

STRATA™ STUDIO Pro

version 2.5
MACINTOSH
WINDOWS

Reference Manual

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S T R A T A

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ACKNOWLEDGEMENTS

The JPEG support software is based in part on the work of the Independent JPEG Group.



INTRODUCTION

Welcome to Strata's StudioPro, the powerful 3-D graphics software that offers you endless modeling possibilities. StudioPro is a superior animation, rendering, and modeling application designed for the creative professional. The interface is very intuitive and easy to use, for the advanced user as well as for the beginner.

Users should have a good working knowledge of their computer and its operating system. If you need assistance, please see the User Guide that came with your computer for more information.

The *StudioPro Reference Manual* provides detailed and in-depth information about using StudioPro. This manual is organized into three sections:

- **Section I** includes the menus and commands in the same order as they appear in the menu bar.
- **Section II** covers the palettes and windows and their functions.
- **Section III** contains reference material. Included in this section: specialized appendices, a glossary, and a comprehensive index.

The *StudioPro User Manual* provides you with easy-to-read instructions for using this program and teaches you how to effectively create your own models. It contains step-by-step instructions for using StudioPro.

When you have specific questions about commands or features in StudioPro that aren't covered in the *User Manual*, see the appropriate entry in the *Reference Manual*. For your convenience, the index includes entries for both the *User Manual* and the *Reference Manual*. The same index appears in each manual, making it easier to locate the information you need.

ABOUT THIS MANUAL

This manual was created for both Macintosh and Windows users. Some of the dialogs in the application may appear slightly different than those presented here due to the different operating systems. Both versions of a dialog, menu, or graphic are shown only when there are significant differences between them. The term "folder" is used when referring to either Macintosh folders or Windows directories. Shortcut commands are provided for both Macintosh and Windows.



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MENUS



StudioPro's Button bar provides buttons for the commands you use most often. It always resides directly below the menu bar; you can't move the Button bar to another location.

Feedback is displayed directly below the button bar. When the cursor is over a button or tool, the name of the button or tool appears in the feedback area. If the cursor is in the Modeling window, the feedback area displays the precise location of the cursor in the 3-D space.

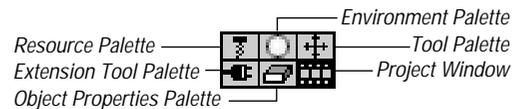
You can display or hide the Button bar by selecting the **SHOW/HIDE BUTTON BAR** command from the Windows menu. Its show/hide status is remembered from session to session. If the Button bar is hidden when you quit StudioPro, it remains hidden the next time you launch the application.

These buttons represent commands in the menus, but you may find the Button bar more convenient to use. However, you can access most of these features through the standard menu commands as well, even when the Button bar is hidden.

Additional buttons may be added as they become available, either from Strata, Inc. or from third-party developers in the future.

Buttons may be active or dimmed. If the action represented by the button cannot be used, the button is dimmed.

There are six additional buttons on the extreme right of the Button bar. They allow you to quickly show or hide the other palettes.



These buttons perform the same action as selecting Show/Hide palette commands found in the Windows menu.

 **NEW.** This button opens a new model. It is the same as selecting the **NEW** command in the File menu. See **New** on page 7 for more information on this command.

 **OPEN.** Use this button to open an existing model. Clicking this button is the same as selecting the **OPEN** command in the File menu. See **Open** on page 7 for more information.

 **SAVE.** This button lets you save the active document. If the active document has never been saved, the Save dialog appears. This is the same as selecting the **SAVE** command from the File menu. For complete information on this command, see **Save** on page 9.



COPY. This button puts a copy of the selected object(s) on the clipboard. It is the same as selecting the **COPY** command from the Edit menu. For complete information on this command, see **Copy** on page 18.



CUT. This command removes the selected object from the model and places it on the clipboard. It is the same as selecting the **CUT** command from the Edit menu. For more information on this command, see **Cut** on page 17.



PASTE. Use this command to paste the contents of the clipboard into the active model. Clicking this button is the same as selecting the **PASTE** command from the Edit menu. See **Paste** on page 18.



UNDO/REDO. Use the **UNDO/REDO** button to undo the last action. If you're not happy with the results, clicking the button again lets you redo what was undone. This is the same as selecting **UNDO/REDO** from the Edit menu. See page 17 for more information.



RESHAPE. Use this button to reshape the selected object(s). If the selected object can't be reshaped in its present form, the button is dimmed. This is the same as selecting **RESHAPE** from the Modeling menu. See **Reshape** on page 35.



END RESHAPE/EDIT. Use this button to get out of Reshape, Edit Placement, or Edit Selected mode. Clicking this button is the same as selecting the **END RESHAPE/EDIT** command from the Modeling menu. See **End Reshape/Edit** on page 45.



CONVERT. This button allows you to convert the geometry of the selected object from one type to another. Clicking this button is the same as selecting **CONVERT** from the Modeling menu. See **Convert** on page 45.



GROUP. Use this button to combine the selected objects into one. See **Group** on page 49. This button is the same as choosing the **GROUP** command from the Modeling menu.



UNGROUP. This button splits grouped objects into separate objects again. It is the same as selecting the **UNGROUP** command from the Modeling menu. See **Ungroup** on page 51.



DROP A CURVE. This button lets you create a 2-D Bézier curve that is an exact match of any animation path present in your model. See **Drop A Curve** on page 55.



ALIGN TO PATH. Use this button to align an object to its animation path. You control which direction the object is pointing as it travels along the animation path. See **Align to Path** on page 51 for complete details.



METABALL. This button allows you to transform separate elliptical shapes into a single, smoothly-blended entity. This is the same as selecting the **METABALL** command from the Modeling menu. See **Metaball** on page 52 for more information.



UNMETABALL. This button lets you unjoin a Metaballs entity. This is the same as selecting the **UNMETABALL**

command from the Modeling menu. See **UnMetaball** on page 54.

Three additional buttons are provided as an extra convenience when reshaping objects or when applying textures to objects.

 **Align Handles.** Use this command to align previously hinged direction handles. This command is especially useful when a single set of direction handles resides on two different planes. See page 39 for details.



Make First Point. To make a different vertex point on a 2-D region the first point, select the desired vertex point, then click this button on the Button bar. The selected point becomes the first point. See page 40 for more information.



Fit Texture. While in texture placement mode, clicking this button centers the texture on the object with 100 percent coverage. See page 43 for details.



File	
New	⌘N
Open...	⌘O
Open As...	
Close	⌘W
Save	⌘S
Save As...	
Save a Copy As...	
Revert	
Import...	⌘I
Page Setup...	
Print One	
Print...	⌘P
Quit	⌘Q

Macintosh

File	
New	Ctrl+N
Open...	Ctrl+O
Open As...	
Close	Ctrl+W
Save	Ctrl+S
Save As...	
Save a Copy As...	
Revert	
Import...	Ctrl+I
Print Setup...	
Print One	
Print...	Ctrl+P
Exit	

Windows

The File menu contains commands that relate to handling models and other documents. It provides a command for importing data into the current model. Also included are commands for setting up printing options to control the way StudioPro prints and sends images to the printer.

NEW

Macintosh: Command-N
Windows: Ctrl-N

Select **NEW** to open a new model. This command is always available because you can have more than one model open at a time. If there isn't enough memory available to open a new model, an alert is displayed.



You can also open a new model by clicking the **NEW** button on the Button bar.

The new model opens with the default window configuration specified in the Preferences dialog. See **Preferences** on page 23 for information on changing the default settings.

Each model is independent of any other models that are currently open. Any shapes or textures that you make in one model aren't automatically available in another. You can, however, import or copy complete models, selected objects, shapes, and textures, or merge them into other models.

See **Open As** on page 8 and **Import** on page 12.

OPEN

Macintosh: Command-O
Windows: Ctrl-O

OPENING MODELS

Use the **OPEN** command to open existing StudioPro models. If there's not enough memory available to open the model you select, an alert is displayed.



You can also open an existing model by clicking the **OPEN** button on the Button bar.

When you select the **OPEN** command, the *Open* dialog appears. This dialog reads other file formats into StudioPro, depending on the import/export extensions installed. You can open a model in any format supported by StudioPro.

When you load a StudioPro model, it opens with the window and view configuration exactly as it was when you last saved the model. Other file formats open with the default window settings from the Preferences dialog box.

Models are opened in the same scale as when they were originally created. This scale will be converted to the units that you're currently using in StudioPro.

Note that the dialog shows only those files matching the formats supported by the extensions in StudioPro. If the format isn't supported, it doesn't appear in the directory. See **Appendix A** on page 301 for a list of supported file formats.

OPENING IMAGES AND ANIMATIONS

You can use the **OPEN** command to access images as well as models. These images can be from any source, not just images that were rendered in StudioPro.

Files that use any of the recognized image formats appear in the dialog along with StudioPro models. The file opens as either an image or a model, depending on the file type.

OPEN AS

To open files with non-standard formats, use the **OPEN AS** command. All files appear in the directory dialog. First select the file, then select its format.

You need to know the file type of the selected file; StudioPro makes no attempt to guess the file type. If the file format you specify isn't correct (if the actual data doesn't conform to the expected format), an alert is displayed.

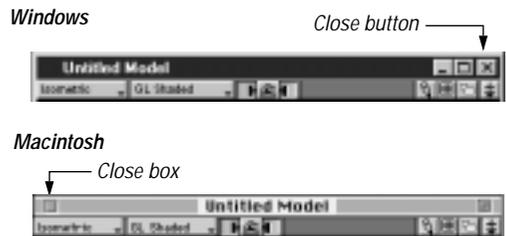
NOTE: This command can also be used to open an image as a 3D mesh. When this format is selected, the intensity values of the image are converted into elevation data. See **Extracting 3-D Objects from 2-D Images** on page 13 for more information.

CLOSE

Macintosh: Command-W

Windows: Ctrl-W

Use the **CLOSE** command from the File menu to close the active (front-most) window, or click the window's close button.



If the Modeling window is the active window, this command also closes any other windows associated with the model.

CLOSING MODEL WINDOWS

When you close a model that has never been saved, you'll be asked if you want to save before closing. If you click *Yes*, the *Save* dialog appears, allowing you to specify a name and location for the file.

If you've made any changes to your model since it was last saved, you'll be asked if you want to save again before closing. If you click *Yes*, the model is saved with its current name and in the same file location as when you last saved it.

CLOSING RENDERING WINDOWS

When you close a completed rendering that you haven't saved yet, or one you've made changes to since you last saved (such as a rendering that you previously suspended), you'll be asked if you want to save before closing.

If the image required less than 30 seconds to render, however, StudioPro assumes that you rendered the image for preview purposes only, and you won't be asked if you want to save before closing.

If you close an unfinished rendering that has been in progress for longer than 30 seconds, StudioPro asks if you want to suspend the rendering. If you want to suspend the rendering, click the *Yes* button to display the *Suspend Rendering* dialog.

Once a rendering is complete, the rendering window has no ties to the model. However, if you close a model with a rendering still in progress, you'll terminate the rendering as well.

SAVE

Macintosh: Command-S

Windows: Control-S

The **SAVE** command is used to save models and images. A separate **SAVE** command is provided in the Plus menu of the Resource palette for saving resources (shapes, textures, effects, etc.) so they can be accessed later for use in other models.

SAVING DOCUMENTS

Use the **SAVE** command to save changes made to either a model or a rendered

image. The **SAVE** command is available whenever you make any changes. The command is dimmed if you haven't made any changes since the last time you saved.



You can also save the active document by clicking the **SAVE** button on the Button bar. The active document can be either a model or a rendered image.

If the active document has never been saved, the *Save* dialog box appears. This dialog lets you name the document, and select the location to which it is saved.

For previously-saved models, this command replaces the old version with the current version.

SAVING UNFINISHED RENDERINGS

You can save an unfinished rendering before it completes rendering. Select **SAVE** from the File menu at any time during the rendering process. The *Save As* dialog automatically provides a default name based on the name of the model where the snapshot was taken.

You can choose any format that appears in the dialog. See **Appendix A** on page 301 for a list of supported formats. The options that appear in the secondary dialog depend on the format you select. For more information, see **Save As**, below.

SAVE AS

Use the **SAVE AS** command to save the active document using a different name and location. You can also choose which

file format to use. You can use this command to save models, animations, or images.

Shapes, textures, and other resources are saved by selecting the **SAVE** command from the Plus menu of the Resource palette.

SAVING MODELS

You can save models with any of the file formats listed in the dialog.

Regardless of any other formats you wish to use, you should always initially save your model as a StudioPro file. This will allow you to go back to the original model and edit it, if necessary.

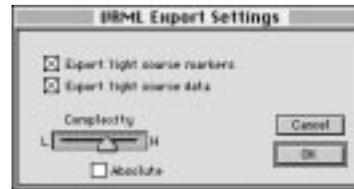
When the dialog opens, it contains the current name of the model. If you want to save the model with a different name, enter the new name in this field.

If you haven't saved the model yet, a default name is provided (Untitled Model, Untitled Model 2, etc.) which you can change as desired.

When you save a document with a new name, the new name, disk volume and folder location will be used for all future saves to the document. You can change the name, file location, and file format of the model at any time by using the **SAVE AS** command.

Depending on the format you select, a dialog may appear that allows you to specify the settings for exporting this file.

Some export formats may require that specific data about the model be included in the file.



- **Export model view data.** Check this box to save and export the active modeling view. Use the view management tools to get the exact angle you want before exporting the file.
- **Export light source markers.** Check this option if you want to see and manipulate the light object in another application. This allows you to see where the original light source was, but will not change the lighting effect.
- **Export light source data.** Check this option to export the effect of the light source, but not the light source marker itself.
- **Binary.** Check this option for normal use. Both *Text* and *Binary* files contain the same information, but each type stores it differently.

- **Text.** This option saves the model as text which can be read and edited in text applications. It includes the model's geometry, textures, and light sources. The *Text* option will create a much larger file than the *Binary* option.
- **Complexity slider.** The export dialogs allow you to specify the complexity of the model. The position of this slider determines the complexity, or amount of detail, with which each object in the model is exported.
- **Absolute checkbox.** If the *Absolute* checkbox is *checked* AND the object's *Absolute* checkbox on the Object Properties palette is checked, the object's *Complexity Slider* setting overrides the setting of the slider in this dialog.

When the *Absolute* checkbox is *unchecked*, the setting of the *Complexity* slider in this dialog will be used for all objects.

SAVING IMAGES FROM MODELING WINDOWS

You can save images from the Modeling windows, Camera windows, and Spotlight windows. Images are simply 2-D representations of the model; they don't contain any model information. Once you've saved an image, it becomes completely independent of the model. To save images, use the **SAVE AS** command and select a format from the dialog.

SAVING STILL IMAGES

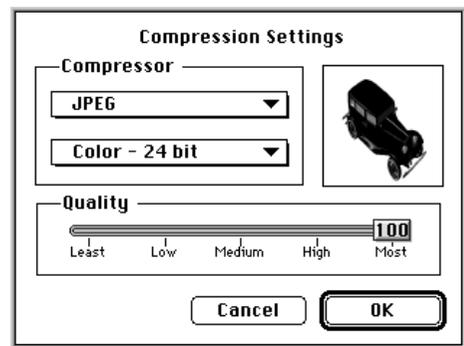
You can save the image in a rendering window at any time during the rendering process. The image at the point when you save the rendering will become a separate file. You can rename later saves of the

image, as it continues to render, or you can replace the previously-saved image with the same name.

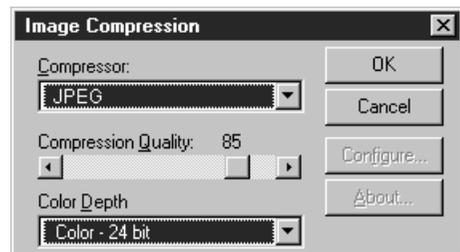
Any format supported by StudioPro appears in the *Format* field in the dialog.

When you click the *Save* button, the *Compression Settings* dialog appears which allows you to choose the color depth and a compression method.

Macintosh



Windows



The compression and color depth options available depend on the file format you select.

You must save the image with *Millions of Colors+* if you want to include alpha data in the file.

If you select *QuickTime* or *PICT* file formats, the maximum image size is 16K by

16K pixels. The maximum size for either *Targa* or *JPEG* is 32K by 32K pixels.

SAVING ANIMATIONS

Each frame of an animation is saved as it is rendered. Once the entire animation completes rendering, however, the **SAVE A COPY AS** command (below) can be used to save the file with a different name or in a different format. For information on saving animations and the formats available, see **Rendering Animations** on page 72.

For information on saving animations as sequentially-numbered image files, see **Saving Sequentially-numbered Files** on page 73.

SAVE A COPY AS

MODELS

The **SAVE A COPY AS** command allows you to save a copy of the current model with a different name (and in a different location, if you choose) without changing the current name of your model. In this way, the current name and location will be retained for future saves, not the one used with the copy.

IMAGES AND ANIMATIONS

When saving a copy of an image or an animation, the **SAVE A COPY AS** command also allows you to select a format to use for the save operation.

REVERT

Use the **REVERT** command to discard any changes you've made to your model since you last saved it. If you've already saved your document and then make changes to it, this command is available.

When you select the **REVERT** command, an alert warns you that your changes will be permanently discarded.

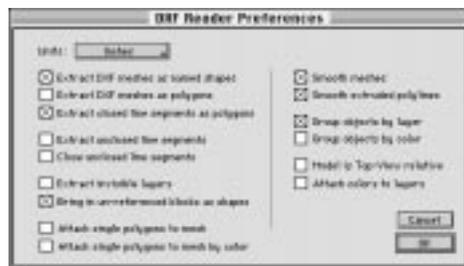
IMPORT

Macintosh: Command-I
Windows: Ctrl-I

The **IMPORT** command allows you to merge StudioPro models with models or images created in other formats into the current model; or, you can import images as three-dimensional meshes. This command can also be used to import resources (shapes, textures, etc.) into the active model.

When you select a file to import, the *File Format* field shows the file format used when it was saved.

There are several import options available for DXF files that let you specify how to transport the imported file into StudioPro data.



The options set in this dialog are retained from session to session, so the next time you import a DXF file, the *DXF Reader Preferences* dialog appears with the same settings you chose the last time it was used.

If a DXF file consists of several components, each component may appear in its own shape preview on the Resource palette after importing. The entire DXF file can be easily located on the palette because it appears with the same name as the DXF file that was imported.

In addition to the import/export extensions that ship with StudioPro, other formats may also be supported with extension import filters provided by Strata Inc. or by third-party developers. If the file appears in the *Import* directory dialog and its file format is correctly identified in the *File Format* field at the bottom of the dialog, the chances are excellent that you can successfully import the file.

Any data you import is loaded into your model into a Shape workspace, and its preview appears on the Shapes tab of the Resource palette. The shape (imported file) is then placed at the center of the active view.

Objects are imported at the same scale at which they were created. This scale will be converted to the units that you are currently using in StudioPro.

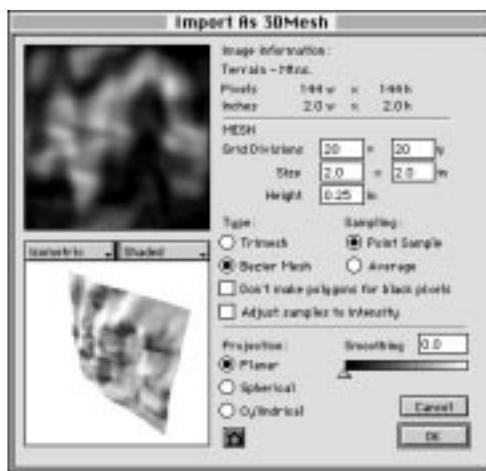
Because all imported data is treated as a shape, you should handle the editing and texture applications as you would any other shape that you have created directly in the program.

EXTRACTING 3-D OBJECTS FROM 2-D IMAGES

The **IMPORT** command also makes it possible to create three-dimensional geometry from a two-dimensional image. The gray-scale values of an image are interpreted as elevation data from which a 3-D object is created. Light areas indicate raised areas in the geometry, and dark areas indicate low areas.

If a color image is imported, StudioPro converts the color information into gray-scale data. Once the image is converted into a three-dimensional object, it becomes a shape and is placed in the center of your model space. It also appears on the Shapes tab of the Resource palette. You can handle it just like any other shape in StudioPro.

When you import an image into StudioPro using the **IMPORT** command, a dialog appears that lets you control the various parameters used for the conversion.



- **Previewing the object.** A preview area is provided that allows you to see how the 3-D mesh will appear with the current settings. You can manipulate the settings until you get the results you want to achieve. Just click the camera icon to render a preview image of the 3-D mesh.

Controls for the *View Orientation* and the *Display Method* can be found at the top of the preview. You can also grab the image in the preview area and move it around so that you can see the image from any angle.

- **Setting Mesh Density and Size.** You can control the density of the mesh by adjusting the number of grid divisions. The higher the number of grid divisions, the more control points and the denser the mesh. The number of control points should not exceed the total number of pixels in the image. (Each pixel can only be sampled once.)

The dialog also lets you specify the overall size of the mesh you're creating. You can use an image of any size, and adjust its size in the dialog; you don't need to resize the image before you import it.

- **Adjusting the height.** The total amount of elevation variation can be controlled by changing the value in the *Height* field. The value in this field represents

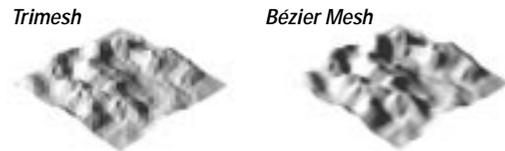
the total height of the white areas of the image.



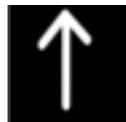
By varying the value in the *Height* field, you can adjust the total height of the mesh.

Once the image is converted to geometry and becomes part of your model, the height can be adjusted in the Project window or on the Transform tab of the Object Properties palette.

- **Mesh Type.** The 3-D mesh you create can be either a *Bézier mesh* or a *Trimesh* (a polygonal mesh in which all of the polygons are triangles).



If you're creating a trimesh, a *Don't make polygons for black pixels* checkbox is provided. If the image you're using contains a black background, this option makes it possible to ignore the background entirely.



You can tell StudioPro to ignore the black background in an image. The 3-D image is created from the rest of the pixels.



- **Sampling the image.** The Import dialog allows you to control the type of sampling StudioPro uses when converting the image into elevation data.

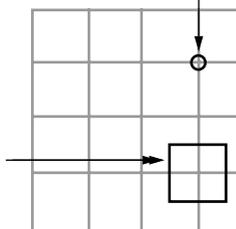
At each intersection of the mesh grid divisions, StudioPro samples a point, so the more subdivisions, the denser the mesh and the more points that are sampled.

Point sampling uses information from the points being sampled only, and does not use any of the information from the surrounding pixels.

Averaging also samples information from surrounding pixels, then averages the grayscale values together and uses this average for each of these surrounding points, as well.

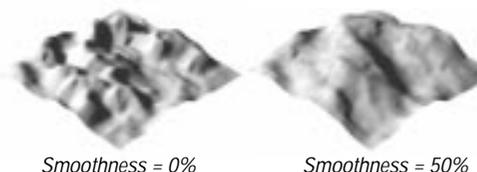
Point Sampling samples just one pixel at EACH point, then plots the elevation data from point to point.

Averaging samples the grayscale value of surrounding pixels as well, then averages the values together. All pixels in this area are then assigned the same elevation.



An *Adjust samples to intensity* checkbox is available when using the *Point Sampling* method. When this box is checked, StudioPro looks for intensity extremes in the vicinity of the points that are to be sampled, and uses these pixels to sample instead. Although the results may be subtle, you may want to use this option if your image contains areas of high contrast.

- **Projection.** You can select the type of object you want to create by selecting one of the three projection modes available: *Planar*, *Spherical*, or *Cylindrical*. Planar, for example, may be used to create terrain. Or, you may want to project the image of a face onto a sphere or a cylinder.
- **Smoothing the Geometry.** A slider is provided that lets you control the smoothness of the object.



Smoothness set at 0% produces geometry with the sharpest angles; higher values produce softer, smoother transitions between elevations.

PAGE SETUP (MACINTOSH)

PRINT SETUP (WINDOWS)

The **PAGE SETUP** command (Macintosh) or **PRINT SETUP** command (Windows) allows you to specify printing information, such as page size, image orientation, and image size.

The options provided in the dialog depend on the printer driver installed. See the documentation supplied with your printer for details.

PRINT

Macintosh: Command-P
Windows: Ctrl-P

The **PRINT** command displays a dialog that allows you to specify various printing options for your document. These options include the range of pages to be printed, tiling, color depth, etc.

PRINT is available whenever a document is open. Choosing the **PRINT** command displays the *Print* dialog box. The options provided in the dialog depend on the printer driver installed.

PRINT ONE

The **PRINT ONE** command allows you to print one copy of the active document using the current print settings. No dialog is displayed with this command.

QUIT (MACINTOSH)

EXIT (WINDOWS)

Macintosh: Command-Q

Choose **QUIT** (Macintosh) or **EXIT** (Windows) to exit StudioPro. Before quitting, StudioPro asks if you want to save changes to any open, unsaved documents or documents that have been changed since they were last saved.



Edit	
Undo	⌘Z
Cut	⌘H
Copy	⌘C
Paste	⌘V
Delete	
Duplicate	⌘D
Replicate...	
✓ Snap to Grid	
✓ Hide Grids	
Active Grid	▶
Visible Grids	▶
Set Units...	
Show Clipboard	
Customize Menus...	
Preferences...	

Macintosh

Edit	
Undo Object Insertion	Ctrl+Z
Cut	Ctrl+X
Copy	Ctrl+C
Paste	Ctrl+V
Delete	
Duplicate	Ctrl+D
Replicate...	
Snap to Grid	
Hide Grids	
Active Grid	▶
Visible Grids	▶
Set Units...	
Show Clipboard	
Customize Menus...	
Preferences...	

Windows

The Edit menu provides you with commands for editing the objects in your model and for controlling the various grids. Commands are also included to change the default specifications of StudioPro, as well as allowing you to customize the application to meet your specific needs.

UNDO/REDO

Macintosh: Command-Z

Windows: Ctrl-Z

Select **UNDO** to reverse the last action performed. You can undo most operations. The name of the command specifies what can be undone. For example, **UNDO OBJECT ROTATE** appears after you use the Object Rotate tool.

Once you undo the action, the menu entry changes to **REDO**. This means that you can

repeat the previous action by using this command. You can alternate between **UNDO** and **REDO** as often as needed.



This command is also available by clicking the **UNDO/REDO** button on the Button bar.

If the operation can't be undone, the command name changes to **CAN'T UNDO**. However, even when you can't use this command to undo an action, there's often another command or tool that you can use to reverse the first action.

CUT

Macintosh: Command-X

Windows: Ctrl-X

Use the **CUT** command to remove the selected items from the document and store them on the clipboard. Each time you use the **CUT** command, the most recently cut items replace the previous contents of the clipboard.



You can also access this command by clicking the **CUT** button on the Button bar. This command is available only if something is selected. If nothing is selected, both the command in the menu and the button on the Button bar are dimmed.

Items that you can **CUT** are objects in a model (including light sources and cameras), text in a dialog field, surface maps in a texture, or anything else that you can select.

COPY

Macintosh: Command-C
Windows: Ctrl-C

Select the **COPY** command to place a copy of the selected items on the clipboard.

COPY does not remove anything from the document, but it does replace the previous contents of the clipboard with the copied items.



You can also choose this command by clicking the **COPY** button on the Button bar. This command is available whenever an item is selected.

You can **COPY** anything that you can select. This includes the objects in a model, as well as text in a dialog, surface maps in a texture, etc.

PASTE

Macintosh: Command-V
Windows: Ctrl-V

The **PASTE** command places the contents of the clipboard in the active document, keeping all of the data intact.



You can also access this command by selecting the **PASTE** button on the Button bar. This command is available as long as the clipboard contains an appropriate item.

Items that you **PASTE** must be in the same context as the place from which you copied them. For example, you can't paste a 3-D object into a text field in a dialog, or text from a dialog into the Modeling window.

DELETE

Macintosh: Delete key
Windows: Delete key, Backspace key

When you select the **DELETE** command, any selected items are removed from your model. They are not saved to the clipboard.

DUPLICATE

Macintosh: Command-D
Windows: Ctrl-D

Use the **DUPLICATE** command to create a copy of the selected object, slightly offset (0.25 inches or equivalent unit) from the original. The copy becomes the selected object.

You can control the amount of offset used by this command. To change the default offset, first select an object and choose **DUPLICATE** from the Edit menu. Then drag the newly duplicated object the desired distance from the original. The distance you drag the duplicate from the original becomes the new offset each time you use the **DUPLICATE** command.

If more than one model is open, each model can have its own offset value which remains in effect until the model is closed. However, each time you open a model, the original default offset of 0.25 inches (or equivalent unit) is restored.

All of the properties of the original object are copied in the duplicate, including geometry, textures, animation path, shapes hierarchy, etc.

REPLICATE

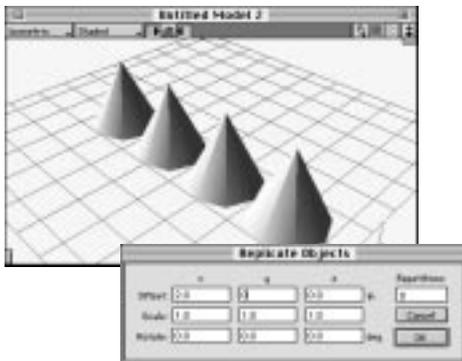
The **REPLICATE** command creates multiple copies of a selected object or group of objects.

The dialog box lets you input numeric values for each replication setting. The values are in the same units as defined in the *Preferences* settings.



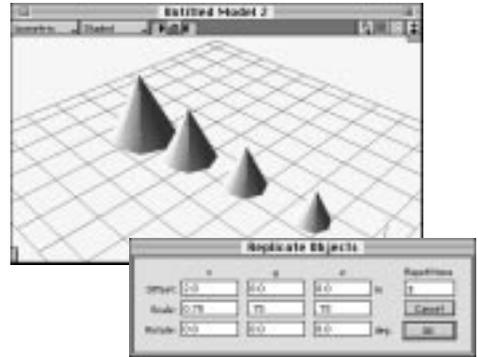
The fields perform the following functions:

- **Offset.** These fields allow you to specify the offset distances along one or more of the three axes for each successive copy. If the units are set to inches, the default value of the offset is 0.25 inches on all three axes.

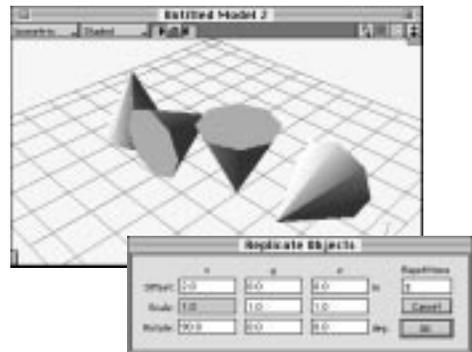


- **Scale.** These fields let you specify the size of each copy relative to the original. A value of two will double the size

of the object(s) with each repetition. A value of one, which is the default value, will make all copies the same size as the original. A value of 0.5 will result in half the size with each repetition.



- **Rotate.** These fields allow you to specify the amount (in degrees) on all three axes by which each repetition should be rotated from its predecessor. The default value for rotation is zero degrees on all axes.



- **Repetitions.** This field specifies how many times the **REPLICATE** command should copy the object(s). The default setting for this field is one.

Any settings you enter in the *Replicate* dialog are retained until you change them or until you close the model. The settings in the *Replicate* dialog apply to the current model only. If more than one model is open, the replicate settings in each model can be different. However, the original default settings are restored each time you open a model.

SET UNITS

Choose **SET UNITS** to select the default units of measurement. **SET UNITS** is available whenever a model is open. If no model is open, the command name changes to **SET DEFAULT UNITS**, and any changes you make to the dialog become the new default settings.



This command displays a dialog box which allows you to choose from pre-defined units of measure. Select *Arbitrary* to specify your own units of measure. You can also specify the abbreviation that's used for the units you define. In the dialog above, *Ten Pixels* is specified as the name

for the arbitrary units, and each unit is equivalent to ten pixels.

The *Snap subdivisions* field allows you to specify the number of subdivisions within each unit. This value is then used when the *Snap to Grid* option is enabled. In the dialog above, each unit of ten pixels is divided into two subdivisions. Therefore, objects will snap at five-pixel increments. You can enter any integer value greater than zero in this field.

The *Nudge subdivisions* field allows you to indicate the number of subdivisions within each unit to use for nudging objects in your model. In the above example, each unit of ten pixels is divided into ten equal subdivisions. Therefore, each nudge is equivalent to one pixel. Enter any integer value greater than zero in this field.

Nudge works with any of the selection tools (Object Move, Rotate, or Scale tools). All nudge operations are relative to the active grid. The arrow keys nudge the selected object along the grid in the direction indicated by the arrow.

The **Command** key (Macintosh) or **Ctrl** key (Windows) used in addition to the Shift key and the Up or Down Arrows nudge the selection perpendicular to the active grid.

NOTE: Remember, nudging occurs relative to the active grid. Therefore, if you're viewing the model from

the backside of a grid, objects may appear to move in the opposite direction.

Keystroke	Direction moved <i>(relative to the active grid)</i>
Up Arrow	Negative Z direction
Down Arrow	Positive Z direction
Right Arrow	Positive X direction
Left Arrow	Negative X direction
Command-Shift-Up Arrow (Mac) Ctrl-Shift-Up Arrow (Win)	Positive Y direction
Command-Shift-Down Arrow (Mac) Control-Shift-Down Arrow (Win)	Negative Y direction

You can also specify how often grid lines are displayed. You can enter any number greater than zero in the *Grid Lines* field. In the previous example, grid lines appear every 30 pixels.

NOTE: *Models do not save the units in which they were constructed. If you change the default units, and then open a model that uses another scale, the current units and scale are adopted by the opened model.*

SNAP TO GRID

Select this command if you want all objects to snap to the active grid when you

move them. Snapping occurs in the increments that you've specified in the Set Units dialog. This command also affects the placement of any objects you insert in your model.

SNAP TO GRID applies to any active grid in your model. When this command is enabled, a check appears next to the command name in the menu. Select the command again to disable this option.

HIDE GRIDS

Select the **HIDE GRIDS** command to hide all grids in your model. When you select this command, the View grid becomes the active grid, even though the View grid is also hidden. All modeling is done relative to the active view while **HIDE GRIDS** is enabled.

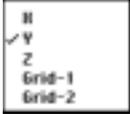
A check appears next to the command name in the menu when this command is enabled. Select the command again to disable it.

ACTIVE GRID

Select the **ACTIVE GRID** command to specify which grid is active. This command is available only if the **HIDE GRIDS** command is disabled.

When you select the command, a sub-menu appears. Each grid in the model appears in this list. Only one grid can be active at a time, and the active grid is

always visible unless **HIDE GRIDS** is enabled.

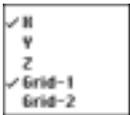


If you select a grid that is currently hidden (with the **VISIBLE GRID** command), that grid becomes visible only while active. Then, when you choose a different grid from the submenu, the current grid returns to its hidden status.

In addition to this command, there are other ways of selecting the active grid. You can select one of the World grids with the X, Y, or Z hotkeys. You can cycle forward or backward through all of the World or User-defined grids in your model with the plus (+) key or the minus (-) key.

VISIBLE GRIDS

When you select the **VISIBLE GRIDS** command, a submenu appears that allows you to specify which grids to display in the Modeling window.



To view individual grids, select them by name from this submenu. Any number of grids may be designated as visible at a time, or none at all, but the active grid is always visible unless **HIDE GRIDS** is enabled.

If **HIDE GRIDS** is enabled, the **VISIBLE GRIDS** command is dimmed and unavailable.

Grids that are visible in the Modeling window appear with a checkmark in front of their names. To turn off a grid that is currently visible (checked), select the grid again to de-select it. This will remove the check from beside its name.

SHOW/HIDE CLIPBOARD

The **SHOW CLIPBOARD** command displays the current contents of the clipboard. When the clipboard is open, the menu command changes to **HIDE CLIPBOARD**. The **HIDE CLIPBOARD** command is the same as clicking the clipboard window's close button.

You can't edit the contents of the clipboard. Each time you use the **CUT** or **COPY** commands, the contents of the clipboard are replaced. Also note that the clipboard is erased when the computer is restarted or shut down.

CUSTOMIZE MENUS

The **CUSTOMIZE MENUS** command lets you define your own command keystrokes to use in the menus. The command name itself is not editable.

StudioPro ships with a default set of keystrokes for the commands. You may use these, or change them as you desire. You may also add keystrokes to any command that does not already have one defined.

After selecting the **CUSTOMIZE MENUS** command, a dialog opens instructing you to choose the command to which you want to add or change the keystroke shortcut.



When you select a menu command to change, the command won't perform its normal function. Instead, a second dialog appears.



This dialog asks for a keystroke to be used (along with the **Command** key - Macintosh; or the **Ctrl** key - Windows) as the shortcut for the command. Be sure to hold down the **Command** or **Ctrl** key AND the key you want to use for the shortcut. When you click **OK**, the first dialog appears again. This dialog remains open so that you can change as many command keystrokes as you want at one time. When you've finished making changes, click the **Done** button or push the Return key.

Macintosh only: Normally, command keystrokes use a two-key combination involving just the **Command** key and another character. On occasion, you may wish to use a three-key combination. While you may enter only one character in the dialog, you can use the **Option** key (in addition to the **Command** key) while entering the single keystroke. Then, when you

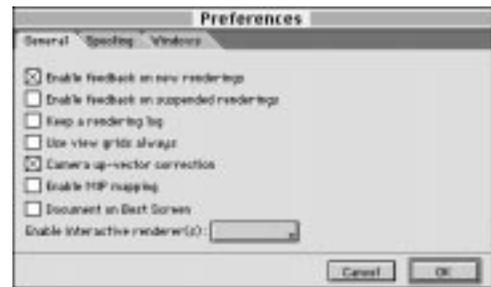
use the keystroke to select the command, you must hold down **BOTH** the keys while typing the character. Only two characters are displayed in the menu (the **Command** key and character combination), but the character displayed is the one obtained through the **Option** key, if used, to remind you of the special key-stroke variation.

PREFERENCES

You can change the default settings of the application so that StudioPro will start up each time with the settings you specify.

Choose the **PREFERENCES** command from the Edit menu to display the Preferences dialog. The dialog contains three tabs: *General*, *Spooling*, and *Windows*.

General



- **Enable feedback on new renderings.** Check this box if you want to watch the image take shape while it is rendering. This will cause the rendering process to take a little longer, however.

If this box is not checked, images still render internally, but no information is

sent to the screen so the rendering proceeds faster.

With the feedback turned off, you can still display the progress of the rendering.



Refresh button

Click once on the button with the pencil icon to update the Rendering window. The image redraws, and the rendering continues without further updating unless the pencil icon is clicked again.

- **Enable feedback on suspended renderings.** When this box is checked, screen feedback is *On* when suspended renderings are restarted. This is the same as the previous description of screen feedback for new renderings.
- **Keep a rendering log.** Enabling this option creates a text file that records the start and end times for your rendering projects. It also documents the name of the file, the number of frames, frame size, resolution, and image depth of the rendering.

```
Name: "Untitled.0001"  
Finish date: Aug 20 1997  
Finish time: 09:51:20  
Elapsed time: 0:04:05  
Number of frames: 4  
Frame memory: 1003K  
Frame size: 552 x 424  
Resolution: 72dpi  
Image depth: 32-bit
```

The rendering log contains a variety of information, including file name, finish time, and time to render.

Macintosh: *The rendering log is located in System Folder >Preferences>Strata Preferences.*

Windows: *StudioPro places the rendering log in the default Windows temporary directory, which is usually the \TMP or \TEMP directory located on the boot drive. If neither of these directories can be found, the rendering log is placed inside the Strata™ StudioPro directory.*

- **Use View Grids Always.** When this box is checked, new models open with the *View Grids* active. With *View Grids* enabled, all modeling occurs relative to the active view. To disable *View Grids*, click the *View Grid* button in the Modeling window. See **View Grids** on page 251 for more information.

If this box is unchecked, all models open with the default grid specified on the *Windows* tab.

- **Camera Up-vector correction.** When this box is checked, the default camera tool setting is to constrain the camera from rolling as it moves through your model. The camera always remains in a vertical orientation.
- **Enable MIP mapping.** MIP mapping prevents moiré patterns and/or background flickering in textures or backgrounds that contain surface maps. (See page 161 for more information.) Enabling this option may increase the amount of memory required.

When this option is disabled, MIP mapping won't be available in any new textures you create, but existing models will retain any MIP mapping already present.
- **Put new document on best screen.** If you have more than one monitor, checking this box will cause the new window to open on the best color monitor. If there is no difference in color depth between the monitors, the

window will open on the monitor where the Menu bar appears.

If this option is disabled, the new window also opens on the monitor where the Menu bar appears.

- **Enable interactive renderer(s).** This pop-up allows you to select the type of interactive renderers that load the NEXT time you launch StudioPro. Only LOADED renderers appear in the *Display Method* pop-up on the *Windows* tab of the Preferences dialog, so if the renderer wasn't selected in this pop-up before you launched the application this time, it won't be available for use in this session.

Spooling

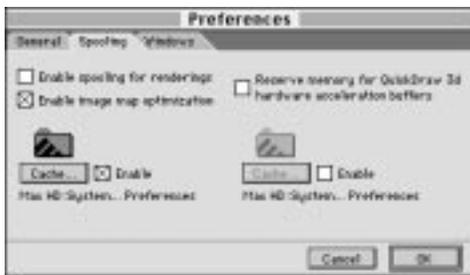


Image spooling is the process of setting up a buffer or cache on the hard-disk drive. A cache is a temporary memory or hard-disk storage allocation used by StudioPro. Using caches may cause slower rendering speeds. Several rendering processes require caches to make more room available when handling images that cannot fit completely in RAM.

- **Enable spooling for renderings.** The actual rendering process occurs in memory, but through the use of image

caching, renderings too large for the available memory can still be created.

Disabling this option forces StudioPro to keep the entire image in memory, which may render faster, but can severely limit the size of rendered images.

- **Enable image map optimization.** This checkbox allows a blanket optimization to occur for any new textures you create in your existing model, or when you open an existing model. Once the maps in existing models have been optimized, they remain in that form when saved, so you may wish to save map-optimized models with a different name.

This optimization improves rendering speed by storing ALL color maps in the model as 32-bit images and all gray-scale maps as 8-bit images. This allows rendering algorithms to run more efficiently. The actual speed improvement depends on several factors, but it will be significant.

Note that when the checkbox for map optimization is enabled, the color depth pull-down menu in the *Image Map* dialog is inoperative for individual maps you load into a texture, even though it still appears active.

Map optimization takes more memory, so if memory is a problem, you should disable this feature.

- **Reserve memory for QuickDraw 3D hardware acceleration buffers.** This option is only accessible if QuickDraw 3D is available. Enabling this option changes the way buffering is handled

for the QuickDraw 3D interactive renderers.

Checking this box causes StudioPro to set aside additional memory for use by QuickDraw 3D when a hardware accelerator card is used. If no acceleration card has been installed in your computer, this box should remain unchecked.

- **Cache...** These buttons allow you to designate two separate volumes on which to create spooling files. When no more space is available on the first volume, spooling continues to the other cache file. You can put the spooling file on any mounted volume that you have write access to.

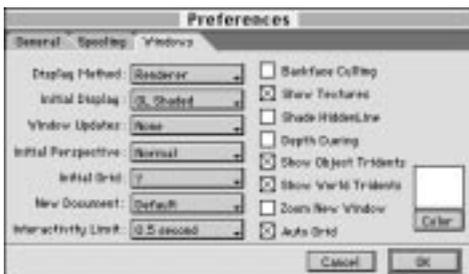
Once you have designated a location:

Macintosh: Click the "Select Current Folder" button at the top of the dialog.

Windows: Click the "Select" button.

A checkbox is also provided for enabling or disabling spooling to either volume. We recommend that at least one cache remain enabled at all times.

Windows

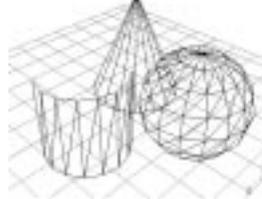


- **Backface Culling.** When this option is enabled, the back side of objects don't appear in the Modeling window. This

results in much faster redraw times for any of the interactive renderers, because the inside surfaces of objects aren't calculated.

When this option is enabled and modeling is done in *Wireframe*, only the frontside of the wireframe is displayed. However, you can still see "through" the wireframe, and objects behind other objects are visible; but the inside surfaces are eliminated from any of the calculations.

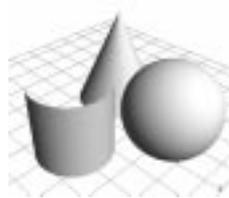
Wireframe



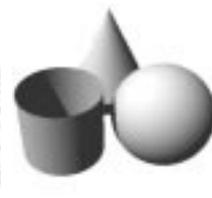
Notice that both the grid lines and the objects behind other objects are still visible in Wireframe mode.

Also, the inside surfaces of objects without endcaps won't be visible in the Modeling window.

This option applies to interactive renderers only, it does NOT affect renderings.



Modeling window



Rendered image

- **Display Method.** All currently loaded interactive renderer(s) appear in the pop-up menu. (See **Enable Interactive Renderer(s)** on page 25 for information)

on specifying which renderers load when StudioPro is launched.)

This pop-up allows you to select which loaded interactive renderers you want to appear in the *Display Method* pop-up in the Modeling windows. If you use more than one type of interactive renderer, sub-menus appear in the *Display Method* pop-up in the Modeling window.



To take advantage of texture display, backdrops, and depth cueing in modeling windows, make sure you have selected an interactive renderer capable of displaying these features (for example, OpenGL).

- **Window Updates.** When you perform an action in any window, this option determines how the other windows in your model update. Multiple windows may include Modeling windows, Camera windows, or Spotlight windows. (If views are split, all views within a single window update simultaneously, regardless of this setting.)

None. Windows only update when they become the active window.

Auto. When you let go of the mouse button, all inactive windows update.

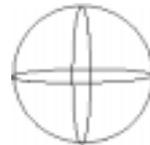
Live. All windows update as the action is performed in any window.

- **Initial Display.** You can specify the display method used when a new model window opens. There are several choices in the *Initial object display* field's pop-up menu; however, the choices available depend on the type of render-

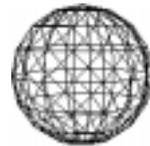
ing method you're using. See also pages 58 - 59 for a more complete description of each option.



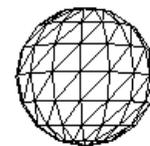
PointCloud is the simplest and fastest rendering method used by StudioPro. Only the vertices are rendered.



Outline displays only an outline of the objects. This gives you enough visual information to determine what the object is, but still allows you to model and animate quickly.



Wireframe generates a line representation of objects in a model. No surfaces, lighting, or surface shading are calculated.



HiddenLine (if supported by the rendering method) removes the hidden lines from the *Wireframe* representation before displaying them in the window.



Flat calculates a single color for each face on the surface, so the final rendering is faceted in appearance. This option is still relatively fast.



Shaded calculates surface orientation and lighting intensity. The objects are rendered with a smooth, shaded surface.

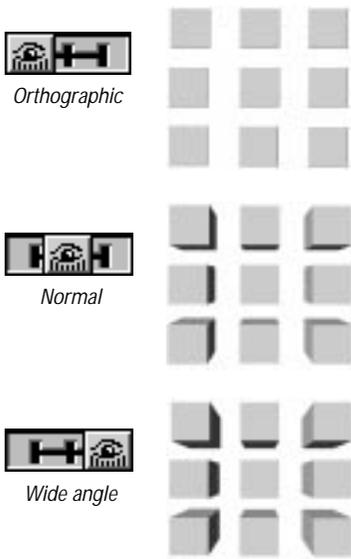
For the fastest redraws, use the *Point Cloud*, *Outline*, *Wireframe*, or *Hidden Line*

options. *Flat* speeds up redraws, but retains some of the color and lighting information in the Modeling window. *Shaded* lets you take advantage of all of StudioPro's modeling features, but takes longer to redraw.

You can change the display method later from the *Display Method* pop-up menu located at the top of the Modeling window.

- **Initial Perspective.** The default perspective used when opening new Modeling windows is set by the *Initial Perspective* field. The pop-up menu allows you to choose from three settings: *Orthographic*, *Normal*, and *Wide Angle*.

These settings correspond to the three-position perspective control located at the top of each Modeling window. The three choices indicate how the views in the new window present objects in the model. They indicate how much perspective is in the display.



Orthographic displays present the parallel lines of objects in the model as parallel lines in the views. There is no vanishing point, no convergence of lines with distance. *Orthographic* displays preserve the absolute dimensions of objects, so they can be sized accurately relative to each other.

The *Normal* and *Wide Angle* settings provide perspective and produce more realistic views, but do not maintain actual or relative dimensions. Distant objects appear smaller than those closer to the viewing plane, even when they are the same size.

- **Initial grid.** You can specify the default grid that appears each time you open a new model.
- **New document.** You can specify the default window that appears for all new documents.
- **Interactivity limit.** This pop-up menu allows you to set the speed at which a selected object reverts to a simple outline (bounding box) while in motion.
- **Show Textures.** When this box is checked, a representation of the texture appears on objects in the Modeling window. This option is available only if the interactive renderer is capable of supporting texture display. (For example, *OpenGL* supports texture display in the Modeling window.)

If all of the textures applied to the object use UV mapping, a composite of all the textures appears. (Only surface textures use a mapping type, so

all textures must also be surface textures.) If any of the textures use any mapping style other than UV, only the top texture is displayed.

If the top texture is a surface texture, the surface map and/or color are displayed. If the top texture is a *Solid* texture (wood, stone, or marble) or a *Simple Color* texture, the object appears as a single color.

Remember, only surface textures are displayed; solid textures (marble, stone, wood) appear as a single color. However, because a surface texture can be created with a map that looks like wood or marble, it may be difficult to distinguish surface textures from solid textures just by looking at the preview on the Resource palette. If you're not sure if the texture is a surface texture or a solid texture, open its texture editing dialog. If it doesn't say "Surface Texture" at the top, it's not a surface texture.

- **Shade HiddenLine.** When this option is enabled, objects displayed in *Hidden Line* appear with surfaces, similar to *Flat*, except the lines are also visible.



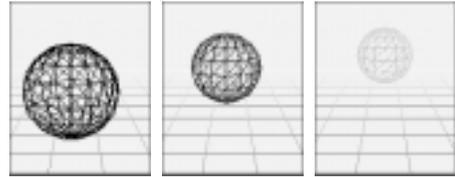
Shade HiddenLine enabled



HiddenLine with no shading

- **Depth Cueing.** When this option is enabled, the farther away an object is

from the view plane, the less visible it is.



The first sphere is closest to the view plane and fully visible.

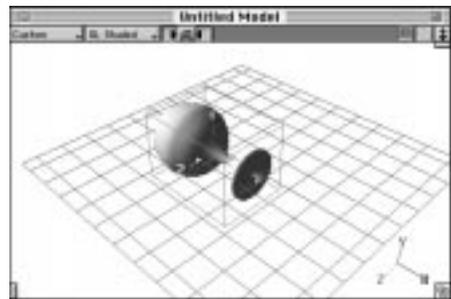
Notice the back side of the center sphere. The back side of the wireframe is less visible than the front.

The third sphere is farthest from the view plane, so it is less visible than the other two spheres.

This option is only available if the type of rendering method you're using is capable of depth cueing.

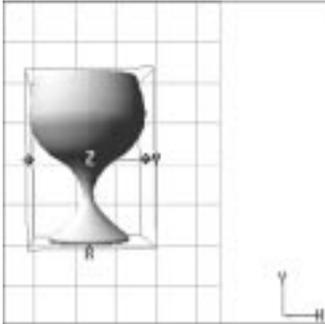
- **Show Object/World Tridents.** You can choose to show object tridents, world tridents, or both.

Tridents provide a visual indication of the orientation of grids and objects in your model.



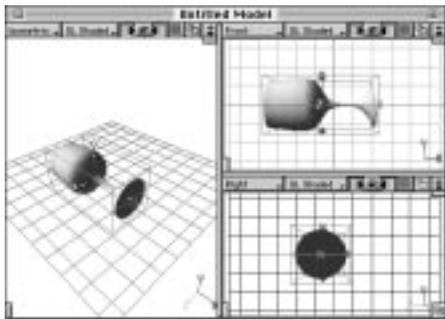
You'll find it much easier to keep track of an object's orientation, especially when using the *Transform* tab of the Object Properties palette to move, scale, or rotate objects. When you change views, the tridents make it

much easier to establish the object's orientation.



Changing grids becomes much easier also. You need only glance at the world tridents in the lower right corner of the window to determine which grid you want.

When views are split, each view displays its own set of world tridents.



- **Zoom new windows.** When this box is checked, new windows fill the entire screen space.
- **Auto Grids.** When this box is checked, switching views automatically switches

the active grid to the face-on grid. For example, if you switch to a top, bottom, or isometric view, the Y grid becomes the active grid. If you switch to a front or back view, the Z grid becomes the active grid. And if you switch to a right or left view, the X grid becomes active.

This does not in any way restrict you to any particular grid. You may still change to any grid you want, but this option automatically activates the grid that's easiest to model on from your current viewing orientation.

- **Background color.** You may specify the background color used in the modeling window.

NOTE: *If you have multiple monitors installed on your computer, StudioPro will ALWAYS open the system color picker on the monitor with the most color depth available.*

If you change the background color, that change applies immediately to the current model when you click the *OK* button, as well as for all future models. The background color is not saved with the model. Don't confuse the background color with the background applied to the model on the Environment palette. This is the background color of the Modeling window only.

SAVING PREFERENCE SETTINGS

Changes in the Preferences dialog box take effect immediately in the current model, and StudioPro updates its Preferences.



Macintosh	Windows
Select All ⌘A	Select All ⌘+A
Select None ⌘I	Select None ⌘+I
Mouse Filter...	Mouse Filter...
Hide Selected ⌘5	Hide Selected ⌘+3
Show Hidden ⌘4	Show Hidden ⌘+4
Make Shy ⌘5	Make Shy ⌘+5
Make Shy Normal ⌘6	Make Shy Normal ⌘+6
Make Construction ⌘7	Make Construction ⌘+7
Make Construction Normal ⌘8	Make Construction Normal ⌘+8
Hide Animation Paths ⌘9	Hide Animation Paths ⌘+9
Show Animation Paths ⌘0	Show Animation Paths ⌘+0

The Selection menu commands are provided to make it easier to handle complex models. These commands allow you to specify how objects are selected.

SELECT ALL

Macintosh: Command-A
Windows: Ctrl-A

Use the **SELECT ALL** command to select all of the visible objects, light sources, and cameras in your model. **SELECT ALL** is available when a model is active and there is at least one object in the model.

Selection handles appear around all selected objects. Any objects or shapes that are hidden are not selected with this command.

You can add or remove objects from the group of selected objects by holding down the Shift key while clicking on the object. In this manner, you can de-select a selected object without affecting any of the other objects.

SELECT NONE

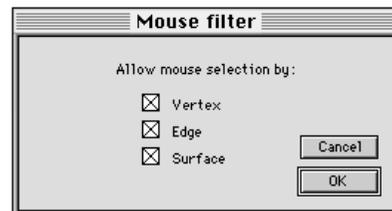
Macintosh: Command-1
Windows: Ctrl-1

The **SELECT NONE** command de-selects all currently selected objects. Using this command is the same as clicking the mouse button while the cursor is in the active view, but away from any objects.

MOUSE FILTER

Several selection commands are available to determine how and which objects to select. Sometimes it becomes very difficult to select objects, either because they are inside another object or behind an object in the active view.

The **MOUSE FILTER** command displays a dialog with options for selecting objects. These checkboxes allow you to select surfaces only, vertices only, or edges only; or you may use any combination of the three. The mouse filter settings are retained between sessions or until you change them.



Each time you click the mouse, StudioPro checks to see if this point matches any of

the mouse filters you've selected. If the point matches, the object is selected. If no match is made, no selection is made.

If you turn off ALL three selection filters, clicking on an object will never select it, since no condition exists to match the settings. However, you can still select objects in the Project window, or by dragging a selection marquee around them in the Modeling window.

HIDE SELECTED

Macintosh: Command-3
Windows: Ctrl-3

The **HIDE SELECTED** command hides the selected object(s). Hidden objects don't appear in the Modeling window, nor do they render while hidden.

You can use this command when you're trying to select objects behind, or inside, other objects. For more information on selecting objects that are hidden behind or within other objects, see **Selecting Objects** on page 92.

This command may also be useful when you want to temporarily hide objects. Hiding complex objects may decrease the time required for rendering and re-drawing.



When you select the **HIDE SELECTED** command, the "hide" icon appears next to the name of the selected object(s) or group in the Project window.

SHOW HIDDEN

Macintosh: Command-4
Windows: Ctrl-4

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



When you select the **SHOW HIDDEN** command, the "show" icon appears next to the names of all previously hidden objects in the Project window.

MAKE SHY

Macintosh: Command-5
Windows: Ctrl-5

The **MAKE SHY** command allows the object(s) to be visible when rendered, but *shy* objects do not appear in the Modeling window.

This feature is useful when you've finished working on a particular object in the model. You can remove the object from the Modeling window so that it doesn't obscure other objects or interfere with the modeling process.

If the object you've selected is an instance of a shape, then only the instance is hidden. Other instances are still visible. You can still access the shape for editing.



When you select the **MAKE SHY** command, the "shy" icon appears next to the name of the selected object in the Project window.

MAKE SHY NORMAL

Macintosh: Command-6

Windows: Ctrl-6

Use this command to make objects that were previously designated as “shy” to appear in the Modeling window, as well as in renderings.

 When you select the **MAKE SHY NORMAL** command, the “normal” icon appears next to the names of all objects that were previously shy in the Project window.

MAKE CONSTRUCTION

Macintosh: Command-7

Windows: Ctrl-7

Use the **MAKE CONSTRUCTION** command when you want the selected object(s) to display in the Modeling window only. Construction objects are used as an aid during the modeling process. They do not appear in renderings.

 When you select the **MAKE CONSTRUCTION** command, the “construction” icon appears next to the name of the selected object(s) in the Project window.

MAKE CONSTRUCTION NORMAL

Macintosh: Command-8

Windows: Ctrl-8

Use this command if you want all of the previously-designated construction objects to appear in rendered images.

 When you select this command, the “normal” icon appears next to the names of all objects that were previously specified as construction objects.

HIDE ANIMATION PATHS

Macintosh: Command-9

Windows: Ctrl-9

Use this command to hide all animation paths in the Modeling window.

When this command is enabled, pay special attention to the position of the *Current Time* pointer when you move objects. If you move an object when the *Current Time* pointer is anywhere other than at time zero, you are giving that object an animation path. If this command is enabled, the path will be hidden, and it may not be apparent that you moved the object.

SHOW ANIMATION PATHS

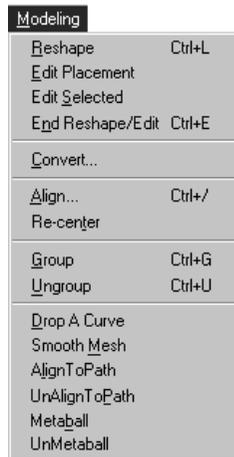
Macintosh: Command-0

Windows: Ctrl-0

Selecting this command displays the animation path of the object selected in the Modeling window, if that object has an animation path.



Macintosh



Windows

The Modeling menu contains commands for working with objects. It allows you to reshape objects, convert them to other object types, group and ungroup objects, etc.

Modeling extensions that are present in the *Strata StudioPro™ Extensions* folder (directory) at the time the application is launched appear at the bottom of the menu. The contents of this menu may change, depending on the contents of the *Extensions* folder.

