access to multiple views so that you can look at models from any direction. You can split views and each view will have independent controls allowing you to look at your model from more than one view point at a time.

You can manipulate objects, assign textures, position lights, and take snapshots from any view. You will want to look at objects from several views to ensure that what you get is what you want.

View Planes

StudioPro uses Euclidean geometry to define its view planes. The three-axis coordinate system is patterned after the standard Cartesian space model with the axes always at right angles to one another.



By default, X is horizontal, Y is vertical, and Z (which is not shown) is depth. Of course, this makes an assumption about which way is up in 3-D space. Since views can be rotated in virtually any direction, how do you keep track of which way is up? By understanding StudioPro's coordinate systems.

Coordinate Systems

While the model space is absolute (X,Y,Z), the view and object coordinates are not.

There are three systems maintained by StudioPro:

- **World coordinates** (absolute)
- **Grid coordinates** (relative)
- **Object coordinates** (relative)

When you open a new model, you will see one of the X,Y, or Z grids. These grids maintain world coordinates. Any View or User grids maintain grid coordinates, and an object always maintains its own set of coordinates.

Windows

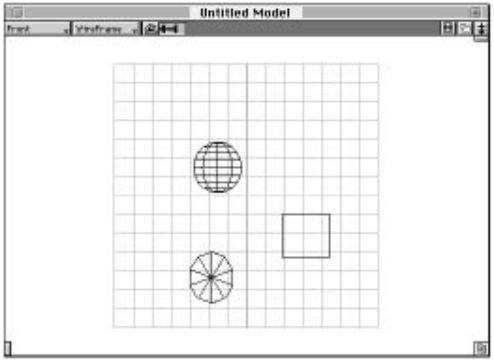
Windows give you access to documents. These may be either 3-D models, renderings in progress, still images, or animations to be played. StudioPro gives you eight types of windows.

- **Modeling**
- **Project**
- **Camera**
- **Spotlight**
- **Shape**
- **Rendering**
- **Image/Snapshot**
- **Animation Playback**

Only one window can be active at a time. You activate a view by clicking that window.

Windows will open according to the configuration specified in **PREFERENCES**. This can be changed through the Preferences dialog. See the *Reference Manual* for an explanation of Preference settings.

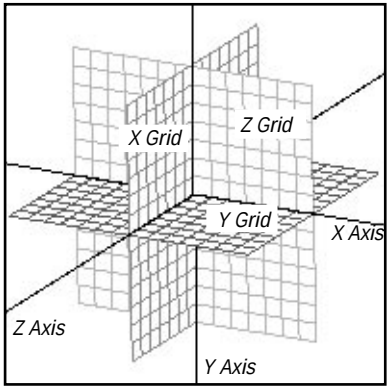
Modeling Window



Most of your work will be done in the modeling window. This is where you will create and modify your objects. Controls here make it easy for you to change views, change display methods, and change view orientation.

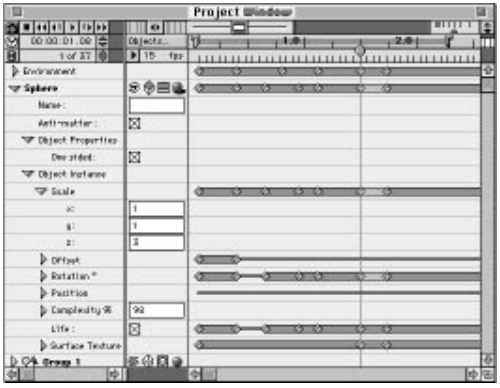
World Grids

When you open a new window, you will be faced with a world grid.



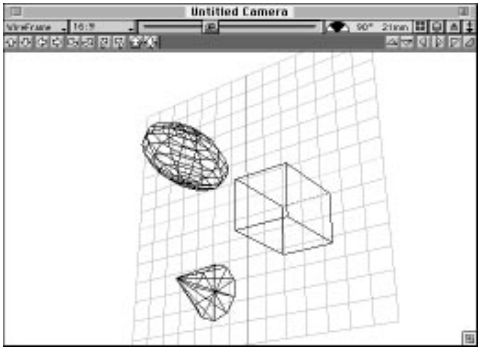
There are three world grids. The Z grid is tan, the Y grid is blue, and the X grid is purple. Objects are drawn on world, view, or user grids.

Project Window



The Project Window is another way to edit objects in the modeling window, as well as animate your model. It places all controls needed to create an animation in one convenient location. It may be expanded in both directions to show all objects in the modeling window and all event markers on the timeline.

Camera Window



Camera windows allow you to perform the same functions as modeling windows.

After you insert camera objects and position their views, you can go to the Windows menu and select the camera window you want to view.

The windows are linked to the camera objects inserted into the modeling window. From this view, you are looking at the object as if through the camera view finder.

Spotlight Window

The spotlight window allows you to view the area that a spotlight illuminates. It has controls that function similarly to those in the camera window.

Shape Window

The shape window looks just like a modeling window. You can do everything here that you can do in a modeling window. You will know it is a shape window because it will say *Shape* in the title bar.

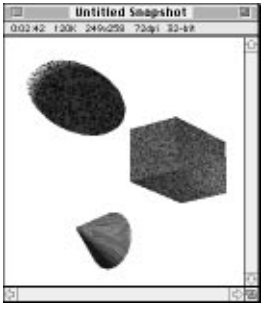
Rendering Window

You can render images from the modeling window by using the Rendering tool from the Tool Palette or selecting **RENDER** from the Rendering menu.

When a rendering is initiated, a separate rendering window opens. These windows are like frames of film developing.

The main area of the window usually matches the image's size, but if it is larger than the screen, the window will contain scroll bars and a Resize button.

Image Window



An image window is a view only window for PICT or draw-type images.

The image may be from any source in any format supported by an import/export extension. You can save an image in any format supported by the installed extensions, and you can print the image.

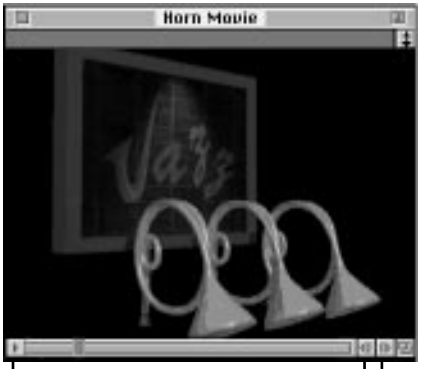
When the window is open, it contains information about the image's size on disk, dimension in pixels, and resolution.

A completed rendered image also displays in a similar snapshot window.

Animation Playback Window

With animation playback windows, you can play rendered animation sequences

that have been saved to multiple-image files.



MANAGING DOCUMENTS

StudioPro works with original models that you create and with files modeled in other applications, then imported into StudioPro. You are provided with the tools to make managing documents an easy process. These are found on the Button Bar and in the Menus.

System Buttons

StudioPro provides you with system buttons to manage your documents. For quick access to the system commands, use these buttons found on the Button Bar:

NEW lets you create a new document to model in.

OPEN lets you open existing documents.

SAVE lets you save an entire model with objects, animations, and all modeling information intact.

CUT removes selected information from the document and places it on the clipboard.

COPY places the selected information on the clipboard without cutting it from the document.

PASTE takes the information from the clipboard and places it in the document.

UNDO/REDO lets you undo the last action or redo the last undone action.

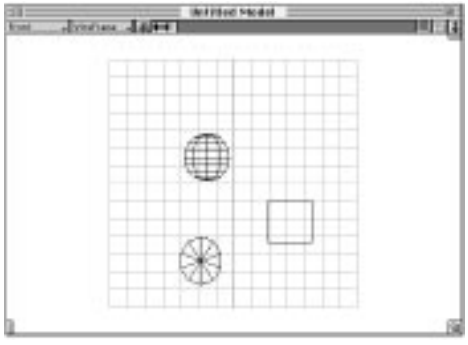
Working With Models

Models are stored as documents. When a model is being worked on, it is loaded into RAM and is available for editing. You can create new models or load existing models, and then edit and save these models.

Creating New Models

When you create a new document by selecting the **NEW** command from the File menu, your modeling window will open.

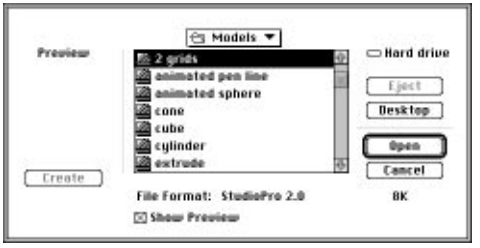
This window may be split to display two or more panes, and you can open other windows as needed.



Loading Existing Models

Use **OPEN** to open previously saved StudioPro models and to load other 3-D files. Follow these steps:

1. Choose **OPEN** from the File menu. The *Open* dialog box appears.



2. Locate the folder that contains the file you wish to open.

3. Click the file name, then click the *Open* button, or double-click the file name.

Only files with formats recognized by StudioPro appear in the *Open* dialog box. **OPEN AS** is available when the file type designation is incorrect for the document you want to open.

When a model is loaded, the window and view configurations are the same as when it was last saved.

You may have more than one model open at a time, but only one model may be active at one time. This allows you to copy textures and objects from one model to another. Tools and menu commands only work in the active window.

When you have more than one model open, it is simple to switch between them. Click in the window you want active.

Saving Models

Models may be saved at any time. They will be saved with all files that relate to that model, including shapes, textures, images, and lighting.

It is a good practice to save models periodically, but especially when you make major changes. This allows you to access the **REVERT** command if a problem occurs. Then you can restore the last-saved edition of a model.

Saving a New Model

Save a new model at an early stage and throughout its creation to ensure there is no loss of data.

To save a new model:

1. Make sure the active window is part of the model to be saved.

2. Choose **SAVE** from the File menu. The *Save* dialog box appears.

3. Type a name for the model in the *Save This Document As* field.

4. Use the drive and directory buttons to choose the location for saving the document.

5. Click the *Save* button.

Saving a Copy of a Model

You can create and save copies of a model by using **SAVE A COPY AS.**

It is similar to **SAVE AS**, but the model being copied is not renamed internally. Information on **SAVE AS** can be found under *Saving Images* in this chapter.

Closing Models

There are three ways to close a model:

- **Click the close box** in the upper left corner of the window.
- **Option-click the close box** of a window. This will close all associated windows as well as the model.
- **Choose CLOSE** from the File menu.

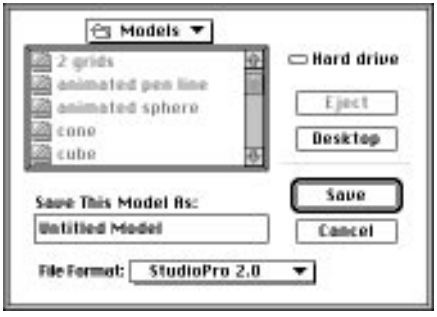
Saving Images

Images can be saved from modeling, camera, or rendering windows. They are simply 2-D images and contain no modeling information. They are completely independent of the model that was used to create them.

Use **SAVE AS** to save images. PICT is the default format for saving rendered images; however, you can save in other file formats. The format is selected using a pop-up menu in the *SaveAs* dialog box.

Modeling Window Images

Images in the modeling windows can be saved by using **SAVE AS.** They are 2-D representations of the model, but contain no model information, and are saved as PICT files.

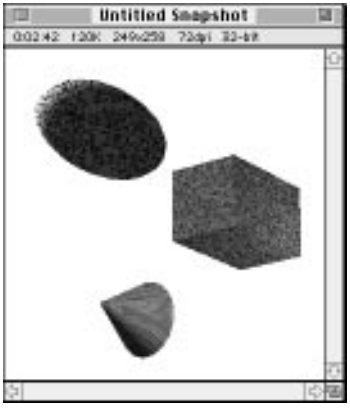


Rendered Images

Snapshots taken in a modeling or camera view open a rendering window.

Here the image develops. These images can be saved at anytime during the rendering process. They can be saved in different formats depending on the extensions available.

If an image is not saved, the window will become a snapshot window. The rendering controls are replaced with information about the rendered image.



Suspending and Restarting Renderings

Suspending and restarting renderings allows you to schedule rendering time at your convenience.

To suspend a rendering in progress:

Once you initiate a rendering:

1. Select **SUSPEND RENDERING** in the Rendering menu. The *Save Suspended Rendering* dialog appears.

2. Enter the name and select a location. The rendering will be placed in separate files, model data in one and image data in another. If you are suspending an animation, completed frames will be saved in one file and the suspended frames in another. Enable the *Collect* button if you want them combined on opening.

3. Click the *Save* button.

To restart a suspended rendering:

1. Select **OPEN** in the File menu.

2. Select the rendering.

3. Click *OK*.

This also applies to renderings that were suspended in the Render dialog.

You can open as many suspended renderings as memory allows. You can render them all at once, or in sequence.

You can also open a suspended rendering by double-clicking its icon on the desktop. This will automatically load StudioPro and start the rendering.

Animations

The process for scripting animations is discussed in the animation chapter of this manual. Rendering animations is discussed in the rendering chapter of this manual.

Opening Images and Animations

Saved images can be opened for viewing or for printing. They may be from any source supported by StudioPro.

The **OPEN** command is used to access these images. Files using any of the recognized image formats appear in the directory dialog.

You can use **OPEN AS** to force an image to be read in a particular format when the file type code for the file is known to be incorrect and the format matches the data structure of the file.

Importing/Exporting

Importing

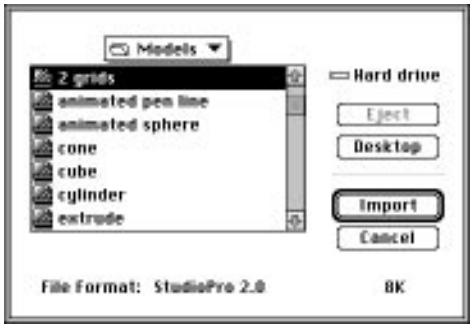
Models and images created with other programs can be brought into StudioPro through import extensions. Also, objects from one StudioPro model can be brought into another StudioPro model.

With the **OPEN** command, you can read an import file and convert it to a StudioPro model upon loading. Or, by using the **IMPORT** command, you can merge an imported file with an existing model.

To import a file:

1. Be sure you have a modeling window open.
2. Choose **IMPORT** from the File menu.

   The *Import* dialog box will appear.



3. Locate, then select the file you want to import.
4. Click the *Import* button.
5. Place the imported file into the model by either clicking once in the model window, or by clicking-and-dragging a marquee.

The file will be imported as one grouped object. It must be un-grouped for further editing. That object will appear in the loaded shapes list of the Resource Palette.

Exporting

With StudioPro, you can export models in different formats, depending on which extensions are available. This format is selected during a **SAVE AS** operation. If the modeling window is the active win-

dow, the dialog defaults to the StudioPro model format.

Because no export file format supports all the features available in StudioPro, it is possible that some data will be lost.

COMMANDS USED FOR GENERAL OPERATION

The following commands will be used during general operation. While the descriptions here are brief, detailed descriptions can be found in the *Reference Manual*.

Close (File menu)

CLOSE closes the active (front-most) window. Holding down the **Option key** while using this command closes all windows associated with the active document.

If the active window is a Rendering window, only that window is affected. If it has not completed rendering, you will be asked if you want to suspend the rendering.

Copy (Edit menu)

COPY places a copy of selected items on the Clipboard. The **Option key** lets you paste objects into another model with its coordinates intact.

Customize Menus (Edit menu)

CUSTOMIZE MENUS lets you customize the keystroke equivalents used by menu commands.

Cut (Edit menu)

CUT removes selected items from the active document and stores them in the clipboard. The **Option key** removes the selected objects from a model and retains the coordinates for those objects.

Delete (Edit menu)

DELETE removes selected items from the active document without saving the items on the Clipboard.

Fit Views to All (Windows menu)

FIT VIEWS TO ALL adjusts all views in the active window to include all objects. The **Option key** includes the paths of all objects with animation scripting in the view.

Fit Views to Selection (Windows menu)

FIT VIEWS TO SELECTION adjusts all views in the active window to position around a selected object or set of objects. The **Option key** includes the paths of the selected objects with animation scripting in the view.

Import (File menu)

IMPORT lets you merge StudioPro models and object data from other formats into the current model. This data is loaded into the model as a shape.

New (File menu)

NEW creates a new StudioPro model.

New Window (Windows menu)

NEW WINDOW opens another window with the same configuration as the active window.

Open (File menu)

OPEN lets you open an existing StudioPro model. It displays the *Open directory* dialog box.

Open As (File menu)

OPEN AS lets you open files with non-standard format designations.

Page Setup (File menu)

PAGE SETUP lets you specify printing information.

Paste (Edit menu)

PASTE places items contained on the clipboard in the active document. If the object is a StudioPro object and it was copied with the **Option key** down, you can **PASTE** with the **Option key**, and the object will retain its previous coordinates.

Preferences (Edit menu)

PREFERENCES lets you modify settings for basic StudioPro functions. Although the changes are effective immediately, if you exit StudioPro without using **QUIT**, the changes will not be saved.

Print (File menu)

PRINT lets you specify printing options for the active document.

Quit (File menu)

Choose **QUIT** to exit StudioPro.

Revert (File menu)

REVERT lets you discard the changes made to a model or image and restore the active document to the last saved version. When you choose this command, a warning appears.

Save a Copy As (File menu)

SAVE A COPY AS lets you save a copy of the current document under a different name without changing the current name and file path of the document.

Save (File menu)

SAVE lets you save changes made to the active document.

Save As (File menu)

SAVE AS lets you save the active document using a different name and location. It can also be used to save rendered images.

Set Units (Edit menu)

SET UNITS allows you to specify the units of measure for the model. This will apply to grids and object sizes. It also affects all dialogs that have measurements.

Show/Hide Clipboard (Edit menu)

SHOW CLIPBOARD displays a window showing the current contents of the Clipboard. If the Clipboard is currently open, the command changes to Hide Clipboard. The contents of the Clipboard can't be edited in this window.

Show/Hide Button Bar (Windows menu)

SHOW/HIDE BUTTON BAR allows you to show or hide the Button Bar.

Show/Hide Environment Palette (Windows menu)

SHOW/HIDE ENVIRONMENT PALETTE allows you to show or hide the Environment Palette.

Show/Hide Extension Palette (Windows menu)

SHOW/HIDE EXTENSION PALETTE allows you to show or hide the Extension Tool Palette.

Show/Hide Object Palette (Windows menu)

SHOW/HIDE OBJECT PALETTE allows you to show or hide the Object Palette for the selected object.

Show/Hide Project Window (Windows menu)

SHOW/HIDE PROJECT WINDOW allows you to show or hide the Project Window.

Show/Hide Resource Palette (Windows menu)

SHOW/HIDE RESOURCE PALETTE allows you to show or hide the Resource Palette.

Show/Hide Tool Palette (Windows menu)

SHOW/HIDE TOOL PALETTE allows you show or hide the Tool Palette.

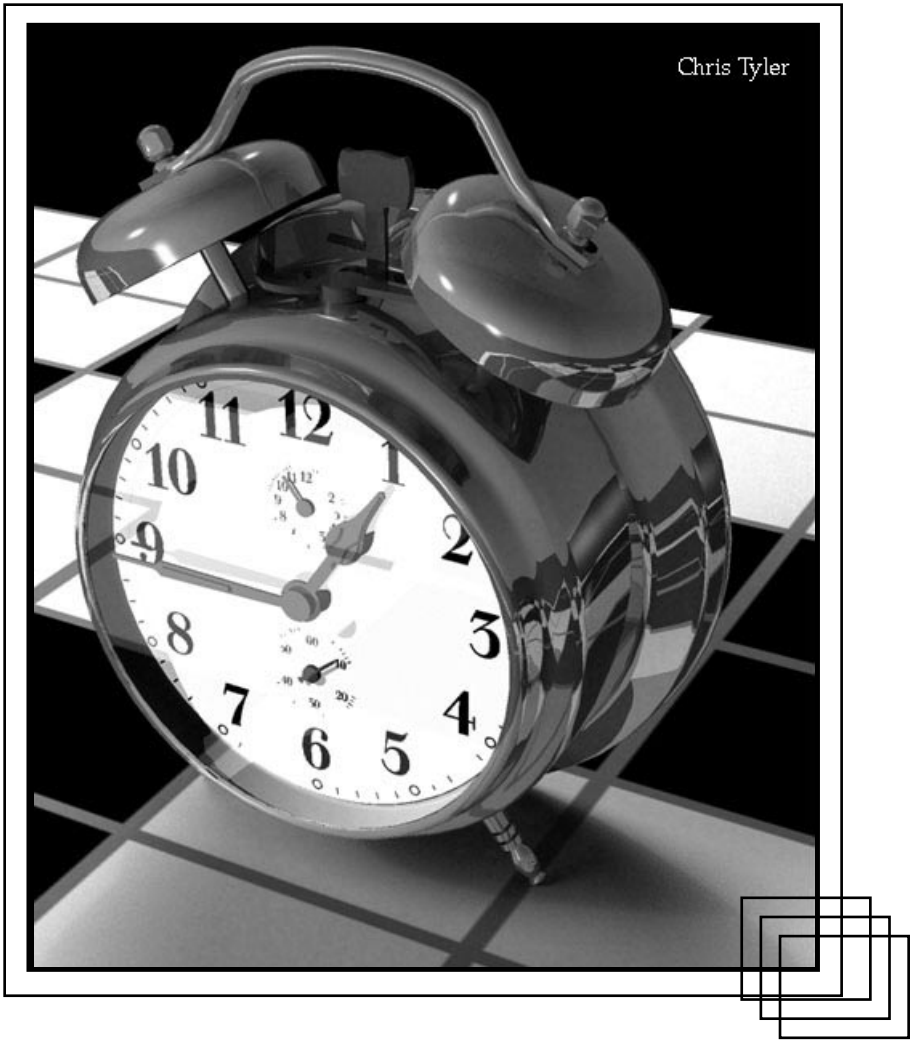
Show/Hide Statistics Palette (Windows menu)

SHOW/HIDE STATISTICS PALETTE opens an information window for StudioPro.

Undo/Redo (Edit menu)

UNDO/REDO identifies and reverses the last action performed.

2 MODELING



INTRODUCTION

StudioPro offers you a wide range of methods and tools to model with. Some of the modelers are part of the core program, others are included as extensions. In any case, they are found in the menu, on the Tool Palette, on the Extension Tool Palette, or can be accessed through a button on the Button Bar.

This chapter takes a look at the modeling capabilities of StudioPro, some guidelines for effective modeling, and the operation of the various modeling tools.

There are no absolutely right or wrong ways to build objects, but some methods are definitely more efficient—methods that save time, effort, and RAM.

PROJECT PLANNING

An important part of any project is pre-planning. It can be as simple as thinking a project through in your mind, or as complex as a script and storyboard.

For a complex model or animation, these steps will save you some over-all time.

- **Develop a story board** or hand-sketch a view of where the objects belong—their size and relationship to one another. What will the finished project look like? What are the necessary components?
- **Make an official list** of things which will be in the model. It should be very detailed.
- **Write a sample scene** complete with lighting and camera angles if you are scripting an animation.
- **Pre-script** the entire animation.
- **Plan the sequence of steps** to complete the project. Set up the models without textures to test the composition; lay down the textures; set up the lighting and special effects.

GENERAL MODELING PRINCIPLES

Points To Remember When Modeling

- **For memory efficiency, use primitives and instances as much as possible**. Many of the complex objects in the world are combinations of simple primitives or instances of shapes. An instance works much as an alias does. It references the original shape. In StudioPro, these objects use less memory and render faster.

  At some point it may become more efficient to use a polygonally-defined shape. There is no absolute point at which this happens; you will develop a feel for what works best for you.

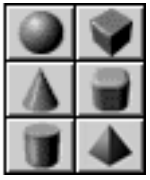
- **Use textures for surface detail** rather than trying to explicitly model the geometry. In addition to the extended modeling time needed, rendering time increases with the number of polygons and Bézier patches. Surface maps render faster.
- **Consider lower resolution and less detail for animations**. The eye is very forgiving of objects in motion. Screen resolution may be sufficient because nothing stays in place long. You might not even need to anti-alias images.

FUNDAMENTALS OF MODELING

Models can be defined graphically or as mathematical equations. Graphical models are often referred to as geometric models, because they are constructed using primitives, polygons, lines, circles, curves, etc.

Although you will be concerned only with geometric modeling, StudioPro allows you to model with as much or as little detail as you want.

Primitives as Building Blocks



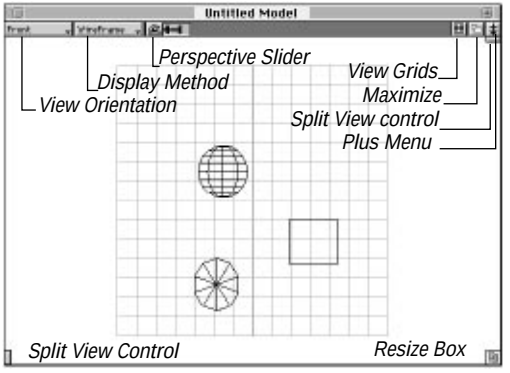
The basic set of StudioPro objects are called primitives. Because their mathematical representations are simple, they are the most efficient of any object, and complex models can be constructed using these primitives.

If the required geometry is not present in the primitive, it can be used as a template and then a modeler used to construct the necessary 3-D geometry.

Modeling Windows

These are the windows you will use most often, so you need to become familiar with their function and capabilities.

Modeling Window



Opening and Closing

The **NEW** command in the File menu opens a modeling window. If you select **OPEN**, you can choose from those documents which were previously saved. The **NEW WINDOW** command (Windows menu) opens a completely new window with the same configuration as the current window.

Windows are closed with the close box or the **CLOSE** command. If you hold down the **Option key** while clicking the close box, the model and all its windows will be closed.

Sizing

When you click on the Zoom box in the upper right corner, the window space expands to fill the screen. If you click again, the window returns to its original size.

You can manually size the window with the Resize box in the lower right corner. A read-out appears in the feedback area that gives you the size of the active window in pixels.

The View Set

Each window has seven home views: Front, Back, Top, Bottom, Left, Right, and Isometric. You can access more than one view by splitting the window using the Split View control. You can choose the view through the title pop-up menu, or set custom views with the view manipulation tools.

Each window has its own view set. Each view set is linked together through an imaginary point common to all views in the window, the View Set Center.

View Set Center

Each window has its own View Set Center which ties it to the other views in that window. This keeps it from getting lost. It is the center of the area you're looking at and is represented by a plus in the center of the active view whenever a view move tool is selected.

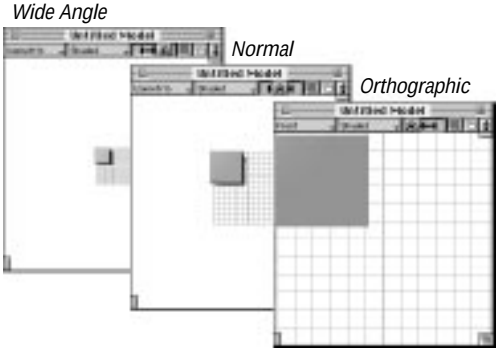
You can change the position of the view set by moving the *plus icon* in the active view to any area of the model space. When you do, all views connected to that view will move. This allows you to look at different areas of the same model.

Perspective

While in the modeling window you can adjust the perspective of your objects.

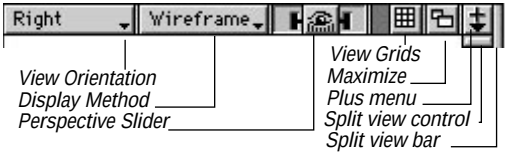
The Perspective control on the modeling window operates like the telephoto lens on a camera. You have three positions on the bar to choose from: Orthographic, Normal, and Wide Angle.

Normal and Wide Angle add the element of depth.



The appearance of the object depends on the view angle, the magnification, and the distance of the view from the objects.

Modeling Window Controls



Modeling windows have special controls to adjust the way objects are shown. Most of the tools you will need for handling views can be found within the window. They are:

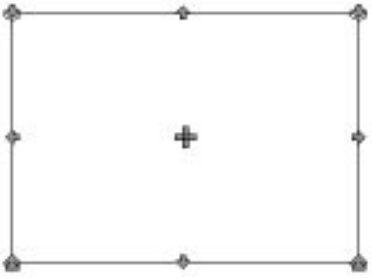
- **View Orientation**. This shows the direction from which you are viewing the model. Choose from: Front, Back, Right, Left, Top, Bottom, or Isometric. If you manually rotate the view with

View Rotation tool, the view orientation will display *Custom*.

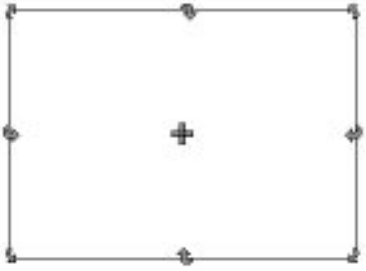
- **Display Method**. This shows how the objects will be displayed in the modeling window. Choose from: Wire-frame, PointCloud, Flat or Shaded.
- **Perspective control**. Perspective adds the element of depth to the views. With perspective, objects closer to the view plane appear closer than those farther away. Choose from: Normal, Orthographic (no perspective), or Wide-angle.
- **Maximize View button**. Click this button to maximize the view within the window. This will only be noticeable if the modeling window is split into multiple views. Click the button again to return to the window's previous state.
- **View Grid button.** Click this button to show the View Grid.
- **Split View control**. You can split the window pane size in half by double-clicking this control. You can also drag the control to create a pane.
- **Split View bar**. To size a view pane, drag a split bar to the size you want. To delete a pane, drag its full-size split bar to the window's edge.
- **Plus menu**. Commands in the Plus menu are: **PREVIEW ANIMATION, NEW WINDOW FROM VIEW, NEW CAMERA FROM VIEW, SPLIT VIEW, REMOVE VIEW, DISPLAY OBJECTS, RENDER.**

Other controls appear when you select a view manipulation tool.

- **Move Handles**. Use the handles to move your view. They appear when a view move tool is selected.



- **Rotate Handles**. Rotate your view in any direction.

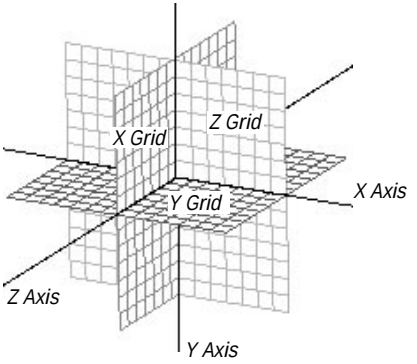


All object creation is done relative to the active grid, so it is important that you spend a little time getting familiar with the different types of grids—World, User, and View.

World Grids

When you open a new window, you will be faced with a world grid. This can be changed in **PREFERENCES** in the Edit menu.

There are three world grids. The X grid is purple, the Y grid is blue, and the Z grid is tan.



World Grid Behavior

- Only one grid can be active at a time. The inactive grids are hidden or dimmed. This is set in Preferences.
- The plus (+) and minus (-) keys toggle between all grids.
- Short cut keys are: **x** for the X grid, **y** for the Y grid, and **z** for the Z grid.
- To hide grids, select **HIDE GRIDS** from **GRIDS** in the Edit menu.

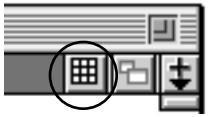
You can also use the Grid tool to scale the visible portion of the world Grid.

User-defined Grids

User-defined grids allow you to more accurately align and position objects relative to other objects. User-defined grids are explained with the Tool Palette's Grid tool in this chapter.

View Grids

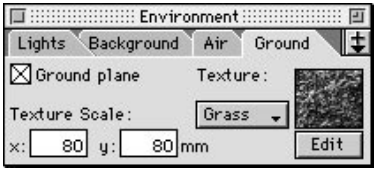
Display a View grid in the active window by clicking the View Grid button.



View grids are drawn parallel to the view plane and are view relative. View grids will allow you to model much like you did in previous versions of StudioPro. Clicking the button again will turn off the view grid and make the previous grid active.

Ground Planes

In the course of setting up your model, you will want to add certain effects. At the beginning stages, a ground plane might be a useful tool. StudioPro provides one for you in the Ground tab of the Environment Palette.

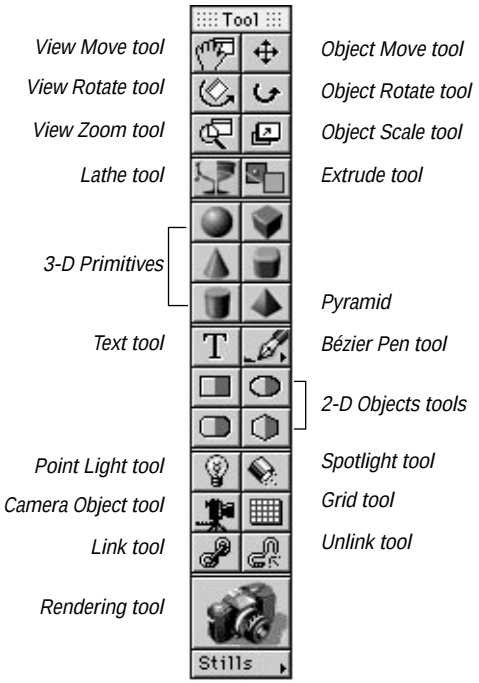


In this tab you can select a texture from those currently loaded in the model for application to the ground plane. Select only one texture from the pop-up list on the Ground tab.

Although the ground plane is infinite, you can set the scale for the texture you apply in the *x* and *y* fields.

Remember: a ground plane is not visible until it is rendered.

TOOL PALETTE



You were briefly introduced to the Tool Palette in Chapter One. In this chapter, you will become familiar with the tools on it and their functions.

The Tool Palette is essentially a floating mini-window. It may be moved around in the active window by dragging its move bar.

Although it is normally visible, you can hide it by:

- **Selecting HIDE TOOL PALETTE** in the Windows menu.
- **Clicking the Tool Palette's Hide/Show button** on the Button Bar.