RESHAPE

Macintosh: Command-L

Windows: Ctrl-L

Select **RESHAPE** to edit objects after they've been created. This command allows you to push and pull vertices on any axis to mold the object into any configuration. You can reshape both 2-D and 3-D objects with the Reshape command. The shape of any object can change over time.



You can also access this command by clicking the **RESHAPE** button on the Button bar.

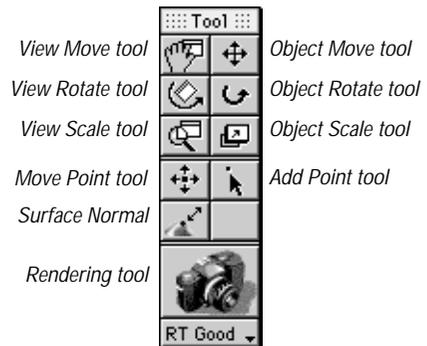
If the object you select cannot be reshaped, the command is dimmed. Some object types may need to be converted before they can be reshaped, depending on how you want to reshape the object.

Objects may be reshaped directly in the Modeling window. Select the object you want to reshape, then select the **RESHAPE** command from the Modeling menu.

To reshape an object that belongs to a group or shape, you can double-click on the group or shape. The group or shape opens in its own window, allowing you to select a single object. You can then Reshape the object in this window.

You can also select and reshape individual objects in a group or shape if that group or shape's *Base Properties* is opened in the Project window. For more information, see page 49.

Different object types are reshaped in different ways. The tools available on the ReshapeTool palette depend on the type of object that you're reshaping.



The top six tools provide the same function in Reshape mode as they do during modeling. The Object Move, Rotate, and Scale tools can be used on any of the objects in the Modeling window. They apply to objects only, not to selected vertex points.

As you edit an object, you can zoom in to work on a specific area. When you want to see the entire object in the view again, you can use the **FIT VIEWS TO SELECTION** command from the Windows menu. This is a quick way to accomplish the task, rather than use the zoom out option on the magnify tool.

This is especially useful if you have dragged some of the vertices outward to the edge of the workspace. This provides more room to move them further if desired, because the workspace will be made larger automatically to accommodate the larger object.

Additional tools are provided to assist you in reshaping objects by manipulating the vertices. Each tool performs a specific function.



Move Point tool. Use this tool to move one or more vertex points along a plane parallel to the active grid. If you hold down the **Command + Shift** keys (Macintosh) or **Ctrl + Shift** keys (Windows) while using this tool, you can move points perpendicular to the active grid.



Surface Normal tool. Use this tool to move the selected vertex point(s) in the direction the surface normal faces. (The surface normal is the direction the surface is facing in 3-D

space, or the direction perpendicular to the surface.)



Add Point tool. Use this tool to add another vertex point on the surface of a Bézier object. Adding a point causes the surface patch on which the point is added to sub-divide into more (and smaller) patches. You can only add vertex points to Bézier objects.



Render tool. This tool is provided so that you can render the object in its current state of progress as you manipulate the points.

Vertex points are visible whenever one of the reshape tools are selected (Move Point, Add Point, or Surface Normal tools). Vertices appear black when unselected, and turn red when you select them.

Any changes you make to an object while in Reshape mode take effect immediately. The **UNDO** command is available if you're unhappy with the results, but it must be used immediately after the action.

When you're finished reshaping the selected object(s), select the **END RESHAPE/EDIT** command from the Modeling menu, or click the End Reshape/Edit button on the Button bar.

RESHAPING 3-D OBJECTS

To push or pull points on the surface of three-dimensional objects, the objects must be Bézier or polygonal objects only. Primitives, such as cubes or spheres, must be converted to a different object type with the **CONVERT** command in the Modeling menu before they can be reshaped.

Comparing Bézier and Polygonal Objects

Vertex points are always visible on Bézier objects. But because there are usually so many more vertices on polygonal objects, to avoid confusion they only show when selected.



Bézier object:

- Always rectangular surface
- Direction handles on selected vertices
- Vertices always show



Polygonal object:

- Triangulated surface (When "Show Hidden Edges" box on Object Properties palette is checked.)
- Vertices show only when selected

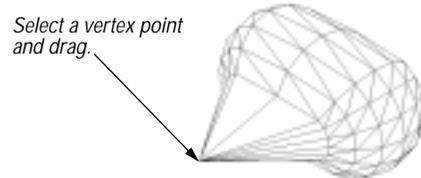
Bézier vertices are normally black, and turn red when you select them. Polygonal vertices appear red when they're selected. Bézier vertices have direction handles attached, allowing you to bend or warp the surface. Polygonal objects do not have direction handles.

When you move a Bézier vertex, the adjacent surface patches follow in a spline-like fashion. When you move polygonal vertices, adjacent polygons simply stretch or contract. You can also add and remove vertex points on a Bézier object.

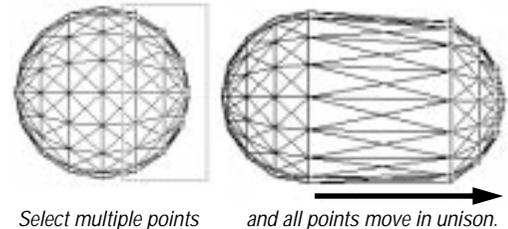
Reshaping Polygonal Objects

To edit a polygonal object, simply click on one or more vertex points and drag any

direction. The surface of the object redraws to show the changes.



You can pull more than one vertex point at a time. For example, to stretch a sphere into an ovoid, select multiple points by shift-clicking or using a selection marquee. Then, drag them in unison.



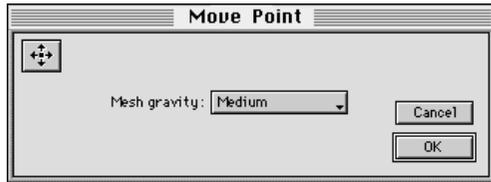
NOTE: You can only select vertex points that are visible, so you must be in Wireframe, Outline, or PointCloud display modes in order to select backfacing vertex points. In addition, the **Backface Culling** option on the Windows tab of the Preferences dialog must also be disabled to select backfacing points. (See page 26 for details.)

To move points perpendicular to the active grid, use the **Command + Shift** keys (Macintosh) or the **Ctrl + Shift** keys (Windows). A temporary grid line appears to assist you in the proper placement of the selected vertex points.

Gravity

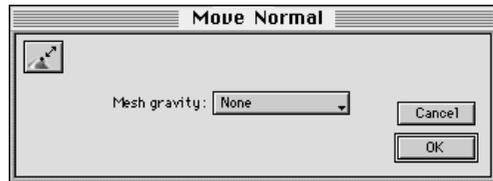
Pulling a single point often results in sharp spikes coming out of the object. If you want a more rounded effect, you can turn on *Gravity*.

To enable *Gravity*, double-click the Move Point tool to display the Tool Settings dialog.

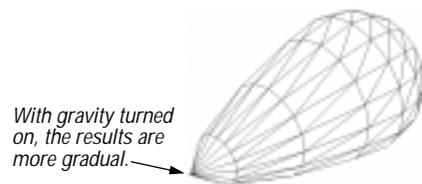
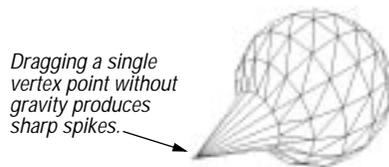


You can also specify the degree to which gravity affects the move operation. You can select *None*, *Low*, *Medium*, or *High* from the *Mesh gravity* pop-up list.

You can enable *Gravity* on the Surface Normal tool, as well. Double-click the tool to display its Tool Settings dialog.

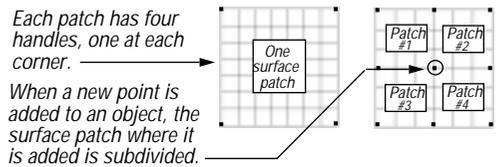


When *Gravity* is enabled, the distance other vertices move lessens with their distance from the vertex being dragged.



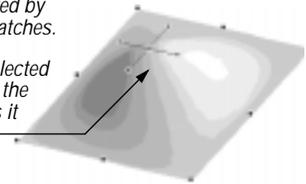
Reshaping Bézier Objects

It's easier to work with Bézier objects if you understand how surface patches are constructed and manipulated. The following illustration describes the basic structure. Think of a simple rectangle, with its single surface patch, as a sub-set of more complex objects with multiple surface patches; the behavior is the same.



The new point is shared by the four subdivided patches.

When that point is selected and moved, it affects the four adjacent patches it controls.



As long as the vertex point you are moving is shared by adjacent patches, the surface responds in a smooth, predictable way. Most vertices are like that.

Adding Vertex Points

Use the *Add Point* tool to add a point. Click on the surface where you want the point added. When you click, the window redraws to show any changes in the geometry.

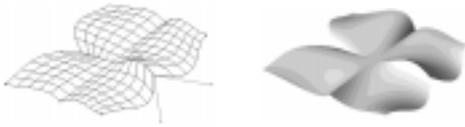
Whenever you add a point to a Bézier surface patch, it subdivides. This requires additional memory. To conserve memory, you should avoid adding more points than you need.

Deleting Vertex Points

Select the points you wish to remove and press the Delete key. The object will redraw to show its new form. You can **UNDO** the deletion if you don't like the results.

Hinging Direction Handles

To hinge a vertex point so that you can move its direction handles independently, hold down the **Option** key (Macintosh) or **Alt** key (Windows) while dragging the direction handle you want to hinge.



To create a crease in the surface of an object, "hinge" the vertex point by holding down the **Option** key (Macintosh) or **Alt** key (Windows) while dragging one of its direction handles.

Hinged vertices allow you to crease the surface. Aligning them makes the surface smooth at that point.

If the vertex point has four direction handles attached to it, only one set of handles are hinged when you use the **Option** key (Macintosh) or **Alt** key (Windows). The other handles that pass through the point aren't affected unless you also drag one of those handles with the **Option** or **Alt** key. Once you hinge a set of direction handles, you can drag them again without holding down the **Option** or **Alt** key.

Aligning Direction Handles

To align the direction handles of a vertex point that you have previously hinged,

grab one of the handles and visually align it with the opposite handle. When it's properly aligned, the handles snap into position.



An **ALIGN HANDLES** button is also provided on the Button bar that can be used to align selected direction handles. This command is especially useful when a single set of direction handles reside on two different planes.

RESHAPING 2-D OBJECTS

The **RESHAPE** command allows you to reshape 2-D objects after you have drawn them. This includes the 2-D construction elements used for creating objects with the various modeling tools, such as Lathe, Extrude, Path Extrude, etc.

The tools available on the Reshape Tool palette depend on the type of object selected.

If a **Lathe** object is selected, the **RESHAPE** command allows you to edit the 2-D profile used in the Lathe operation. When you select the command, the profile appears with its direction handles.

If an **Extrude** object is selected, you can manipulate the vertices to edit either the face or the bevel.



If a **Path Extrude** object is selected, direction handles appear on the control points of both the template and the path.

If a **Skin** object is selected, you can change the position, rotation, or scale of the ribs at

different times on the timeline to animate the skin object. If you want to change the geometry of the ribs, you'll need to unskin the object first. Then, with the ribs selected, you can select the **RESHAPE** command to edit the ribs, and then Skin the ribs again.

No Move Point tool is required for reshaping skin objects; the object manipulation tools are used for moving, rotating, and scaling the ribs of a skin object.

NOTE: *While the construction elements such as templates can be edited without first being converted, individual points on the object cannot. Once converted, you can use the Reshape command to edit these points. However, once an object has been converted to another type, you won't be able to convert it back into its original object type again.*

Editing Vertex Points

If the 2-D object you are editing is a polygonal object, you can reshape it by simply clicking on a vertex point and dragging the point to the desired position.

If you're editing a Bézier object, there are usually fewer points. You can move these points just as you would move points on a polygonal object, but each point also has direction handles attached. These handles allow you to bend the edges of the object if it is closed, or the line segments between points if it is an open polyline.

You can select and move more than one vertex point at one time. To select multiple vertices, you can either drag a marquee around them, or click on the points one at a time while holding down the Shift key. Then when you drag one of the selected vertices, all of the selected points move in unison. If all vertices are selected, moving one vertex point moves the entire object.

To deselect all vertices, click anywhere in the window away from the object.

Changing the Beginning Vertex Point

All 2-D regions have a beginning and ending vertex point. The green handle indicates the beginning point; the red handle is the ending point. All other vertices are square and black.

The location of the beginning point on an object is usually determined by the sequence in which the vertex points are created when the object was drawn in the Modeling window. However, some tools just arbitrarily pick a point.

Usually you do not care which vertex is the beginning point, but there are some situations where you may need to shift the beginning point to align it with beginning points on other 2-D objects.

Creating ribs for a skin object, for example, is one situation where the position of the beginning vertex point is very important to the result.



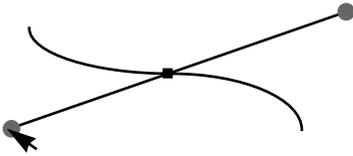
The location of the first point can affect the appearance of a Skin object. If the beginning points on the two ribs are not aligned, the final Skin object appears twisted.



To make a different vertex point the first point, select the desired vertex point, then click the **MAKE FIRST POINT** button on the Button bar. The selected point becomes the first point.

Working with Bézier Splines

The vertex point determines the absolute position of the line path or object edge as it passes through that point. Each vertex point has two direction handles that control or influence the curve of the line segment between it and the next point on either side.



The farther a direction handle is pulled out from its vertex point, the more force it applies to its line segment to bend or curve it. Direction handles are moved by clicking and dragging them.

Dragging Out Collapsed Direction Handles

If either one of the direction handles for a particular vertex point is not visible, it is because it has a zero force and is on top of the vertex point. No bending force is being applied to the line segment on that side of the point. However, you may want to change that part of the line or object.

To pull a direction handle off of a point, hold down the **Command** key (Macintosh) or the **Ctrl** key (Windows) while click-and-dragging that point. With this key down, the vertex point remains stationary and the direction handle is selected and dragged instead. If both direction handles are on top of the vertex point, the topmost handle is dragged out first. To get the other handle, repeat the process.

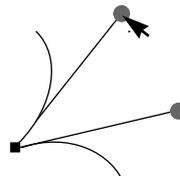
Once a direction handle is away from a vertex point, you can click-and-drag it without using the **Command** key (Macintosh) or **Ctrl** key (Windows). The **Command** or **Ctrl** modifier key can also be used if a direction handle from one vertex point happens to fall on top of another point. Without this modifier key, clicking on the direction handle will always select the point instead, since points are given precedence over direction handles.

Collapsing Handles

To collapse the handles, drag the handle to overlap the vertex point, then release the mouse button.

Hinging Direction Handles

You can hinge the vertex points so that the line or object edge is free to make sharp angles at the point. When a vertex point is hinged, its direction handles can be moved independently to adjust the curve of the line segments separately on either side of the point. Moving one direction handle has no effect on the other handle.



To hinge a vertex point, hold down the **Option** key (Macintosh) or **Alt** key (Windows) while dragging one of the direction handles. You can drag it without the opposite handle moving. Once you break the alignment between direction handles for a particular point, either handle can be later

moved freely without using the **Option** or **Alt** key again.

Aligning Direction Handles

Vertices usually have direction handles that are aligned with the line passing through that point. When the direction handles are aligned, they are hooked together. Adjusting one handle also moves the one on the other side.

To re-align previously hinged direction handles, grab one of the handles and move it until it is visually aligned with the one on the other side of the point and it locks into position. When you release the mouse button, the direction handles become linked together. If you move one of the direction handles again, the other follows.



You can also click the **ALIGN HANDLES** button on the Button bar. This command is especially useful when a single set of direction handles reside on two different planes. In this case, you may not be able to re-align these previously hinged handles into position by simply aligning them visually.

Removing and Adding Vertex Points

In addition to moving vertices, you may want to remove or add some vertices. Note that you cannot delete all the vertices from an object. A minimum of two vertex points are required for either a line or a closed Bézier object. To delete the entire object that you're currently reshaping, you must first exit Reshape mode by selecting the **END RESHAPE/EDIT** command. Then delete the object from the model.

Deleting Vertex Points

With the Move Point tool, select the points you wish to remove and press the **Delete** key. (Windows users may also use the **Backspace** key.) The object will redraw to show its new form. If you don't like the results, you can **UNDO** the deletion and try something different.

Adding Vertex Points

Hold down the **Option** key (Macintosh) or **Alt** key (Windows) while positioning the cursor on an edge or line between two other points. Then, when the cursor intersects the line, simply click the mouse button to add a vertex point.

You can add a vertex point and begin dragging it immediately. You do not have to release the mouse button between adding the point and dragging. When the mouse button is released, the window redraws to show the new point and any changes in the geometry.

Modifier keys used with the RESHAPE command:

- **Shift key**
Extends the selection of points. Without the Shift key, you can only select one point at a time. With the Shift key held down, if you select a point that is already selected, that point becomes deselected.
- **Command key** (Macintosh)
Ctrl key (Windows)
Use to drag out collapsed direction handles. Without this modifier key, the point moves instead of the handles.

- **Option key** (Macintosh)
Alt key (Windows)

Used to hinge direction handles so they can be moved independently.

- **Option key** (Macintosh)
Alt key (Windows)

While in 2-D Reshape, this key can also be used to add a point to a line. Hold down the Option or Alt key; when the cursor intersects the line, click to add a point.

- **Command + Shift keys** (Macintosh)
Alt + Shift keys (Windows)

Allows you to move the selected vertex point perpendicular to the active grid. (2-D regions must reside on a single plane, so individual vertex points cannot be moved perpendicular to the grid.)

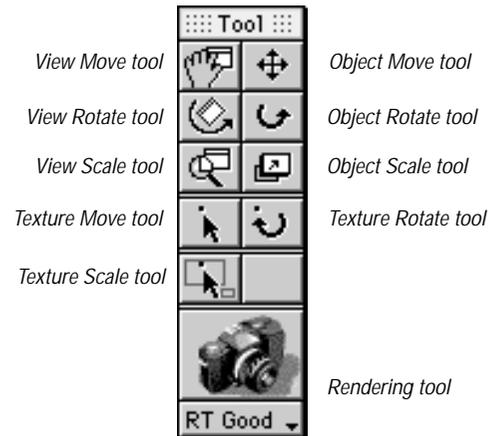
EDIT PLACEMENT

When you select this command, a list of all the textures applied to the selected object appear in a submenu. This command lets you position the selected texture on the object, as desired.

The command is also available by clicking the *Position* button on the Texture tab of Object Properties palette. Clicking this button lets you edit the placement of the texture selected in the scrolling list.

The Tool palette changes to display only the tools you need to change the position or alignment of the texture on the object. The top six tools are provided for use on the object itself, and three additional tools are provided for manipulating the tex-

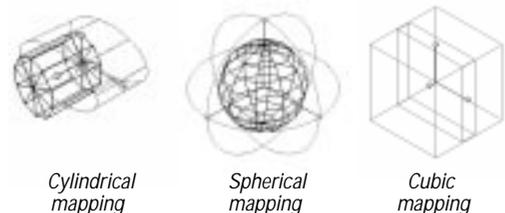
ture. The Rendering tool is also available for previewing the current placement on the object.



When you select the **EDIT PLACEMENT** command from the menu, handles appear on the selected object. You can move, rotate, or scale the texture as desired.

NOTE: If Mapping is set to UV on the Texture tab of the Object Properties palette, no handles are available and the placement of the texture cannot be changed. You can, however, change the mapping style at any time.

The handles allow you to place the texture precisely where you want it. The appearance of the handles reflects the mapping style you select.



A special **FIT TEXTURE** button is provided on the Button bar that allows you to center the texture on

the object with 100 percent coverage. This is the default texture orientation. You can use this feature at any time during the texture placement process.

NOTE: *If the texture contains a surface map and you've selected a display method that is capable of displaying the texture in the Modeling window (such as OpenGL), you'll be able to see the map as you position it on the object.*

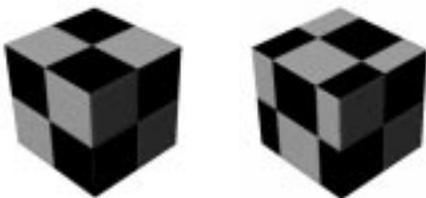
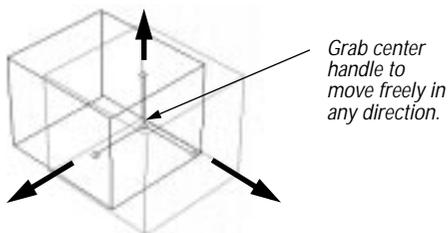
MOVING TEXTURES



Select the Texture Move tool to reposition the texture on the object.

Grab a face handle to constrain the movement of the texture perpendicular to the plane of the selected handle. Grab the center handle to move the texture freely in any direction.

You can place the texture anywhere on the object.

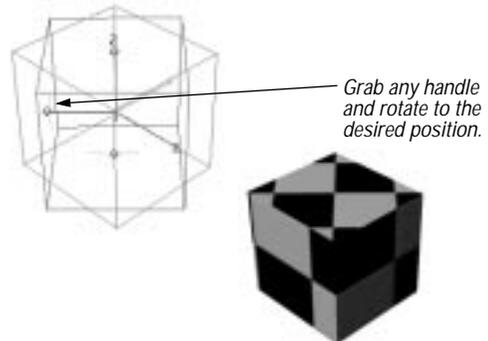


ROTATING TEXTURES



Select the Texture Rotate tool to rotate the selected texture on the object.

Grab the rotation handles and rotate to the desired position.

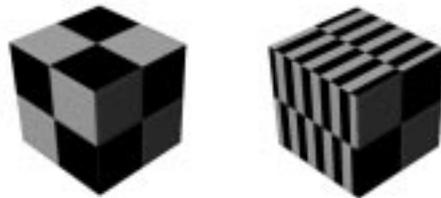
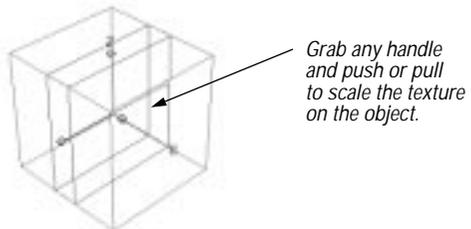


SCALING TEXTURES



Select the Texture Scale tool to scale the selected texture on the object.

Scaling the texture maps affects the way in which the maps tile onto the surface of the object.



When you're finished positioning and aligning the texture on the object, select the **END RESHAPE/EDIT** command from the menu or click the **END RESHAPE/EDIT** button on the Button bar.

EDIT SELECTED

When you select this command, a submenu of all the textures or effects applied to the selected object appears.

When you select a texture or effect from the submenu, its editing dialog appears, allowing you to edit it as desired.

Any changes you make in this dialog apply to ALL of the objects that this texture or effect is applied to.

You can't edit the position of the texture on the object with this command, only the texture itself. To change the texture's position, see **Edit Placement** on page 43.

END RESHAPE/EDIT

Macintosh: Command-E

Windows: Ctrl-E

Use this command when you're finished reshaping an object or editing the attributes of an object. This command exits the various modes invoked after selecting one of these commands:

RESHAPE command

EDIT PLACEMENT command

EDIT SELECTED command



You can also use the **END RESHAPE/EDIT** button on the Button bar to exit any of these modes and return to basic modeling mode.

CONVERT

The **CONVERT** command in the Modeling menu allows you to change an object from one type of geometry to another.



You can also access this command by clicking the **CONVERT** button on the Button bar.

There may be several reasons for wanting to convert an object from one type to another. You may want to animate the ribs of a Path Extrude object, for example. Or, you may want to reshape the object in a manner that is not allowed with the current object type, such as pushing or pulling points on the surface of a lathe object. In order to accomplish this, you would first need to convert the lathe object into a polygonal or Bézier object.

Once you convert an object from one type to another, the link to its native modeler or tool is broken, and you may not be able to convert it back to its original object type again.

For example, if you convert an object created with the Extrude tool into a polygonal mesh, you will not be able to edit the Extrude parameters again. The **RESHAPE** command will now allow you to push and pull individual vertices, but you can no longer edit the template or the bevel of the object because the object is no longer linked to the Extrude tool.

Converting Objects

Select the object(s) you want to convert; then select the **CONVERT** command from the menu to display the *Convert* dialog. All of the allowable conversions appear in the dialog. Those that don't apply to the

selected object(s) are dimmed and unavailable.

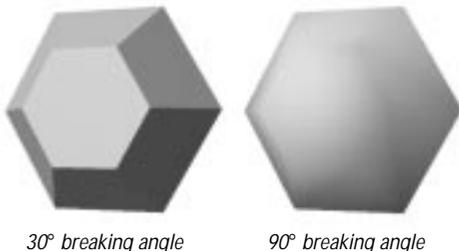


- **One sided.** This checkbox allows you to specify whether the object is one-sided or two-sided after the conversion operation.

If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as *Fog* or *Mist*, it must be created as a solid, one-sided object.

- **Breaking angle.** The *Breaking Angle* field only applies when converting objects to *Polygon Mesh*. It sets the maximum angle between adjacent polygons. If the angle of incidence is greater than this value, no smoothing occurs at this particular boundary, and the surface appears creased.

The range for this field is from zero to 180 degrees. Generally, the higher the value, the smoother an object appears. Lower values result in a more angular appearance of the surface.



Object Types

The conversions available depend on the type of object(s) selected:

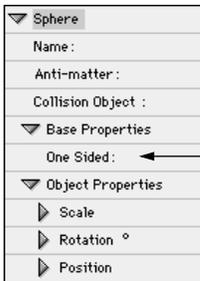
- **Skin:** Objects created with the Lathe, Extrude, or PathExtrude tools can be converted to Skin objects.
- **Bézier Surface:** 3-D primitives (spheres, cones, cubes, rounded cubes, cylinders); Skin objects (may convert to part *Bézier Surface* and part *Bézier Region*); filled or unfilled 2-D rectangles, rounded rectangles, and discs created with the Oval tool.
- **Bézier 2-D Region:** Filled, two-dimensional objects created with the Rectangle, Rounded Rectangle, or Oval tools. Objects created with the Polygon tool must be converted to *Polygon Group* first, and then converted to *Bézier Region*.
- **Polygon Mesh:** Almost any object can be converted into a polygonal mesh. This includes all of the 3-D primitives, any filled 2-D primitive, Bézier surfaces, and Bézier regions. Unlike other object types, polygonal meshes can also be re-converted to *Polygon Mesh*, allowing you to change the breaking angle of the mesh object.
- **Polygon Group:** Anything that can be converted to a *Polygon Mesh* can be converted to a *Polygon Group*. (However, a *Polygon Group* cannot be re-converted to a *Polygon Group*.)

All conversions occur on a one-to-one basis. That is, if five objects are selected and converted to *Bézier Surface*, the result will be five Bézier surfaces. If the five objects are grouped together first, the

result will be one group with five Bézier surfaces.

However, if five objects are grouped together and converted to *Polygon Mesh*, the result is ONE mesh. When converting to *Polygon Group*, the result is one group with all of the polygons. This allows you to combine multiple meshes together.

When objects are converted, all of the properties listed under their *Base Properties* in the Project window are lost during the conversion process. All of the properties listed under *Object Properties* are maintained. However, once you group an object, the object and ALL of its properties – both *Base Properties* AND *Object Properties* appear under the Group's *Base Properties*.



If this Sphere is converted, its One-sided state would NOT be retained, because it is a Base Property of the sphere. Only the Object Properties of the sphere would be retained.



Once grouped, the sphere and ALL of its properties (BASE and OBJECT) become the Base Properties of the Group, and are therefore lost when converted.

So, if you group an object BEFORE converting it to another object type, ALL of its properties are lost. This provides a way of eliminating any information that may

become unnecessary later. For example, if you've used a lattice to deform a sphere so it resembles a head, once you've achieved the shape you want, the lattice is no longer necessary. If you group the new shape before converting it, the lattice is removed. Removing the lattice requires less calculations and significantly speeds up the time required for redraws. However, if you want the shape of the sphere to deform over time, don't group it before converting it because grouping it would result in a loss of all the time-varying information, as well as all of its other properties.

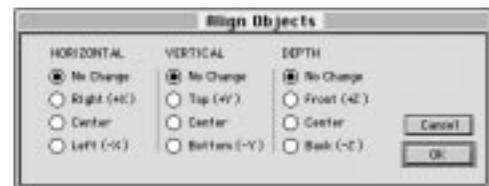
ALIGN

Macintosh: Command-/

Windows: Ctrl-/

The **ALIGN** command allows you to align selected objects on the horizontal, vertical, or depth axis, either separately or in any combination of the three. **ALIGN** is available whenever two or more objects are selected.

The *Align* dialog allows you to specify which combination of alignments you want. When you first open the dialog, the settings default to *No Change* on each axis.



The alignment options in the dialog box (left, center, top, front, etc.) are relative to the front view in world coordinates. You can align the objects horizontally by either their left or right sides, or by their

centers. The vertical alignment can be by the tops, bottoms or centers of objects, and depth alignments are by front, back or object centers.

If none of the selected objects are locked, the location of the outermost object on each axis determines the boundary for the edge alignment point. Objects move to the point of alignment on each axis you choose. If the position of one of the selected objects is locked (on the Transform tab of the Object Properties palette), the command uses the outermost extents of the locked objects as the alignment boundaries.

RE-CENTER

The **RE-CENTER** command positions the object's origin point back to its geometric center after the origin point has been moved. The **RE-CENTER** command is available whenever an object is selected. If more than one object or group is selected, each origin point is re-centered.

The object origin point is the point that the object rotates around. This point is not necessarily at the geometric center of the object.

When the display method is set to *Wireframe*, *Outline*, or *PointCloud*, you can see the object origin point whenever an object is selected. It appears as a small blue diamond.

When you first create an object, the origin point is located at the geometric center of the object. However, you may want to move the origin point to a new location.

The position of the origin point can affect the object in the following ways:

- It sets the axis for rotation on the object.
- It is where a child object is linked to its parent.
- It locates the object on its animation path.

To move the origin point without moving the object itself, hold down the **Command** key (Macintosh) or **Ctrl** key (Windows) while dragging the origin point to its new position. This position now becomes the point around which the object rotates. Instead of grabbing the origin point, if you hold down the **Command** key (Macintosh) or the **Ctrl** key (Windows) and grab the object, the object moves and the origin point remains stationary.

You can move the origin point in any direction on the active grid or in a plane parallel to the active grid. To move the origin point perpendicular to the active grid, you must switch to a perpendicular grid.

The **RE-CENTER** command is the easiest method for putting the origin point back in the geometric center of an object, although you can reposition it back to its center manually, as well.

The origin point of objects imported from other applications may not be located in the geometric center. You may need to use the **RE-CENTER** command on objects after importing them into your model.

You may need to use the **RE-CENTER** command for a number of reasons:

- **After linking two objects.** For example, you might want the child-object to

rotate about its own geometric center rather than the parent's. (When you link one object to another, the child's origin point moves to the position of the parent's origin point.)

- **After lathing or extruding a 2-D object.** Otherwise, the origin point remains in the center of the template.
- **After manually moving the origin point for some operation.** This is often done for special rotation needs.

Modifier keys that apply to POSITIONING object origin points:

- **Command key** (Macintosh)
Ctrl key (Windows)
Moves the object origin point without moving the object. Without the Command key, the object moves with the origin point.
- **Command + Shift keys** (Macintosh)
Ctrl + Shift keys (Windows)
Constrain the motion of the origin point to 90-degree increments on the active grid, or on a plane parallel to the active grid. Unconstrained, the origin point can move diagonally.

GROUP

Macintosh: Command-G
Windows: Ctrl-G

Use the **GROUP** command to combine two or more objects into one. This command is available whenever any individual objects or groups are selected. There can be as many grouping levels as desired.



This command is also available by clicking the **GROUP** button on the Button bar.

You can group any combination of objects, cameras, and/or light sources together. Once you've grouped them, they act as one object. You can perform the same basic operations on a group that you can perform on a single item. When a group is established, its coordinate system is aligned to the active grid.

When selected, groups normally appear within a single bounding box. However, if the group's *Base Properties* is opened (turned down) in the Project window, individual components of the group can be selected individually. (See **Editing Groups**, below.)

A group can contain other groups; for example, two or more groups can be grouped together.

This command can also be used with single objects. There may be times when you want the object's coordinates aligned to the grid. Once you rotate an object, for example, its own coordinates may no longer be aligned to the grid, and moving the object perpendicular to the grid may be difficult. When you group an object, a new set of coordinates is established for the group, with its new coordinates aligned to the active grid. Therefore, once you group the object, you can grab the handle parallel to the active grid and move the object away from (perpendicular to) the grid. Then, after you've moved the object, you can ungroup it to restore its previous coordinates.

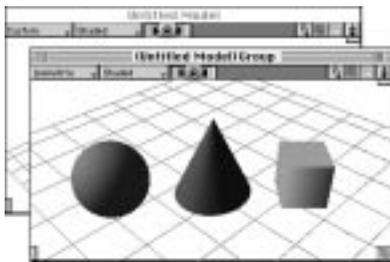
EDITING GROUPS

You can access the individual objects within a group in two ways:

- **Double-clicking on the group in the Modeling window.** It may be easier to work with a group in its own window. You can open a group in its own window by double-clicking on the group.

For example, you may want to change the relative position of the individual objects within the group. If the model is complex, it may be difficult to access parts of the group without affecting other objects.

You can double-click on the group so it opens in its own window, then change the position, scale, etc. of the individual components within the group. You don't need to **UNGROUP** the group first.



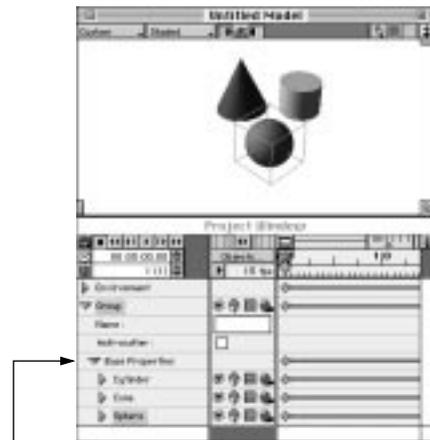
- **Open the Group in the Project window.** Then, open (turn down) the *Base Properties* triangle. Any time the *Base Properties* field of a group (or shape) is in its "open" position in the Project window, the individual objects that make up the group can be edited and

otherwise manipulated in the Modeling window.



Notice the selection borders. When the *Base Properties* field is closed, a selection border appears around the entire group.

When the *Base Properties* field is opened, each object can be selected separately.



When the *Base Properties* of the Group is opened (turned down), you can select and edit the individual objects within the group.

SHAPES WITHIN GROUPS

Even when you can't access individual objects within a group, you can still access shapes that are part of a group in their own shape windows. Any changes you make to a shape in its workspace will appear in any instances of the shape, even if it is inside of a group at the model level.

UNGROUP

Macintosh: Command-U
Windows: Ctrl-U

Use the **UNGROUP** command to split grouped objects into separate objects again. You can access this command any-time one or more grouped objects are selected.



You can also select the **UNGROUP** button on the Button bar.

When a group contains other groups, only the outermost group is affected by the **UNGROUP** command. Each time you use this command, the next level is ungrouped.

Each object's previous coordinate system is re-established when ungrouped.

You can ungroup shape instances at the model level also. However, when a shape instance is ungrouped, it loses its hierarchical connection to the shape, and it becomes a regular object. It may be better to edit the shape instance in a Shape window instead.

ALIGN TO PATH

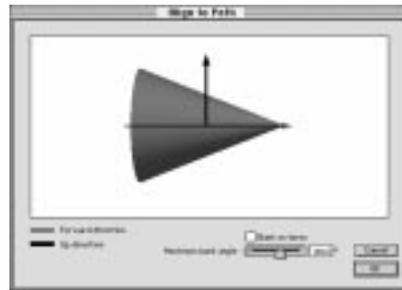
Select the **ALIGN TO PATH** command from the Modeling menu to align an object to any animation path that it may be associated with, either currently or at any time in the future.

You control which direction the object is pointing as it travels along its path. This command also allows you the option of having your object "bank" on turns as the animation path changes direction.



You can also access this command by clicking the **ALIGN TO PATH** button on the Button bar.

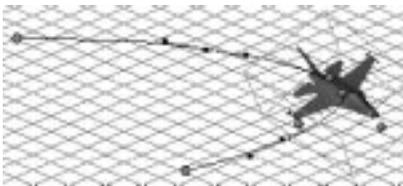
To use this command, you must have an object selected in the Modeling window. When you select the **ALIGN TO PATH** command from the Modeling menu, the *Align to Path* dialog appears, displaying a representation of the selected object with controls to orient it relative to its animation path.



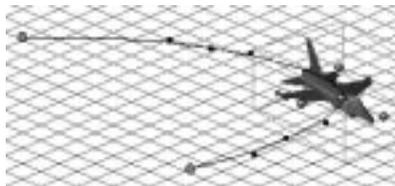
Two directional pointers, one indicating the forward direction and one indicating the up direction, are overlaid on the selected object. You specify which parts of the object represent *forward* and *up*. The

object's *forward* point will be rotated so it always points in the direction the object is moving. The *up* point will always be aligned perpendicular to the "best fit" plane in which the object is moving. Use the cursor to click on any of the selection handles, and then drag to rotate the object in the desired direction. When you release the mouse button, the object is redrawn to show its new alignment along any path that it's attached to.

This dialog also gives you the option of having the object "bank" on turns as the animation path changes direction. The slider allows you to specify the approximate maximum banking angle that may be used over the entire animation. When the *Bank on turns* option is disabled, the object's *up* point always remains pointing in the same direction.



"Bank on turns" feature enabled.



"Bank on turns" feature disabled.

NOTE: Once an object is aligned to a path, it cannot be rotated with the Rotate tool. However, you can change the rotation on the Transform tab of the Object Properties palette, although the new coordinates won't take effect unless you unalign the object with the **UNALIGN TO PATH** command.

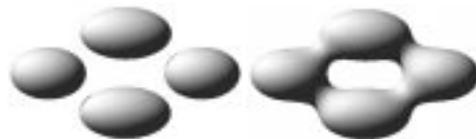
The forward and up alignment of an object is time varying. The settings in this dialog take effect at the current time (the time indicated by the position of the *Current Time* point on the timeline), and remain in effect unless changed again.

UNALIGN TO PATH

This command is provided to remove the **ALIGN TO PATH** constraint from an object. Select the object, then select the **UNALIGN TO PATH** command from the menu. The object will no longer automatically point forward as it travels along its path.

METABALL

The **METABALL** command lets you transform separate elliptical shapes into a single, smoothly-blended entity. You can create and animate spheres that seem to melt together as they come close to one another.



Spheres before Metaball

Sphere of Influence = 2.0



Sphere of Influence = 2.5

Sphere of Influence = 3.0

You have full control on how close the spheres must be to one another before they begin to blend together. (See **Editing Metaballs**, below.)

To use the Metaball modeler, first select two or more spheres to use in the Metaball operation, and select the **METABALL** command from the Modeling menu.

A Metaball entity is created immediately after selecting the command.



You can also access this command by clicking the **METABALL** button on the Button bar.

If two or more ellipsoids are not selected, or if any of the selected objects are not ellipsoids, the command and the button are dimmed and unavailable.

You can select any ellipsoid created with the sphere tool; it does not have to be a perfect sphere. Although the Metaball operation supports spheres of any size or proportion, it works fastest with those that are approximately the same size and of nearly equal proportions.

Select single spheres only; grouped spheres must be ungrouped before they can be used. Any number of spheres can be used in a single Metaball operation, assuming enough memory is available. Spheres that have been converted to other object types are no longer spheres, and cannot be included in a Metaball operation.

If you animate the spheres beforehand, the motion will be incorporated in the final entity. For example, if you script the spheres to travel toward each other from a distance, pass through each other, then travel away from each other again, the rendered animation will show the spheres traveling toward a shared point in space, globbing together as they get closer to that point until they seem to become a single

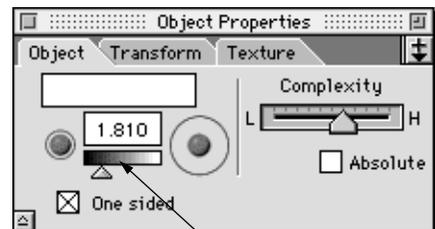
sphere, and then pulling apart into individual shapes again as they go their separate ways.

Any textures that were applied to the spheres before the Metaball modeler is used will not appear on the Metaball entity. Once the Metaball operation is complete, textures can be re-applied.

Editing Metaballs

To rearrange the spheres within an existing Metaball, unjoin the Metaball with the **UNMETABALL** command, re-arrange the spheres, and then rejoin them by selecting the **METABALL** command again.

Once you've created a Metaball entity, you can also edit it on the Object tab of the Object Properties palette.



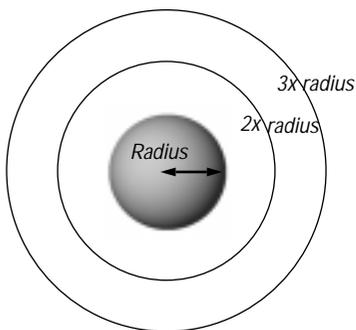
Radius of Influence slider

- **Name.** This field contains the name of the Metaball entity. You can add a name, or change the existing name in this field at any time. The name is also reflected in the *Object* list of the Project window.
- **Radius of Influence.** The *Radius of Influence* slider determines when and to what extent the spheres will merge.

Moving the *Radius of Influence* slider to the left reduces the radius of influence, so the spheres need to be relatively close together for the globbing effect to appear.

Sliding the bar to the right increases the sphere's influence, allowing the spheres to be farther apart while still affecting each other.

A value of 2.0 creates a sphere of influence with a radius that is twice the radius of the sphere itself. A value of 3.0 creates a sphere of influence with a radius three times the radius of the sphere.



Acceptable values for *Radius of Influence* range from 1.1 to 5.0. The Metaball modeler initially uses a default radius of 1.5.

When you change the *Radius of Influence*, the radius specified becomes the default setting for future Metaball operations. The new default setting remains in effect until the radius is changed again, or until you unjoin an existing Metaball with the **UNMETABALL** command. If you unjoin a Metaball entity, the radius setting of that entity becomes the new default setting. The *Radius of Influence* is not time varying.

- **Complexity slider.** The position of this slider determines the complexity, or amount of detail, with which the Metaball entity is rendered, either in the Modeling window or in the final image. It does NOT change the complexity of the entity (which is defined mathematically), but only the way the polygon renderers display it.
- **Absolute checkbox** - When this box is *unchecked*, the slider indicates a relative complexity based on the maximum allowed by that renderer. The range of complexity is also affected by the size of the Metaball entity and its proximity to the view plane.

When this box is *checked*, the slider indicates the EXACT percentage of the maximum complexity allowed.

UNMETABALL

This command lets you undo the Metaball operation on the selected Metaball entity. If no Metaball entity is selected, the button is dimmed and not available.



You can also access this command by clicking the **UNMETABALL** button on the Button bar.

When you **UNMETABALL** a Metaball entity, the radius of that entity becomes the new default setting for future Metaball operations. This simplifies the process of editing a Metaball entity. (See *Editing Metaballs*, above.) This default setting remains in effect until a new radius is specified in the Object Properties palette, or until you unjoin another Metaball entity.

If you select the **UNMETABALL** command, textures applied to the Metaball entity are lost, and any textures that were originally applied to the spheres **BEFORE** the Metaball operation will be restored to the individual spheres again.

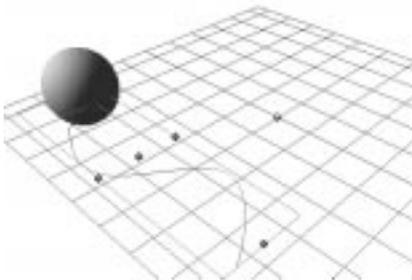
DROP A CURVE

The **DROP A CURVE** command allows you to easily duplicate the animation path of any object in your model by creating a 2-D Bézier curve that matches the path exactly.



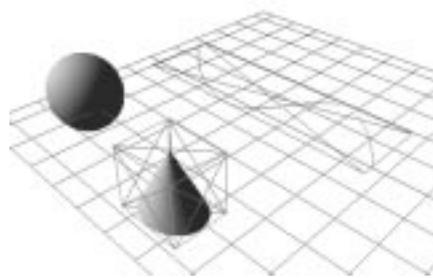
You can also access this command by clicking the **DROP A CURVE** button on the Button bar.

When you click the **DROP A CURVE** button or select the command from the Modeling menu, a Bézier curve is placed directly below the animation path of the selected object.

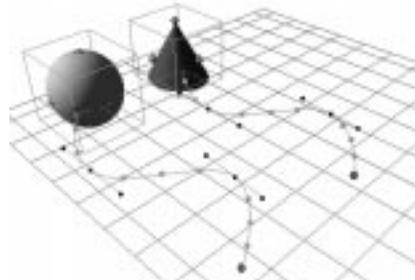


This command is only available if an object with an animation path is selected in the Modeling window.

You can select the line and position it anywhere in your model. This curve can then be converted into an animation path for another object with the Convert to Path tool, creating identical paths.



The **DROP A CURVE** command allows you to animate multiple objects in your model so that they move in unison.





Macintosh



Windows

The Rendering menu includes commands for specifying the various options that relate to rendering images.

RENDER

Macintosh: Command-R

Windows: Ctrl-R

Use the **RENDER** command to begin the rendering process. This command is available whenever a model, shape, or camera window is active.

It is important to remember that there are settings in the Project window that may affect the outcome of the final rendering.

These icons determine if the object renders



This icon controls shadow casting

These settings determine whether or not an object appears in the rendering or if it casts shadows. Each object has its own settings. For more information, see **Project Window** on page 257.

When you select the **RENDER** command, the *Render* dialog opens, allowing you to choose the rendering method, the level of

anti-aliasing used, set the frame or number of frames to be rendered, and the image size and resolution.



SETTINGS

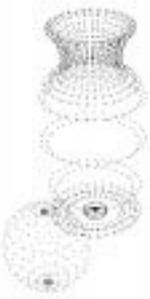
You can set the options and values in the dialog to previously defined settings. It can be one of the standard StudioPro configurations; or, if you previously saved any of your own configurations from this dialog, they will also appear in the *Custom* submenu. See **Saving Custom Settings** on page 69 for more information on creating your own rendering settings.

RENDERER

The available rendering algorithms appear in the *Renderer* pop-up list. All renderers may not be available. The renderers available depend on the type of rendering method you're using.

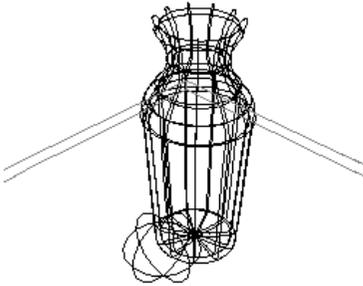
Select a rendering method that only supports those features that actually contribute to the image.

PointCloud



PointCloud is the simplest and fastest rendering method used by StudioPro. Only the vertices are rendered. It is used primarily for displaying your model in the Modeling window, but it might also be useful for rendering animation sequences for previewing purposes.

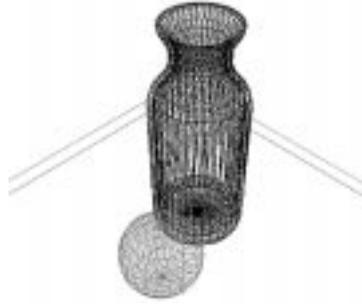
Outline



Outline displays only an outline of objects in the Modeling window. This display method gives you enough visual information to determine what the object is, while allowing you to model and animate quickly.

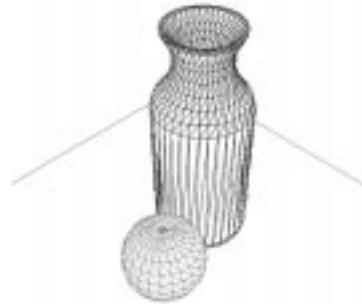
This is a good display option to use when speed is more important than detail.

Wireframe



Wireframe is generally used for displaying the model in the Modeling window, but you can also use it to render images quickly. It generates a line representation of objects in a model. No surfaces, lighting, or surface shading are calculated. In *Wireframe*, no surfaces are shown; surfaces are indistinguishable from hollow areas.

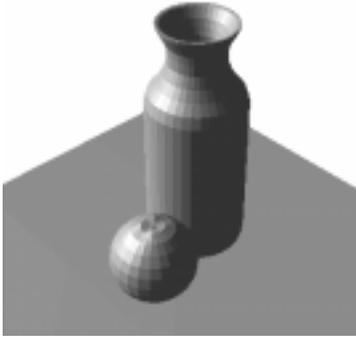
HiddenLine



HiddenLine display method removes the hidden lines from *Wireframe* representations before displaying them in the view or in rendered images, so objects appear solid, with implied surfaces, but without any illumination on the surface. The *HiddenLine* display method makes it much easier to determine the orientation of objects.

NOTE: *HiddenLine* display method may not be supported by all rendering methods.

Flat



This rendering algorithm calculates a single color for each face on the surface. The orientation of a surface relative to the light source(s) illuminating it is also factored into the color as an intensity value.

Flat is relatively fast. However, it uses only one lighting calculation per polygon, so the final rendering is faceted in appearance. This renderer is most often used for preview-type images and animation development.

Shaded



The *Shaded* renderer calculates polygonal surface orientation and lighting intensity.

The objects are rendered with a smooth, shaded surface.

The *Shaded* rendering method can be used for displaying the model in the Modeling window. It can also be used for rendering images and animations. This rendering method is relatively fast, but it doesn't include many of the features found in the higher level renderers.

Scanline



Scanline renders high quality images, and does it faster than *Raytracing*. This renderer is a good choice if your image doesn't require refraction or inter-object reflectivity. *Scanline* is also capable of rendering soft shadows.

The *Scanline* renderer renders images one line at a time. It supports shadows, environmental reflectivity, and transparency, although additional time may be required to complete the rendering process when these options are enabled.

This renderer is capable of rendering extremely small detail, including polylines that may be missed by other rendering methods.

Expert Settings

When you select the *Scanline* renderer from the pop-up list of available rendering methods, the *Expert* button becomes available.

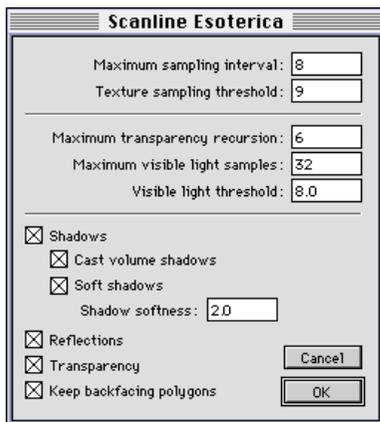


If you choose the *Scanline* renderer...

...the *Expert* button becomes available.

When you click the *Expert* button, the *Scanline Esoterica* dialog appears.

When you first install StudioPro, the default values present in the *Scanline Esoterica* dialog are designed to deliver the most efficient overall performance. You can customize these settings to fit your own specific requirements.



- **Maximum sampling interval.** The Scanline renderer starts with large blocks of pixels which are refined

smaller and smaller during the rendering process. The refinement continues on every pixel block until the maximum block size is reached. At that point, the *Texture sampling threshold* setting decides which blocks to refine smaller. The Scanline renderer retains its ability to render fine details even when larger block sizes are used. A setting of four in this field means a four-pixel by four-pixel block.

- **Texture sampling threshold.** When the maximum sampling interval is reached, the Scanline renderer scans the image block-by-block to see if it needs to be refined further. If two adjacent blocks of pixels have a difference in color values, this field determines the variation threshold, when it is significant enough for the Scanline renderer to refine the two blocks to resolve the difference. This process will continue until all adjacent blocks (pixels) are within the allowed percent of variation.

Setting the value higher increases rendering speed, but may cause noticeable color banding of certain colors on curved, shaded surfaces. Setting the value lower forces all block sizes to be resolved more finely, even if banding is not visible.

- **Maximum transparency recursion.** The value in this field represents the number of transparent surfaces the Scanline renderer will look through to see if something is behind it. This only affects models that have multiple transparent objects in front of each other. This setting has no effect unless the

Transparency checkbox in this dialog is checked (enabled).

- **Maximum visible light samples.** The value in this field specifies the maximum number of times the light is sampled to determine the detail of shadow casting through objects to which volumetric effects, such as mist, have been applied. (Shadows are cast *within* the volume, not *by* the volume.)
- **Visible light threshold.** The value in this field determines the size of the visible light samples. Too large a number in this field results in coarser samples, and shadows cast through a volume may be missed.
- **Shadows.** This option determines whether or not any shadows appear in the final rendering.
- **Cast volume shadows.** When this option is enabled, shadows are cast by volumes. If mist is applied to an object, for example, shadows are cast by the mist as light passes through the object.
- **Soft shadows.** This option creates soft edges on shadows cast by objects that are illuminated by local light sources. (Rays of light from global lights are always parallel, so shadows cast by global lights are never soft.) The softness of the edge is determined by the *Shadow softness*, below.
- **Shadow softness.** This setting determines the number of samples taken to calculate the edges of the shadows. The higher the number in this field, the

softer the edges of the shadow appear. This field is only available only when *Soft shadows* is enabled.

- **Reflections.** When this option is enabled, the Scanline renderer supports environmental reflectivity.
- **Transparency.** This option enables transparency. When disabled, all transparent objects present in the model appear opaque in the rendered image.
- **Keep backfacing polygons.** When this box is checked, the Scanline renderer also renders the backside of one-sided polygons.

Raytracing



The Raytracing algorithm operates by following each ray of light striking the view plane backward through the model to its source. If a ray comes from light reflecting off an object's surface, the texture applied to that object helps determine what that reflected light should look like. That may include surface maps, reflectivity, shininess, or many other lighting factors. If the

ray of light is coming from another object that is reflecting in the first object's surface, then the ray must be followed further backward from this surface to determine whether it came from another surface or from a light source.

This backward tracing continues until each light ray is accounted for, ending at either a light source or passing out of the scene. The minimum number of rays that must be traced is equal to the number of pixels in the image being rendered. The larger the image and the higher its resolution, the longer the rendering time. A 288 dpi image, for example, has four times as many rays to trace as a 72 dpi image of the same dimensions.

Expert Settings

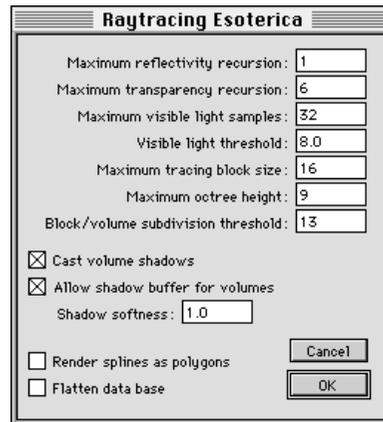
When you choose the Raytracing renderer, the *Expert* button becomes available. Clicking this button displays the *Raytracing Esoterica* dialog box.



allows access to the Raytracing Esoterica dialog through this button.

The default values that are present when StudioPro is first installed are the settings designed to deliver the most efficient performance from the Raytracing algorithm. You can customize these settings to fit your requirements. Before changing these settings, however, you should thoroughly understand how these fields control the algorithm. Otherwise, you may adversely

affect the speed and efficiency of the Raytracing renderer.



If you change the settings in this dialog, then want to return to the factory settings, just choose one of the preset rendering options from the *Settings* pull-down menu in the *Render* dialog. The values in this dialog will revert to those shipped with the software.

The optimal values for the Raytracer can vary from project to project, depending on model size, available memory, the type of surface maps in the textures, etc. There are no wrong settings. Anything that slows down rendering speed without significantly improving image quality is less desirable than a configuration that gains performance while maintaining image quality.

The fields in the *Raytracing Esoterica* dialog and their effect on renderings are explained below:

- Maximum Reflectivity Recursion.**
 This field determines how far a ray of light is traced as it reflects from surface

to surface. It determines how many times an object will be reflected in the surfaces of other objects. The default setting is one. For most models this is adequate. Increasing this setting usually adds to the rendering time; however, if your model contains many reflective textures, you'll want to set this value higher.

- **Maximum Transparency Recursion.** This field's setting only affects models with multiple transparent objects positioned in front of each other. It determines how many layers of transparent surfaces the Raytracer will look through to see if there is something behind before giving up. If more transparency layers exist than this setting allows the Raytracer to look through, the background will appear in that area of the image. The default setting is six.
- **Maximum Visible Light Samples.** The value in this field specifies the maximum number of times the light is sampled to determine the detail of shadow casting through objects to which volumetric effects have been applied.
- **Visible Light Threshold.** The value in this field determines the size of the visible light samples. Too large a number in this field results in coarser samples, and shadows cast through a volume may be missed.
- **Maximum Tracing Block Size.** When creating an image, the renderer starts with large blocks of pixels which are refined smaller and smaller during the rendering process. The refinement continues on every pixel block until the maximum block size is reached. At that

point, the *Block/volume Subdivision Threshold* setting decides which blocks to refine smaller. A setting of four in this field means a four-pixel by four-pixel block.

Larger block sizes render much faster, but may sometimes cause the Raytracer to miss fine detail. If your model has lots of detail work, either as surface maps or as explicit object geometry, you'll want to set this field smaller. In models that do not have fine details, a larger block size is usually preferred.

Setting the maximum block size smaller will not only ensure picking up the fine details in an image, but may actually render faster in those cases where it is needed. That's because starting with smaller block sizes at the beginning of a rendering doesn't waste time later by having to go back to find the detail that was missed, if it is found at all.

A tracing block size that is too large for the situation usually shows up as disappearing holes in 3-D text or the one-pixel lines in surface maps not showing up consistently. This becomes especially obvious in animations, where one frame contains detail, and the next frame does not.

- **Maximum Octree Height.** StudioPro's Raytracer sets up several octree levels during the rendering operation. An octree is an internal data structure used to subdivide the model space for more efficient handling and to simplify the ray tracing process.

Initially, all objects are contained in one large cube or model space. The model space is first subdivided along the three axes into eight smaller cubes of the

space. Each of those cubes may then be subdivided into another eight smaller cubes, depending on whether there are objects found in them. The various levels of subdivision is called an octree structure. Octal means eight, which is the number of smaller cubes created each time a larger cube is subdivided on each axis. The actual number of octree levels created for a particular rendering depends on the complexity of the model.

Theoretically, the higher the number of octree levels, the faster the Raytracer will run. There is a point, however, when the octree structure becomes too big and it begins to take more and more time to maintain, negating any gains in its efficiency.

This field determines the maximum number of levels in the octree. The higher this value, the more memory required. Higher numbers divide the model space more finely, but take longer to set up and sort through. A lower value uses less memory, but may decrease efficiency.

- **Block/volume Subdivision Threshold** (percent). When the maximum tracing block size is reached, the Raytracer scans the image block-by-block to see if it needs to be refined further. It usually does. If two adjacent blocks of pixels have a difference in color values, this field determines the variation threshold, when it is significant enough for the Raytracer to refine the two blocks to resolve the difference. This process will continue until all adjacent blocks (pixels) are within the allowed percent of variation.

Setting the value higher increases rendering speed, but may cause noticeable color banding of certain colors on curved, shaded surfaces. Setting the value lower forces all block sizes to be resolved finer, even if banding is not visible.

- **Cast volume shadows.** When this option is enabled, the volumes cast shadows. If you've applied a volumetric texture, such as fog, to an object, shadows are cast by the fog.
- **Allow shadow buffer for volumes.** This option sets up a buffer to store previously sampled information to use for calculating the resulting shadows cast inside volumes. This option may reduce the rendering time for simple animations, but shadows are an approximation only.
- **Shadow softness.** This setting specifies the number of samples taken for calculating shadows cast *within* volumes. If you want objects illuminated by local light sources to cast shadows with soft edges, use the Scanline or Raydiosity renderers instead.
- **Render splines as polygons.** When this box is checked, all Bézier meshes are treated as polygonal meshes while rendering. This may significantly reduce the time required for rendering, but may require additional memory. This option does not change the model in any way.
- **Flatten data base.** When this box is checked, all hierarchy is removed from the data base, and all instances are replaced by actual geometry for rendering purposes only. This will result in faster rendering times, but increases the

amount of memory required. This option affects the rendering process only; it does not remove hierarchy from the model, nor does it change the model in any way. Under certain conditions the Raytracer may be forced to flatten the data base even if this box is not checked.

Raydiosity



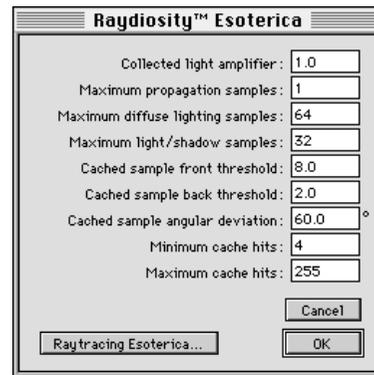
The photo-realistic effects of lighting and reflection in scenes can be very complicated and subtle. Indirect lighting is particularly difficult to render. Raydiosity calculates the illumination caused by reflected light from nearby objects. This is called *inter-object diffuse illumination*. The effects are then included in the resulting image. Unlike Raytracing, which works best for highly reflective scenes, Raydiosity takes into account the distribution of light throughout the scene and is best suited for images containing mostly matte surfaces and indirect lighting. Raydiosity also supports soft edges on shadows from spot and point light sources.

Raydiosity requires a substantial number of calculations. The Raytracer uses only a finite number of rays limited to the viewing position of the rendering, but the Raydiosity renderer is also capable of tracing

rays that are not limited to the viewing position.

Expert Settings

When you choose the *Raydiosity* rendering method, an *Expert* button becomes available. Clicking this button opens the *Raydiosity Esoterica* dialog box. This second dialog also has a button to open the *Raytracing Esoterica* dialog. Since the Raydiosity renderer uses the Raytracing renderer to perform much of its work, those settings will also impact this renderer.



Every surface is considered a primary surface at some time during the rendering process. Which surface is primary and which is secondary (and third, fourth, fifth, etc.) depends on what ray of light the Raydiosity renderer is tracing at any given moment.

Essentially, each time a ray of light reflects from a surface, the Raydiosity algorithm generates a cone of rays from the point of reflection to gather as much information as possible about the light that directly and indirectly influences the surface

there. This information is cached for later reference.

The number and type of rays in that secondary cone are set in the *Raydiosity Esoterica* dialog. Each of the rays in the secondary cone can reflect off another surface and generate a cone of third-level rays, as well as a fourth, and a fifth, etc. The actual number of rays traced can be significant.

- **Collected Light Amplifier.** This field controls the brightness of the diffuse illumination. Values less than one reduce the brightness; values greater than one increase the brightness level.
- **Maximum Propagation Samples.** This field determines the maximum number of secondary rays that are generated when a primary ray strikes a reflective or transparent surface. The actual number of rays (not to exceed the number set in this field) is based on the roughness of the surface.

A setting of one means just one secondary light ray is traced for every primary ray; a setting of two means two rays are traced for each reflected ray, etc.

- **Maximum Diffuse Lighting Samples.** This field determines the maximum number of secondary rays generated when a primary ray strikes a diffuse surface. Again, the actual number depends on the roughness of the surface. This field determines how much other surfaces contribute to the appearance of a primary surface. This field is the setting that most significantly influences the amount of inter-object illumination or color bleed between adjacent objects.

A setting of one means just one secondary light ray is traced for every primary ray. The higher the value, the more the secondary objects influence the illumination of the primary object, and the longer the rendering time.

- **Maximum Light/Shadow Samples.** This field determines the number of rays traced to calculate the edges of shadows. It applies only to spot and point light sources. Rays of light from global lights are always parallel, so the edges of shadows cast by global lights aren't soft.

A setting of one means only one ray is traced for each pixel in a shadow area, which yields no softening of the shadows. Increase this number to generate higher samples between the shadows and the light sources. Higher numbers produce a softer edge to the shadows, but take longer to render.

- **Cached Sample Front Threshold.** This setting determines the coarseness of the previously cached samples to use in front of the point being computed.

The higher the value, the coarser the sample. Lower values represent finer samples, but may require longer to render.

- **Cached Sample Back Threshold.** The setting in this field determines the coarseness of the previously cached samples to use behind the point being computed.

Higher values represent coarser samples. Lower values result in finer samples, but may require additional time to render.

- **Cached Sample Angular Deviation.** The Raytracer will include previously cached samples of reflected light from surfaces if their normals are within the angle specified in this field.
- **Minimum Cache Hits.** This value represents the minimum number of samples required. If the cache contains less than this number, more samples are taken by the Raytracer.
- **Maximum Cache Hits.** The value in this field specifies the maximum number of samples to use.

MULTI-PROCESSOR SUPPORT

StudioPro automatically supports multiple processors if the required hardware and software extensions are available.

TEXTURE DETAIL

The *Texture detail* field is set independently of the rendering algorithm or the image quality. You can select *Fine*, *Normal*, *Medium*, or *Coarse* levels of texture detail. However, not all rendering methods can use all of the information contained in the texture. As the level of detail increases, the quality of the surface detail increases, as well as the length of time required to render the image.

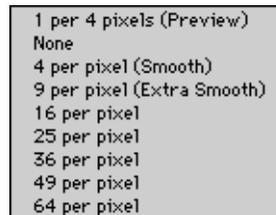
The sampling rate is a global setting. Every object in the scene is sampled at the same rate. The finer the detail, the higher the quality, and the longer the time required for rendering. Use lower settings for preview renderings during modeling, then use a finer sampling rate for the finished image.

OVERSAMPLING

The *Oversampling* field determines the rendering detail of the final image. You can select the depth of anti-aliasing used.

The process of smoothing edges in an image is called anti-aliasing. In addition to simply rendering at a higher resolution, there are two other ways to achieve a smooth-edged image: super sampling and pixel averaging.

Super sampled anti-aliasing is used when you select an anti-aliasing depth from the *Oversampling* pop-up in the *Render* dialog.



The *4 per pixel (Smooth)* setting generates a total of four pixels (two pixels vertically and two pixels horizontally) for each edge pixel in the final image. The *9 per pixel (Extra Smooth)* setting renders three pixels both directions.

This pop-up is only available with rendering options that support anti-aliasing.

Anti-aliasing by super sampling



An anti-aliasing factor of three generates a 3x3 pixel grid centered around each pixel.



When the rendering is completed, the pixels are interpolated down to the one pixel used in the image.



The final image appears smooth because its pixels are the result of many extra samples taken during rendering.

It is important to remember, however, that higher anti-aliasing levels can significantly increase the time required to complete a rendering.

NOTE: *Because of the additional time required, if your image does not require a high level of a resolution, you may want to select None from the Oversampling pop-up, and then apply an anti-aliasing filter to the image after the rendering is complete.*

ANTI-ALIAS FILTER OPTION

This option is available when choosing any *Oversampling* rate other than *None* or *Preview*. The anti-alias filter option is available with all but the lowest level renderers.

Although StudioPro uses super sampling as its primary method of anti-aliasing, pixel averaging anti-aliasing can be added to the super sampling to obtain an even higher quality image. This method alters the color of the pixels along diagonal lines or edges. The adjustment is proportionally weighted, based on how much of each pixel the line covers. Pixel averaging uses only the existing pixels at the base resolution to perform its smoothing. Because of that, this method of smoothing images can produce subtle blurring that may cause loss of fine details.

Pixel averaging can produce visually pleasing images without the need for higher resolution and larger file sizes. During rendering, pixel averaging anti-aliasing can be added to the super sampling to obtain a vastly superior image. To enable this option, check the *Anti-alias*

filter checkbox to the right of the *Oversampling* menu.

DISABLE PARTICLE PRE-ROLL

When rendering animation sequences which contain a particle effect, such as *Fountains*, StudioPro must compute the exact position of the particles, any effects applied to them, the amount of energy the particles have, etc. in EACH frame of the animation. (This process is referred to as *pre-roll*.) These calculations may require a significant amount of time, depending on the settings for the particle effect.

Even if you're only rendering a single frame of the animation, such as Frame 22 of 30, StudioPro must make these calculations for each previous frame to determine how the effect appears in the frame you're rendering.

When you check the *Disable Particle Pre-roll* box, any particle effects present in your model are temporarily disabled. This process allows you to accomplish test renderings in less time without the need to remove the particle effects, render, then re-apply them. Once you've gotten the effect the way you want it, you can use this checkbox to turn off particle effects and proceed with your modeling. Test renderings will require less time to complete. Then, when you're ready to start the final rendering process, enable particle effects again by removing the check from this box.

NOTE: *You may want to set up a custom rendering setting with Particle Pre-roll disabled just for the purpose of test renderings.*

RENDER ALPHA CHANNEL

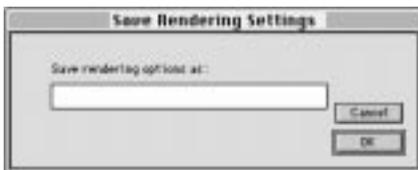
The alpha channel is an eight-bit channel in the 32-bit color image. Eight bits each for the red, green and blue components add up to only 24 bits, so the alpha channel completes the 32 bits of information contained in the 32-bit color format. The remaining eight bits are used to store transparency data.

The alpha channel makes it easy for you to place renderings into image and animation compositing applications. This feature is available only if you save the rendering in full-color, 32-bit (*Millions+Alpha*) QuickTime, PICT, Targa, or TIFF format.

SAVING CUSTOM SETTINGS

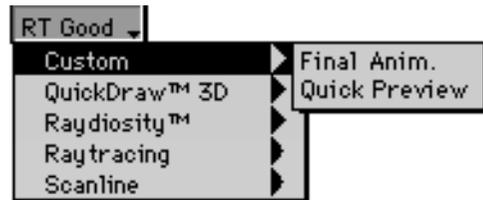
Select the *Save* button if you want to save the rendering options you defined so you can recall them later, either in the current project or in another model. The renderer, texture detail, image quality, the anti-alias filter, the particle pre-roll option, and the Alpha Channel option are saved as a custom setting.

When you click the *Save* button, the *Save Rendering Settings* dialog appears, prompting you for a name for the new settings.



These custom settings will then appear in the list of pre-sets available in the Render-

ing tool's pop-up menu, as well as in the *Settings* pop-up list in the *Render* dialog.



Deleting Preset Rendering Options

You can delete custom settings from either the *Render* dialog's *Custom Settings* pop-up list or the Render tool's pop-up list. To delete an entry from the *Custom* rendering options list, hold down the **Option** key (Macintosh) or **Alt** key (Windows) while selecting the name of the preset you want to delete. When you release the mouse button, the system will beep to confirm the deletion of that entry from the list. You cannot undo this action.

If you change your mind, you can always add the preset again by manually selecting the same rendering options and saving them to the list.

FRAMES TO RENDER

There are three radio buttons to select from:

- *Current Frame*
- *All*
- *From*

Only one button can be selected at a time. Click the *Current Frame* button to render a still image. To render an animation, select

All to render all frames; or select *From*, and then enter the first and last frame to be included in the rendering.

FRAME SIZE

In addition to allowing you to specify the frames to render, the center section of the *Render* dialog also lets you to set the units and adjust the dimensions of the frame size.



- **Units.** Values for the image size can be specified in pixels, inches, centimeters, percentage, etc.
- **Size.** You can choose from a set of predefined sizes or enter your own custom sizes. Based on the size and resolution settings, the dialog provides feedback on the resolution and how much disk space will be required while the image is being rendered. Remember, to create a QTVR panorama, select *Panorama large* or *Panorama small*, and use the *Panoramic* camera (selected in the camera's Object Properties palette). Also be sure to select either the *Raytracing* or *Raydiosity* renderer.

NOTE: *The size requirement shown is the absolute minimum; you may need more. You must have at least this much free space, either in RAM or in the virtual memory cache on your hard disk. Depending on the format chosen for saving the image, the saved file may be much smaller.*

- **Resolution.** You can also adjust the number of dots per inch in the final ren-

dered image. This setting determines the resolution of the final image. (If *Pixels* is selected in the *Units* pop-up, the resolution is always 72 dpi and cannot be changed.)

A checkbox is provided to allow you to constrain the proportions of the frame size.

- **Field Rate.** This feature allows you to render animations that are compatible with video. Most broadcast video is interlaced, with each frame consisting of two fields. Each field contains every other horizontal line in a frame. The first field of horizontal lines is displayed on the screen, and then the second field is displayed, filling in the gaps. Normally, each field is displayed for approximately 1/60th of a second, resulting in a frame rate of 30 frames per second. However, NTSC standards require precisely 29.97 frames per second.
- **Start with Upper/Lower.** You can begin the rendering with the upper field (first horizontal line) or the lower field (second horizontal line). This setting defaults to *Upper*. These buttons are available only when the *Field Rate* option is enabled.

MAINTAIN OUTPUT SETTINGS

This checkbox allows you to maintain the current output settings during the current session of StudioPro. These settings include the frame number (*Current*, *All*, or the range of frames indicated), *Units* and *Size*, and the status of the *Constrain proportions* and *Field Rate* checkboxes. These settings are maintained unless you change them, or until you quit StudioPro.

LIGHT HANDLING

Automatic exposure control is a built-in feature of StudioPro. You can specify the method used for handling lighting overflow during the rendering process.

- **Clipped.** If you select this method, all lighting intensity over 100% is ignored. This is the fastest method of overflow handling. However, it may cause color shifts in the rendered image. The quantity of light falling on a specific area is based on the total of the red, green, and blue components of light. Excess light is clipped as individual components, then recombined, which tends to affect each color component differently. If exact color is critical, clipping the excess light may not be the best solution.
- **Scaled.** This method scales the total lighting intensity down so the highest intensity is equal to 100%. It does not adjust the lighting if no area in the scene exceeds 100%. This method is least likely to cause color shift problems, but takes a bit longer to render.
- **Hybrid.** If the total lighting intensity exceeds 100% in a specific area of the model, the light striking the surface is divided into its specular and diffuse components. It then scales back the diffuse light based on the value in the *Diffuse %* field (see below), and recombines the diffuse and specular components together again. Again, color shifts can occur during the re-mixing process, but this method gives you a greater degree of control.

- **Debug.** If any lighting exceeds 100%, this option shows the overflow areas in the debug color you specify when the scene renders. You can then adjust the lighting components manually to reduce these hot spots. To select the color, click the *Debug* button to display the color picker dialog.

DIFFUSE %

When the *Hybrid* light handling option is selected, the value in this field is used for scaling the diffuse component of light when the intensity exceeds 100%.

DEBUG COLOR

When the *Debug* light handling option is selected, the color specified here is used to show areas of the rendered model where the lighting intensity exceeds 100%.

INITIATING THE RENDERING

Click *Render* or push the Return key to begin the rendering of the model from the currently active view.

You can choose to set up the rendering now, but not actually begin rendering it until later by clicking the *Suspend* button. All of the modeling data is saved as a self-contained file, and the model won't need to be reopened to restart the rendering. For more information, see **Suspend Rendering** on page 74.

When **RENDER** is selected directly from the Rendering menu, the currently active view is used as the viewpoint for the rendering, as well as for size and pro-

portion. The view's focal length setting also becomes the perspective used for the image.

You can also access this dialog by holding down the Shift key while using the Rendering tool to define the dimensions of the rendering. This lets you to crop the scene, as well as letting you access the *Render* dialog.

When using the drag-define method with the Rendering tool, the image size in the dialog is adjusted according to the area defined by the drag marquee.

If you try to modify the model while the rendering is in progress, an alert is displayed warning you that the rendering cannot proceed if any changes are made to the model.

Rendering Images

If the *Current Frame* button is selected, a single image is rendered. This image is rendered and stored internally in full 32-bit color, even if the monitor you're using isn't capable of showing that much color depth. The rendering window displays the image at the best capability of the monitor. To see the full range of colors contained in a 32-bit color image at the time of rendering, you will need a full color monitor.

For information on saving the image once it's rendered, see **Saving Still Images** on page 11.

Rendering Animations

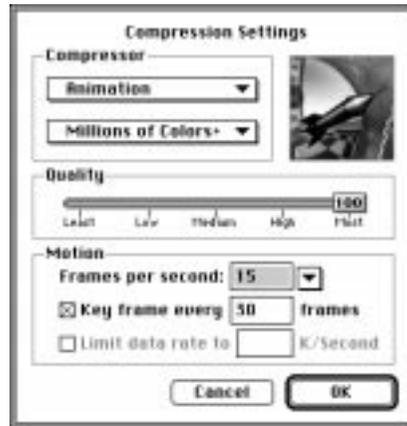
When rendering multiple frames, Studio-Pro saves each frame of the animation as soon as it completes rendering. If either

the *All* or *From* buttons are selected, a dialog is presented allowing you to specify a name and location for saving the animation.

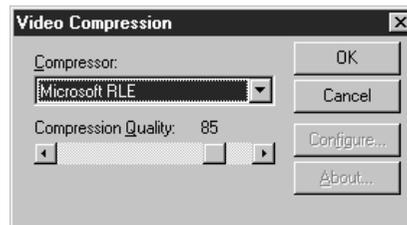
Select a format from the pop-up list in the dialog. See **File Formats** on page 301.

When you click the *Save* button, a dialog appears that allows you to select a compression method and color depth, and set the quality of the rendering. (*Targa* doesn't require a *Quality* setting; it is always *lossless*.)

Macintosh



Windows



See **Compression Formats** on page 303 for a brief description of some of the commonly used compression formats.

Each frame of the animation is saved as it completes rendering. If you terminate the rendering, the saved animation will be a fully-functional movie file containing those frames that were rendered and saved up to the point it was stopped.

Saving Sequentially-numbered Files

You may use a single image format to save animation sequences. StudioPro will then sequentially number the individual files for you.

If you specify a file name with a numeric part, such as **myFile0001.tga**, StudioPro will automatically increment the numeric part of the file name, and create **myFile0002.tga**, **myFile0003.tga**, etc. The numeric part of the file name can appear anywhere within the name. However, **it MUST contain at least two digits** in order to be recognized by StudioPro as a numeric part.

If you choose a file name such as **myFileOnly**, StudioPro will append a number to the end of the file name, and create individual files that are named **myFileOnly0001**, **myFileOnly0002**, etc. (Macintosh) or **myFileOnly0001.tga**, **myFileOnly0002.tga**, etc. (Windows). StudioPro won't add a numeric extension if it sees a usable numeric part (two or more digits) already present within the name; it will instead increment the number already present.

NOTE: *If you specify a file name with a numeric part, be sure the numeric part includes enough digits to cover the total number of frames in the animation sequence. For example, if the animation contains 100 to 999 frames, the numeric part of the file name must contain at least three digits (001, 002...100). If the*

numeric part does not contain enough digits, the file name may be overwritten.

Rendering in the Background

One of the most powerful features of StudioPro is its ability to render images in the background. The number of images that you can render at the same time is limited only by the available memory. However, rendering in the background splits available CPU time among the renderings in progress and any other activity. The only limitation to rendering in the background is that you can't make any changes to the model during the rendering process.

RENDERING QUEUE

The **RENDERING QUEUE** command lets you add suspended renderings to, or remove them from, the rendering queue. The **RENDERING QUEUE** command is available at all times.

You can add one or more suspended renderings to the job list in the *Rendering Queue* dialog. Only one rendering is active at a time. The order in which you add the jobs to the queue determines the order in which they are rendered.

When you close a queued rendering, either because it has completed and been saved or it has been terminated by clicking the close box, the next rendering in the queue (if any) loads and begins rendering.

If you want to render more than one image at a time, you must open them manually. The rendering queue cannot

support multiple renderings at one time. Remember, with more than one rendering in progress at a time, you must send them all to the background so they will share CPU time. Otherwise, the one in the active window takes priority and is given the majority of the CPU time, just like using the rendering queue.

If you quit StudioPro while renderings are in the queue, they are deleted from the queue. The queuing of renderings between sessions is not retained. An alert is displayed informing you that renderings are still present in the queue, and asking if you are sure you want to quit.

SUSPEND RENDERING

Use the **SUSPEND RENDERING** command to save a rendering in progress. You can then restart it at a later time. The **SUSPEND RENDERING** command is available when a rendering window is the active window, and the rendering is in progress.

When you select this command, the *Suspend Rendering* dialog is displayed, allowing you to specify a name and location for saving the suspended rendering.

SUSPENDING SINGLE FRAMES

If you suspend a still image (single frame), the dialog allows you to specify a name, location, and file format for the suspended rendering. The *Collect* checkbox is unavailable when suspending single frames.

SUSPENDING ANIMATIONS

If you suspend an animation, the name, file format, and location of the file were previously designated at the time the rendering was initiated. The frames were saved as either a self-contained QuickTime movie file, AVI movie, or a folder of sequentially numbered images as the individual frames completed rendering.

The **SUSPEND RENDERING** command creates a suspension file containing all of the information necessary for continuing the rendering process. The dialog allows you to specify a name and location for the suspension file. This is the file that you need to restart when you're ready to continue rendering. Suspended renderings can also be added to the rendering queue.

Collect existing frames. When this box is unchecked, any frames that have completed rendering remain in the location previously specified.

If this box is checked, all frames of an animation are collected and 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 previous location.

You can specify a new location each time you suspend the rendering. This option allows you to save groups of frames to different volumes, and can be extremely useful when disk space is limited on any one volume.

RESTARTING A SUSPENDED RENDERING

Once you've suspended the rendering, you can use the **OPEN** command in the File menu to restart the suspended rendering, or you can add it to the rendering queue.

You do not need to have the original model open to restart the suspended rendering. The suspension file contains all of the model data necessary to complete the rendering.

You can restart a suspended rendering, let it render for awhile, then suspend it again, as often as necessary to complete the rendering. If you open more than one suspended rendering, you have the option of rendering them all at once, sharing processing time among the windows, or queuing the renderings in sequence.

RENDERPRO

Strata's **RenderPro**[™] allows you to distribute renderings to other computers on your network. Suspended renderings can be opened and rendered in RenderPro, allowing you to distribute renderings across a network.

Each copy of StudioPro has its own unique serial number, and only one copy per serial number can run simultaneously on a network. But you can use your StudioPro installation CD to load and run **RenderPro** on any number of networked computers at the same time.

Installing and Serializing RenderPro

Using the StudioPro installation CD, install StudioPro on each computer that you want to use for rendering. On the Installer screen, select *Custom Install*, then check *Minimum Install*. Since you'll be using these computers for rendering only, it won't be necessary to install any of the resources.



Once the installation process is complete, launch StudioPro. When the registration screen appears, enter your name and organization. In the *Serial Number* field, enter **RenderPro**.

Serial Number:

Enter it exactly as shown – with a capital R and a capital P, and no spaces in between or at the beginning or end.

Each time you launch a StudioPro application with the RenderPro serialization, RenderPro launches instead.



The RenderPro menu bar contains only the File and Rendering menus.

File Rendering

The **RENDERING QUEUE** command allows you to add suspended renderings to the queue.

Rendering

Rendering Queue...
Suspend Rendering...
Suspend And Continue

See **Rendering Queue** on page 73 for information about this command.

SUSPEND AND CONTINUE

Use the **SUSPEND AND CONTINUE** command to save your rendering at its current state of completion, then automatically continue with the rendering process. See **Suspend Rendering** on page 74 for complete details.

Once the progress has been saved, the model continues to render. Then, if the rendering is interrupted for some reason, such as a power outage, you won't have to start the rendering process over from the beginning. We suggest you use this command frequently when rendering extremely large or complex models that require a significant amount of time to render.



Macintosh



Windows

The Windows menu includes commands to control which windows and palettes are displayed on the screen. There are also commands to adjust the proportion and size of the Modeling window.

NEW WINDOW

Macintosh: Command \

Windows: Ctrl \

The **NEW WINDOW** command opens a new window with the same configuration as the active window. This command is useful because it allows you to view your model through another view set center. **NEW WINDOW** is available whenever a document is open.

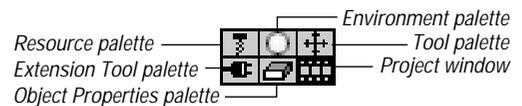
Once the new window is open, it can be changed. For example, you can add view panes within the window, delete or resize panes, change the view orientation, or change the display scale.

Each window has an independent view set center. You can move the view set for one window without affecting any other window of the same document. The view set center determines the area of the model space that shows within the views of that window.

SHOW/HIDE BUTTON BAR

This command allows you to show or hide the Button bar. The command toggles between *Show* and *Hide*, depending on the current status of the Button bar.

The Button bar contains buttons for the most often used operations. It also contains buttons that allow you to hide or show any of StudioPro's palettes.

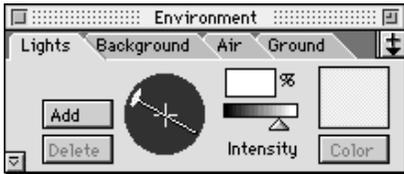


The Button bar's hide/show status is retained between sessions. If it is hidden when you quit StudioPro, it remains hidden the next time you launch the application. The Button bar's position on the screen, however, cannot be changed.

SHOW/HIDE ENVIRONMENT PALETTE

The **SHOW ENVIRONMENT PALETTE** command displays the Environment palette. If it is already open, the command changes to **HIDE ENVIRONMENT PALETTE**. Each time

you select this command, it toggles between *Hide* and *Show*.



Choosing the **HIDE ENVIRONMENT PALETTE** command is the same as clicking the close button on the Environment palette.

You can also show or hide this palette by clicking the Environment palette button on the Button bar.

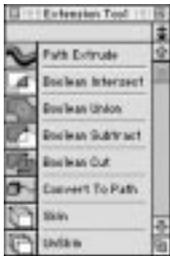
Environment palette



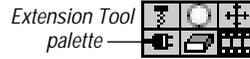
The show /hide status of the Environment palette is remembered between sessions. If it is showing when you quit StudioPro, it will be showing the next time you launch the application.

SHOW/HIDE EXTENSION PALETTE

The **SHOW/HIDE EXTENSION PALETTE** commands allow you to display or hide the Extension Tool palette, as needed.



This palette can also be shown or hidden by clicking the Extension Tool palette's hide/show button on the Button bar.

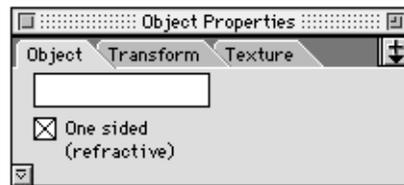


Clicking the close button on the Extension Tool palette is the same as selecting the **HIDE EXTENSION PALETTE** from the Windows menu.

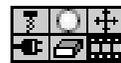
The hide/show status of the Extension Tool palette is retained from session to session. If the palette is showing when you quit the application, it will be showing the next time you launch StudioPro.

SHOW/HIDE OBJECT PALETTE

The **SHOW OBJECT PALETTE** command displays the Object Properties palette. This command is available whenever the Object Properties palette is hidden. **HIDE OBJECT PALETTE** is available when the Object Properties palette is showing.



The **HIDE OBJECT PALETTE** command is the same as clicking the close box on the Object Properties palette or on the Object Properties palette's show /hide button on the Button bar.



Object Properties palette

The hide/show status of the Object Properties palette is remembered from session to session. If the palette is hidden when you quit the application, it will be hidden the next time you launch StudioPro.

SHOW/HIDE PROJECT WINDOW

The **SHOW PROJECT WINDOW** command displays the Project window. This command is available when the Project window is hidden. When the Project window is showing, the command changes to **HIDE PROJECT WINDOW**.



Choosing the **HIDE PROJECT WINDOW** command is the same as clicking the close button on the window or clicking the Project window's show/hide button on the Button bar.



Project window

Only one Project window is displayed at a time, even if you have more than one model open. However, when you change the active model, the Project window redraws to reflect the current model.

If the window was showing when you quit the application after the last session, it will be showing when a model is opened in the current session. If it was hidden

when you quit last time, it will be hidden on start up this time.

SHOW/HIDE RESOURCE PALETTE

The **SHOW/HIDE RESOURCE PALETTE** commands toggle as needed to display or hide the Resource palette.



Choosing the **HIDE RESOURCE PALETTE** command is the same as clicking the close button on the palette or clicking the Resource palette show/hide button on the Button bar.



If the palette was showing when you quit the StudioPro the last time, it will be showing again when you open a model in the current session. If it was hidden when you quit, it will be hidden on start up this time. The status is retained from session to session.

SHOW/HIDE STATISTICS PALETTE

Select the **SHOW STATISTICS PALETTE** command to display the Statistics palette. To

close the palette, select **HIDE STATISTICS PALETTE** from the menu.



The Statistics palette displays important information about the active model. This information includes the number of objects, light sources, spline patches, and polygons in either the active view or in the entire model.

SHOW/HIDE TOOL PALETTE

The **SHOW TOOL PALETTE** command displays the Tool palette. **SHOW TOOL PALETTE** is available when the Tool palette is hidden. **HIDE TOOL PALETTE** is available when the Tool palette is showing.

Choosing the **HIDE TOOL PALETTE** command is the same as clicking the show/hide button on the Button bar for the Tool palette.



Only one Tool palette is displayed at a time, even if you have several models open. All open palettes are associated with the active model only.

The Tool palette's show/hide status is retained from session to session. If the palette is showing when you quit the application, it will be showing the next time you launch StudioPro. If it is hidden when you

quit, it will be hidden on start-up next time.

FIT VIEWS TO ALL

Macintosh: Command =
Windows: Ctrl =

The **FIT VIEWS TO ALL** command adjusts all views in the active window to include all objects in your model, excluding grids. **FIT VIEWS TO ALL** is available anytime a model is open.

When you select this command, the distance of all views in the active window from their view set center is adjusted and repositioned, if necessary, so the entire model is displayed. The magnification settings are also reset so that all of the objects in the model will appear in all the views. This is useful when you have lost your place in your model.

This command allows you to automatically move to a larger view of the model or shape. The location of the active view set center at the time you select this command determines the extent to which the view must be modified.

Only the views of the active window are affected, unless other windows are also linked to the same view set center. In that case, the views in those windows will also reset to show the entire model.

Modifier keys that apply to FIT VIEWS TO ALL command:

- **Option key** (Macintosh)
Alt key (Windows)
Includes all animation paths, as well as all objects. Without the **Option key**

(Macintosh) or **Alt** key (Windows), this command extends the view to include only the objects in the model.

Determining the extents of all the animation paths of all the objects so they can be included in the views takes longer to calculate, so this command operates noticeably slower with the **Option** or **Alt** key held down.

FIT VIEWS TO SELECTION

Macintosh: Command -

Windows: Ctrl -

Use the **FIT VIEWS TO SELECTION** command when you want to adjust all views in the active window to include only the selected object or set of objects. It does not include any grids which may be associated with the object. **FIT VIEWS TO SELECTION** is available whenever an object is selected.

The command adjusts the distance of all views in the active window from their view set center and, if necessary, repositions the view set center to fit around the selection. The magnification settings are also reset so that any objects you have selected will appear in the views.

This command allows you to automatically move to a tighter view of a specific area within the model or shape. Depending on the location of the view set center at the time you select this command, the affected views may need to be relocated. You can also shift the views and viewing scale manually by using the tools on the Tool palette.

Only the views in the active window are affected, unless other windows are also linked to the same view set center. In that case, the views in those windows will also redraw to show the selection.

Modifier keys that apply to FIT VIEWS TO SELECTION command:

- **Option key** (Macintosh)
Alt key (Windows)

Includes the animation path of the selected object. Without the **Option** key (Macintosh) or the **Alt** key (Windows), this command fits the view(s) only to the selected objects.

Determining the extents of the animation path for the selected object so it can be included in the views takes longer to calculate. This command may operate noticeably slower with the **Option** or **Alt** key held down.

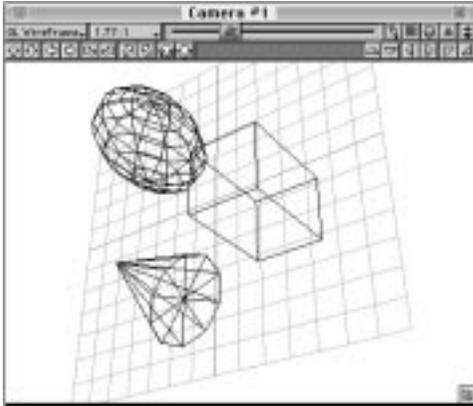
CAMERA WINDOWS

The **CAMERA WINDOWS** command displays a list of the all camera objects inserted into the model. A camera window is available for each camera object in your model.

This command lets you access camera objects by name through a submenu. If you haven't inserted any camera objects in the active model, the **CAMERA WINDOWS** command is dimmed.

When you select one of the camera objects in the list, that camera's window becomes the active window. You can also open a camera window by double-clicking on the

camera object directly in the Modeling window.



A check mark appears in front of the camera window's name when it's the active window. To make another camera window the active window, select that camera's window from the list. A check mark appears in front of its name in the menu.

Camera windows are a special type of window. Each one contains a view of the model from the position of the camera object. It is not attached to any view set, as are the views in Modeling windows. Camera objects (and their windows) are free to move anywhere and have any orientation in the model.

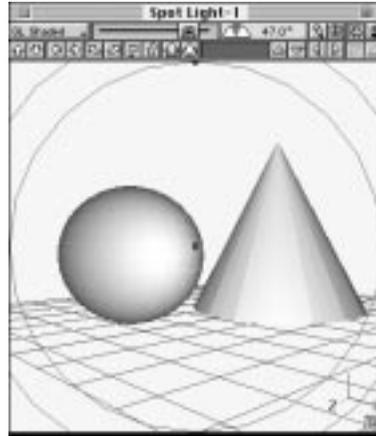
SPOTLIGHT WINDOWS

The **SPOTLIGHT WINDOW** command displays a list of all the spotlights that are present in the active model. Each spotlight has its own spotlight window.

Spotlight windows make it possible for you to "see" exactly where the spotlight is illuminating the model. Spotlight windows are always square, and represent the area of *full* illumination. If the spotlight is selected in the Modeling window when you select its

window from the submenu, the ring representing the area of full illumination is also visible and fits exactly in the window.

This window also provides controls that help you aim the spotlight in the Modeling window.



When you select a spotlight from the list, the window associated with that spotlight opens and becomes the active window.

You can also open a spotlight window by double-clicking on the spotlight icon in the Modeling window.

When a spotlight window becomes active, a check appears in front of the spotlight window's name.

If no spotlights are present in the active model, this command is dimmed and unavailable.

IMAGES

The **IMAGES** command displays a submenu listing all open rendering, snapshot, and animation windows. This command is available when one or more of these windows are

open. If none are open, the command is dimmed.

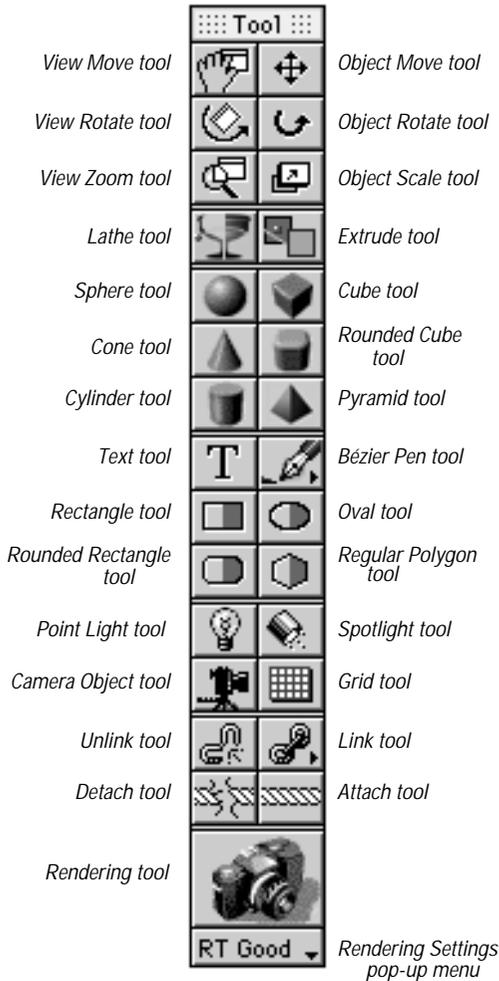
When a rendering, image, or animation window is the active window, a check mark appears in front of the window's name. To make another window the active window, select that window from

the list. A check mark appears in front of its name in the menu.

You can also select to show all open rendering, image, or animation windows. Selecting **SHOW ALL** brings all of these windows forward, in front of the Modeling window.



PALETTES & WINDOWS



The Tool palette contains tools to create and manipulate the objects in your models. When a tool is selected, its icon becomes highlighted and appears inverted on the Tool palette. Only one tool can be active, or selected, at a time.

The Tool palette is a floating palette. You can move it around the screen and position it wherever you want. This palette floats above all model windows and is always available for selecting tools. To move the palette, just drag it by its title bar.

To hide the Tool palette, select the **HIDE TOOL PALETTE** command in the Palettes submenu of the Windows menu, or click the Tool palette's hide / show button on the Button bar.



To show the Tool palette, select **SHOW TOOL PALETTE** from the Palettes submenu in the Windows menu, or click the Tool palette's show / hide button on the Button bar.

Each time StudioPro is launched, all of the palettes are positioned just as they were when you quit (or exited) the last time. If a palette was hidden when you last quit, it remains hidden when the application is launched the next time.

The tools are arranged on the palette according to their function. The following categories of tools appear on the Tool palette:

- View Management tools
- Object Manipulation tools
- Specialized Modeling tools
- 3-D Primitive tools
- 2-D Drawing tools
- Construction tools
- Rendering tools

Many of the tools on the Tool palette have an associated Tool Settings dialog that allows you to change the default behavior of the specific tool. To access this dialog, double-click the tool on the Tool palette.

There are times during the modeling process when you would like more precision as you create, edit, or position the objects in your model. You can change the tool's cursor to a cross-hair cursor at any time by turning Caps Lock on. This applies to any of the tools other than the View Management tools.

VIEW MANAGEMENT TOOLS

The View Management tools allow you to control how your model appears in the Modeling window. These tools do not affect the objects in any way; they only change how the objects are viewed.



View Move tool

View Rotate tool

View Zoom tool

These tools are located in the upper left section of the tool palette. This grouping consists of the View Move tool, the View Rotate tool, and the View Zoom tool.

Each view can be rotated or moved independently, but all views remain linked to the view set center at all times.

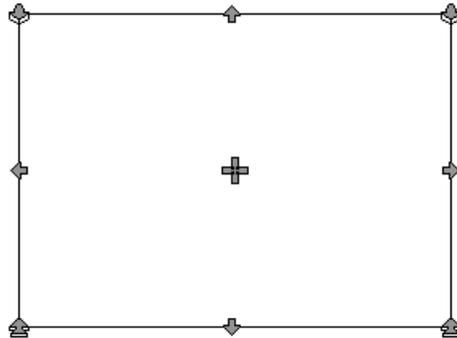
VIEW MOVE TOOL



The View Move tool is also referred to as the Grabber or Scrolling tool. It lets you scroll a model in the window. Only the view moves; not the objects themselves.

TOOL FUNCTION

When the View Move tool is selected, an overlay appears in the Modeling window. This overlay contains specialized handles which allow you to change the view plane. Each view can be moved independently, but all views remain linked to the view set center at all times.



Numeric feedback appears in the feedback area below the button bar, showing the actual distance moved from the view center. When you release the mouse button, a new view center is calculated.

When the View Move tool is selected, the cursor changes to a "grabber" cursor.



View Move cursor

Corner handles move view planes on the depth axis. The bottom corner handles move the view plane closer; the top corner handles move the view farther away. However, if the perspective selector is set at the *Orthographic* position, the effect of the move is not apparent. You may want to change the perspective setting or the view so you can more accurately move the view.

Edge handles constrain the movement of the view horizontally or vertically, as indicated by the arrows.

Free move by grabbing anywhere in the view except on a handle. This moves the view in an unconstrained manner in any direction, including diagonally.

Sometimes the views don't appear to be moving at all. This is usually because one or more of the following conditions exist:

- There is no perspective in the view.
- The view plane is very close to the view set center.
- The view plane is very far away.

If this occurs, back up slightly to make sure the entire object is visible on the front side of the viewing plane.

Modifier keys that apply to the View Move tool:

- **Shift key**
Constrains the scrolling direction while using the "Grabber" method to either the vertical or horizontal axis.

VIEW ROTATE TOOL

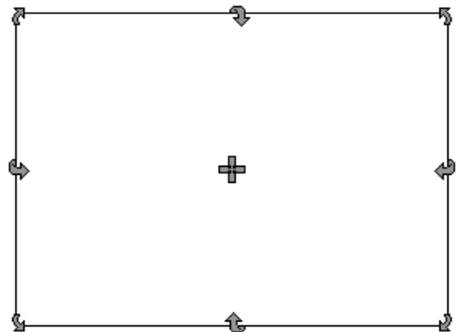


This tool rotates views around the view set center. Only the view rotates; the objects are not affected in any way.

Any view can be rotated independently, but it always remains linked to the view set center.

TOOL FUNCTION

When the View Rotate tool is selected, an overlay appears on the active view. This overlay contains handles to rotate the view around the model on any axis. The overlay is visible in all views of the active window.



The view set center determines the center of rotation for rotating views in that window. Use the appropriate handle to adjust the view on one axis at a time. Numeric feedback is provided below the Button bar showing the degrees of rotation relative to the previous location.

When the View Rotate tool is selected, the cursor changes to a “grabber” cursor.



View Rotate cursor

Corner handles rotate the view plane clockwise or counter-clockwise, as indicated by the arrows, around the view set center.

Edge handles rotate the view plane around the view set center. The rotation is constrained horizontally or vertically in the direction indicated by the arrows.

Free rotate by grabbing anywhere other than a handle. The view rotates freely in any direction around the view set center.

Modifier keys that apply to rotating views:

- **Shift key**
Constrains the view rotation on the chosen axis to 45° increments.
- **Option key** (Macintosh)
Alt key (Windows)
Allows you to rotate the view in one-degree increments.

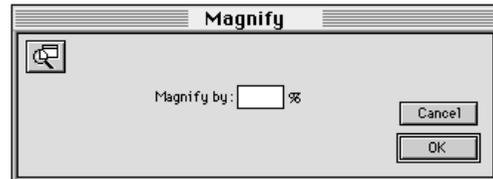
VIEW ZOOM TOOL



The View Zoom tool is used to magnify or reduce the size of the image in a particular view. The magnification can be adjusted to control how much of the model is visible at one time.

TOOL SETTINGS

To access the Tool Settings dialog, double-click on the View Zoom tool.



You can specify the percentage that the view is enlarged or reduced with each click in the window.

TOOL FUNCTION

Magnifying (or reducing) an image does not change the actual size of the objects. It only changes the apparent size in the view.

The View Zoom tool operates in two ways:

- **Click to zoom.** Each click in the active view magnifies or reduces the image by the percentage specified in the Tool Settings dialog. The default mode is set to magnify, and this is indicated by a plus symbol in the cursor.

To reduce the view, hold down the **Option** key (Macintosh) or **Alt** key (Windows) while clicking. Note that when this modifier key is held down, the symbol in the cursor changes to a minus symbol



Plus symbol to magnify view



Hold **Option** key (Mac) or **Alt** key (Win) down to reduce the view

The single click method also moves the view set center. When magnifying, the view zooms in on the point where the cursor is clicked, and the location of the view set center also changes to that area of the model.

When using the **Option** key (Macintosh) or the **Alt** key (Windows) in conjunction with the View Zoom tool to reduce the view, the position you click in the Modeling window becomes the new view set center.

- **Drag to zoom.** Position the cursor in the view and click-and-drag to define the area to be magnified. The area of the model you define with this method will enlarge to fill the entire active view. Use this method to adjust the magnification according to the amount the cursor is dragged.

There is a limit on how much you can magnify or reduce a view, depending on your computer's ability to display the objects accurately.

To achieve the desired view without going beyond these limits, try one of the following methods:

- Move the view plane closer to (or farther from) the objects in the view with the View Move tool.

Or, you can first use the **FIT VIEWS TO ALL** or **FIT VIEWS TO SELECTION** commands in the Windows menu to globally adjust the position of the view distance and view scale in one step.

- Try increasing (or decreasing) the focal length of the view using the perspective control at the top of the window.

However, it has limited range and may not be sufficient for your needs.

- Increase (or decrease) the scale of the objects. You should use this approach only as the last resort to solve view display and rendering problems. Some situations may require this adjustment in order for the software to function at its best.

Modifier keys that apply to magnifying views:

- **Option key** (Macintosh)
Alt key (Windows)
Reduces the image with the single-click method.

You can temporarily switch from any other tool to the View Zoom tool:

- **Command key + Space bar** (Macintosh)
Ctrl key + Space bar (Windows)
While these keys are depressed, the cursor changes to the View Zoom cursor, allowing you to zoom in at the location where you click in the Modeling window.
- **Command + Option + Space bar** (Macintosh)
Ctrl + Alt + Space bar (Windows)
Causes the symbol in the cursor changes to a minus (-) sign, and you can zoom out at the location where you click in the Modeling window.

OBJECT MANIPULATION TOOLS

The Object Manipulation tools are located in the top right corner of the tool palette.

Use these tools to select or manipulate objects.



Object Move tool

Object Rotate tool

Object Scale tool

Any of the Object Manipulation tools can be used as selection tools. In addition to selecting objects with these tools, each one also has a separate function.

SELECTING OBJECTS

You can select an object with any of the object manipulation tools (Move, Rotate, Scale). Simply click on the surface of the object.

You can also change the way that StudioPro selects objects. To change the selection rules, use the **MOUSE FILTER** command in the Selection Menu. See **Mouse Filter** on page 31 for more information.

More than one object can be selected at a time using either of the following methods:

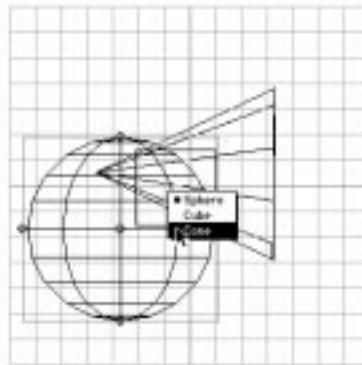
- **Hold down the Shift key while clicking on additional objects.** If an object is already selected, that object becomes deselected without affecting any of the other objects.

If you click on overlapping objects, only the object in front is selected. You can also use a view from another direction to access hidden objects.

- **Drag a selection marquee around the item or items to select them.** Normally, an item is selected only when completely enclosed within the marquee. However, by holding down the **Command** key (Macintosh) or the **Ctrl** key (Windows), all items touched by the selection marquee are also selected.

To deselect all objects, click anywhere in the view away from any objects. You may also use the **SELECT NONE** command in the Selection menu.

If you hold down the **Control** key (Macintosh) when selecting an object, or **click the object with the right mouse button*** (Windows), a list appears that includes all of the objects that reside along the depth axis at the position you click.



* **Windows only:** Click with the button defined as the secondary button. This is usually the right mouse button.

A bullet (•) appears beside objects that are currently selected. If you hold down the shift key as well, you can select multiple items. If you select an item from the list

that is already selected, it becomes deselected.

You can delete the selected object(s) from your model by pressing the Delete key or selecting the **DELETE** command from the Edit menu.

Double-Clicking on a Shape or Group

If you double-click on a group, the group opens in its own window. If the object is a shape instance, its shape window opens. If the shape contains other shape instances, double-clicking on a shape within a shape window opens that shape in its own window, and so on.

Modifier keys that apply to selecting objects with the Object Move, Rotate, or Scale tools:

- **Shift key**

Extends the selection of objects. Without the Shift key, you can only select one object at a time. With the Shift key held down, if you select an object that is already selected, it becomes deselected.

- **Command key** (Macintosh)
Ctrl key (Windows)

Selects all objects that are within or touching a selection marquee. Without the **Command** or **Ctrl** key, only the objects that are completely within the marquee are selected.

- **Control key** (Macintosh)
Right mouse button (Windows) *

Displays a list of all objects found along the depth axis at the position the cursor

is clicked. You can select or deselect objects from this list.

* *Click with the button defined as the secondary button. Usually, the right button is defined as the secondary button.*

OBJECT MOVE TOOL



The Object Move tool moves selected objects in the active view. This tool also functions as a pointer or selection tool.

TOOL FUNCTION

When the Object Move tool is selected, the cursor changes its appearance. If the Caps Lock key is on, the cross-hair cursor appears.



Object Move cursor



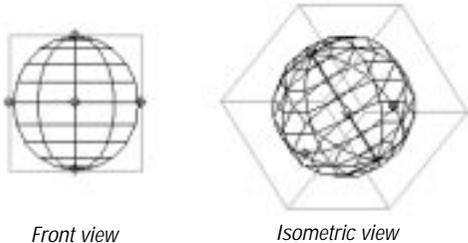
with Caps Lock key on

You can toggle from any tool on the Tool palette to any of the object manipulation tools (Move, Rotate, Scale) by simply pressing the Space bar. Then, tapping the Space bar again returns to the previous tool.

The Object Move tool can also be selected at any time by simply pressing “1” on the keyboard.

To move an object, click-and-drag on the surface or drag the object with the selection handles.

When the Object Move tool is selected, handles appear on each face of the selected object. When the display method is set to *Front*, the face handles may appear similar to edge handles.



However, if you change the view plane slightly, the location of the handles becomes apparent.

Face handle constrains the movement perpendicular to the plane of the selected handle.

Free move by grabbing anywhere on the surface other than on a handle. Using this method, the object can be moved anywhere on the active grid.

To move the object perpendicular to the active grid, hold down the Shift key and the **Command** key (Macintosh) or **Ctrl** key (Windows), then grab anywhere on the surface of the object (other than on a handle).

If more than one object is selected, multiple bounding boxes appear and move in unison.

Moving the object perpendicular to the active grid can be accomplished in different ways:

- If the object has never been rotated, you can grab the face handle on the plane

parallel to the active grid. This is easiest to accomplish in the *Isometric* view orientation. (An object always moves relative to itself, but if it's never been rotated, the object's coordinates are aligned to the grid.)

- **Group the object.** The **GROUP** command in the Modeling menu can be used with single objects as well as multiple objects. When you group an object, a new set of coordinates is established for the group, with its new coordinates aligned to the active grid. Therefore, once the object is grouped, you can grab the handle parallel to the active grid to move the object away from (perpendicular to) the grid. After you've moved the object, you can then ungroup it if you want to restore its previous coordinates. When you ungroup the object, its previous coordinates are re-established.
- **Move the object on the Transform tab of the Object Properties palette.** You can specify to move the object relative to the active grid.



You can easily change grids at any time, even in the middle of a move operation, by pressing the Plus (+) or Minus (-) keys to cycle through all of the World and User-defined grids in the active model.

NOTE: *The X, Y, and Z grids are always in world coordinates. The "Grid" radio button applies to user grids only.*

The Object Move tool can also be used to move camera objects and light sources; however, these objects do not have han-

dles. Just grab the camera or light source to move it. To move a camera or light source perpendicular to the active grid, use the **Shift + Command** (Macintosh) or **Shift + Ctrl** (Windows) keys.

You can also nudge objects with the arrow keys. The distance nudged is determined by the nudge subdivisions indicated in the Set Units dialog. Nudging always occurs relative to the active grid. The arrow keys are used to nudge the selected object in following directions:

<i>Keystroke</i>	<i>Direction moved</i> <i>(relative to the active grid)</i>
Up-Arrow	Negative Z direction
Down-Arrow	Positive Z direction
Right-Arrow	Positive X direction
Left-Arrow	Negative X direction
Command -Shift Up-Arrow (Mac)	Positive Y direction
Ctrl -Shift Down- Arrow (Win)	Negative Y direction

NOTE: Remember, nudging occurs relative to the active grid, so if you're viewing the model from the backside of a grid, objects may appear to move in the opposite direction.

Modifier keys that apply to moving objects with the Object Move tool:

- **Shift key**

Constrains the motion of the selected object to 45-degree increments on the active grid or on a plane parallel to the active grid.

- **Command key** (Macintosh)
Ctrl key (Windows)

Moves the object origin point without moving the object itself; or, if you grab the object rather than the origin point, moves the object, but not the origin point. Without the **Command** key (Macintosh) or **Ctrl** key (Windows), the object and the origin point move together.

To move the object's origin point on the depth axis, it may be necessary to change the orientation of the view to reveal the grid on which you want to move the origin point.

- **Option key** (Macintosh)
Alt key (Windows)

Leaves a copy of the object, including all its associated data (texture, animation, etc.) in the original position.

- **Command + Shift keys** (Macintosh)
Ctrl + Shift keys (Windows)

Move the object perpendicular to the active grid when using the free move method (grabbing the object anywhere on the surface, other than on a handle).

NOTE: You should note that ALL modeling occurs on the active grid. If the active grid appears edge-on, or nearly edge-on, you may want to switch to a different grid. Also, be cautious when moving objects in a NEARLY edge-on orientation to the active grid. When moving objects in this orientation, what appears to be a very short distance may actually be an extremely long distance. You may want to change the view orientation before moving objects to achieve more predictable results.

By enabling the Auto Grids option in the Preferences dialog, you can avoid accidentally modeling edge-on to the active view. When this feature is enabled, switching views automatically switches the active grid to the face-on grid. See **Auto Grids** on page 30 for more information.

OBJECT ROTATE TOOL



The Object Rotate tool rotates objects in the active view. This tool can also be used for selecting objects.

TOOL FUNCTION

When you select the Object Rotate tool, the cursor changes its appearance.



Object Rotate cursor

with Caps Lock key on

You can toggle from any tool on the Tool palette to any of the object manipulation tools (Move, Rotate, or Scale tools) by simply pressing the Space bar. Tapping the space bar again returns you to the previous tool.

The Object Rotate tool can also be selected at any time by simply pressing “2” on the keyboard.

When you select an object, handles appear on each edge of the bounding box. Objects can be rotated either by click-and-dragging on the surface or by rotating them with the edge handles. However, by using the handles, you have additional constraints and control not otherwise available.

Edge handle constrains the rotation of each face clockwise or counter-clockwise around the object’s origin point. You can rotate the object on all three axes.



Front view



Isometric view

The location of the object origin point determines the axis of rotation. The object origin point is the blue diamond that appears with the selection handles on an object. Normally, this point is at the geometric center of the object, but you can move it, if desired. See **Re-center** on page 48 for more information on object origin points and their use.

If multiple objects are selected, each object rotates around its own origin point.

Free rotate by grabbing anywhere on the surface of the object. The object rotates around the object’s origin point in an unconstrained manner. Rotation can be in any direction. If multiple objects are selected, each object rotates around its own origin point.

If you want to rotate the object freely around its geometric center instead of its origin point, you can do so by grouping the object. (Select the object and select the **GROUP** command. This command can be used with single objects as well as multiple objects.) When you group an object, a new set of coordinates is established for the group, with the initial position of the origin point at its geometric center. Once

the object is grouped, you can freely rotate it around its origin point (now at its geometric center) and then ungroup it after you rotated it. When you ungroup the object, its previous coordinates are re-established, including the previous position of the origin point.

The Shift key does NOT constrain the rotation direction while freely rotating.

NOTE: *If you're rotating an object over time, it is important that each rotation be in increments of less than 180 degrees. If you rotate more than this amount, StudioPro will rotate the object using the shortest path, and you may get unexpected results.*

For example, if you manually script an object to rotate 270 degrees from one event marker to the next, StudioPro will instead rotate the object 90 degrees in the opposite direction during the animation sequence, because this is the most direct route from zero degrees to 270 degrees. To control the direction of rotation, always rotate the object in increments of less than 180 degrees.

Modifier keys that apply to rotating objects:

- **Command key** (Macintosh)
Ctrl key (Windows)

If this key is used in conjunction with the Object Rotate tool and the origin point is selected instead of the object, the tool merely acts as a selection tool, and you can move the position of the origin point.

To move the object's origin point on the depth axis, you must change the orientation of the view to reveal the grid on which you want to move the origin point.

- **Option key** (Macintosh)
Alt key (Windows)

Leaves a copy of the object in its original position.

- **Shift key**

Constrains the rotation to 45° increments. The Shift key constrains ONLY when rotating objects by dragging the handles. When rotating by grabbing the surface of the object, the Shift key does not constrain the motion.

OBJECT SCALE TOOL



The scale tool is used to resize or stretch objects. You can also use this tool to select objects.

TOOL FUNCTION

When you select the Scale tool from the Tool palette, the cursor changes its appearance.



Object Scale cursor



with Caps Lock key on

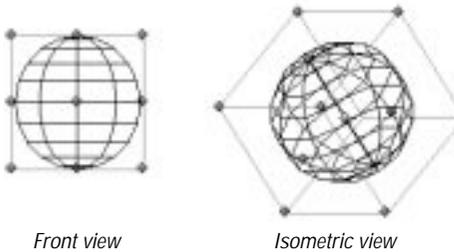
You can toggle from any tool on the Tool palette to any of the Object Manipulation tools (Move, Rotate, Scale) by simply pressing the space bar.

The Object Scale tool can also be selected at any time by simply pressing "3" on the keyboard.

Scaling an object allows you to enlarge or reduce it in a single dimension (height, width, or depth) or on all three axes at

once. Objects are scaled in the direction the cursor is dragged.

When you select an object, handles appear on each face and corner of the object's bounding box. The handles modify the behavior of the scale operation:



Face handle constrains the scale perpendicular to the face. The handle can be pushed or pulled along one axis only. If it's pushed beyond the original position, the object inverts and continues to scale.

Corner handle scales in a plane parallel to the active grid. As with the center handle, if the corner handle is pushed beyond the original position, the object inverts and continues to scale.

Free scale by grabbing anywhere other than a handle. The object scales proportionally in all three directions.

Modifier keys that apply to scaling objects with the Object Scale tool:

- **Command key** (Macintosh)
Ctrl key (Windows)

If this key is used in conjunction with the Object Scale tool and the origin point is selected instead of the object,

the tool merely acts as a selection tool, and you can move the position of the origin point.

To move the object's origin point on the depth axis, you must change the orientation of the view to reveal the grid on which you want to move the origin point.

- **Option key** (Macintosh)
Alt key (Windows)

Scales an object from its geometric center.

- **Shift key**

When grabbing with a handle, maintains the proportions of the object while enlarging or reducing its size. The object scales on all three axes according to the path you drag.

- **Option + Shift keys** (Macintosh)
Alt + Shift keys (Windows)

Scale an object proportionally from the object's geometric center.

SPECIALIZED MODELING TOOLS

This section of the Tool palette allows you to create lathed and extruded objects directly in the Modeling window.



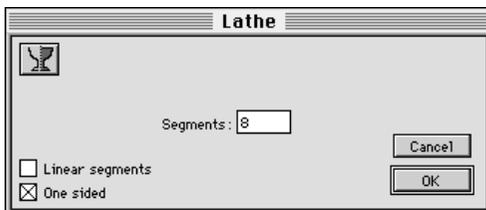
LATHE TOOL



Use the Lathe tool to create 3-D objects by revolving a 2-D template around a central axis.

TOOL SETTINGS

The Tool Settings dialog allows you to change the default behavior of the Lathe tool. To access the *Tool Settings*, simply double-click the Lathe tool.



- **Segments.** This field determines the default number of segments used in each 360° revolution. The greater the number of segments, the smoother the final object appears.
- **Linear segments.** When this box is checked, the areas between segments contain flat surfaces. The more segments, the smoother the surface appears. When this box is unchecked, the areas between segments create a smoothly curved surface.
- **One sided.** A check mark in this box will create a solid, one-sided lathed object. If no check appears in this box, the lathed object will be two-sided.

TOOL FUNCTION

You can use any single 2-D object or 2-D group as a template. If the template is a closed line, it can be filled or unfilled.

The Lathe tool can be used to select a 2-D template. If an object is already selected, you can use the tool to select a different 2-D object or group, if desired.

If a filled 2-D object is lathed less than 360 degrees, it appears as a solid object with endcaps. If you perform the same lathe operation on an unfilled 2-D object, it appears hollow with no endcaps.