Show it again by:

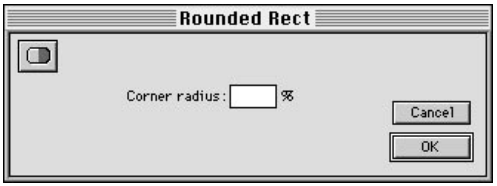
- **Selecting SHOW TOOL PALETTE** in the Windows menu.
- **Clicking the Tool Palette's Show/Hide button** on the Button Bar.

The position of the Tool Palette is remembered from session to session, but the palette is not available where the tools are not applicable (for example, if a rendering window is the active window).

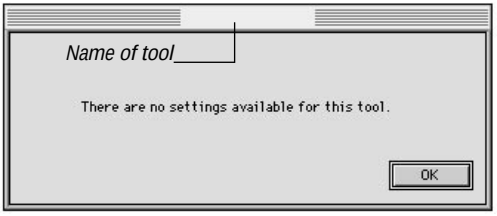
Tool Settings Dialog

Many of the tools will have a Tool Settings dialog with options available for that particular tool. Changing a tool's settings will change that tool's behavior for any future use of that tool. It will not affect any objects already created with that tool.

The Tool Settings dialog can be accessed by double-clicking the desired tool. The following example is for the 2-D Rounded Rectangle.



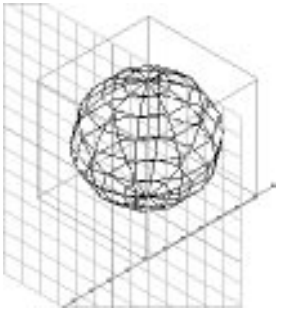
If there are no settings for the selected tool, you will get the following dialog.



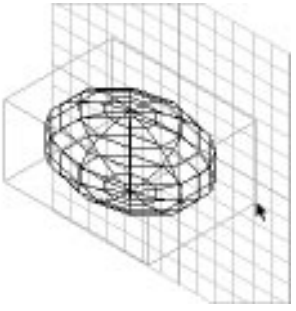
Inserting an Object Into a Window

All objects must be inserted on a grid. It may be a world, view, or user-defined grid. With the exception of objects created with the Bézier Pen, the Text tool, and construction objects, objects are inserted into the drawing space in two ways:

1. **Three step method.** Position the cursor on the grid where you want the object to start, then click. Click again where you want the next dimension to begin. A temporary guide will appear. Use this to set the third dimension. The third click will complete the object.



2. **Click-and-drag method.** Press the mouse button and drag in any direction on the active grid. The third dimension is determined by adding the first two dimensions together, and dividing this by two.



- **Shift key** constrains the object's proportions so the object is symmetrical.
- **Option key** draws the object from the center.

Selecting Objects

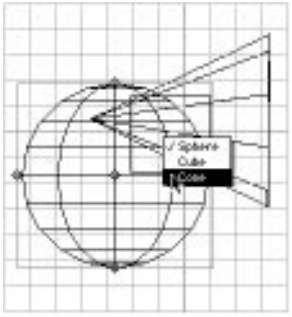
The simplest way to select an object is to choose one of the manipulation tools and then click on the surface of the object.

- Select more than one object by holding down the **Shift key** and clicking on the objects one at a time.
- Select more than one object by dragging a selection marquee around the objects you want selected. With the **Command key**, all objects that are touched by the marquee are selected; otherwise, they must be completely enclosed by it.
- Select all visible objects in the window with the **SELECT ALL** command in the Selection menu.

There are four ways to select hard-to-reach objects:

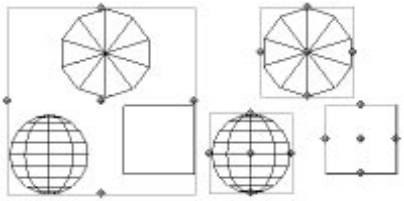
- Move to another view.
- Drag a selection marquee around the desired object. If objects you don't want are still selected, use the **Shift Key** to un-select them.
- Temporarily hide the objects that are in the way by using the **HIDE SELECTED** command.

- Select with the **Control key** pressed to access the pop-up list of all objects on the depth axis of the cursor.



To deselect an object, click anywhere in the view away from the object, or use the **SELECT NONE** command in the Selection menu.

When an object is selected, handles appear. They provide a means of using the object manipulation tools.



Grouped objects *Individual Objects*

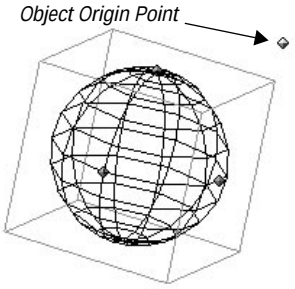
Double-Clicking an Object

When selecting an object, double-clicking allows you to access a separate window where you can edit that object. If it is an editable entity, you can use the **RESHAPE** command to access all the reshape functions. If it is not, you will have to convert it to an editable entity. See the **CONVERT** command in this chapter for directions on this process.

Object Origin Points

Each object has an object origin point. When an object is selected, the object origin point is displayed along with the handles. The object origin point may not be visible in some display methods.

You may want to move the object origin point to change the center of rotation for that object. For example, you may be creating a planet revolving around the sun. In order to do this you would have to move the origin point of the planet, so that it did not move around its own geometric center.



In StudioPro, the default object origin point is generally the geometric center. This may not be the case with objects imported from other sources, or if you have moved the origin point. You can adjust this with **RE-CENTER** in the Modeling menu.

The **object origin point** is used to determine:

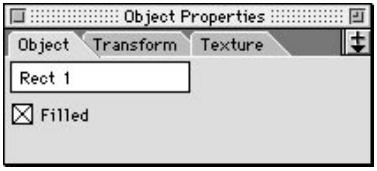
- The axis for object rotation.
- Where a child object is linked to its parent.
- The animation path for the object.

Modifier keys used with center points:

- **Command key** moves the origin point without moving the object, if the origin point is grabbed. If the object is grabbed, the center point will not move, only the object will.
- **Shift key** constrains the movement on the active grid to 45° increments.

Using the Object Properties Palette

All objects have an Object Properties Palette where you can change the characteristics of that object. They will all look different according to the needs of that object. The following example is for the 2-D Rectangle.



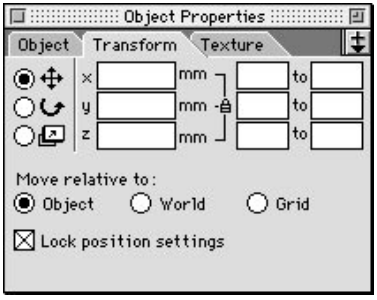
Once an object is selected, you can access its Object Properties Palette by:

- Selecting **SHOW OBJECT PALETTE** from the Windows menu.
- Clicking the Object Properties button in the Button Bar.
- Selecting an object accesses its properties if the palette is already open.

In the Object Properties Palette, you can change basic characteristics of the object you have defined. Changes are automatically made when you click out of the field or press the Enter, Return or Tab key. Click on the Resize box in the title bar to access the expanded portion of the palette.

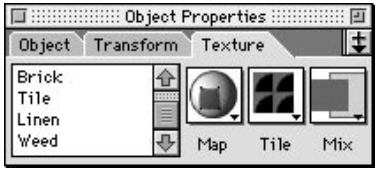
The Object Properties Palette also has a Transform and Texture tab. The Transform tab allows you to change the position, rotation, and size of objects in the model.

Transform tab



The Texture tab allows you to change the textures on an object and is explained in the chapter on textures.

Texture tab



How the Tools Work

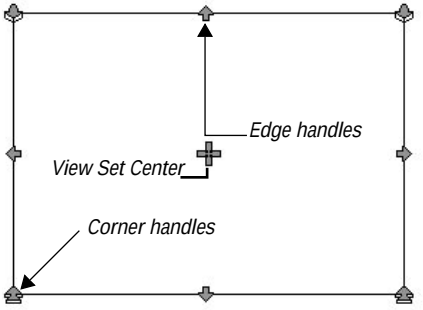
View Management

View Management tools let you control how the views in the modeling windows display the object. Move and Rotate operate with overlays that appear in the active view when one of the tools is selected.

VIEW MOVE TOOL

This tool lets you scroll the view through a model. With the tool selected, position the cursor any-

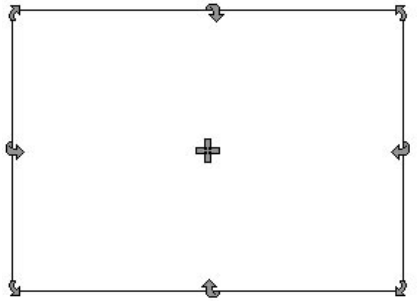
where in the active view, then click-and-drag in any direction.



- If you drag with any **edge handle**, you will limit the movement of the view set horizontally or vertically.
- **The corner handles** move the view set along the depth axis (in and out). This will only show if you are not in orthographic view.
- **Free move** by grabbing anywhere in the view except on a handle.

VIEW ROTATE TOOL

Use this tool to rotate views around the view set center point by using handles provided through the overlay.



This only rotates the view, not the object. Rotation is indicated by the direction of the handles.

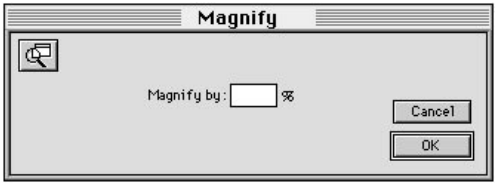
- **Shift key** constrains the view rotation to 45° increments.
- **Option key** allows the rotation of the view to be in less than 1° increments.

VIEW ZOOM TOOL

The View Zoom tool magnifies or reduces the scale of the view of the image. It does not change the scale of the object itself.

It works in two distinct ways: clicking once in the window, or dragging a marquee around the object and then releasing it.

You can predefine the magnification increments in the Tool Settings dialog for the click to zoom.

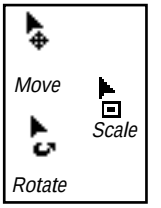


- **Option key** reduces the image.

Object Manipulation Tools

These tools are found in the upper right corner of the Tool Palette. They are used to select and manipulate 2-D and 3-D objects, light sources, and cameras.

When an object is selected, handles appear. When one of these tools is selected, the cursor changes shape.



If Caps Lock is on while using a cursor, the cursor will change to cross hairs.

You can toggle between the last used Object Manipulation tool and a modeling tool by pressing the space bar. You can also access them by pressing the number 1, 2, or 3 keys respectively.

OBJECT MOVE TOOL

This tool operates in the active view on selected objects.

Move objects in two ways:

1. Use *handles* to move an object on the grid relative to that object's coordinates.

2. Free move by grabbing anywhere other than a handle. The object moves on the active grid plane.

   Dragging an object without the handles does not allow in and out (or depth) movement.

- **Shift key** constrains the movement vertically and horizontally in 45° increments.

- **Command key** moves the object, but not its origin point. If you grab the origin point and move it with the **Command key** held down, the point will move; the object will not.

- **Option key** leaves a copy of the object in the original position.

Nudge keys have been provided for more exact positioning. They are the Arrow keys and the Command+Up Arrow and Command+Down Arrow. Any object that is selectable is nudgable. The Nudge units are specified in the Set Units dialog.

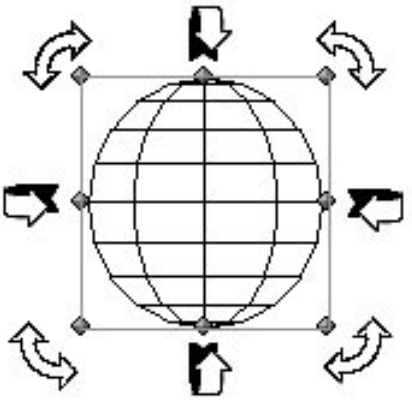
To use the Nudge keys, select any object with a selection tool, then use the keys for the direction indicated. If the nudge is object relative the object will move relative to its own coordinates. If the nudge is in world coordinates the object will move relative to the primary (world) grids.

OBJECT ROTATE TOOL

This tool is used to rotate objects, including camera icons and light source icons.

Rotate an object by one of two methods:

1. **Drag the handles** with the cursor to rotate the object about the object axis. You can rotate on any of the object's three axes.



- **Option key** leaves a copy of the object in its original position.
- **Shift key** constrains the rotation to 45° increments.

2. **Click-and-drag** on the surface of the object. The rotation will be unconstrained. The object origin point is the rotation point. If you want to rotate the object around its geometric center without moving the origin point, group the object, rotate it, and then ungroup it.

OBJECT SCALE TOOL

This is used to resize or stretch objects. You can enlarge or reduce them horizontally or vertically. An object's depth can be adjusted by stretching it in another view. The object is scaled in the direction the cursor is dragged.

The handles behave in the following ways:

- If you select a **face** handle, the opposite face handle will become the anchor point.
- If you select a **corner** handle, the opposite corner handle will become the anchor point.
- **Option key** scales an object from its geometric center.
- **Shift key** maintains the object's proportions on all three axes.
- **Option+Shift keys** scale the object proportionally with the geometric center as the anchor point.
- **Command key** scales the object in the direction the cursor is dragged, keeping the origin point stationary.

-or-

- **Command key** moves the origin point without moving the object if the origin point is selected instead of the object.

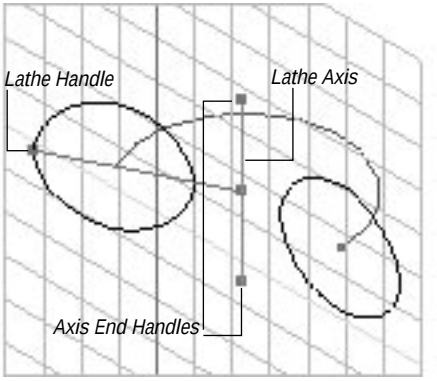
Modeling Tools

Modeling tools create various kinds of objects. As you draw, consider what type of texture will go on the object. If you want your object to show refraction, or you will be applying a volumetric texture or effect, the object must be one sided. This can be set in the Object Properties Palette for the selected object.

LATHE TOOL

LATHE revolves 2-D objects through space to create 3-D

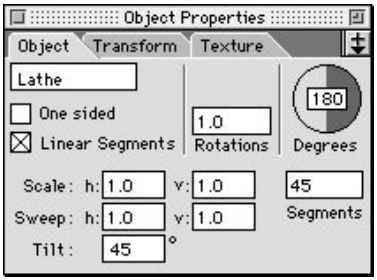
objects. Any 2-D object can be used as a template. You can lathe either clockwise or counter-clockwise. You can lathe a full 360°, or more, or an increment less than 360°. You can also move and tilt the lathe axis.



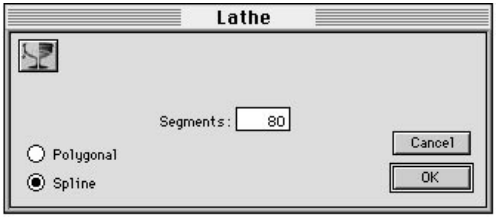
- When you grab a handle, the opposite handle becomes the center point of the lathe axis.
- Use the Lathe handle to determine the degrees of rotation.
- Use the axis end handles to tilt the axis by clicking and dragging.
- While clicking and dragging, use the lathe center handle to change the location of the axis.
- While clicking and dragging, use the axis center handle with the **Shift key** pressed to create a Sweep object.

NOTE *If you cannot see the lathe handles, click the mouse on the object, or change to Wireframe or Point-Cloud object display method.*

If you are not happy with the results, you can use the Lathe tool to interactively change your lathed object, or you can open the Object Properties Palette for that object to further refine it.



If you know you want a polygonal object and know how many segments you want your object to have, you can double-click the Lathe tool for access to the Tool Setting dialog. The more segments, the smoother the object will appear.



The **RESHAPE** command lets you edit the lathe profile. If you want to edit any points on the completed lathe object to change its shape, you will have to convert it to an editable object, such as a Bézier mesh.

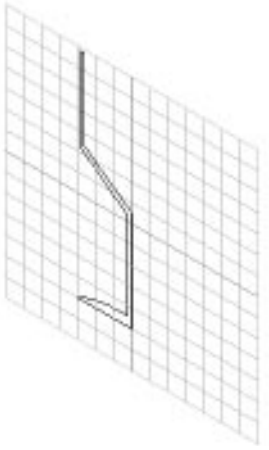
When you select **RESHAPE**, the Tool Palette will change, giving you the tools necessary to edit the object.

Lathe Exercise:

1. Select *Isometric* from the view pop-up menu in the modeling window.

   It is easier to see the lathe action of an object if you view it from the object's isometric view.

2. Using the Pen tool, draw the outline of a goblet by clicking at each point.



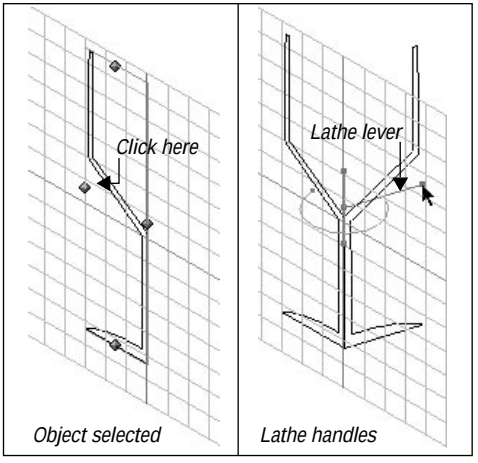
When you release the mouse, the object will remain selected and show a bounding box with handles.

3. Select the Lathe tool.

Handles appear on the object.

4. Click on the handle opposite the intended lathe axis and drag the handles.

The axis and handles appear.



NOTE *If you inadvertently select the wrong handle, you can drag the axis to the other side of the object which will place it where you want it.*

5. Drag the lathe lever 360°.

6. Release the mouse button.

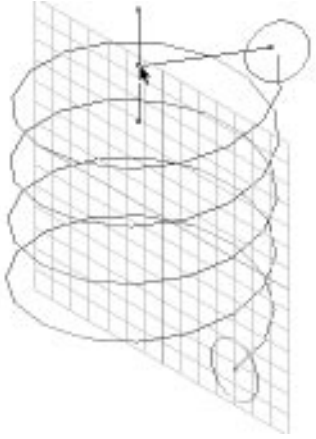
The lathed object will be generated.

When you are creating a lathed object that you don't want to lathe a full 360°, click on the lathe lever and move it the distance you want the lathe to take place. As before, the object will be generated when you release the mouse.

NOTE *If you grab the axis, you can move it horizontally any distance from the profile you wish. This will change the dimensions of the lathed object.*

SWEEP

Once a lathe object has been created, you can perform a **SWEEP** operation with the Lathe tool by holding down the **Shift key** and pulling the center handle up or down as you move it. You can add as many rotations as desired with the lathe handle.



EXTRUDE TOOL

EXTRUDE lets you take a 2-D object or 2-D group and extrude it into a 3-D object.

To create an Extrude object:

1. Select *Isometric* view.

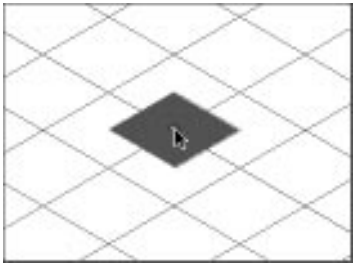
   It is easier to see the extrude action of an object if you view it from the object's isometric view.

2. Draw any 2-D object in the modeling window.

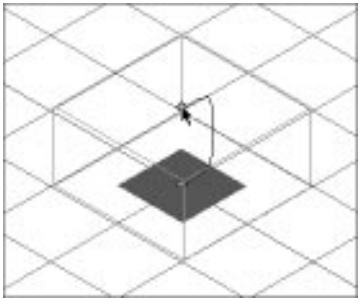
3. Select the Extrude tool.

4. Select the 2-D object.

   A bounding box with a center handle will appear.

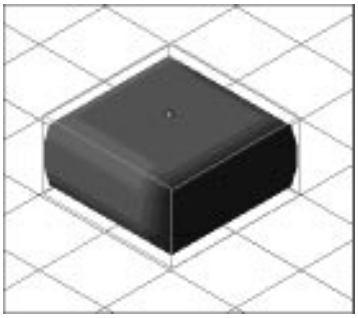


5. Click on the center handle and drag out the extrusion depth. This constrains the movement perpendicular to the face of the 2-D object.

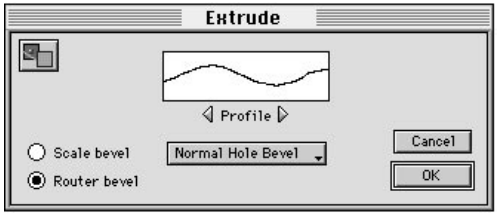


6. Release the mouse; the extrusion will be complete.

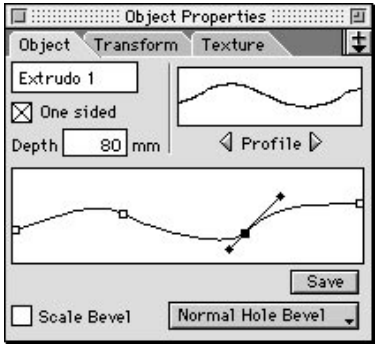
   The new object will have a bounding box and a default bevel.



A different bevel can be selected beforehand in the Tool Settings dialog.



The bevel can be edited in the expanded section of the Object Properties Palette once you have extruded the object.

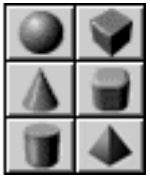


RESHAPE allows you to reshape the face of the object and edit the bevel.

To change the depth of the extrusion, use the Extrude tool.

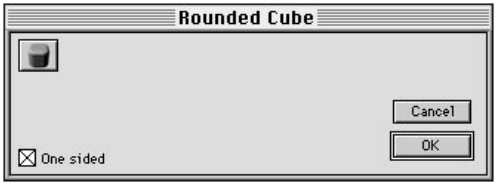
If you wish to reshape the extruded object itself, you will need to convert it to an editable entity, such as a Bézier mesh. Once converted, you can use the **RESHAPE** command to adjust points on the object. Once you have done this, you lose the ability to edit it as an extruded object.

Primitives (3-D Objects)



Primitives are directly below the modeling tools on the Tool Palette. You can select from a sphere, cube, cone, rounded cube, cylinder, or the pyramid.

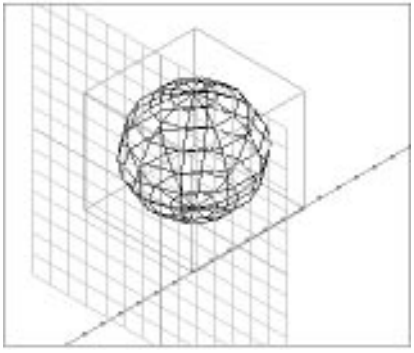
The primitives will have a Tool Settings dialog. They will all have the One sided check box, but other properties may be different according to the needs of the tool. These settings can be set beforehand by double-clicking the tool. The following illustration is the Tool Settings dialog for a rounded cube.



To insert a Primitive:

1. Single click on the active grid.
2. Click a second time to define the object's first two dimensions.

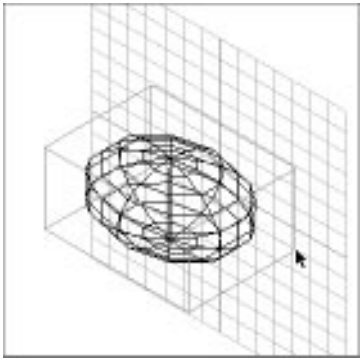
   A temporary grid line to aid in positioning the third click will appear.



3. Click a third time to define the object's final dimension.

   -or-

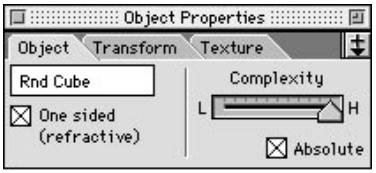
   Click-and-drag to define the size of the object.



- **Shift key** constrains the object to equal dimensions on all axes.
- **Option key** draws an object from its center.

- **Option+Shift keys** draw object from the center with equal proportions.

Once you have inserted a primitive into the active window, it may be edited through the Object Properties Palette. The following illustration is for the Rounded Cube.



Each object will have its own Object Properties Palette with settings for that object.

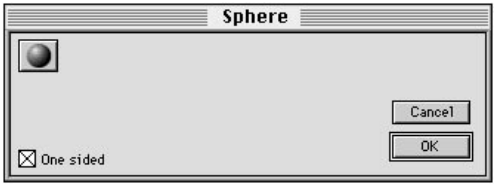
If you edit it by changing its dimensions, the object will be altered, but still retain its original object type.

You can also convert an object to another type to reshape it with the **CONVERT** command. But once an object is converted to another type, it can't be converted back to its original type.

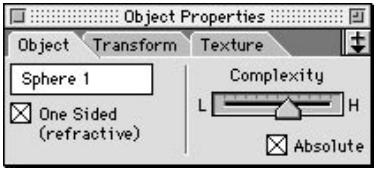
SPHERE TOOL

Use this tool to draw spherical objects.

The Tool Settings dialog allows you to make the object one sided.

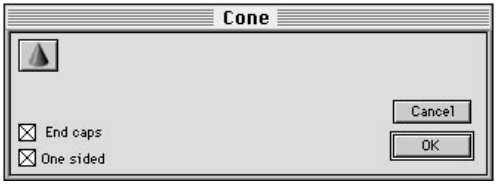


In the Object Properties Palette, you can elect to have the sphere single or double-sided and set the complexity level.

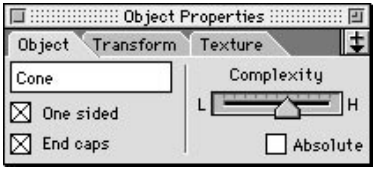


CONE TOOL

Use this tool to draw conical objects. You can determine whether or not you will have end caps and if the cone will be one sided.



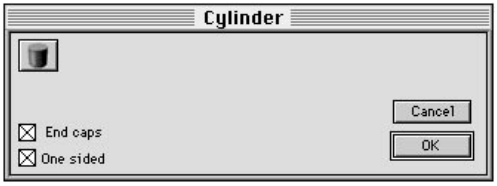
You can also make the cone single sided or double-sided in the Object Properties Palette. You can add end caps, set the complexity and make it one sided here.



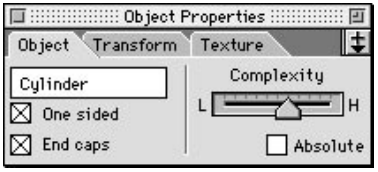
CYLINDER TOOL

Use this tool to draw cylindrical objects. You can decide whether to

add end caps and make it one or two-sided in the Tool Settings dialog.

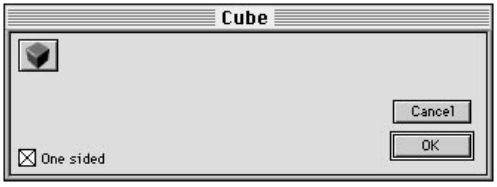


You have those same options with the cylinder as with the cone. You can elect to have end caps, make it single-sided or double-sided and set the complexity.

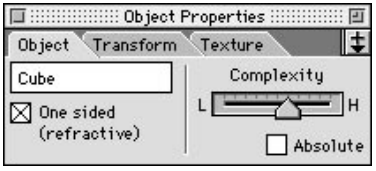


CUBE TOOL

Use this tool to draw cubes. In the Tool Settings dialog, you can determine if it will be one sided or two-sided.



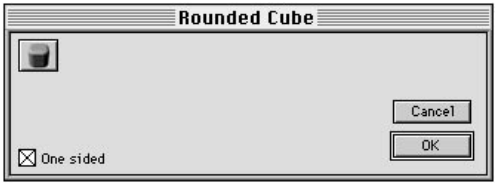
In the Object Properties Palette you can make your cube single sided, or double-sided, and set the complexity.



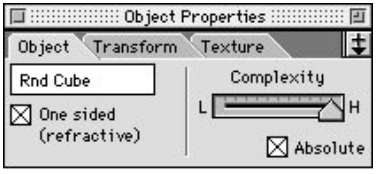
ROUNDED CUBE TOOL

Use this tool to draw cubes with rounded corners.

The Rounded cube can be made one sided or two in the Tool Settings dialog,

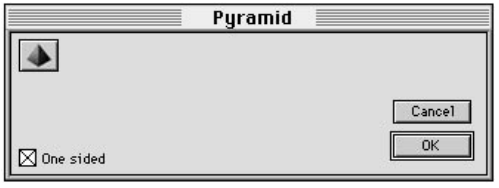


or in the Object Properties Palette.

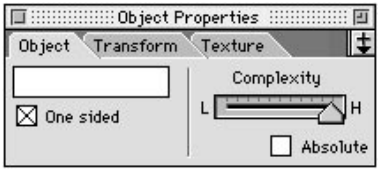


PYRAMID TOOL

Use the Pyramid tool to draw pyramids. You can make it one sided in the Tool Settings dialog.



In the Object Properties palette, you can name your pyramid, make it one or two-sided, and adjust the complexity.



Text

TEXT TOOL

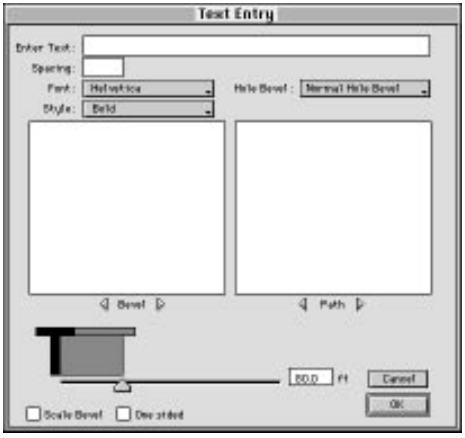
Use this tool to create extruded text. All fonts currently in the system are accessible.

To create Text:

1. Select the Text tool.
2. Drag the cursor vertically in the active modeling window.

   This specifies the location and size of the text.

   When you release the mouse, the Text Entry dialog box appears.



3. Enter text in the *Enter Text* field.

   You are limited to a single line of text, so the return character is invalid.

4. Choose a font from the pull-down menu.

   Both ATM and TrueType fonts are supported, but for best results, choose fonts that have smoothing data present. Simple bitmap fonts are not recommended.

   You can manually kern by placing the cursor between letters, holding down the **Option key** and using the right and left arrow keys.

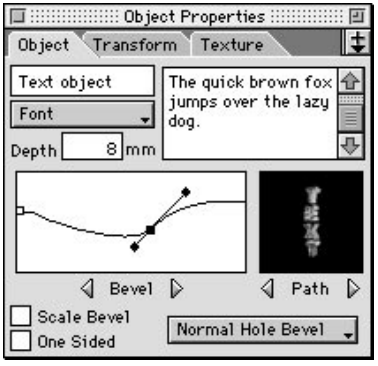
5. Select a style (if appropriate).
6. Choose the desired Extrusion Bevel and Path.

   You can edit the bevel by adjusting points along the path that describes it.

7. Set the depth of the extrusion.
9. Click *OK*.

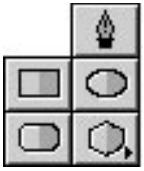
When the *OK* button is clicked, the characters are returned to the modeling window as an extruded 3-D object.

Once text is created, it can be edited in the Object Properties Palette.



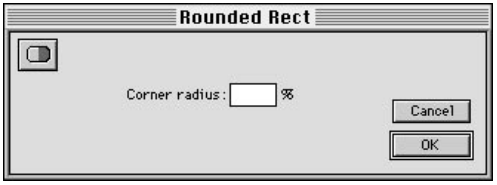
You can customize the bevel by choosing one from the Object Properties Palette and changing its vertex points along the spline path that describes the bevel. You can also change the text, depth, font, path, and select router or scale bevel in the Object Properties Palette.

Drawing Tools (2-D objects)

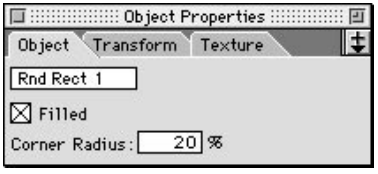


These tools let you create objects that have height and width, but no depth. Typically, they serve as templates for objects such as **LATHE** and **EXTRUDE,** but you can leave them two-dimensional if you choose.

You can define properties for the 2-D tools in their Tool Settings dialog before drawing with them. The following illustration is for the 2-D Rounded Rectangle. Each dialog will be specific to that selected tool.



Once the object is created, you can edit it in its Object Properties Palette. The following illustration is for the 2-D rounded rectangle. The palette will display information for the specific selected object.

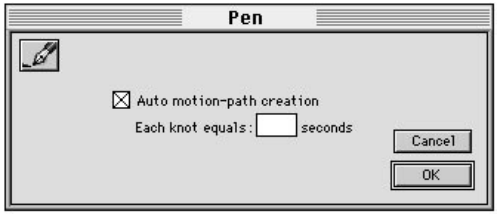


- **Double-clicking** the tool in the Tool Palette opens the *Tool Settings* dialog.
- **Shift key** constrains the tools to draw the objects with equal proportions.
- **Option key** draws an object from the center, instead of the corner.
- **Option+Shift keys** draw from the center and maintains proportions.

PEN TOOL

Use this tool to draw Bézier lines and regions. The line can appear as a straight line or a curve.Your method of drawing will determine what the finished line will look like.

The Tool Settings dialog for the Bézier Pen tool lets you create a path and define the time between markers as you draw your line segment. Each click of the mouse defines a control point.

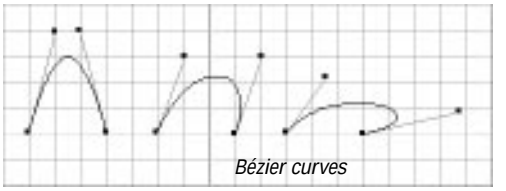


When creating an animation path with the Auto motion-path feature, the first click as you draw the path must be on the object that will use the path. If the path is not on an object it is just a line.

The line you draw with the Pen Line tool may or may not be closed and it may or may not be planar. You will need to use the Pen Region tool to create a filled region.