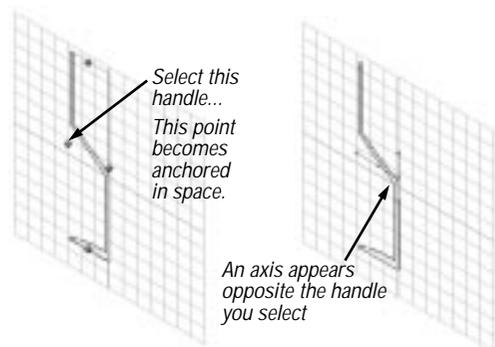


180° lathe with filled 2-D template

180° lathe with unfilled 2-D template

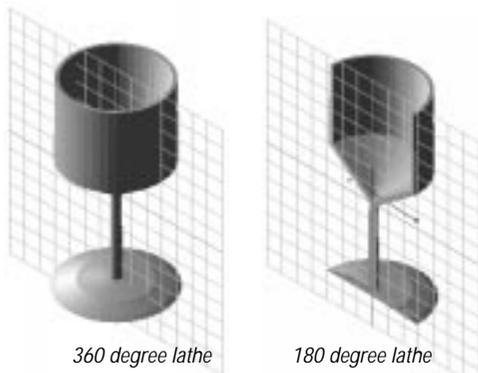
NOTE: If you're going to apply a transparent texture to a lathed object that is rotated 360 degrees (or more), you'll want to use an unfilled template. Otherwise, when the image is rendered, the endcaps will appear as seams in the surface of the object.

Select a handle on the bounding box to revolve around the object. The opposite extent of the bounding box becomes the initial axis of rotation for the lathe operation



The location of the handle you grab becomes a beginning point for the lathe operation, and cannot be moved. This is especially important when choosing to perform a sweep operation.

Grab the handle and rotate the profile to define the total number of degrees. Rotations of more than 360 degrees are not apparent in the Modeling window unless the axis is shifted, as when performing a sweep motion. However, the total number of rotations is indicated on the Object Properties palette.



Click any other tool on the Tool palette to complete the lathe operation. If you choose the wrong handle and lathe in the opposite direction, you can use the **UNDO** command in the Edit menu, but only if you select the command immediately after the Lathe operation is complete.

The object origin point remains in its original position in the lathe template. If you want the origin point placed at the geometric center of the object itself, then select the **RE-CENTER** command from the Modeling menu.

EDITING LATHE OBJECTS

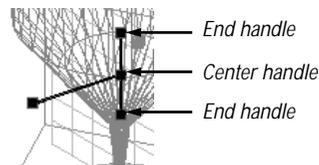
To edit the template of the selected lathed object, select the **RESHAPE** command from

the Modeling menu or click the **RESHAPE** button on the Button bar. You can edit the template directly in the Modeling window.

To push or pull individual vertices on the final 3-D lathed object, you must first convert it to another object type. See **Convert** on page 45 for complete details about this command.

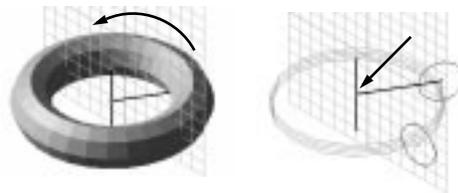
To change any of the original lathe parameters of the lathe operation, select the lathe object and Lathe tool. You can then edit the object in several different ways.

To tilt the axis, grab an end handle on the axis and push or pull it to the desired position.



Grab the center handle on the axis to move it in or out.

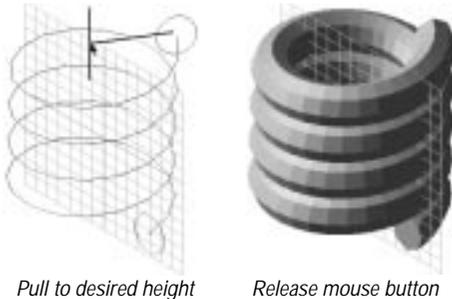
To perform a sweep, hold down the Shift key, then grab the center handle on the axis and move it up or down.



Template rotated four times around its axis.

With Shift key down, grab center handle and pull upward.

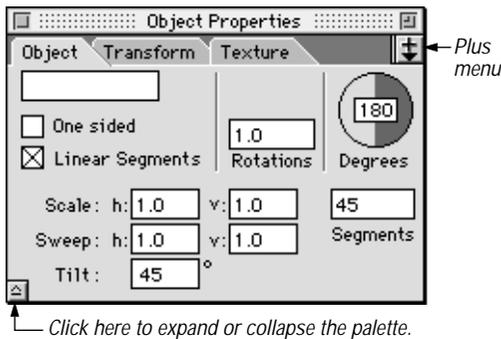
Rotations greater than 360 degrees are apparent with sweep operations.



To temporarily display the entire lathed object so you can view its current geometry as you edit it, select any other tool on the tool palette. Then, if you wish to continue editing the lathe parameters, select the object with the Lathe tool again.

Object Properties Palette

You can also edit the Lathe object from the Object tab of the Object Properties palette.



To expand the palette to reveal the expert settings, as well as the basic settings:

- Select the **EXPERT MODE** command from the Plus menu.
- or -
- Click the arrow in the lower left corner or the palette.

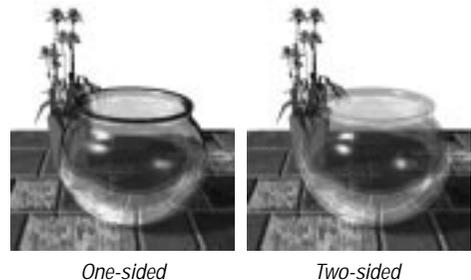
Macintosh only: You can also click the Zoom box in the upper right corner to expand or collapse the palette.

The following controls are provided for editing Lathe objects:

- **Name.** If the selected object has been named, its name appears in this field. You can edit the existing name at any time. If you add or change the name in this field, that change is reflected in the *Name* field in the Project window, as well.
- **One sided.** This checkbox indicates whether the object is one-sided or two-sided. You can convert it from one type to another by checking or unchecking this box.

If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as mist or fog, you'll need to create a solid, one-sided object.

A transparent object with a single-sided surface refracts light coming through it.



This template was used for the Lathe operation. It gives thickness to the final lathed object.

Notice how the light seems to bend as it passes through the bowl on the left.

- **Linear segments.** When this box is checked, the areas between segments contain flat surfaces, creating a ridge-like appearance. The greater the number of segments, the smoother the surface appears. When this box is unchecked, the areas between segments create a smoothly curved surface.



Linear Segments option enabled



Linear Segments option disabled

- **Rotations.** This field keeps track of the total number of rotations. Each time the axis is rotated more than 360°, the number in this field increases by one.
- **Degrees.** This value indicates the degrees of rotation used to create the lathed object. Enter any number in the numeric input field or specify the value interactively with the control provided.



With the cursor, grab the control here...

then drag and rotate to indicate the total number of degrees of rotation desired.



If greater than 360 degrees, however, the effect is not visible unless you move the horizontal or vertical axis to any

value other than one. This is equivalent to a sweep operation.

- **Scale.** This value indicates the percentage of the height and width of the template that EACH segment is scaled, relative to the previous segment. Each segment will get progressively larger or smaller.



- **Sweep.** The value in the horizontal field controls the perpendicular distance from the axis that each segment moves, relative to the previous segment. The value in the vertical field determines the distance each segment moves ALONG the axis, relative to the previous segment.
- **Tilt.** This value represents the number of degrees that the axis of rotation is tilted relative to its original orientation.
- **Segments.** This field indicates the number of segments the lathed object has. The higher the value in this field, the smoother the surface of the object appears.

For more information about the **Object Properties palette**, see page 221.

EXTRUDE TOOL

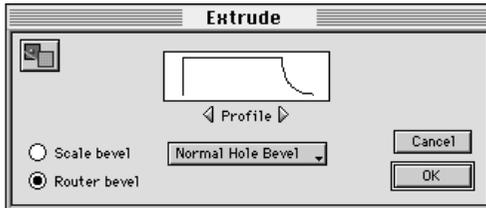


The Extrude tool allows you to create 3-D objects from 2-D templates.

TOOL SETTINGS

Double-click the Extrude tool to display the Extrude Tool Settings dialog. From this

dialog, you can change the default behavior of the Extrude tool.



The *Tool Settings* dialog lets you select a profile to use as a bevel for the Extrude operation. The default profile is a square profile, but a variety of profiles are available to choose from.

- **Router or Scaled bevel.** There are two different ways to extrude objects: *Router* and *Scaled*. The method chosen determines how the extrusion bevel is applied to the template.



Router-type extrusion

Scale-type extrusion

- **Profile.** Use the arrows to scroll through the pre-defined bevels available.
- **Hole extrusion method.** You can choose one of three ways to extrude

any holes in the object: *Normal*, *Inverted*, and *None*.



*No bevel
in holes*

*Normal bevel
in holes*

*Inverted bevel
in holes*

The inverted bevel is apparent when viewed from behind.

These settings determine the default behavior of the tool. You can always edit the extrude object from the Object Properties palette after it's been created. For details, *see page 104*.

TOOL FUNCTION

Select any 2-D object, or 2-D group, to use as a template for the Extrude operation. Once selected, a 2-D bounding box with a single handle in the center appears around the object.

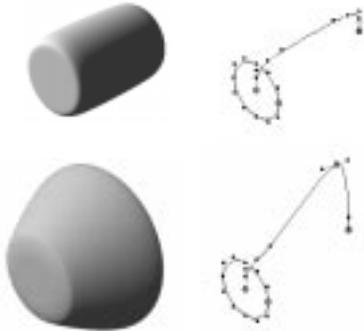
If an object isn't suitable for extruding, you can't select it with the Extrude tool.

To extrude the object, grab anywhere on the face and pull or push. The extrusion always occurs in a direction perpendicular to the face of the template. If the face is pushed beyond the original position, it inverts and continues to extrude.

EDITING EXTRUDED OBJECTS

You can edit the face and the bevel of the selected Extrude object by using the

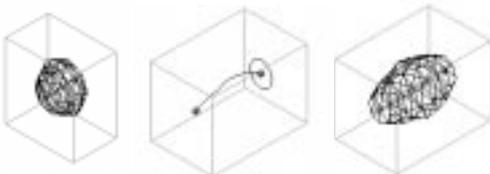
RESHAPE command from the Modeling menu. Only the template and the bevel appear.



You can edit the bevel of an extruded object to radically change its appearance. By changing the bevel at different points in time, you can create an animation in which the object changes shape at different times.

You can manipulate the vertices to edit either the template or the bevel of the extruded object. See **Reshape** on page 35 for more information about this command.

To change the depth of the extrusion, select the extruded object with the Extrude tool.

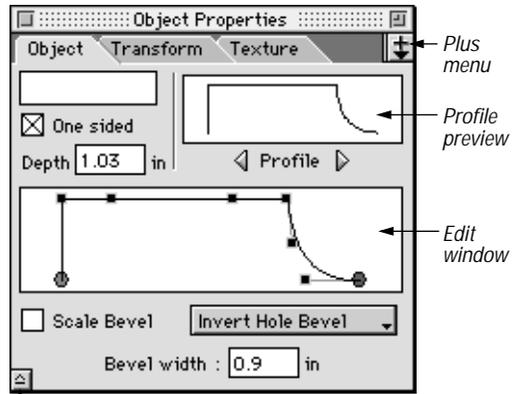


Select object with Extrude tool

Grab handle, then push or pull to change the depth of the extrusion

Object Properties Palette

An Extrude object can also be edited on the Object tab of the Object Properties palette.



Click here to expand or collapse the palette.

To expand the palette to reveal the expert settings, as well as the basic settings:

To expand the palette to reveal the expert settings, as well as the basic settings:

- Select the **EXPERT MODE** command from the Plus menu.
- or -
- Click the arrow in the lower left corner of the palette.

This palette contains the following fields:

- **Name.** You can assign a name to this object, if desired.
- **One sided.** When this box is checked, the object is a solid, one-sided object. When no check appears, the object is a two-sided object. You can convert it

from one type to another by checking or unchecking this box.

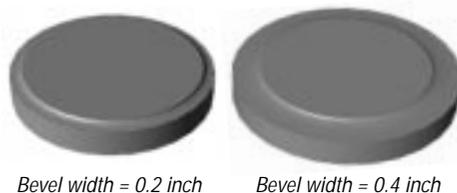
If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as mist or fog, you'll need to create a solid, single-sided object.

- **Depth.** This field indicates the current depth of the object.
- **Profile.** This area contains a preview of the current bevel. You can change the bevel by using the arrows to scroll through the pre-defined profiles.

An edit window is provided to edit the profile that appears in the preview area. When you click in the edit window, you can reposition the control points and their handles.

To add a point, hold down the **Option** key (Macintosh) or **Alt** key (Windows) and click at the position on the line where you want to add a point.

- **Scale Bevel checkbox.** When a check appears in this box, the *Scale Bevel* option is enabled. If the box is not checked, the *Router Bevel* is used instead.
- **Hole extrusion method:** This field contains the current hole bevel option: *None*, *Normal*, or *Inverted*.
- **Bevel width.** This setting indicates the current width of the bevel.

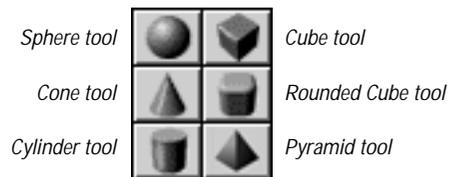


To change the width, enter a different value in this field, then tab out of the field or press the Return key.

For a description of the other tabs, see **Object Properties Palette** on page 221.

PRIMITIVES TOOLS (3-D OBJECTS)

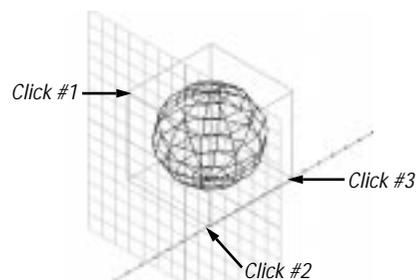
This section of the tool palette contains tools that draw 3-D primitives. Of all object types, primitives take the least amount of memory and render the fastest. You should use primitives whenever possible.



Drawing Primitives

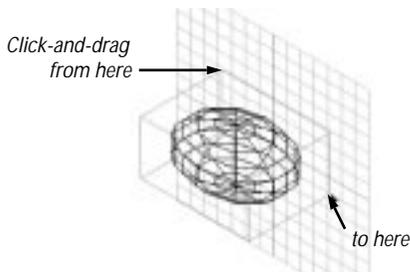
You can draw primitive objects in two ways:

- **Three-step method.** The size of the primitive's bounding box is defined by three separate mouse clicks.



The first two clicks are placed on the active grid. After the second click, a temporary grid line appears as an aid for positioning the third click. This is easiest to accomplish when working in isometric view. If you're working in *Front - Orthographic* view, for example, you won't be able to see where to position the third click. However, you can change the view orientation before positioning the third click.

- **Click-and-drag method.** Again, the first two points are on the active grid.



StudioPro determines the location of the third point by adding the first two dimensions together, and dividing the sum by two.

Modifier keys that apply to drawing 3-D objects with the click-and-drag method:

- **Shift key**
Constrains the tools to draw objects with the same dimensions on all axes.
- **Option key (Macintosh)
Alt key (Windows)**
Draws an object from its center, instead of the corner.

- **Option + Shift keys (Macintosh)
Alt + Shift keys (Windows)**
Draws objects from the center with equal proportions in all dimensions.

SPHERE TOOL



Use this tool to draw spherical-shaped objects.

TOOL SETTINGS

Double-click the Sphere tool to display the Tool Settings dialog.

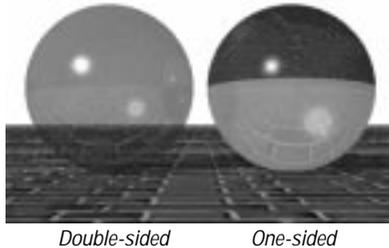


- **One sided.** This checkbox indicates whether the object is one-sided or two-sided. You can convert it from one type to another by checking or unchecking this box.

If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as fog or mist, be sure to check the *One-sided* checkbox.

A transparent sphere with a single-sided surface refracts light coming through it as if it was solid, such as a solid crystal ball. A sphere with a

double-sided surface appears hollow and cannot refract light.

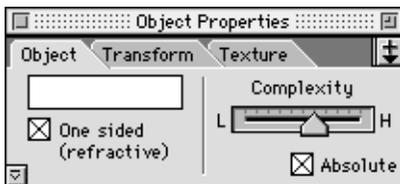


TOOL FUNCTION

All primitives are drawn the same way. For instructions on drawing a sphere, see **Drawing Primitives** on page 105.

Object Properties Palette

After you've inserted a sphere into your model, you can edit it by modifying the values on the Object tab of the Object Properties palette.



- **Name.** This field contains the name of the selected sphere if one has been assigned. You can edit or add a name at any time.
- **One sided.** A check mark in this box indicates the selected sphere is a solid,

one-sided sphere. If no check appears in this box, the selected sphere is a hollow, two-sided sphere. You can change the sphere from solid to hollow, or vice versa, at any time.

- **Complexity slider.** The position of this slider determines the complexity, or amount of detail, with which the sphere is rendered, either in the Modeling window or in the final image. It does NOT change the actual complexity of the sphere, but only the way the renderers display it.
- **Absolute checkbox** - When this box is *unchecked*, the slider indicates a relative complexity based on the maximum allowed by that renderer. The range of complexity is also affected by the size of the sphere and its proximity to the view plane. For example, if the sphere appears at a substantial distance in the background, a lesser complexity level will be used.

When this box is *checked*, the *Complexity Slider* indicates the EXACT percentage of the maximum complexity allowed.

For complete details on the other tabs, see **Object Properties Palette** on page 221.

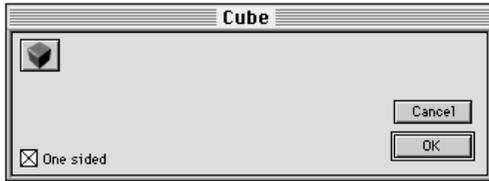
CUBE TOOL



Use this tool to draw cube-type shapes in the active view.

TOOL SETTINGS

Double-click the Cube tool to display the Tool Settings dialog.



- **One sided.** This checkbox indicates whether the cubes created with this tool will be one-sided or two-sided. Single-sided surfaces are only visible to the rendering algorithms from one side; double-sided objects are visible from either side.

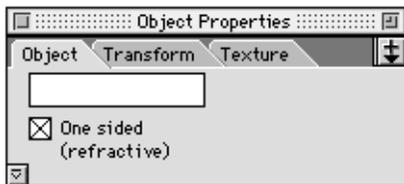
If you are planning to apply a volumetric effect such as fog or mist, or a transparent texture with refractive properties, you'll need to create a solid, single-sided cube.

TOOL FUNCTION

For instructions on drawing a cube, see **Drawing Primitives** on page 105.

Object Properties Palette

Once you've inserted a cube into your model, you can modify it on the Object tab of the Object Properties palette.



- **Name.** This field contains the name of the selected cube, if a name has been

assigned. You can assign a name at any time, or edit the existing name.

- **One sided.** You can change the cube from a solid, one-sided cube to a hollow, two-sided cube, or vice versa, at any time.

For details on the other tabs, see **Object Properties Palette** on page 221.

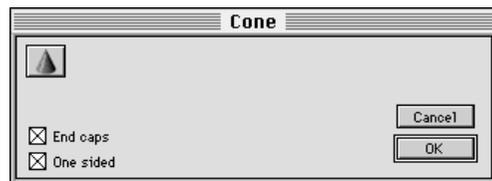
CONE TOOL



Use this tool to draw cone-shaped objects.

TOOL SETTINGS

You can change the default settings for the tool by double-clicking the Cone tool icon on the Tool palette. The Tool Settings dialog appears.



- **Endcaps.** This checkbox determines whether or not the cones created with this tool have endcaps. You can create a cone with no endcap or a closed cone, depending on the settings for the tool.



With endcap



Without endcap

NOTE: If the **Backface Culling** option is enabled in the Preferences dialog (page 26), the inner side of a cone without an endcap won't be visible in the Modeling window. It will render, however.

- **One sided.** When this box is checked, cones created with this tool will be solid, one-sided objects. Objects must be created as *One-Sided* to have refractive properties, or when you want to apply volumetric effects, such as mist, to them. If no check appears in this box, cones will be created as two-sided. If a transparent texture is applied to a double-sided cone, it appears as a hollow object, and does not refract light passing through it.

TOOL FUNCTION

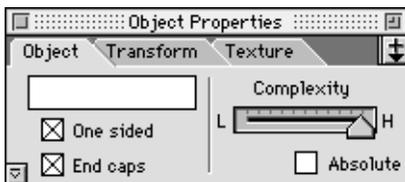
Cones are always drawn with the base placed flat on the active grid, and the top of the cone pointing in a direction perpendicular to the active grid.

When you draw a cone using the click-and-drag method, you can specify the height or width of the cone. If you change the proportions of the cone, the base is also distorted from a perfect circle.

For instructions on drawing a cone, see **Drawing Primitives** on page 105.

Object Properties Palette

Once you've inserted the cone in your model, you can edit it by changing the values on the Object tab of the Object Properties palette.



- **Name.** This field contains the name of the selected cone. To assign a name to the cone, enter a name in this field. You can edit this name at any time.
- **One sided.** When this box is checked, the selected cone is a solid, one-sided object. If no check appears in this box, the selected cone is two-sided.
- **Endcaps.** This checkbox indicates whether or not the selected cone has an endcap. You can add or remove the endcap at any time.
- **Complexity slider.** The position of this slider determines the complexity, or amount of detail, with which the cone is rendered, either in the Modeling window or in the final image. It does NOT change the actual complexity of the cone, but only the way the renderers display it.
- **Absolute checkbox** - When this box is *unchecked*, the *Complexity Slider* indicates a relative complexity based on the maximum allowed by that renderer. The range of complexity is also affected by the size of the cone and its proximity to the view plane.

When this box is *checked*, the *Complexity Slider* indicates the EXACT percentage of the maximum complexity allowed.

For instructions on using the other tabs on this palette, see **Object Properties Palette** on page 221.

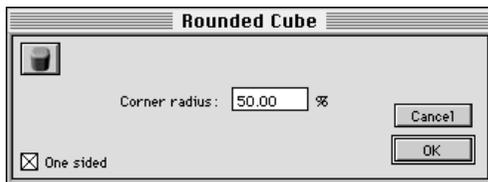
ROUNDED CUBE TOOL



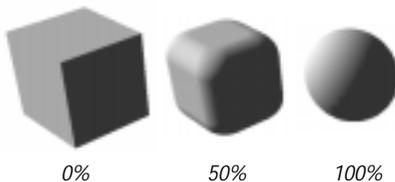
Use this tool to draw cube-type shapes with rounded corners.

TOOL SETTINGS

Double-click the Rounded Cube tool to access its Tool Settings dialog.



- **Corner radius.** This setting determines the roundness of the corners of the cube. Zero percent results in a cube with 90 degree corners; 100 percent results in a perfect sphere.



- **One sided.** This checkbox indicates whether cubes created with this tool are one-sided or two-sided.

If you are planning to apply a transparent texture with refractive properties, or a volumetric shader such as mist, you'll need to create a solid, single-sided object.

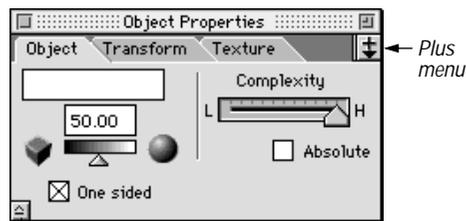
TOOL FUNCTION

The radius of the rounded corners is determined by the value specified in the Tool Settings dialog. Like the standard cube, this object is a single entity and cannot be ungrouped.

For instructions on drawing a rounded cube, see **Drawing Primitives** on page 105.

Object Properties Palette

Once drawn, the rounded cube can be edited on the Object Properties palette.



Click here to expand or collapse the palette.

To expand the palette to reveal the expert settings, as well as the basic settings:

- Select the **EXPERT MODE** command from the Plus menu.
- or -
- Click the arrow in the lower left corner of the palette.

The following controls are available for editing:

- **Name.** This field contains the name of the selected object, if one has been assigned. You can enter a name in this field, or edit an existing name at any time.

- **Corner radius.** You can change the radius of the corners on the selected cube by entering a value in this field or by adjusting the slider.
- **One sided.** This checkbox specifies whether the selected cube is one-sided or two-sided. You can convert it from one type to another by checking or unchecking this box.
- **Complexity.** The position of this slider indicates the current complexity setting, or amount of detail, with which the cube is rendered, either in the Modeling window or in the final image. It does NOT change the actual complexity of the cube, but only the way the renderers display it.
- **Absolute checkbox** - When this box is *unchecked*, the slider indicates a relative complexity based on the maximum allowed by that renderer. The range of complexity is also affected by the size of the cube and its proximity to the view plane.

When this box is *checked*, the slider indicates the EXACT percentage of the maximum complexity allowed by each renderer.

For complete details on the other tabs found on this palette, see **Object Properties Palette** on page 221.

CYLINDER TOOL



Use this tool to draw cylindrical-shaped objects.

TOOL SETTINGS

You can change the default behavior of the Cylinder tool through the Tool Settings

dialog. To access this dialog, double-click the Cylinder tool icon on the Tool palette.



- **Endcaps.** This checkbox determines whether or not the cylinders created with this tool have endcaps. You can create a cylinder with no endcaps or a closed cylinder, depending on the settings for the tool.



With endcaps



Without endcaps

NOTE: If the **Backface Culling** option is enabled in the Preferences dialog (page 26), the inner side of a cylinder without endcaps won't be visible in the Modeling window. However, it will render.

- **One sided.** When this box is checked, cylinders created with this tool will be solid, one-sided cylinders. Objects must be created as *One-Sided* to have refractive properties. If no check appears in this box, cylinders will be created as two-sided objects, and will appear hollow if a transparent texture is applied.

TOOL FUNCTION

Cylinders are always drawn with the base placed flat on the active grid. The curved

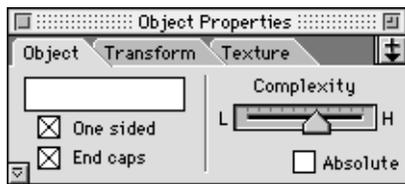
surface of the cylinder is smoothed when rendered.

For instructions on drawing a cylinder, see **Drawing Primitives** on page 105.

You can create a hollow cylinder or a closed cylinder with endcaps, depending on the settings for the tool.

Object Properties Palette

Once you've created a cylinder, you can edit it from the Object tab of the Object Properties palette.



- **Name.** If this cylinder has been named, the name appears in this field. You can add a name, or edit an existing one, at any time.
- **One sided.** When this box is checked, the selected cylinder is a solid, one-sided object. If you want the cylinder to have refractive properties, or you plan on applying a volumetric effect to the cylinder, it must be created as *One sided*. If no check appears in this box, the selected cylinder is two-sided. When a transparent texture is applied, the cylinder appears hollow, and does not refract light passing through it.
- **Endcaps.** This field indicates whether or not the cylinder has endcaps. You can remove or add endcaps by changing the status of this checkbox.

- **Complexity slider.** The position of this slider determines the complexity, or amount of detail, with which the cylinder is rendered, either in the Modeling window or in the final image. It does NOT change the actual complexity of the cylinder, but only the way the renderers display it.
- **Absolute checkbox** - When this box is *unchecked*, the slider indicates a relative complexity based on the maximum allowed by that renderer. The range of complexity is also affected by the size of the cylinder and its proximity to the view plane.

When this box is *checked*, the slider indicates the EXACT percentage of the maximum complexity allowed.

See **Object Properties Palette** on page 221 for information about the other tabs on the Object Properties palette.

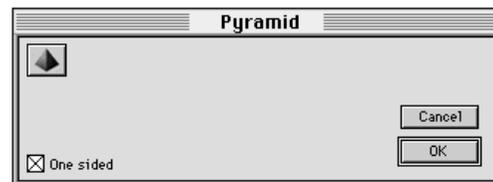
PYRAMID TOOL



This tool allows you to draw pyramid-shaped objects.

TOOL SETTINGS

Double-click the Pyramid tool to display the Tool Settings dialog.



- **One sided.** This box indicates whether the pyramids you create are solid, one-sided objects or hollow, two-sided objects.

If you are planning to apply a transparent texture with refraction, or a volumetric effect such as fog or mist, the pyramid must be created as a one-sided object.

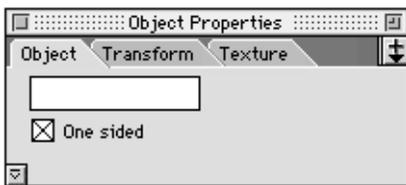
TOOL FUNCTION

The base of the pyramid is always drawn on the active grid, with the top of the pyramid pointing in the direction perpendicular to the active grid.

See **Drawing Primitives** on page 105 for detailed instructions on drawing pyramids.

Object Properties Palette

Once created, the pyramid can be modified on the Object tab of the Object Properties palette.

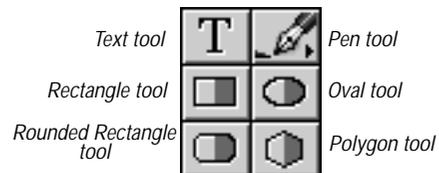


- **Name.** If the selected pyramid has been named, the name appears in this field. You can add a name, or edit an existing one, at any time. The name in this field also appears in the *Name* field in the Project window.
- **One sided.** When this box is checked, the selected pyramid is a solid, one-

sided object. If you want the pyramid to have refractive properties, or if you plan on applying a volumetric effect such as fog or mist, it must be created as *One sided*. If no check appears in this box, the selected pyramid is two-sided and will appear hollow if a transparent texture is applied.

DRAWING TOOLS (2-D OBJECTS)

The drawing tools are used to draw two-dimensional objects. These objects have height and width, but no depth. The 2-D drawing tools include the Text tool, Bézier Pen tool, and the Rectangle, Oval, Rounded-Rectangle, and Regular Polygon tools.



Typically, they serve as templates for the Lathe and Extrude tools, but may also be left as two-dimensional objects.

The size and proportion of the object are determined by the starting and ending position of the cursor on the grid as it is dragged.



The Rectangle, Oval, Rounded Rectangle, and the Polygon tools all have a filled and unfilled representation showing on the Tool palette. You can select the filled ver-

sion by clicking the right side of the tool, or the frame version by clicking the left side. A filled object renders with a surface, while the unfilled, frame-only version renders hollow.

The cursor can be changed to a cross-hair cursor by turning on Caps Lock.

- | - Cross-hair cursor

Modifier keys that apply to drawing 2-D objects (except the Text tool):

- **Shift key**
Constrains the tools to draw equally-proportioned objects, (squares, circles, etc.). With the Pen tool, the Shift key constrains line segments to 45° increments.
- **Option key (Macintosh)**
Alt key (Windows)
Draws an object from its center, instead of the corner. The **Option** or **Alt** keys do not apply to the Pen or Text tools.
- **Option + Shift keys (Macintosh)**
Alt + Shift keys (Windows)
Draws equally proportioned objects from the center.

TEXT TOOL

You can add three-dimensional text to your model. The text can be easily customized to create the look you want.

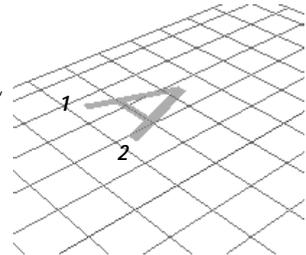


Use this tool to enter text into a model.

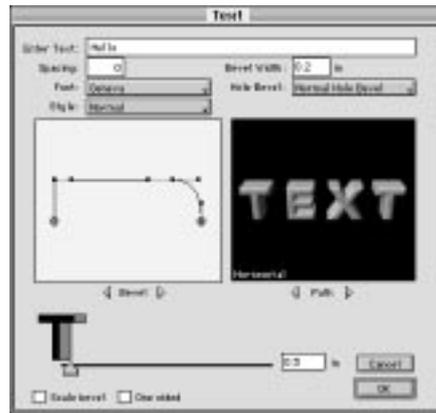
TOOL FUNCTION

Click and drag in the Modeling window to define the size of the text you want to create.

To define the height of the text, click at Point 1, then at Point 2. Or, click and drag from Point 1 to Point 2.



When you release the mouse button, the Text dialog appears for specifying the necessary settings.

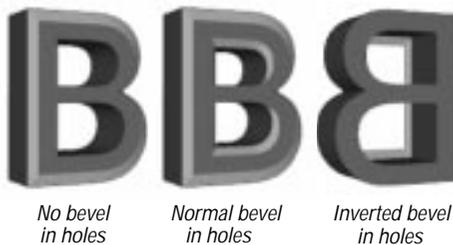


This dialog contains the following settings:

- **Text.** Enter a single line of text in this field. This line can contain up to 255 characters. However, because you are

limited to a single line, the *Return* character is not a valid character.

- **Spacing.** Set the default letter spacing in this field. A value of zero is the normal letter spacing for the chosen font. Letter spacing is an index value that is proportional to the font being used. The higher the value, the wider the characters are spaced apart. Negative values will condense letters.
- **Font.** Supported fonts appear in the pop-up list.
- **Style.** Choose a style for the text. You can choose *Regular*, *Italics*, or *Bold*.
- **Bevel Width.** The value in this field sets the width of the bevel.
- **Hole Bevel.** You can choose one of three ways to extrude any holes in the text: *Normal*, *Inverted*, and *None*.



The inverted bevel is apparent when viewed from behind.

- **Bevel.** Use the arrows to scroll through the preset bevels available. Select a profile to use as a bevel for the text. The default bevel is a square profile.

If you don't find the exact extrusion settings you want, StudioPro allows you to modify one of the pre-defined bevels to meet your specifications.

To customize a bevel, first choose one from the pre-defined settings that is closest to the results you want to achieve. Then, to customize the bevel, adjust the individual vertex points along the spline path that describes the bevel.

The bevel is a side profile. It is always an open line with the right end point corresponding to the front face of the text and the left end point corresponding to the back face.

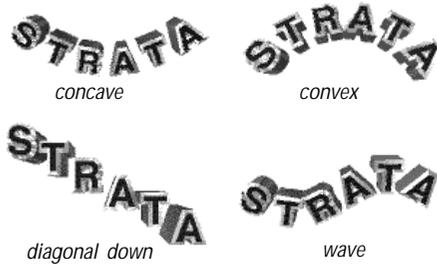
You can move vertex points within the window and adjust their direction handles to bend the line as needed to create the desired bevel. (See **Working with Bézier Splines** on page 41 for details.)

To add a vertex point, hold down the **Option** key (Macintosh) or **Alt** key (Windows) while placing the cursor on the line between two other points. When the cursor intersects the line, click the mouse button. When you add a vertex point, you can begin dragging it immediately.

To hinge a vertex point, hold down the **Option** key (Macintosh) or **Alt** key (Windows) while dragging one of the direction handles. You will be able to drag it without the opposite handle moving. Once you break the continuity of the direction handles for a particular point, you can move either handle freely without using the **Option** key or **Alt** key again.

To re-align direction handles that were previously hinged, move one of the handles until it is visually aligned with the handle on the other side, causing the handles to link together.

- **Path.** Select a path on which to align the text. Some of the preset path choices appear below:



- **Extrude Depth.** Use the slider or enter a value in the numeric entry field to specify a depth, or thickness, for the extrusion. If you want to create 2-D text, enter an extrusion depth of zero.
- **Scale bevel.** You can choose from two different ways to extrude text: *Router* and *Scale*. The method chosen determines how the extrusion bevel is applied to the template. If this box is not checked, the *Router*-type extrusion is applied.

Router-type extrusions:



Scale-type extrusions:



- **One sided.** This checkbox indicates whether the text is one-sided or two-sided. You can convert it from one type to another by checking or unchecking this box.

If you are planning to apply a transparent texture with refractive properties, or a volumetric shader such as fog or mist, you'll need to create the text as solid, single-sided objects.

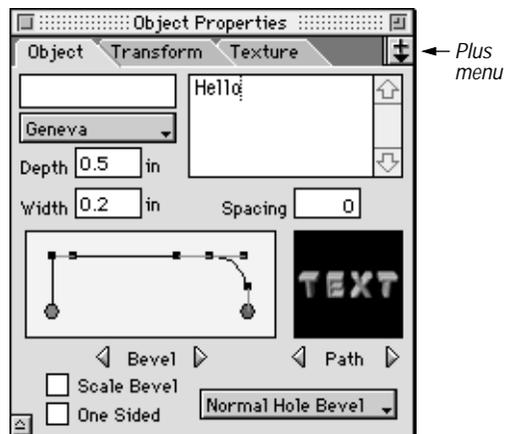
Transparent objects with single-sided surfaces refract light coming through them as if the objects were solid, such as a solid crystal ball. Objects with double-sided surfaces appear hollow, like a hollow shell, and cannot refract light.

As you enter text into the text field, the text preview appears according to the font, style, and spacing that you specified in those fields.

When you click the *OK* button, the characters are extracted in the shape of the selected font, and then extruded into 3-D objects.

Object Properties Palette

Once created, the text can be edited from the Object tab of the Object Properties palette.



Click here to expand or collapse the palette.

To expand the palette to reveal the expert settings, as well as the basic settings:

- Select the **EXPERT MODE** command from the Plus menu.
- or -
- Click the arrow in the lower left corner of the palette.

The following fields can be edited:

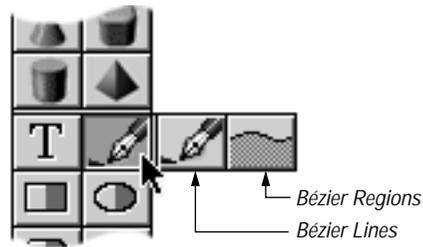
- **Name.** You can name the text object, if desired. This field contains the name of the selected text object. You can edit the name at any time.
- **Font.** This field contains the current font. You can change the font by selecting a different one from the pop-up menu.
- **Text.** You can edit the text in this field.
- **Depth.** This field determines the depth of the extrusion. A value of zero in this field indicates a 2-D object.
- **Width.** The value in this field determines the width of the bevel.
- **Bevel.** Editing the bevel on the Object Properties palette is the same as editing the bevel in the Text dialog. All of the same commands for editing the bevel apply here, as well. For details, see **Bevel** on page 115.
- **Path.** This field specifies the path on which the text is oriented. Use the arrows to scroll through the other paths that are available.

- **Scale Bevel.** When this box is checked, a scale-type bevel is applied; otherwise, a router-type bevel is used.
- **Hole Bevel Type.** You can choose one of three ways in which to extrude the holes in text: *Normal bevel in holes*, *Inverted bevel in holes*, or *No bevel in holes*.

For information on the other tabs, see **Object Properties Palette** on page 221

PEN TOOL

The Bézier Pen tool can be used to draw Bézier lines or Bézier regions. To switch from one pen tool type to the other, hold down the tool on the Tool palette, then select the desired pen tool from the tool's pop-out.



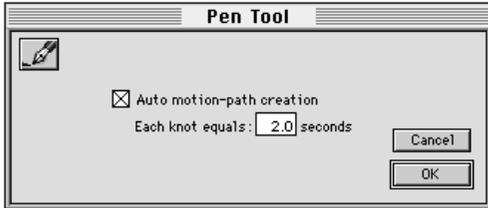
BÉZIER LINES



Select this tool from the Pen tool pop-out to draw Bézier curves or lines. Lines drawn with this tool can reside on more than one plane. You can switch grids at any time while you're drawing the line.

Tool Settings

Double-click on the Pen tool to display the Tool Settings dialog.



- **Auto motion-path.** Check this box to create an animation path rather than a 2-D line. Even with the box checked, however, this option applies **ONLY** when the first click of the mouse button is on another object. If the first click is on an object, that object will highlight, verifying that the click did occur on an object, and the line you draw will become an animation path, not a 2-D line. If the object does not highlight, the line you create is a 2-D line, not an animation path.

Each click of the mouse button, as the animation path is drawn, inserts an anchor point. The time interval between anchor points is also specified in this dialog.

If this option is checked, but the first click is **NOT** on another object, the line you draw does not become an animation path, but just a 2-D line. However, it can be changed into an animation path later with the Convert to Path tool on the Extension Tool palette. (See **Convert to Path** on page 235.)

BÉZIER REGIONS



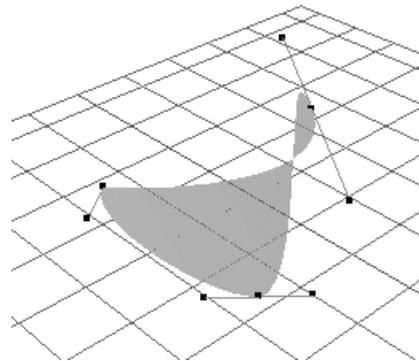
Select this tool from the Pen tool pop-out to draw Bézier regions.

Tool Settings

Double-click the Bézier Region tool to display the Tool Settings dialog.



- **Create Filled Region.** When this box is checked, objects drawn with this tool are filled; however, you can change the filled status on the Object Properties palette later.



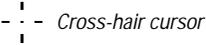
TOOL FUNCTION

Both Pen tools function in a similar manner. All of the lines must be drawn on the active grid, but you can change grids while you're drawing.

You can change from the pointer cursor to the cross-hair cursor with the Caps Lock key.



Pointer cursor



Cross-hair cursor

Simply click anywhere in the Modeling window to define the starting position of a **straight line segment**.

Click-and-drag to define the starting position of a **curved line segment**. The direction the control handle is dragged determines the direction of the curve. The length of each control handle determines the height or depth of the curve.

Continue to click, or click-and-drag to create the line.

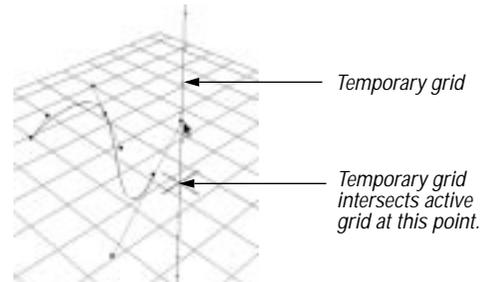
To complete the line, double-click or press the Return key. Clicking on the first point closes the line.

To remove the last line segment, press the Delete key at any time during the drawing process. To remove more than one segment, continue to press the Delete key until as many line segments have been deleted as desired.

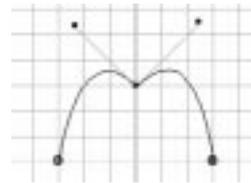
Try to use as few anchor points as possible. Don't place them too close together unless necessary. The more anchor points there are, the more memory required.

To draw perpendicular to the active grid, hold down the **Command + Shift** keys (Macintosh) or **Ctrl + Shift** keys (Windows). This option is available only with the Bézier Line Pen tool. A temporary

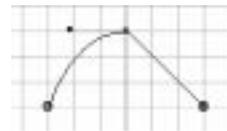
grid line appears to assist you in accurately positioning the next anchor point.



To create a hinged anchor point, hold down the **Option** key (Macintosh) or **Alt** key (Windows) and click to define the position of the anchor point to be hinged, then drag in the direction of the curve.



To add a straight line segment to a Bézier curve, click on the last anchor point, and then click again where you want the straight line segment to end.



To add to an existing line. Later, you can select the Bézier Pen tool again and add to an existing Bézier line. Just click on either end of the existing line (it highlights to confirm that you're adding to the line – not beginning a new line), then continue drawing. If you add to the beginning of the line, the position of the *First point* also moves. If you add to the end of the existing line, the *End point* moves.

Modifier keys that apply to the Pen tool:

- **Shift key**
Constrains drawing or dragging to 45 degree increments.
- **Option key (Macintosh)**
Alt key (Windows)
Breaks continuity on Bézier handles, creating a sharp corner or hinged joint.

EDITING LINES

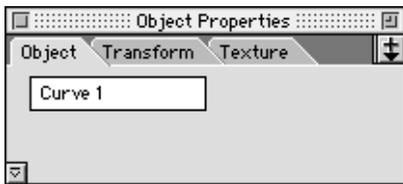
To edit the selected line, choose the **RE-SHAPE** command from the Modeling menu.

See **Reshape** on page 35 for more information on using this command.

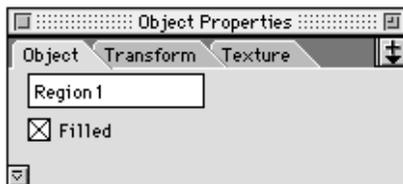
Object Properties Palette

The Object tabs of the Object Properties palette are similar for the two types of Pen tools. Bézier regions, however, can be converted from filled to unfilled, and vice versa.

Pen tool - Bézier Line



Pen tool - Bézier Region



For complete information on the **Object Properties palette**, see page 221.

RECTANGLE TOOL



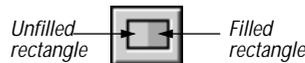
Use this tool to draw rectangular-shaped objects. The Rectangle tool has no tool settings.

TOOL FUNCTION

You can draw squares or rectangles of any proportions. These objects always have square corners.

The size of the rectangle is determined by the starting and ending position of the cursor as you drag it on the active grid. Or, click at the starting point and at the ending point to define its size.

The rectangle can be either filled or hollow, depending on which side of the rectangle tool icon is selected.

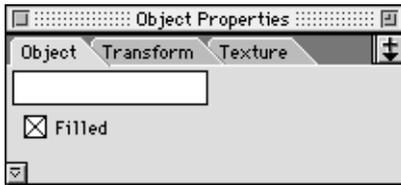


Modifier keys that apply to drawing rectangles:

- **Shift key** constrains the tool to draw perfect squares.
- **Option key (Macintosh)**
Alt key (Windows)
Draws a rectangle from its center, instead of the corner.
- **Option + Shift keys (Macintosh)**
Alt + Shift keys (Windows)
Draws a square from its center.

Object Properties Palette

You can assign a name or change the existing name of the selected rectangle on the Object tab of the Object Properties palette. The *Filled* checkbox indicates whether or not the object is filled or unfilled. You can change its *filled* status at any time.



For information on the other tabs found on this palette, *see page 224*.

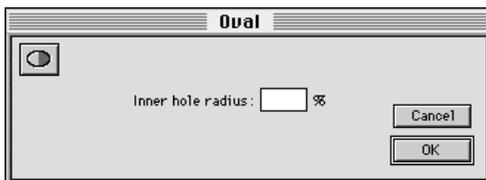
OVAL TOOL



Use this tool to draw 2-D oval-shaped objects.

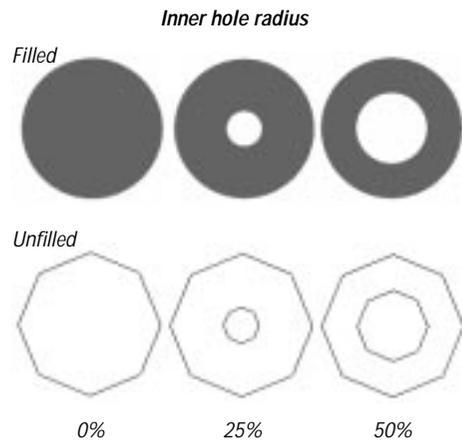
TOOL SETTINGS

Double-click the Oval tool to display the Tool Settings dialog.



- **Inner hole radius.** You can create a hole in the center of the oval by entering a value in this field. This value specifies the percentage of the outer radius to

remove from the center of the oval. If this value is zero, no hole is created.



TOOL FUNCTION

The Oval tool can draw exact circles or ovals of any proportion.

The size of the oval is determined by the starting and ending position of the cursor as you drag it on the active grid. You can also draw an oval by clicking at the starting point and at the ending point to define its size.

The oval you draw can be either filled or hollow, depending upon which side of the oval tool icon you clicked.



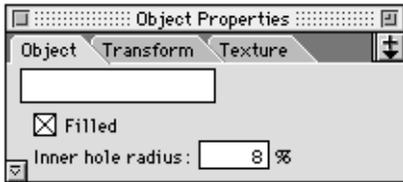
Modifier keys that apply to drawing ovals:

- **Shift key**
Constrains the tool to draw circles.

- **Option key** (Macintosh)
Alt key (Windows)
Draws an oval from its center, instead of the corner.
- **Option + Shift keys** (Macintosh)
Alt + Shift keys (Windows)
Draws a circle from its center.

Object Properties Palette

Once the oval is drawn, you can modify it on the Object Properties palette.



- **Name.** This field contains the name of the selected oval, if one has been assigned. You can add a name or change the existing name at any time.
- **Filled.** When this box is checked, the oval is filled. You can change its status between filled and unfilled at any time.
- **Inner hole radius.** This field indicates the current size of the hole in the center of the oval. You can change its size by entering a different value in this field. The value in this field indicates the percentage of the oval to remove from the center.

For information on the other tabs, *see Object Properties Palette on page 221.*

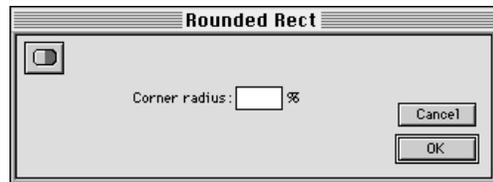
ROUNDED RECTANGLE TOOL



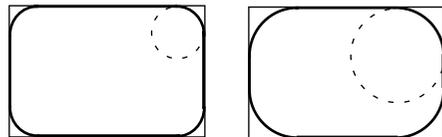
Use this tool to draw rectangles with rounded corners.

TOOL SETTINGS

You can change the radius of the corners on the rectangle in the Tool Settings dialog. Double-click on the Rounded Rectangle tool to access this dialog.



- **Corner radius.** This setting determines the roundness of the corners. The value entered is a percentage of the smaller dimension of the rectangle.



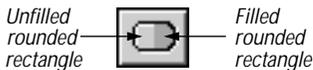
The radius of the circle determines the way in which the corners are rounded. The smaller the circle, the less rounded the corners appear. Larger circles create more rounded corners.

TOOL FUNCTION

The radius of the corners is determined by the setting specified in the Tool Settings dialog.

The size of the rounded rectangle is determined by the starting and ending position of the cursor as you drag it on the active grid. You can also draw a rounded rectangle by clicking at the starting and ending points to define its size.

You can create either a filled or unfilled rectangle, depending on which side of the Rounded Rectangle tool icon you click.

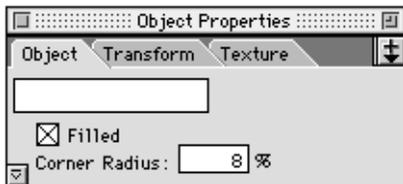


Modifier keys that apply to drawing rounded rectangles:

- **Shift key**
Constrains the tool to draw squares.
- **Option key** (Macintosh)
Alt key (Windows)
Draws a rectangle from its center, instead of the corner.
- **Option + Shift keys** (Macintosh)
Alt + Shift keys (Windows)
Draws a rounded-corner square from its center.

EDITING ROUNDED RECTANGLES

Once the rounded rectangle is drawn, you can change the roundness of the corners on the Object tab of the Object Properties palette.



You can also add or change the name, and change the filled/unfilled status of the rounded rectangle. See page 221 for information on the other tabs on the Object Properties palette.

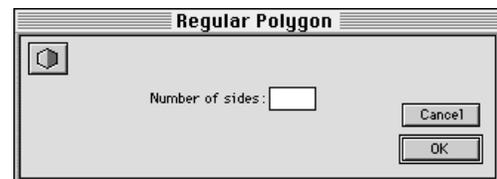
POLYGON TOOL



Use this tool to draw 2-D polygons with a pre-determined number of equilateral sides.

TOOL SETTINGS

To change the number of sides on polygons created with this tool, double-click the Polygon tool on the Tool palette to display the Tool Settings dialog.



- **Number of sides.** The number in this field determines the number of sides the polygon will have. (A polygon requires a minimum of three sides.)

TOOL FUNCTION

The size of the polygon is determined by the starting and ending position of the cursor as you drag it on the active grid. You can also define the size of the polygon by clicking at the starting point and at the ending point.

You can draw either filled or hollow polygons, depending on which side of the rectangle tool icon you selected.

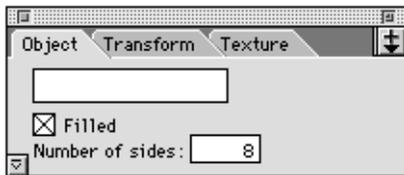


Modifier keys that apply to drawing polygons:

- Shift key**
 Maintains the proportions of the polygon. All sides are equilateral.
- Option key (Macintosh)**
Alt key (Windows)
 Draws a polygon from its center, instead of the corner, and maintains the proportions. In addition, you can rotate the polygon to position it in any orientation you want before releasing the mouse button.
- Option + Shift keys (Macintosh)**
Alt + Shift keys (Windows)
 Draws an equilateral polygon from its center.

EDITING POLYGONS

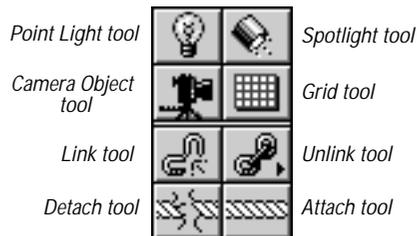
Once the polygon is drawn, you can change the number of sides it contains on the Object tab of the Object Properties palette.



You can also assign a name or edit the existing name, and change the filled / unfilled status of the polygon at any time. For information on the other tabs found on the **Object Properties palette**, see page 221.

CONSTRUCTION TOOLS

This section of the Tool palette contains tools to assist you in the construction of your model. It includes the Spot and Point Light, Camera Object, Grid, Link, and Attach tools. Construction objects are not visible when rendered.



POINT LIGHT TOOL



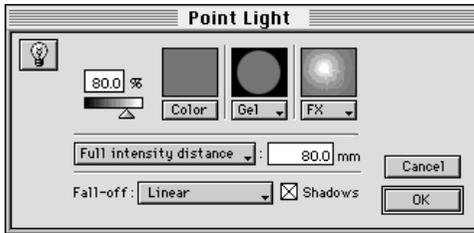
Use this tool to insert non-directional light sources into a model.

TOOL SETTINGS

You can change the default settings of the Point Light tool in the Tool Settings dialog. This way, your choices are set in advance. In most cases, you probably won't want the default point light to have any gels or effects applied; those are options you'll most likely want to add later, depending

on the effect you're trying to achieve. In any case, you'll want to adjust the default settings of the point light to the those that you'll use most often.

Double-click on the tool to access the Tool Settings dialog.



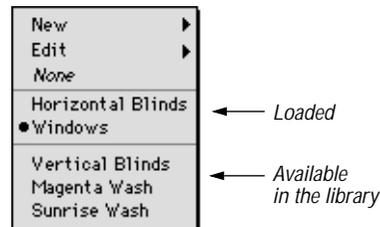
- **Intensity.** Use the slider to adjust the quantity of light being emitted from the point light, or enter a value in the numeric entry field above the slider. A setting of zero produces no illumination, and a setting of 100 is maximum illumination.
- **Color.** To specify the color of the default point light, click the *Color* button to display the color picker dialog.
- **Gels.** Gels allow you to project a pattern or image onto the surface of objects illuminated by a light. If you want the default point light to have a gel applied to it, you can specify one here.
- **FX.** You can apply a lens flare or atmospheric effect to the default point light. To make the point light visible, apply an atmosphere to it. Any volumetric texture (fog, haze, or mist) can be used as an atmosphere. When attached to a point light, the atmosphere is visible in

the area illuminated by that light. See **Visible Light** on page 136.



Both a Mist and a Lens Flare have been applied to the point light.

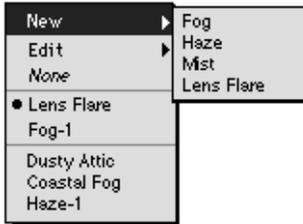
Both the *Gel* and *FX* pop-up menus function in the same manner. They allow you to add, edit, apply, or remove gels or effects from the default point light.



The top section contains commands for creating new gels or effects, editing those that are already applied, or removing existing gels or effects from the default point light.

The center section contains gels or effects that are currently loaded in the active model. Any gel or effect associated with the default point light appears with a bullet (•) beside its name.

To create a new gel or effect, select **NEW** from the pop-up menu.



Select the gel or effect you want to create. The appropriate dialog appears.

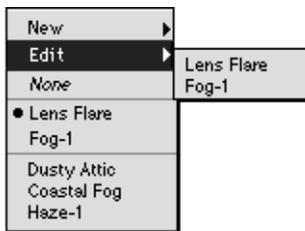
For complete instructions on creating a new gel, see **Creating Gels** on page 199.

See **Fog** on page 181, **Haze** on page 182, or **Mist** on page 183 for information on creating new effects.

For details on creating a lens flare effect, see **Lens Flare** on page 194.

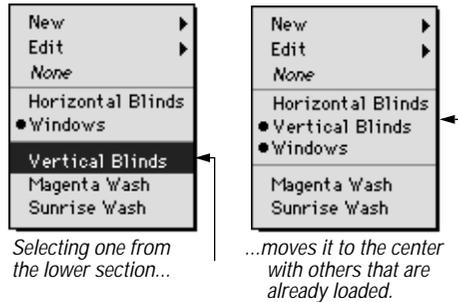
Once created, the gel or effect appears in the center of the pop-up menu with a bullet beside its name.

To edit a gel or effect, select it from the *Edit* submenu. All loaded gels or effects appear in the submenu.



The appropriate dialog appears, allowing you to modify the current settings. This is the same dialog that was used when the gel or effect was originally created. Remember, if you edit the gel or effect, the changes will apply to anything that it is applied to.

To apply a gel or effect to the default point light, select one from the submenu.



When you select any gel or effect from either the center section (loaded) or the lower section (all available in the library), a bullet (•) is placed beside the name, indicating that this gel or effect will be applied to the default point light.

To remove a gel or effect from the default point light, select it again; the bullet is removed from beside its name, indicating that it is no longer applied. To remove all gels or effects, select *None*.

- **Light source radius.** To define the default radius of the light source, select *Light source radius* from the pop-up directly below the slider. This setting influences the degree to which soft shadows are calculated when using the Scanline or Raydiosity renderer. The larger the light source, the softer the shadows appear. (See **Soft shadows** on page 136.)
- **Full intensity distance.** To define the distance of full intensity illumination for all point lights created with this tool, select *Full intensity distance* from the pop-up, and enter a value in this

field. This value specifies the default radius of the inner illumination ring.

- **Total fall off distance.** Select *Total fall off distance* from the pop-up menu to define the total distance the illumination travels away from the point light before it completely disappears. Objects just inside the fall-off distance may not appear illuminated, even though they are, because the amount of light at that distance is so low. Objects that lie outside this distance are not illuminated by the light source at all. The value entered here defines the default radius of the outer illumination ring.
- **Shadows.** This checkbox determines whether or not objects illuminated by this light cast shadows. There may be special cases where you don't want the objects illuminated by the point light to cast shadows.
- **Fall-off.** You can specify the method used for calculating the rate of fall off. *Linear* - light diminishes at an even rate. *Exponential* - the rate of fall-off increases with distance.

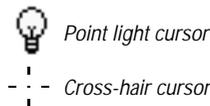
TOOL FUNCTION

Unlike global lights, which are designed to illuminate the entire model, point lights are designed to illuminate small areas of the scene. Point lights always shine outward in all directions from the source. There's no limit to the number of point lights you can insert into your model.

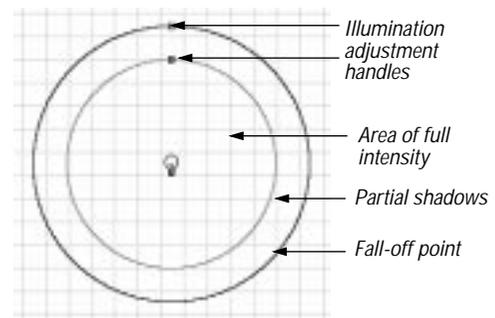
 To insert a point light, select the Point Light tool and click in the Modeling window. Notice that the appearance of the cursor changes to resemble a light bulb

when this tool is selected. A point light marker is placed on the active grid at the position the cursor is clicked. Markers appear in the Modeling windows, but they don't show in the rendered image.

You can change from the point light cursor to the cross-hair cursor by enabling Caps Lock.



Click once with a selection tool on the point light marker to select it. You can see the area illuminated by the light.



The inner circle represents the area of the model illuminated by the light with full intensity.

The section between the two circles represents that area of the model that resides in partial shadows. Any objects lying outside the outer circle do not receive any illumination whatsoever from the point light. If *Total fall-off distance* is set to INF (infinity) in the Tool Settings dialog, the outer circle doesn't appear because it's infinite in size.

You can change the radius of these circles, when visible, by grabbing an illumination adjustment handle and dragging it to the desired size. Any change to the size of these rings is reflected in the *Full intensity distance* (inner ring) and the *Total falloff distance* (outer ring) fields on the Object Properties palette.

If *Total fall-off distance* is set to INF and you want to change it to a specific value, you will need to change the *Total fall-off distance* value on the Object Properties palette because you won't have access to the outer circle in the Modeling window.

You can move the point light to a different position on the active grid with the Object Move tool. To move the point light perpendicular to the active grid, use the **Command + Shift** keys (Macintosh) or the **Ctrl + Shift** keys (Windows). You can also change the position of the point light on the Transform tab on the Object Properties palette. See **Transform Tab** on page 224.

For information on creating soft shadows, see **Soft shadows** on page 136.

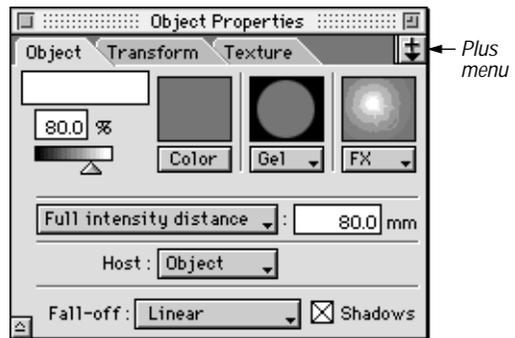
Modifier keys for moving point lights with the Object Move tool in the Modeling window:

- **Shift key**
Constrains the motion of the point light to 45-degree increments on the active grid or on a plane parallel to the active grid.
- **Option key** (Macintosh)
Alt key (Windows)
Leaves a copy of the point light behind.

- **Command + Shift keys** (Macintosh)
Ctrl + Shift keys (Windows)
Moves the point light perpendicular to the active grid.

Object Properties Palette

Once you've inserted a point light into your model, you can edit it on the Object tab of the Object Properties palette.



Click here to expand or collapse the palette.

To expand the tab to reveal the expert settings, as well as the basic settings:

- Select the **EXPERT MODE** command from the Plus menu.
- or -
- Click the arrow in the lower left corner of the palette.

The Tool Settings dialog and the Object tab of the Object Properties palette contain many of the same fields, so if you want additional information about any of the following fields, see **Tool Settings** on page 124.

- **Name.** This field contains the name of the selected point light, if a name has been specified. You can add a name to

this field, or change the existing name at any time.

- **Intensity.** This setting indicates the amount of light emitted from the point light. You can change this setting by moving the slider or by entering a value in the numeric entry field above the slider.

By entering a negative value in this field, you can decrease the light intensity in areas of overlapping light. (See page 137.)

- **Color.** This field displays the color of the selected point light. To change the color, click the *Color* button and the color picker appears, allowing you to select a new color for the light.
- **Gel.** This field indicates any gels applied to the selected point light. A list of pre-defined gels appear in the *Gels* pop-up menu. You can also add, edit, apply, or remove gels from the selected point light with the *Gel* pop-up menu. Select *None* to remove all gels from the selected point light.
- **FX.** This field indicates any effects, such as Lens Flares, Fog, or Mist, that are applied to the selected point light. You can add new effects, modify existing ones, or remove current effects from the *FX* pop-up menu. Selecting *None* from the *FX* pop-up removes all effects currently applied to the selected light.
- **Light source radius.** This setting influences the degree to which soft shadows are calculated when using the Scanline or Raydiosity renderer. The larger the light source radius, the softer

the shadows appear. (See **Soft shadows** on page 136.)

- **Full intensity distance.** This setting determines the distance illuminated at full intensity. If you change the value in this field, the size of the inner illumination ring in the Modeling window also changes.
- **Total fall off distance.** The value in this field determines the total distance light travels from the selected point light. This setting controls the radius of the outer illumination ring in the Modeling window.
- **Host.** You can attach the selected point light to an object in the model. All named objects in the active model appear in the *Host* pop-up menu. When you move the host, the light moves with it.

NOTE: *Objects MUST be named before they appear in this pop-up list. Objects can be named on their Object Properties palette or in the Project window.*

- **Fall-off.** This setting indicates the method used for calculating the rate of fall off. Select *Linear* if you want the light to diminish at an even rate. Select *Exponential* if you want the rate of fall-off to increase with distance. (*Exponential* produces more realistic results, but requires more time to calculate.)
- **Shadows.** This field indicates whether or not objects illuminated by the selected point light cast shadows.

For complete details on this palette, see **Object Properties Palette** on page 221.

SPOTLIGHT TOOL

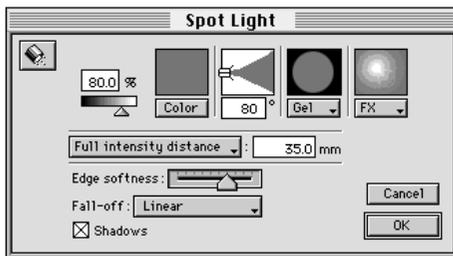


Use this tool to insert spotlights into a model.

TOOL SETTINGS

You can control the default settings of the spotlight tool through the Tool Settings dialog. Then, each time you insert a spotlight into your model, it will already be set up with the settings you like.

To change the default settings, double-click the Spotlight tool on the Tool palette to display the Tool Settings dialog.

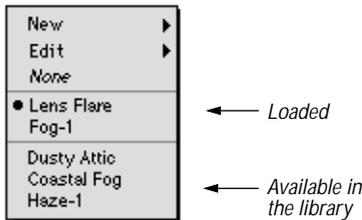


- Intensity.** This field lets you control the amount of light emitted from the default spotlight. You can set the intensity interactively by adjusting the intensity slider, or numerically by entering a value in the numeric field above the slider. A setting of zero produces no illumination, and a setting of 100 is maximum illumination.
- Color.** You can specify the color of the default spotlight. The color picker opens when you click the *Color* button.
- Cone Angle.** You can set the cone angle of the default spotlight here. This area represents the size of the cone of full illumination, in degrees.

Grab the control to adjust it interactively, or enter a value in the numeric field directly below the cone angle preview. The value entered can be from 1° to 179°. The greater the angle, the larger the inner ring. However, the size of the inner ring may never exceed the size of the outer ring, so the maximum value here is also limited by the current size of the outer ring.
- Gel.** If you want the default spotlight to project an image or pattern onto objects it illuminates, you can apply a gel to it. In most cases, however, you'll want to apply gels to spotlights after they've been inserted by using the *Gel* pop-up on the Object Properties palette. For more information, see page 138.
- FX.** You can apply a lens flare or atmospheric effect to the default spotlight. (Fog, haze, and mist can be used as atmospheric effects.) To create

a visible light, apply an atmosphere to the spotlight. Any atmosphere attached to a light is visible in the area illuminated by that light. (See page 136.)

Both the *Gel* or *FX* pop-up menus allows you to add, edit, apply, or remove gels or effects.



The top section of the menu contains commands for creating new gels or effects, or editing those that are already loaded in the active model.

The center section of the menu contains gels or effects that are currently loaded in the active model. Those associated with the default spotlight appears with a bullet (•) beside the name.

To create a new gel or effect, select **NEW** from the pop-up menu.



When you select the gel or effect you want to create, the appropriate dialog is

displayed, allowing you to create a new custom gel or effect that will be applied to all spotlights created with the Spotlight tool.

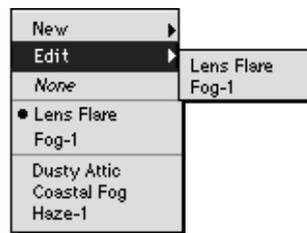
For complete instructions on creating a new gel, see **Creating Gels** on page 199.

See **Fog** on page 181, **Haze** on page 182, or **Mist** on page 183 for details on creating new effects.

For instructions on creating a lens flare, see **Lens Flare** on page 194.

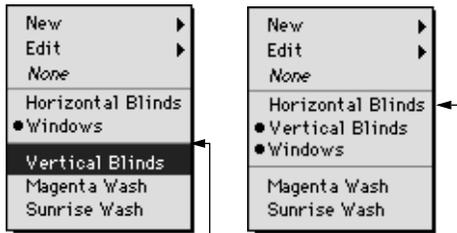
Once created, it appears in the center of the pop-up menu with a bullet beside its name. It also appears in the upper portion of the Resource palette with other gels or effects that are loaded in the active model.

To edit an existing gel or effect, select one from the *Edit* submenu. All loaded gels or effects appear in the *Edit* submenu.



When you select one, the appropriate dialog appears, allowing you to modify the current settings as desired.

To apply a gel or effect to the default spotlight, select one from the submenu.



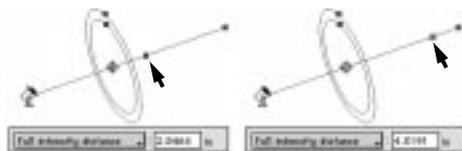
Selecting one from the lower section...

...moves it to the center with other loaded gels or effects.

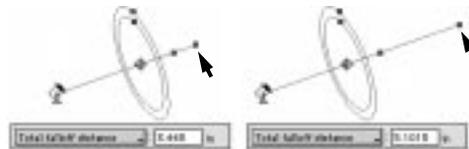
A bullet is placed beside all gels or effects that are currently associated with the default spotlight.

To remove a gel or effect from the default spotlight, select it again; the bullet is removed from beside its name, indicating that it is no longer applied. You can remove all gels or effects from the default spotlight by selecting *None*.

- **Light source radius.** Select *Light source radius* from the pop-up list below the *Intensity* slider to specify the default radius of the spotlight. This setting influences the degree to which **soft shadows** are calculated when using the Scanline or Raydiosity renderers. Larger values result in softer shadows. (See **Soft shadows** on page 136.)
- **Full intensity distance.** Select *Full intensity distance* to specify the distance from the spotlight that is illuminated at full intensity.



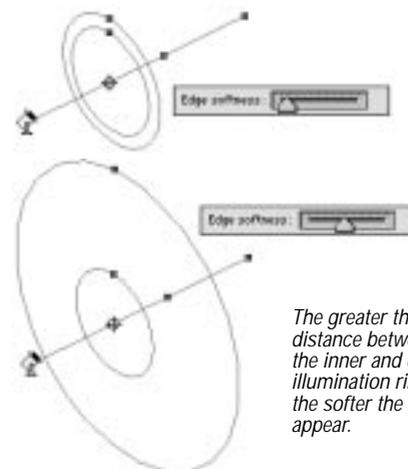
- **Total fall off distance.** To specify how far the illumination travels, select *Total fall off distance* from the pop-up list. This value is the absolute maximum distance that an object will be illuminated by the spotlight.



If you place an object just inside this distance, it may not appear illuminated even though it is, because the amount of light is so low.

- **Edge Softness.** This slider lets you set the softness of the edges around the light. Move the slider to the right to soften the edges.

This setting determines the distance of the outer illumination ring from the inner illumination ring. The sharper the edges, the closer together the rings appear in the Modeling window.



The greater the distance between the inner and outer illumination rings, the softer the edges appear.

- **Fall-off.** You can specify the method used for calculating the rate of fall off.

Linear - light diminishes at an even rate.

Exponential - the rate of fall-off increases with distance.

- **Shadows.** When this box is checked, objects illuminated by the spotlight cast shadows. There may be special cases where you don't want the objects illuminated by this light to cast shadows.

TOOL FUNCTION

Spotlights are designed to illuminate small areas of the scene. Spotlight markers are visible in the Modeling windows, but they don't show in a rendering. Only the lighting effects are visible in the rendered image. There's no limit to the number of spotlights you can insert into your model.



When this tool is selected, the appearance of the cursor changes to resemble an actual spotlight. To insert a spotlight, click in the Modeling window. A spotlight marker is placed on the active grid and points in a direction perpendicular to the grid. The marker does NOT indicate the direction the light is shining; it merely marks the position of the spotlight in the model.

You can change from the spotlight cursor to the cross-hair cursor by enabling Caps Lock.



Spotlight cursor

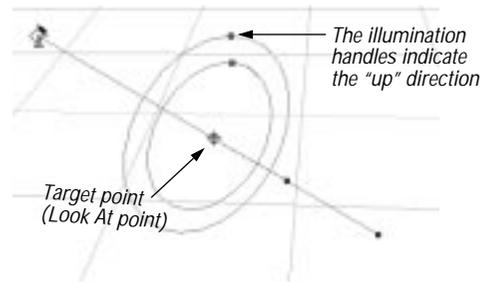


Cross-hair cursor

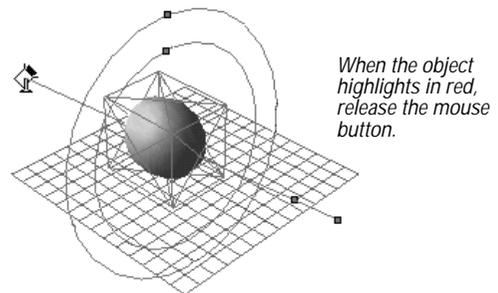
Aiming Spotlights

When you select the spotlight marker, the direction and area of illumination is indicated.

Grab the *Look At* point and drag it so it points in the desired direction.



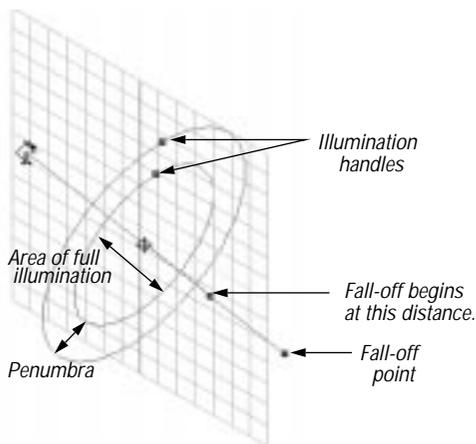
If you want the spotlight to always point at a particular object, drag the target (*Look At*) point to that object. When the target point passes over the object, the object highlights in red. If you release the mouse button while the object is highlighted in red, the spotlight becomes attached to the object.



Then, if you move either the object or the spotlight, the spotlight remains pointed at the target object.

To ignore all of the objects, hold down the **Option** key (Macintosh) or **Alt** key (Windows) while dragging the *Look At* point. As the *Look At* point passes over objects, the objects highlight in green, indicating that the spotlight is aimed at the object, but not attached to it. This allows you to point the spotlight at an object in space, but when you move the object, the spotlight doesn't follow it. Instead, the spotlight remains aimed at the same position in space.

The inner circle represents the area of full intensity of the cone of light. The area between the outer and inner circles represents the penumbra, or area of partial shadows. This is the area around the edges of the cone of light, and it determines the edge softness. It is the area between total illumination and total shadow. To change either the inner or outer circles, grab an illumination adjustment handle and drag to increase or decrease the area as desired.



The location of the *Fall-off* point represents the distance at which the light no

longer illuminates objects. If *Total fall-off distance* is set to INF (infinity), the *Fall-off* point will be inaccessible in the Modeling window; if you want to change the fall-off distance, you'll need to change the value on the Object Properties palette. Note that the fall-off may not appear accurately in the Modeling window, but it will render correctly.

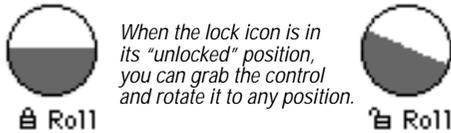
To move the spotlight in the Modeling window, use the Object Move tool. The spotlight always remains pointed at the *Look At* point. If you grab the spotlight, the spotlight moves, but the *Look At* point remains in place. If you grab the *Look At* point instead, the *Look At* point moves, but the spotlight remains in place. If you grab the line connecting the *Look At* point and the spotlight, both the *Look At* point and the spotlight move together in unison.

To move the spotlight or the *Look At* point perpendicular to the active grid, use the **Command + Shift** keys (Macintosh) or the **Ctrl + Shift** keys (Windows). This feature makes it possible to move the spotlight to the desired location without having to switch grids.

When you first insert a spotlight into the Modeling window, the *Steady Spotlight* option is enabled. This constrains the spotlight so its "up" vector always remains pointing in the "up" direction (in world coordinates).

Normally, a spotlight's "up" vector is insignificant. However, if a gel containing an image map has been applied to the spotlight, you may want to rotate the gel. The gel itself cannot be rotated, but rotating the spotlight has the same effect.

To rotate the spotlight, disable *Steady Spotlight* by clicking on the *Roll* control on the Object Properties palette. Then, you can grab and rotate the spotlight *Roll* control on the Object Properties palette to the desired position. If you've applied a gel, it rotates with the spotlight.



When the lock icon is in its "unlocked" position, you can grab the control and rotate it to any position.



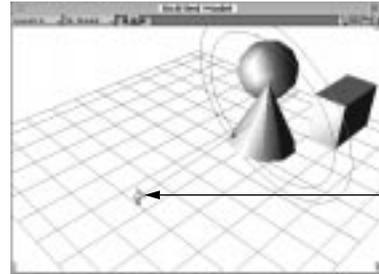
Unrotated spotlight with gel. (Steady Camera "ON")
Illumination handles are in "up" position.



Rotating the spotlight also rotates the gel.
Position of handles reflect the degree of rotation.

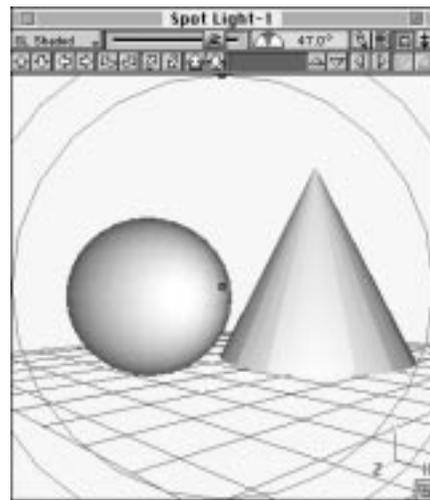
A Spotlight window is provided to assist you in accurately positioning spotlights in

your model. To display the Spotlight window, double-click the spotlight icon in the Modeling window.



Double-click spotlight icon.

The window for that spotlight opens. This window allows you to "see" which objects are illuminated by the spotlight.

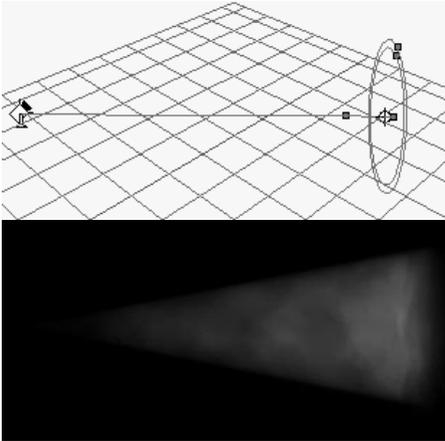


You can also access this window by selecting the spotlight from the **SPOTLIGHT WINDOWS** command's pop-up list in the Windows menu.

Controls are provided at the top of the window to assist in precise positioning of the spotlight. For more information, see **Spotlight Window** on page 287.

Visible Light

If you want to make the light emitted from the spotlight visible, you can apply an effect (fog, mist, or haze) to the spotlight.



The default Mist is applied to the spotlight. When rendered, the light emitted is visible.

To apply an atmosphere to the selected spotlight, select an atmosphere on the Resource palette, then click the *Apply* button.

You can also apply an atmosphere to a light by selecting one from the *FX* pop-up on the selected spotlight's Object Properties palette.

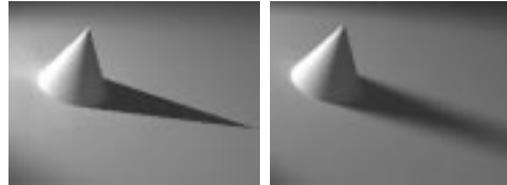
Soft shadows

Because rays of light from a Global light are always parallel, the shadows cast by the objects it illuminates appear harsh with sharp edges. You can't get soft shadows with this type of light alone. But you can create soft shadow by inserting point lights or spotlights into your model.

You may want to decrease or eliminate the global light and ambient light on the Environment palette, then use a local light

source (point and/or spotlight) to illuminate your model.

To make the shadows from these light sources appear soft, use the *Light Source Radius* field on the Object Properties palette. The larger the radius of the light source, the softer the shadows.



Light Source Radius = 1

Light Source Radius = 8

Increasing the Light Source Radius softens the shadows cast by objects illuminated by the light source.

NOTE: Soft shadows are only possible if you use the Scanline or Raydiosity renderers. Also, remember to check the Shadows checkbox in the Scanline Esoteric dialog if you're using the Scanline renderer.

Modifier keys for moving spotlights with the Object Move tool in the Modeling window:

- **Shift key**
Constrains the motion of the spotlight to 45-degree increments on the active grid or on a plane parallel to the active grid.
- **Command key** (Macintosh)
Ctrl key (Windows)
Moves the spotlight closer to, or away from the *Look At* point (along a straight line connecting the two).
- **Command + Shift keys** (Macintosh)
Ctrl + Shift keys (Windows)
Moves the spotlight or the *Look At* point perpendicular to the active grid.

- **Option key** (Macintosh)
Alt key (Windows)

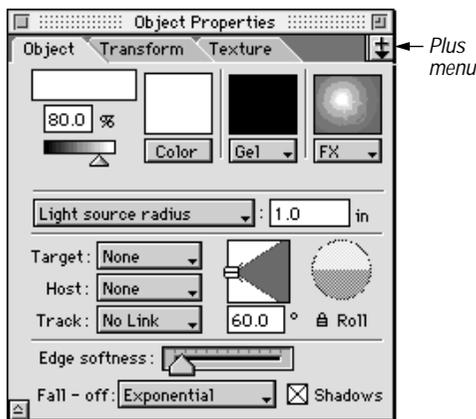
While moving a spotlight in the Modeling window, leaves a copy of the spotlight behind.

- **Option key** (Macintosh)
Alt key (Windows)

While positioning the *Look At* point, ignores all objects. You can aim the spotlight at a position in space rather than at an object.

Object Properties Palette

You can edit the selected spotlight on the Object Properties palette.



Click here to expand or collapse the palette.

To expand the palette to reveal the expert settings, as well as the basic settings:

- Select the **EXPERT MODE** command from the Plus menu.
- or -
- Click the arrow in the lower left corner or the palette.

This palette contains the following fields:

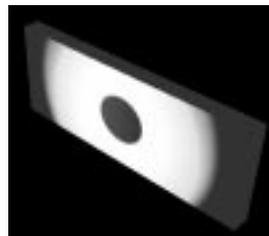
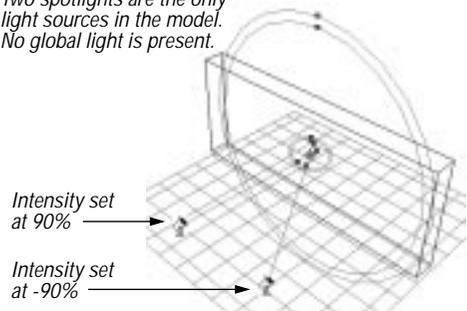
- **Name.** This field contains the name of the selected spotlight. A default name is provided, but you can change the name in this field at any time, if desired.

All spotlights must be named, and the name must be unique. The name of the spotlight also appears in the **SPOTLIGHT WINDOW** submenu in the Windows menu, as well as in the Project window.

- **Intensity.** This setting indicates the amount of light emitted from the selected spotlight. The slider indicates values from zero to 100, but you can enter numbers below zero in the data input field above the slider.

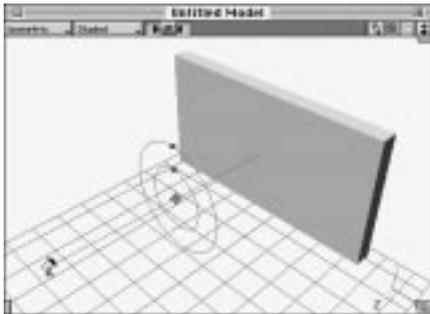
By entering a negative value in this field, you can decrease the light intensity in areas of overlapping light, even causing the appearance of “holes” in the light. (Negative-intensity light is not appear unless is overlaps other light.)

Two spotlights are the only light sources in the model. No global light is present.

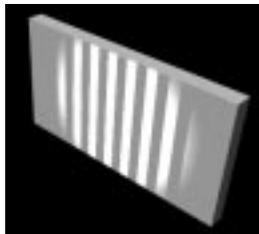


In areas where the two lights overlap, the negative intensity value of one light is subtracted from the intensity value of the other, resulting in a “hole” in the light.

- **Color.** This setting indicates the color of the selected spotlight. To change the color, click the *Color* button.
- **Gel.** This setting indicates the gel applied to the selected spotlight. For information on adding, modifying, or removing gels from the selected spotlight, see page 130.



The "Vertical Blinds" gel was applied to the spotlight above. When rendered, the image is projected onto objects struck by the light.



- **FX.** This field indicates any effects or atmospheres applied to the selected spotlight. You can add, edit, apply, or remove an effect or atmosphere from the *FX* pop-up menu. For complete information, see page 130.
- **Light source radius.** This setting influences the degree to which soft shadows are calculated when using the Raydiosity or Scanline renderers. The larger the light source radius, the softer the shadows appear.

- **Full intensity distance.** This setting indicates the distance illuminated at full intensity.
- **Total fall off distance.** This setting indicates the absolute maximum distance at which an object is illuminated by the spotlight.
- **Target.** The *Target* pop-up menu lists all of the objects in the active model that have been named (in the *Name* field on the Object Properties palette or in the Project window). You can select any object from this pop-up to use as a target for the spotlight. If you've interactively targeted the spotlight to an unnamed object in the Modeling window, no name appears on the button.
- **Host.** You can attach the spotlight to a host object. Then, when the host moves, the spotlight moves with it. Any objects that have been named appear in this list.
- **Track.** Select a tracking style. This field is set to *Swivel* and grayed out if a *Host* is selected.
 - No Link* - This option unlinks the spotlight from the target.
 - Hard Link* - If the target moves, the spotlight moves as though welded to it.
 - Swivel* - The spotlight swivels to follow the target object.
 - Chase* - The spotlight chases a moving object with it's own gravity.
- **Cone Angle.** This field indicates the cone angle of the selected spotlight. This value can be from 1° to 180°.

- **Shadows.** When this box is checked, objects illuminated by the spotlight cast shadows.
- **Edge Softness.** This setting indicates the softness of the edges around the light.
- **Fall-off.** This setting indicates the method used for calculating the rate of fall-off.
- **Roll.** Rotating a spotlight has no apparent effect unless a gel has been applied to the spotlight. You can rotate a gel by rotating the spotlight when the *Steady Spotlight* feature is disabled. To disable *Steady Spotlight*, click the lock icon beneath the control.



This feature can also be disabled from the Spotlight window. When the *Steady Spotlight* option is enabled, this control is dimmed and unavailable.

For information about the other tabs on the Object Properties palette, see **Object Properties Palette** on page 221.

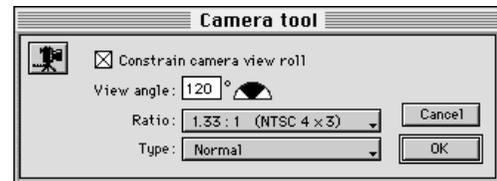
CAMERA OBJECT TOOL



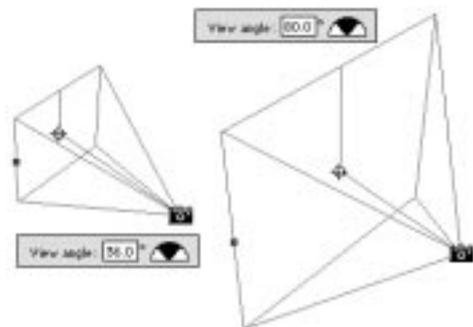
The Camera Object tool inserts camera objects into the model.

TOOL SETTINGS

You can specify the default settings for the camera objects you insert into your model. To access the Tool Settings dialog, double-click on the Camera Object tool.



- **Constrain camera view roll.** This feature keeps the camera's "up" vector always in the "up" position. When this box is checked, the *Steady Camera* option is enabled.
- **View Angle.** The view angle can be specified numerically by entering a value in this field, or interactively by grabbing the *View Angle Control* and adjusting it as desired.



- **Ratio.** This setting specifies the ratio of the width of the camera window to its height. Select an aspect ratio from the *Ratio* pop-up list. See **Appendix C** on page 307 for a description of the most commonly used aspect ratios.

- **Type.** Select the type of camera used from the *Type* pop-up menu: *Normal* or *Panoramic*.

Panoramic - This camera produces a 360-degree rendering, which can then be converted to a Panorama Quick-Time VR movie. If the 3.25 : 1 aspect ratio is selected, the camera type defaults to *Panoramic*.

NOTE: Use only the *Raytracing* or *Raydiosity* renderers when using this camera type.

TOOL FUNCTION

When this tool is selected, the cursor changes its appearance to look like a real camera.

If Caps Lock is on, the cursor changes to a cross-hair cursor so you can more accurately position a camera in the model.

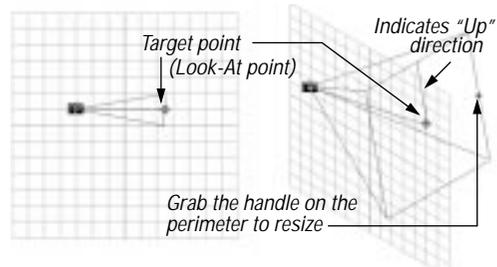


To add a camera object to a model, click in the Modeling window. A camera marker is placed on the active grid and is initially aimed in a direction perpendicular to the grid.

The camera marker does NOT indicate the direction the camera is actually facing; it merely marks the location of the camera in the model.

There is no limit to the number of camera objects that you can insert into a model. You can position them anywhere in 3-D space. Camera markers are visible in modeling views, but they don't appear in renderings.

When you select the camera, the direction the camera is facing, as well as the portion of the model visible through the camera, is indicated. The "up" direction is indicated by a line that runs from the *Look At* point to the outer perimeter of the viewing angle.

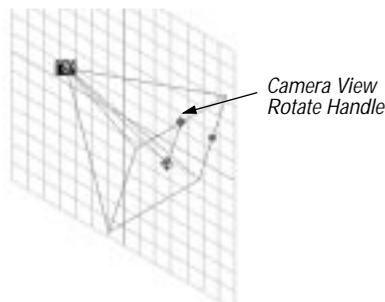


Viewed from straight on and from an isometric view

To point the camera, grab the *Look At* point and position it to point in the desired direction.

To increase or decrease the area visible through the camera's viewfinder, grab the handle on the rectangular bounding box and drag to the desired size.

If you disable the *Steady Camera* option, a handle is provided to rotate the camera's view.



You can disable the *Steady Camera* option on the Object tab of the Object Properties palette or with the controls provided at the top of the Camera window.

If you want the camera to always look at a particular object, drag the *Look At* point to that object. As the *Look At* point passes over an object, that object becomes highlighted in red; then release the mouse button. The camera is now associated with the object; regardless of whether you move the camera or the object, the camera will always remain pointed at that object.

If you hold down the **Option** key (Macintosh) or **Alt** key (Windows) while dragging the *Look At* point, all objects are ignored, allowing you to aim the camera at a position in space, rather than aiming at a particular object. As the *Look At* point passes over an object, it highlights in green, indicating that the camera is aimed at that object, but not attached to it. If you move the object, the camera is no longer aimed at the object.

To adjust the view angle of the camera, grab the *View Adjustment* handle and drag it to the desired position. The size of the Camera window does not change; only the focal length changes.

You can move the camera object in the Modeling window with the Object Move tool. The camera always remains pointed at the *Look At* point. If you grab the camera, the camera moves, but the *Look At* point remains fixed. If you grab the *Look At* point, that point moves, but the camera remains in place. If you grab the line between the camera and the *Look At* point, both the camera and the *Look At* point move together.

Unless you're working in an orthographic view, moving the camera toward or away from a *Look At* point works just as it does with a real camera. When you move the camera farther away from the *Look At* point, the area of the model that's visible through the camera's viewfinder increases; if you move the camera closer to its *Look At*, the visible area decreases.

You can move a camera freely anywhere on the active grid. To move the camera perpendicular to the active grid, hold down both the **Command + Shift** keys (Macintosh) or the **Ctrl + Shift** keys (Windows). To move the camera closer to or away from the *Look At* point (along a straight line connecting the two), hold down only the **Command** key (Macintosh) or the **Ctrl** key (Windows).

Modifier keys for moving cameras with the Object tool in the Modeling window:

- **Shift key**

Constrains the motion of the camera to 45-degree increments on the active grid or on a plane parallel to the active grid.

- **Command key** (Macintosh)
Ctrl key (Windows)

Moves camera closer to or away from the *Look At* point (along a straight line connecting the two).

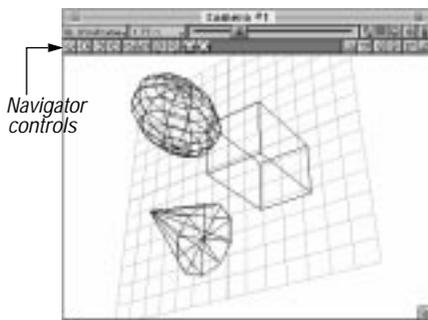
- **Command + Shift keys** (Macintosh)
Ctrl + Shift keys (Windows)

Moves camera or the *Look At* point perpendicular to the active grid.

- **Option key** (Macintosh)
Alt key (Windows)
When moving the camera, leaves a copy of the camera behind.

- **Option key** (Macintosh)
Alt key (Windows)
When aiming the *Look At* point, holding down the **Option** key (Macintosh) or **Alt** key (Windows) ignores all objects, allowing you to aim at a position in space rather than at a particular object.

Once you've inserted a camera in the Modeling window, you can view the model through the camera's "viewfinder" by either double-clicking on the camera object or choosing it by name from the **CAMERA WINDOW** submenu in the Windows menu.

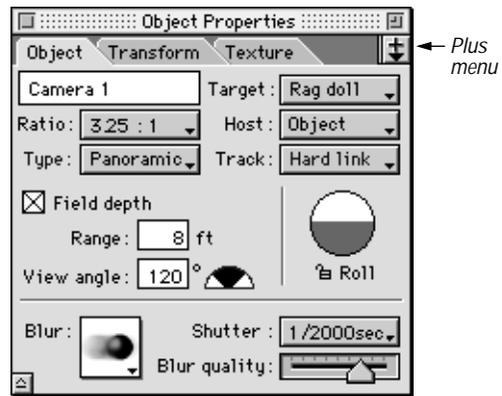


For complete details on this feature, see **Camera Window** on page 281.

ADJUSTING A CAMERA'S SETTINGS

A camera object has several settings that control the way it operates in a model. These settings can be changed on the Object tab of the Object Properties palette.

In addition to the controls found on this palette, controls for aperture radius, focus distance, lens thickness, and film size are also provided in the Project window.



Click here to expand or collapse the palette.

To expand the palette to reveal the expert settings, as well as the basic settings:

- Select the **EXPERT MODE** command from the Plus menu.
- or -
- Click the arrow in the lower left corner of the palette.

The following fields can be edited:

- **Name.** When you insert a camera object in a model, it is given a default name. The name of the camera also appears in the **CAMERA WINDOW** submenu in the Windows menu, as well as in the Project window.
- **Ratio.** The setting in this field indicates the ratio of the width of the camera window to its height. This ratio is not time variable. When changed, the

new setting becomes a global setting which effects all frames of a rendering.

0.77 : 1	(Page 8.5 × 11)
1.00 : 1	(Square)
1.25 : 1	(D-1 PAL)
1.33 : 1	(NTSC 4 × 3)
1.49 : 1	(Classic)
1.66 : 1	(PAL 5 × 3)
1.77 : 1	(HDTV 16 × 9)
1.85 : 1	(Movie)
2.00 : 1	(Double Wide)
2.35 : 1	(Wide Screen)
3.25 : 1	(Panorama)

If 3.25 : 1 is selected, *Panorama* appears in the Type field. See **Appendix C** on page 307 for a list of the most commonly used aspect ratios.

- **Type.** This setting determines the type of the selected camera. When *Panoramic* is selected, 3.25 : 1 appears in the Aspect Ratio field, and some of the other fields may not apply.
- **Target.** You can select any object in the active model that has been previously named (in the *Name* field on the Object Properties palette or in the Project window) to associate with the selected camera.
- **Host.** You can attach the selected camera to a host. Then, when the host object moves, the camera moves with it. This setting defaults to *None*. Only named objects appear in the pop-up list.
- **Track.** Select a tracking style. This field is set to *Swivel* and grayed out if a *Host* is selected.

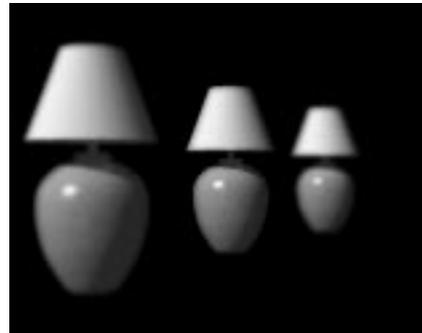
No Link - This option removes the existing target from the selected camera.

Hard Link - If the target moves, the camera moves as though welded to it.

Swivel - The camera swivels to follow the target object.

Chase - The camera chases a moving object with it's own gravity.

- **Field Depth/Range.** When the *Field Depth* box is checked, the value in the *Range* field determines the total distance in front of and behind the *Look At* point where objects will remain relatively focused. If the *Field Depth* checkbox is unchecked, the *Range* field is dimmed.



Only the lamp in the center is in focus. The other two lamps are outside of the specified range.

- **Roll.** You can interactively rotate the camera when the *Steady Camera* feature is disabled. To disable *Steady Camera*, click the lock icon beneath the control.



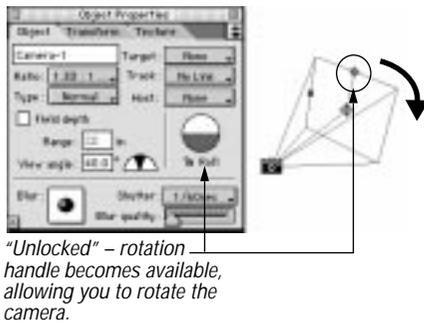
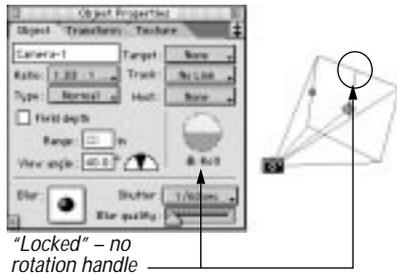
When the lock icon is in its "unlocked" position, you can grab the control and rotate it to any position.



This feature can also be disabled from the Camera window.

When the *Roll* control is in its "unlocked" position, a rotation handle becomes available in the Modeling

window. When the *Steady Camera* option is enabled (*Roll* control in its “Locked” position), the rotation handle is not available.



- **View Angle.** This setting determines the amount of perspective. A value can be entered directly in this field, or you can specify the view angle interactively with the *View Angle Control*. You can also adjust the view angle by adjusting the *Perspective* slider in the Camera window.
- **Blur.** Motion blur occurs when objects move while the camera’s shutter is open. You can control the softness of the blur behind an object, creating an especially realistic effect. Select a blur effect from the *Blur* pop-up list.



When the *Blur* pop-up is set to this option, no blurring occurs at all.



When this option is selected, blurring occurs evenly in front of, and behind the image. This option produces the most realistic blurring effect and is the normal result of too slow a shutter speed.



When this option is selected, motion is blurred in both directions. The shutter opens more slowly than it closes, causing more blurring to occur behind the image than in front of it.



When this option is selected from the *Blur* pop-up menu, almost all blurring occurs behind the image. This occurs when the shutter opens slowly and closes very rapidly.



When this option is selected, almost all blurring occurs in front, causing the image to look as though it’s moving backward. This occurs when the shutter opens very rapidly and closes slowly.

- **Shutter speed.** This field determines the speed of the shutter, in fractions of a second.
- **Blur Quality.** Higher quality settings may require significantly longer rendering times. StudioPro must render additional images, and then composite the intermediate renderings to create a blur effect.

For a complete description of the other tabs on this palette, see **Object Properties Palette** on page 221.

GRID TOOL

The Grid tool is provided to create User-defined grids, but it can also be used to resize World and User-defined grids. To access any grid present in the active model, use the plus (+) or minus (-) keys to cycle forward or backward through the grids.

For information on World grids and View-relative grids, see **Modeling Window** on page 245.

TOOL FUNCTION



The Grid tool is provided to define your own grids for use in modeling individual objects. It can also be used to resize the visible portion of World and User-defined grids.

User-defined Grids

User-defined grids are different than World grids in that they are initially drawn directly on an object, but they can be re-positioned anywhere in your model. User-defined grids appear orange.

To change the pointer cursor to the cross-hair cursor, turn on Caps Lock.



Pointer cursor



Cross-hair cursor

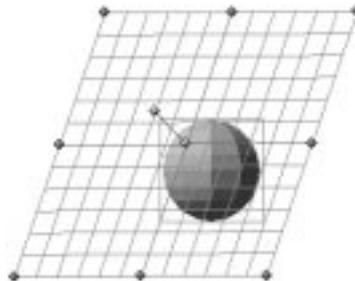
Like all grids in StudioPro, User-defined grids are infinite in size. With the grid tool selected, click on the object and drag to define the size of the visible portion of the grid. The exact position of the initial

mouse click determines the orientation of the grid.

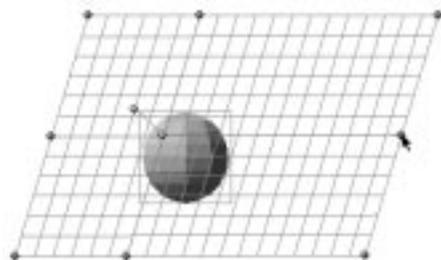
User-defined grids are drawn on the face of the object perpendicular to the surface normal (the direction the surface is pointing) at the precise location where the mouse is clicked.

User-defined grids are always drawn from the center instead of the corner. This is useful when drawing a grid on an irregular-shaped object.

The grid appears with handles on the sides and corners that are used for resizing, and two center handles that are used for re-positioning the grid.

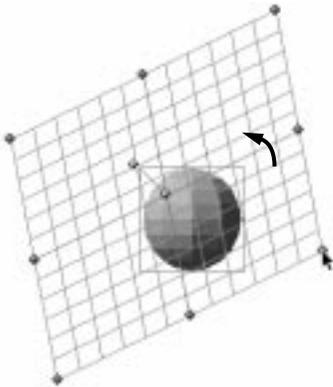


To resize the grid, grab a side handle and drag to the desired size with the Grid tool.

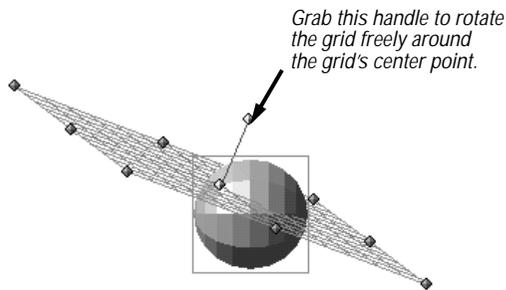


Remember, the grid is actually infinite in size; you're resizing only the portion that's visible in the Modeling window.

To rotate the grid, grab a corner handle and drag. The grid rotates in its own plane only.

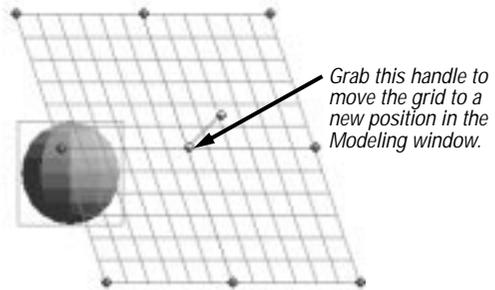


To tilt the grid on any axis, grab the center handle that resides ABOVE the surface of the grid, and rotate it in any position. The grid rotates around its center.



To move the grid to another location in the Modeling window, grab the center

handle that resides ON the grid, and drag it to the desired position. Only the grid moves; the objects in the model are completely unaffected. **To delete a User-**



defined grid, select the grid you want to delete with the grid tool, then press the Delete key.

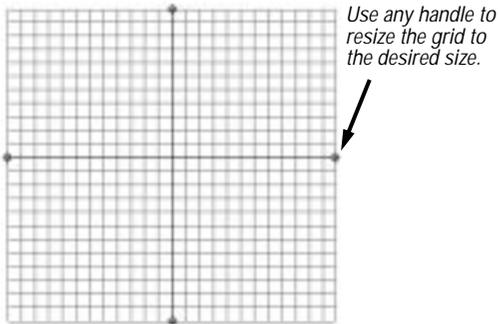
To cycle through all User-defined grids in your model, use the **Option-Plus(+)** keys (Macintosh) or the **Alt-Plus (+)** keys to cycle forward. To cycle backwards, use the **Option-Minus(-)** keys (Macintosh) or the **Alt-Minus(-)** keys (Windows).

Without the **Option** key (Macintosh) or **Alt** key (Windows), the Plus (+) or Minus (-) keys cycle in order through both World and User grids.

RESIZING WORLD GRIDS

The Grid tool can also be used to resize a World grid. World grids cannot be rotated

or moved, but you can increase or decrease the visible portion of the grid.



Grab a side handle and drag to resize it. Remember, you can only size the *visible* portion of the grid; its actual size is infinite. For more information on **World grids**, page 250.

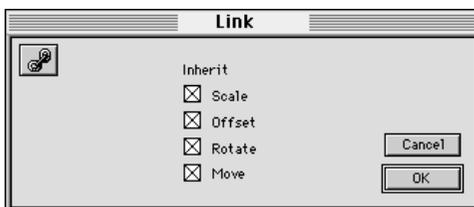
LINK TOOL



Use the Link tool on the Tool palette to establish a link between two objects.

TOOL SETTINGS

You can change the default settings by double-clicking the Link tool.



The Tool Settings dialog is displayed.

- **Scale.** If this box is checked, links created with the link tool will cause all child objects to scale together with the parent when the parent object is scaled.
- **Offset.** Check this box if you want the child to inherit the distance that the parent's object origin point is offset from its geometric center.
- **Rotate.** When a parent object is rotated, all child objects linked to that parent will rotate around the parent object's origin point if this box is checked.
- **Move.** When a parent object is moved, all child objects linked to that parent will move with it.

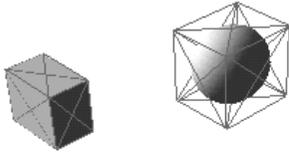
When none of the boxes are checked, moving, rotating, or scaling the parent object has no effect on the child. However, if the parent object is deleted, all child objects linked to the parent will also be deleted.

TOOL FUNCTION

This tool can be used to link objects, light sources, or cameras together. The link connection is used primarily for constraining an object's movement during animation sequences.

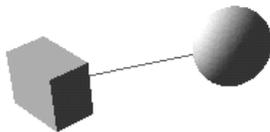
The Link tool makes the link connection between the child and parent. Select the child first, then drag the link cursor to the

parent. Each object becomes highlighted in turn as the link is made.



Objects highlight in red to indicate the linking process is complete.

Once the link is complete, a line connecting the parent and child appears in the Modeling window.



A line connecting parent and child indicates a link exists between objects.

The order of selection is very important. When you move a parent object, the child object moves also. However, you can move the child object without affecting the parent object.

All child objects appear beneath the parent object in the hierarchical structure in the Project window. An object can be linked to only one parent.

UNLINK TOOL



Use the Unlink tool to select the objects from which you want the links removed.

With the Unlink tool, select the object that you want to unlink, and then drag to the object you want to unlink from. You can unlink multiple objects by continuing to select objects with the Unlink tool.

ATTACH TOOL



The Attach tool is used to associate objects in your model with various modeling extensions, such as bones in IK structures. The modeling operation or extension controls the behavior of this tool. Full details can be found with the extension that requires the use of this tool.

DETACH TOOL



The Detach tool is used to detach, or remove the association from an object to the modeling extension.

IMAGING TOOLS

The Rendering tool is used for taking snapshots or creating animations.

RENDERING TOOL



When you're ready to render a single image or animation of your model, select the Rendering tool at the bottom of the Tool palette.

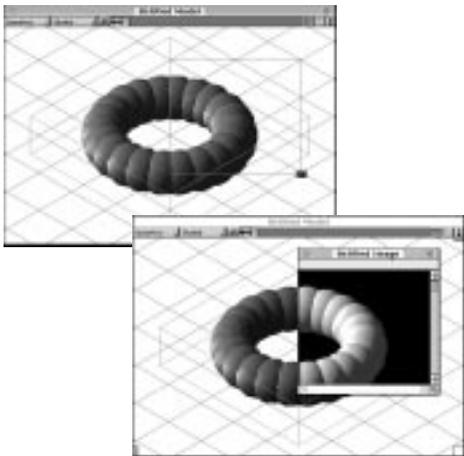
You can use the Rendering tool's pop-up menu to select the renderer and level of detail you want to use. This list is the same as the *Settings* pop-up list in the Render dialog.

The images are rendered in separate Rendering windows. A rendering can be initi-

ated from several different locations: the Modeling window, a Camera or Spotlight window, or the Project window.

You can initiate a rendering in one of three ways:

- **Single click.** The entire window renders. (The size and proportion of the rendering, as well as the viewing position, is determined by the size of the view where the camera cursor was clicked.)
- **Cursor drag.** The size and proportion of the rendering is determined by the marquee drawn with the cursor. The viewing position of the rendering is based on the view from where the cursor was dragged.



If you're using the cursor drag method, you can more accurately define the exact position of the cursor by turning on Caps Lock. When Caps Lock is on, a cross-hair appears in the center of the tool icon,

allowing you to more accurately position it in the window.



Rendering tool cursor



with Caps Lock on

- **Use the Render command.** Select the **RENDER** command from the Rendering menu to display the Render dialog.

This command allows you to specify the complete set of rendering parameters, including image size, image quality, resolution, and animation frames, if applicable, before the rendering starts. For complete information on using this dialog, see **Render** on page 57.

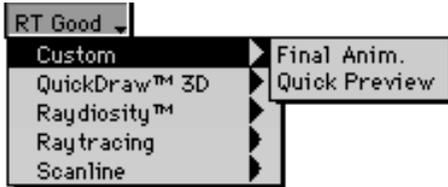


If you hold down the Shift key while clicking or dragging the tool in a view, the Render dialog also appears. The currently active view determines the viewing position for the rendering.

Custom Rendering Options

You can define a particular set of rendering options that you can recall later, either in the current project or in another model. See **Saving Custom Settings** on page 69 for details.

These custom settings will then appear in the list of presets available in the Rendering tool's pop-up menu.



When you select one of the *Custom* settings, the Render tool changes its appearance.

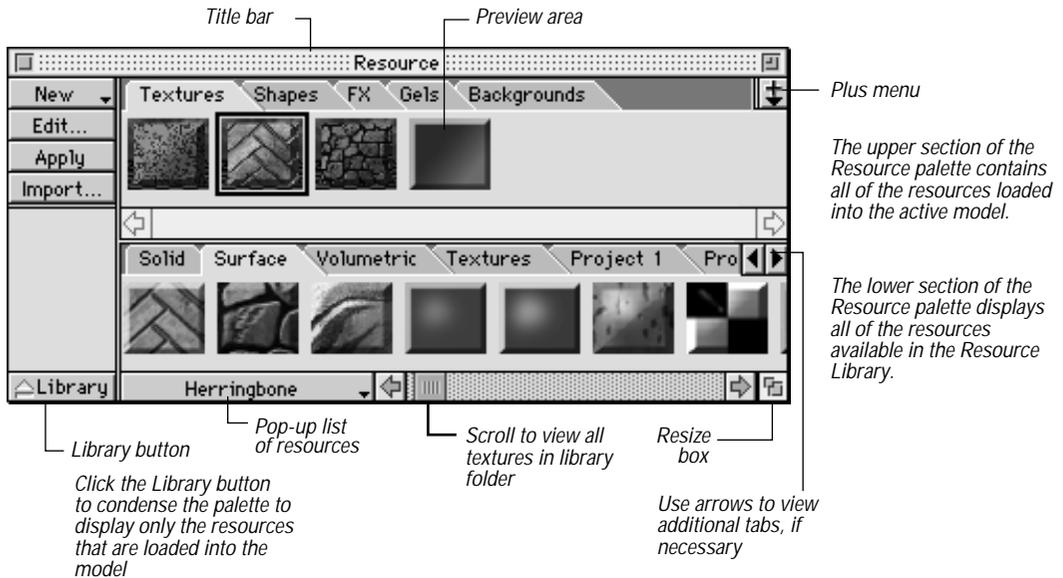
You can delete an entry from the *Custom* rendering options list by holding down the **Option** key (Macintosh) or **Alt** key (Windows) while selecting the name of the preset you want to delete. When you release the mouse button, the system beep sounds to confirm the deletion of that

entry in the list. You cannot undo this action.

If you change your mind, you can always add the preset again by manually selecting the same rendering options and saving them to the list.

Modifier keys that apply to initiating renderings using the Rendering tool:

- **Shift key**
Opens the Render dialog box. Without the Shift key, clicking or dragging the Rendering tool immediately begins a rendering.
- **Option key** (Macintosh)
Alt key (Windows)
Draws the camera's marquee from its center, instead of the corner.

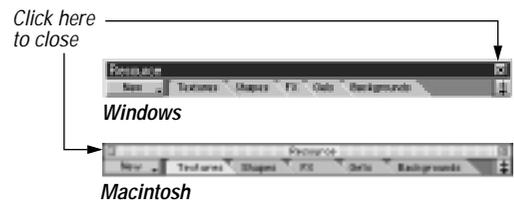


The Resource palette places all of the resources available to you in one convenient location. The palette includes resources for textures, shapes, special effects, gels, and backgrounds.

This palette includes controls that allow you to add existing resources to your model, or create new ones to add to the palette. You can also edit any existing resources to meet your needs.

To open the Resource palette, select **SHOW RESOURCE PALETTE** from the Palettes sub-menu in the Windows menu, or click the Resource palette's hide/show button in the Button Bar.

To close the Resource palette, select **HIDE RESOURCE PALETTE** from the Windows menu, or click the close button at the top of the palette.



You can also close this palette by clicking the Resource palette's hide/show button on the Button Bar.



If the Resource palette is open when you quit StudioPro, it will be open the next time you launch the application.

You can display the Resource palette in several different ways: condensed to display only those resources that are currently loaded in your model; fully expanded to display the entire library of resources available, as well as those already loaded; or collapsed to display the folder tabs only.

When viewed in its condensed form, the palette displays only those resources that are currently loaded in your model. If there aren't any resources in your model, the preview area of the palette will remain empty until resources are loaded.

Use the *Library* button in the lower left corner of the palette to toggle between the condensed and expanded forms of the Resource palette.



Click Library button to expand or collapse palette

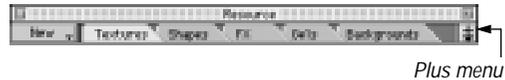
The condensed palette contains only those resources that are associated with the active model. If more than one model is open at a time, the contents of the palette change depending on which model is active.

Even though a resource may be loaded in the model (into RAM), it doesn't necessarily mean it is being used in the model. You can remove any unused or unwanted

resources through the Plus menu in the upper right corner of the Resource palette.

If the library portion of the palette contains more folder (directory) tabs than fit in the available space, you can use the left or right arrows to scroll through them. You can also increase the width of the palette with the resize box.

To reduce the size of the Resource palette even further to display only the folder tabs, select the **COLLAPSE PALETTE** command from the Plus menu.



Plus menu

Once collapsed, the command name changes to **EXPAND PALETTE**.

You can also double click on any of the folder tabs to collapse or expand the palette.

Several standard controls can be found on the Resource palette:

- **Title bar.** Grab the title bar to position the palette anywhere on the desktop. StudioPro remembers the position of the palette; the next time you launch the application, the Resource palette appears in the same position.
- **Close box.** Click the close button to close the Resource palette. This is the same as selecting the **HIDE RESOURCE PALETTE** command from the Windows menu.

- **Resize box.** Use this button to manually set the width of the palette on the screen.

The left side of the palette contains controls that are context sensitive and may change depending on which tab is active.

- **New.** This button allows you to create new resources for the active tab. All new resources appear on the top section of the palette.

When you create a new resource, it immediately appears on the palette and becomes part of the model. You can also save any resources you create to their appropriate folders so they will be available for use in other models.

- **Edit.** You can edit any existing resource. First select a resource, then click the *Edit* button. If the resource you select to edit is not already loaded, it automatically loads at this time.
- **Apply or Insert.** Use this button to apply or insert the selected resource into your model. You can also drag-and-drop resources from the palette into the Modeling window.
- **Import.** Click this button to import the selected resource from the Library into the active model.

The Resource palette also contains these controls which are available with all of the tabs:

- **Library button.** The Library portion of the Resource palette contains all resources available for use in your model. Click the *Library* button to expand or collapse the palette.

- **Pop-up Resource List.** All available resources for the active tab are listed in this pop-up list. Resources contained in the library appear in the upper portion; loaded resources appear below the line. The currently selected resource appears with a bullet (•) beside its name.



You can select a resource from the upper portion of this list, even when the palette is not expanded to display the contents of the Library. The name of the selected resource appears in the pop-up field. To load the resource into your model, you must *Insert*, *Apply*, *Edit*, or *Import* it. You must have an object selected before applying a resource; if no object is selected, the *Apply* button is dimmed and unavailable.

- **Scroll bar.** Use the upper scroll bar to scroll horizontally in the palette to view all the textures loaded in the current model. Use the lower scroll bar to scroll through all of the resources in the Library. The scroll bars are active only if there are more resources than can be displayed.
- **Preview area.** This area contains a preview image for each resource, if available.

Plus Menu

The Plus menu commands apply to the active tab.



COLLAPSE PALETTE. Select this command to collapse the palette to display only the folder tabs.



Once collapsed, the command name changes to **EXPAND PALETTE**.

SAVE. Use this command to save the selected resource to a disk or the hard drive so it can be accessed later for use in other models. See **Handling Resources**, below.

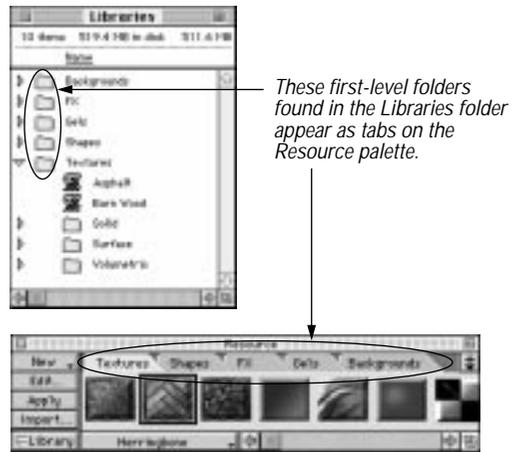
DELETE UNUSED. Use this command to remove all of the unused resources on the active tab from the model. This reduces the amount of memory required for the active model.

REPLACE SELECTED. This command is available when the Shapes tab is active. It allows you to replace the object that is selected in the Modeling window with the shape selected on the Resource palette. See page 190 for more information.

NOTE: When used in this manual, the term “folder” refers to both Macintosh **folders** and Windows **directories**.