Drawing Lines and Curves

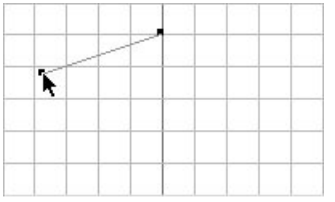
To draw Bézier curves:



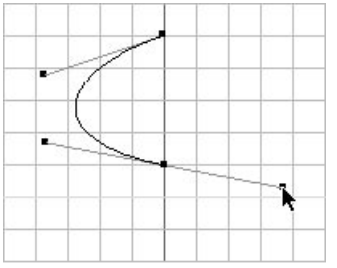
Bézier curves

1. Select the Pen Line tool.

2. Place the pen tip where you want the curve to begin. Hold down the mouse button. The first anchor point will appear.



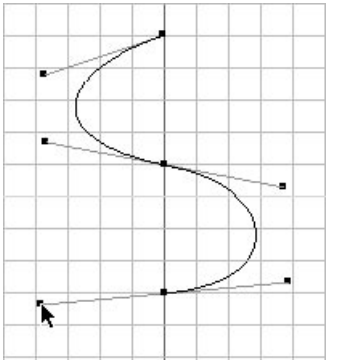
3. With the mouse held down, drag in the direction you want the curve segment to be drawn. Release the mouse.



   The shape of the curve will be determined by the length and slope of the direction line. This can be edited later.

4. Position the pen point where you want the curve segment to end and click-and-drag in the direction of the curve to complete the segment.

5. For each segment of a continuous curve, position the pointer where you want that segment to end and click-and-drag away from the curve.



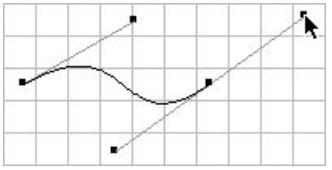
6. Position the pen point where you want the final curve segment to end, then double-click, or click once and press the **Enter (Return) key**.

You can change the direction of the curve and create a non-continuous curve by positioning the pointer on the last anchor point and pressing the mouse button to set a corner point, then drag in the direction of the curve. Drag in the opposite direction to complete the curve segment.

- Holding the **Option key** down while dragging will break continuity. To realign the handles, slowly drag the handle back and forth across the line until it locks in place. Or click the **ALIGN HANDLES** button.

- Using the **Delete key** will back up a segment or delete a selected point.
- When drawing, the **Shift key** will constrain the polyline to a 45° angle relative to the grid.

NOTE *Dragging both direction points in the same direction creates a wavy curve. For a smooth curve, drag the first direction point in the direction of the bump of the curve, and drag the second direction point in the opposite direction.*



- **Command + Shifts keys** allow you to draw perpendicular to the grid.

To draw a straight line:

1. Select the Pen Line tool.
2. Click in the window where you want the line to begin. An anchor point will appear.
3. Click where you want the line segment to end.
4. Continue clicking until you have completed your straight line object.
5. End the object by one of three methods:

   Press *Enter.*

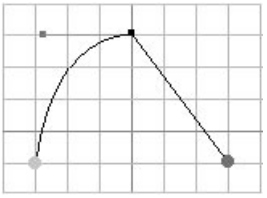
   Double-click on the last point.

   Click on the first point.

To draw both curved and straight lines in the same object:

1. Select the Pen Line tool.
2. Draw a curved line according to instructions above.
3. Release the mouse and click on the last anchor point.

   The second handle on the previous Bézier point will snap to that point.
4. Click where you want the next anchor point.



You can draw straight lines attached to curves without using a modifier if the last point drawn has no visible handle.

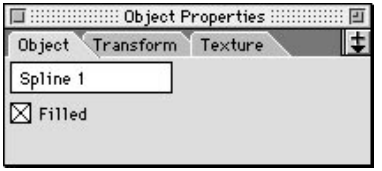
Drawing Regions

A region is a closed Bézier curve that must be planar. It may or may not be filled, but it will be filled by default. If you want it unfilled, you must change this in the Object Properties Palette for that object.

To draw a region:

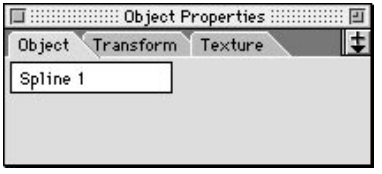
1. Select the Pen Region tool from the Bézier Pen tool pop-out.
2. Follow the directions for drawing a line or curve.

Change it to an unfilled region in the Object Properties Palette.



Editing Lines and Paths

Once you have created your curve, line, or object with the Pen tool, you can edit it in the Object Properties Palette or with **RESHAPE**. The following illustration is the Object Properties Palette for a line.



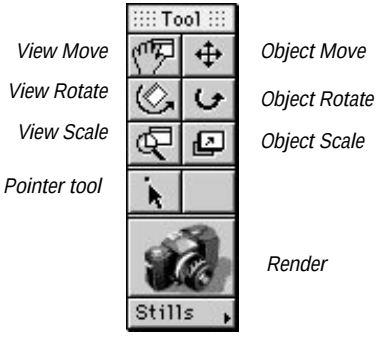
To Reshape Lines and Curves:

1. Select the line you want to adjust.
2. Click the **RESHAPE** button,

   -or-

   Select **RESHAPE** from the Modeling menu.

   The tool palette will change to reflect the fact that you are in **RESHAPE** mode.



   See the **RESHAPE** button in this chapter for definitions of the tools.

3. Use the Pointer tool to drag one of the direction handles to adjust the curve, or pull out vertices to adjust line segments.

   If the handles aren't visible, click on the vertex point. If a handle is still not visible, hold down the **Option key** while clicking and dragging the vertex point.

You can hinge a vertex point so the handles can be moved independently.

- Hold down the **Option key** while dragging the handle you want to hinge.

  Once a point has been hinged, you can drag the handles independently without using the **Option key**.

- To realign the handles, slowly move one until it is visually aligned with the other. They will lock into place.

  If the handles are on different planes, use the **ALIGN HANDLES** button as you click-and-drag to align.

To add points:

1. Select the path.
2. Select **RESHAPE**.
3. Hold down the **Option key.** The cursor changes to a plus (+) when it is on the path. Click to add a point.

To delete points:

1. Select the point with the Pointer tool.
2. Press the **Delete key**.

To convert a corner point to a smooth point:

1. Select the point you want to convert.
2. Hold down the **Option Key** and with the Pointer tool, pull the handles out of the point.

To convert a smooth point to a corner point and adjust the line segment:

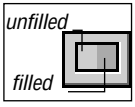
1. Select a single smooth point.
2. With the Pointer tool, pull the handle into the point. It will lock to the point.

2-D Objects

Two-dimensional objects are often used as templates for other modelers. All 2-D objects are drawn with a mouse down, drag, mouse up motion.

To draw a 2-D object:

1. Simply click-and-drag to define the dimensions of the object. You can make it filled or unfilled by selecting that side of the tool's button.The filled version renders with a surface; the unfilled version renders hollow.

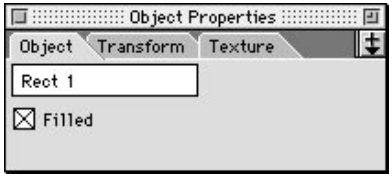


   You determine the size and proportions of the object by the starting and ending position of the cursor as it is dragged.

You can also draw a 2-D object with the two-click method. Click to set the first anchor point, then click to end the object.

- **Shift key** constrains the object to equal proportions.
- **Option key** draws the object from the center.
- **Option+Shift keys** draw an object from the center while maintaining proportions.

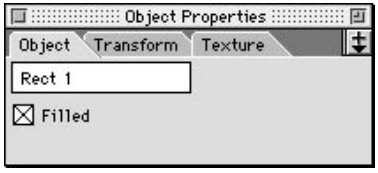
If you change your mind and want a filled object as opposed to an unfilled, or vice versa, you can open the Object Properties Palette for any of the 2-D objects. The following illustration is an Object Properties Palette for the Rectangle Tool.



RECTANGLE/SQUARE TOOL

Use this tool to draw square or rectangular-shaped objects.

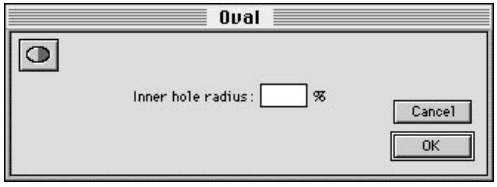
Change it from filled to unfilled or vice versa in the Object Properties Palette.



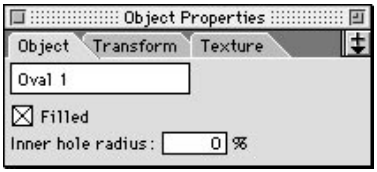
OVAL TOOL

This tool can draw exact circles or ovals of any proportion.

The Tool Settings dialog allows you to draw an oval with a hole in the center of it.



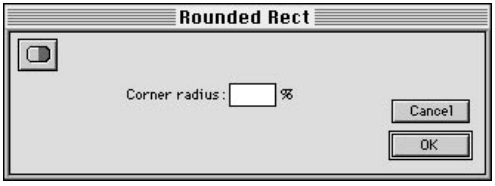
You can also determine the hole radius in the Object Properties Palette and determine its filled or unfilled status there.



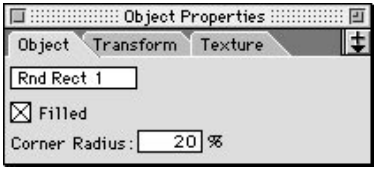
ROUNDED RECTANGLE TOOL

Use this tool to draw rectangles with rounded corners.

The radius of the corners is adjustable in the Tool Setting dialog.



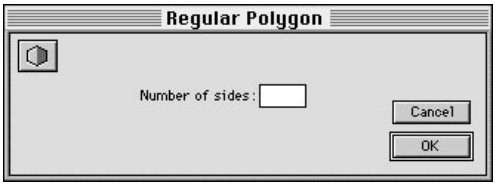
You can also determine what its corner radius is in the Object Properties Palette and determine its filled or unfilled status there.



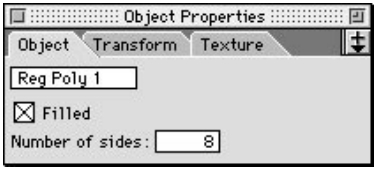
REGULAR POLYGON TOOL

Use this tool to draw multi-faceted shapes.

You can determine the number of sides ahead of time in the Tool Settings dialog.



You can also change the number of sides in the Object Properties Palette and determine its filled or unfilled status there.



Construction Tools

Construction objects don't show in the rendering. They can be markers to indicate where a light source emanates from, or the viewing position of a camera. For example, Link lets you associate objects in a parent and child relationship.

LIGHT SOURCE TOOLS

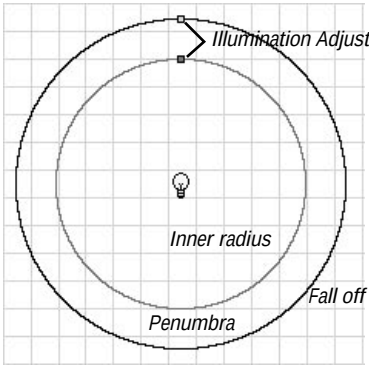
Use these tools to insert spot and point light sources into the model.

Directional light is considered a global source designed to illuminate the entire model, like sunlight striking the Earth. But spot and point lights are local sources designed to illuminate small areas of the scene.

Light source icons are visible in the modeling window so that you can position them, but they do not show in the actual rendering.

POINT LIGHT TOOL

This tool inserts non-directional light sources into the model. The Point Light marker looks like a light bulb. It is drawn right-side up in the active view.



To insert Point lights into the window:

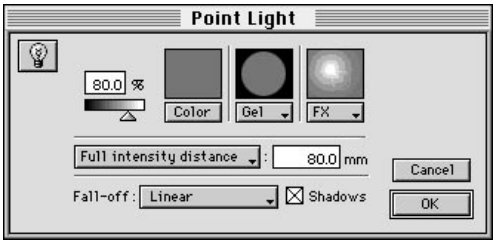
1. Select the Point Light tool.
2. Click in the window where you want the point light.

   A marker will be inserted into the window.

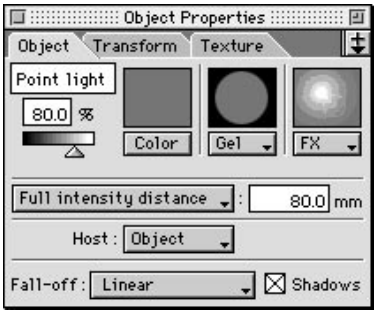
Once selected, the marker shows the area of illumination. Use the handles to adjust the width of the penumbra (the area between full intensity and fall off).

See the chapter on lighting for instructions on how to adjust the Point Light marker.

You can specify default settings in the Tool Settings dialog, such as color, gel, and an effect.



Or edit the light later in the Object Properties Palette.



There you can add color, a gel, or an effect. You can determine the distance for full intensity. The Point Light can have a host object which it will move with.

SPOTLIGHT TOOL

You can place a Spotlight into the window to add light that can be aimed at objects.

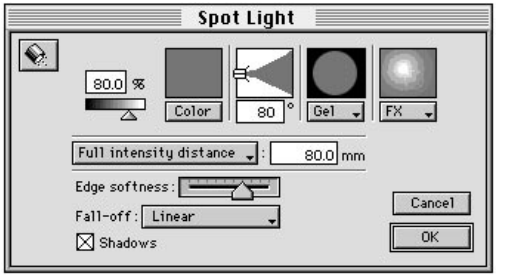
To insert a spotlight:

1. Select the Spotlight tool.
2. Place the cursor into the window where you want the spotlight and click.

A marker will be inserted into the modeling window.

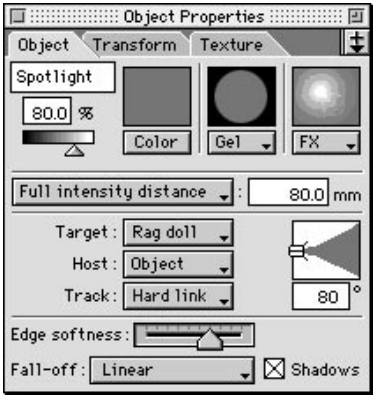
See the chapter on lighting for instructions on aiming the spotlight.

If you double-click the Spotlight tool, the Tools Settings dialog will appear, allowing you to set parameters for the lights you are placing into the window.



You can set the intensity, color, edge softness, cone angle, and add a gel and an effect. You can determine the distance of full intensity and whether the fall-off will be linear or exponential.

Once you have placed the light, you can further edit it in the Object Properties Palette.



You can add color, a gel, an effect, an atmosphere, change the cone angle, and determine edge softness. In the *Target* pop-up, you can aim the spotlight directly at an object.

The *Host* pop-up allows you to determine a host object for the spotlight and the Track pop-up determines how the link will be established. The spotlight will follow along with the host's movements, but remain aimed at the target, if a target is selected.

CAMERA OBJECT (TRIPOD) TOOL

Use this tool to insert camera markers into the modeling window.

To insert a camera:

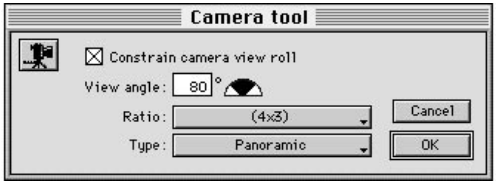
1. Select the Camera Object tool.
2. Click in the window where you want the camera.

   This inserts a marker which you can adjust for accuracy.

There is no limit to the number of camera markers you can insert into the model. These can be positioned anywhere in 3-D space.

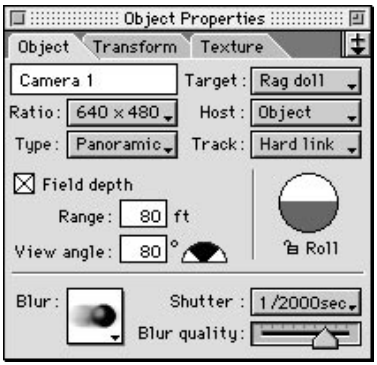
- **Command + Shift** allows you to move the camera perpendicular to the grid.

You can pre-determine what you want the camera to do using the options in the Tool Settings dialog.



You can constrain camera view roll, adjust the view angle, set the aspect ratio for the frame and select the type of camera used.

Once you have inserted a camera object into a window, you can change its properties in the Object Properties Palette.



You can set the aspect ratio, the type of camera, the field depth, range, view angle, and shutter speed. You can add motion blur, and determine a target and host for the camera. In the Track pop-up menu, you can determine the type of tracking between the camera and the host.

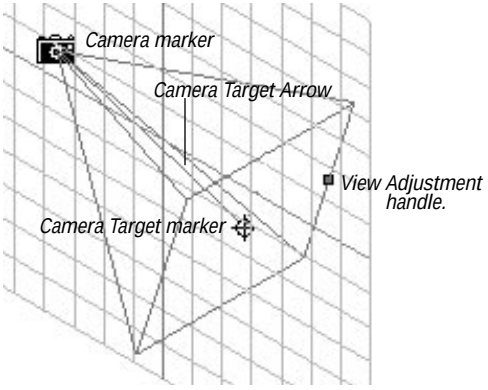
Motion Blur

Motion Blur produces the same effect as that of a camera moving while its shutter is open. You can select a type of blur from the pop-up menu. In the Object Properties Palette you can also adjust the shutter speed and the blur quality.

Camera Icon Behavior

When you insert a camera object into the window, then select the icon, it projects a view angle out from it. In the center of the view angle is a Camera Target marker.

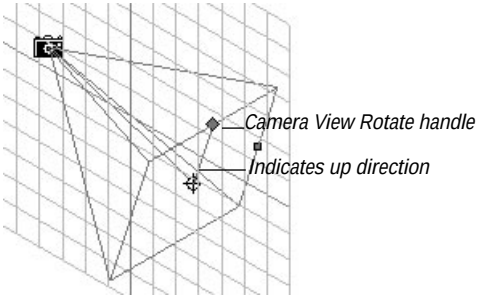
There is also a rectangular bounding box with a View Rotation handle.



You can adjust the view size by grabbing the View Adjustment handle when Steady Camera is disabled. When Steady Camera is enabled, you can grab anywhere on the bounding box to adjust the view size.

When you insert the camera object, it is given a default look at point indicated by the Camera Target Marker which is parallel to the active grid.

If you disable the Steady Camera option, you will be given a Camera View Rotate Handle which allows you to interactively rotate the view.



To aim the camera:

1. Grab the Camera Target Marker.
2. Drag the Target Marker to an object.

   When the object highlights, the object is a potential target. By releasing the Target Marker, you establish the object as the target of the camera.

You can move a camera freely anywhere on the active grid. The camera and target marker can be moved independently, or they can be moved together by moving the line connecting them, which is the Camera Target Arrow.

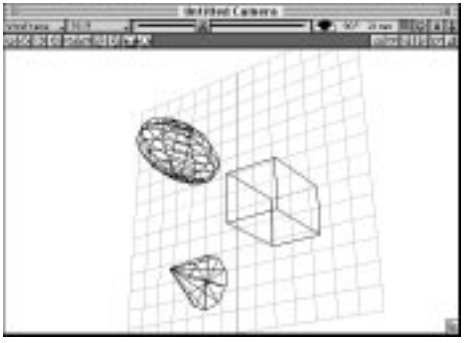
To move the camera manually, use the Object Move tool.

- If you grab the camera, the camera moves and the Target Marker remains fixed.
- If you grab the Target Marker, it moves and the camera remains fixed. If you grab the Camera Target Arrow, both move together.
- **Option key** while dragging the camera leaves a copy of the camera behind.
- **Option key** while positioning the target arrow, highlights in green and ignores all objects, thus allowing you to aim at a position in space.
- **Shift key** constrains movement horizontally and vertically in 45° increments.
- **Command key** moves the camera closer to or farther from the target object along a straight line connecting the two.
- **Command + Shift keys** move the camera perpendicular to the grid.

To adjust the view angle of the camera, grab the View Adjustment handle or the ring and drag it to the desired position.

Camera Window Controls

You can use any open window to initiate a rendering, but camera windows lend themselves better to the task than modeling windows.



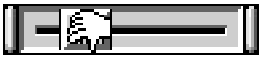
Seven parameters are obtained the moment the Camera Object tool is clicked in a view. They are as follows:

- The center of the projection of the view used by the camera.
- The direction the camera is aimed.
- The orientation of the camera.
- The distance from the objects.
- The width of the area to be rendered.
- The height of the area to be rendered.
- The focal length of the view.

These parameters are interpreted by the renderer to give an accurate representation of the object or scene.

Perspective

The perspective appearance in a camera window depends on the view angle, the magnification, and the distance of the view from the objects.

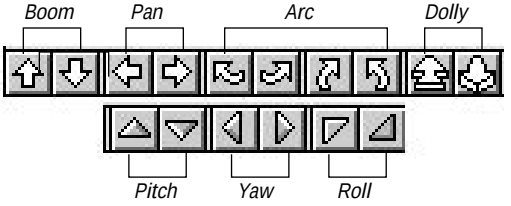


The perspective control is slightly different in a camera window because it is a slider bar with a continuously-variable focal length control.

- If the wider angle makes objects appear too far away, you can move the view plane closer by adjusting the slider.
- If the objects appear too close in perspective, you can move the camera object away from the scene by adjusting the slider.

You can adjust your view further with the View Zoom tool. This does not change the true scale of the object, it only magnifies or reduces the view of the image that is displayed.

The camera window has special controls for adjusting the movement and view of the camera.



- **BOOM** moves the camera up and down.
- **PAN** moves the camera left and right.
- **ARC** moves the camera in an arc around the target.
- **DOLLY** moves the camera in a straight line toward or away from the target.
- **PITCH** tilts the camera along its X axis.
- **YAW** tilts the camera along its Y axis.
- **ROLL** tilts the camera along its Z axis.

Other controls found at the top of the camera window are:

- **Display method** lets you select a display method from the pop-up list.
- **Aspect ratio** indicates the ratio of the width of the camera window to its height.
- **Lock/unlock** lets you lock the aspect ratio to prevent it from changing when you resize the window.

The *Steady Camera* option keeps the camera pointing as near to World up as possible. If the *Steady Camera* option is not on, there will be a handle on top of the rectangle. This can be used to rotate the camera.

These controls allow you to set up cameras for any number of angles or functions.

Commands in the **Plus menu** are used exclusively by the Camera Window. They are: **COLLAPSE WINDOW, PREVIEW ANIMATION, DUPLICATE CAMERA, DISPLAY OBJECTS,** and **RENDER...**

GRID TOOL

You have access to the world grid, view relative grids, and user-defined grids. The Grid tool only draws user defined grids, but can be used to size world grids.

User-defined Grids

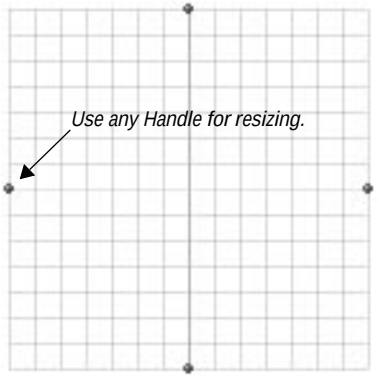
User-defined grids can be positioned anywhere in your model and are attached directly to an object during the modeling process. Once created, they can be scaled, moved and rotated.

To draw a User-defined grid:

1. Select the Grid tool.
2. Click-and-drag on the object face to draw the grid.

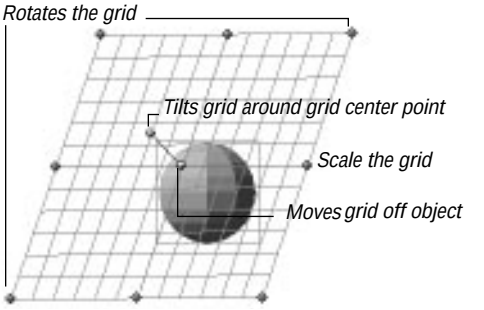
   The grid tool draws from the center. The grid is placed on the face of the object and perpendicular to that surface normal of the object. Handles appear for manipulating the grid. User-defined grids are orange.

You can use the Grid tool to size the user grids. You can also use the Grid tool to resize the visible portion of the world grid. If there is no object present in the model and you select the Grid tool, handles will appear on the world grid for re-sizing.

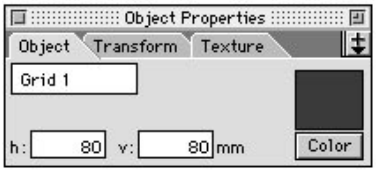


- When resizing a grid, the **Shift key** resizes in both directions proportionally on the same axis.

You can rotate the user grid with the corner handles and tilt it with the center handle. The handle visible where it is attached to the object allows you to move it off the object.

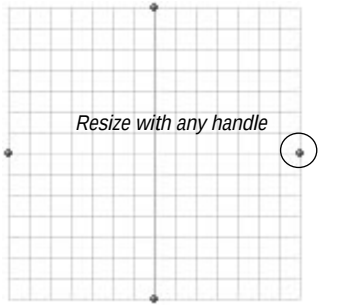


Once you have placed a grid in the window, you can name it and size it in the Object Properties Palette.



To resize the visible portion of the grid with the Grid tool:

1. Select the Grid tool. Handles will appear on the active grid.

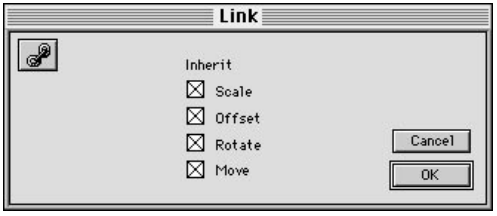


2. Select any handle and size the grid.

LINK TOOL

The Link tool establishes a special connection between two objects. It links geometry to geometry. When using the Link tool, the order you link will be important in determining how the linked objects appear.

You can preset link characteristics in the Tool Settings dialog.



As a tool, it can only create new links. Therefore, there is not an Object Properties Palette for Link.

To link geometry to geometry:

1. Select the Link tool.
2. Click on the first object and drag the mouse to the next object.

   As the objects are linked, a line will form to show they have a parent-child relationship. Remember that the order in which you link the objects is important. Once they are linked, any move, scale, or rotate you perform on the parent object will be followed by the child.
3. Release the mouse button.
4. Link each object in turn.

UNLINK TOOL

Use the Unlink tool to sever the link between previously linked objects.

To UNLINK objects:

1. Select the Unlink tool.
2. Click on the first object and drag the mouse to the next object.

   The objects will become selected.
3. Release the mouse.

   The objects will unlink.

Imaging Tools

RENDERING TOOL

This tool lets you render snapshots of the model or render complete animations. This can be done in either a modeling window or a camera window.

You can take a snapshot in one of three ways:

1. **Single click** in the active window with the Rendering tool. The size of the rendering and the viewing position is determined by the size of the view where the cursor is clicked. The model will be rendered using the previously selected renderer.
2. **Drag** a marquee with the Rendering tool. The size and view of the rendered

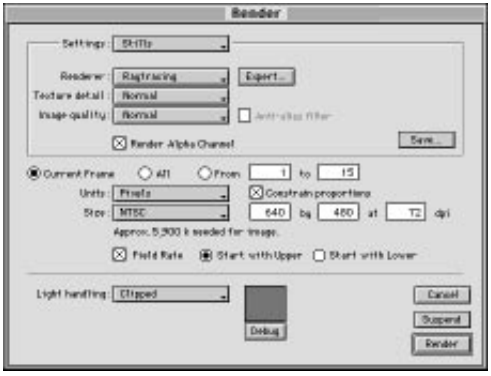
snapshot is dependent on the size and view of the marquee.

3. **Use the RENDER** command from the Rendering menu. A dialog box opens that lets you specify the rendering parameters. This dialog can also be opened by holding the **Shift key** down while using the Rendering tool.

- The **Option key** draws the rendering marquee from its center.

- If the **Caps Lock key** is engaged, the camera icon will change to an outline form with cross hairs which you can see through.

Once you have used one of these methods, except the single click, to determine the size of the snapshot, a rendering dialog will appear.



You will select your rendering parameters from here.

Complete details on this dialog can be found in the chapter on rendering and in the *Reference Manual*.

EXTENSION TOOL PALETTE

Tools on the Palette

Tools on the Extension Tool Palette give you the ability to perform specialized operations.

Extensions for the Extension Tool Palette can be found in the Extension folder. This folder can store new extensions as they are developed.

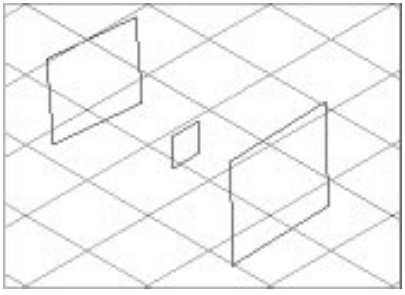
SKIN/UNSKIN

SKIN is used to loft a surface over two or more “ribs” resulting in a Skin object.The Skin tool works with any type object as ribs, as long as they are 2-D objects.

UNSKIN removes that section of the skinned object that is selected with this tool and leaves the ribs. The ribs are then avavailable for editing or animating.

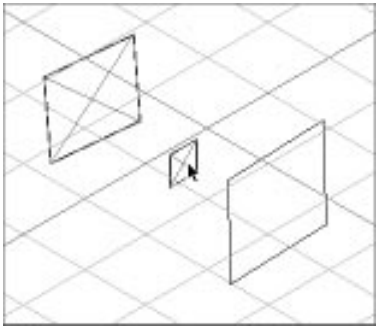
To create a skin object:

1. Draw a series of ribs with any 2-D drawing tool.

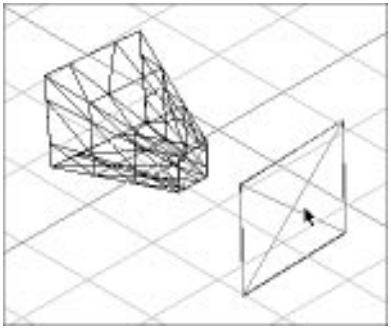


2. Select the Skin tool from the Tool Palette.

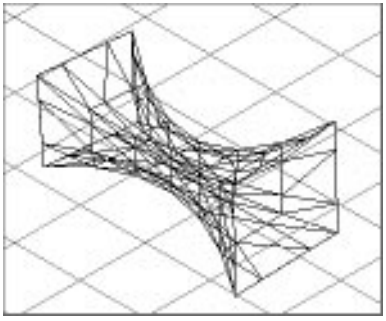
3. Click-and-drag between the ribs.



As you link the ribs, they will become selected.

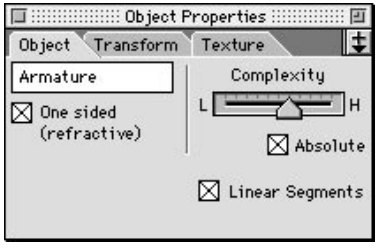


and skinning will take place when you release the mouse.



You can animate the ribs by changing their positions with the **RESHAPE** command. To reshape the geometry of the ribs, you will need to do an **UNSKIN**. The ribs will then be individually available for **RESHAPE**.

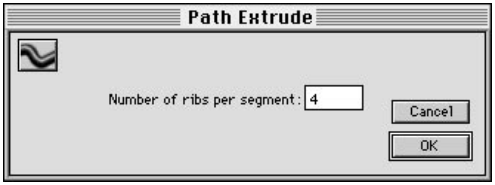
The Object Properties Palette will allow you to make the skin object one sided and set the complexity level. If you click *Linear Segments*, the connecting lines will be straight instead of curved.



PATH EXTRUDE

PATH EXTRUDE allows you to extrude a 2-D object along a predefined path to create a 3-D object.

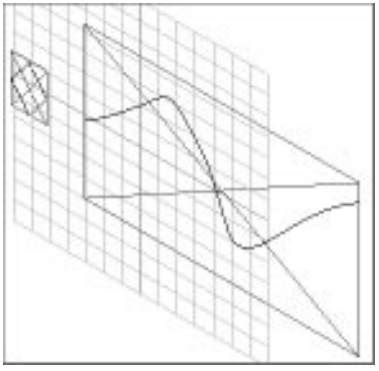
Path Extrude tool settings allow you to determine the number of ribs per segment for your object.



To extrude along a path:

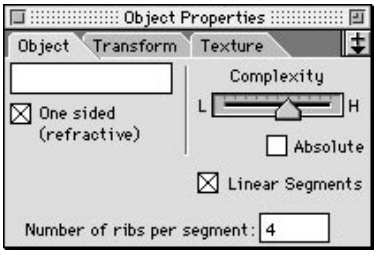
1. Draw or import a Bézier curve to be used as a path.
2. Draw a 2-D object in the modeling window.
3. Select the Path Extrude tool.
4. Link the object and the path by first clicking on the 2-D object, then dragging the mouse pointer over the curve.

   The intended path will become highlighted.



When you release the mouse pointer, the object will extrude along the path making it a three-dimensional object.

You can change properties of the object in the Path Extrude Object Properties Palette.



If you check *Linear Segments*, the lines connecting the segments will be straight instead of curved.

If the orientation of the template is incorrect, use **RESHAPE** in the Modeling menu to change it. When in **RESHAPE,** the extruded object will return to its original components. You will have the curve and template with handles to edit the Path Extrude.

BOOLEAN MODELING

StudioPro performs four distinct Boolean operations: **UNION, SUBTRACT, INTERSECT, CUT**.

UNION fuses two objects to create a single object.

INTERSECT creates a single object from the intersecting point of two objects. The remaining geometry is the overlapping portions of both objects.

SUBTRACT removes the geometry of the first object from the second object and leaves a surface on the resulting object.

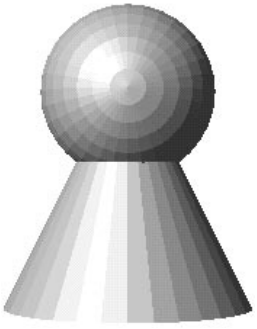
CUT creates a new shape by deleting all of both objects except that part of the

primary object which is inside the secondary object. It is important to select the objects in the proper order. It is like an **INTERSECT**, except it doesn't leave a surface behind.

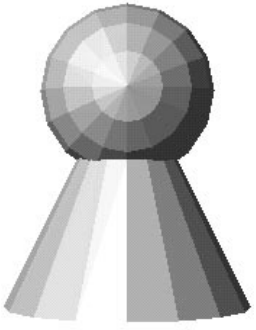
In order for a Boolean operation to be performed, the objects must be touching one another.