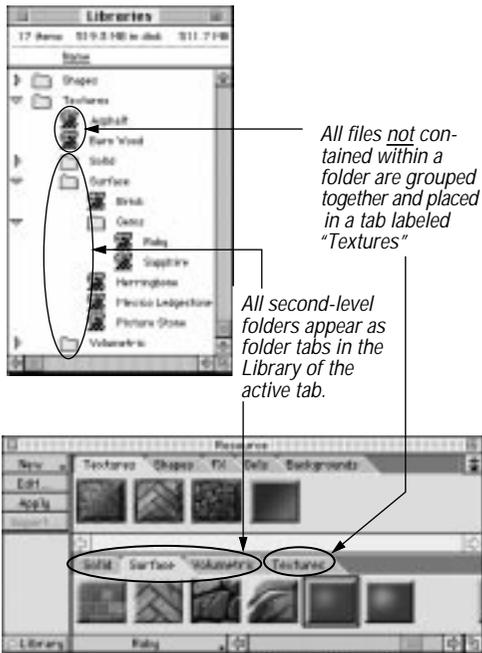
Handling Resources

The tabs on the upper portion of the Resource palette represent folders found in the *Libraries* folder within the *Strata StudioPro™* folder at the time you launch the application. You may not add additional folders at this level; only those folders that are shipped with and recognized by StudioPro will appear on the upper section of this palette. (Third party extensions or additional extensions provided by Strata may provide additional tabs/folders later.) You may need to use the left or right arrows to scroll through the tabs if more folders are present than fit in the available space. You may also increase the width of the palette with the resize box.



All second level folders appear as tabs in the Library of the active tab. For example, if *Textures* is the active tab, all folders contained in the *Textures* folder appear as tabs in the *Textures* library. Any individual files (files not contained within other folders) in the *Textures* folder will automatically appear in a folder tab labeled

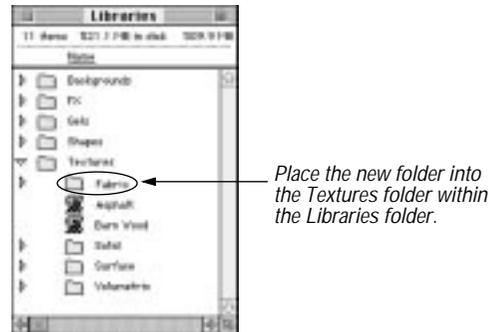
according to the name of the folder in which they're found; in this case, *Textures*.



All third-level folders are completely ignored. Texture previews appear side by side, regardless of how deeply they are nested within other folders. In the previous example, *Ruby* and *Sapphire* appear side by side with *Brick*, *Herringbone*, *Mexico Ledgestone*, etc. All reside side by side in the preview area of the Textures library when the *Surface* tab is active, even though *Ruby* and *Sapphire* are located within another folder.

To create tabs for the library (lower) section of the palette, create a folder for the sub-category (second level) folder. Then place the folder into one of the first-level folders in the *Libraries* folder.

For example, you might want to create a folder that contains only fabric textures. Create a folder named *Fabric* and place it inside the *Textures* folder within the *Libraries* folder. (The *Libraries* folder can be found in the *Strata StudioPro™* folder.)



Then place the individual fabric textures into the folder. The next time you launch StudioPro, a tab labeled *Fabric* appears in the Textures library along with *Surface*, *Solid*, etc.



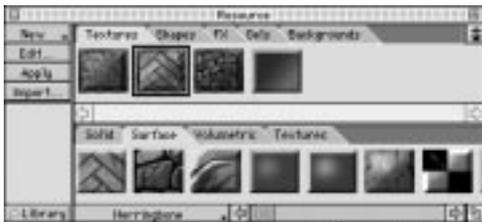
The *Fabric* tab now appears in the Textures library. When the *Fabric* tab is active, the texture files found in the *Fabric* folder appear in the preview area.

TEXTURES TAB

Click the Textures tab to make it the active tab. You can create a new texture, edit an existing texture, or apply a texture to an

object from the Resource palette while this tab is active.

The top portion of the Textures tab displays all of the textures that are loaded into the active model. If no textures have been loaded into the model yet, the preview area remains blank.



When expanded, the bottom portion of the palette displays the Textures library and includes all textures available for use in any model.

Once a texture is created, it remains part of the model even if you never apply it to any object. The new texture is saved with your model. But if you discard the model, the texture is lost unless you have saved it to disk. See **Handling Resources** on page 154 for information on saving resources to the proper location in the Library.

LOADING TEXTURES FROM THE LIBRARY

You can add new textures to your model by loading them from the Library section of the palette. Click the *Library* button to expand the palette to display all of the textures available for use in your model.

Use the scroll bar at the bottom of the palette to view the entire contents of the

library. You can also adjust the width of the palette by using the resize box in the lower right corner of the palette. A box appears around the selected texture in the preview area of the Resource palette.

Textures can also be selected from the pop-up list to the left of the scroll bar.



Entries in the upper portion let you select textures from the library. The contents of each folder appear in a submenu beside the folder name in the pop-up list. Textures that are already loaded into the active model appear at the bottom of the list (below the line). A bullet (•) appears beside the name of the currently selected texture.

You can load a texture from the library into your model in following ways:

- Click once on the texture to select it, or select it from the pop-up list, then click the *Apply* button. If the texture isn't already loaded, it loads the texture first, and then applies it to the selected object.
- Click-and-drag the texture preview from the Resource palette to an object in the Modeling window. When the object highlights, release the mouse button. This process loads and applies the texture.

- Select a texture from the palette and click the *Edit* button. This loads the texture, if it isn't already loaded, and opens the appropriate Texture Editing dialog. Double-clicking on a texture preview also loads the texture and opens the Texture Editing dialog.
- Select a texture in the Library, then click the *Import* button. This imports the texture into the active model.

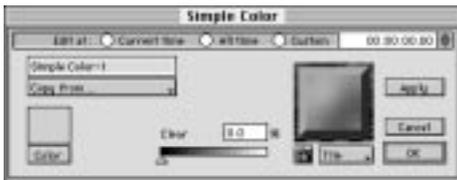
CREATING SIMPLE COLOR TEXTURES

Simple Color textures apply a color to the surface on an object. This type of texture also allows you to control the opacity of the texture. Simple Color textures require less memory than *Surface* textures.



To create a new Simple Color texture, click the *New* button, then select *Simple Color* from the list of all available texture extensions.

The Simple Color dialog appears.



This dialog contains the following fields:

Edit at. Select *Current Time*, *All Time*, or *Custom*. If you select *Custom*, enter the

time at which you want these settings to take effect for this texture. By changing the color at different times, you can create a texture that gradually changes from one color to another over time.

Texture Name. This field contains the name of the new texture. This is the name the texture will be cataloged under in the texture list.

Copy texture from. This field allows you to copy the settings from another Simple Color texture to create a variation for a new texture. (Perhaps you want to create a Simple Color texture that's just a shade or two lighter than a Simple Color texture you've already created.) Simply choose the desired texture from the pop-up list. Only *Simple Color* textures that are already loaded in your model are listed here. The color and transparency from that texture are applied to the new texture. The original texture is unaffected.

Color. Click this button to select a color for the texture. When you apply the texture to an object, the entire surface of the object is tinted this color.

Clear slider. This slider determines how opaque or transparent the texture appears.

Preview. This area allows you to see how the texture will appear when rendered. A pop-up list directly below the preview area lets you select the type of object the texture is previewed on: a tile, a cube, or a sphere.

 Click the camera icon to render a preview of the texture. This allows you to see what the texture looks like with the current settings.

CREATING SURFACE TEXTURES

Surface textures utilize surface mapping to enhance the realism of renderings. Surface mapping gives you pixel-by-pixel control of the texture.

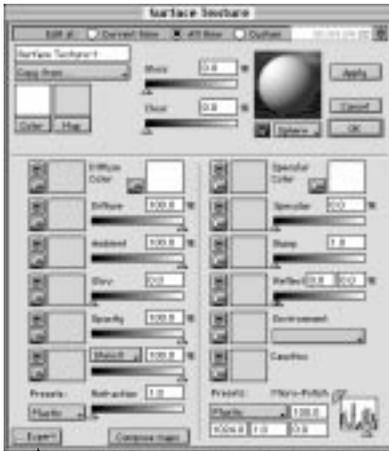
The Surface Texture dialog can be viewed in either its basic or expert form.

Basic



Click to expand

Expert



Click to collapse

Although you can create custom textures from the basic Surface Texture dialog, the *Expert* settings let you create textures that look more realistic. These settings also allow you to control every aspect of the textures you create. To expand the Surface

Texture dialog to display additional controls, click the *Expert* button in the lower left corner.

Using Surface Maps

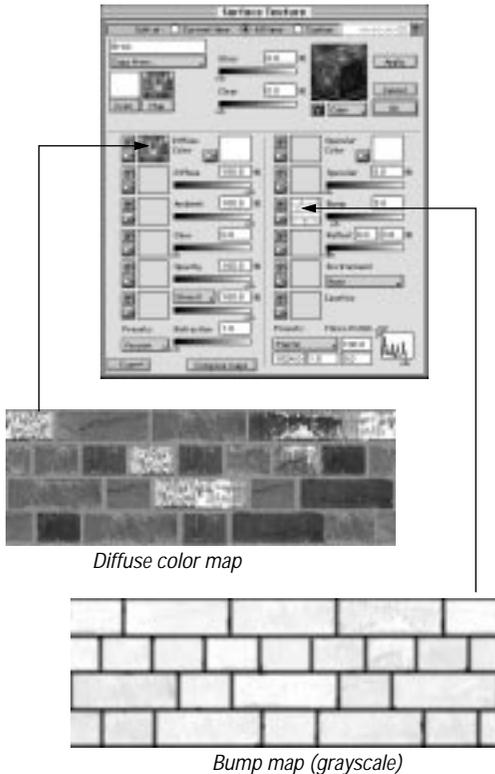
When used properly, textures created with surface maps can be used to simulate actual geometry and may greatly reduce the amount of modeling required to achieve the same results.



This entire brick wall is nothing but a single cube primitive with a surface texture applied. Notice how each brick appears to be a separate geometric object. And the mortar between the bricks seems to be inset slightly, just as a real brick wall would appear. These details are all added as part of the brick texture definition. Maps are used to simulate the appearance of a real brick wall.

You can add dimension and realism to your images by using surface maps to define your textures. A surface map is an image or animation that's used to define the surface of an object. It's quite common to use the same grayscale map, or an inverse of it, in several map fields. Typically, these maps are created from the

same master image. That way, they are guaranteed to align correctly.



The Diffuse color map is simply an image that is mapped onto the surface of the object. But without the bump map, the surface would appear even. The bump map adds dimension to the surface of the wall.

Each surface property field also allows you to specify a value which controls the total effect each map has on the final texture. You can enter this value numerically or use the slider. This way you can make subtle changes to the various surface

properties without the need to change the surface maps themselves.

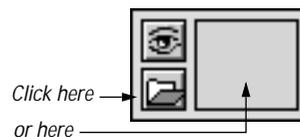
For example, perhaps the grayscale map in the *Reflectivity* field creates a texture that reflects slightly more light than you want. Instead of taking the map back into an image-processing application and toning down the grayscale values, you can simply reduce the value from 100 percent to 90 percent.

If a field contains no map, the values specified by the slider become global settings for the texture. For example, if the *Reflectivity* field contains no map and the slider is set to 90 percent, the texture will reflect 90 percent of the light hitting the surface.



Each surface property field contains two icons which allow you to turn any of the texture channels on or off. When you click the eye, it toggles between its ON (open) and OFF (closed) state.

To load a map, click the folder icon or click directly in the larger rectangle to the right of the folder icon.



The Image Map dialog appears, allowing you to locate and load a map into the texture definition. You'll see this dialog often in StudioPro, so you should become familiar with its fields and their functions.

Image Map dialog



- **Load.** This button allows you to load an image or movie to use as a map.

To load animations consisting of sequentially numbered files, locate and load the first file; StudioPro will load all other sequentially numbered files with the same name that are present within the same folder.

- **Play Movie.** This button displays the animation playback window and plays the movie specified in the Map field.

The animation playback window doesn't support sequentially numbered images. However, sequentially numbered images are acceptable formats for use as maps, even though they can't be viewed from this dialog.

- **View Scale.** You can scale the view of the selected map to one of the values listed in the pop-up list.
- **Image Size.** The pixel size and the scale of the image are displayed to the right of the *View Scale* pop-up.

- **Track.** This field lists all tracks in the current movie. If no movie is present, this field is not available.
- **Playback.** This pop-up controls how the movie plays back. Available choices are:

Once. This option plays back the movie one time, from beginning to end.

Loop. This option repeats the movie over and over again, each time from the beginning to the end.

Back and Forth. This option first plays the movie forward, from beginning to end, then reverses and plays the movie backwards. This forward-backward cycle repeats itself over and over again.

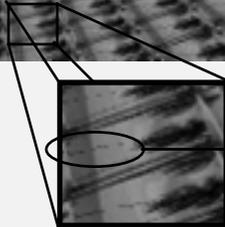
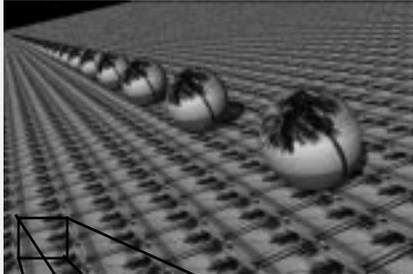
- **Frame rate.** You can select a frame rate for the movie from this field. This pop-up is not available if no movie is present.
- **Sample.** This pop-up lets you specify how the pixels within the image are sampled.

Direct. Pixels in the image are left as is. No interpolation takes place. You may want to select this option if the map you're using is sized to fit the object correctly. However, if you zoom in too close, the image will appear pixelated.

Smooth. Pixels are interpolated (values of adjoining pixels are averaged together) to produce a smoother appearance. If you're going to zoom in close to the surface of the object that this texture is applied to, selecting this option will create a smoother appearance.

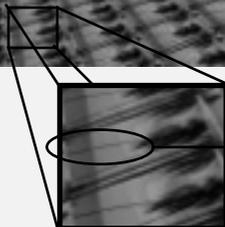
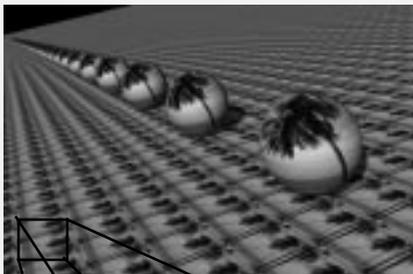
MIP Mapped. In addition to interpolating the pixels, this method also uses super-sampling to prevent moiré patterns and/or background flickering.

Without MIP mapping



Notice how the trunk of the tree is breaking up in the image without MIP mapping.

With MIP mapping



The trunks of the trees in this image appear smooth and unbroken.

Also notice the much smoother appearance across the entire top edge of the image with MIP mapping.

Selecting this option, however, may increase this texture's memory requirement by approximately 1/3, as compared to the *Direct* or *Smooth* options.

- **Color Depth.** You can select a color depth for the image or animation from this pop-up list. Reducing the color depth saves memory. A color map stored as a 32-bit image requires four times more memory than an eight-bit color map. However, if you change the color depth, then save and close your model, when you open your model again, you'll need to re-load the map to revert to its original color depth.
- **Orientation.** You can change the orientation of the map. The *Orientation* pop-up includes the following choices: *Normal*, *Flip Horizontal*, *Flip Vertical*, and *Flip Both*.
- **Invert.** The *Invert* checkbox is used to invert the map. This feature can be very useful in several situations. Perhaps you want the light areas of the map to become the depressions in the surface of an object, rather than the high areas. You can simply invert the grayscale map and use it as the new bump map.
- **Color/Grayscale.** These buttons indicate the status of the currently loaded map. You can change a color map to a grayscale map by clicking the *Grayscale* button.

When you click the *OK* button, the map appears in the appropriate box in the texture editing dialog.

Using the Texture Editing dialog

Most of the fields in this dialog use maps. However, *Refraction* and *Micro-Polish* have no maps, so the settings for these fields are always global in nature and apply to the overall texture.

Diffuse Color, *Specular Color*, and *Caustics* are the only fields that contain maps that use color information. All of the other maps are treated as grayscale maps. The value of each pixel in the map determines the level of effect for that particular surface property for that pixel in the final rendered image.

Basic Texture Editing dialog

In many cases you can create the textures you want with only the controls found in the Basic texture editing dialog.



The Basic dialog contains the following controls:

Edit at. Select *Current Time*, *All Time*, or *Custom*. If you select *Custom*, enter the time that you want these settings to start taking effect for this texture. You can create textures that change over time by changing the settings in this dialog at different points in time.

Texture Name. This field contains the name of the new texture. This is the name

that will appear in the pop-up list on the Resource palette. Using a descriptive name will help you remember its name and locate it again later.

Copy texture from. This field allows you to copy the settings from one texture to create a variation for a new texture. Simply choose the desired texture from the pop-up list. (Only surface textures that are already loaded in your model are listed here.) All settings from that texture are applied to the new texture; the original texture is unaffected.

Color. Click this button to select a color to apply to the texture. When you apply this texture to an object, the entire surface of the object is tinted this color. If the texture you create also contains a color map, all of the entire map is tinted this color, as well.

Map. Click the *Map* button to add an image to use as a color map for your texture. When you click this button, the Image Map dialog appears. See **Image Map dialog** on page 160 for information on the fields in this dialog. (This map also appears in the *Diffuse Color Map* field in the lower section of the dialog.)

Gloss slider. This slider determines how shiny the texture appears by controlling the amount of ambient and diffuse light reflected, the amount of specular light reflected, the amount of reflectivity, and the smoothness (micro-polish) of the texture.

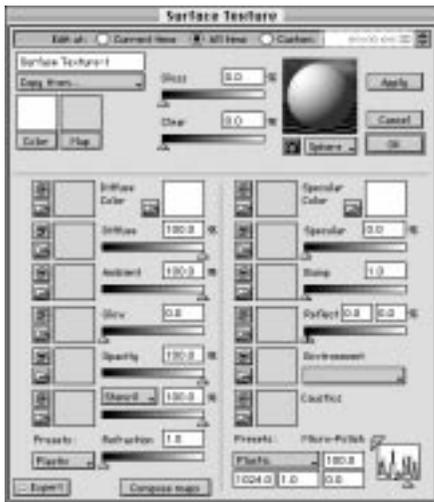
Clear slider. This slider determines how opaque or transparent the texture appears by controlling the level of opacity, and the amount of ambient and diffuse light reflected.

Preview. This area allows you to see how the texture will appear when rendered. A pop-up list directly below the preview area lets you select the type of preview used. You can choose to view the texture on a tile, a cube, or a sphere.

 Click the camera icon to render a preview of the texture. This allows you to see what the texture looks like with the current settings.

Expert Texture Editing dialog

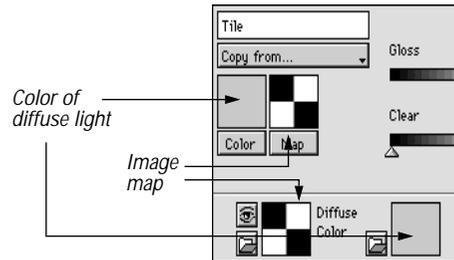
Click the *Expert* button at the bottom of the dialog to reveal additional controls:



The following surface properties fields, or channels, appear in the Expert section of the Surface Texture dialog:

Diffuse Color Map. *Diffuse Color Map* and *Diffuse Color* can both be set from the basic

Surface Texture dialog (upper portion of the dialog).



- **Diffuse Color Map.** Diffuse color maps are the main method of putting color images on objects. They are visible when diffuse light reflects off the surface. This is the same as the *Map* field in the upper portion of the dialog.
- **Diffuse Color preview.** The preview to the right of the *Diffuse Color Map* field displays the color of the diffuse light. The entire object is tinted this color. This is the same as the color in the preview directly above the *Color* button in the upper portion of the dialog.

Diffuse. Diffuse light is light that scatters in all directions. Surfaces with a lot of diffuse reflection appear dull or matte.



- **Diffuse Map.** This grayscale map controls how much diffuse light is reflected from the surface of an object, based on the pattern in the map. Black areas of the map prevent any light from being

reflected. White areas allow full diffuse light reflected (according to the value set by the *Diffuse* slider). Gray areas suppress the light reflected depending on the level of gray.

- **Diffuse Value.** The slider in this field specifies the percentage of the total light which is reflected from the surface of an object. You can enter a value in the numeric entry field, or use the slider. The range for this field is from 0 to 100 percent. A setting of zero means no diffuse light is reflected; a setting of 100 percent means all of the diffuse light is reflected, based on the values indicated by the map.

Ambient. Ambient light is non-directional background lighting. The amount of ambient light that a surface reflects controls the apparent brightness of the object when it is not directly illuminated by a light source, such as the areas of an object that are in the shadows.



Notice that the lower the Ambient Fraction setting, the higher the contrast in the shaded areas of an object. The un-lit side is almost black in the image with a low ambient setting.

- **Ambient Map.** You can load a grayscale map in this field by clicking the folder icon or mapping field. This map controls the amount of ambient light reflecting from the surface of an object. Black areas of the map reflect no ambient light. Gray areas reflect varying degrees of ambient light, depending on the level of gray. White areas reflect all

of the ambient light present, based on the setting of the *Ambient* slider.

- **Ambient Value.** The setting here determines how much of the ambient light the surface reflects. The range for this field is 0 to 100 percent. A setting of zero percent means the surface will reflect no light and will be very dark (or black) in the shadows; a setting of 100 percent reflects all light striking the surface, based on the pattern of the *Ambient* map.

Glow. Glow determines the amount of luminescence a surface emits, without reflecting light from an outside surface. The renderers can't detect backlighting, but you can use this field to simulate the glow of a surface that is illuminated from behind. The color of the glowing surface is determined by the color set in the texture, not the color of the light falling on the object.

With Glow, you can create objects that appear to emit light.



- **Glow Map.** This grayscale map determines where, and how much, glow occurs on the surface of an object, based on the pattern in this map. White areas are areas with the highest amount of glow, grays with areas of less glow (depending on the level of gray), and black areas are areas with no glow at all. The maximum glow is determined by the *Glow* value.
- **Glow Value.** Use this field to control the amount of glow emitted from the surface of the object. A value of zero

produces no glow at all; a value of one may overpower any other surface characteristics of this texture.

Opacity. Opacity describes the texture's ability to prevent light from passing through it. If you're creating a transparent texture, remember to lower the amounts of ambient and diffuse light, as well.

- **Opacity Map.** Grayscale opacity maps specify areas on a surface that are opaque. You can use opacity maps to give the illusion of geometry that is entirely different than the actual object. You can create holes in objects or add features that don't exist, such as doorways, windows, or holes in the surface of any object.



When an opacity map is used in a texture definition, it can create an illusion of holes in the surface of the object to which it's applied.



The white areas of the map correspond to areas that are fully opaque, gray areas are semi-opaque according to the level of gray, and black areas correspond to fully transparent areas, according to the *Value* setting for *Opacity*.

When using *Opacity* maps to create holes in objects, you must also suppress the amount of ambient, diffuse and specular light that would normally

reflect from the surface. This requires that you use maps in these fields also.

- **Opacity Value.** Use this field to set the amount of opacity for the surface, based on the values indicated by the grayscale map. Opacity is entered as a value between 0 and 100 percent. A value of 100 percent results in a fully opaque surface. A value of zero is fully transparent and therefore invisible, except for its effect on the objects behind it, such as color and refraction. However, fully transparent objects can also have ambient and diffuse values which cause the surface to become visible, and if set too high, can obscure the objects behind it.

NOTE: *Using the Clear slider in the upper portion of the dialog automatically reduces the Opacity, Diffuse, and Ambient surface properties accordingly.*

Stencil. This field allows you to use only a specific portion of the texture definition.

- **Stencil Pop-up.** The *Stencil* pop-up contains two entries: *White* and *Transparent*. If no other texture has been applied to the object when this texture is applied, any areas outside the area covered by the maps (areas of the object that are normally visible) will appear either white or invisible (transparent), depending on your selection. The currently selected option appears with a bullet beside its name in the pop-up list.



For example, if you select *Transparent* from the pop-up list, then apply a texture with this star map in its *Stencil* channel, the object will appear invisible in all areas outside the areas defined by the map (assuming no other textures have been applied). You don't need to apply a transparent texture first to achieve this result.

If a texture has already been applied to the object, the *Stencil* pop-up is ignored, and the texture below appears, as expected.

- **Stencil Map.** This grayscale map defines the area of the surface map to use in the texture definition. Black areas of the map do not exist, and the texture below shows through. White areas define the areas of the surface texture that are used. Gray areas of the texture mix with the texture below, according to the level of gray.



Stencil Map

Black areas do not exist in the texture definition.

White areas define the portion of the surface map that will use only this texture's settings in each channel.

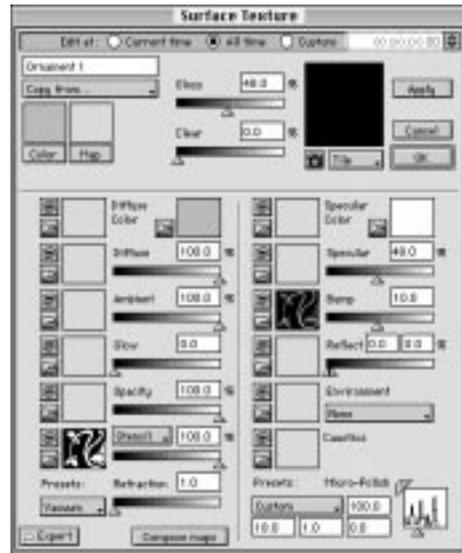
Gray areas will mix values in all channels with the values in the texture below.

Do not confuse *Stencil* with *Opacity*; *Stencil* affects ALL channels of the texture, not just the opacity channel.

- **Stencil Value.** This field indicates the value used to scale the Stencil map. If no map is present, this setting deter-

mines to what degree the texture below shows through.

The image below was created using the texture shown in the Texture Editing dialog:



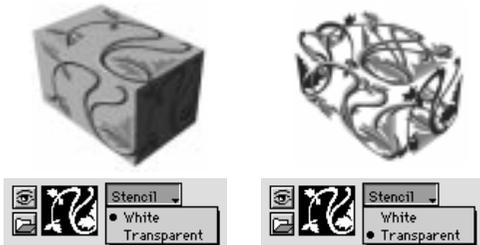
This texture consists of a single color. It doesn't even contain a color map. Without the map in the stencil channel, the entire surface of the object would be tinted this color.

The stencil map controls which areas of the texture will use the settings of ALL the other channels (color, diffuse, opacity, etc.). When you apply the texture to an object, it only appears in the areas specified by the white regions of the stencil map. Any texture below this one appears in all other areas.



The Brick texture below shows through.

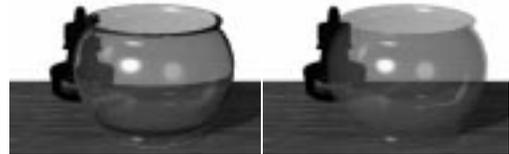
If you haven't applied any other textures to the object yet, the stencil pop-up lets you decide whether the object that it's applied to appears invisible, or whether it appears a matte white color.



(The option selected in the *Stencil* pop-up is ignored if any other textures have been applied to the object.)

Refraction. This field is used to control the amount of refraction visible through a transparent surface. Refraction causes light to bend whenever it travels through one medium to another, such as from air

through glass through water and back to air.



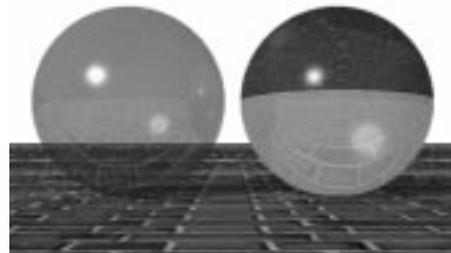
With refraction

No refraction

Notice how the light seems to bend as it passes through the bowl on the left.

Refraction is apparent only if the texture also contains transparency and is applied to solid, one-sided objects.

Transparent objects with single-sided surfaces refract light coming through them as if the objects were solid, such as a solid crystal ball. Objects with double-sided surfaces appear hollow, like a hollow shell, and do not refract light.



Two-sided

One-sided

Refraction is used to simulate curved or transparent surfaces such as flat glass, lenses, crystal, gems, etc.

- **Presets:** You can select a refraction index from a pop-up list of common materials. The slider updates to reflect your selection.
- **Refraction Value:** A value of one is equivalent to the refraction index of

air. See page 311 for a table of the more common materials and their indexes of refraction.

In reality, the color (or wavelength) of the light determines the angle at which light is refracted. StudioPro does not consider wavelength, and therefore an average index of refraction is used. All colors are refracted the same amount; therefore, prismatic effects are not generated.

Specular Color Map. A specular color map allows you to have pixel-by-pixel color control of the highlights that reflect from the surface of an object.

- **Specular Color Map.** This map is a color map. It controls the specular light reflected from the surface of an object based on the pattern in the map.
- **Specular Color preview.** You can tint the entire specular color map. Click on the preview area to the right of the Specular Color Map field to select a color to use to tint the map.

Specular. Surfaces that reflect mostly specular light appear shiny. Specular reflections create highlights or “hot spots” on the surface of an object.



HIGH



MEDIUM



LOW

- **Specular Map.** A specular map is a grayscale map that allows you to create surfaces that vary in their gloss or shininess. Black areas of the map reflect no specular light; grays reflect varying amounts depending on the

level of gray; and white areas reflect the most specular light, according to the value set by the slider or the value in the numeric field above the slider.

When used properly in conjunction with reflectivity maps, you can accurately simulate all types of surfaces, such as metals, plastics, glass, paper, paint, etc.

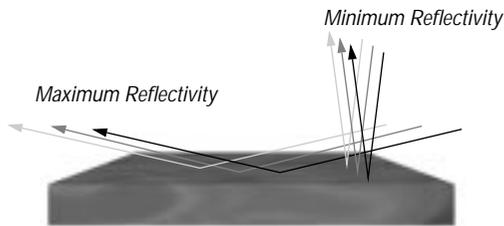
- **Specular Value.** Use this field to control the total amount of specular light reflected. If a Specular map is used, this value determines the total amount of specular light reflected from the white areas of the map. Enter a value from 0 to 100 percent.

Reflectivity. This field determines the level of mirror-like reflection a surface has. For a perfectly reflective surface, use no *Ambient* or *Diffuse*, but set full *Reflectivity* and *Opacity*. However, very few surfaces, except mirrors, are perfectly uniform in their reflectivity. You can create more realistic-looking shiny objects by using a surface map to define the variations in the reflectivity of the surface. The color displayed in the *Specular Color* preview determines the color of the reflected light.

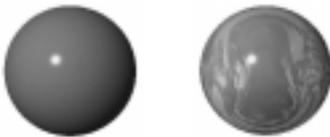
- **Reflectivity Map.** A reflectivity map uses a grayscale image to vary the level of reflectivity on the surface of an object, according to the value specified by the *Reflectivity* slider. White corresponds to the most reflective areas, gray areas vary according to the level of gray, and black produces no reflectivity at all.
- **Minimum Reflectivity Value.** This value controls the intensity of the light that reflects perpendicular to the viewing plane.

- **Maximum Reflectivity Value.** This value controls the intensity of the light that reflects at nearly parallel angles to the viewing plane.

For example, compare the way light reflects off the surface of water in a lake. When you look directly into the water, it doesn't reflect much light. This is equivalent to minimum reflectivity. When you look at the surface of the water at an angle, it takes on a mirror-like appearance and reflects far more light.



Environment. Environments add surrounding reflections to the objects in your models, creating a more realistic appearance. This field allows you to build a reflective background into your texture to control the reflections that appear in shiny surfaces.



The sphere on the left has no environment map in its texture definition. The sphere on the right has the "Room" environment map built-in to the texture.

- **Environment Map.** This is a grayscale map that allows you to control which areas of the surface reflect the environ-

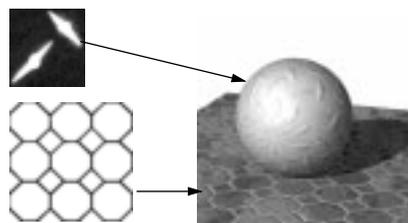
ment. White areas are fully reflective, as determined by the value of the slider; black areas reflect none of the selected environment, and gray areas are scaled according to the level of gray.

- **Environment pop-up menu.** You can select any background from the Background library to build a reflective environment into a texture.



All available backgrounds appear in the upper section, and those available in the *Backgrounds* library appear in the lower section. Select *None* to remove the existing reflective background.

Bump. This field allows you to create objects that appear to have uneven surfaces, even though the geometry isn't altered in any way. To the renderer, the object appears to have high areas and depressions.

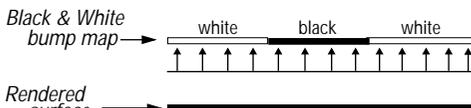


White areas in bump map create raised areas on ball. Dark areas in ceramic tile's bump map create depressions in the floor for seams in the tiles.

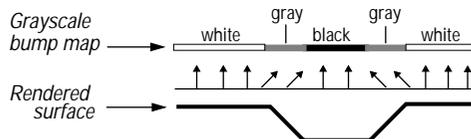
- **Bump Map.** White areas of the map indicate areas of raised height; dark areas indicate depressions in the surface.

Bump mapping works with surface normals. A surface normal is the direction the surface is facing, which, in turn, determines the direction which light reflects from an object. It doesn't alter the geometry of the object; bump maps just change the direction the surface normals are facing.

Because bump mapping works with surface normals, this map requires transitional grays between the white (high) and black (low) areas of the map to determine how deep the depression appears. This is extremely important. If your bump map contains only white and black, the appearance of the surface of your object won't change. However, you can simply blur the bump map in an image processing application, such as Adobe's Photoshop™, before you load it into the *Bump Map* field of the texture.



B&W image for bump map (no gradation) – Normals are unaffected by the bump map.

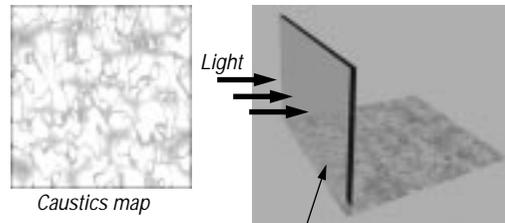


Grayscale image for bump map (w/ gradation) – Normals are deflected by the bump map, and the surface appears with depressions because of variations in lighting intensity.

A sudden change from white to black, with no gradient between the two, will not register as a surface depression.

- **Bump Value.** The *Bump* field must have a bump map to have any effect on the surface. It sets the depth of surface variations specified by the bump map field. The higher the value, the deeper the depressions appear. If no bump map is present, this setting has no effect.

Caustics. Caustics affect the light as it passes *through* an object, so the caustic effect isn't apparent on the object that it's applied to; it's only visible where the objects cast a shadow. For this field to have any apparent effect, the texture must have some degree of transparency as well.



The texture applied to this object uses the caustics map on the left, with Opacity set at 5% (95% transparency). The effect of the map is not apparent on the object itself, but as the light passes through the object, shadows are cast according to the patterns in the caustic map.

One example of this effect is the way light is affected as it passes through the water in a swimming pool, creating patterns of light and dark on the bottom of the pool.

- **Caustics Map.** A grayscale or color image or animation is used to define the way this texture affects the light that passes through it. This pattern doesn't appear on objects that this tex-

ture is applied to, but only on the objects that are behind or below.

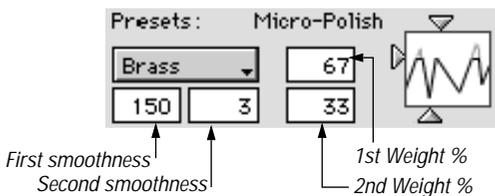
Micro-Polish. The smoothness of a surface affects the way light reflects from it. Micro-polish settings determine the smoothness of an object on a microscopic scale. Metallic surfaces have a high degree of specularity and the hot spots tend to have halos around them. Micro-polish allows you to simulate this “halo” effect.

StudioPro provides a variety of preset values for various materials. You can select a preset from the pop-up list, or you can modify one to meet your needs. You can also use the interactive *Micro-polish* controls or enter values directly in the numeric fields below.

This control determines the *ANGLE* at which the irregularities are removed when polished.
(*Second Weight %*)

This control determines the *LEVEL* at which the irregularities are removed when polished.
(*Second Smoothness*)

This control determines the *coarseness* of the irregularities in the surface.
(*First Smoothness*)

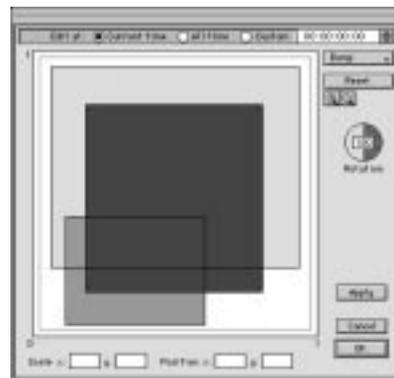


- **First Smoothness** (lever on bottom). This field defines the overall smoothness of the surface of the object.
- **First Weight %**. There is no lever for interactively defining this field. The

default value in the *First Weight %* field is an inverse function of the *Second Weight %*. However, you can enter a value in this field without affecting the value in *Second Weight %* field.

- **Second Smoothness** (lever on side). This field is provided primarily for creating metallic textures. It determines the level at which irregularities are removed from the surface when polished.
- **Second Weight %** (lever on top). The value in this field determines how much the coarseness of the material affects the way in which it's polished.

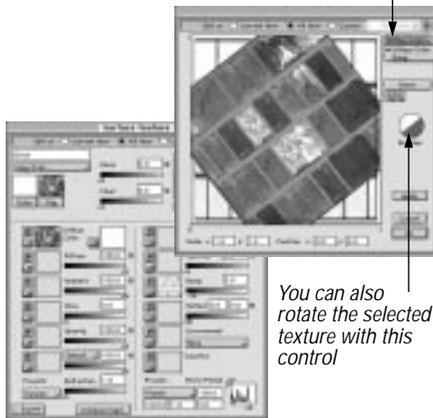
Compose Maps. This button allows you to align the individual maps in the texture definition to the orientation required to create the desired affect. When you click this button, a dialog is displayed that allows you to position individual maps in any orientation.



- **Edit At.** Select *Current Time*, *All Time*, or *Custom*. If you select *Custom*, enter the time at which you want these settings to take effect for this texture.

- **Map.** This pop-up list contains all of the maps in the current texture definition. Select the map from the list that you want to position.
- **Editing window.** You can grab the representation of the selected map in the editing window and move it to any position. To rotate the map, use the interactive *Rotation* control to the right of the editing window.

Select a map from the pop-up list. All maps contained in the texture appear in this list.



You can also rotate the selected texture with this control

- **Reset.** If you're unhappy with the placement of the selected map and want to revert to its original position, click the *Reset* button. The map will return to the orientation it was in at the time this dialog was last opened.

NOTE: When using UV mapping, the *Edit* window, from zero to one in both directions, represents the entire surface of the object to which this texture will be applied, both width and height.

If you want the position of the individual maps to change over time, click the

Apply button, then you can change the time in the *Custom* field at the top of the dialog and re-align the maps. You can repeat this procedure as often as desired. When you're finished, click *OK*.

Apply/Cancel/OK buttons. You can change any of the properties of the surface texture so that the texture actually changes over time. Define the texture as you want it initially, click the *Apply* button, then change the time in the *Edit At* field at the top of the dialog. Then, adjust the settings as you want them at the time specified, click *Apply* again. Repeat this procedure until the texture is as you want it.

When you're finished defining the new texture, click the *OK* button to load the texture into the current model. The texture becomes part of your model and appears in the "loaded" portion of the Textures tab on the Resource palette. It will be saved with the active model. If you want to save this texture for use in other models, select the **SAVE** command from the Plus menu on the Resource palette.

You can also choose to discard entries in this dialog by clicking the *Cancel* button.

CREATING SOLID TEXTURES

Solid textures (Marble, Stone, and Wood) are mathematically generated. They appear to be carved out of a three-dimensional volume. For instance, when a solid *Wood* texture is applied to an object, it

appears as though the object was carved from a solid block of wood



NOTE: You can also create surface textures that resemble wood or marble, for example, by using a Diffuse Color image map. The wood texture shown above, however, was created with the Wood solid texture extension, then part was cut away to show the interior.

Solid textures render faster than surface textures. However, they do not give you the same pixel-by-pixel control as surface maps. Surface properties settings in a solid texture are global in their effect. For example, all areas of the surface reflect the same amount of diffuse light. You can control the total amount of light reflected, but the entire surface reflects that light uniformly. You can't use a Diffuse map to control the amount of light reflected from different areas of the surface.

Several solid textures are shipped with the software. You can load them into your model from the texture library, and modify them, if desired.

You can also create your own solid textures with StudioPro. They can be saved and used in other models. Each type of solid texture requires a special texture extension to generate its texture pattern. Each extension has its own texture dialog.

Solid texture editing dialogs contain many of the same fields provided in the Surface texture editing dialog. For a more complete description of some of these fields, refer to the section on Surface Textures (page 158).

To create a solid texture, hold down the *New* button. A list of the available texture extensions is displayed. *Wood*, *Stone*, and *Marble* are all solid textures.

All of the solid texture editing dialogs contain the following fields:

Edit at. Select *Current Time*, *All Time*, or *Custom*. If you select *Custom*, enter the time that you want these settings to take effect for this texture. This allows you to create solid textures that change over time.

Name. This field allows you to name your new texture. A default name is provided, but you can change the name of the texture at any time.

Copy from. This field allows you to copy the settings from other similar solid textures (wood, marble, or stone) to create a variation for a new texture. Choose an existing texture from the pop-up list. (Only textures that are already loaded in your model are listed here.) All settings from that texture are applied to the new texture. The original is unaffected.

Preview. Select the object type to use for previewing your texture. You can choose a cube, sphere, or tile preview.

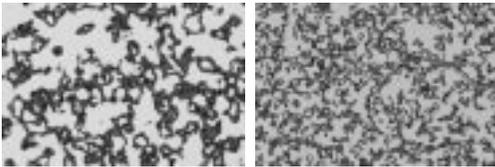


Click the camera icon to render a preview of the texture. This allows you to see what the texture looks like with the current settings.

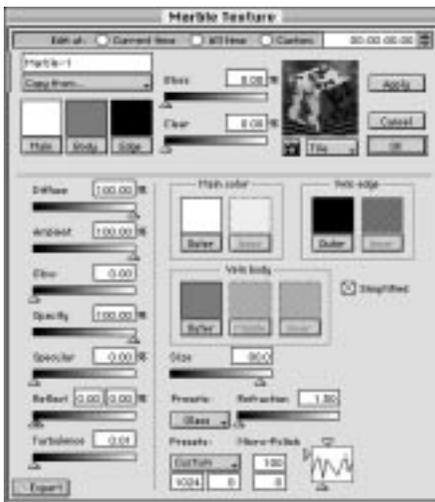
Although you can create any of these textures by using only the settings available in the Basic editing dialogs, you can access additional settings by clicking the *Expert* button.

MARBLE

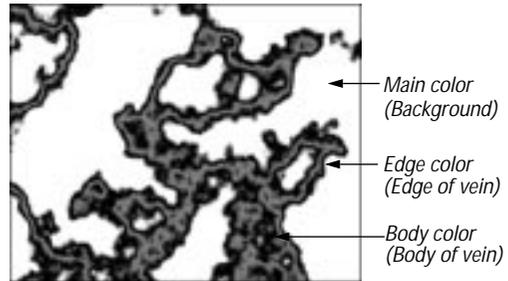
The Marble texture dialog lets you create your own unique marble textures.



You can create a wide variety of interesting textures by varying the settings in this dialog. Although the dialog was initially designed to create marble textures, it may be suitable for creating many other textures, as well.



Main. Click this button to select a color to use as the background color of the marble texture.



Body. This button lets you select a color to use for the body of the vein.

Edge. This field allows you to specify a color for the edge of the vein.

Gloss slider. This slider controls how shiny the surface of the marble appears by controlling the amount of ambient, diffuse, and specular light that is reflected, the level of reflectivity, and the smoothness of the texture. (Each of these channels can be edited separately with controls provided in the Expert dialog.)

Clear slider. This slider determines how opaque or transparent the marble appears by controlling the level of opacity, and the amount of ambient and diffuse light that is reflected.

Expert Settings

Additional controls are provided in the Expert dialog. To access these controls, click the *Expert* button. Values obtained by using the sliders produce the best

results; however, you may enter values in the numeric input fields above the sliders that exceed those values represented by the slider. These values override the values determined by the sliders in the Basic dialog. For more complete descriptions of these fields, see *page 163*.

Diffuse. The setting in this field determines the total amount of diffuse light reflected from the surface of an object. Surfaces that appear dull have higher diffuse reflection than surfaces that are glossy.

Ambient. This field indicates how much of the background light present in the environment is reflected from the surface. It controls how visible the object is in areas of shadow.

Glow. Glow determines the amount of luminescence a surface emits. A value of zero produces no glow at all.

Opacity. This field determines the texture's ability to prevent light from passing through it. A value of zero represents full transparency; 100, full opacity. If you're creating a transparent texture, lower the amounts of ambient and diffuse light also.

Specular. This field determines the amount of specular light, or highlight, that is reflected from the surface. A high specular component normally produces strong highlights or pinpoints of light that make the surface appear glossy.

Reflectivity. This field controls the amount of light reflected from the surface of an object. You can specify a minimum and maximum value for this field. The minimum value represents the amount of light

reflected when the object is viewed at an angle perpendicular to its surface. The maximum value indicates the amount of light reflected when viewed from a nearly parallel angle to its surface.

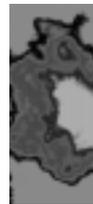
Turbulence. This slider determines the degree to which the veins join together. The higher this setting, the more the veins blend together with nearby veins.

Main color. *Outer* color is the main color, or background, of the marble surface. *Inner* color is the color of any areas completely contained within the vein.

Vein edge. This field is used to specify two different colors for the edges of the veins: *Outer* color and *Inner* color.

Vein body. This field is used to select three different colors, or gradations of a single color, for the body of the vein.

Simplified scheme. When this box is checked, only the *Outer* color selections are used in the texture definition (*Outer* Main color, *Outer* Vein edge, *Outer* Vein body). These are the colors that appear in the upper portion of the dialog. Also, when this box is checked, you can't edit any of the colors that don't apply (*Middle* or *Inner* colors).

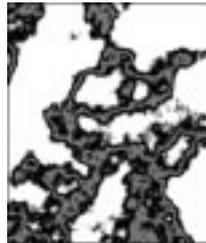


If you uncheck the *Simplified scheme* checkbox, you can specify additional colors for each of the fields. This allows you to increase the amount of detail present in the pattern of the marble.

Size. The value in this field represents the overall size of the marble texture.



Size = 75



Size = 150

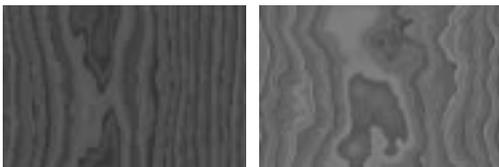
Refraction. This setting controls how light passing through one medium to another bends. However, refraction is not apparent unless the object is also transparent.

You can use the slider, enter a value in the numeric input field, or select from one of the presets provided in the pop-up list.

Micro-Polish. You can adjust this field manually, or use one of the settings from the pop-up list of presets. See page 171 for a complete description of this field.

Wood

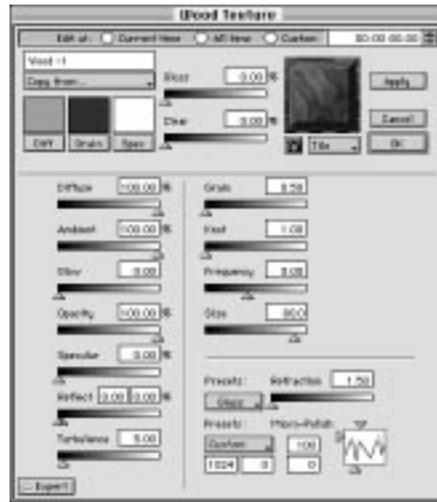
The *Wood* texture dialog lets you create custom wood textures to use in your models.



You can create many different wood patterns by adjusting the settings in the Wood dialog. Depending on the settings, you can create a wide range of other textures, as well.

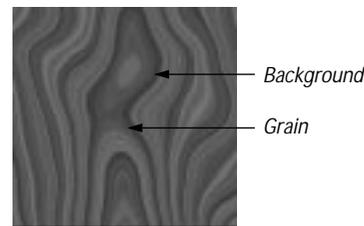
Values obtained by using the sliders produce the best results, but in many cases

you may enter values outside the range of the slider directly in the numeric input fields.



Diffuse (Diff). This field specifies the background color of the wood. It is the color of the diffuse light reflected from the surface.

Grain. This field defines the color of the grain of the wood.



Specular (Spec). This field defines a color for the specular light that's reflected from the surface of the wood.

Gloss slider. This slider defines how shiny the surface of the wood appears. It controls the amount of ambient, diffuse, and specular light reflected, as well as the level

of reflectivity and the smoothness of the wood.

Clear slider. This slider specifies the level of opacity of the wood texture. It controls the opacity, ambient, and diffuse surface properties of the wood.

Expert Settings

To access additional controls, click the *Expert* button to display the Expert dialog. The values in these fields override any values indicated by the *Gloss* and *Opacity* sliders in the upper portion of the dialog. You can use the sliders or enter the values in the numeric input fields directly above the sliders.

Diffuse. The setting in this field determines the total amount of diffuse light reflected from the wood. Because diffuse light scatters in all directions, the higher this setting, the more matte the surface appears.

Ambient. This field specifies how much of the background light present in the environment is reflected from the surface. A setting of zero means the surface will reflect no ambient light and will appear very dark, or black, in the shadows.

Glow. Glow determines the amount of luminescence a surface emits. A value of zero produces no glow at all.

Opacity. This field determines the texture's ability to prevent light from passing through it. A value of zero represents full transparency; 100 represents full opacity. If you're creating a transparent texture, lower the amounts of ambient and diffuse light also.

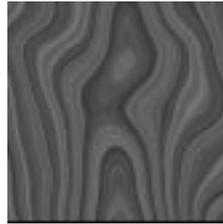
Specular. This field controls the high-lights that reflect from the surface. Surfaces with a high specular component appear shiny or glossy.

Reflectivity. This field controls the amount of light reflected from the surface of an object. You can specify a minimum and maximum value for this field.

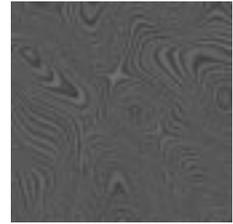
The minimum value represents the amount of light reflected when the object is viewed at an angle perpendicular to its surface. The maximum value indicates the amount of light reflected when viewed from a nearly parallel angle to its surface.

Turbulence. This value indicates the amount of agitation or irregularities in the appearance of the wood texture.

Grain. This value represents the amount of variation in the direction of the grain.



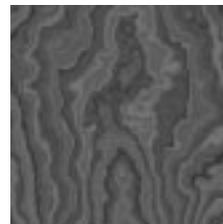
Grain = 1



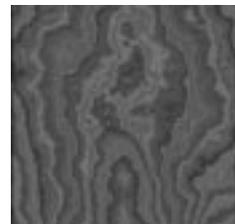
Grain = 15

Knots. This field determines the frequency of the knots in the wood. The higher the value, the more frequently knots appear in the texture.

Frequency. This setting determines the amount of spacing or waviness present in the grain of the wood. Lower values result in a smoother grain appearance.

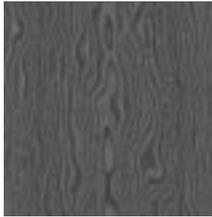


Frequency = 5

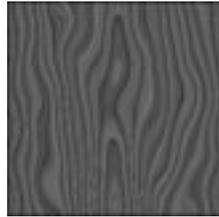


Frequency = 20

Size. The value in this field represents the overall size of the wood texture definition.



Size = 75



Size = 150

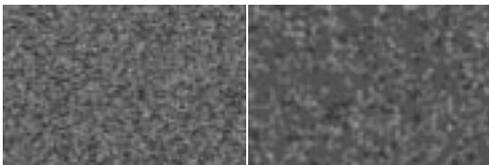
Refraction. This field controls how light is bent as it passes from one medium to another. It is only apparent in transparent objects.

Enter a value, or select one of the settings provided in the *Presets* pop-up list.

Micro-Polish. Adjust *Micro-Polish* manually, or use the settings from one of the presets in the pop-up list. For more information, see page 171.

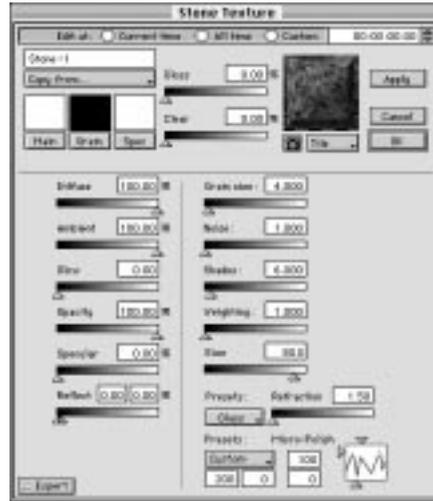
Stone

StudioPro includes a Stone texture extension that allows you to make your own stone textures or modify existing ones.



You can change the characteristics of the stone texture by editing the settings in the Stone dialog.

The Stone texture editing dialog includes the following fields:



Main. Click the *Main* button to define the color for the main portion, or background, of the stone texture.

Grain. This field defines a color for the grain of the stone.

Specular (Spec). This field defines the color of the highlights that reflect from the stone's surface.

Gloss slider. This slider defines how shiny the surface of the stone appears.

Clear slider. This slider defines the texture's level of opacity. This slider also affects the amount of ambient and diffuse light reflected.

Expert Settings

If you want more precise control over the stone's surface properties, click the *Expert* button to expand the dialog.

The values in these fields override any previously defined values indicated by the *Gloss* and *Clear* sliders in the upper portion of the dialog. You can use the sliders or enter the values in the numeric input fields directly above the sliders.

For the most realistic-looking stone textures, use values obtained with the sliders. Some fields, however, may accept values outside the range of the slider. The following fields are included in this section of the dialog:

Diffuse. The setting in this field determines the total amount of diffuse light that reflects from the surface of the stone. The higher this setting, the more dull the surface appears.

Ambient. This field specifies how much of the background light that's present in the environment reflects from the surface. The level of ambient light reflected controls how visible areas in the shadows are. If a high amount of ambient light is reflected, areas in the shadows appear relatively bright.

Glow. Glow determines the amount of luminescence the surface emits. A value of zero produces no glow at all.

Opacity. This field determines the texture's ability to prevent light from passing through it. If you're creating a transparent texture, lower the amounts of ambient and diffuse light also.

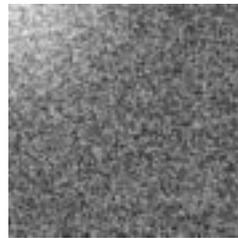
Specular. This field controls the amount of the highlight reflected from the surface. A high specular component creates a glossy or shiny surface, and creates pinpoints or hot spots to appear on the surface.

Reflectivity. This field controls the total amount of light reflected from the surface of the stone. Since the level of reflection

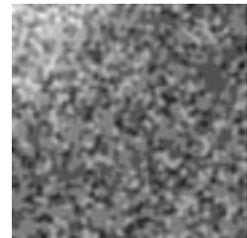
can change with the viewing angle, you can specify a minimum and maximum value for this field.

The minimum value represents the amount of light reflected when the object is viewed at an angle perpendicular to its surface. The maximum value indicates the amount of light reflected when viewed from a nearly parallel angle to its surface.

Grain size. This value determines the size of the grain particles present in the texture.



Grain size = 4



Grain size = 20

Noise. This field determines how erratic the pattern in the stone appears. The more noise present, the more disorderly the pattern.

Shades: This field indicates the total number of shades of the specified grain color that are used in the stone texture.

Weighting. This field determines the amount of the grain color used relative to the amount of main color used.



When you increase the weighting of the stone, more of the grain color is used, as compared to the amount of background color used.

Size. The value in this field represents the overall size of the stone texture.

Refraction. Enter the index of refraction, or use the value from one of the presets in the pop-up list.

Refraction determines how light is bent as it passes from one medium to another. It is only apparent in transparent objects.

Micro-Polish. Adjust Micro-Polish settings manually, or use the settings from one of the presets in the pop-up list. For more information, *see page 171*.

CREATING VOLUMETRIC TEXTURES

Volumetric textures can be applied to the entire model on the Air tab of the Environment palette, or they can be applied to individual objects within your model. When applied to objects, volumetric textures occupy the volume or space within the objects that they're applied to. Fog, Mist, and Haze are examples of volumetric textures.

The objects to which volumetric textures are applied do not appear in the final rendering; these objects are used merely for the purpose of defining the volume to which the texture (mist, fog, etc.) is confined. Once a volumetric texture is applied to an object, the object itself will not be visible when rendered.

This allows you to place fog, for example, within a cube; but when the scene is rendered, only the fog is visible. The cube is not visible when rendered, because no other textures were applied to the cube.

NOTE: *Volumetric textures, such as Fog, Mist, and Haze, must be applied to solid, one-sided objects only*

in order to be visible when rendered. If a volumetric texture is applied to a double-sided object, it will not be visible when rendered.

To create a volumetric texture, hold down the *New* button on the Resource palette while the Textures tab is active. The *Fog*, *Mist*, and *Haze* options appear in the pop-up list.

Several fields are common to all textures and appear on all of the volumetric texture editing dialogs:

Edit at. Select *Current Time*, *All Time*, or *Custom*. If you select *Custom*, enter the time at which you want these settings to apply for this particular volumetric texture. By changing the settings at different times, you can create a *Fog*, *Mist*, or *Haze* that changes over time.

Name. A default name appears in this field. You can change the name as desired. This name also appears in the Project window under any object that this effect is applied to. It is also the name that appears in the Resource palette.

Copy from. All currently loaded volumetric textures of the same type appear in this list. To edit an existing one, select it from the list. All settings from that texture are applied to the new *Fog*, *Mist*, or *Haze*. The original is unaffected.

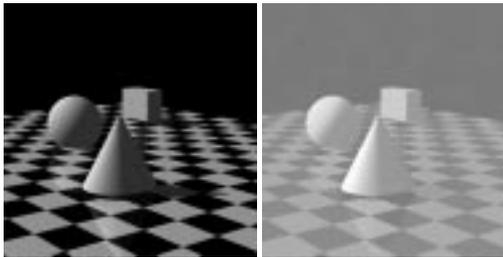
Preview. This area allows you to preview the volumetric texture with its current settings. You can select to use a cube, sphere, or tile for the preview.



Click the camera icon to render a preview. This allows you to see what the texture looks like with the current settings.

Fog

The *Fog* volumetric texture allows you to define areas of your model that contain fog. Or, you can apply fog to the entire model using the Air tab of the Environment palette.



No fog

With fog

If you're applying fog to an object, the object must be a one-sided object in order to be visible. The fog fills the entire volume of the object, but the object itself will not be visible unless another texture has been applied.

Any of the settings can be varied over time.



Color. This is the color that is transmitted through the fog. Any color other than white will obscure objects seen through the fog. When the *Link colors* box is checked, this is the color used in the *Direct* and *Ambient* fields as well.

Direct. This is the color of the light reflected from directional light sources.

Ambient. This is the color of the ambient (background) light that is reflected from the individual particles of fog.

Logarithmic. If *Logarithmic* is selected, a natural looking, even fog that trails off with distance is created.

Linear. When *Linear* is selected, a very simple fog that obscures evenly over distance is created.

Maximum depth. This sets the maximum depth of the fog and prevents it from completely obscuring the background.

Start depth. This is the distance at which the fog begins.

Density. This setting determines how dense the fog is, or how much the fog obscures with each unit of distance. Enter any value from 0.0 to 100.0; however, values from 1.0 to 10.0 produce the best results.

Enable shadows. When this box is checked, shadows cast by other objects are visible within the volume.

Link colors. When this box is checked, the color specified in the *Color* field is used in the *Direct* and *Ambient* fields as well.