To perform a UNION operation:

1. Place a new shape in the model window.
2. Create another new shape and position it so that it intersects the first shape.

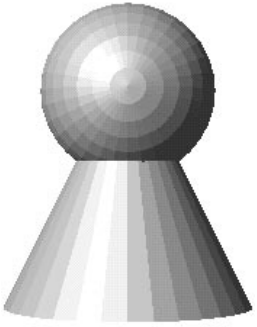


3. Select the **UNION** tool.
4. Click-and-drag from one object to another.
5. The **UNION** is automatically generated.

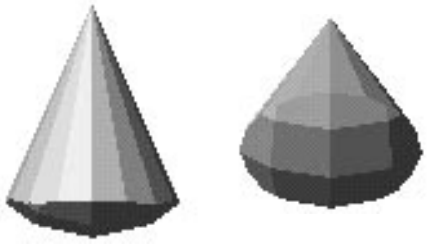


To perform an INTERSECTION:

1. Place a new shape in the model window.
2. Place another shape in the window so that they overlap such that the intersecting pieces are what will be left.



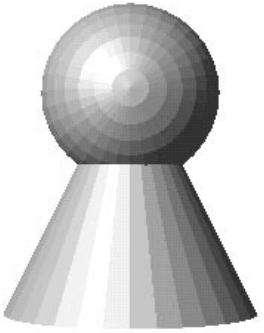
3. Select the **INTERSECT** tool.
4. Click-and-drag from one object to the other. The **INTERSECTION** will be automatically generated.



To perform the SUBTRACT operation:

1. Place a new shape in the modeling window.
2. Create another new shape and position it so that the objects overlap where you

want the geometry of one shape removed from the other shape.

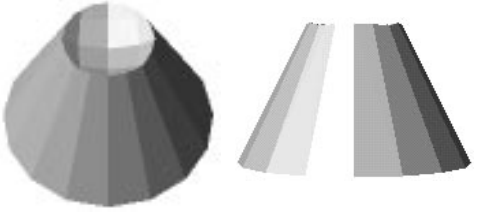


3. Select the **SUBTRACT** tool.

4. Click-and-drag from one object to another and the **SUBTRACT** will be automatically generated.

   Since the order of selection is important, be sure to select the objects where the geometry of the first object will be subtracted from the second.

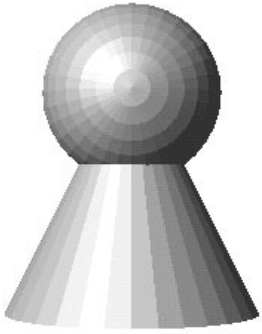
   SUBTRACT provides an additional surface to the resulting object.



To perform a CUT operation:

1. Place an object in the modeling window.

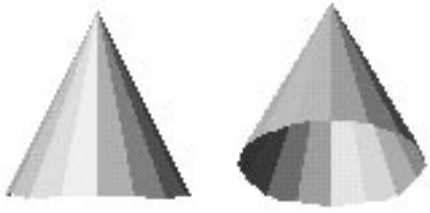
2. Place another object in the window such that it intersects the first object where you want the cutting to take place. For an interesting effect you can make the second object a plane, making sure that it is large enough to be recognized by themodler.



3. Select the **CUT** tool.

   Order of selection is also important in a cutting operation. Only the overlapping portion of the first object will remain.

4. Click-and-drag between the objects in the order you want the cut to take place. The **CUT** will be automatically generated.



All parts of both objects will be deleted except that part of the primary object which is inside of the second object.

Unlike **INTERSECT**, the **CUT** operation does not supply any additional surfaces. A sphere cut by a plane looks like a bowl.

BUTTON BAR

StudioPro provides you with buttons to use in place of commands. Use the mouse cursor to click on a button. It depresses to provide visual feedback.

Buttons will be active or dimmed, depending on whether or not they apply to the current model.

System Shortcuts

NEW

NEW opens a New modeling window.

OPEN

Use **OPEN** to open previously saved StudioPro models and to load other 3-D files. Chapter One explains this process in detail.

SAVE

Use **SAVE** to save your model and all associated information. You may also save snapshots, images, and animations. Chapter One explains this process in detail.

CUT

CUT works like it does in any other program. It removes the selected item and places it on the clipboard. You can cut objects in a model, text in a dialog field, surface maps, or anything else that can be selected.

- **Option key** removes the selected objects from a StudioPro model and retains the coordinates for those objects.

COPY

COPY works like it does in any other program. It copies selected information and places the duplicate information on the clipboard.

- **Option key** copies the selected object's coordinates as well so they may be pasted into another model with absolute coordinates.

PASTE

PASTE places the contents of the clipboard in the active document, keeping all of the data intact. Items being pasted must be in the same context as the place they were copied from. For example, modeling information would have to be pasted into a modeling window.

- **Option key** pastes the contents of the clipboard into the same coordinates from which it was copied.

UNDO/REDO

UNDO will reverse the last action performed. You can undo most operations. You can also **REDO** the last action undone.

Modelers

RESHAPE

With **RESHAPE,** you can modify original defining geometry in the modeling window.

RESHAPE is designed to work with the surface of objects. These objects can be either Bézier or polygonal 2-D or 3-D objects.You can push and pull vertices on any axis to mold an object's geometry in complex organic ways.

As you work with **RESHAPE,** you will find that some objects will need to be converted before they can be edited. The **CONVERT** command will show a dialog listing the possible conversion types for that selected object. Once you have converted it, you can use the tools on the **RESHAPE** tool palette to move points, add and subtract points, and push and pull vertices.

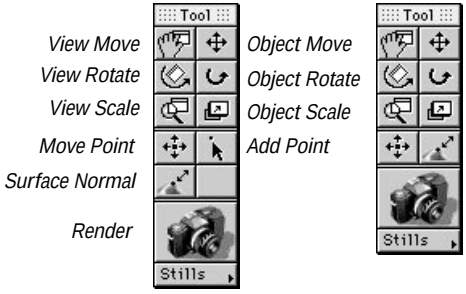
To open RESHAPE:

1. Select an object.
2. Click on the **RESHAPE** button,

-or-

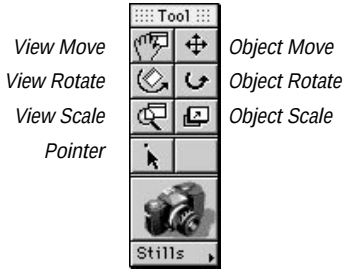
Select **RESHAPE** from the Modeling menu. The tool palette will change to reflect the fact that you are in **RESHAPE**. If you are reshaping a 3-D object the palette will look like the following illustration.

Tools for Bézier Objects



Tools for Polygonal Objects

The 2-D Reshape has fewer tools because you can only move handles or add points.



The tools on the Tool Palette when **RESHAPE** is active are:

- **Point Move tool**. Use this to move the selected point perpendicular to the grid.
- **Surface Normal tool**. Use this to move the selected vertex point in a direction dictated by the surface normal for that point.

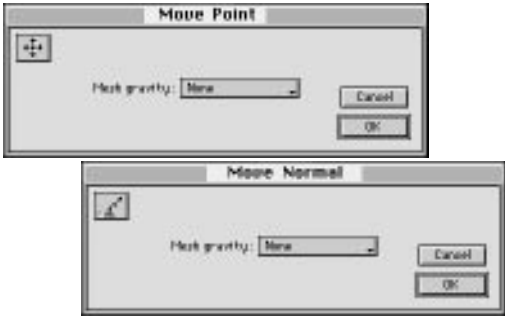
- **Add Point tool**. Use this to add another vertex point to the surface.

  These tools act on the points or handles of the object you are reshaping.

In **RESHAPE**, the following tools interact with objects in the modeling window, including the object you are reshaping.

- **View Move tool**. Use this to move the view.
- **View Rotate tool**. Use this to rotate the view.
- **View Magnify tool**. Use this to zoom in or out in the view.
- **Object Move tool**. Use this to move the object in the window.
- **Object Rotate tool**. Use this to rotate the object in the window.
- **Object Scale tool**. Use this to scale the object.

The Move Point, and Surface Normal tools have Tool Settings dialogs. Access them by double-clicking the tool.



If you select an option from the *Mesh gravity* pop-up, pulling points will stretch the object in a proportional way. Without gravity, points will pull out sharply from the object.

To exit RESHAPE:

- Select **END RESHAPE** from the Modeling menu, or use **Command - E**.

  The Tool Palette will change to the modeling window Tool Palette.

Modifying Bézier Objects

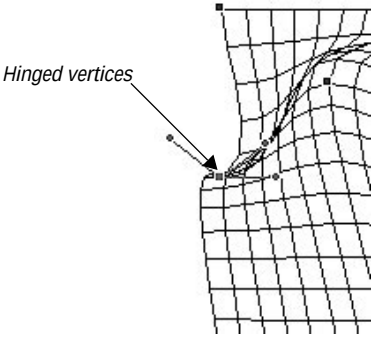
Bézier objects always show vertices for editing their surfaces. They also have handles to bend or warp their surface patches.

To modify a Bézier object:

1. **Select** a vertex point with the Pointer tool.
2. Use a **handle** to change the geometry of the object.

- You can hinge a vertex point so that the handles can be moved independently by holding down the **Option key** while dragging the handle you want to hinge.

  Once a point has been hinged, you can drag the handles independently without using the **Option key**.



- To align the handles, move one handle so that it is visually aligned with the handle on the other side of the point. When they get in close proximity, they will lock in place.

Removing and Adding Vertex Points

To remove vertex points:

1. Select the point you want to remove with the Pointer tool.
2. Press the **Delete key**.

   UNDO is available if you don't like the results.

   NOTE *If you removed all vertices the object would cease to exist in the model; therefore, this is not an option.*

- Holding down the **Shift key** as you click on vertices allows you to select multiple vertices.

To add vertex points:

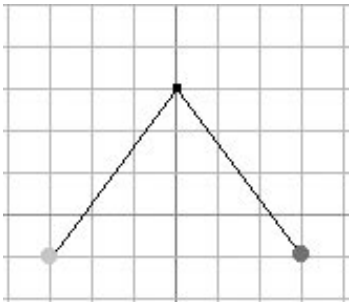
Hold down the **Option key** while clicking on the line with the Pointer tool where you want to add the point. The cursor will change to a plus (+). When this happens, you can click to add a point.

To change the beginning point:

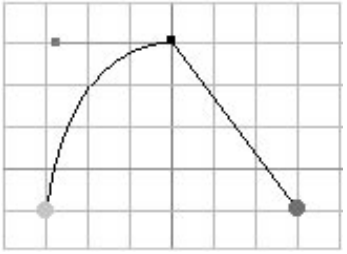
Select the vertex point you want to make first and press the **MAKE FIRST POINT** button on the Button Bar.

Working With Bézier Lines

Each vertex point has two direction handles that influence the curve of the line segment between it and the next point on either side. If the line appears straight, the handles are locked in place at the point of the line. This makes a corner.



- Click-drag the handles to move the line segment.



- If the handles aren't visible, click on the vertex point.
- If a handle is still not visible, hold down the **Command key** while click-dragging the vertex point.

- To align the handles, move one so that it is visually aligned with the one on the other side of the point. When they get in close proximity, they will lock into place.

NOTE *Without the **Command key**, clicking will always select the point first, since vertex points are given precedence over direction handles.*

Polygonal Objects

Polygonal objects also have vertices; they are at the intersection of the triangulated polygons.

Because there are so many vertices, they only show when selected. You can work on the points as they already exist by pushing and pulling the selected vertices.

- **Command + Shift keys** allow you to pull points perpendicular to the grid.

Reshape Exercise (2-D):

1. Open a new modeling window.
2. Select the Pen tool.
3. Click at several points in the modeling window to make a line with a series of points.
4. With the object selected, choose the **RESHAPE** command from the Modeling menu.
5. Choose the Pointer tool.
6. Select one of the handles and pull it out to change the shape of the line. Do this with any of the handles.
7. Select **END RESHAPE** from the Modeling menu, or click the button.

Reshape Exercise (3-D):

1. Open a new modeling window.
2. Select the sphere tool. With the click-and-drag method draw a sphere in the modeling window.
3. With the object selected, choose the **CONVERT** command from the Modeling menu. When the dialog appears, select *Bézier* from the dialog, and then click *OK*.
4. With the object still selected, select the **RESHAPE** command from the Modeling menu.
5. With the Point Move tool, select multiple vertices by using the **Shift key** as you select them.
6. Use the Surface Normal tool and pull the vertices.
7. Select **END RESHAPE** from the Modeling menu.

END RESHAPE

When you have finished the editing process in **RESHAPE**, you can click this button to complete the process.

CONVERT

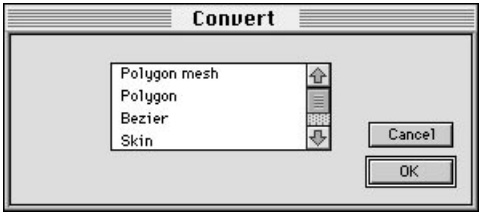
Once objects are created, they can be converted from their original type by using the **CONVERT** button or command. It is often necessary to convert objects to another type before they can be edited with the **RESHAPE** command.

To convert an object:

1. Select the object.

2. Choose **CONVERT** in the Modeling menu or select the **CONVERT** button from the Button Bar.

When you select the **CONVERT** command a dialog will appear that will give you access to all the possible conversions for that object type.



Once you have converted an object to an editable type, you can edit it with **RESHAPE**.

GROUP/UNGROUP

GROUP lets you take two or more selected objects and combine them into a single object so that it acts as a single entity. Any combination of objects can be grouped together, and the same basic operations can be performed on a group as on a single object.

Individual objects within a group cannot be accessed, although Shapes that are part of the group can be accessed in their own window.

Although groups will have an Object Properties Palette, only the Transform and Texture tabs are editable.

Selecting **UNGROUP** splits the grouped object into separate selectable objects.

Shape instances may be ungrouped at the model level, but this is not generally desirable because their hierarchical links will be broken.

EDIT PLACEMENT

EDIT PLACEMENT is covered in the chapter on textures.

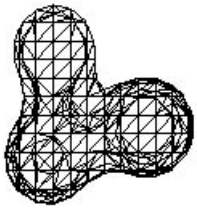
ALIGN TO PATH

ALIGN TO PATH is covered in the chapter on animation.

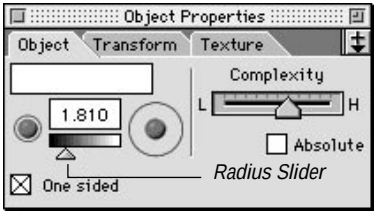
METABALLS

With **METABALLS** you can transform separate ellipsoid shapes into a single entity.

As the operation proceeds, the objects will seem to melt into each other as they come close to one another.



Once you have created a Metaballs entity, you can edit it using the Object Properties Palette.



You can use the radius slider bar to change the radius of influence. This determines when and to what extent the ellipsoids will merge. For the merging to occur, the radii of the ellipsoids as defined by the slider must overlap.

Sliding the bar to the left requires that the ellipsoids must be in close proximity. Sliding the bar to the right allows them to be further apart.

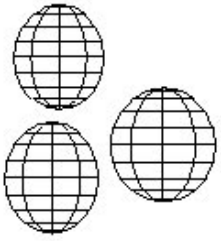
The *Complexity* slider determines the amount of detail in the rendered entity.

NOTE *Metaballs requires ungrouped spheres to perform the operation.*

To use METABALLS:

1. With the Sphere tool selected, place an ellipsoid in the model window.

2. Place other ellipsoids in the window in close proximity to the first ellipsoids.



   If the ellipsoids are not in close proximity, you will not achieve a metaballs effect.

3. Select all ellipsoids.

4. Click on the **METABALLS** modeler button or select **METABALLS** from the Modeling menu.

The spheres will be returned to the model window as a metaball entity with default properties. You can edit the metaball using the **CONVERT** command, then **RESHAPE**.

To restore the original ellipsoids, select the metaball. Then choose the **METABALLS UNJOIN** button in the button bar. This allows you to change the ellipsoids and then re-do the metaballs if you choose.

ALIGN HANDLES

ALIGN HANDLES lets you align Bézier handles on an object during **RESHAPE**.

MAKE FIRST POINT

MAKE FIRST POINT lets you select another vertex point on an object while in **RESHAPE** and make it the beginning point on the object.

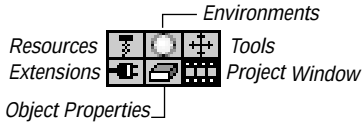
FIT TEXTURE

FIT TEXTURE centers the texture on the object with coverage at one-hundred percent, if you have moved it with **EDIT PLACEMENT**.

Show/Hide Palettes

SHOW/HIDE PALETTES BUTTONS

At the far right of the Button Bar are six special buttons.



They allow you to show or hide the Tool Palette, Resource Palette, Environment Palette, Object Properties Palette, Extension Tool Palette, and Project Window.

They perform the same function as the **SHOW/HIDE** commands in the Windows menu.

COMMANDS USED IN MODELING

While the descriptions of these commands are brief, complete details can be found in the *Reference Manual*.

Active Grid (Edit menu)

ACTIVE GRID displays a sub-menu so you can specify which grid is active.

Align (Modeling menu)

ALIGN allows selected objects to be aligned on the horizontal, vertical, or depth axis either separately or in any combination of the three. When you select Align a dialog will open.

Camera Windows (Windows menu)

CAMERA WINDOWS displays a list of the camera objects in the Modeling window. A Camera window is available for each camera.

Convert (Modeling menu)

CONVERT allows selected objects to be converted to editable entities.

Duplicate (Edit menu)

DUPLICATE creates a copy of the selected object. By default, it will be placed one-fourth unit down and to the left of the object selected.

Group (Modeling menu)

GROUP combines two or more objects into one element which then acts as a single entity. It can also be accessed by the **GROUP** button on the Button Bar.

Any combination of objects, light sources, or cameras can be grouped together. The same basic operations can be performed on them as on single objects. When objects are grouped, a marquee appears and the group has a single set of handles.

Individuals within a group can't be accessed, but shapes can be accessed in their own work spaces using the shape editing commands.

Hide Grids (Edit menu)

HIDE GRIDS hides all of the grids in your model.

Hide Selected (Selection menu)

HIDE SELECTED lets you hide objects in the model so that you can access others that may be hidden or unreachable.

Images (Windows menu)

The **IMAGES** command has a sub-menu listing all open image windows. If no image window is open, the command is dimmed.

Make Construction (Selection menu)

MAKE CONSTRUCTION displays the selected object in the modeling window, but it will not render.

Make Construction Normal (Selection menu)

MAKE CONSTRUCTION NORMAL causes all objects designated as Construction to show in the modeling window and to render.

Make Shy (Selection menu)

MAKE SHY renders the selected objects, but they don't show in the modeling window.

Make Shy Normal (Selection menu)

MAKE SHY NORMAL displays the object in the modeling window and enables the rendering of the object.

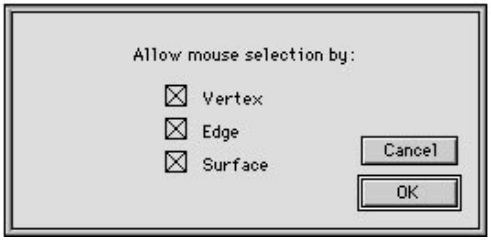
Metaballs Unjoin (Modeling menu)

METABALLS UNJOIN breaks the metaball entity into its separate parts.

This can also be accessed through a button on the Button Bar.

Mouse Filter (Selection)

The **MOUSE FILTER** command displays a dialog with various options for selecting objects.



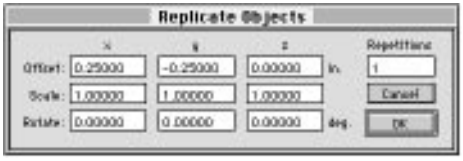
Once these settings are in place, StudioPro uses them to determine the qualifications for selecting an object. If you turn off all three of the filters, clicking on an object will never select it. If this were the case, you could still select an object by dragging a marquee around it.

Re-center (Modeling menu)

The **RE-CENTER** command re-centers an object's origin point at its geometric center.

Replicate (Edit menu)

REPLICATE makes multiple copies of a selected object or group of objects. A dialog box is displayed for setting the replication parameters.



Reshape (Modeling menu)

RESHAPE allows you to edit objects at their most basic level of creation. In many cases you will need to **CONVERT** the object to an editable entity first.

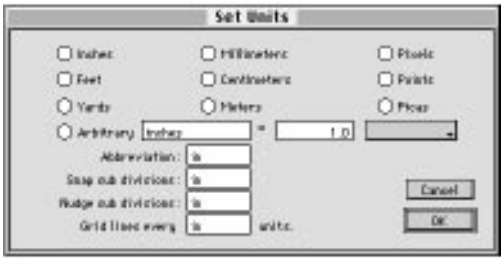
Select All (Selection menu)

SELECT ALL command selects all visible objects, light sources, and cameras in the current work space. Hidden objects or Shapes are not selected.

Select None (Selection menu)

SELECT NONE deselects all currently selected objects.

Set Units (Edit menu)



SET UNITS allows you to specify the measurement units for your modeling window. The grid units will be the same as those in the Set Units dialog.

Show All (Selection menu)

This command shows all hidden objects after you have used the **HIDE SELECTED** command.

Show/Hide Button Bar (Windows menu)

SHOW/HIDE BUTTON BAR allows you to show or hide the Button Bar.

Show/Hide Environment Palette (Windows menu)

SHOW/HIDE ENVIRONMENT PALETTE allows you to show or hide the Environment Palette.

Show/Hide Extension Palette (Windows menu)

SHOW/HIDE EXTENSION PALETTE allows you to show or hide the Extension Tool Palette.

Show/Hide Object Palette (Windows menu)

SHOW/HIDE OBJECT PALETTE allows you to show or hide the Object Properties Palette for the selected object.

Show/Hide Project Window (Windows menu)

SHOW/HIDE PROJECT WINDOW allows you to show or hide the Project Window.

Show/Hide Resource Palette (Windows menu)

SHOW/HIDE RESOURCE PALETTE allows you to show or hide the Resource Palette.

Show/Hide Tool Palette (Windows menu)

SHOW/HIDE TOOL PALETTE allows you show or hide the Tool Palette.

Show Hidden (Selection menu)

SHOW HIDDEN shows all objects that were previously hidden in the active model.

Snap to Grid (Edit menu)

SNAP TO GRID causes all objects to snap to the active grid when moving them.

Ungroup (Modeling menu)

After grouping objects, use **UNGROUP** to split them into separate entities.

UNGROUP can also be accessed through the **UNGROUP** stage of the Group button on the Button Bar.

Visible Grids (Edit menu)

VISIBLE GRIDS displays a sub-menu that allows you to specify which grids to display in the modeling window.

3

SHAPES

INTRODUCTION

Drawing an object, applying a texture, and rendering an image of it is a simple enough task. Even assembling several objects together into something actually recognizable probably won't tax your 3-D modeling skills too much. And it's always a good idea to start with something simple, but what happens when you want to create something more complex?

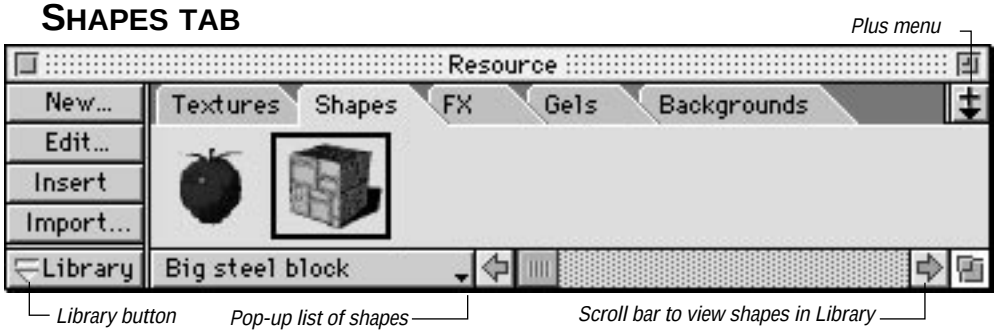
The time will come when you want to tackle a really big project, complete with fine detail, multiple objects, complex textures, and rendered with high resolution. This chapter will provide you with the necessary information to help make this task easier to accomplish. StudioPro offers a feature called Shapes that allows you to break down big models into smaller units.

Shapes allow you to work on just one component at a time in its own separate work space, with its own windows, and then insert it into the model for use with other shapes.

When you insert a shape, you put an instance of that shape into another work space. It behaves much as an alias does on your desktop, with a path to the original shape.

The use of shapes not only gives you the ability to set up logical groupings of objects, it also allows you to establish a structure for your project. The bigger the project, the more helpful the shapes structure, or hierarchy, can be.

SHAPES TAB



SHAPES TAB

The Shapes tab on the Resource Palette contains preview images and a pop-up menu for each shape available on disk.

The condensed tab contains only those shapes currently loaded into the model. When you click the Library button, the tab will expand vertically and you will have access to all shapes stored in the Shapes folder on your hard drive.

As you create new shapes, they also appear in the loaded area of the Shapes tab. Files imported into a model are shown on the pop-up list, and a preview image is automatically created for them.

If more than one model is open when you switch active models, the Shapes tab will redraw so that it can accurately show the currently loaded shapes for the active model.

How the Shapes Tab Works

To select a shape on the palette, single click its preview image. A black rectangle will appear around the selected shape. You can also choose a shape by scrolling through the pop-up menu.

To load a shape from the palette:

In the Library section, double-click its preview image. This procedure loads the shape into the active model; it does not insert an instance.

To insert a shape from the palette:

In either section, select its preview on the palette, then click the *Insert* button. You can also select the preview on the palette and drag-and-drop it into the active window.

Controls on the Shapes tab

Controls on the Shapes tab let you manage the shapes from within the Shapes library.

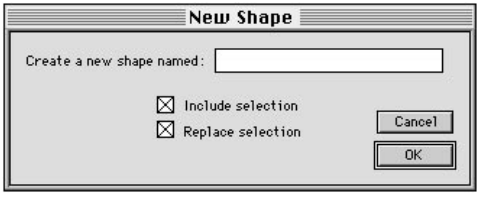
Shapes Tab Controls

Standard controls:

- **Move bar**. You can use this to position the Resource Palette anywhere on the desktop. Its position will be remembered from session to session.
- **Close box**. Click here to hide the Resource Palette.
- **Resize box**. You can only resize the palette horizontally. The widest possible setting is the full width of the monitor in use. The width snaps to the closest whole preview.

Palette specific controls:

- **New button**. Click this button to create a new shape.The *New Shape* dialog box opens where you can enter the name of the shape and indicate whether or not you want to include the currently selected objects in the new shape's work space.



  If you choose to include the selected objects in the new shape, you can replace them with instances of these objects in the active work space.

- **Edit button**. This button allows you to edit the selected shape. A window opens into the shape's work space. If a shape is not loaded, it will be automatically loaded first.
- **Insert button**. When you click this button, you can insert a selected shape's instance into the active model. The instance's size is the same as the original shape.
- **Import button**. Import lets you merge StudioPro model data into the current model. This data is loaded into the model in a Shape work space.
- **Shapes preview area**. Here you will find a preview image of all the loaded shapes in the active model. If you expand the palette by clicking the *Library* button, you will see all the shapes available to you.
- **List of Shapes**. This pop-up menu provides you with a list of shapes from the Shapes tab. They are listed by name, with those loaded appearing last. A line separates those loaded from those which have not yet been loaded, but are available in the Shapes folder.
- **Scroll bar**. Use this to scroll horizontally through the Shapes tab. It is only active when there are more shapes than can be viewed at one time.
- **Library button**. Use this button to expand the palette to preview all shapes in the Shapes Library.
- **Plus Menu.** Commands in the Plus menu are relevant to the entire Resource Palette. When the Shapes tab is active, those commands will apply to Shapes: **COLLAPSE PALETTE, NEW...,**

SAVE..., DELETE SELECTED, DELETE UNUSED, INSERT/APPLY, EDIT, HIDE.

HOW SHAPES WORK

Shapes Hierarchy

Any object that is constructed as a shape may be made part of another shape. This is done by inserting one shape into another shapes's work space through the **INSERT** button in the Shapes tab of the Resource Palette. Although the inserted shape has all the characteristics of the original shape, it is really only an instance of the original object. As an instance, it is not directly editable, but can be given additional transformations.

The transformations and texture applications at the instance level override those at the shape level, as the shape is considered a lower level than its instance.

There are few limitations on the different ways shapes and their instances can be combined to form objects. Shapes can even be inserted into themselves, a condition called recursion, often with interesting results.

A complex shape assembled with instances is hierarchical in nature. In these hierarchical models, the original object is called the root shape. You can have as many, or as few, root shapes as you need. A root shape can be used in other shapes, or inserted directly into the model.

Saving Time With Instances

At any point in the construction of your model, you can change your mind about the properties of some of the objects—their geometry, texture, even the type of object used. Any changes you make to a shape will be reflected throughout the model wherever that shape was used.

Whatever you put in a shape's work space becomes part of its instance also. If you replace an object in the shape with another one, the new object appears in the instance in place of the previous object.

If you delete the object(s) inside a shape, the objects in the instance's windows will disappear as well, but the instances are still where you put them. They are acting as place-holders in the original model window.

If you draw a new object into the Shapes work space, it will appear as an instance in the model at the point where the place is being held.

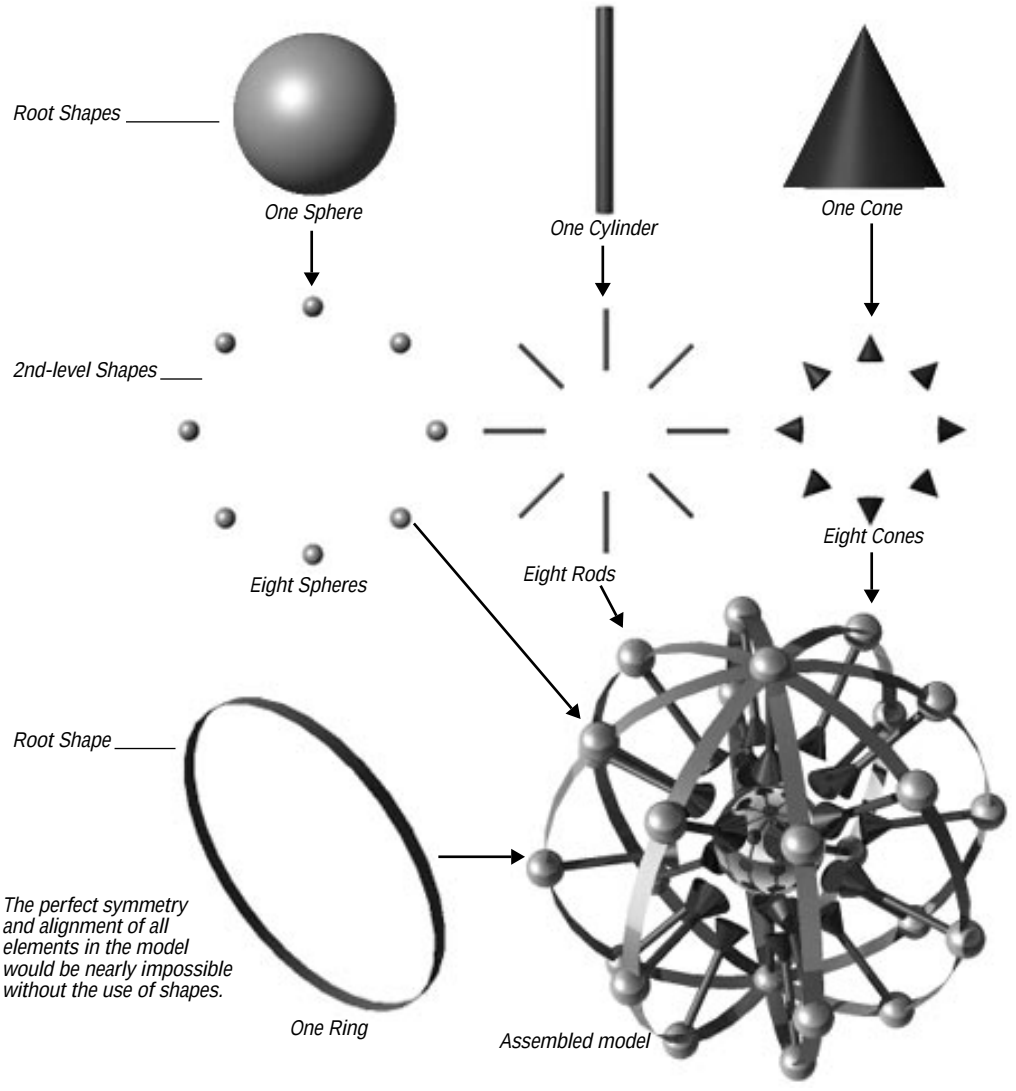
Saving Memory With Instances

In addition to making modeling easier, there is another distinct advantage to using shapes. A shape instance takes much less memory than making copies of the original object does. This might mean the difference between being able to complete a project or running out of memory.

You can use a shape as often as you need to and at multiple levels in the hierarchical structure of the model. But, there is a tendency to use them inefficiently. This is where pre-planning will make your project much more efficient.

Your hierarchical model should have a linear progression from the creation of the root shapes to their ultimate presence in the model. Diagram the structure on paper and you won't get lost or forget an important piece of the model. Doing this should make your modeling more efficient and less stressful.

SHAPES HIERARCHY



The perfect symmetry and alignment of all elements in the model would be nearly impossible without the use of shapes.

An exercise in hierarchy:

As you work through this exercise, you will understand how shape hierarchy works.

Before you begin this exercise, open a new modeling window.

Be sure you are working on the Y grid.

BUILDING THE ROOT SHAPES

1. Click New... on the Shapes tab of the Resource Palette.

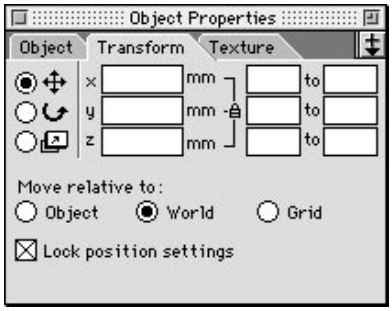
   The New Shape dialog will appear.

2. Name it “One Sphere.”

   Be sure neither check box in the *New Shape* dialog is enabled. Click *OK*. The shape window appears.

3. In the shape window, draw a symmetrical sphere with a one inch diameter by using the **Shift key** while drawing.

4. Click the Transform tab on the Object Properties Palette and set the move coordinates to 0,0,0. Be sure the *World* coordinate system button is enabled.



5. While the object is selected, choose a texture from the Texture tab on the Resource Palette, then click *Apply*.

   You can create your own texture following instructions in the chapter on textures, or select one from the Library section of the Texture tab. Once it is applied, it will be loaded for use later.

   Once the texture is applied, close the shape window.

6. Follow the above steps to make a one inch by one inch cone in its own shape window. Name it “One Cone.”

7. Use the New button to open another shape window following the same procedures. Name it “One Cylinder.”

8. Use the three-click method to draw a cylinder three inches tall and one-quarter inch in diameter.

This will also need to be centered at 0,0,0, using the Transform tab.

9. Apply a texture, and then close the window.

THE NEXT LEVEL

1. Click the *New* button on the Shapes tab. When the dialog appears, name the shape "Eight Spheres," then click *OK*.

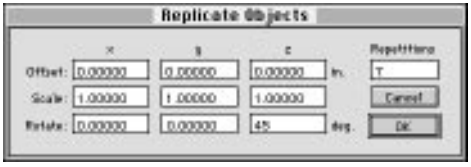
2. From the Shapes tab select the sphere and click *Insert*.

3. In the Transform tab on the Object Properties Palette, click the *Move* radio button and position the sphere at 0,6,0. Be sure the *World* coordinate button is enabled.

4. Change to the Z grid. With the Object Move tool selected, hold down the **Command key** and move the sphere's center point to 0,0,0. You can use the **Shift key** to constrain the movement.

5. While the sphere is selected, select **REPLICATE** from the Edit menu.

6. In the *Offset* fields enter 0,0,0. In the *Scale* fields enter 1,1,1. In the *Rotate* fields enter 0,0,45. In the *Repetitions* field enter 7.



7. Click *OK*, then close the shape window.

8. Follow the same steps for the cone as you did for the sphere, but name it "Eight Cones" and in the *Move* field on the Transform tab set the position of the cone at 0,3,0. Once you have completed all steps, close the window.

9. Follow the same steps for the cylinder, but name it "Eight Cylinders," and in the *Move* field on the Transform tab set the position of the cylinder at 0,4.5,0. Once you complete all steps, close the window.

ANOTHER ROOT SHAPE

1. Click the *New* button on the Shapes tab of the Resource Palette. Name the shape "Ring."

   Be sure neither check box is enabled. When you have named it, click *OK*.

2. Be sure you are still on the Z grid. With the 2-D Circle tool, draw an unfilled proportional circle with a diameter of 12 inches in the shape window.

3. With the Extrude tool selected, extrude the ring .50 inches with a straight bevel (the default bevel).

4. Use the Transform tab to center it at 0,0,0. Remember to enable the *World* coordinate system radio button.

5. Apply a texture.

6. Close the window.

THIRD LEVEL (THE MODEL)

1. Insert the "Eight Spheres," "Eight Cones," and "Eight Cylinders" into the modeling window at 0,0,0, coordinates.

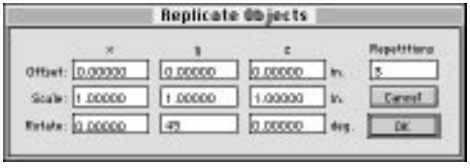
2. Insert the "Ring" shape into the window at 0,0,0.

3. Group all the shapes in the modeling window by selecting them all and clicking the Group button on the Button bar.

4. With the grouped shapes selected, choose the **REPLICATE** command.

   The Replicate dialog will appear.

5. Enter 45 degrees on the Y axis in the *Rotate* field. Leave X and Z at 0. Set the *Offset* fields all at 0, and the *Scale* all at one (1). Enter 3 into the *Repetitions* field.

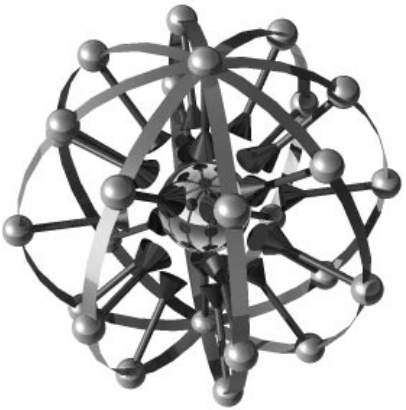


6. Click *OK*.

7. With the Sphere tool, draw a 3 inch sphere. Using the Transform tab, center it at 0,0,0.

8. Apply a texture to the Sphere.

9. You can now render the new model.



WORKING WITH SHAPES

Shapes created or loaded into a model become part of that model. When you save the model, you save the shapes as part of the document. Shapes' work spaces are kept just the way you left them when you closed the window.

Loaded shapes will be visible on the Resource Palette in the Shapes tab. Unloaded shapes can be accessed when you click the Library button.

Creating Shapes

Creating a shape may be as simple as drawing a single object, or it may include using previously created shapes, pasting an object from the scrapbook, or importing 3-D data from disk.

Textures can be applied to new shapes. When a texture is applied to a shape, it will also be applied to the instances of the shape.

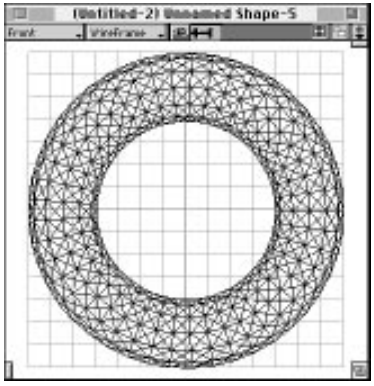
To create a shape:

1. Select *New* from the Shapes tab.

   The New Shape dialog will open asking you to name the shape. Be sure neither check box is checked.

2. Name the shape, then click *OK*.

   A shape window opens where you can create your shape.



3. Select any of the drawing tools, then create a shape.

In the Shape Window, you can work with the shapes using StudioPro's object manipulation and modeling tools.

Loading Shapes

You can load shapes into a model at any time during the creation process. As you work with StudioPro, you'll build shapes that you'll want to save. A full Shapes library helps you to assemble ready-made building blocks very quickly into a complex model.

Loading a shape only loads it onto the palette. You must insert it into your model to have it appear there.

The orientation of the view into which the instance of a shape is inserted determines its orientation. If you don't like the orientation, you can rotate it, or delete it and insert it in a different view orientation.

There are four ways to load a shape into an open model:

- **Double-click** its preview image in the Shapes tab. This loads the shape and opens its window for editing.
- Select a shape from the palette, then click the **Insert** button.
- Select a shape on the palette and click the **Edit** button. This loads the shape and opens its window for editing. It will not insert the shape into the model.
- Select a shape from the Shapes tab and the **INSERT** command from the Plus menu on the Resource Palette. This will load and insert the shape.

Adjusting the Scale of a Shape

Since StudioPro doesn't restrict the scale at which a model is constructed, it is inevitable that you will load shapes that are not the same scale as the model. And, unfortunately, using the same scale for all your work is not always practical.

If you need to adjust the scale of a shape, you can edit the shape and change the size of the original object. For simple objects this may be a viable option. But suppose you have an object that is assembled from many other shapes. Opening up and editing each shape and then reassembling the object could become a nightmare. Fortunately there is a better way.

At any point in the creation process, an instance's scale can be changed. You can scale it at the time of insertion, or after insertion. Each instance, even instances of the same shape, can be a different scale. And everything about the shape is scaled with the instance, including its geometry and texture.

To scale by one of the methods that insert automatically, for example the *Insert* button, use the Scale tool from the Tool Palette, or the Transform tab on the Object Properties Palette.

NOTE *Changing the size of an instance does not affect the original object in the shape work space in any way.*

Deleting Shapes

Shapes can be unloaded from memory by using the **DELETE SELECTED** or **DELETE UNUSED** commands in the Plus menu of the Resource Palette while the Shapes tab is active.

Saving Shapes

You can save shapes as separate files. This is also accessed through the Plus Menu with the **SAVE** command. They will be more accessible if you name them with something that is sufficiently descriptive.

Shapes Exercise (Oriental Tea Set):

This exercise will give you a basic understanding of how shapes work in StudioPro. You will learn how to load,

copy, create, and edit shapes. You will also see how the shape hierarchy works.

Teapot:

1. Open a new modeling window.
2. Scroll through the pop-up list on the Shapes tab and select the Teapot by clicking it.

3. Insert the Teapot into the model space. With the Teapot selected in the Shapes tab, click the *Insert* button.

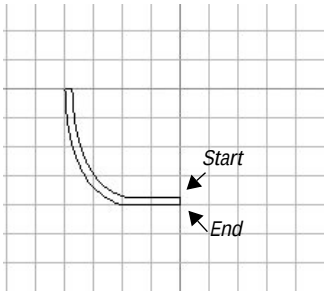
   Be sure the Teapot remains selected.
4. Select the Textures tab from the Resource Palette. Scroll through the pop-up list and select the Green Marble texture.
5. Click the *Apply* button.

Cups:

1. Create a new shape work space using the **NEW** command from the Shapes tab on the Resource Palette. Be sure the *Include selection* and *Replace selection* check boxes are not checked.
2. Name the shape *Cup*, then click *OK*.

   A new Shape window will appear.
3. Draw a cross-section of the cup with the Bézier Pen tool.

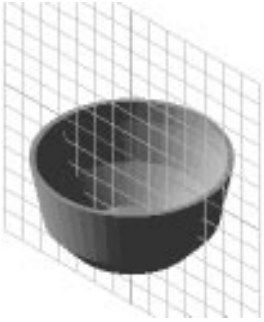
   Your cup cross-section should look similar to the following illustration.



4. Select the Lathe tool from the Tool Palette to lathe the template.

5. Move the lathe handle around the template 360°.

   The lathed cup will be redrawn in the shape work space. It should look similar to the one shown in the following illustration.



6. Apply the Green Marble texture from the Textures Palette.

7. Close the Shape window.

NOTE *This would be a good time to save.*

8. Insert the cup into the modeling window.

   To do this, select the cup on the Shapes tab of the Resource Palette, then click the *Insert* button.

9. **Option-Copy** the cup three times.

   To do this, hold down the Option key while selecting the cup with the Object Move tool. This creates a copy.

   You will probably need to use the **FIT VIEWS TO ALL** command from the Windows menu to view all four cups and the teapot.

Tray:

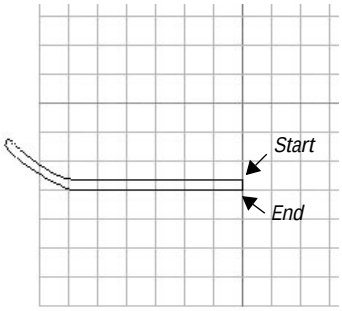
1. Create a new shape. Be sure none of the shapes in the Modeling window are selected before you open the new Shape window.

2. When the dialog box appears, make sure both the *Include selection* and *Replace selection* check boxes are unchecked.

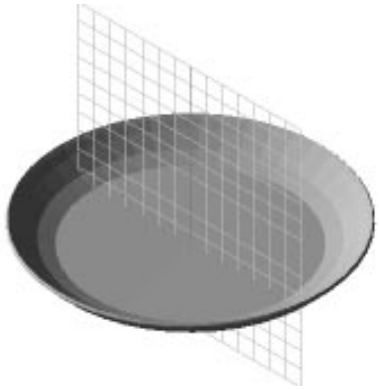
3. Name the new shape, *Tray*.

4. Use the Bézier Pen tool to draw a cross-section of the tray.

   It should look similar to the following illustration.



5. Lathe the tray template.



6. Apply the Gold texture from the Textures Palette to the tray.

7. Close the shape window.

Putting it all together:

1. Insert the tray into the Modeling window.

   Once all objects are in the model, you will need to use the Scale tool to make them proportional to one another. The simplest way to scale the cups will be in the Cup shape window.

2. Open the Cup Shape window by selecting the cup from the palette, then clicking *Edit* from the Shapes tab on the Resource Palette.
3. Select the Scale tool.
4. With the cup selected, hold down the **Shift key** and drag a corner handle until the cup is small enough to be proportional to the teapot.
5. Close the shape window.

   You will notice that all cups reflect the size change of the original shape. You can scale the tray and the teapot in the same way.
6. Change the view to *Top*.
7. Use the Object Move tool to place the cups and the teapot on the tray.

8. Change the view to *Front* and make sure the cups sit within the tray.

9. Deselect all objects, then select the View Rotate tool.

   Move the cursor to the bottom center handle, and when it changes to a rotate pointer, move the view upward -18°.

If desired, render your model. This will allow you to view the completed project with the textures applied. Simply click in the window with the Rendering tool. Use the default settings in the Rendering dialog, then click *OK*.

COMMANDS USED WITH SHAPES

Make Shy (Selection menu)

MAKE SHY hides the object in the modeling window, but renders it.

Group/Ungroup (Modeling menu)

GROUP allows you to group together selected shapes. **UNGROUP** lets you ungroup them for editing.

Reshape (Modeling menu)

RESHAPE, if the shape is editable, allows you to edit it.

Show/Hide Resource Palette (Windows menu)

SHOW/HIDE RESOURCE PALETTE hides or shows the Resource Palette for access to the Shapes tab.

4
TEXTURES

INTRODUCTION

Because StudioPro offers extensive surface description capabilities, the best way to achieve realism in rendered images is through textures.

Mastering the use of textures in StudioPro will allow you to create images that are indistinguishable from an actual photograph.

This chapter will provide you with the necessary information to build your texture creation and application skills. Once you have the fundamentals in place, you can begin to experiment, since learning by doing is always the most successful method.

CONCEPTS IN TEXTURE CREATION

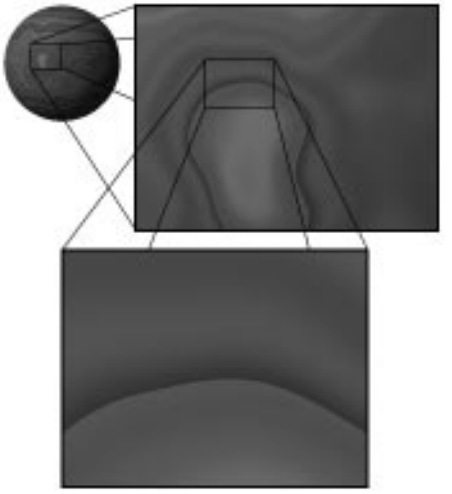
StudioPro supports both Solid (volumetric) and Surface (mapping) textures. The steps in their creation are similar, but the way they work on an object is significantly different.

Textures may be created in the active model at any time. Previously-built textures can be loaded from disk. Once a texture is created in a model, it is saved with that model's file, even if you haven't applied it to anything.

Once a texture is created or loaded into a model, it can be edited. It doesn't matter where the texture originated, all textures are fully editable.

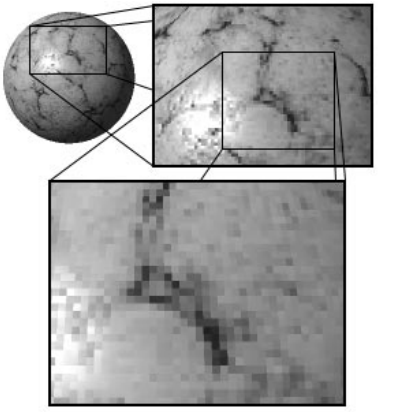
Solid Textures (Stone, Wood, Marble)

Solid textures offer greater technical precision, are more efficient, and are infinite in resolution and size. No matter how closely you view the surface, it will not pixilize. No matter how big the object, a solid texture will cover the surface completely. But, because they are mathematically generated, they can often look artificial. Practice will help you set up solid textures for a realistic feel.



Surface Textures (Surface, Simple Color)

Used properly, surface textures can look quite realistic because the surface maps are often digitized from actual objects. These maps are readily available to the average user and can be prepared with available software. However, if they are viewed too closely, they will pixilize.



Creating surface textures can be as simple as scanning a color picture, loading it into a texture and applying it to an object.

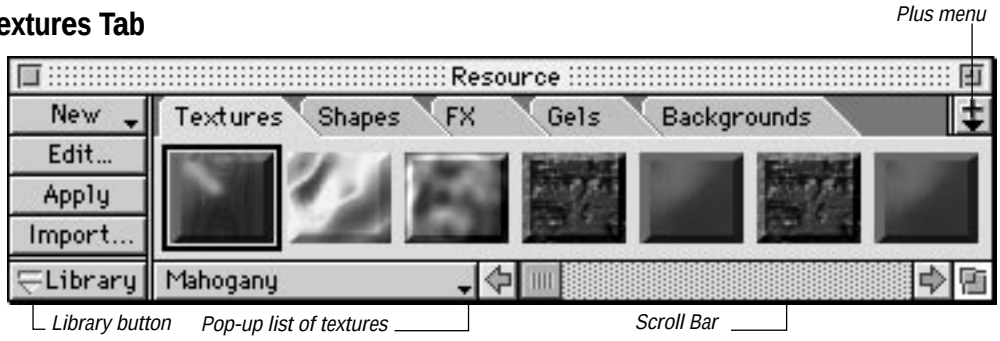
In more advance functions, surface mapping offers the ability to control multiple surface properties at every point on the face of an object. This is done with specialized PICT images.

Handling Textures in a Model

Textures created or loaded into a model become part of that model. When you save the model, you save its textures as part of the document.

You can create any number of textures for your model. You do this by holding down the New button from the Textures tab on the Resource Palette and selecting a texture type from the pop-up list. This will open the appropriate Texture Editing dialog. Once created, they can be saved using the **SAVE** command in the Plus menu.

Textures Tab



TEXTURES TAB

The Textures tab is found on the Resource Palette. It contains a preview image and a listing in the pop-up menu for each texture in the Textures folder.

Only those textures that are actually loaded will appear in the upper section of the palette.

If you load texture files from other sources, they will appear on the Textures tab also. When you create a new texture in a model, it immediately appears on the Textures tab.

Any textures that come with an object imported into the model will also be displayed on the Textures tab.

If more than one model is open, switching active models will cause the loaded portion of the Textures tab to redraw. Only those textures associated with the active model will be displayed there.

You can delete any unwanted textures from your model through a **DELETE SELECTED** command in the **Plus menu**.

To expand the palette to include all textures found on disk in the Textures folder, click the *Library* button.

If the Library contains more folders than fit in the available space, use the left and right arrows to scroll through them.

Using the Textures Tab

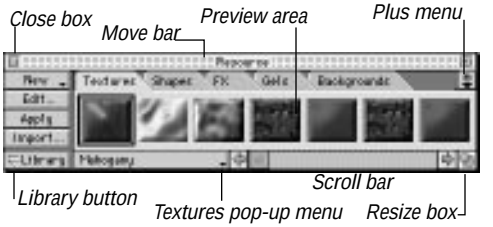
You can preview the textures on the Textures tab, either by using the scroll bar to view those that are loaded, or by scrolling through the pop-up menu. If the Library is open, you can scroll through the previews in either the loaded textures or those in the Library.

When you select a loaded texture, a black outline will appear around it.

When you select a texture from the pop-up menu, if the texture has been loaded, the palette will scroll to show the texture's image and move the selection rectangle to that texture.

If the Library is not open and you select a texture from the pop-up list that is not loaded, you will not see it in the palette. You will know it is selected because the name will appear in the pop-up menu's field.

Controls on the Palette



Textures tab controls allow you to manage the textures found there.

Standard Controls:

- **Move bar.** Use this to position the palette on the desktop. This position is retained from session to session.
- **Close box.** Use this box to hide the palette.
- **Resize box**. Use this box to manually set the width of the palette.
- **Scroll bar**. Use this bar to scroll horizontally in the loaded section or Library to view all the textures represented there. It is active only when there are more textures than can be viewed at one time.
- **Textures preview area**. If the Library is not open, the preview area shows the loaded textures. When you expand the tab to include the Library, all textures available in the folder are displayed.

Palette specific controls:

- **New button**. Hold down this button to create a new texture. This will be created in the active model. When you select the texture type, the Texture Editing dialog box will open allowing you to define properties for the new texture.
- **Edit button**. Use this button to edit the texture selected on the Textures tab.

  The Texture Editing dialog box will open. If the selected texture is not currently loaded, it will be.
- **Apply button**. Use this button to apply a selected texture to your selected object.
- **Import button.** Use this button to import textures from disk.
- **Library button**. Use this button to give you access to all textures in the library.
- **Textures pop-up menu**. Choose a texture by name from this list.
- **Plus menu**. Commands found in the Plus menu are: **COLLAPSE PALETTE, NEW, SAVE..., DELETE SELECTED DELETE UNUSED, APPLY, EDIT**.

Loading Textures

You can load textures into your model as you need them. This is an easy way to

transfer work done on other projects to your current one.

When you load a texture, it is given storage space in the loaded section of the palette, but it is not applied.

How to Load a Texture

There are several ways to load a texture into an open model:

- **Double-click** the preview image in the Textures tab. This loads the texture and opens its Texture Editing dialog.
- **Select** a texture from the palette, then click the *Apply* button. This loads the texture and applies it to the selected object.
- **Select** a texture from the palette, then drag-and-drop it onto an object. This applies and loads the texture.
- **Select** a texture from the palette and click the *Edit* button. This loads the texture and opens the Texture Editing dialog box.
- **Import** will load textures from disk.

The method you choose depends on what you want to do with that texture. You may only want to load the texture for comparison, apply the texture to an object, or edit the texture to create a new one.

Applying Textures

Any texture, or number of textures, can be applied to any object; you decide which textures are suitable for your project. When you first begin using the program, you will probably use the ready-made textures from the palette, but it won't be long before you create and apply your own to achieve the effects you want on your objects.

How to Apply Textures

To apply a texture, complete the following steps:

1. Select one from the palette.
2. Select your object.
3. Click the *Apply* button from the Textures tab.

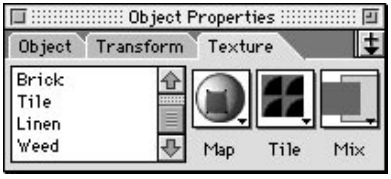
Alternately, you can select the texture on the palette and drag-and-drop it onto the selected object. If the texture is in the library and not loaded, this will load the texture, as well as apply it.

Once you have applied a texture, you can preview it on the object by using the Rendering tool from the Tool Palette. See the chapter on rendering in this manual for this procedure.

Texture Placement

The direction from which a texture is applied and the mapping settings determine the way the texture is wrapped onto the object.

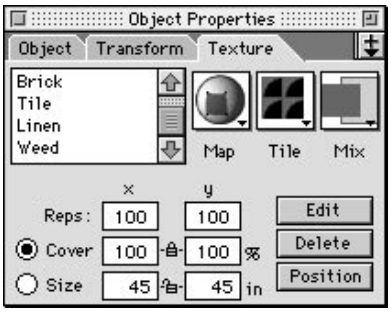
Once you have applied a texture, you can customize how it is applied to the object with the *Mapping* button on the Texture tab in the Object Properties Palette,



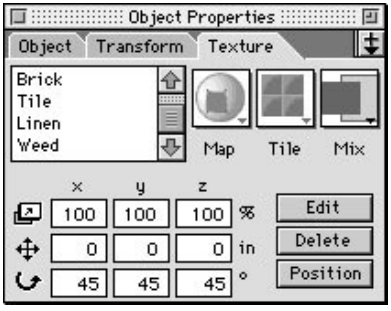
or with the **EDIT PLACEMENT** command or button.

When the Object Properties Palette appears. A list of the object's applied textures is shown. You can select the texture you want to map from the texture list.

The expanded section of the Object Properties Palette will appear different for solid textures than for surface textures.



Surface Texture Object Properties



Solid Texture Object Properties

Once all mapping decisions have been made, click off the Object Properties Palette to initiate these changes.

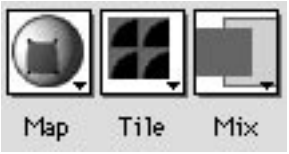
Coverage Versus Scale

The *Cover* and *Size* radio buttons set the size of a surface texture as a percentage of object coverage or as a specific size. The two fields next to *Cover* reflect the percentage of the object coverage, and the two fields next to the *Size* radio button reflect the coverage of the texture as a specific size.

You can also specify the number of times a map will be repeated. Enter numeric values in the *Reps* field. *Infinite* repeats the map infinitely across the object until the edge is reached

Mapping, Tiling, and Mixing

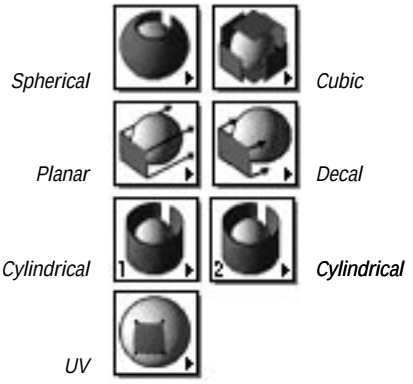
You can map, tile, and mix Surface textures.



There is a pop-up under each of the buttons on the Object Properties Palette which gives you options for each of these functions.

Mapping

You can select from: Spherical, Cubic, Planar, Decal, Cylindrical, and UV.

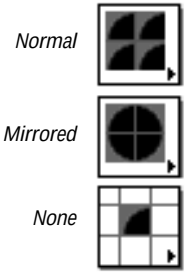


Typically, you would choose the pattern that most closely matches the geometric shape of the object.

Tiling

You want to anticipate whether the tiling pattern should be normal, mirrored across the surface, or none.

This option can be found in the *Tiling* button pop-up menu.



If you choose normal tiling, it is important that the maps match correctly at the seam, or the tiling will be obvious. Mirrored tiling can minimize the problem when the pattern doesn't match.

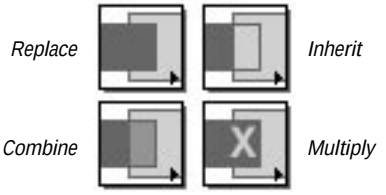
Solid Texture Differences

A solid texture cannot be mapped. In the expanded section of its Object Properties Palette, you can set only the parameters for scaling, moving, and rotating.

Mixing

It is possible that you will have more than one texture on your object at a time. In that case, the textures will need rules for interaction with one another.

The fields for this are found under the Mixing button.



When combining textures StudioPro uses these mixing rules:

- **REPLACE** all other textures with this one.
- **INHERIT** all properties of the texture below.
- **COMBINE** this texture with the texture below.
- **MULTIPLY** the values from this texture with the values in the texture below.

The default setting is *Replace*.

Editing and Positioning

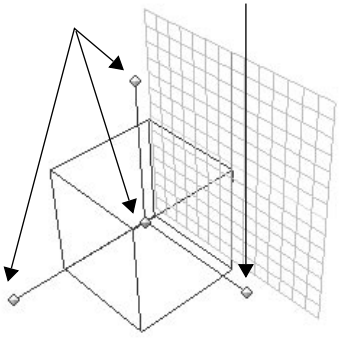
Edit, *Delete*, and *Position* buttons are in the lower right corner of the Object Properties Palette.

When you select the *Edit* button, the appropriate Texture Editing dialog will appear.

The illustration above is for the Simple Color Texture Editing dialog.

When you click the *Position* button, handles for interactively positioning the texture will be displayed. The following illustration is for volumetric textures.

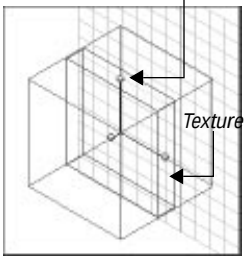
Handles for positioning and scaling the texture



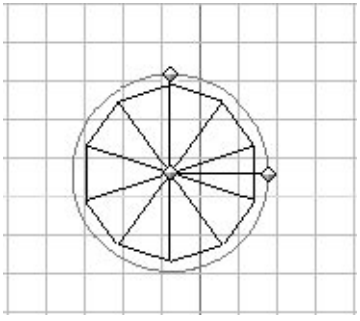
As you adjust the handles keep in mind that if the texture doesn't fit exactly, tiling may occur. You may want tiling to occur; therefore, how you adjust the handles will be determined by the effect you want.

Positioning handles

Rendered object



Any of the mapping styles are available. The following example is for Cylindrical mapping.



The window for positioning textures will have a shortened Tool Palette.

View Move
View Rotate
View Zoom
Texture Move
Texture Scale

Object Move
Object Rotate
Object Scale
Texture Rotate
Rendering tool

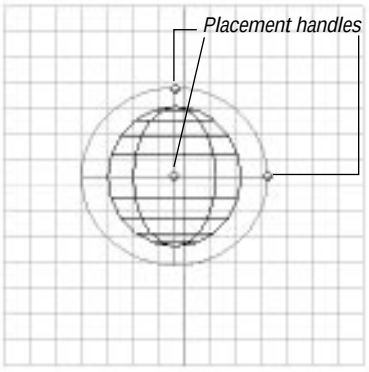
You can use these tools to interactively move and size the texture around on the object.

A special **FIT TEXTURE** button is provided on the button bar that centers the texture on the object with 100 percent coverage.

To map a texture interactively:

1. Select an object with textures applied.
2. If the Object Properties Palette is hidden, choose **SHOW OBJECT PALETTE** from the Window menu.
3. Click the Texture tab on the Object Properties Palette. Click the *Zoom* box in the title bar to expand the palette.
4. Click the *Position* button.

   Placement handles for mapping the texture will appear.



5. Select the Texture Scale tool and use it to click-and-drag a handle to scale the texture. Use the Texture Move tool to move it around.

   Try several positions and scalings, and render after each change. Do this by clicking and dragging the Rendering tool in the modeling window over the object. This will render only that portion of the object that the marquee encloses.

Rendered object with Spherical mapping

MAKING AND EDITING TEXTURES

Any number of textures can be created as part of a model. Any existing texture can be edited. The procedures to edit and create textures are basically the same, you just access the dialogs differently.

Creating a New Texture

To create a new texture:

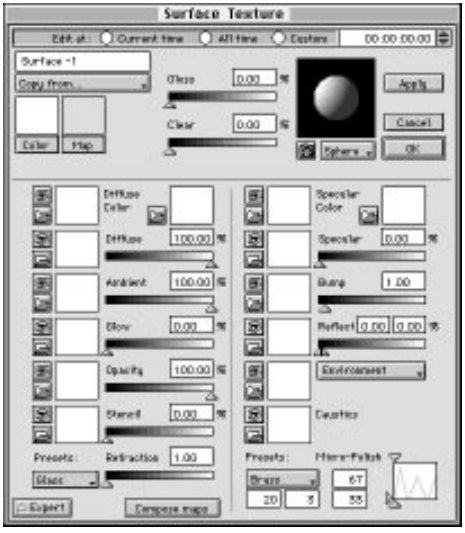
1. Hold down the *New* button on the textures tab of the Resource Palette.

   You will get a list of the possible texture types.

2. Select a texture type from this list.

   The appropriate Texture Editing dialog box will open. The following illustration is for the Surface texture.

3. You can use the basic fields to set the parameters for the new texture, or you can click *Expert* and the dialog will expand for greater control.



4. Once you are satisfied with the results, click *OK*.

Your new texture may be saved by using the **SAVE** command in the Plus menu.

Texture Editing

Editing a texture will change the characteristics of that texture on every object in the model. If you don't want that to happen, use the *Copy from* field to copy the texture. You can then edit the copy and apply it to the selected object.

Once a texture is selected, there are several ways available to edit it.

To edit a texture:

- Use the *Edit...* button from the textures tab. *Edit...* opens the Texture Editing dialog for the selected texture.
- Use the **EDIT TEXTURE** command from the **Plus menu** on the Resource Palette while a texture is selected.
- Open the Object Properties Palette for an object with a texture applied and select the texture you want to edit from the texture list. Click *Edit*. This will open a texture editing dialog.
- In the Project Window, open an object with a texture to access that object's properties.

When you click *OK*, the Texture Editing dialog closes, and the program returns to the location in the model where you began editing.

Surface Textures

The texture editing dialog for Surface textures contains a basic and an expert section. All Surface textures use the same dialog. The settings in this dialog determine the properties of the texture named in the primary dialog.

Basic Surface Texture Editing Dialog

When you select a texture for editing, the basic texture editing dialog appears first. The previous illustration is for that of a surface texture. The graphic controls and fields in the basic section interact with the channels in the expert section. For many textures, these simple adjustments will be sufficient.

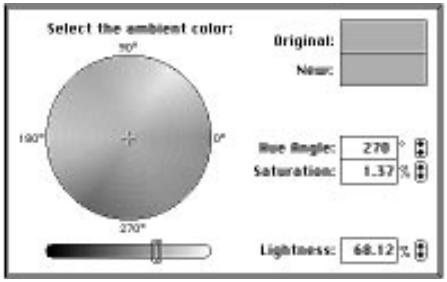
In this dialog, you can adjust the color, gloss, and transparency values, and see the effect of the changes in the preview area by clicking the Camera (rendering) button. Adding color has the effect of tinting a color surface map. You can also bring in a surface map with the *Map* button, or create a new texture by copying from another texture and modifying it.

Fields found in the Texture Editing dialog are:

- **TEXTURE NAME FIELD** to enter a new name that is descriptive of the texture you are creating or editing.
- **COPY TEXTURE FROM** pop-out menu lets you copy the properties from a previously-defined texture that is loaded in the active model. When you release the mouse button, all of that texture's properties are copied to the open texture. The original texture remains unaffected.
- **GLOSS SLIDER** controls multiple surface properties which determine how shiny the surface appears. Adjust it manually to get the desired results.
- **CLEAR SLIDER** determines how opaque or transparent the texture appears.

  These fields can also be found in the Expert dialog. For detailed information on the settings in the expert section, see the *Reference Manual.*

- **COLOR BUTTON** brings up the Color Picker dialog box.



  This field gives the texture a global color. When it is applied to an object, the entire surface of the object is tinted with this color.

- **MAP BUTTON** allows you to use a PICT image or a QuickTime movie as a color map for your texture. When you click this button the Image Map dialog will appear.