Haze

Use the *Haze* volumetric texture to create layers of haze that sit in valleys or layers of smog that rest over a city.



Haze can be applied globally (on the Air tab of the Environment palette), or to individual objects within your model.

To be visible, *Haze* must be applied to one-sided objects only. The haze fills the entire volume of the object, but the object itself will not be visible unless another texture has also been applied to the object.

You can create a haze that has multiple layers, each layer with its own settings. The number of layers cannot vary over time, but you can change the characteristics of each layer over time.



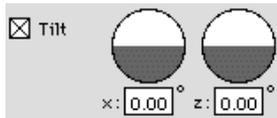
The following controls apply specifically to the layer designated in the layer pop-up:

- **Color.** This is the color that is transmitted through the selected layer of haze. Any color other than white will obscure objects seen through the haze. When the *Link colors* box is checked, this is the color used in the *Direct* and *Ambient* fields as well.
- **Direct.** This is the color of the light reflected from directional light sources on the selected layer of haze.
- **Ambient.** This is the color of the ambient (background) light that reflects from the individual particles within the selected layer of haze.
- **Link colors.** When this box is checked, the color specified in the *Color* field is used in the *Direct* and *Ambient* fields as well.
- **Add layer.** Click this button to add an additional layer of haze. You can add multiple layers to the haze, each layer with its own settings.
- **Delete.** Click this button to delete the selected layer of haze.
- **Layer.** This setting indicates the active, or selected, layer of haze. The current settings apply to this layer only.
- **Density slider.** Use this slider to indicate how tightly packed together the individual particles of haze are. The denser the haze, the more opaque it appears.
- **Thickness.** This setting represents the thickness of the selected layer of haze. (This control is located in the Expert section of the dialog. Click the *Expert* button to access it.)

These controls apply to the entire *Haze* effect, not to the individual layers. These

controls are also located on the Expert section of the dialog.

- **Enable shadows.** When this option is enabled, shadows cast by other objects are visible within the volume.
- **Tilt.** Checking the *Tilt* checkbox enables the *Tilt* controls.

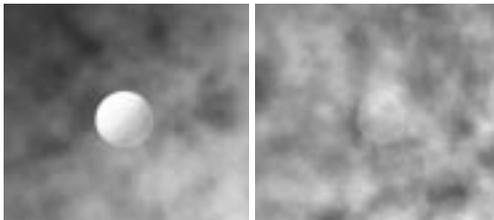


Normally, haze is oriented horizontally, but you can tilt the *Haze*, if desired, with these controls.

- **Top.** This setting specifies the top of haze.
- **Max depth.** The value in this field sets the maximum depth of this layer of haze and prevents it from completely obscuring the background.
- **Start depth.** This value in this field sets the initial depth of this layer of haze.

Mist

You can create a smooth mist or patchy, fog-like clouds with the *Mist* texture.



You can create a wide variety of custom *Mist* effects.

Mist is a volumetric texture and must be applied to one-sided objects to be visible.



Color. This is the color that is transmitted through the mist. Any color other than white will obscure objects seen through the mist. When the *Link colors* box is checked, this is the color used in the *Direct* and *Ambient* fields as well.

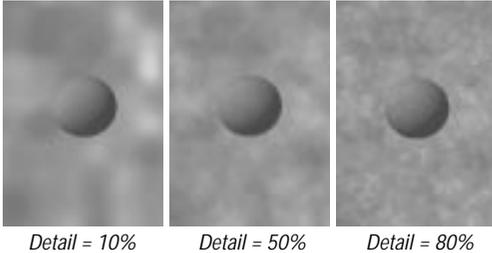
Direct. This is the color of the light reflected from any directional light sources in your model.

Ambient. This is the color of the ambient (background) light that reflects from individual particles within the mist.

Link colors. When this box is checked, the color specified in the *Color* field is used in the *Direct* and *Ambient* fields as well.

Detail. This setting controls the amount of detail in the *Mist*. Enter a value from 0 to 100. A value of 100 produces a very smooth mist; a value close to zero pro-

duces a lot of detail, or variation, in the mist.



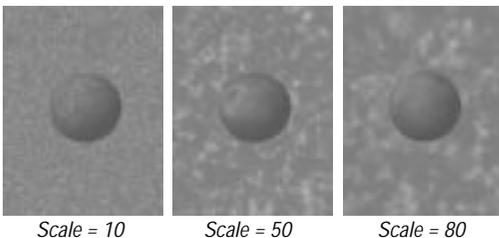
The patches remain the same size as you adjust this control, but the grain or texture of the individual patches change.

Minimum Density. This setting defines the level of the least opaque areas of the mist. Enter a value from 0.0 to 100.

Maximum Density. This setting defines the level of the most opaque areas of the mist. Enter a value from 0.0 to 100.

Seed. Enter any value in this field to ensure that this mist will look different from all other *Mist* textures, even when all of the other settings are the same.

Scale. This setting determines the size of the individual patches of mist.



The value indicated here represents the size of the largest patches of mist.

Evolve. When a check appears in this box, the mist will grow and change over time; otherwise, the *Mist* is similar to the appearance of the inside of an ice cube. To use mist to simulate an overcast sky, turn *Evolve* ON and set *Speed* to SLOW. To use mist for the detail inside an ice cube, turn *Evolve* OFF.

Speed. This setting determines the speed at which the mist evolves over time. A setting of one means that patches of mist will live for about one second; a value of two means that, on average, a patch of mist will live for about one half second. If *Evolve* is OFF, this field is dimmed.

Maximum depth. This sets the maximum depth of the mist and prevents it from completely obscuring the background.

Start depth. This sets the depth at which the mist begins.

Apply in Object Space. The object is filled with mist, and when the object moves, the mist moves with it, as you would expect.

Apply in World Space. When this button is selected, it's as though mist exists everywhere in space, but it is only visible within the boundaries of the object to which it's applied. When you move the object, the appearance of the mist changes.

Enable shadows. When this option is selected, shadows cast by other objects are visible within the volume.

EDITING TEXTURES

You can edit any texture on the Resource palette. Click the *Edit* button to edit the selected texture. If the texture you choose is not already in the model, it will automatically load first. If no textures are selected, the *Edit* button is unavailable.

When you click the *Edit* button, the texture dialog for the selected texture appears. You can also double-click on the texture preview. If the texture is not already loaded, it will load and then display the appropriate texture dialog. You can change any of the parameters for the texture definition. See page 158 -page 185 for information on each of the fields in the Texture Editing dialog.

When the Texture Editing dialog for the selected texture is displayed, you can rename the texture, if desired. Any time you edit a texture, it's a good idea to change the name of the texture. Then you can use both the edited texture and the original texture in your model.

The edited texture then becomes a part of the current model. You can save edited resources so they can be used later in other models by selecting the **SAVE** command from the Plus menu on the Resource palette.

Animating textures

StudioPro allows you to create animated textures in several different ways:

- **Use a movie as an image map.** You can load any movie (or sequentially-num-

bered files in formats supported by StudioPro) into the *Image Map* field in the Text Editing dialog.

- **Edit the texture settings to occur over time.** The appearance of a single texture can change over time. When you edit a texture, the *Edit at* fields at the top of the Texture Editing dialog allow you to specify the time at which the settings occur. Varying the settings in the dialog at different times causes the appearance of the texture to change over time.
- **Use the Stencil slider to gradually transition from one texture to another.** With the Stencil channel, you can change from one texture to another over time. Setting the Stencil slider to zero in any texture dialog will completely "block out" that texture, and the texture below will show through instead. (You don't need to have a Stencil map loaded to use the slider.) By varying the value in the slider, you can create textures that gradually change or "morph" into other textures.

APPLYING TEXTURES

Click the *Apply* button to apply the selected texture to the selected object(s). If no object is selected, the *Apply* button is dimmed.

You can also use the drag-and-drop method to apply a texture to an object. Select a texture from the Resource palette, then drag-and-drop that texture onto any object in the Modeling window. The object does not have to be previously

selected; you can drag-and-drop a texture on ANY object in the Modeling window.

SAVING TEXTURES

When you create a new texture, it becomes part of the model and is saved with the model. However, if you want to be able to access the texture for use in another model, you must save the texture to disk. A **SAVE** command is provided in the Plus menu. See **Plus menu**, below.

IMPORTING TEXTURES

You can import a texture from another source to use in your model. Only file types recognized by StudioPro will be available with this command. See **Import** on page 12 for more information.

To import textures from the library into the active model, select the texture in the Textures library, then click the *Import* button.

THE PLUS MENU

When the Textures tab is active, the Plus menu contains entries that apply to handling textures.

SAVE. When you create a new texture, it automatically becomes part of the current model and is saved with it. You may, however, want to access a texture to use later in other models.

To save a texture to your Textures library, choose the **SAVE** command from the Plus menu on the Resource palette. A dialog appears allowing you to specify a name

and the location for the save function. To appear in the library, you must save the texture to the appropriate folder. See **Handling Resources** on page 154 for more information.

DELETE UNUSED. You can delete all of the textures from the model that are not being used. Removing unnecessary textures decreases the amount of memory required for the model.

If the texture has already been saved using the **SAVE** command from the Plus menu, this command doesn't delete the textures from your disk, just from the model itself. However, if you haven't saved the texture to disk, once it's deleted from your model, you won't have access to it again.

SHAPES TAB

Using shapes makes your modeling more efficient. It requires much less memory to insert multiple instances of a shape than to create the objects over again. Inserting a shape instance requires approximately 20K. This is much less than the memory required to duplicate the object, especially if the object is a complex polygonal mesh.

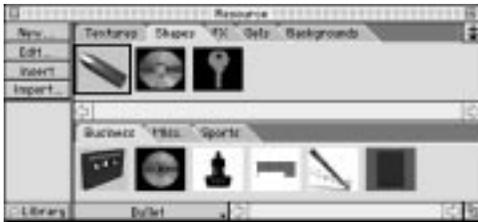
Using shapes also saves time during rendering because the renderer has to process the shape's information only once, rather than many times.

Click on the Shapes tab to make it the active tab. You can create new shapes, edit existing shapes, insert shapes into the active model, or load shapes from the library into the active model.

All of the currently loaded shapes in the active model appear in the top section of the Shapes tab.



To expand the palette to include the Shapes library, click the *Library* button. All shapes available for use in your model appear in the Shapes library.



If more than one model is open, switching between models causes the Shapes tab to redraw. Only shapes included in the active model appear in the upper portion of the Shapes tab.

LOADING SHAPES FROM THE LIBRARY

You can select shapes from the Shapes library to add to your model. If the Shapes library is not visible, click the *Library* button to expand the palette to display all of the shapes available to you. Use the scroll bar, if necessary, to scroll through the entire collection of shapes. You may also use the resize control in the lower right corner to change the width of the palette.

The shapes in the library may be subdivided into categories, with each category represented by a separate folder in

the library. To view the contents of a library folder, click on the folder tab.

Shapes can be loaded into your model in the following ways:

- Click once on the shape to select it, then click the *Insert* button. This loads the shape, if necessary, and then inserts an instance of the shape into the Modeling window.
- Select a shape from the palette and click the *Edit* button. This loads the shape and opens the shape's workspace. This can also be accomplished by double-clicking the shape preview. Double-clicking a shape is the same as selecting the shape and clicking the *Edit* button.
- Click the *Import* button to import the selected shape from the library into the active model.

CREATING SHAPES

Click the *New* button to create a new shape. A New Shape dialog appears allowing you to name the object and add it to the list of shapes.



The dialog also contains two checkboxes. If an object (or group of objects) is selected in the Modeling window when you click the *New* button, two checkboxes will be available. If no objects are selected, both checkboxes will be dimmed.

- **Include selection**

Any selected objects are included in the new shape and appear in the new

Shape window. If you don't want the selected object(s) to be included, be sure this checkbox is unchecked.

- **Replace selection**

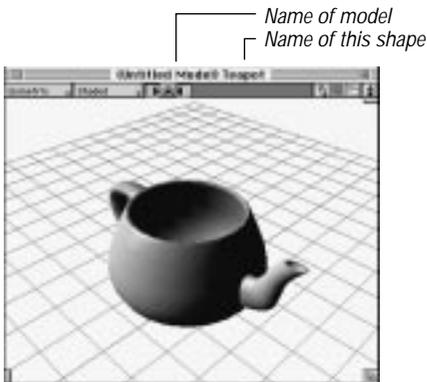
When an object is converted to a shape, the selected object becomes an instance of the shape.

If you don't want the original object to be replaced by an instance of the shape, be sure this box is unchecked. The selected object remains a completely independent object.

Leaving both boxes unchecked simply opens a new, empty Shape window.

Clicking the *OK* button opens a *New Shape* window. Shapes are created in their own workspace and inserted into the model when they're needed. You can also insert a shape instance into other Shape windows. You can create one or more objects in this window.

A Shape window looks the same as a model window. The only noticeable difference is the name in the title bar.



You can have more than one Shape window open at a time. The number of open windows depends on the amount of memory available.

Also notice that the Project window changes to reflect the contents of the Shape window.

If the shape is based on a selected object, the new shape retains all of the properties of the selected object. This includes the geometry, proportions, surface maps, etc.

Any new shapes you create in the active model appear on the upper portion of the Shapes tab. To save new shapes so they can be used in other models, select the **SAVE** command from the Plus menu of the Resource palette.

Each time you insert a shape in your model, it is treated as an instance of the shape, not as a separate object.

If your shape contains more than one object, the objects are grouped together and inserted into your model as a single grouped object.

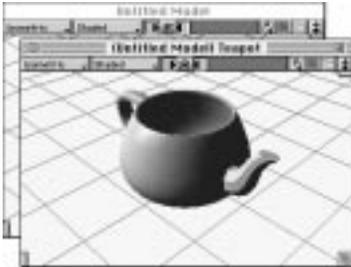
Ungrouping a shape instance at a different level will break its link to the shape, and it will be treated as a separate, regular unnamed object.

EDITING SHAPES

Click the *Edit* button to edit the shape selected on the palette. If the selected shape is not already in the model, it will

automatically load first, and then its Shape window opens for editing. Clicking this button opens the Shape window of the selected instance. This button is accessible only when an instance of a shape is selected. If the selected object is not linked to any shape, the button is dimmed.

If you double-click on a shape instance in the Modeling window, the Shape window for that object opens.



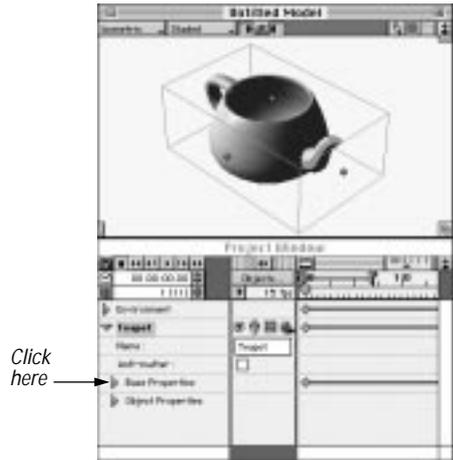
Double-clicking on a shape opens the shape in its own window.

Any changes that you make in the Shape window are reflected in all instances of the shape. The preview on the palette also reflects any changes you made to the shape.

Editing Shapes in the Project Window

You can also access the individual parts of a shape in the Project window. Any time the *Base Properties* field of a shape is in its “open” position in the Project window, the individual objects that make up the shape

can be edited and otherwise manipulated in the Modeling window.



Notice the selection borders. When the *Base Properties* triangle is closed, a selection border appears around the entire shape.

When the *Base Properties* field is opened (turned down), each object can be selected separately.



When the *Base Properties* of the Shape is opened (turned down), you can select and edit the individual components within the shape.

INSERTING SHAPES

Click the *Insert* button to insert the selected shape into the active model. The shape is loaded into the model, if necessary, and then an instance of the shape is automatically inserted into the model relative to the view set center.

You can also insert a shape with the drag-and-drop method. Select the shape from the Resource palette, then drag-and-drop it in the Modeling window. An instance is placed on the active grid at the location the mouse button is released.

SAVING SHAPES

When you create new shapes, they become part of the active model and will be saved with the model. However, unless you save the shapes to disk, they cannot be accessed for use in other models. A **SAVE** command is provided in the Plus menu for saving shapes you create so you can access them later for use in other models. See **Plus menu**, below.

IMPORTING SHAPES

To import shapes from other sources, use the **IMPORT** command in the File menu. When you import a file from another source, it is placed in the center of the active view. All imported files are treated as shapes and will appear in the upper portion of the Resource palette, along with all of the other shapes that are loaded in your model. See **Import** on page 12 for more information.

To import shapes from the Shapes library into the active model, select the shape in the Library, then press the *Import* button.

THE PLUS MENU

When the Shapes tab is active, the Plus menu provides commands for working with shapes. Use the Plus menu to save, load, and remove shapes from the active model.

SAVE. Any new shapes you create are part of the current model and are saved with your model. If you want to have access to these shapes for use in other models, you'll need to save them with this command. When you select the **SAVE** command, a dialog appears allowing you to specify a name and the location for the save procedure.

DELETE UNUSED. You can delete all of the shapes that aren't being used from the model. Removing unnecessary shapes decreases the amount of memory required for the model.

If the shape has already been saved using the **SAVE** command, this command doesn't delete the shape from your disk, just from the model itself. However, if you haven't saved the shape to disk yet, once it's deleted from your model, you won't be able to access it again.

REPLACE SELECTED. Use this command to replace the object selected in the Modeling window with the shape selected on the Resource palette.

The new shape is resized, if necessary, to fit within the bounding box of the shape it is replacing.

All animation information associated with the object is retained, as well as any texture that may have been applied to it.

NOTE: *If you're using this command to substitute complex geometry with a simple shape for the purpose*

of speeding up redraws, you may want to use the *Fast Box* option in the *Project* window instead.



Click this icon...
to toggle between displaying the object normally, or as a simple bounding box.

This option allows you to display a complex shape with a simple bounding box, which results in a significant reduction in the time required for redraws. For more information, see page 262.

EXCHANGE SELECTED. Use this command to replace the shape selected on the *Shapes* tab with the object or shape selected in the *Modeling* window. Any animation associated with the original object is retained.

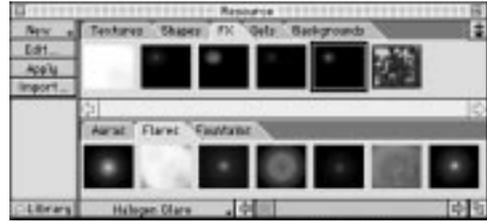
This command is very similar to the *Replace Selected* command above, with one significant difference: THE SIZE AND TEXTURE(S) OF THE SHAPE SELECTED ON THE SHAPES TAB ARE MAINTAINED. With the *Replace Selected* command, the new shape is sized to the exact proportions of the object or shape you're replacing.

EFFECTS TAB

The *FX* tab on the *Resource* palette contains a variety of special effects to use in your modeling. You can create custom effects to meet your needs.

The top portion of the *FX* tab contains the effects that are loaded in the active model. When expanded, the palette also displays all of the effects available for use in your model. Effects can be loaded even though they aren't being used in the current model. A command is provided in the

Plus menu that allows you to remove any unused effects from your model.



Each effect has its own dialog that allows you to customize the effect. Unless otherwise specified, the units used are those defined in the *Set Units* dialog (*Edit* menu).

StudioPro contains different types of effects. You can create particle effects, such as *Fountains*, which are comprised of individual particles; and post-rendering effects, such as *Lens Flare* and *Aura*, that are applied after the image completes rendering.

CREATING EFFECTS

To create a new effect, hold down the *New* button. A list of available effects is displayed. When you select one from this list, the appropriate dialog appears.

Several of the fields are common to all of the dialogs:

Edit at. Select *Current Time*, *All Time*, or *Custom*. If you select *Custom*, enter the time that you want these settings to take effect for this particular effect. By changing the settings at different times, you can create an effect that changes over time.

Name. A default name appears in this field. This is the name that appears in the

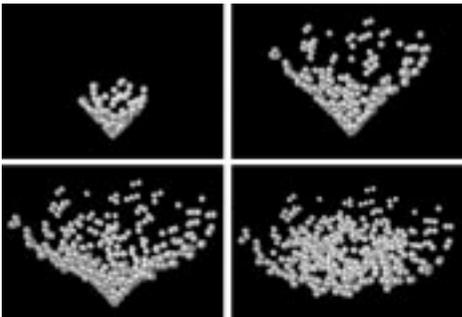
Resource palette, and also in the Project window under the Object Properties of any objects that have this effect applied to them. You can change the name as desired.

Copy from. All currently loaded effects appear in this list. If you want to edit an existing one, select it from the list. All settings from the original effect are applied to the new effect, and the original remains unchanged.

Preview. This preview allows you to see what the effect looks like with the current settings.

Fountain

The Fountain effect emits particles which bounce off other particles they encounter. You can create a fountain that emits spheres, to resemble water droplets or bubbles, or a fountain that emits any variety of other shapes.



These particles also bounce off objects that have been designated *Collision* objects in the Project window. (For more details, see **Collision Detection of Particles** on page 263.) All particles emitted from a fountain are detected by the ground plane, if your model contains one. (See **Ground**

Tab on page 219 for information on adding a ground plane.)

You can also control how much “bounce” they have when they collide with other particles, objects, or the ground plane. They can strike the ground plane and lose all their energy, like mud; or they can spring back like a rubber ball.

If the fountain emits spheres, you can “metaball” them to simulate a flowing stream of water. You control the amount of influence the spheres have on one another.

When you apply a Fountain, its starting point is always placed at the geometric center of the object that it’s applied to. See **Positioning effects on objects** on page 197 for information on changing the starting point.

You can create a wide variety of different effects by varying the settings in each of the fields.



Color. If the particles being emitted from the fountain are spheres, you can select a color for the particles by clicking this but-

ton. If shapes are used instead of spheres, this button is unavailable.

Textures/FX. If the particles are spheres, you can apply a texture or effect to them. All available textures and effects appear in the *Textures/FX* pop-up list. Those effects or textures that are currently applied appear with a bullet (•) beside the name. A fountain can have multiple textures or effects; however, use caution when applying multiple effects as they may require a substantial amount of memory. To remove an effect or texture, select it again from the pop-up menu; the bullet is removed indicating it is no longer applied to the fountain. If the fountain is emitting shapes instead of spheres, this pop-up is not available.



Angle of Spray. Use this control to specify the width, in degrees, of the spray coming from the fountain. Acceptable range: 0° to 360°. This control

uses the color you selected in the *Color* field, so if you selected a light color, it may be difficult to see the cone.

Cone Spray. If this box is checked, the particles spray out of the fountain around the perimeter of the cone only. If unchecked, particles spray from the center randomly in all directions within the cone.

Amount. Enter a value or use the slider to define the amount of particles being emitted from the fountain. The value entered represents the number of particles per second being emitted. You can enter any number in this field, but values from 50.0 to 1000.0 give the best results. However, when emitting metaballs, use values in the 10 -100 range to avoid excessive memory requirements.

Life. This control sets the lifespan of the particles. Smaller particles normally have a shorter lifespan than larger particles. The slider on the left represents the lifespan, in seconds, of the smallest particles, and the slider on the right represents the lifespan of the largest particles. The sliders allow you to select values from 0 to 10 seconds; however, you can enter any value from 0 to INF in the entry fields above the sliders.

Size. Enter a minimum particle size and a maximum particle size, or use the slider controls to define the minimum/maximum sizes. Any value can be entered, but values from 0.1 to 10.0 provide the most realistic appearance.

Speed. This field determines the velocity at which the particles are emitted from the fountain. Any value (in units per second) is acceptable, but values from 1.0 to 1000.0 provide the best results.

Seed. Enter any value in this field. This setting ensures that this Fountain will look unique, even when all of the other settings are the same.

Weight. This control lets you make the droplets heavier or lighter. The weight of the particles determines how they are affected by wind and gravity. By entering a negative value in this field, you can add buoyancy to the droplets, causing them to float upwards.

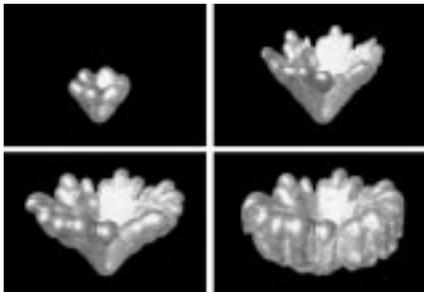
Spin. This field allows you to control the minimum and maximum amount that the particles “twist” or “whirl” as they are emitted from the fountain.

Bounce. This field allows you to control the minimum and maximum amount of

energy the particles have when they collide with other particles or with objects. (An object can only detect particles if it has been designated as a *Collision Object* in the Project window. See page 263 for details.)

Particle type. Select the type of particles that you want to use:

- **Spheres.** Click this button if you want the fountain to emit spheres.
- **Metaballs.** This option also emits spheres, but when *Metaballs* is enabled, the *Influence* slider becomes available. This slider allows you to control the amount of influence the spheres have on one another, and determines at what point the spheres merge together.



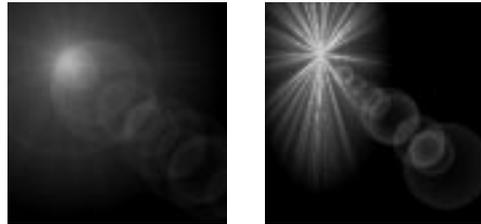
For more information, see **Metaball** on page 52.

- **Shapes.** When this option is enabled, you can select one or more shapes from the pop-up list. If you select more than one shape from this list, the *Randomize* checkbox becomes available. Check this box if you want StudioPro to emit the shapes in random order.

NOTE: To reduce rendering time, the particle effect may be temporarily disabled in the Render dialog. See **Disable particle pre-roll** on page 68.

Lens Flare

Lens Flare simulates what happens when a camera lens is pointed toward a bright light source. You can apply a Lens Flare effect to any object or light source in the model. This is a post-rendering effect; it is added after the image completes rendering.



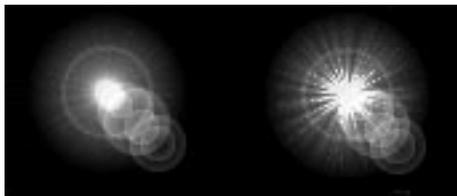
You can create a wide range of different Lens Flare effects by varying the values in the Lens Flare dialog.

The Lens Flare effect is placed at the geometric center of the object that it's applied to. For information on changing its placement, see **Positioning effects on objects** on page 197.



- **Enable Flash.** The **Flash** is the bright area directly over the light source. It simulates lens astigmatism. This checkbox turns the *Flash* on or off.

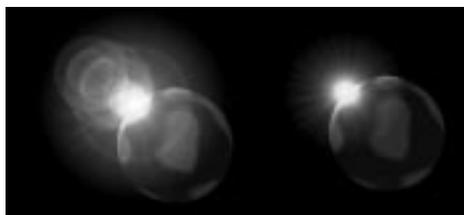
- **Enable Glare.** The **Glare** element creates rings, halos, rainbows, or disks of light which may be offset from the light source. These effects simulate reflections and refractions within the lens of the camera. This checkbox turns *Glare* on or off.
- **Plasma.** This checkbox turns *Plasma* on or off. Plasma makes the flash appear more harsh by adjusting the profile to look less like an optical effect.



No plasma

With plasma

- **Blend mode.** When this box is checked, the color of the flash and the color of the object are averaged together. When this box is unchecked, the flash and object colors are added together, often resulting in overexposure.
- **Obscure.** When this box is unchecked, lens flares are visible even when placed on objects that are behind other opaque objects in your model. Results can vary widely, depending on the proximity of the objects to the camera.

Obscure checkbox
uncheckedObscure checkbox
checked

Intensity. This setting determines bright the Lens Flare effect is. Enter a value from 0 to 100 percent.

A Lens Flare effect consists of two separate components: *Flash* and *Glare*. The center section of the Lens Flare dialog contains settings that pertain to the *Flash*.

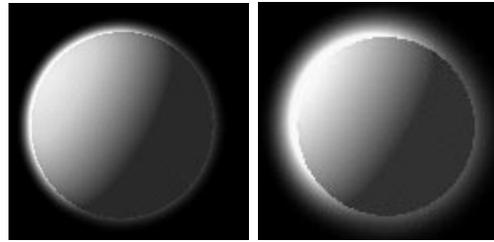
- **Flash color.** Click on the Flash button or in the box directly above the button to select a color to tint the flash.
- **Rays.** This field determines the number of rays or spokes of light that radiate from the light. Enter any number in this field.
- **Saturation.** This setting controls how white-hot the center becomes. Enter a value from 0.0 to 100 percent.
- **Seed.** Enter any value in this field. This setting ensures that the Lens Flare will look unique, even when all of the other settings are the same.
- **Size.** This field determines how large the flash is (in degrees of viewing angle). Enter a value from 0 to 100 percent. It is possible to completely white-out the entire picture.
- **Glow.** This setting controls the amount of soft illumination that occurs around the flash. Enter a value from 0 to 100 percent.
- **Rotate.** Specify the total number of degrees to rotate the Lens Flare effect.
- **Chaos.** This field controls how disorderly the rays appear around the light. The lower the setting, the more even the distribution of rays.

The lower section of the dialog contains settings for the *Glare* component of the Lens Flare effect.

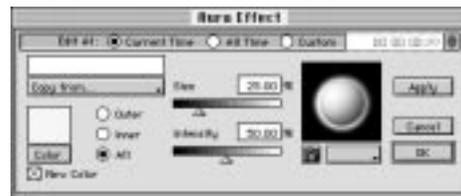
- **Glare Color.** The color specified here determines the tint given to the glare elements. However, if the value in the *Glare - Chaos* setting is high, the variation of colors increases.
- **Detail.** This setting determines the total number of *Glare* elements in the Lens Flare.
- **Saturation.** This field controls to what extent the halos appear white hot.
- **Seed.** A value in this field ensures the uniqueness of the *Glare* elements, even when all of the other settings are the same.
- **Size.** This field determines the *maximum* size of the disks of light. Glow elements will range from very small up to the size specified in this field.
- **Opacity.** This field determines the highest opacity level of any of the glare elements. In reality, this tends to be less than about 30 percent, but this amount may be increased substantially to create some interesting special effects. Acceptable values range from 0 to 100 percent.
- **Spread.** This value represents the percentage of the maximum possible spread allowed, as determined by the position of the object to which the lens flare effect is applied, relative to the camera's position.
- **Chaos.** This setting controls how much disorder occurs with the placement, color, and size of the glare elements. Enter a value from 0 to 100 percent.

Aura

Aura is the haze of light that appears around an object. You can create a variety of interesting effects with this feature by varying the values in the Aura dialog.



Aura is a post-rendering effect; it is added to the image when it finishes rendering.



Outer. When this button is selected, the Aura effect begins just beyond the edge of the object.

Inner. When this option is selected, the Aura effect overlaps the boundaries between the object and the background.

Both. When this option is selected, the Aura effect will appear over the entire surface of the object, as well as extending beyond the edges.

Blend mode. When this box is checked, the color of the aura and color of the object are averaged together. When this box is unchecked, the colors of the aura and the object are added together, often resulting in overexposure.

Color. Click this button to select a color for the Aura effect.

New Color. When this box is unchecked, the color of the Aura effect is the same color as the object that it's applied to.

Because this is a post-rendering effect, the exact color present in the rendered image is used. Therefore, on areas that are not well-illuminated, the Aura effect may appear darker than on well-lit areas.

If you select a new color (by checking this checkbox), the exact color you select is used evenly around the entire object, regardless of lighting intensity at any particular point on the object.

Intensity. This is the opacity of the aura immediately surrounding the object. Enter a value from 0 to 100 percent.

Size. This is the distance the glow extends from the object. Size is entered as a percentage of the diameter of the object.

EDITING EFFECTS

You can edit any of the effects on the Resource palette. Click the *Edit* button to edit the selected effect. If the effect is not already loaded in the active model, it will load, and the appropriate dialog appears.

The edited effect becomes part of the current model. If you want to access this effect for use in other models, select the **SAVE** command from the Plus menu.

You can edit an effect so it appears to change over time. When you edit any of the special effects, you can specify the time at which the changes occur. Remember, however, changes to any effect occur on ALL of the objects to which that particular effect is applied.

APPLYING EFFECTS

To objects: Select an effect on the Resource palette and click the *Apply* button. The effect is applied to the selected object. If no object is selected, the button is dimmed.

You can also apply an effect with the drag-and-drop method. Select the effect on the Resource palette, then drag it to the desired object. When the object highlights, release the mouse button.

To light sources: To apply effects to light sources, use the *Apply* button on the Resource palette, or select it from the *FX* pop-up on the light source's Object Properties palette.

Positioning effects on objects

Effects are applied to the geometric center of the selected object. If you want the starting point to be somewhere other than the geometric center, you can apply the effect to construction geometry, then place the center of the construction geometry at the precise location where you want the effect to begin.

For example, you might want to create a cone-shaped object with water particles being emitted from the top of the cone. If you apply the fountain directly to the cone, the particles are emitted from the geometric center of the cone, instead. But, you can create another object, then make it *Construction geometry* by selecting the **MAKE CONSTRUCTION** command from the Edit menu. Apply the fountain to the construction object, then place that object on the cone so its geometric center is at the exact location on the cone where you want the fountain's particles to be emitted. Con-

struction geometry does not appear in renderings, but the fountain renders.

To ensure the fountain remains with the cone at all times, you may also want to use the Link tool to link the construction object to the cone. Then, if you animate the cone, the fountain remains with it.

NOTE: *Auras behave differently, however. They affect the entire object to which they are applied and do not render when applied to construction geometry.*

SAVING EFFECTS

When you create a new effect, it becomes part of, and is saved with, the model. However, if you want to be able to access the effect for use in another model, you must save the effect to disk. A **SAVE** command is provided in the Plus menu. See **Plus menu**, *below*.

IMPORTING EFFECTS

Click the *Import* button to import the effect selected in the FX library into the active model.

PLUS MENU

When the FX tab is active, the commands contained in the Plus menu apply to effects.

SAVE. This command allows you to save any effects you create so you can access them for use in other models later.

When you select the **SAVE** command, a dialog appears allowing you to specify a name and the location for the save function. If you want the effects to appear in the Library portion of the Resource pal-

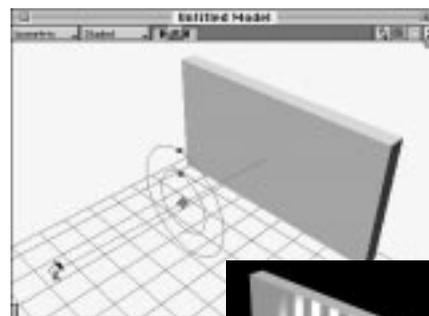
ette, you can save them to the *Libraries* folder inside the *Strata StudioPro* folder. See **Handling Resources** on page 154.

DELETE UNUSED. Select this command to delete all of the unused effects from the active model, thus decreasing the amount of memory required for the model.

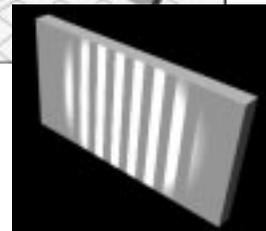
If the unused effects haven't been saved yet and are not part of the effects library, you will not be able to access them again.

GELS TAB

Gels are special textures which are applied to light sources. When gels are applied, the light source projects the pattern or image present in the gel onto the objects the light source is illuminating.



"Vertical blinds" gel was applied to the spotlight above.



Click on the Gels tab to make it the active tab. When this tab is active, you can make new gels or edit existing ones.

All of the currently loaded gels appear in the upper portion on the Gels tab.



Several built-in gels are included with StudioPro. They are stored in the *Gels* folder within the *StudioPro* application folder. All gels contained in this folder are available for use in your model.

CREATING GELS

To create a new gel, click the *New* button. The Image Gel dialog is displayed.



Edit at. This field lets you specify the time at which you want the settings to take effect for this gel. By changing the time (with the *Custom* option) you can create a gel that changes over time.

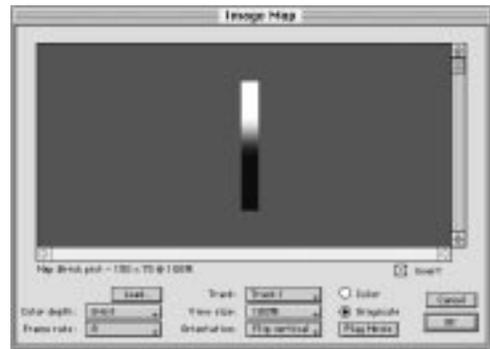
Name. This field contains the name of the gel. It is helpful if you use a descriptive name that indicates the appearance of the gel. You can change the name of the gel at any time.

Copy from. This field lets you copy the settings from gels that are currently con-

tained in the active model. All currently loaded gels appear in the pop-up list.

Color. This button lets you select a color for the gel. You must load a map before the *Color* button is available. If you just want to apply a color filter to a light source, you can do so on the light's Object Properties palette.

Map. Click this button to load a map to use as an image for the gel. You can also load an movie to use as a gel. When you click the button, the Image Map dialog appears.



For a complete description of each of the fields in this dialog, see **Image Map dialog** on page 160.

If you load an animation, the light source acts similar to a movie projector, and the moving image appears on objects struck by the light.

Tiling. If the gel contains an image or animation, this pop-up list lets you choose a tiling method. A map present in the gel definition can be repeated in different patterns:

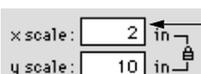
 **Normal.** The map repeats in a straight manner, beginning over each time the previous pattern ends.

 **Mirrored.** The image alternates end-for-end each time it repeats.

 **None (No tiling).** The image appears once at the scale or coverage specified.

Scale. These fields let you adjust the scale of the map.

 *When the Lock is in its closed (locked) position, the dimensions of the map remain proportional.*

 *Changing the value in one field causes StudioPro to update the value in the other field so the proportions of the map are maintained.*

To ensure the map used in the gel remains proportional, the *Lock* icon needs to be in its “locked” position. To remove this constraint, click on the *Lock* icon to change it to its “unlocked” position. When in this position, the value entered in one field does not affect the value in the other field.

 *When the Lock is in its open (unlocked) position, you can change the value in one field without affecting the value in the other field.*

Preview. This area displays a preview of the gel with its current settings. You can select the type of object used for the pre-

view rendering. Choose *Cube*, *Sphere*, or *Tile* from the pop-up list.

 Click the camera icon to render a preview of the gel.

Once you’ve created the gel, it appears on the upper portion of the Gels tab on the Resource palette and becomes part of the active model.

EDITING GELS

You can edit any of the gels on the Resource palette. With the Gels tab active, click the *Edit* button to edit the selected gel. If the gel is not already loaded in the active model, it will load, and the appropriate Gel dialog appears.

It’s a good idea to change the name of any gel that you edit. Then you can use both the original and the edited versions of the gel in your model.

Once you edit the gel, it becomes part of the current model. If you want to have access to this gel for use in other models, select the **SAVE** command from the Plus menu.

You can edit any gel so it appears to change over time. Specify the time at which the changes occur by entering a time in the *Edit At* field. Remember, however, that changes you make to any gel occur on ALL of the lights to which that particular gel is applied.

APPLYING GELS

To spotlights or point lights: Gels can be applied from the Object Properties palette of the selected spotlight or point light.

To global lights: Apply gels to global lights from the Lights tab of the Environment Palette.

SAVING GELS

When you create a new gel, it becomes part of, and is saved with, the model. However, if you want to be able to access the gel to use in other models, you must save it to disk. A **SAVE** command is provided in the Plus menu. See **Plus menu**, below.

IMPORTING GELS

To import a gel from the library into the active model, select the gel in the Gels library, then click the *Import* button.

PLUS MENU

When the *Gels* tab is active, the commands found in the Plus menu apply specifically to gels.

SAVE. This command allows you to save any new gels you create so you can access them later for use in other models.

When you select the **SAVE** command, a dialog appears allowing you to specify a name and the location for the saving the gel. If you want the gel to appear in the Library section of the Resource palette, you can save it to the *Libraries* folder inside the *Strata StudioPro* folder. See **Handling Resources** on page 154.

DELETE UNUSED. Select this command to delete all of the unused gels from the active model, thus decreasing the amount of memory required for the model.

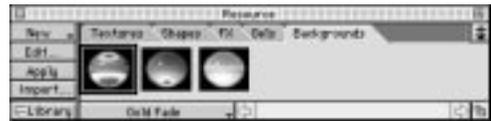
If the unused gels haven't been saved yet and are not part of the *Gels* library, you will not be able to access them again.

BACKGROUNDS TAB

StudioPro allows you to add backgrounds to your models without the need to create any unnecessary geometry. This feature lets you use colors, gradations, or image maps (including animations) that are wrapped around your model at an infinite distance.

Several different types of backgrounds are provided. In addition to the backgrounds that are included, you can create your own custom backgrounds which can be used as either visible backgrounds, or as reflected backgrounds that appear as reflections in the objects in your model.

Click on the Backgrounds tab to bring it to the front of the Resource palette, making it the active tab.



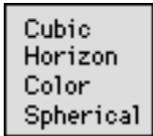
The upper portion of the palette contains any backgrounds that are currently loaded in the active model.

To display the backgrounds contained in the library, click the *Library* button.



CREATING BACKGROUNDS

To create a new background, hold down the *New* button on the left side of the Resource palette. A list of available background types appear in the pop-up list.

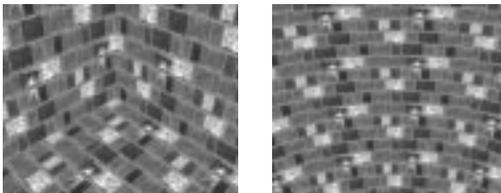


You can choose to create a new *Cubic*, *Horizon*, *Color*, or *Spherical* background.

Cubic vs. Spherical

A spherical background consists of a single plane, wrapped around the model on an imaginary sphere, and gathered at the top and the bottom to fit on that sphere.

A cubic environment consists of six different planes: top, bottom, front, back, left, and right. You can use up to six maps, with a different one on each face of the cube.

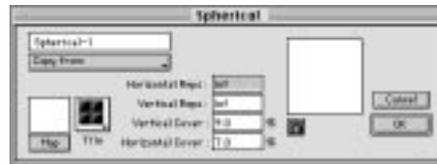


A brick image map was used in both of these backgrounds to illustrate the difference between cubic and spherical backgrounds.

An important difference between spherical and cubic backgrounds is the way light reflects from them. Light does not reflect from a spherical background onto a flat

surface as well as it does from a cubic background. For example, if your model consists of extruded text with a shiny surface applied, you might want to use a cubic background to take advantage of the increased reflectivity it allows. Your final rendering may appear quite different, depending on which type of background you choose.

Select *Spherical* to load a single image or animation to use as a background. The Spherical dialog appears.



To create a cubic environment instead, select *Cubic* from the pop-up list.



Both dialogs contain the same fields. The only difference between the two dialogs is that you can load up to six images or animations to use in a cubic background, while a spherical background may contain only one.

Name. A default name is provided which can be changed. This is the name that appears on the *Background* tab on the Resource palette.

Copy from. This field allows you to copy the settings from an existing background to create a variation for the new background. The original background is unaffected. All currently loaded spherical backgrounds appear in the *Copy from* field in the *Spherical* dialog, and currently loaded cubic backgrounds appear in the *Copy from* field on the *Cubic* dialog.

Map. Click the *Map* button to load an image to use for the background.



See **Image Map dialog** on page 160 for a complete description of each of the fields in this dialog.

You can create a background that changes over time by loading an animation file instead of a single image file. Movie files or sequentially numbered images in any of the formats supported by StudioPro can be used for backgrounds.

Cubic backgrounds allow you to load up to six different images or animations. A

default black background will be used for any face that does not contain a map. If you want to use the same map on each plane of the background, load the map into the *Front* field and check the *Use Front image for all sides* checkbox.

You can change the scale or mapping parameters for the individual background maps. Backgrounds using maps are usually scaled smaller.

Cubic backgrounds allow you to adjust the scale and mapping parameters for each individual map. Select a map from the pop-up list, or select *All Faces* if all of the maps are to be scaled and tiled the same.

Horizontal/Vertical Repetitions. You can specify how many times to repeat the image.

Tile. Select a tiling style from the *Tile* pop-up list:



Normal. The map repeats in a straight manner, beginning over each time the previous pattern ends.



Mirrored. The image alternates end-for-end each time it repeats across the surface.

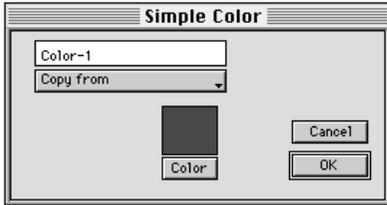


None (No tiling). The image appears once at the scale or coverage specified.

Vertical/Horizontal Coverage. The values in the horizontal and vertical coverage fields are entered as percentages; 100% scales the map to cover the entire environment sphere once, a setting of 33% scales the map to tile three times.

Color

Select *Color* to define a single color to use as a background. The Simple Color dialog appears.



Name. A default name is provided which can be changed. This is the name that appears in the Resource palette.

Copy from. This field allows you to copy the settings from an existing simple color background to create a variation for the new background. (Perhaps you want to use a slightly less intense variation of the same color.) The original background is unaffected.

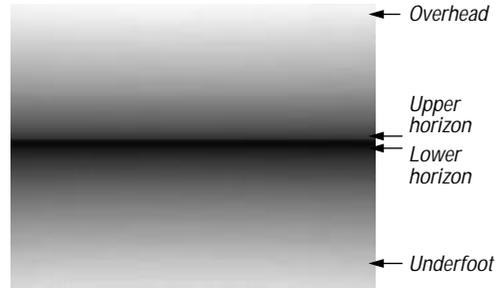
Color. Click this button to select a color to use as the background for your model.

Horizon

Select *Horizon* to create a new sky background that is wrapped around your model.



This dialog allows you to specify colors for the upper and lower areas of the background, as well as colors that appear just above and just below the horizon.



Three blend rate options allow you to blend the colors with the proper gradation to match the lens angle of the view.

Slow blending uses a linear gradation from the horizon color to the overhead and underfoot colors. The transition from horizon color to sky color is complete within 45° of the horizon line. This is useful for simulating a wide-angle lens setting.

Medium uses an accelerated linear gradation to complete the horizon color's transition by 33° above or below the horizon line. This is useful for normal lens settings.

Fast uses a logarithmic gradation to complete the color transition by 20° above or below the horizon line. This is useful for semi-telephoto lens settings.

EDITING BACKGROUNDS

Click the *Edit* button to edit the selected background. If the background is not already loaded in the active model, it will load, and the appropriate Background dialog appears.

It's always a good idea to change the name of any backgrounds that you edit. Then you can use both the original and the edited versions in your model.

Once you edit a background, it becomes part of the current model. If you want to be able to use this background in other models, select the **SAVE** command from the Plus menu.

APPLYING BACKGROUNDS

Backgrounds are applied from the *Background* tab of the Environment palette. Any background on the Resource palette appears in both the *Visible* and *Reflective* pop-up lists. See **Applying Backgrounds** on page 218 for more information.

SAVING BACKGROUNDS

When you create a new background, it becomes part of, and is saved with, the model. However, if you want to be able to access this background later to use in other models, you must save it to disk. A **SAVE** command is provided in the Plus menu. See **Plus menu**, below.

IMPORTING BACKGROUNDS

Click the *Import* button to import backgrounds from the Backgrounds library into the active model.

PLUS MENU

When the Backgrounds tab is active, the commands contained in the Plus menu apply specifically to backgrounds.

SAVE. This command allows you to save any new backgrounds you create in this model so you can access them later for use in other models.

When you select the **SAVE** command, a dialog appears allowing you to specify a name and location for the save function.

If you want any new backgrounds that you create to appear in the Library portion of the Resource palette, you can save them to the *Libraries* folder inside the *Strata StudioPro* folder. See **Handling Resources** on page 154.

DELETE UNUSED. Select this command to delete all of the unused backgrounds from the active model, thus decreasing the amount of memory required for the model.

If the unused backgrounds haven't been saved yet and are not part of the *Backgrounds* library, you will not be able to access them again.



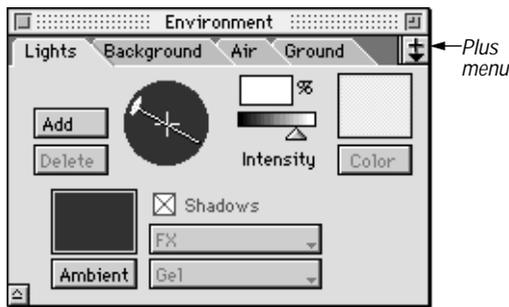
ENVIRONMENT PALETTE

The Environment palette contains the controls that are global to the entire model. This palette includes tabs for *Lights*, *Background*, *Air*, and *Ground*.

The Environment palette is a floating palette. It floats above the model windows and is always available. You can move the palette around the screen and position it wherever you want. To move it, just drag it by its title bar.

You can display the Environment palette on your desktop in one of three ways: expanded to display the Expert settings, collapsed to display only the Basic settings, or fully collapsed to display the folder tabs only.

To expand the Environment palette to its maximum size:

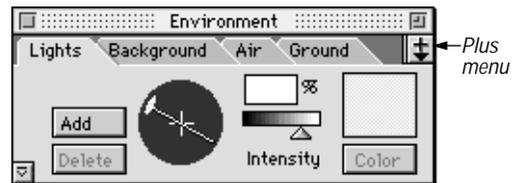


Click this button to expand or collapse the palette.

- Select the **EXPERT MODE** command from the Plus menu.
- or -
- Click the arrow button in the lower left corner of the palette.

Macintosh only: You can also expand or condense the palette by clicking the Zoom box on the far right of the palette's title bar.

To collapse the Environment palette to its minimum size:



- Select the **BASIC MODE** command from the Plus menu.
- or -
- Click the arrow in the lower left corner of the palette.

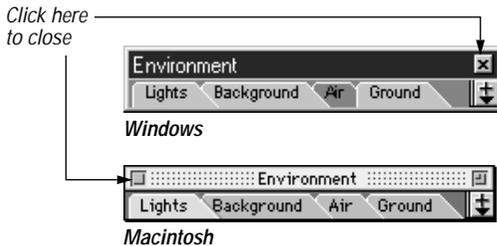
To reduce the Environment palette even further to display only the folder tabs, double-click on any folder tab or select the **COLLAPSE PALETTE** command from the Plus menu.



This command allows you to free up valuable screen space, but still have easy access to the Environment palette.

To close the Environment palette, select **HIDE ENVIRONMENT PALETTE** from the Win-

dows menu, or click the close box in the title bar.



You can also close the palette by clicking the Environment's Hide/Show button on the Button bar.



To open the Environment palette, select **SHOW ENVIRONMENT PALETTE** from the Windows menu, or click the Environment palette's button in the Button bar.

If the Environment palette is open when you quit StudioPro, it will be open the next time you launch the application.

When you enter text or numeric data from the keyboard, changes take effect when you press the *Enter*, *Return*, or *Tab* keys. Other changes to the contents of the palette (checkboxes, radio buttons, etc.) occur immediately.

LIGHTS TAB

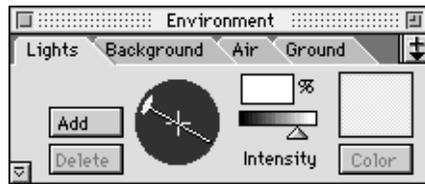
The Lights tab contains controls for handling directional light sources, as well as ambient lighting. You can add, adjust, or

delete directional lights from the Lights tab on the Environment palette.

Directional lights are considered global in nature. They are an infinite distance away, so they illuminate a model with parallel rays of light, similar to the way sunlight strikes the earth.

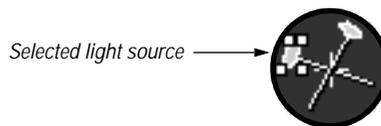
Directional lights are considered the primary light source for a model. In contrast, ambient light is a non-directional general illumination that fills shaded or shadow areas of a model so that details not directly illuminated by light sources are still visible.

The following fields appear on the Lights tab when the Environment Palettes is displayed in its basic display form:

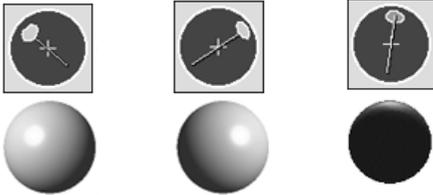


Lighting Sphere. You can adjust the position of the light by grabbing it and rotating it to the desired position. The Modeling window updates to reflect the new position of the light.

You can control the lighting in your model by repositioning, adding, or deleting light sources. The sphere around the light source(s) on the palette represents the space around your model.



You can add or delete light sources as needed. You can select and move each light anywhere on the sphere to illuminate the model from that direction.



You can move the sphere to change the direction of illumination.

Use the **Command** key (Macintosh) or the **Control** key (Windows) to switch between front and back hemispheres.

The lighting sphere displays the position of directional light sources relative to the currently active view. If you change the active view, the position of the light(s) shift on the palette to correspond with the new view.

Add. Click the *Add* button to add an additional light to the lighting sphere.

Inserting multiple light sources has the same effect as increasing the intensity of a single light to more than 100 percent. This is not recommended under normal circumstances because of the possibility of over-exposure. See **Light handling** on page 71 for information about preventing over-exposure when rendering.

If you want an object to appear extra bright, you might want to consider using a glow factor in the texture that you apply to the object.

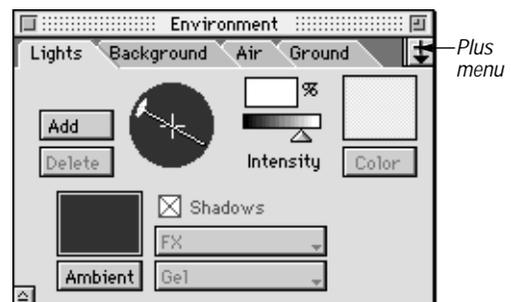
Delete. Click the *Delete* button to delete the selected light.

Intensity. You can adjust the intensity of the selected light by using the slider control or by entering a value directly. If you move the slider control, the corresponding numeric value appears in the box above the slider. If you enter a value directly in the box, the slider updates to reflect the new value.

StudioPro also allows you to enter negative values in this field, which decreases the light intensity in areas of overlapping light. Because this is a global light, you can decrease the intensity of other lights present in your model by entering a negative intensity value for this light. Then, the intensity of the other lights will be uniformly decreased by this negative value anywhere the light from the global light source overlaps light from other sources.

Color. You can apply a color filter to a directional light. Click the *Color* button to display the color picker.

Additional fields are displayed to allow you to further edit the selected light source. To access these controls, select the **EXPERT MODE** command from the Plus menu, or click the arrow button in the lower left corner of the palette.



Ambient. This is non-directional background light. Ambient light has no

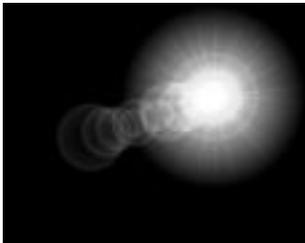
source; it's just present in the model, and makes it possible to see areas of your model that are in the shadows. This field displays the current color of ambient light in the scene.

The level of ambient light is controlled through the color picker – the brighter the color you select, the brighter the ambient lighting.

To change the ambient color, click the *Ambient* button. The color picker appears, allowing you to select a color to use in this field.

Shadows checkbox. If you want your light source to cast shadows, be sure this box is checked. Otherwise, no shadows are cast by objects illuminated by this light.

Effects and Gels. You can attach effects or gels to the selected global light. Effects include lens flares and volumetric effects, such as fog or mist.



*Lens Flares are visible on global lights only when the light is facing towards the camera. You can use the **Command** key (Macintosh) or **Control** key (Windows) while clicking on the light in the lighting sphere to toggle between hemispheres.*

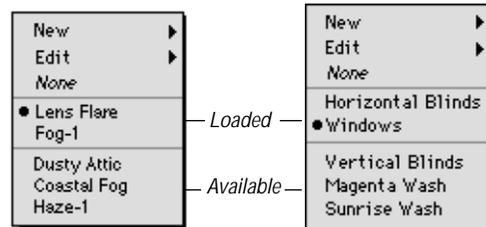
When you apply a gel, the pattern or image of the gel is projected onto the

objects illuminated by the global light source.



The "Dirty Windows" gel is applied to the global light.

If you hold down the *FX* or *Gel* button, a submenu is displayed that allows you to apply, remove, create, or edit effects or gels.

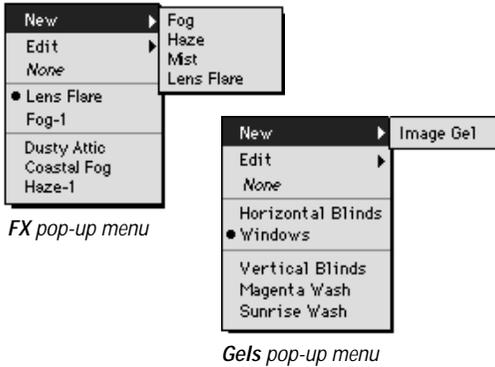


The top section of the menu contains commands for creating new effects or gels, or editing effects or gels that are already applied to the global light.

The center section of the menu contains effects or gels that are currently loaded in the active model. Any effect or gel applied to the selected light source appears with a bullet (●) beside its name.

To create a new effect or gel, select the type of effect you want to create from the

New submenu in the FX pop-up menu, or select **NEW** from the Gel pop-up menu.



Depending on what you select, the appropriate dialog is displayed.

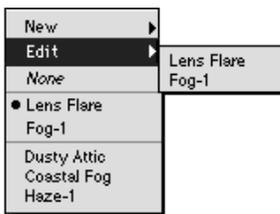
For complete details on creating *Fog*, *Haze*, or *Mist* effects, see page 192.

See page 194 for information on creating a new *Lens Flare* effect.

To create a new gel to use on the selected global light, see page 199.

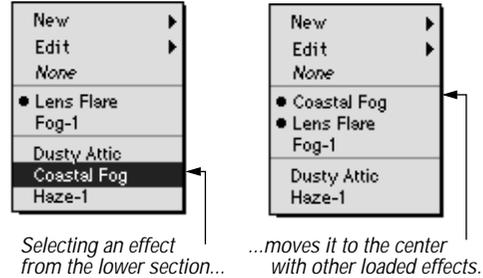
Once you've created a new effect or a gel, it appears in the center of the pop-up menu with a bullet (•) beside its name.

To edit an effect or gel, select one from the *Edit* submenu. All effects and gels currently applied to the global light appear in the *Edit* submenu.



When you select one from the list, the appropriate dialog appears, allowing you to modify the current settings.

To apply an effect or gel to your light, select one from the *FX* or *Gel* menu.



Selecting an effect from the lower section... moves it to the center with other loaded effects.

When you select any item from either the center section (loaded) or the lower section (all available in the library), a bullet (•) is placed beside the name of the item, indicating that it is applied to the selected light source.

To remove an effect or gel from a light, select it again; the bullet is removed from beside its name, indicating that it is no longer applied. To remove all effects or gels from a light, select *None*. The effect or gel still remains loaded in the model, however. To remove an effect or gel from memory, a **DELETE UNUSED** command is provided in the Plus menu on the Resource palette.

Modifier keys that apply to directional light sources:

- **Shift key**

Allows you to select multiple light source icons.

- **Command key (Macintosh) Ctrl key (Windows)**

Allows you to toggle between the front and back hemispheres.

- **Option key** (Macintosh)
Alt key (Windows)

Leaves a copy of the light source in the original position as the original is dragged to a new location. This is an alternative method to clicking the *New* button on the Lights tab, but it is most useful when you need to duplicate a light source's parameters for another light.

AIR TAB

The Air tab lets you add atmospheric effects, such as *Fog* or *Mist*, to your models. This tab also allows you to control the global forces present in your model: wind and gravity.

ATMOSPHERE

Atmospheric effects are created in the same manner as the volumetric effects, *Fog*, *Haze*, and *Mist*, but these effects are global in nature, and apply to the entire model.



No fog was applied to the model. Notice the building in the background. It is clearly visible.