  You can use a PICT or QuickTime movie from any source in the Image Map dialog.

  The fields in the Image Map are:

  Load... Load an image using this button. You can animate a texture by loading a QuickTime movie into this field.

Color depth. Select a color depth for the PICT image.

Frame rate. Set a frame rate for an animation.

Track. All tracks in the current movie.

View size, Orientation. Select the size and orientation of the map.

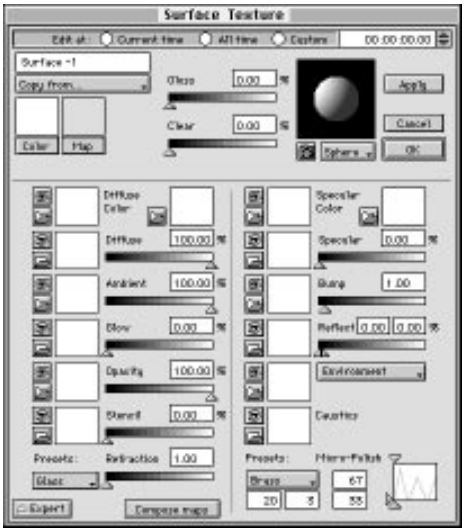
Play Movie. Preview a QuickTime movie, if loaded.

Invert check box. Invert the map.

Color and Grayscale. Radio buttons.

Cancel or ***Okay***. Cancels or applies the changes.

- **Render button**.You can render a preview of the texture.
- **EXPERT BUTTON** opens the dialog to allow you greater editing capabilities.



Surface Maps Explained

When you render an object with textures using only the surface properties fields in the basic section of the texture editing dialog, you will produce images with nicely smoothed, uniform surfaces. This contrasts with objects in the world around us, so they often look computer generated.

Surface maps are much more efficient in achieving realistic texture effects than using explicit geometry which requires lots of memory.

Surface maps can be created in StudioPro, a Draw program, or you can use existing PICTs. If you create your map in a Draw program, be sure to save it as a PICT.

To create a simple surface map using a PICT:

1. Select *New* from the textures tab or **NEW** from the Plus menu.

2. From the pop-up list, select Surface Texture.

   The Surface Texture editing dialog will appear.

3. Name the texture.

   The *Diffuse Color Map* and the *Diffuse Color* can both be set from here. You will use the *Map* field to bring in a PICT. If you click the *Color* button, you

will get the color picker for editing this field.

4. Click *Map*.

   The Image Map dialog will appear. You can invert the map, and you can elect to keep it in color or grayscale.

   You can select a *Color depth* from the pop-up list. Reducing the depth can save memory, but you will have to reload the map if you want to revert to the original color depth.

5. Click *Load* and select PICT from the pop-up menu.

6. Locate the PICT.

   NOTE *You may also copy and paste images to and from the Clipboard in this dialog.*

7. Select it, then click *Open*.

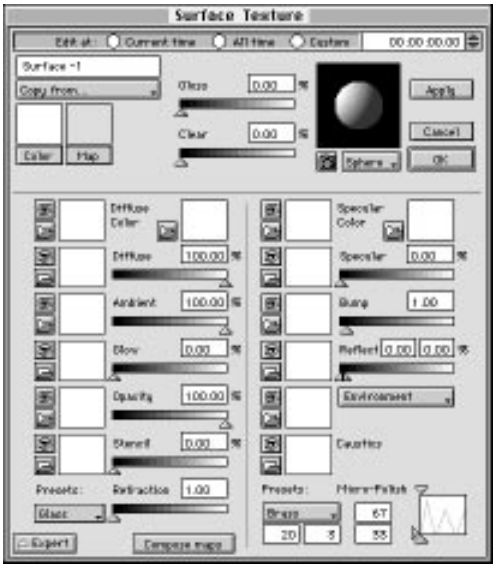
   A preview will appear in the Map box.

   Once you have loaded the map you can adjust its View size and Orientation.

8. Click *OK*.

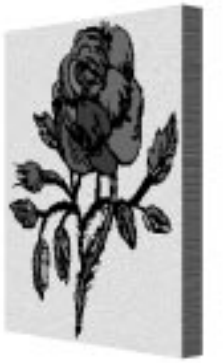
   You will be returned to the Texture Editing dialog where you can further edit the texture.

All of the texture's surface properties can be found when you expand the dialog. Click the *Expert* button for access to the texture channel surface properties fields.



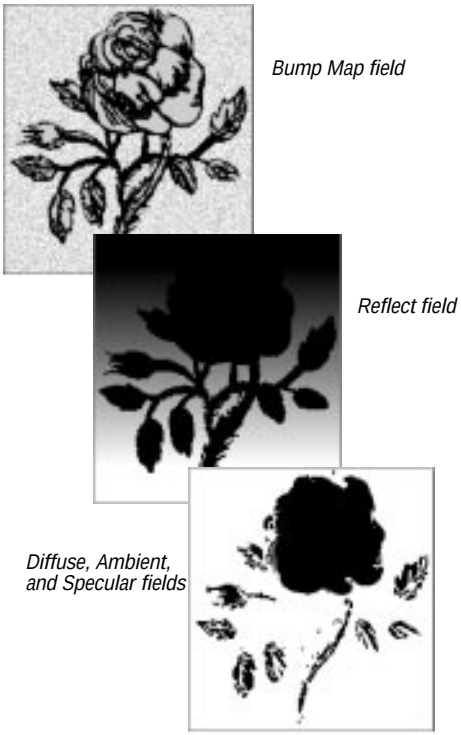
Using these fields, you can further edit the texture. Complete descriptions of these fields can be found in the *Reference Manual*.

Example of a Surface Map



This texture was created using surface maps.

The maps were created in a drawing program and then brought into StudioPro.



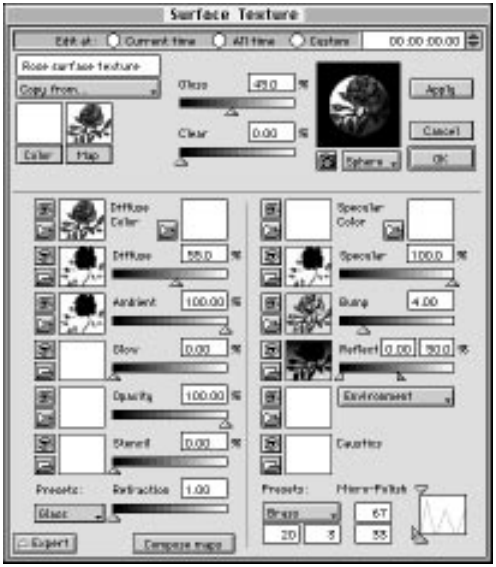
Bump Map field

Reflect field

Diffuse, Ambient, and Specular fields

The completed texture has a bump map and maps in several fields to achieve the effect of a real rose.

The Surface Texture Editing dialog would look like the following illustration.

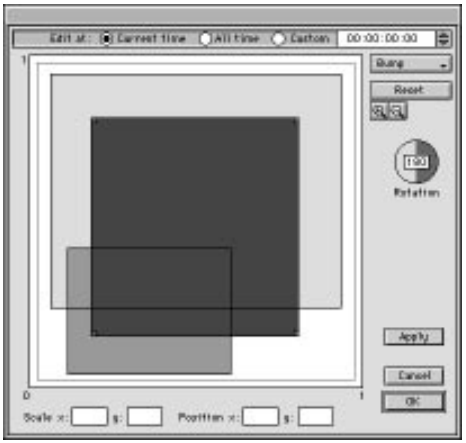


Aligning Texture Maps

There is one button in the expanded section that you will want to become familiar with, a *Compose maps* button. When you click the button, a dialog appears that allows you to position the different surface properties maps.

NOTE *Any changes you make in a Texture Editing dialog will affect the appearance of the texture on all objects to which it is applied.*

The window represents the entire size of the object to which the texture is applied.



To align surface maps:

1. Double-click the texture on the Texture tab of the Resource Palette. This loads the texture, if necessary, and opens its *Texture Editing* dialog.
2. Click the *Expert* button to expand the dialog.
3. Click the *Compose Maps* button at the bottom of the dialog.

   The Compose Maps dialog will appear.
4. From the *Channel Selection* pop-up, select the channel you want to edit.
5. You can scale the map by dragging any of the corner handles, or use the *Rotation* control on the right of the dialog to rotate the map. To change the position of the map, use the cursor to drag the preview.
6. Click *OK*.

Solid Textures

Solid textures, are volumetric in nature. Their patterns are defined as a three-dimensional volume out of which the objects appear to be carved.

StudioPro ships with several solid textures. From these, you can create new solid textures of your own. They can then be saved for later use.

There are several types of solid textures. Each type of solid texture requires a special extension. Marble, Wood, and Stone are examples of solid textures available through extensions in StudioPro.

When you hold down the *New* button and select one of those three from the list, its texture editing dialog will appear. From this dialog, you can make changes which will create a new solid texture of that type.

Each dialog will be specific to that extension. Many of the fields will be similar. If there is a color choice necessary, when you click the appropriate button the Color Picker will appear.

To create a solid texture:

1. Click the *New* button on the Resource Palette.

   A list of textures will pop-up.
2. Select Wood, Stone, or Marble.

   The texture editing dialog for that texture type will appear.
3. Use that solid texture as a basis for a new solid texture simply by changing

some of its properties, or define new properties using the available fields.

4. Name the texture.

5. When you are satisfied, click *OK*.

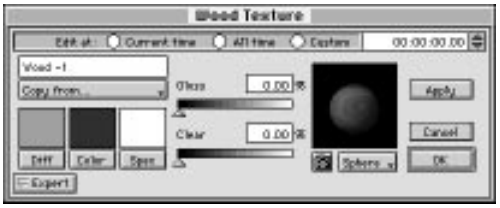
Marble

With the Marble Texture Editing dialog, you can create unique marble textures.

See the *Reference Manual* for explanations of these fields.

Wood

With the Wood extension, you can create custom wood textures to use in your models.



See the *Reference Manual* for explanations of these fields.

Stone

The Stone texture extension can be used as is or used to create unique stone textures.

For detailed explanations of these fields, see the *Reference Manual*.

LAYERING TEXTURES

One of StudioPro's most powerful features is the ability to layer textures. You can

place as many textures on an object as you wish. Those texture's mixing rules determine how the textures will appear on the object. They will mix where they contain like channels, such as Reflectivity.

Exercise in Layering a Texture

1. With the Sphere tool, draw a sphere in the modeling window.
2. From the Brick / Stone folder in the Library section on the Textures tab of the Resource Palette, double-click *Herringbone*.
3. Click *Edit...*

   The Surface Texture Editing dialog will appear.
4. In the texture editing dialog, turn off all channels except *Bump* by clicking the eye icons shut.

5. With the sphere selected, click *Apply.*
6. From the Wood folder in the Library section of the Textures tab of the Resource Palette, select *Zebra.*
7. Click *Apply.*

You now have two textures applied to the sphere with the default mixing rule, *Replace.*

To change this mixing rule:

1. With the sphere selected, open the Object Properties Palette and click the Texture tab to bring it to the front of the palette.
2. In the scrollable list, select *Zebra.*
3. Click the Mixing button, then select *Combine.*

   The bump map from *Herringbone* will combine with all values in *Zebra.*

You can also mix according to one of the other rules. See the *Reference Manual* for a more detailed explanation of these rules.

COMMANDS USED WITH TEXTURES

Show/Hide Resource Palette (Windows menu)

SHOW/HIDE RESOURCE PALETTE shows or hides the Resource Palette. The status of the Textures tab is determined by its status in the previous session.

Edit Selected (Windows menu)

EDIT SELECTED allows you access to all editable properties of the selected object.

Edit Placement (Windows menu)

EDIT PLACEMENT lets you edit the placement of textures on the selected object. This command also opens the Object Properties Palette for the selected object and brings the Texture tab to the front of the palette.

5 LIGHTING

INTRODUCTION

Dramatic lighting effects add impact and realism to rendered images. Besides, objects are only visible when illuminated. The nature of that reflected light provides important visual clues about the textures applied to those objects.

In the modeling window, the shaded and flat modes show lighting; however, you will not be able to truly see most lighting effects until the model is rendered.

This chapter provides you with the necessary information to add lighting to your models so you can achieve realism when you render a scene.

LIGHT SOURCES

StudioPro uses four different light sources, ambient, directional, spotlights, and point lights to provide illumination. They allow you to customize the lighting for the specific needs of your project. Tools and controls are provided to manage the light

sources, just like those provided for geometric objects.

The four types of light sources are:

- **Directional**. These are also called Global lights, a reference to their illumination effects.
- **Ambient**. Ambient light is non-directional background lighting.
- **Spotlight**. These lights shine in one direction only, and have a control for setting the cone angle.
- **Point Light**. These lights shine in all directions from the point of illumination.

You can add light sources to the model in any number and combination. Just remember that the more light sources you add to the model, the longer it takes to render a scene and the greater the risk of over-exposure.

Properties of Light

The three types of light sources have one or more properties in common:

- **Position**. They may be positioned anywhere in 3-D space.
- **Intensity**. Intensity settings range from zero to 100 percent.
- **Color**. A light source's color is not calculated in wavelengths internally; it is expressed either as a hue, through saturation and brightness, or as a red, green, and blue triplet. This is determined when you select a color in the Color Picker.
- **Gel**. You may use pre-defined gels from the Gels tab on the Resource Palette, or create your own and apply them to a light source.
- **Direction**. The position of a light source's icon determines its direction of illumination. The Point Light and Spotlight sources can be adjusted in the modeling window. The global light source can be positioned from the Lights tab on the Environment Palette.
- **Spread**. Only the Spotlight has a control for the cone angle. You can also set it to have a hard or soft edge.
- **Fall-off**. Point light and Spotlight sources have a Fall-off setting.

GLOBAL/DIRECTIONAL LIGHTS

Directional light sources are considered global in nature. They are an infinite distance away from your model, much like the sun. They are added, deleted, and edited through the Lights tab on the Environment Palette. They are not in the model, more accurately, they are placed around the model.

When you open a new model, a single directional light source is automatically present in the Environment Palette. The illumination is set to come from the upper left front quadrant (over your left shoulder as you face the screen).

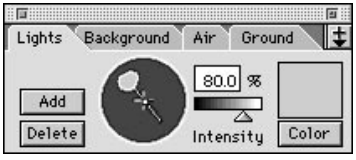
Directional light sources shine toward the model from a source outside the model space. They are intended to approximate sunlight striking the earth in rays that are parallel to each other.

You can add, move, change intensity of, or even delete the directional light sources. If you remove all directional lights, the model will appear very dark unless you insert local lights to replace the directional lights.

LIGHTS TAB

The Lights tab is part of the Environment Palette. It has controls for handling directional light sources, as well as ambient lighting.

The Lights tab is open by default whenever a session is begun.



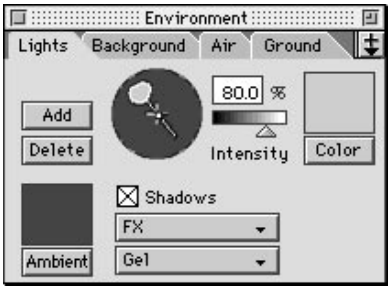
You can hide or show the Environment Palette with the **SHOW/HIDE ENVIRONMENT PALETTE** command. Or, by clicking the palette's close box, you can hide it. You can also view it as tabs only by using the **COLLAPSE PALETTE** command in the Plus menu.

Ambient light, also controlled in the Lights tab, is non-directional general illumination that fills shaded or shadow areas of a model so the details not directly illuminated by light sources are visible.

When you click *Ambient* in the Lights tab, the Color Picker is displayed. You can change the ambient light's color here. When you click *OK*, you will be returned to the Lights tab.

Editing Directional Lights

You can change the parameters for the directional lights within the Environment Palette.

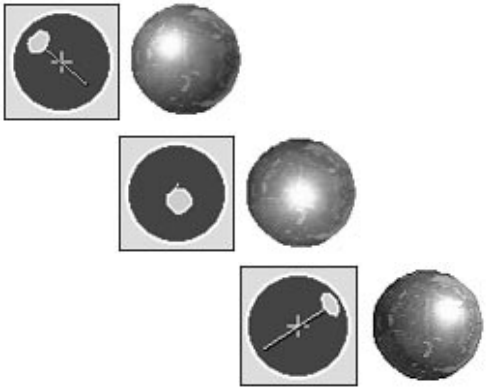


Select the directional light you want to edit, then select the properties you want that light to have. Use the *FX* and *Gel* pop-up lists to apply gels and effects to your directional lights. When you select one from the list, its editing dialog will appear. See the chapter on effects for details on editing these effects and the section on gels in this chapter for editing gels.

Positioning a Directional Light

Think of the area on the palette containing directional light sources as a sphere surrounding the model. From the Lights tab, each light may be selected and

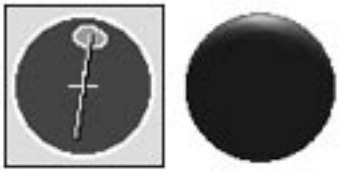
moved anywhere on the sphere to illuminate the model from any direction.



To position a directional light:

- Click the light source icon on the Lights tab in the Environment Palette, and drag it in any direction.

  Usually lights on the back hemisphere are given less intensity. This would be useful if you want to back-light a model to bounce a highlight off of some of the objects.

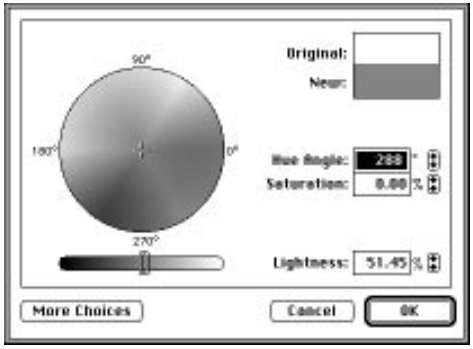


- Use the **Shift key** to select more than one directional light source.
- Use the **Command key** to toggle between front and back hemispheres.
- Use the **Option key** to copy a selected light source. Select the light in the sphere and with the Option key held down, drag. You will have another light with the original light's properties.

Setting Color

Normally, directional lights are white, but you can make them any color you want.

The standard Color Picker dialog will appear when you click *Color* in the Lights tab. The appearance of the color picker will vary depending on the system you are running.



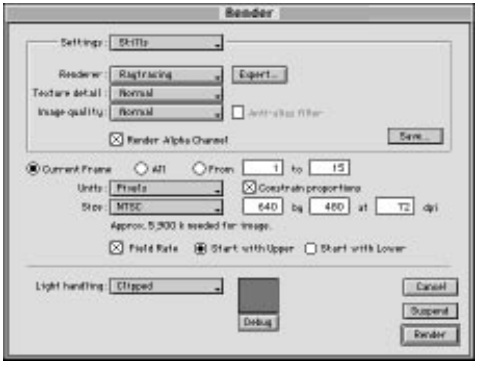
When you click *OK*, you will return to the Lights tab. You will see the color you selected in the Color Preview area.

Setting Intensity

You can set a directional light's intensity with the slider control or by entering a number in the intensity field.

Lighting Overflow Handling

Automatic exposure control is a built-in feature of StudioPro. You can determine how this is handled in the Render dialog.



StudioPro deals with over-exposure in four ways:

- **Clipped** ignores all lighting intensity over 100%. This is the fastest way to handle over-flow lighting.
- **Scaled** scales total lighting intensity down so highest intensity is equal to 100%. Scaled is the least likely to cause color shifts.
- **Hybrid** divides the light striking the object surfaces into its diffuse and specular components, then scales back the diffuse light based on the value in the Diffuse% field. It then recombines the diffuse and specular components into a recalculated light level.
- **Debug** will show the over-flow areas in a chosen debug color when the scene is rendered.

Other Fields on the Environment Palette

You can also change other properties of global lights from the Environment Palette. Fields found there are:

- **Effects**. Lens Flare, Fog, Haze, and Mist appear in the FX pop-up list. When you select one, the appropriate editing dialog will appear. You can use the defaults or create a new one by using the *Copy from* field. It will appear on the Resource Palette and can then be saved through the **SAVE** command in the Plus menu.
- **Gel**. Apply a gel by selecting a light source marker and then selecting *New* from the pop-up menu.

  The Image Gel dialog will appear.

  From here you can create a new gel to apply to a light.
- **Ambient**. To change the ambient color, click this button. The Color Picker will appear.
- **Shadows check box**. Check this box so that your light source will cast shadows.

LOCAL LIGHT SOURCES

Local light sources, spotlights and point lights, are inserted into the model with a single click. Their position is represented by markers.

When a Spotlight or Point Light tool is selected, the cursor changes appearance. It looks like the tool it represents. Once inserted into the model, local light sources can be manipulated using the Object Move tool.

You can select how you want the light source to affect the object in the Object Properties Palette for the Spotlight and Point Light.

Point Light Sources

A Point Light is a local source of illumination. It shines in all directions from a single point contained within the Point Light icon.

Point Light Behavior

Insert a Point Light into the model with the Point Light tool. Click once in the model where you want the light. A Point Light marker will be placed on the active grid. It can then be moved on the grid with the Object Move tool

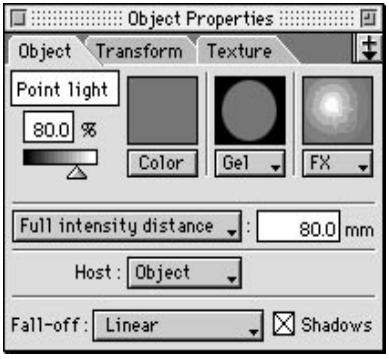
- **Shift** constrains the movement to 45° increments.
- **Option** leaves a copy of the Point Light in place.
- **Command + Shift keys** move the light perpendicular to the grid.

You can delete any local light source by selecting it and using the **Delete key** or by choosing **DELETE** from the Edit menu.

Object Properties Palette

In the basic Object Properties Palette for the selected Point Light, you can set intensity, color, and add an atmosphere. You can apply a gel or special effects, such as Lens Flare.

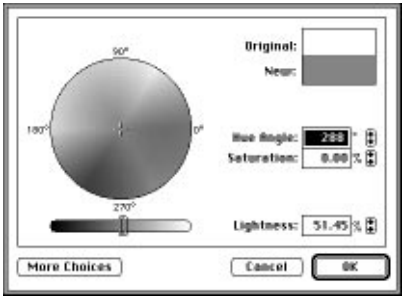
If you expand the palette by clicking the Resize box in the title bar, you can link the light to a host, or give the icon a geometric size in the Radius field. This size determines how soft shadows are calculated.



Setting Color

As with directional lights, the color is set with the standard Color Picker dialog box

when you click the Color button in the Object Properties Palette.



Once a color is selected, clicking OK returns you to the Object Properties Palette where the color is previewed.

Setting Intensity

You can adjust a Point Light's intensity with the slider control or by entering a number from zero to 100 in the Intensity field.

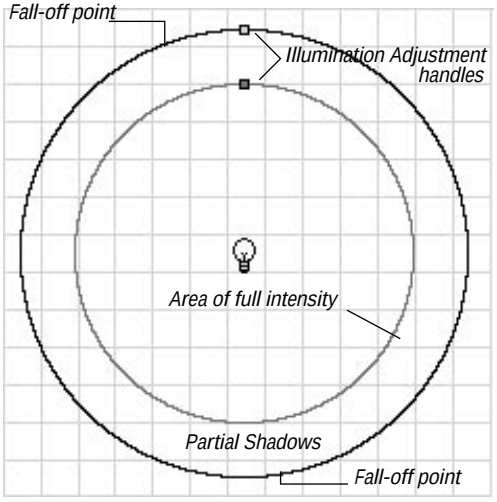
Setting Attenuation

The value in the *Fall-off* field of the Object Properties Palette is the maximum distance at which an object will be illuminated. An object positioned just inside that maximum distance may not appear illuminated even though it is, because the amount of light is so small.

The *Fall-off* field lets you determine this to be a Linear, Exponential, or Custom value.

Reducing the intensity of the light source won't cause the attenuation to fall off any quicker. The fall-off value is a specific distance of illumination regardless of the intensity of illumination. The closer objects will just be less bright.

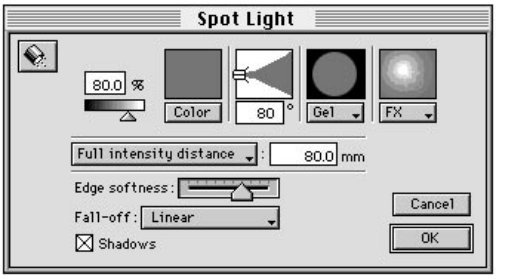
You can also adjust the area of full intensity and the fall-off point interactively. When you insert the Point Light icon, you will get Illumination Adjustment handles which allow you to do this. Use the Object Move tool to adjust them. You can also grab anywhere on the rings.



Spotlight Sources

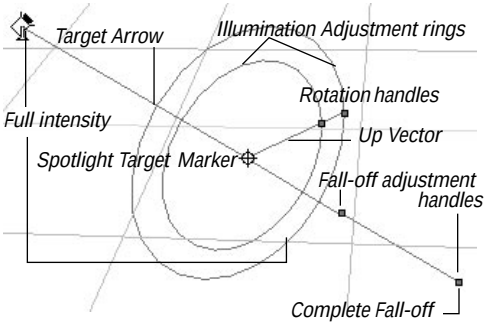
A Spotlight is another local source of illumination; however, it shines in only one direction. The illumination comes from a single point contained within the Spotlight.

The Spotlight is inserted into the model using the Spotlight tool and clicking once. You can set certain characteristics for the spotlights in the Tool Settings dialog.



Spotlight Behavior

When you click on the Spotlight marker, a line is shown between the icon and the object it is pointed at.



When you insert the spotlight into the window, it is given a default look at point parallel to the active grid, and pointing away from the active view plane.

To rotate the spotlight, use the Rotation handles. To adjust the area of illumination and soft shadowing, grab anywhere on the Illumination rings.

To aim the Spotlight:

1. Grab the Target Marker.
2. Drag the Target Marker to an object. When the object highlights in red, the object is a potential target. By releasing the Target Marker over the object, you establish the object as the target of the Spotlight.

   Then, if you move either the Spotlight or the object, the Spotlight remains pointed at the object.

The Spotlight and Spotlight Target Marker can be moved independently, or they can be moved together by moving the line connecting them.

The Up Vector can also be rotated to keep the Spotlight pointing in a specific orientation.

To move the Spotlight, use the Object Move tool.

If you grab the Spotlight, it moves and the Target Marker remains fixed.

If you grab the Target Marker, it moves and the spotlight remains fixed.

If you grab the Spotlight Target Arrow, both the Spotlight and Target Marker move together.

- **Option key** leaves a copy of the Spotlight behind.
- **Option key** while positioning the target arrow, highlights objects in green and ignores them, allowing you to aim at a position in space.

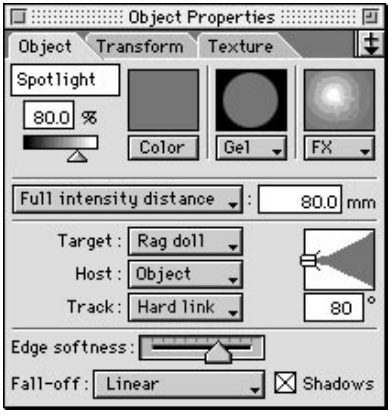
- **Shift key** constrains movement of the Spotlight to 45° increments on the active grid or on a plane parallel to the active grid.
- **Command key** moves the spotlight closer to or away from the target object (along a straight line connecting the two).
- **Command + Shift keys** move the Spotlight perpendicular to the grid.

Object Properties Palette

When you select a spotlight and choose **SHOW OBJECT PALETTE** from the Windows menu, its Object Properties Palette will appear. You can also use Command+I.

In the basic section of the Object Properties Palette, you can edit color, intensity, effects, and add a gel.

When it is expanded to show expert settings by clicking the Resize box, you can link the spotlight with a host or target, set edge softness, the angle of illumination, and determine whether fall-off will be linear or exponential. A full explanation of these fields can be found in the *Reference Manual*.

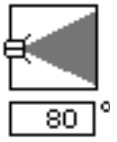


Setting Intensity

You can adjust the Spotlight's intensity with a slider or by numerically entering a value from zero to 100 in the Intensity field.

Setting Cone Angle

Only the Spotlight source has a cone angle setting. It can be adjusted by entering a number into the field. The range is from 0° to 90°.



Zero shuts off any illumination coming from the Spotlight, regardless of the intensity setting.

The cone angle is measured as the amount that the cone of illumination expands outward from the direction of illumination.

This is different than the total angle of the cone of illumination. For example, a setting of 45° has an effective total angle of 90°.

The illumination striking the object is dependent upon the cone angle and the Spotlight's distance from the object. A Spotlight can be moved closer to or farther away from an object to adjust the size of the spot of light.

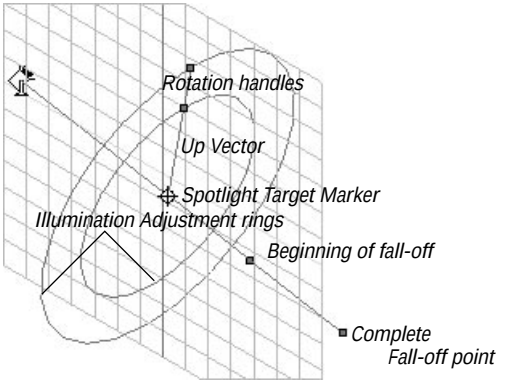
Setting Soft Edges on the Spotlight

There is a slider in the Spotlight Object Properties Palette that allows you to set hard or soft edges on the cone of light as it strikes objects.

Setting Shadowing

Spotlight illumination is set by using the Illumination Adjustment ring on the

marker in the model. The area where shadowing begins is set by the inner Illumination Adjustment ring.



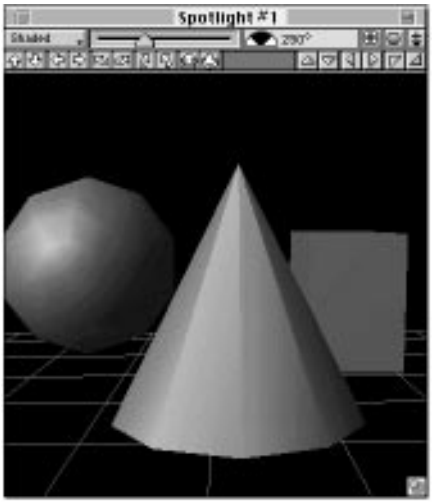
Fall- off is adjusted with the fall-off markers. The point where light falls off completely is inter-actively adjustable by clicking and dragging the Complete Fall-off handle.

Setting Atmosphere

If you want a special effect to emit from your light source, you can select from those in the FX pop-up. Adding an effect will make the light appear visible.

Spotlight Windows

You may want to view the area the Spotlight illuminates. To do this double-click on the Spotlight marker in the modeling window. This will open a spotlight window for that spotlight.

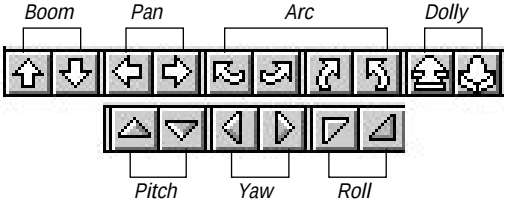


Cone Angle

The angle of illumination is displayed graphically in the feedback area of the window and is controlled by a slider.

Window Controls

Other controls in the window are similar to those in the camera window and perform similar functions. In the spotlight window they allow you to position a gel placed on the spotlight



- **BOOM** moves the spotlight up and down.
- **PAN** moves the spotlight left and right.
- **ARC** moves the spotlight in an arc around the target.
- **DOLLY** moves the spotlight in a straight line toward or away from the target.
- **PITCH** tilts the spotlight along its X axis.
- **YAW** tilts the spotlight along its Y axis.
- **ROLL** tilts the spotlight along its Z axis.

Other controls found at the top of the spotlight window are:

View Display lets you determine how you want your objects displayed.

View Grid button changes the view so that the grid is parallel to the view plane.

The **Steady Spotlight** option keeps the spotlight pointing as near to World up as possible. This can also be adjusted interactively with the Up Vector in the modeling window. If you grab the up vector handle, you can rotate the Spotlight with it.

Plus menu commands are: **COLLAPSE WINDOW, DUPLICATE SPOTLIGHT, DISPLAY OBJECTS, AND RENDER.**

GELS

Gels can be applied to light sources from the Resource Palette and the Object Properties Palette.

Creating Your Own Gels

Rather than using the pre-loaded gels, you might want to create gels of your own.

To create a new gel:

1. Select *New* from the pop-up *Gel* list on the Object Properties Palette for that light source. The Image Gel dialog will appear.

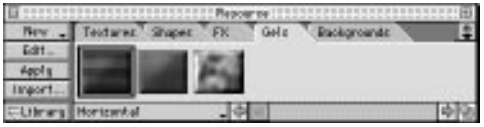
2. Select the properties of the gel.

   Here you can make it a simple color gel or import a PICT or animation for a color map.

3. Click *Apply* then *OK*.

   You can determine the mapping with the *X* and *Y scale* fields. See the chapter on textures for a discussion of texture mapping.

Gels can also be applied and created from the Gels tab of the Resource Palette.



Click the *New* button to access the Gel editing dialog. When you click *Apply*, the gel is applied to the light source and appears on the palette. You can save the gel by using the **SAVE** command in the Plus menu.

Applying Gels (All Light Sources)

Special textures, gels, can be applied to any light source. If you use a gel, the light

source projects the pattern or image onto the objects that the light source is illuminating.

Built-in Gels

StudioPro includes several built-in gels. You can access them through the Gels pop-up list on the Object Properties Palette for that light source or the Gels tab on the Resource Palette.

To apply a gel to a light source:

1. Select the light source.
2. Select a gel from the Object Properties Palette for that light.

   StudioPro loads the gel and applies it to the light source.

Alternately, you can drag-and-drop a gel onto the Spotlight from the Resource palette.

These gels are specialized textures. The mapping and scale information has been determined so that the texture fits to the light source in a way that works correctly the first time. All the work has been done for you. But if you want a different effect, you can adjust the mapping in the Textures tab of the Object Properties Palette for that light source.

To edit an existing gel:

1. Click the *Edit* button and select the gel that you want to edit. Its Gel editing dialog will appear.
2. If you want to keep the original intact, use the *Copy from* field and give it a new name.
3. Make the changes you want, and click *OK*.

COMMANDS USED IN LIGHTING CONTROL

The following commands are used with lighting. The explanations are necessarily brief, but detailed explanations can be found in the *Reference Manual*.

Show/Hide Environment Palette (Windows menu)

The Lights tab shows whenever StudioPro is launched. If you need to hide or reshow it, you can use **SHOW/HIDE ENVIRONMENT PALETTE**.

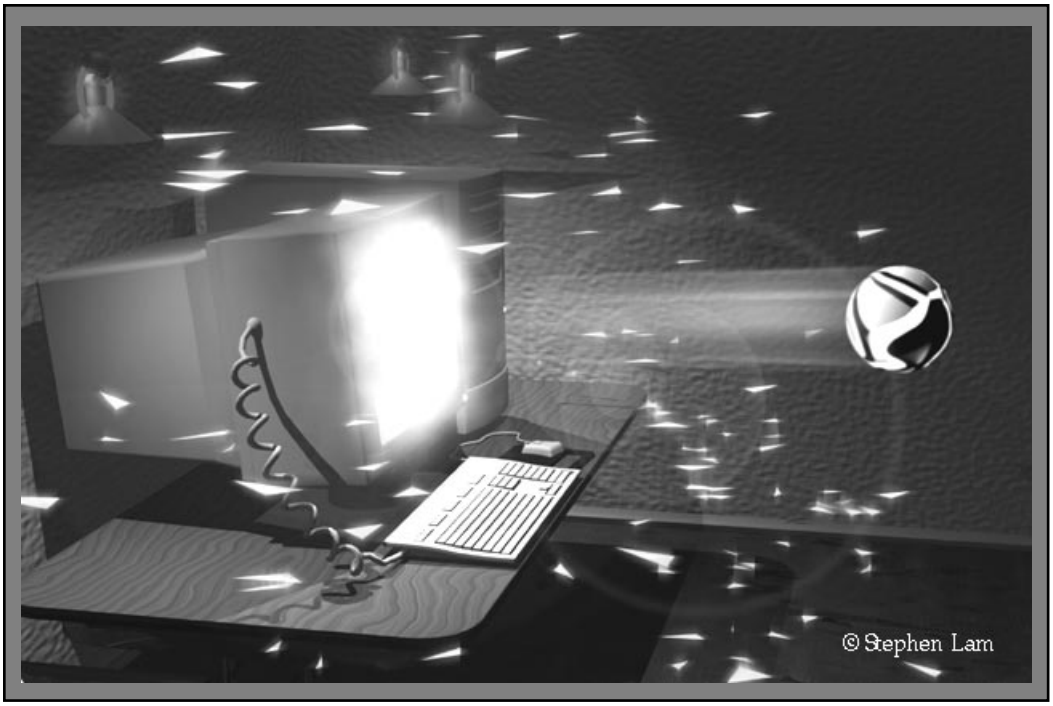
Show/Hide Object Palette (Windows menu)

SHOW/HIDE OBJECT PALETTE shows or hides the Object Properties Palette. This is determined by its previous status.

Edit Selected (Windows menu)

EDIT SELECTED allows you access to all editable properties of the selected object.

EFFECTS



INTRODUCTION

Once you have created your model, given your objects textures, and placed lighting, you will find that you might want some special effects. StudioPro has provided you with a full compliment of special effects. This chapter tells you what they are and how to access them.

GENERAL INFORMATION

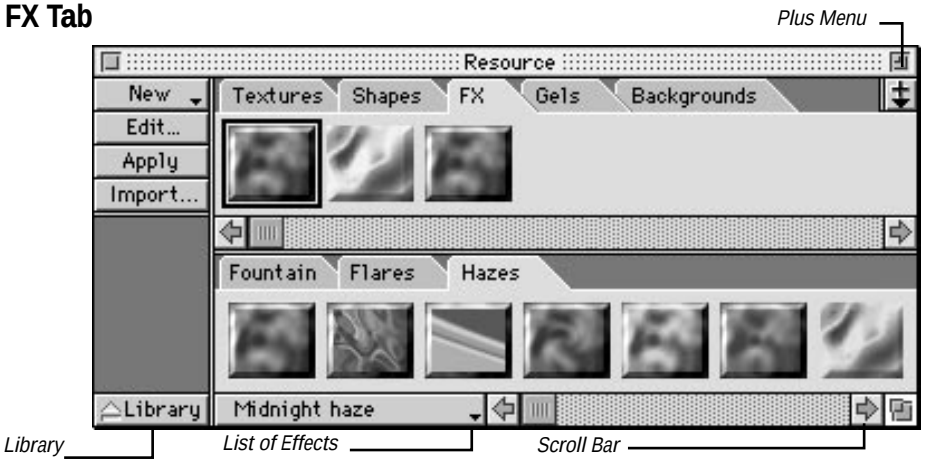
All special effects have certain things in common. They are special textures and are treated as such. Many special effects are volumetric in nature. They must be applied to an object to be visible. Therefore, you must determine the size you want the effect to be, so that you can draw an object to fit.

If the effect is volumetric, the object it is applied to must be one-sided or solid in order for most of the renderers to render the effect.

Effects can be edited and new ones created using their dialogs. They can be saved by using the **SAVE** command in the Plus menu.

Most effects can be positioned just as textures are by using the **EDIT PLACEMENT** command or button. Complete information on this can be found in the chapter on textures in this manual.

FX Tab



THE FX TAB

Although some of these effects can be found on the Air tab of the Environment Palette, they are all located on the FX tab of the Resource Palette.

When you open their editing dialogs you will find that these dialogs also have a few things in common.

- **Name field**.

  Enter a name for your new effect.

- **Copy from...**

  Select an effect from this list. Only effects that are loaded will show up in this list.

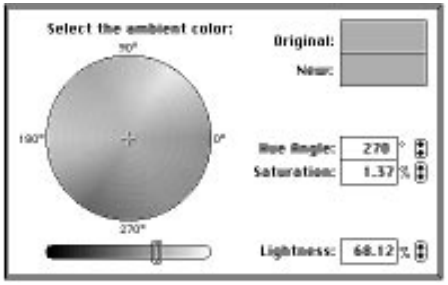
- **Animation time settings**.

  You can use the default settings or edit the animation effect with these settings. For example, if you set it to *All*, the effect will have the settings in the dialog for all time. If you want to change the effect at some point in time, you can enter that time in the *Custom* numeric entry field and change the parameters for the effect.

- **Preview area**.

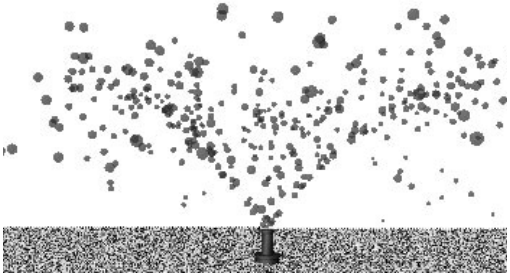
  View the finished effect here.

- **Color**. Most dialogs will have a color setting in some form. When its button is clicked, the Color Picker will appear.



Fountain

When you apply the Fountain effect to an object, you can set it to emit water droplet particles. They fall to the ground and get smaller each time they hit the ground plane until they die. The water droplets are set to look like water, but you can apply textures and effects from the pop-up list if you want a different effect.



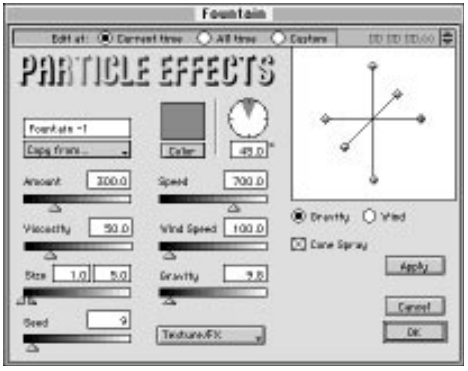
Because of the nature of a fountain, you will want to create an animation to see the rendered effect, even if it is only at one point in time.

To use the Fountain effect:

You will need to create an object to apply the effect to. Determine the size you want it to be, then use one of the modeling tools to create your object.

1. Hold down the *New* button and select the *Fountain* effect from the FX tab on the Resource Palette.

   The Fountain Editing dialog will appear.



2. Use the predefined settings, or edit your fountain and then name it.

3. Click *OK*. This applies the effect and closes the dialog.

Fields in the Fountain Editing dialog allow you to use the existing effect or modify it to create specialized fountains. You can set the color, emission velocity, acceleration, and spread. If you check the *Cone spray* check box, the water sprays out in a cone, like an old style lawn sprinkler.

Fields in the Fountain Dialog

- **Angle of Spray**. The pie-shaped field allows you to set the cone angle of the spray coming out of the fountain.
- **Amount**. The amount of water emitted from the fountain.
- **Viscosity**. The thickness of the air. It works in conjunction with the *Wind*. If the air is thin, the particles will move less in the wind.
- **Size**. The minimum and maximum size of the water droplets.
- **Seed**. The uniqueness of each individual fountain.
- **Speed**. The initial speed at which the particles are emitted in units per second.
- **Wind Speed**. The speed at which the air is moving in units per second.
- **Gravity**. The speed at which the particles fall, in units per second squared.
- **Cone spray check box**. If this box is checked, the water sprays out along the perimeter of the cone like an old-fashioned lawn sprinkler.
- **Gravity/Wind radio buttons**. These buttons allow you to graphically set the direction of the wind and pull of gravity. Grab one of the handles in the area above the buttons and move it around.
- **Texture/FX pop-up**. Apply any listed texture or effect to the fountain.

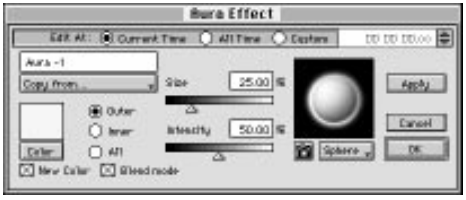
Aura

The Aura effect adds a glow to your object.

To create an Aura:

You will need to create an object to apply the effect to. Determine the size you want it to be, and use one of the modeling tools to create your object.

1. With the FX tab of the Resource Palette active, hold down the *New* button and select *Aura* from the list.



2. When the Aura dialog appears, use the default settings or adjust the intensity and size. If you change settings, name the new Aura.
3. Click *OK*.

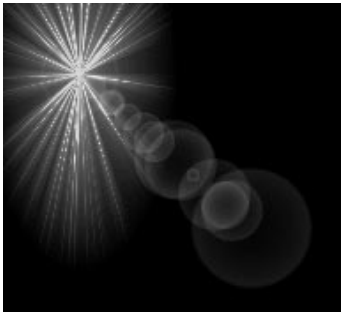
   This applies the aura to the selected object and closes the dialog.

Fields in The Aura Dialog

- **Outer, Inner,** and **All radio buttons**. These buttons determine which section of the aura will be visible. The *Outer* aura is visible at the edges of the object it is applied to. The *Inner* aura overlaps the boundary between the object and the background. *All* will cover the object and extend beyond it.
- **Size**. The size of the aura.
- **Intensity**. The opacity of the aura.
- **New color check box**. A color for the aura other than that of the object.
- **Blend mode check box**. The color in the Aura and the color of the object will be blended.

Lens Flare

The Lens Flare effect lets you affect the rendering of an object as if there were a lens flare from the camera lens.

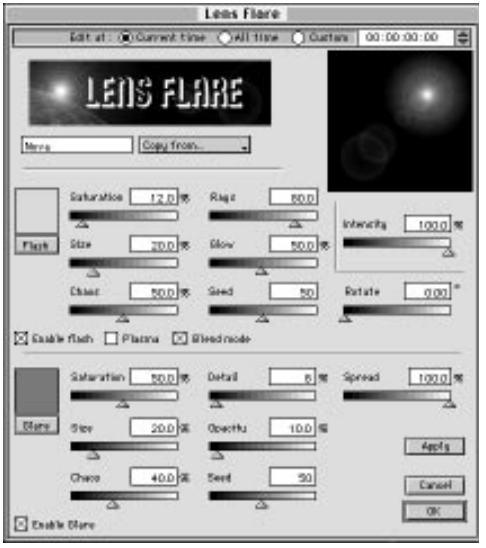


To create a Lens Flare:

You will need to create an object to apply the effect to. Use one of the modeling tools to create your object. Remember, Lens Flare can also be applied to lights.

1. Hold down the *New* button and select *Lens Flare* from the FX tab of the Resource Palette.

   When the dialog appears, you will see there are two sections, **Glare** and **Flash**.



2. Click the *Glare* or *Flash* button.
3. Use the default settings or edit them and name the new lens flare.
4. Click *OK*.

   This applies the Lens Flare and closes the dialog.

Fields for Flash

- **Enable Flash check box.** Turns the flash off or on.

- **Plasma check box.** Makes the flash appear to have substance and look less like an optical effect.
- **Blend mode check box**. The color of the object and the color of the Lens flare will be blended.
- **Saturation**. How white-hot the center looks.
- **Size**. How large the flash is.
- **Chaos**. How disorderly the rays appear around the light.
- **Rays**. The number of rays or spokes of light that radiate from the light.
- **Glow**. Soft illumination around the flash.
- **Seed**. The uniqueness of the Flash.
- **Intensity**. The intensity of the entire Lens Flare.
- **Rotate**. This rotates the flash of the Lens Flare.

Fields for Glare

- **Saturation**. The saturation of the color.
- **Size**. The maximum size of the disks of light.
- **Chaos**. How much disorder occurs with the placement, color, and size of the glare.
- **Detail**.The total number of glare elements in the Lens Flare.
- **Opacity**. How transparent or opaque the lens flare is.
- **Seed**. The uniqueness of the Glare.
- **Spread**. The maximum spread of the flare.

Special Effects

Fog, Haze, and Mist are volumetric textures and can be used to create special effects in your model. These effects are found on the FX tab of the Resource Palette, but they can also be accessed through the Air tab of the Environment Palette.

They must be contained within single sided objects in order to be visible. They can be combined with other textures if the texture is transparent. For example, you could use a multi-channel texture that looked like glass, and was transparent and apply fog. The end result would be a glass object filled with fog.

Fog

With the Fog effect, you can create realistic fog for your model.

Fog can also be accessed through the Air tab on the Environment Palette. For directions on this procedure, see the chapter on rendering in this manual.

To create Fog:

You will need to create an object to apply the effect to. Determine the size you want

it to be, then use one of the modeling tools to create your object.

1. With the FX tab selected hold down the *New* button on the Resource Palette and select *Fog* from the pop-up list.

2. When the Fog dialog appears, use the default settings, or edit it to make a unique new fog. If you change settings, name the new Fog.

3. Click *OK*.

   This applies the fog to the selected object and closes the dialog.

Fields in the Fog Dialog

- **Color**. The color that will be transmitted through the fog. Any color but white will obscure objects seen through the fog.

- **Direct**. The color of light reflected from directional light sources.

- **Bounce**. The color of the light that is reflected from ambient light sources.

- **Link colors check box**. All colors in the *Color, Direct,* and *Bounce* fields will be the same. The color in the *Color* field will be the one used.

- **Max depth**. This allows you to see the background through the fog.

- **Start depth**. The distance at which the fog begins.

- **Density**. How much the fog will obscure with distance.

- **Logarithmic button**. This produces a natural looking fog that trails off with distance.

- **Linear button**. This produces a very simple fog that obscures evenly over distance.

- **Enable Shadows check box**. This allows object shadows to be visible within the fog.

Haze

Haze creates a fog that lies in valleys, or layers like smog over a city.

Haze can also be accessed through the Air tab on the Environment Palette. See the chapter on rendering in this manual for instructions on how to do this procedure.

To create Haze:

You will need to create an object to apply the effect to. Determine the size you want it to be, then use one of the modeling tools to create your object.

1. With the FX tab selected, hold down the *New* button on the Resource Palette and select a Haze from the pop-up list.

The Haze dialog appears.

2. Use the default settings or edit them and name the new haze.

3. Click *OK*.

   This applies the haze to the selected object and closes the dialog.

Fields in the Haze Dialog

- **Color**. The color that will be transmitted through the haze. Any color but white will obscure objects seen through the haze.

- **Direct**. The color of light reflected from the directional light source.

- **Bounce**. The color that is reflected from the ambient light on the selected layer of haze.

- **Link colors check box**. All colors in the *Color*, *Direct*, and *Bounce* fields will be the same. The color in the *Color* field will be the one used.

- **Add layer**. Add layers to the haze.

- **Delete**. Delete layers of Haze.

- **Layer**. The active layer of Haze. The current settings apply to this layer only.

- **Opacity slider**. The opacity or transparency of the haze.

Mist

With Mist you can create patchy fog-like clouds, such as those found in the mountains.

To create Mist:

You will need to create an object to apply the effect to. Determine the size you want it to be, and use one of the modeling tools to create your object.

Mist can also be accessed through the Air tab on the Environment Palette. Information on this procedure can be found in the chapter on rendering in this manual.

1. With the FX tab selected, hold down the *New* button on the Resource Palette and select *Mist* from the pop-up list.

The Mist dialog appears.

2. Use the default settings or edit them for a unique new mist. Remember to name the new mist.

3. Click *OK*.

   This applies the mist to the selected object and closes the dialog.

Fields in the Mist Dialog

- **Color**. The color that will be transmitted through the mist. Any color but white will obscure objects seen through the mist.

- **Direct**. The color of light reflected from directional light sources.

- **Bounce**. The color of light reflected from ambient light.

- **Link colors check box**. All colors in the *Color*, *Direct*, and *Bounce* fields will be the same. The color in the *Color* field will be the one used.

- **Detail**. The amount of detail in the mist effect.

- **Density**. The levels of density between the patches of mist.

Fields in the Expert section of the dialog let you set maximum depth of the mist, its scale, and how it will evolve over time. See the *Reference Manual* for settings in the expert section.

The expert settings allow you to change the thickness, tilt, and depth of each layer. See the *Reference Manual* for detailed descriptions of these fields.

COMMANDS USED WITH EFFECTS

Complete details on these commands can be found in the *Reference Manual*.

Show/Hide Resource Palette (Windows)

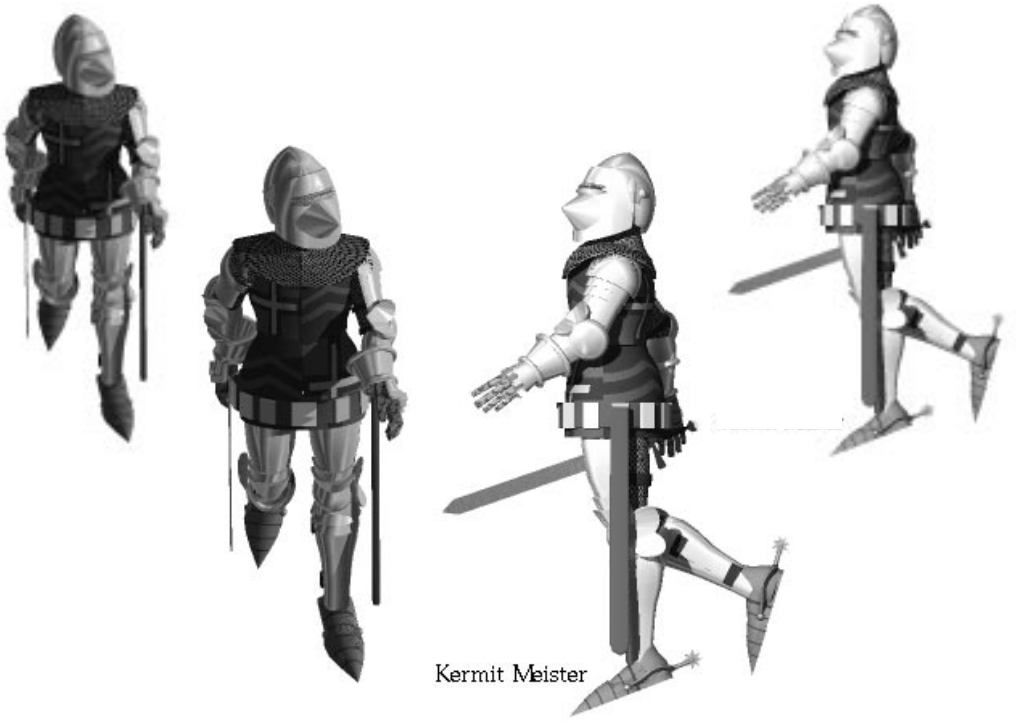
SHOW/HIDE RESOURCE PALETTE allows you to show or hide the Resource Palette.

Show/Hide Environment Palette

SHOW/HIDE ENVIRONMENT PALETTE allows you to show or hide the Environment Palette.

7

ANIMATION



INTRODUCTION

Animation is the perception of motion over time, made possible by the marvelous way our brains process images. This effect is called “persistence of vision.” This is achieved by viewing a series of images in rapid succession where the motion is offset a small amount from frame to frame. The residue of the previous image is still present as we view the next frame. StudioPro makes it possible to achieve this effect with any object, texture, or effect.

This chapter discusses the various methods StudioPro makes available to you for creating an animation.

HARDWARE CONSIDERATIONS

Theoretically, there is no upper limit to the number of frames per second, or to the finished length, of the animation. But there will be limitations due to the state of your hardware, operating system, and extensions. Some of these are:

- QuickTime Movie files can be spooled faster from the hard disk because they are compressed. Unfortunately, image quality is usually sacrificed to achieve high compression.

- The maximum number of frames per second that can be played is highly

dependent on the frame size, the color depth, and your hardware capabilities.

CONCEPTS IN ANIMATION

Complex motion does not happen by accident. Ironically, the best tools for ensuring an excellent animation are pencil and paper. Thoroughly planning your project with a story board and extensive notes will save frustrations throughout the project.

Time-Dependent Actions

In animation, motion is referred to as action. StudioPro measures the following actions as it tweens frames for an animation sequence:

- **Life nodes**. An object can appear and disappear at specified times, and as many times as you want it to.
- **Position**. You can move an object from one location in 3-D space to another over time. Speed is determined by the distance and time given for an object to move.
- **Rotation**. You can rotate an object on any axis or combination of axes over time.
- **Scale**. You can scale an object larger or smaller over time. Speed is also determined by the amount of change and time.
- **Texture**. You can change all attributes of an object's texture over time. You can change it as often as you like.
- **Camera focal length**. You can change a camera object's window focal length over time.
- **Light intensity**. You can change light source objects' intensity over time.
- **Modeling**. Any attribute of the objects you create can be edited over time.

You can script movement for multiple objects to move simultaneously during the same frame sequences. The frame size of the rendered animation, and viewing position in model windows, are not tweened; they are manually set for the entire sequence.

Using Hierarchical Scripting

Each action you perform has its own time line. However, some time lines, such as those for instances or groups, are accumulations of subordinate time lines. Changing an event marker will cause the same change to be made to all of the subordinate event markers that it represents.

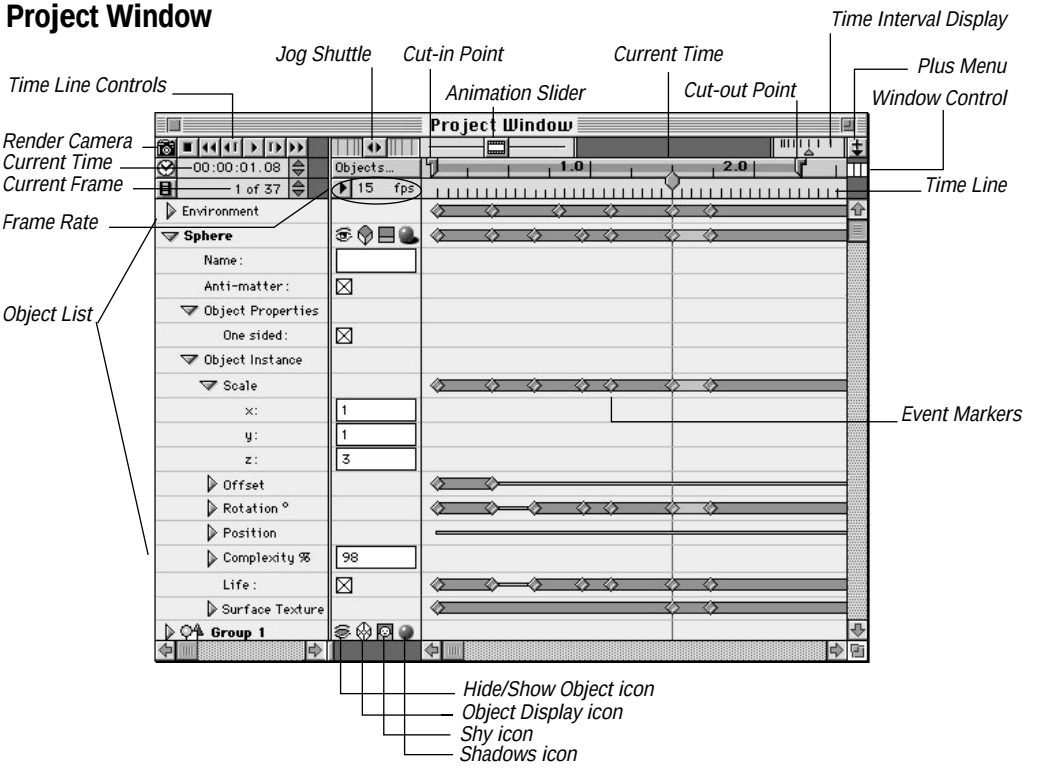
Refer to *Chapter Three* and the discussion on shapes and instances of shapes for complete details on hierarchical scripting.

Other Considerations

The following points are considerations when determining how to script an animation:

- Memory is the only limit to the number of event markers that may be defined.
- Animation sequences may be rendered from any view.
- If you add an object to a model while the Current Time Pointer is at any point other than zero, the object does not exist until that point in time.

Project Window



PROJECT WINDOW

The Project Window places all controls needed to create an animation in one convenient location. This window may be expanded to show all objects in the modeling window.

To access objects' properties in the project window click on the arrow beside the selected object in the list. Each level can be accessed this way. Once open, many of the object's properties can be edited over time. You can do such things as scale, rotate, change position, and change textures.

Window Controls

The Project Window has the standard window controls found on all desktop windows—move bar, close box, zoom box, resize box, and scroll bars. The resize box works both horizontally and vertically.

Controls on the Project Window specific to animation are:

- **Render Camera**. This renders the currently active window.
- **Time Line Controls.** There are six Time Line controls, Stop, Set Current Time to Cut-in Point, Go Back One Frame, Play, Go Forward One Frame, and Go to Cut-out Point. These controls move the Current Time Pointer along the Time Line in the direction indicated. Play gives a preview of the scripted animation in your modeling window.
- **Jog Shuttle**. This control moves the animation forward or backward from the current point in time. The further from center you advance it, the faster it moves. You can view this action taking place.
- **Animation slider**. This control moves the Current Time Pointer to a point on the Time Line.
- **Time Interval Display**. This control lets you specify how the time interval is to be displayed.
- **Plus Menu**. Commands found in the Plus menu are: **COLLAPSE WINDOW, PREVIEW ANIMATION, ADD ATTRIBUTE, DELETE ATTRIBUTE, NEW EVENT MARKER, EDIT EVENT MARKER, DELETE EVENT MARKER.**
- **Current Time**. A method of keeping track of where you are using SMPTE, Society of Motion Pictures and Television Engineers. It reads hours, minutes, seconds, frames.
- **Objects... button**. Click this button to filter what the Project Window will display. A dialog appears.

You can select all options or choose from cameras, lights, shapes, and groups.

- **Cut-in Point**. Set this point at the position on the time line where you want the animation for that model to begin.
- **Cut-out Point.** Set this point at the position on the time line where you want the animation for that entire model to end.
- **Current Time Pointer**. This indicates the current time. Simply drag the pointer with the cursor to the desired position on the time line, or adjust it with the Time Line Controls.
- **Animation Time Line.** Place Event Markers on this line adjacent to the object or attribute you want to animate. Typically, event markers will be created indirectly by changing a data value of the object.
- **Event markers**. Use Event Markers to script the animation paths of objects, textures, cameras, light sources, and object attributes in a model.

- **Current Frame**. Indicates where the Current Time Pointer is and where the Cut-out Point is. It is displayed numerically like 10(210).

- **Frame Rate**. Used to set the frames per second for the animation. The default is 15 frames per second. Video tape is recorded at 30.

- **Object list.** Used to select objects and their attributes in the model. Clicking on an object's name selects that object in the model.

- **Show/Hide icons**. Beside the object list are controls that allow you to control the visible status of objects in the rendering and modeling window. They are:

  Hide/Show icon. You can show an object in both the modeling and rendering windows or hide it in both the modeling and rendering windows.

  Object Display icon. You can display individual objects as wire frame bounding boxes in the modeling window. To do this, select the wire frame icon. This will take precedence over the modeling view display method.

  Shy icon. The first state allows you to show an object in both the modeling and rendering window. The second state hides an object in the modeling window, but it will show in rendering. The third state shows the object in the modeling window, but it won't render.

  Show Shadows icon. The first state forces an object to have shadows even if the object is disabled elsewhere. The second state forces an object to be shadowless, and the final state doesn't override settings anywhere.

- **Anti-matter check box**. With this check box, you can create boolean renderings. If you designate an object as anti-matter by enabling this check box, when it overlaps or comes into contact with another object, it will eat away the second object where it touches or overlaps.

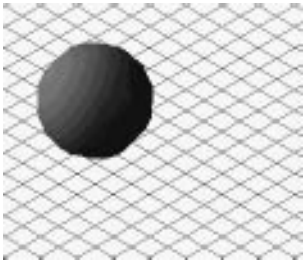
  The surface of the anti-matter object will be left behind on the resulting object where the operation has taken place. You can apply textures to anti-matter and that texture will appear on the surface of the object it has interacted with.

  If you enable this check box in both objects, it will create the equivalent of a boolean intersect. Where both objects overlap, surface will be left behind.

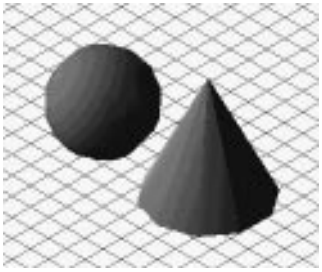
  This operation only shows up in the rendering. It will not be evident in the modeling window.

To create a boolean rendering:

1. In the modeling window, draw a sphere.



2. Be sure the view is in isometric and draw a cone.



3. Apply textures to both objects.
4. Move the cone so that it is inside the sphere.

5. Open the Project Window and click on the triangle next to the cone object. Enable the Anti-matter check box.
6. Render the objects to see the effect.

Selecting and Moving Event Markers on the Time Line.

The primary time line for the object will contain all of the animation markers for any attribute of the object that you have edited in time. It is important to keep this in mind, as they may be stacked one on another. This gives you the advantage of selecting and moving those markers together, but should you select them to delete, all attributes' changes will be deleted together.

Select an event marker by clicking on it. The inset will change to red. Select multiple markers by holding down the **Shift key**. Multiple markers need to be contiguous.

You can move the object's pacing and sequence in the animation by moving its event markers along the time line.

Delete an event marker by selecting it and pressing the Delete key, or selecting **DELETE EVENT MARKER** in the **Plus menu**.

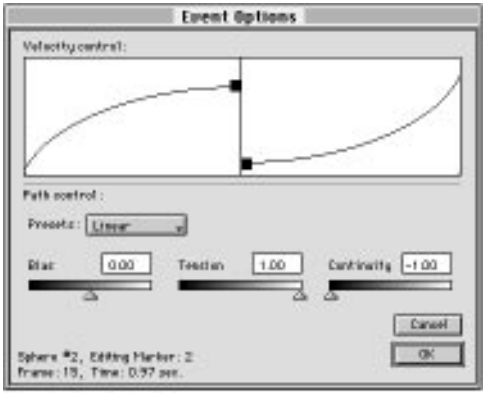
Modifier keys that apply to event markers:

- **Shift key** allows you to select multiple markers.
- **Option key** leaves the original event marker in place and creates a copy as you drag it to a new location.
- **Command key** moves the Current Time Pointer to the position of an event marker when you select that marker.

Event markers can be individually edited to alter their position. You do this by double-clicking on the event marker you

wish to edit. The appropriate dialog appears.

If the event marker defines the motion of the object, the *Event Options* dialog provides additional settings for velocity and path controls..



The Velocity controls determine the velocity along the path from one key frame to the next key frame. Grab the handle in the left window and move it up to increase the velocity or down to decrease the velocity of the object as it approaches the selected event marker. Adjust the position of the handle in the right window to define the velocity of the object as it leaves the marker.

Settings are also provided to control the path of the object at the selected event marker. The *Bias, Tension,* and *Continuity* sliders allow you to numerically control Bézier handles on the path. This physically changes the animation path of the object.

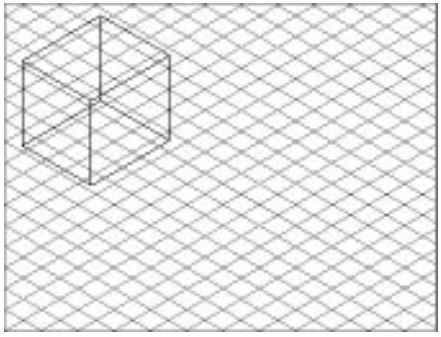
SCRIPTING ANIMATIONS

All actions, object modeling, and object attributes can be scripted over time. The following exercises give you a general feel for animation.

The way you script an animation will depend on the results that you want to achieve, but in most cases the process is basically the same. To illustrate this, let's script an animation path for a simple object.

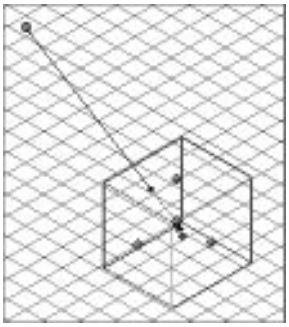
To script an animation:

1. Open an new model.
2. Draw a cube in the upper left corner of the model window.



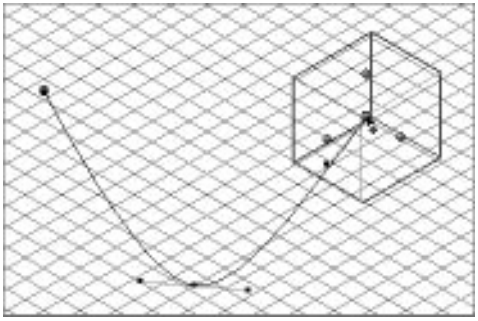
3. Display the Project Window.
4. Set the Cut-in marker to zero and the Cut-out marker to two seconds. Advance the Current Time marker one second.

5. Drag the cube to the lower center of the front view.

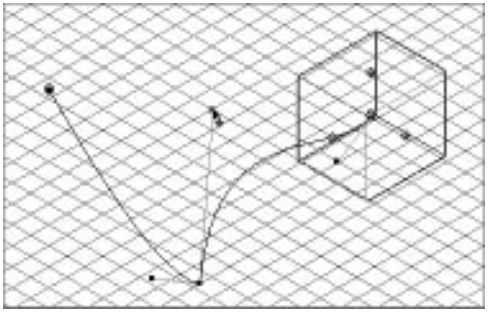


6. Advance the Current Time marker to two seconds.

7. Drag the cube to the upper center of the front view.



You can adjust the path with handles at this point.



8. Set the Frame Rate field to 15.

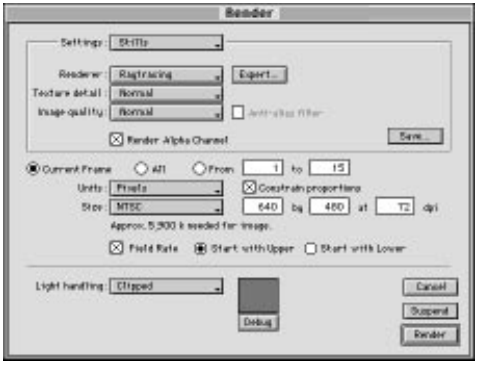
9. Click the *Play* button to preview your animation in the model window.

Rendering Animations

Once you have completed scripting your animation, you can render the scene. This allows you to see the animation with textures applied, background, and effects.

1. Select **RENDER** from the Rendering menu.

   The Rendering dialog will appear.



2. Select the Rendering method from the pull-down list.

   For a fast preview select one of the lower level renders, such as Flat; for a more detailed rendering select one of the higher level renderers, such as Raytracing.

3. Set the *Texture detail* to *Normal*, and the *Image quality* to *Normal*.

   These settings can also be adjusted to accommodate speed and detail.

4. Enable the *All* button in the *Frame Range* field, or select the number of frames you want to render.

   If this is just a preview and if there are 30 frames, for instance, you may want to only render 15 of them.

5. Click *Render.*

   At this point the Save Animation dialog will appear. Before an animation can be rendered, it must be saved.

6. Select *QuickTime* as the file format.

7. When the Compression dialog appears, leave it at its default settings.

8. Click *OK.*

When the rendering is finished, an Animation Playback window will appear with standard QuickTime Movie controls.

Once you have rendered all frames of the animation, you will have available an animation playback window with the necessary controls for viewing the animation.

Animation Playback Window Controls

The QuickTime animation window has a set of controls at the bottom of the window. They are the standard QuickTime controls for playing, advancing, and rewinding. If the animation is set to loop back and forth, it will play continuously.

In addition to the playback buttons, StudioPro allows you to control animations through the cursor and **Return keys**.

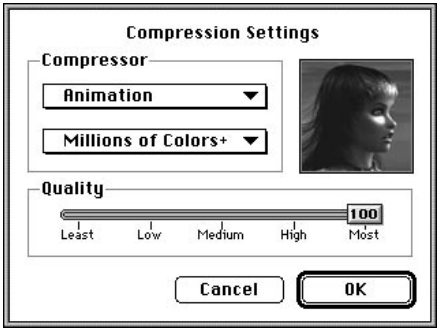
- **Return**. Start or stop playing.
- **Left arrow**. Move backward one frame.

- **Right arrow**. Move forward one frame.
- **Plus menu**. Commands found in the Plus menu are: **COLLAPSE WINDOW, LOOP, LOOP BACK AND FORTH, PLAY EVERY FRAME, PLAYBACK FRAME RATE, HALF SIZE, NORMAL SIZE, DOUBLE SIZE**.

QUICKTIME SUPPORT

When rendering an animation, you will save it as a QuickTime movie or in any format available in the pop-up.

When you save it as a QuickTime movie, a dialog will appear, and you will be given a choice of the compression algorithm and how much to compress the file.



A sample image is displayed in the Compression Settings dialog.The compression settings greatly affect the results of the rendering. StudioPro defaults to the Animation compressor, *Millions of Colors+*, and *Most* quality. This is biased toward quality over file size. Your choice of settings will depend on the end use of the animation.

If an animation is not playing fast enough, you can re-save the animation to a new file to compress it further.

Rendering window controls allow you to observe the rendering in progress. If you want to terminate the rendering, click the close box.

ANIMATION EXTENSIONS

StudioPro ships with an animation extension, **ALIGN TO PATH**. It can be found on the Button Bar and in the Modeling menu.

Align to Path

ALIGN TO PATH lets you align an object to its defined animation path. It gives you control over how the object is oriented on an animation path This means that you can control the direction the object is pointing as it travels along the animation path.

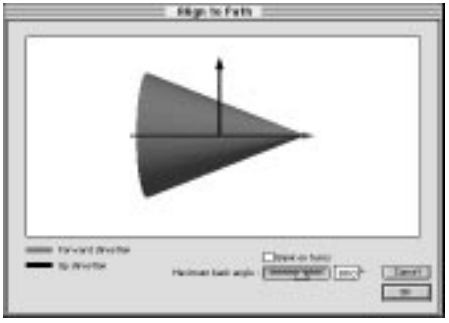
You specify which parts of the object represent *forward* and *up*. The forward part of your object will be rotated so as to point in the direction of the movement. The up will be mapped to a direction perpendicular to the plane of motion.

Using Align to Path

To use Align to Path, you must already have an object and its animation path present in a model. Then complete the following steps:

1. Select the object.
2. Select **ALIGN TO PATH** from the Button Bar.

The Align to Path dialog will appear.



3. Click either the forward or up arrows and interactively align the object to the path. If you enable *Bank on turns*, it will do just that as the animation path changes directions.

   You can determine the maximum bank angle with the slider and numeric entry field.

4. Click *OK*.

If you are not happy with the results, you can select **UNALIGN** from the **PATH** sub-menu in the Modeling menu.

COMMANDS USED WITH ANIMATIONS

Show/Hide Project Window (Windows menu)

SHOW/HIDE PROJECT WINDOW allows you to show or hide the Project Window.

Align to Path (Modeling Window)

ALIGN TO PATH allows you to align an object to its animation path.

Path, UnAlign (Modeling menu)

PATH, UNALIGN allows you to un-align the object with its animation path.

RENDERING

INTRODUCTION

The final effort in a project is often a rendering. The approach you take in setting up the rendering will be determined by the ultimate use of the end product. If it will only be viewed on the computer screen, then it may not require a high degree of resolution and detail. But just the opposite will be the case if you are printing it in a high quality, full-color sales piece, or if the animation will be included in an industry video distributed to thousands of people. In either case, the basic steps are the same, only the size and resolution settings will change.

StudioPro has seven built-in rendering algorithms available for previews, scene construction, fine tuning, and finished renderings.

The type of renderer used determines the effects that will be seen in the rendered image. The more effects you use, the better the quality of the image. The trade-off, of course, is longer rendering times. This chapter discusses the rendering options available and methods which will help you achieve the level of quality you desire.

RENDERING CONSIDERATIONS

There are many things which require consideration when rendering a three dimensional image or scene. All of these items will contribute to rendering times and quality.

- How powerful is your system?
- Which rendering options do you really need?
- What will be the size and resolution of the image to be rendered?
- What types of objects are in the model?
- How many polygons are in the model?
- How many and what kind of light sources are in the scene?
- What types of textures are used on the objects?
- What does the camera see?
- What rendering method will be used?

- How accurately do you want the image to reproduce?

How StudioPro Renders An Image

The presence of light, its interaction with surfaces, and its reflection toward the viewing position are simulated by these algorithms as it renders the image.

The principal job of StudioPro is to let you communicate enough information about the object geometry, object position, surface descriptions, placement of lights, and the camera's position so it can be captured on the view plane used by the camera, and then rendered with total integrity.

There are four factors that determine what a rendered image will look like:

- The active window
- The window view
- Field of View / Focal length
- Resolution

The Window View

Although renderings can be initiated from various windows, the Camera Window is commonly used for setting up renderings because it allows for positioning flexibility and variable perspective control. See the Camera Object tool in Modeling for a detailed explanation of how this is accomplished.

Field of View/Focal Length

StudioPro simulates a pinhole camera because there are several advantages to doing so. The depth of field of a real camera is related to the diameter of the lens aperture. But, with a computer there is no limitation to detail at distances; it has perfect focus at all distances.

With the adjustable focal length controls on the modeling and camera windows, much greater focal range can be achieved with StudioPro. Orthographic projection uses an infinitely long telephoto lens so that all objects of similar scale appear the same size regardless of their distance from the camera.

Perspective lens settings have an extremely wide angle so the objects near the viewing position appear larger than objects positioned farther away. This enables StudioPro to simulate perspective.

Resolution

Resolution is controlled by several factors which determine how the renderer calculates the appearance of objects in a given lighting situation. It calculates the nature of only the light reflecting from the object's surface by determining where the light is coming from.

There are three main factors the renderer uses to determine how object surfaces should appear. They are:

- **Color**. The interaction of surface color with light color is critical to the appearance of objects. The renderers support complex texture mapping to reproduce object color detail.

- **Orientation**. All aspects of light reflection change with object orientation. For

some materials even the color changes with orientation.

- **Smoothness**. The relative roughness or smoothness of a surface determines how light is reflected from it.

RENDERING AN IMAGE

Once you have determined you want to render an image, the process is simple.

1. Select the Rendering tool.

   Use the pop-up menu to determine image resolution.

   You can also select **RENDER** from the Rendering menu. If you do, the Render dialog will appear.

2. If you use the Render command, set the render parameters in the Render dialog, then click *Render*. If you are using the Rendering tool, click once in the window to render the entire image.

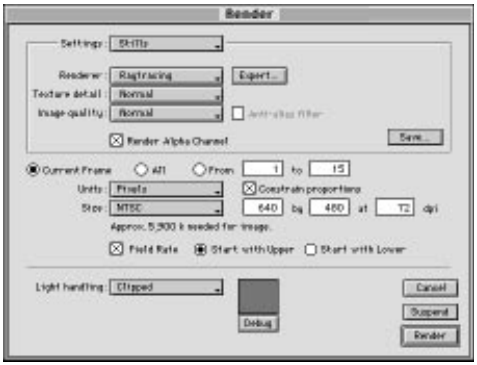
If you want to render only a portion of the model:

1. Select the Rendering tool.

2. Draw a marquee around the section you want to render.

3. Release the mouse button.

   If you hold down the **Shift key**, the Render dialog will appear and you can set parameters for your rendering.



NOTE *If you select **Better** or **Best** for Image Quality, you will get the Render dialog without holding down the Shift key.*

Fields in the Render Dialog

- **Settings.** A pop-up menu is similar to the one on the tool bar. The *Renderer* field allows you to select the rendering method. There are pop-up menus for setting texture detail and image quality and an *Anti-alias filter* check box.

- **Texture detail**. Select from *Fine, Normal, Medium, Coarse*. This selection determines how the image is sampled. The greater the detail, the longer it takes to render.

- **Image quality.** This field determines the detail for the quality of the render-

ing. To smooth the edges, check *Anti-alias filter.*

- **Frame Range**. You can choose to render only the current frame, all frames, or selected frames.
- **Units**. This pop-up menu lets you select the units of measure for the image.Units can be in any unit specified in the Set Units dialog, as well as a percentage.
- **Frame size**. There are several predefined sizes in the Size field. If you want to enter numbers in the fields, you will have to set the *Size* field to *Custom*. The *dpi* field lets you adjust the number of dots per inch, or per centimeter in the final image.
- **Field Rate**. This field allows you to render animations that are compatible with video.
- **Start with Upper/Start with Lower**. You can begin the rendering with the upper field (first horizontal line) or the lower field (second horizontal line).
- **Light handling**. These settings determine how lighting overflow will be handled. More information can be found in the chapter on lighting in this manual. *Debug* is used to select the display color for overexposed areas.
- **Render Alpha Channel**. This allows you to render the alpha channel. The rendered image will include 8 bits of alpha data.

Once you have set your rendering parameters, you can cancel, suspend, or render.

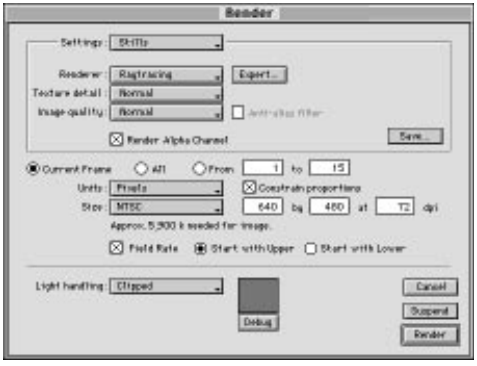
RENDERING ANIMATIONS

Animations must be rendered before they can be viewed. Once you have completed scripting your animation, render the scene. This allows you to see the animation with textures applied and with backgrounds and effects.

1 Select the Rendering tool from the Tool Palette.

2. Hold down the **Shift key** and draw a marquee around the animation.

   The Rendering dialog will appear.



3. Select the Rendering method from the pull-down list.

   For a fast preview select one of the lower level renderers, such as Flat; for a more detailed rendering select one of the higher level renderers, such as Raytracing.

4. Set the *Texture detail* to *Normal*, and the *Image quality* to *Normal.*

   These settings can also be adjusted to accommodate speed and detail.

5. Enable the *All* button in the *Frame Range* field, or select the number of frames you want to render.

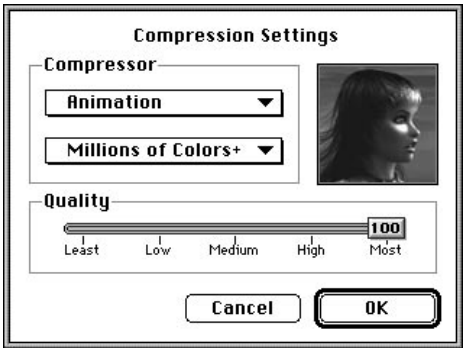
   If this is just a preview and if there are 30 frames, for instance, you may want to only render 15 of them.

6. Click *Render.*

   At this point the Save Animation dialog will appear. Before an animation can be rendered, it must be saved.

7. Select a location to save the file, then select *QuickTime* as the file format.

8. When the Compression dialog appears, leave it at its default settings, then click OK.



When the rendering is finished, an Animation Playback window will appear with standard QuickTime Movie controls.

RENDERING OPTIONS

Preset Rendering Options

Preset rendering settings are accessed through the Camera tool pop-up menu on the Tool Palette, or from the Render dialog.

If you select a preset from the *Movies* submenu, the Camera tool button changes to a movie reel to indicate a set of rendering options have been selected for rendering animations.

A bullet appears next to the preset option that you choose. If more than one of the

presets happens to match the currently-selected rendering options, bullets appear next to all that match.

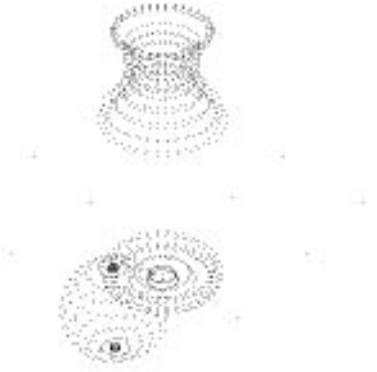
CHOOSING THE APPROPRIATE RENDERING METHOD

StudioPro has seven different rendering algorithms to provide you with images of varying resolution and detail. They are: PointCloud, Wireframe, Flat, Shaded, Scanline, Raytracing, and Raydiosity.

The lower-level renderers—PointCloud, Wireframe, Flat, and Shaded—are used primarily for displaying objects in the modeling views, but they are renderers in their own right and can be used to quickly preview an image. The higher-level algorithms provide smooth shaded surfaces for image realism.

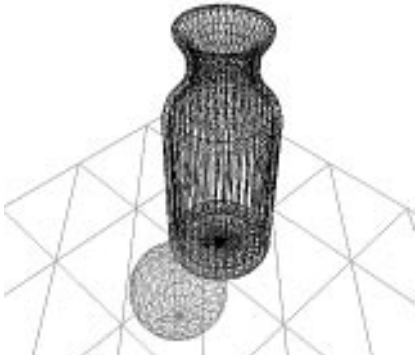
Comparison of the Rendering Algorithms

PointCloud



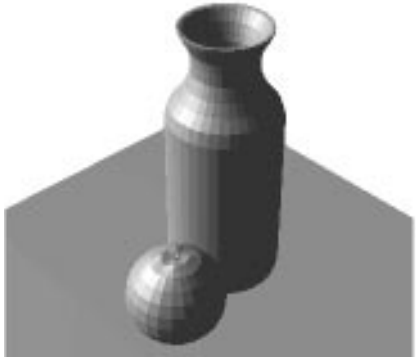
PointCloud calculates, then displays the vertices of the object.

Wireframe



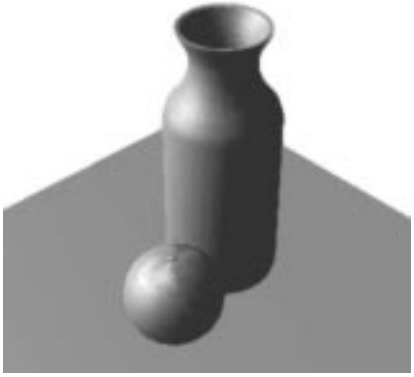
Wireframe is commonly used as a display method, but can be used for rendering. No surfaces, lighting, or surface shading are calculated or implied.

Flat



Flat is sometimes called constant shading. It calculates a single color for each face on the surface. Illumination is also factored into the color as an intensity value. The renderer is relatively fast, but the object will still appear faceted. It is most often used for preview-type images and animation development.

Shaded



Shaded calculates polygonal surface orientation and lighting intensity. The objects are rendered with a smooth, shaded surface.

Raytracing

Raytracing traces rays of light backward through a model to determine how the image should appear. It brings true reflectivity, refractive transparency, and shadows to the imaging calculations. It also supports surface mapping and environmental mapping in its effects.

Scanline

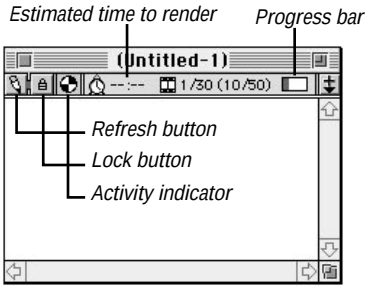
The Scanline render provides photo-realistic rendering and supports shadows, reflectivity, and transparency. Unlike the Raytracer, it can render polylines. It renders the image one line at a time.

Raydiosity

Raydiosity calculates light intensity of each surface in a scene as a function of the intensity of all other surfaces. It is best suited for images containing mostly matte surfaces and indirect lighting. It also supports soft edges on shadows from Spotlight and Point Light sources.

RENDERING WINDOWS

When a rendering is initiated, a separate window opens. The windows are like frames of film developing and you can watch the progress, or speed it up by turning off the Continuous Rendering Feedback (Lock Button).



The rendering window has some unique controls:

- **Refresh Button** allows you to update the rendering window display as often as you like.
- **Continuous Rendering Feedback (Lock button)** can be enabled by clicking the lock button. When it is enabled you can watch the drawing progress, but this significantly slows the rendering time.
- **Activity Indicator** is in the shape of a beach ball which rotates as the rendering progresses.
- **Estimated Time To Render** is continuously displayed and updated.
- **Progress Bar** moves horizontally as the rendering proceeds.
- When you render an animation, a combination of numbers appear between the time estimate and the progress bar. They indicate the current frame being rendered.
- **Plus Menu** contains items specific to this window. They are: **COLLAPSE WINDOW, SUSPEND RENDERING, SUSPEND AND CONTINUE, ZOOM IN, ZOOM OUT.**

When the rendering is complete, resolution information is provided in the feedback area. If the rendering is part of an animation, an Animation Playback window will appear.

Rendering in the Background

You can initiate any number of renderings at the same time within the limits of available memory, and each can be in a separate rendering window. The only limitation is that no changes can be made to the model data.

Background rendering does free the desktop's foreground environment to work on other tasks. Rendering in the background splits available CPU time among the renderings in progress and the activity in the foreground. If there are a substantial number of renderings to complete, it may be more productive to suspend the renderings, then queue them up for rendering one at a time at non-use periods.

SUSPENDING AND RESTARTING RENDERINGS

You can suspend and restart renderings as often as you like. The benefits to this are:

- The original model does not have to be open to restart a suspended rendering.
- You can restart the suspended rendering on another machine.
- Restarted renderings automatically save upon completion, replacing the suspended rendering file with a finished image.

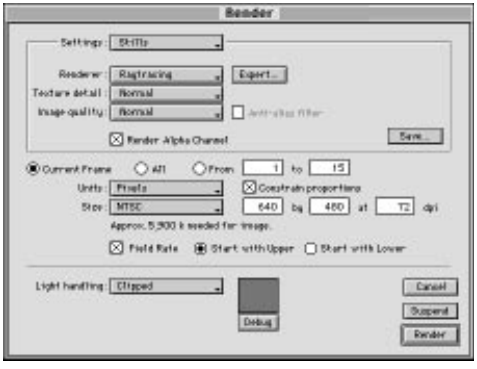
Suspending a Rendering at the Time it is Initiated

1. Hold down the **Shift key** while clicking in the active view with the Rendering tool.

   -or-

   You can select the **RENDER** command from the Render menu.

   The Render dialog appears.



2. Select the rendering parameters, then click *Suspend*. (Of course, you can cancel and start over.)

   A directory dialog appears asking for the name of the rendering file and where you want to save it.

Suspending a Rendering in Progress

1. Make the rendering window the active window.
2. Choose **SUSPEND RENDERING** from the Rendering menu.

   The Suspend Rendering dialog appears.You are asked for a name and location.

   For an animation, the completed frames and the suspended frames will be in separate files.

   If you enable the *Collect* check box when the rendering is restarted, the completed frames will be copied to the same location as the suspension file. The files are renamed with the same name as the suspension file and the file type is appended to the end. The original frames remain in the original location.

   If *Collect* is not enabled, the files will remain separate and will have to be combined manually.

3. Click *OK*.

You can also suspend a rendering in progress by simply closing it. If it has been rendering for more than 30 seconds, an alert will appear that allows you to suspend the rendering, close it, or continue rendering.

A rendering queue is established when one or more suspended renderings are added to the job list in the Rendering Queue dialog. The order in which they are added to the queue determines the order in which they will be rendered.

If you quit StudioPro while renderings are in the queue, they are deleted from the queue.

The rendering queue doesn't provide for multiple renderings at one time, so you will have to open them manually if you want to render more than one image at a time.

Starting Suspended Renderings

You can start up a suspended rendering by simply using the **OPEN** command and selecting that rendering.

Playing Back Partially Completed Animations

As the frames of an animation are rendered, they are placed into a self-contained file. This file can be played as if it were the complete animation.

ENVIRONMENTAL EFFECTS

Before you render a scene, you may want to incorporate environmental effects into it. You may want to add both visible backgrounds and ones that are reflected by the objects in the scene. You may also want to add some atmospheric effects.The Environment Palette and the Resource Palette allow you to do this.

Background Tab

The default background for new models is a simple white color which can be changed in the Preferences dialog. The default background that is visible when you render is black. You can use the Background tab from the Resource palette and the Environment Palette to add different backgrounds to your model.

To apply a background to your scene:

1. Select a background from the Resource Palette.

2. Click *Apply.*

Alternately, you can select a background from the pop-up list under the *Visible* and *Reflected* buttons on the Background tab of the Environment Palette.

You can create a background from the Resource Palette or from the Environment Palette. Once the background is created, it will appear on the Resource Palette for that model. If you want to save it for future use, select it from the Resource Pal-

ette and use the **SAVE** command in the Plus menu.

If you have an object selected, when you click *Apply* while in the Resource Palette a warning will appear telling you that you are about to make that background a reflected background for that object.

To create a new background:

1. With the Background tab active, hold down the *New* button on the Resource or Environment Palette.
2. Select the type of background you want.
3. Follow the steps for the type of background you want to create.

To edit a background:

1. With the Background tab active, hold down the Edit button.
2. Select the background you want to edit.
3. When its dialog appears, edit the fields you want to change.
4. Click *OK*.

You can delete a background by using the **DELETE SELECTED** or the **DELETE UNUSED** command in the Plus menu.

Spherical Backgrounds

To create a Spherical background:

1. Select *Spherical* from the pop-up list.

   The Spherical Background Options dialog will appear.

2. Click the *Map* button.

   The Image Map dialog will appear.

3. Click the *Load* button and select PICT from the pop-up menu to locate the image you want to use as a background.
4. Select it, then click *Open*.
5. Click *OK*.

   You will return to the Spherical background dialog.

   Images may need to be adjusted for scale and mapping. You can do this from this dialog.

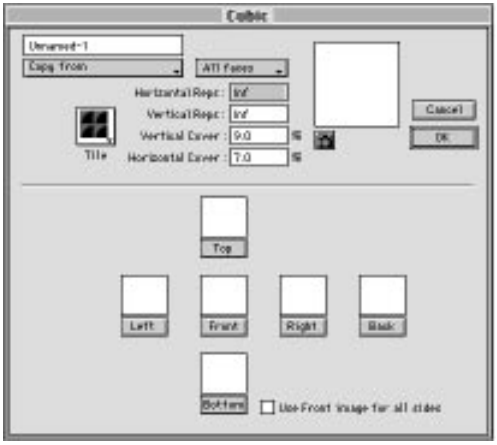
6. Once you have set the repetitions, coverage, and tiling, click *OK*.

If you have created it from the Environment Palette, it will appear in the pop-up.

7. Click *OK*.

Cubic Backgrounds

You can also create a cubic environment for your background. The Cubic dialog allows you to load six different maps, one for each of its six sides.



To create a cubic background:

1. Select Cubic from the pop-up list.

   The Cubic dialog will appear.

2. Click the buttons under each side in succession.

   When you click the buttons, the Image Map dialog will appear. From here, you can load a PICT. You can load different images for each side or use the same one for each of the six sides.

3. Once the images are loaded, click *OK*.

The background may also need to have its mapping adjusted. You can do that from this dialog.

Once the cubic background appears on the Resource Palette, you can save it with the **SAVE** command from the Plus menu. There is also a *Copy from* field which allows you to select from already existing cubic backgrounds.

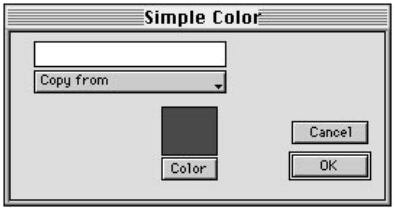
Simple Color Backgrounds

If you select Simple Color, you can create a simple color for your background.

To create a simple color background:

1. Select Simple Color from the pop-up list.

   The Simple Color dialog will appear.



2. Click on the *Color* button.

   The Color Picker will appear.

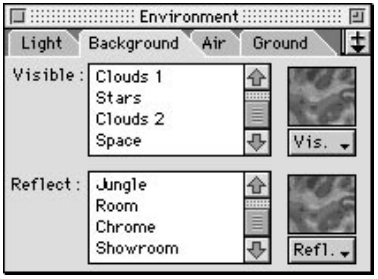
3. Select a color and click *OK*.

Once the simple color is displayed on the Resource Palette, you can save it with the **SAVE** command in the Plus menu. You can use the *Copy from* field in the Simple Color dialog to access an existing simple color background.

Environment Palette, Background Tab

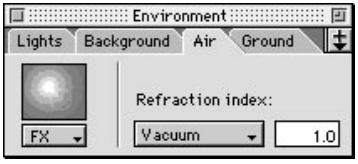
In the Background tab, you can rearrange the applied layers by selecting one and dragging it then droping it in the order you want the background. You can access

the backgrounds found on the Resource Palette by holding down the *Vis*, (Visible) or *Refl*. (Reflective) buttons.



The Pop-up list that displays includes all backgrounds contained within the Backgrounds folder.

Air Tab



In the Air tab, you add an atmosphere to your model. Hold down the *FX* button, select *New*, and then select an effect from the pop-up list. Once you select an effect, such as fog, its editing dialog will appear. You can use the default settings, or edit them using the *Copy From* field.

To add an atmosphere:

1. Hold down the *FX* button.
2. Select *New*. A pop-up list appears.
3. Select from the list.

   The texture editing dialog for that effect will appear.
4. Use the default settings, or create a new effect using the *Copy from* field.

You can also access Fog, Haze and Mist from the FX tab of the Resource Palette.

The *Refraction index* pop-up gives you a list of pre-sets to choose from.

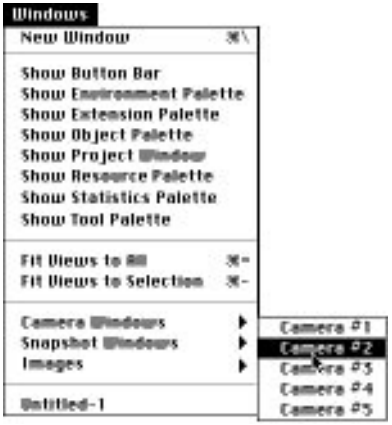
Editing these effects is discussed in the chapter on textures in this manual.

QTVR

QuickTime VR Panorama is a new feature of StudioPro. It simulates an actual camera with a 360° panorama, and must be rendered through a camera window. The object can then be viewed interactively from any angle using VRML files created in StudioPro.

To create a VR Panorama:

1. Insert camera objects into the scene.
2. Select the camera view you want to render using the **CAMERA WINDOWS** command, or double-click the camera you want to view from.



A camera window will appear showing the view from the selected camera.

3. With the slider bar, set the lens control to 15 millimeters.

4. In the Camera Object Properties Palette, select QTVR from the *Type* field.

5. Click the *Render* button in the camera window.

NOTE *Because the QuickTime VR Large option is twice the size of the QuickTIme VR option, it will take roughly four times as long to render.*

Creating a VR Object Movie

Any 3-D object can be rendered in StudioPro to create a QuickTime Movie that can be viewed interactively using Apple's QuickTime VR Navigable Movie Player. This allows the viewer to manipulate the object in any direction, and view it from all angles.

The object movie is created by using a prescripted camera to capture views of the object from all directions. The renderer will take a picture of your object every 10 degrees, starting directly overhead, for a total of 684 frames.

Rendering time will depend on your machine, the complexity of the model, and number of colors you specify. To reduce rendering time, keep complexity as low as is practical for your project.

You can create an object movie of more than one object, as long as all are within the cube. The objects will function as a group, not independently.

To create an object movie:

1. Open the StudioPro QuickTime VR Object Camera located in your Stationary folder.

   This model automatically gives you three views to help you center your object. Notice the small built-in camera and the cube.

   Place your object(s) inside the cube. There are several ways to accomplish this, including the **IMPORT** command.

2. The object must be completely within the cube for the rendering to work properly. To place the object within the cube, first scale it to the appropriate size while holding down the **Shift key**.

3. Draw a marquee to select the object and the cube and select **ALIGN** from the Modeling menu. Enable the *Center* radio buttons in the Horizontal, Vertical, and Depth options.

4. Click *OK*.

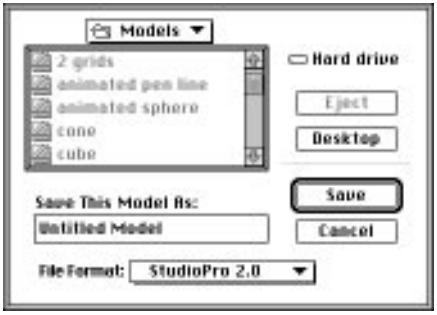
5. Place any light sources now.

6. Hide the cube before you render or you will end up with a rendering of a solid gray cube.

7. Render the object movie using the QTVR camera from the **CAMERA WINDOW** option of the Windows menu, or double-click the camera.

8. When the Rendering dialog appears, select *All* in Frame Range, and click

Render Now, and when the Save As dialog box appears, specify a name and location, and select *QuickTime Movie File*. Click *OK*.



9. In the Compression Settings dialog box, choose the setting which best suits your needs.

The animation setting is the default. If you choose another setting, or use another compressor, make sure that *every* frame remains a key frame. While in the Compression Settings dialog, choose the lowest number of colors, and the lowest quality setting that will suit your needs. Click *OK*.

You are now ready to convert your animation to a QTVR object movie. StudioPro animates it at 684 frames with 19 rows and 36 columns. The horizontal pan is 0 degrees to 360 degrees and the vertical pan is 90 degrees to -90 degrees.

COMMANDS USED WITH RENDERED IMAGES

While the descriptions of these commands are brief, complete details can be found in the *Reference Manual*.

Render (Rendering menu)

RENDER is available whenever a model, shape, or camera window is active. The Render dialog allows you to set parameters for the rendering.

Rendering Queue (Rendering menu)

RENDERING QUEUE lets you add suspended renderings to or remove them from the rendering queue. **RENDERING QUEUE** is available all the time. A queue is established when one or more suspended renderings are added to the job list in the Rendering Queue dialog.

Suspend Rendering (Rendering menu)

SUSPEND RENDERING lets you save a rendering in progress, which can then be restarted at a later time. All the model data, as well as the rendered image at its current state of completion, are saved as a self-contained file.

Suspend and Continue (Rendering mneu)

SUSPEND AND CONTINUE allows you to save a rendering in progress. The Suspend Rendering dialog will appear. Once the progress has been saved, the model continues to render.

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