Fog was added to this model. The building in the background is almost obscured by the fog.

Volumetric effects, in contrast, are confined to the space occupied by the single-sided objects to which they are applied.

Click on the Air tab to bring it to the front, if necessary.

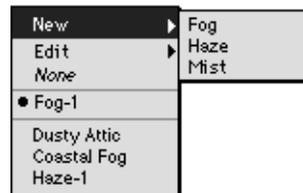


Air. This field allows you add atmospheric effects, such as fog or mist, to your model.

Refraction index. This field lets you set a global index of refraction for your model. This setting is independent of the atmospheric effect selected from the *Air* pop-up. You can select an index of refraction from one of the presets in the pop-up list or enter a value directly in the numeric field next to the list of presets.

Adding Atmospheric effects

To create a new effect, hold down the *FX* button, then select one from the *New* sub-menu.



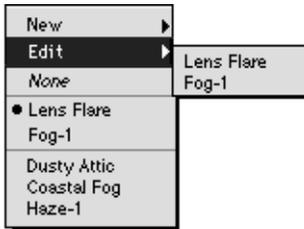
The appropriate dialog appears, allowing you to define the specific air effect you

want present in your model. For complete information on creating custom atmospheric effects, see **Fog, Mist, and Haze** beginning on page 181.

Once you've created the effect, it appears in the center section of the *FX* pop-up menu with a bullet (•) beside its name.

Editing Atmospheric effects

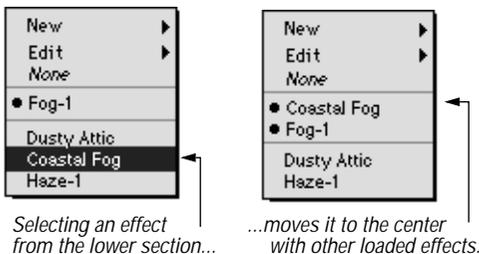
All atmospheres currently loaded in the active model appear in the *Edit* submenu.



Select the effect you want to edit. The appropriate dialog appears, allowing you to modify the current settings.

Applying Air

To apply an atmosphere to your model, select one from the *Air* pop-up menu.



When you select an atmosphere, its name appears in the center of the menu with a bullet (•) beside its name, indicating that it is currently applied.

Removing Air

To remove an applied atmosphere from the model, select it again to remove the bullet from beside its name. Select *None* to remove all atmospheres. This will not remove the effect from memory, but it will no longer be applied to the model.

GLOBAL FORCES

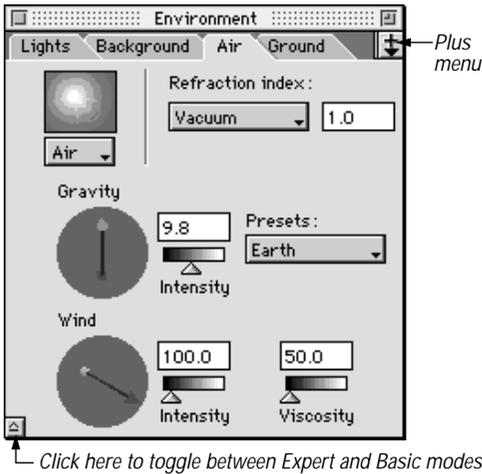
The expert (lower) section of the Air tab provides controls for global forces. These forces, gravity and wind, affect any particle effects present in your model, such as fountains.

For example, the particles emitted from a fountain are pulled down by gravity and blown by the wind. With the controls provided in the *Expert* section of the Air tab, you can specify the direction gravity pulls and the direction the wind blows.

These settings can change over time, allowing you to add realistic effects, such as gusts of wind, to your model. You can also specify the viscosity, or heaviness, of the air.

The *Expert Mode* controls let you control the global forces, gravity and wind, that are present in your model. Select the **EXPERT MODE** command from the Plus menu to access the expert controls, or click

the arrow in the lower left corner of the palette.



Gravity

Gravity This control indicates the direction of gravitational pull on particle effects in your model. Grab the control and drag it into the desired position. Use the **Command** key (Macintosh) or **Control** key (Windows) to toggle between front and back hemispheres.

You can select one of the settings from the *Presets* pop-up list, or specify the relative intensity with the slider. Or, you can enter a value directly in the entry field above the slider. The slider allows you to select intensity values



from zero to 20, but you can enter any negative or positive number in the entry field provided above the slider. A negative value in this field causes particles to fall in an “upward” direction.

Wind

Wind This control indicates the direction the wind is blowing. The intensity of the wind ranges from zero to 400. Use the slider or enter a value directly into the entry field above the slider. To switch between the front and back hemispheres, use the **Command** key (Macintosh) or **Control** key (Windows) while dragging the control into the desired position.

Viscosity

The value in this field determines how heavy, or thick, the air is. Acceptable values range from 0 to 100 percent.

Don't confuse *Viscosity* with *Refraction*. *Refraction* determines how light is affected; *Viscosity* determines how particles are affected.

BACKGROUND TAB

Environments add a surrounding reflection and/or background to the scene. By using a background instead of additional modeling, you can minimize the number of objects being used. You can use one background for the visible background and another for the reflections that appear

in shiny surfaces. Backgrounds are always placed an infinite distance away from your model.

The background is not visible in the Modeling window. The *Visible* and *Reflected* backgrounds are visible only when rendered.

You must render the image with perspective for the background to render properly. If you render in *Orthographic*, the entire background will consist of color information from only one pixel, and your background will appear as one solid color.

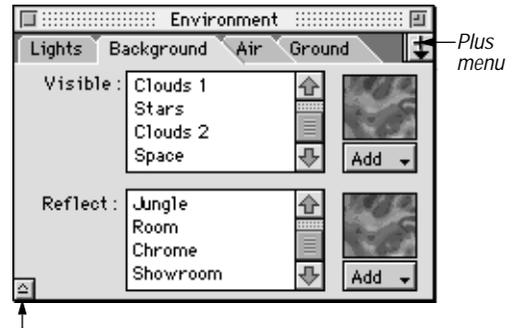
The default visible background for new models is black, but you can change the background at any time.

A preview of the visible and reflective background is provided on the right side of the palette.

The Background tab lets you customize backgrounds to suit your needs. You can choose from a number of pre-designed backgrounds, or create your own. You can also specify what type of reflective environment, if any, you want to use.

In addition to *Simple Color* and *Horizon* backgrounds, StudioPro also offers *Spherical* and *Cubic* background types. An important difference between spherical and cubic backgrounds is the way light reflects from them. If your model consists of extruded text with a shiny surface applied, for example, you might want to use a cubic background to take advantage

of the increased reflectivity it allows. The end result of your rendering may appear quite different, depending on the type of background you choose.

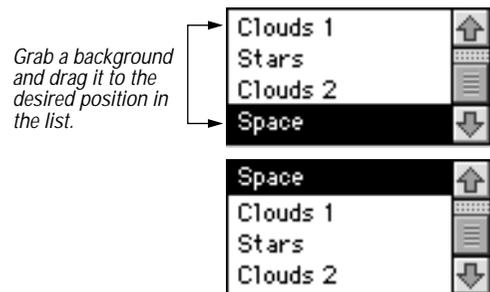


Click here to expand or collapse the palette...

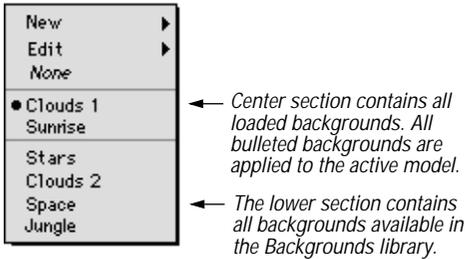
or select the "Expert Mode" command from the Plus menu to reveal controls for the Reflective background.

The upper section of the Background tab deals with the visible background, and the lower section deals with the reflective background.

You can reposition any of the applied backgrounds, either visible or reflected, by simply grabbing the name of the background and dragging it up or down to the desired position in the list.



Visible/Reflected buttons. When you hold down either of these buttons, a pop-up list appears.



You can create a new background or edit any loaded backgrounds.

CREATING NEW BACKGROUNDS

You can create new backgrounds from the Background tab of the Environment palette, or you can create them on the Backgrounds tab of the Resource palette. For more detailed information on creating new backgrounds, see **Creating Backgrounds** on page 202.

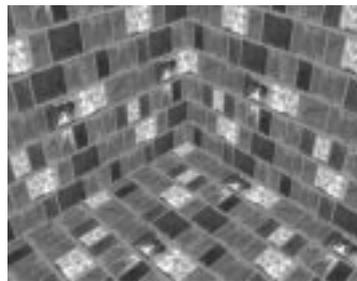
To create a new background for your model, select *New* from the *Visible* pop-up menu, then choose the type of background you want to create from the submenu. You can create a *Cubic*, *Horizon*, *Simple Color*, or *Spherical* background.



Once you've created a new background, it appears on the Environment palette and on the upper portion of the Resource palette. If you want to use this background in other models, you'll need to save it to disk. A special **SAVE** command is provided in the Plus menu on the Resource palette.

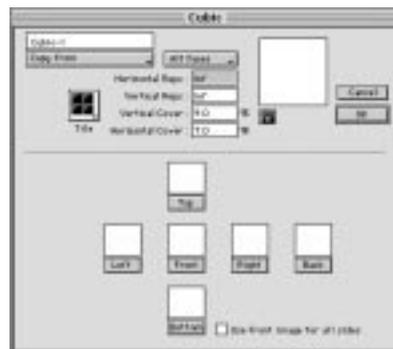
Cubic

Select *Cubic* to create a cubic environment for your model. A cubic environment consists of six different planes: top, bottom, front, back, left, and right.



Example of a cubic background

The Cubic dialog allows you to load up to six different images or animations, with a different map on each face.

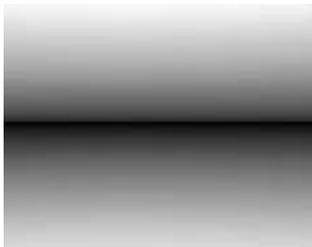


If you want to use the same map on each plane of the background, load the map into the *Front* field and check the *Use Front image for all sides* checkbox. A default black background will be used for any face that does not contain a map.

This dialog also allows you to change the scale and mapping parameters for each map individually. If you want to use the same scale and mapping parameters for all maps, select *All Faces* from the pop-up list.

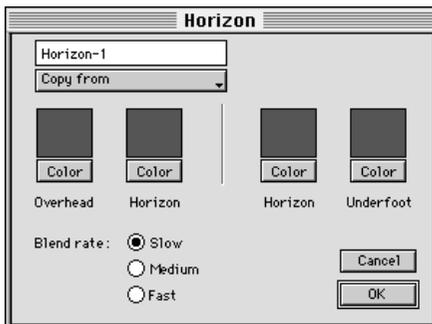
Horizon

The Horizon background lets you create a gradation of colors that blend together.



Up to four different colors can be used. The colors blend together at the rate you specify.

Select **Horizon** to create a new sky background.



This dialog allows you to specify colors for the upper and lower areas of the background, as well as colors that appear just above and just below the horizon. An adjustable blend rate allows you to blend the colors with the proper gradation to match the lens angle of the view.

Slow blending uses a linear gradation from the horizon color to the overhead and underfoot colors. The transition from horizon color to sky color is complete within 45° of the horizon line. This is useful for wide angle lens settings.

Medium uses an accelerated linear gradation to complete the horizon color's transition by 33° above or below the horizon line. This is useful for normal lens settings.

Fast uses a logarithmic gradation to complete the color transition by 20° above or below the horizon line. This is useful for semi-telephoto lens settings.

Color

Select **Color** to define a single color to use as a background. The Simple Color dialog appears.

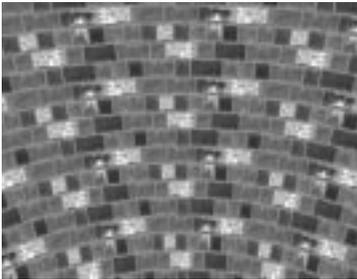


Click the **Color** button to display the color picker. This dialog allows you to specify a

color to use for the visible or reflective background.

Spherical

Select *Spherical* to specify a single image or animation to use as a background. A spherical background consists of a single plane, wrapped around the model on an imaginary sphere, and bunched up at the top and bottom to fit on that sphere.



This brick background illustrates how a spherical background is "wrapped" around the model space.

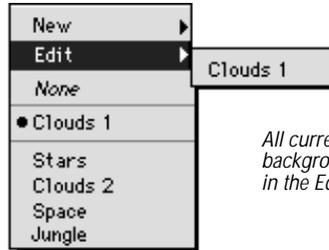
The Spherical dialog lets you load an image or animation, and also allows you to specify the scale and tiling method used.



For complete details on creating a new **Spherical Background**, see page 202.

EDITING BACKGROUNDS

To edit any background currently applied to your model, select *Edit* from the *Visible* or *Reflected* pop-up menu.

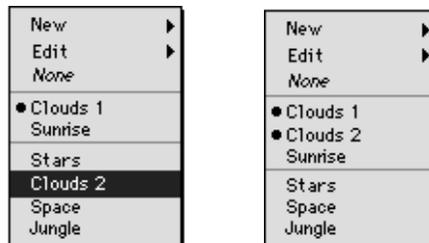


All currently loaded backgrounds appear in the Edit submenu.

When you select a background to edit, the appropriate dialog appears. For more information on the fields contained in this dialog, see **Creating Backgrounds** on page 202.

APPLYING BACKGROUNDS

To apply a background to your model, select one from the pop-up list.



When you select any item from either the center section (loaded backgrounds) or the lower section (backgrounds contained in the library), that background is loaded, if necessary, and a bullet (•) is placed beside the name of the background, indicating that it is currently applied.

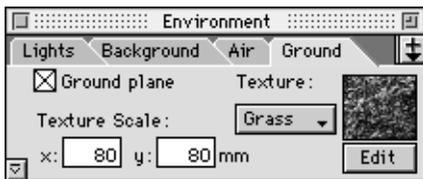
REMOVING BACKGROUNDS

Backgrounds that are currently applied to the model appear with a bullet (•) beside the background name. To remove a background, select it again; the bullet is removed, indicating that the background is no longer applied.

You can remove all backgrounds that are applied by selecting *None*. The background still remains loaded, however. To remove the background from the memory, a **DELETE UNUSED** command is provided in Plus menu on the Resource palette.

GROUND TAB

The Ground tab lets you set up a ground plane for your model. It also lets you apply a texture to the ground plane.



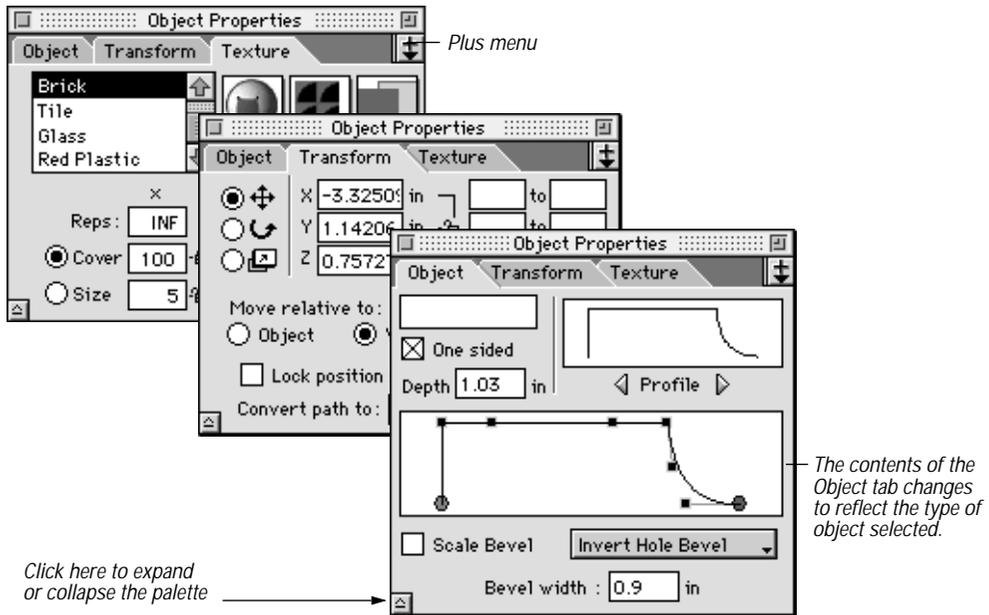
Ground plane. Place a check in this box if you want to use a ground plane in your model. When this box is checked, the Y grid is used as the ground plane for the model.

A ground plane is infinite in size, and it cannot be moved. Particles, such as those generated by Fountain effects, will bounce from the ground plane if they come in contact with it, or simply gather on the surface, depending on the amount of energy the particles have.

Texture. You can apply any surface texture to the ground plane. All of the textures that are available appear in the *Texture* pop-up list. Select one to apply to the ground plane, or create a new texture by selecting *New* from the popup. StudioPro will render the ground plane with a light gray texture if no other texture is applied.

Texture Scale. If the texture used on the ground plane contains a map, you can specify its scale. All maps use normal tiling with infinite repetitions.

Edit. Click this button to edit a texture that you've applied to the ground plane. The Texture Editing dialog for the selected texture is displayed, and you can modify it as desired.



The Object Properties palette contains all of the information about the currently selected object. You can edit the selected object at any time from this palette.

You can position the Object Properties palette anywhere on your screen by dragging it by its title bar. This palette floats above the Modeling window.

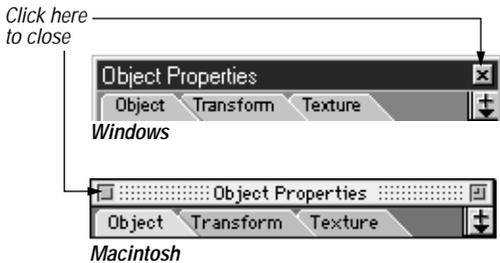
To show the Object Properties palette, you can use the **SHOW OBJECT PALETTE** com-

mand in Windows menu. You can also click the Object Properties palette show /hide button on the Button bar.



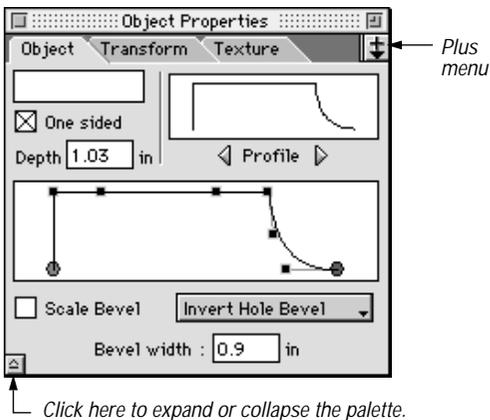
To close the palette, select the **HIDE OBJECT PALETTE** command from the Windows menu. You can also close this palette by

clicking on the hide/show button on the Button bar, or by clicking the palette's close button in the title bar



The contents of the Object Properties palette apply to the selected object. If multiple objects are selected, the palette grays out.

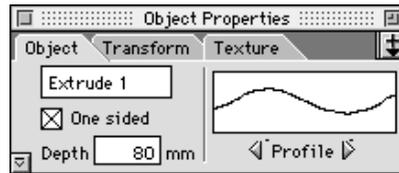
If the selected tab contains additional settings, you can expand the Object Properties palette.



To expand the Object Properties palette:

- Select the **EXPERT MODE** command from the Plus menu.
- or -
- Click the arrow in the lower left corner palette.

To condense the palette to reveal only the basic settings:



- Select the **BASIC MODE** command from the Plus menu.

- or -

- Click the arrow in the lower left corner of the palette.

Macintosh only: You can also expand or collapse the palette by clicking the Zoom box in the far right corner of the title bar.

When you enter text or numeric data from the keyboard, changes take effect when you press the *Enter*, *Return*, or *Tab* keys. Other changes to the contents of the palette (checkboxes, radio buttons, etc.) occur immediately.

Plus Menu

This menu contains the following commands:



COLLAPSE PALETTE. This command collapses the palette to display the tabs only.



You can also display the palette in this manner by double-clicking any folder tab. This frees up valuable screen space, but the palette remains available for easy access. When the palette is collapsed, the command name changes to **EXPAND PALETTE**.

EXPERT MODE. Use this command to expand the palette to reveal the expert settings. When expanded, the command name changes to **BASIC MODE**.

EDIT OBJECT. This command is the same as selecting the **RESHAPE** command from the Modeling menu. For more information, see **Reshape** on page 35 (Some objects may need to be converted to another object type before they can be reshaped, so this command may not be available for all objects.)

The Object Properties palette contains three tabs. The foremost tab is the active tab. Whenever you click on a tab, it moves to the front and becomes the active tab. You can modify the object at any time by entering new data into any of the palette's editable fields.

OBJECT TAB

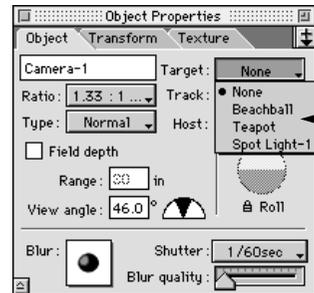
The Object tab contains information about the specific object type. When you create an object, you can assign a name to the object by entering a name in the field provided. Some objects are required to be named. These objects are given a unique default name which appears in the *Name* field at the time they are created.

You can change the name at any time; however, all names must be unique. If the object has been named, its name also appears in bold type in the Project window.



Project Window – named objects appear in bold type.

If you want an object to be available to select as a *Target* or *Host* for spotlights or camera objects, they must be named. Only named objects appear in the *Host* or *Target* fields on the spotlight or camera's Object Properties palette.



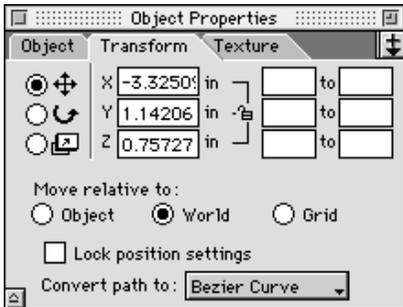
Only named objects appear in the pop-up list.

The other fields contained on the Object tab differ depending on the type of object selected.

StudioPro contains many different types of objects, and each type contains its own fields. For complete information about the Object tab for each object type, see the entry for the tool or command that was used to create the object.

TRANSFORM TAB

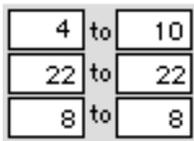
The Transform tab allows you to easily and accurately position and size objects in your model. Click on the Transform tab to bring it to the forefront.



Click here to expand or collapse the palette.

You'll find the Transform tab much easier to use if you have the *Show Object Tridents* option enabled in the Preferences dialog (Windows tab).

You can specify the range allowed for any move, rotate, or scale operation. Enter the values in the fields at the right to use to restrict the range of each operation (move, rotate, scale).



Constraints can be set in world coordinates only. Once constraints have been specified, objects can be moved, scaled, or rotated in any coordinate system, but only within the world space specified by those constraints.

The Transform tab also allows you to lock objects in place so they can't be accidentally moved, rotated, or scaled. This feature locks the position, rotation, or scale of the object ONLY; you can still change the object in other ways, such as reshaping, converting it to other object types, applying textures, etc.

MOVE



When the *Move* button is selected, the X, Y, and Z coordinates for the selected object appear in the appropriate fields. You can change the position of the object on any or all axes.

You can also specify the relative coordinates to which the move applies in the *Move relative to* field.



You can move the selected object relative to the *World* (the World grid's 0,0,0 coordinates), the *Object*, or the active *Grid* (which may or may not be the World grid). The object's coordinates change to 0,0,0 if you select *Object*, and as soon as the object moves, its coordinates immediately revert back to 0,0,0. To lock the object into position, check the *Lock position settings* checkbox.

ROTATE



When the *Rotate* button is selected, you can rotate the selected object on any axis. Enter the number of degrees in the appropriate fields. You can rotate the object around the

center of the *World* (World grid), the *Object's* origin point, or the active *Grid*.



If you select *Object*, the object's coordinates change to 0,0,0. Then, as soon as the object rotates, the coordinates revert back to 0,0,0 immediately.

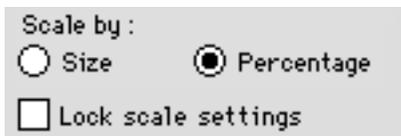
If you're rotating an object over time, it is important that each rotation be in increments of less than 180 degrees. If you rotate more than this amount, StudioPro will rotate the object using the shortest path, and the object may not rotate in the direction you intended. See **Object Rotate tool** on page 96 for more information.

Check the *Lock rotation settings* checkbox to prevent the object from being rotated.

SCALE

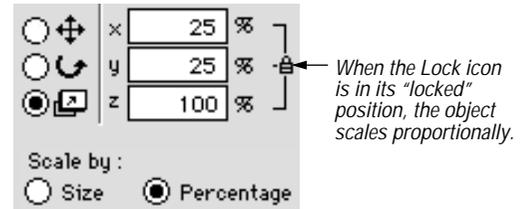


When you select the *Scale* button, you can scale the selected object on any axis. You can also choose to scale the object by *Percentage* or by *Size* in the *Scale by* field



Place a check in the *Lock scale settings* checkbox if you want to prevent changing the scale of the object.

To scale the object proportionally, click the *Lock* icon. When the *Lock* icon appears in its locked position, the current proportions of the object are maintained.

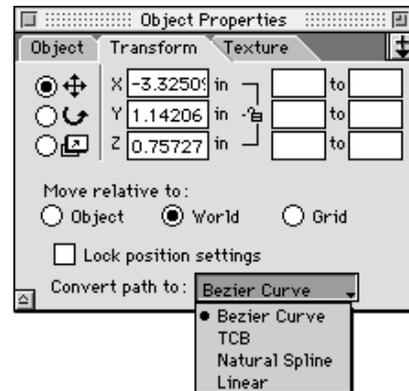


When the *Lock* icon is in its "locked" position and you enter a value in one field, the other fields update to maintain the object's proportions.

Each time you click the *Lock* icon, it toggles between its locked and unlocked status.

PATH TYPE

A *Convert path to* pop-up at the bottom of the Transform tab lets you select a path type for this object.



Then, any path associated with this object, either currently or in the future, will be converted to the type indicated here. For

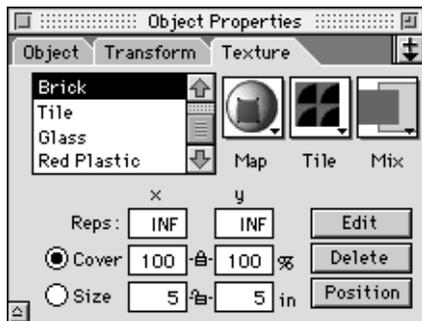
information on the various path types, see **Animation Path Types** on page 271.

TEXTURE TAB

The Texture tab allows you to control the placement of textures on the selected object. These settings apply to the way the texture appears on the selected object only; they don't in any way affect how the texture appears on other objects. This tab allows you to customize the appearance of the texture on separate objects by mapping it differently.

StudioPro allows you to apply more than one texture to an object. The way these textures mix together affects the final appearance of the object when it is rendered. The Texture tab lets you control how multiple textures mix together.

Click on the Texture tab to bring it to the foreground.



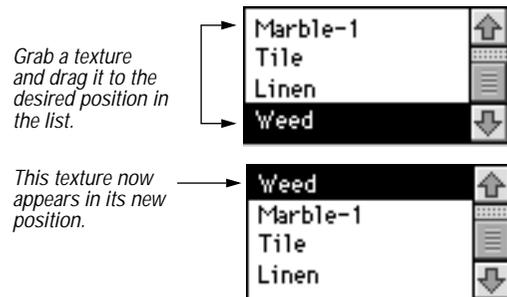
Click here to expand or collapse the palette.

List of Applied Textures

This is a list of all the textures applied to the selected object. When you apply a tex-

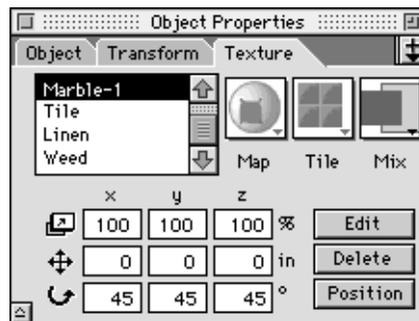
ture to an object, it's placed on top of any other textures that have been applied, and it appears at the top of the list.

You can change the position of a texture in the list by grabbing the name of the texture and dragging it to the desired position in the list.



Each texture is mapped separately. Select the texture for which you want to change the mapping parameters.

If the selected texture is a 3-D (or solid) texture, such as *Wood* or *Stone*, several of the fields are dimmed. Because they are three-dimensional in nature, the texture contains no maps, so the *Mapping*, *Tiling*, and *Mixing* fields are dimmed and unavailable.



Texture tab, as it appears when a 3-D texture is selected.

Solid textures, such as marble, stone, or wood, can be positioned interactively by clicking the *Position* button, or you can enter numeric values on this tab to position the texture on the object.

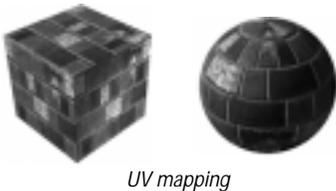
Volumetric textures (fog, haze, mist) and effects (lens flare, aura, fountain) also appear in the scrolling list with any other textures that have been applied to the selected object.

However, when an effect or volumetric texture is selected in the list, only the *Edit* and *Delete* buttons are available; the other controls appear dimmed and are unavailable.

Map

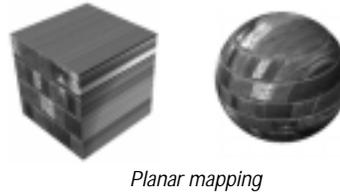
This pop-up list contains several different ways to map a texture:

 **UV** – This method of mapping actually maps the texture onto the object, stretching and squeezing where necessary. Texture maps retain their relative position on the object even when the object is twisted or folded. This is the only method that does not use projection mapping, which is the process of projecting the image onto the surface.

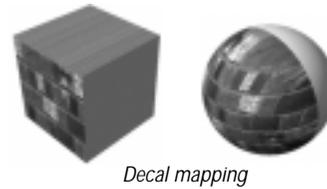


 **Planar** – This method pushes the texture straight through the object.

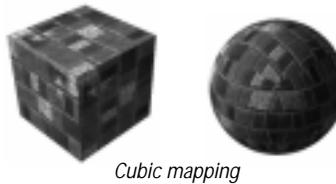
The texture shows on all faces of the object, even the inside and back.



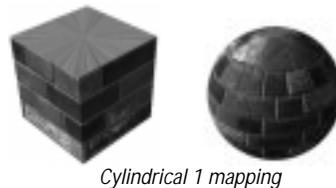
 **Decal** – This method applies the texture to only one side of an object.



 **Cubic** – This method applies the texture from six directions, even if the selected object isn't a cube.



 **Cylindrical 1** – This method wraps the texture around the object in a cylindrical fashion. If the texture is longer than the object (top and bottom), the texture smears to the center of the object on the top and bottom end caps.



 **Cylindrical 2** – This method wraps the texture around the object in the same cylindrical pattern as the Cylindrical mapping type does, but the aspect ratio of each pixel is retained.



Cylindrical 2 mapping

 **Spherical** – This method wraps the texture around the object in a spherical manner, and then gathers the texture together at the top and the bottom poles.



Spherical mapping

Tile

A surface map can be repeated over the surface of an object in different patterns:

 **Normal.** The map repeats in a straight manner, beginning over each time the previous pattern ends.

 **Mirrored.** The image alternates end-for-end each time it repeats across the surface.

 **None (No tiling).** The image appears once at the scale or coverage specified.

Mix

You can specify the rules for mixing multiple textures on an object. These rules apply to all channels of the selected texture. The default setting is *Replace*.

 **Replace.** Replace all other textures with this texture.

 **Inherit.** Inherit all properties of the texture below.

 **Combine.** Combine the settings in the texture above with the settings in the texture below.

 **Multiply.** Multiply the values from this texture with the values in the texture below.

For example, compare the effect of each of the above mixing rules with the colors specified in the *Diffuse Color* fields and the values specified in the *Opacity* fields.

	<u>Diffuse Color</u>	<u>Opacity</u>
<i>Texture ABOVE</i>	<i>Red</i>	<i>70%</i>
<i>Texture BELOW</i>	<i>Green</i>	<i>30%</i>
Replace	<i>Red</i>	<i>70%</i>
Inherit	<i>Green</i>	<i>30%</i>
Combine	<i>Yellow</i>	<i>100%</i>
Multiply	<i>Black</i>	<i>21%</i>

Reps

You can specify the number of times to repeat the map across the surface of the object. The default setting is *INF* or infinite in both the horizontal and vertical directions. The *INF* setting ensures that an object will be completely covered no matter how large or small the map is scaled relative to the object.

Cover

This option scales the size of the map to cover a specified percentage of the object. Enter a percentage in both the horizontal and vertical fields. To maintain the proportions of the map, make certain the *Lock* icon is in its locked (closed) position. When locked, you'll only need to enter a value in one field; the value in the second field is determined for you to keep the dimensions of the map proportional.

Size

This option defines the actual size of the map. You can specify the size of the map in both directions. If you want the map to remain proportional, make sure that the *Lock* icon is in its locked (closed) position.

TEXTURE EDITING AND POSITIONING

You can edit either the texture itself or the position of the texture with the buttons provided in the lower right corner of the Texture tab.

Edit

You can edit the texture by clicking the *Texture* button in the lower right corner of the Texture tab. The appropriate Texture Editing dialog is displayed.

Delete

To delete the selected texture, click the *Delete* button. This action removes the texture from the object; it does not remove the texture from the model.

To remove the texture from the model, you can use the **DELETE UNUSED** command from the Plus menu on the Resource palette.

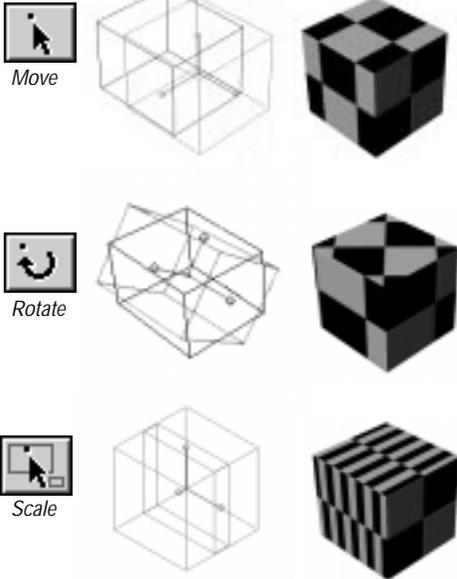
Position

The *Position* button allows you to change the position of the selected texture on the object. Do not confuse positioning the individual textures applied to an object with the process of aligning individual maps within a single surface texture definition. Aligning individual maps is accomplished by clicking the *Compose Maps* button at the bottom of the Surface texture editing dialog. (See **Compose Maps** on page 171 for more information about this feature.)

Clicking the *Position* button is the same as selecting the **EDIT PLACEMENT** command from the Modeling menu.

When you click the *Position* button, the tool palette changes. Tools are provided for moving, rotating or scaling textures on the object. Handles appear on the selected

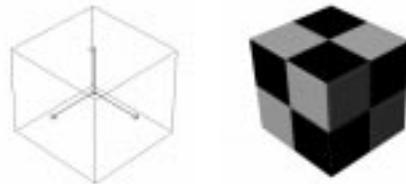
object. You can move, rotate, or scale the texture as desired.



If you're using an interactive renderer capable of displaying textures in the Modeling window, you'll find it much easier to precisely position the texture on the object. (The *Show Textures* option must be enabled on the Windows tab of the Preferences dialog.)

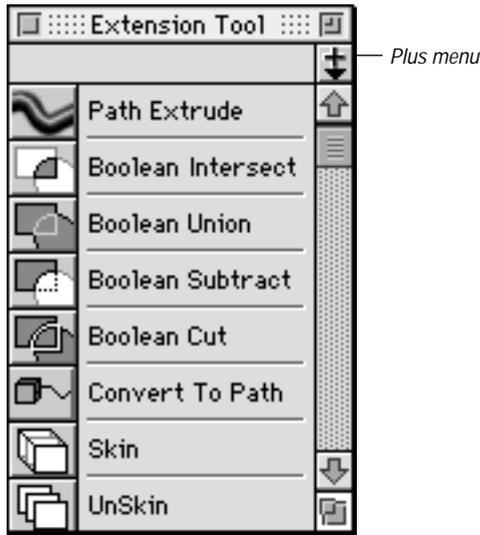
NOTE: You cannot edit the placement of a texture with UV mapping, so handles won't be available with this mapping style. However, you can change the mapping style at any time.

 A special **FIT TEXTURE** button is provided on the Button bar that allows you to center the texture on the object with 100 percent coverage. This is the default texture orientation. You can use this feature at any time during the texture placement process.



When you're finished positioning and aligning the texture on the object, select the **END RESHAPE/EDIT** command from the Modeling menu.

For complete details on moving, rotating, or scaling textures, see **Edit Placement** on page 43.



with the resize control in the lower right corner.

To open the Extension Tool palette, select the **SHOW EXTENSION PALETTE** command in the Windows menu. You can also open this palette by clicking the hide/show button on the Button bar.

Show/Hide
Extension
Tool palette



To hide the Extension Tool palette, click the close button in the move bar, or use the **HIDE EXTENSION TOOL PALETTE** command in the Windows menu. You can also hide the palette by clicking its hide/show button on the Button bar.

The Extension Tool palette contains additional tools to use for creating objects and adding special effects to your models.

All of the tools that appear on this palette are extensions. In order to appear on the palette, each tool's extension must be present in the *Strata StudioPro™ Extensions* folder at the time the application is launched. The order in which these extensions tools appear on this palette may vary. This palette is extensible; other tools may be added as they become available in the future, either directly through Strata Inc. or from third-party developers.

You can place this palette anywhere on your screen. To move the palette, drag it by its move bar and position it wherever you want. You can also resize the palette

The hide/show status and the position of the Extension Tool palette is remembered between sessions. The next time you launch StudioPro, the palette will appear exactly as it was when you quit the application.

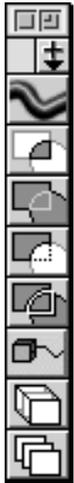
Plus Menu

Commands found in the Plus menu allow you to change the size of the palette.



- **COLLAPSE PALETTE.** Selecting this command reduces the Extension Tool palette to its minimum size. When the

palette is collapsed, the command name changes to **EXPAND PALETTE**.



When collapsed, the Extension tools remain readily available, but the palette requires much less screen space.

- **ABOUT TOOL.** This command displays information about the selected tool on the Extension Tool palette, when available.

BOOLEAN

StudioPro provides several tools to perform various Boolean operations: Intersect, Union, Subtract, and Cut. The resulting objects are polygonal meshes.

TOOL FUNCTION

If one of the objects used in a Boolean operation is a shape instance, the link to the parent object is broken. Any future changes you make to the shape will no longer affect that object.

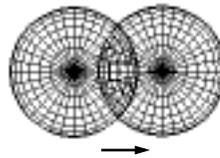
Each of the Boolean tools has a specific function:

Boolean Intersect



The Intersect tool creates an object that consists of only the overlapping portions of two objects. This tool can be used for creating cross-sections of the internal structure of objects and for defining overlapping areas in a model.

First, with the Object Move or Object Rotate tool, position the objects so they intersect in the desired location. Then select the Intersect tool, and click-and-drag to select both objects. When you release the mouse button, the new object is created.



Drag the cursor from one sphere to another with the Intersect tool...



to create this single object.

The order in which the objects are selected is irrelevant.

Once the Intersect operation is complete, the origin point is placed at the geometric center of the resulting object.

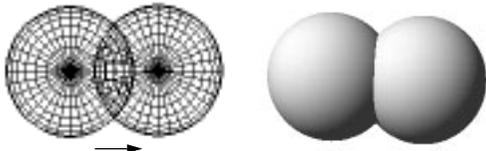
Boolean Union



The Union tool performs a Boolean operation that physically joins two objects at their intersecting points, creating a single, more complex object.

With the Object Move or Object Rotate tool, position the two objects so they overlap as desired. Then, with the Union tool, click-and-drag to select both objects. It

doesn't matter which one you select first. When you release the mouse button, the two objects fuse together into one.



Drag the cursor from one sphere to another with the Union tool...

to create this single object.

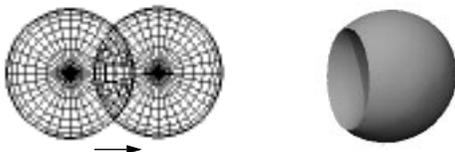
Once the Boolean Union operation is complete, the origin point is placed at the geometric center of the resulting object.

Boolean Subtract



The Subtract tool allows you to remove geometry from an object to create holes, indentations, or voids. This is accomplished by completely removing the geometry of an object from a model, taking with it that portion of any object sharing the same space.

When using the Subtract tool, the order of selection is very important. First, position the objects so they overlap as desired with the Object Move or Object Rotate tool. Then, with the Boolean Subtract tool, select the object you want to use to subtract geometry. Drag to highlight the second object from which geometry will be subtracted.



Drag the cursor from one sphere to another with the Subtract tool...

to create this single object.

The overlapping section of the first object is always subtracted from the second object.

Once the Boolean Subtract operation is complete, the origin point is placed at the geometric center of the resulting object.

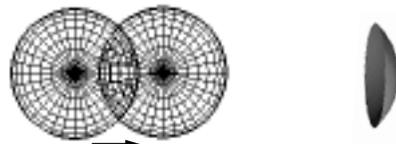
Boolean Cut



The Cut tool creates a new shape by deleting all of both objects except that part of the first object which is inside the second object.

The Cut tool is similar to the Intersection tool, except that the object created with the Intersection tool consists of the overlapping sections of BOTH objects; with the Cut tool, the final object consists of only the overlapping portion of the FIRST object. And, unlike the Subtract tool, the Cut tool does not supply any additional surfaces. Therefore, a sphere cut by another sphere results in a bowl-shaped object.

With one of the Object Manipulation tools (Object Move or Object Rotate), position the objects so they intersect in the desired location. Then select the Cut tool, and click-and-drag to select the objects.



Drag the cursor from one sphere to another with the Cut tool...

to create this single object.

The order in which you select the objects is very important. Only the overlapping portion of the object you select first remains.

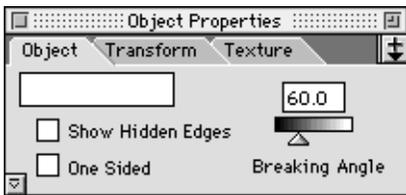
Once the Boolean Cut operation is complete, the origin point is placed at the geometric center of the resulting object.

EDITING POLYGONAL MESHES

You can edit the resulting mesh object with the **RESHAPE** command in the Modeling menu. This command allows you to push and pull individual vertex points on the surface of the object. See **Reshape** on page 35 for complete details on this command.

Object Properties Palette

You can also edit the properties of the mesh object on the Object tab of the Object Properties palette.

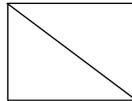


- **Name.** This field contains the name of the selected mesh object, if a name has been assigned. You can change the name at any time in this field.
- **Show Hidden Edges.** When this option is enabled, all polygons in the selected mesh are displayed as three-sided polygons. If this option is disabled, polygons appear as four sided. Displaying four-sided polygons speeds up redraw times because less calculations are required, and also makes it

somewhat easier to decipher objects in the Modeling window.



By default, all polygons appear as four-sided polygons. But this is actually two polygons – the edge between the two is hidden.



When “Show Hidden Edges” is enabled, the edge (or line) between the two polygons is also displayed.

Edges of polygons are only visible when using the *Wireframe* or *HiddenLine* renderers.

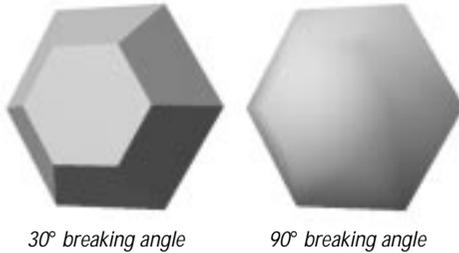
- **One Sided.** This checkbox indicates whether the object is one-sided or two-sided. You can convert it from one type to another by checking or unchecking this box.

If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as *Mist* or *Fog*, you’ll want the object to be a solid, one-sided object. One-sided surfaces are only visible to the rendering algorithms from one side; double-sided objects are visible from either side.

- **Breaking Angle.** Use this control to smooth the surface of the selected polygonal mesh object. It sets the maximum angle between adjacent polygons. If the angle is greater than this value, no smoothing occurs at this particular boundary, and the surface appears creased.

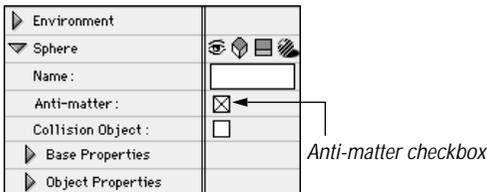
The range for this field is from zero to 180 degrees. Generally, the higher the value, the smoother an object appears.

Lower values result in a more angular appearance of the surface.



BOOLEAN RENDERINGS

StudioPro also offers you the option of performing Boolean renderings instead. Boolean renderings can simulate objects created with the Subtract and Intersect tools. You can designate an object as “anti-matter” in the Project window.



When you render the image, anti-matter objects will not render, nor will any portion of other objects that they overlap. The rendered objects appear as though they were created with the Subtract tool.

If two anti-matter objects overlap, only the overlapping portions render; all other portions of the anti-matter objects will not be visible. These rendered objects appear as though they were created with the Intersect tool.

Boolean renderings do not change the geometry of objects as do the Boolean tools; they only affect the way in which the objects are rendered.

CONVERT TO PATH

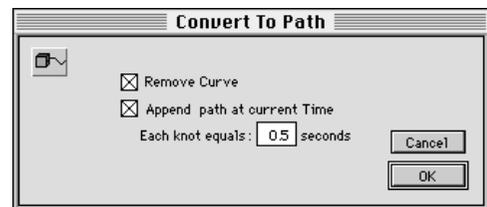


The Convert to Path tool converts any 2-D object into an animation path which can be used for any other object in your model. This tool is located on the Extension Tool palette.

The resulting animation path is a Bézier Curve type path, but you can change it to another path type on the *Transform* tab of the object’s Object Properties palette, or in the Project window under the object’s *Position* line.

TOOL SETTINGS

You can change the default behavior of the Convert to Path tool through the Tool Settings dialog. Double-click the tool to open the dialog.



- **Remove Curve.** When this box is checked, once a 2-D object has been converted into an animation path, it is removed from the model and no longer exists as an object. However, you may want to create a path from the curve, but not remove the curve from

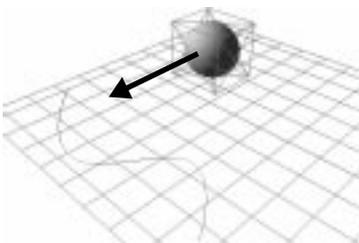
your model. You may want to use the same curve to create animation paths for other objects in your model. Or, perhaps you want to use the curve as a template for extruded or lathed objects. Whatever the reason, if you want the 2-D object to remain in your model, remove the check from this box. The 2-D object is left behind after the animation path has been created.

- **Append path at current time.** When this box is checked, you can append the selected path to the current path. The first point on the new path becomes the current position of the object at the time indicated by the *Current Time* pointer.
- **Time Interval.** You can specify the time interval between knots, or control points, along the path.

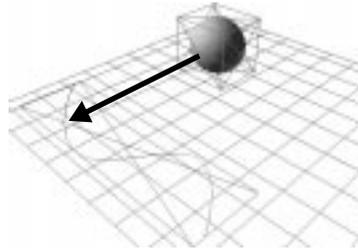
TOOL FUNCTION

Any 2-D object can be converted to an animation path. It can be an open or closed line or region.

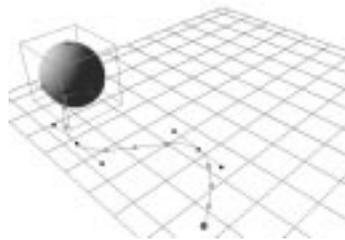
Select the Convert to Path tool from the Extension Tool palette, then select the object that you want to animate. When the object highlights, drag the cursor to the 2-D line that you want to convert into an animation path.



The path also highlights, indicating the selection is complete.



When you release the mouse button, the 2-D object changes into a path for the first object you selected.



If the *Remove Curve* checkbox is checked, the 2-D path object is removed from your model. If this box is unchecked, the 2-D object converts to a path for the specified object, but it also remains as a 2-D object in your model.

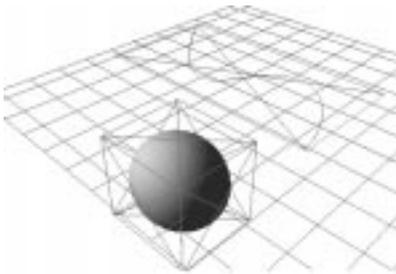
The starting point of the path is determined by the starting point of the 2-D object as it was initially created. The object travels along its path according to the time intervals indicated in the Convert to Path Tool Settings dialog.

NOTE: When you convert a 2-D object into a path, you move the object TO the path; therefore, you may want to position the path so that its beginning point is

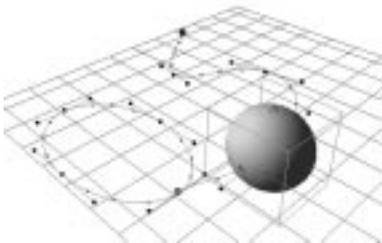
where you want the object to begin its travel before you convert the 2-D object into a path.

Appending additional paths to an object

You can convert additional 2-D objects into animation paths and append them to the end of the existing path.



The first point on the new path becomes the position of the object at the current time.



SKIN

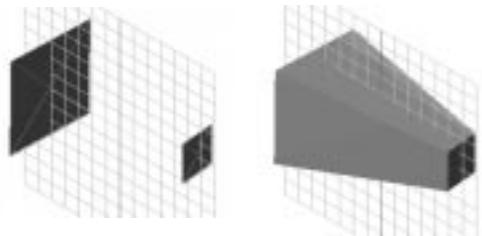


The Skin tool lets you create a surface over two or more ribs. The ribs of the skinned object can be animated.

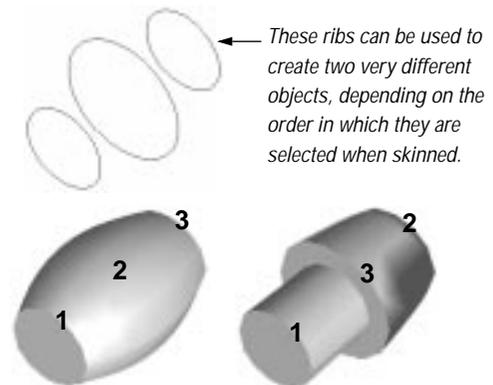
TOOL FUNCTION

There's no limit to the number of ribs you can use, depending on the amount of memory available. Any 2-D object can be used as a rib. The ribs do not have to contain the same number of edges or vertices. One rib can be a rectangle and one a circle.

Select the Skin tool, then select the objects to be skinned. The skin surface appears as soon as the ribs are selected.



The order in which you select the ribs determines the final shape of the skin object.



EDITING SKIN OBJECTS

Each rib can be animated independently either before or after the skinning process.



To animate the ribs after skinning, select the skin object with the Object Move tool, then select the **RESHAPE** command from the Modeling menu, or click the **RESHAPE** button on the Button bar. The **RESHAPE** command lets you move, rotate, or scale the ribs of the skin object.

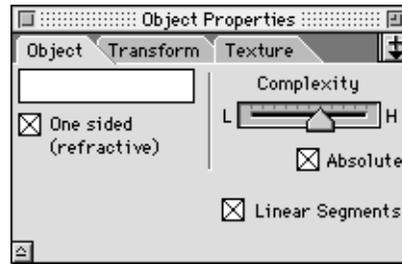
To push or pull individual points on the skin object, you must first convert it to Bézier or polygonal mesh. Once you convert a skin object to another type, you can then use the **RESHAPE** command to edit the vertex points. However, once you convert a skin object to another type, you can't convert it back into a skin object again.

To edit the 2-D ribs of a skin object, you must first unskin the object by selecting the Unskin tool on the Extension Tool palette. You can then select the rib(s) you want to modify and select the **RESHAPE** command from the Modeling menu. This allows you to edit the size, shape, or location of any of the ribs.

For more information on the **RESHAPE** command, see page 35.

Object Properties Palette

You can also edit the skin object on the Object tab of the Object Properties palette.



Click here to expand or collapse the palette.

- **Name.** This field contains the name of the Skin object, which can be edited if desired. If no name has been assigned, you can add one at any time.
- **One sided.** A check mark in this box indicates the selected Skin object is a solid, one-sided object. If no check appears in this box, the selected Skin object is a hollow, two-sided object. You can change the Skin object from solid to hollow, or vice versa, at any time.

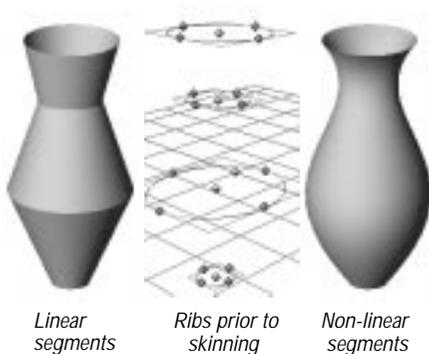
If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as *Fog* or *Mist*, the Skin object must be a solid, single-sided object.

- **Complexity slider.** The position of this slider determines the complexity, or amount of detail, with which the Skin object is rendered, either in the Modeling window or in the final image. It does NOT change the actual complexity of the object, but only the way the renderers display it.

- **Absolute checkbox** - When this box is *unchecked*, the slider indicates a relative complexity based on the maximum allowed by that renderer. The range of complexity is also affected by the size of the object and its proximity to the view plane. For example, if the Skin object appears at a substantial distance in the background, a lesser complexity level will be used.

When this box is *checked*, the *Complexity Slider* indicates the EXACT percentage of the maximum complexity allowed.

- **Linear segments.** When this box is checked, the areas between segments are flat surfaces, creating sharp angles between ribs. When this box is unchecked, the areas between segments create a smoothly curved surface.



For information on the other tabs on the Object Properties palette, see **Object Properties Palette** on page 221.

UNSKIN



The Unskin tool lets you remove the skin between any two ribs.

Select the Unskin tool, then select the segment from which you want to remove the skin. When you select the segment, it appears highlighted. When you release the mouse button, the skin disappears.

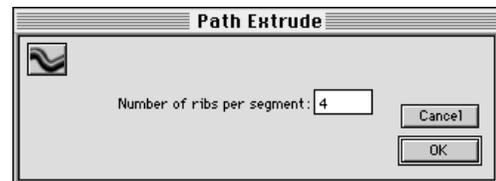
PATH EXTRUDE



The Path Extrude tool allows you to extrude a 2-D object along a pre-designated path to create a 3-D shape.

TOOL SETTINGS

You can change the default behavior of this tool. To access the Tool Settings dialog, double-click on the Path Extrude tool.



- **Number of ribs per segment.** When an object is created with this tool, ribs are placed between the control points along the path. You can specify the default number of ribs that are placed between these points.

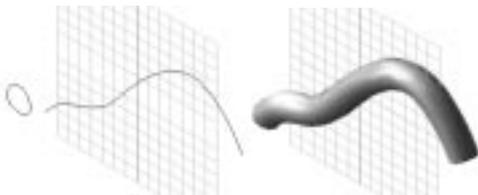
TOOL FUNCTION

Use any single 2-D object as a template for the extrusion. It can be filled or hollow, open or closed. The Path Extrude tool cannot be used with grouped objects.

Draw or import a Bézier line to use as a path for the extrusion. The direction the line is drawn determines the direction the object moves along the path, from its beginning point to its ending point. The template is always extruded perpendicular to the path.

You can animate the path and/or template before extruding, and all of the animation information will be retained.

To perform the extrusion, drag the template to the path. When you release the mouse button, the extrusion occurs along the path.

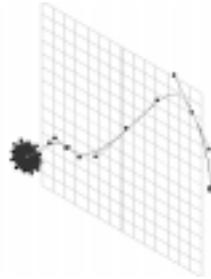


Always select the template first, then the path. The order of selection is extremely important.

EDITING A PATH EXTRUDE OBJECT

To edit either the path or the template of an object created with the Path Extrude

tool, select the **RESHAPE** command in the Modeling menu.



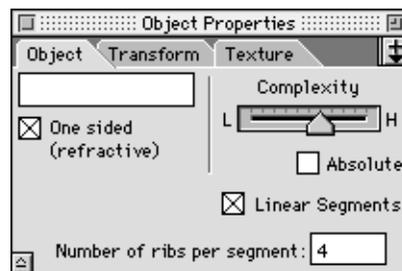
When you select this command, direction handles appear on the control points of both the template and the path, and you can edit either 2-D object as desired.

For more information, see **Reshape** on page 35.

If you want to push or pull individual vertices on the final Path Extrude object, you must convert it to a mesh. See **Convert** on page 45 for more information.

Object Properties Palette

You can also edit the selected Path Extrude object on the Object tab of the Object Properties palette.



Click here to expand or collapse the palette.

- **Name.** This field contains the name of the selected Path Extrude object, which can be edited if desired.
- **One sided.** A check mark in this box indicates the selected Path Extrude object is a solid, one-sided object. If no check appears in this box, the selected object is a hollow, two-sided object. You can change the Path Extrude object from solid to hollow, or vice versa, at any time.

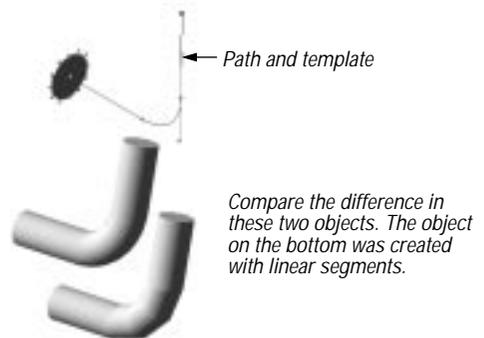
If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as *Fog* or *Mist*, the Path Extrude object must be a solid, single-sided object.

- **Complexity slider.** The position of this slider determines the complexity, or amount of detail, with which the Path Extrude object is rendered, either in the Modeling window or in the final image. It does NOT change the actual complexity of the object, but only the way the renderers display it.
- **Absolute checkbox** - When this box is *unchecked*, the slider indicates a relative complexity based on the maximum allowed by that renderer. The range of complexity is also affected by the size of the object and its proximity to the view plane. For example, if the Path Extrude object appears at a substantial

distance in the background, a lesser complexity level will be used.

When this box is *checked*, the *Complexity Slider* indicates the EXACT percentage of the maximum complexity allowed.

- **Linear segments.** When this box is checked, the areas between segments contain flat surfaces, creating a ridge-like appearance. When this box is unchecked, the areas between segments create a smoothly curved surface.

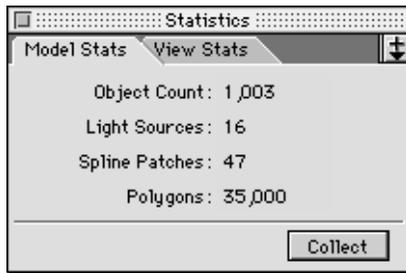


- **Number of ribs per segment.** This field indicates the number of ribs placed between each segment.

For information on the other tabs on the Object Properties palette, see **Object Properties Palette** on page 221.

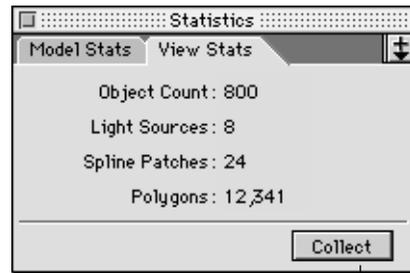


Model Statistics



Plus menu

View Statistics



Update statistics

The Statistics palette displays important information about the active model. This information includes the number of objects, light sources, spline patches, and polygons. This information is helpful when you're trying to determine the amount of RAM you need to successfully render the images in your model.

This palette floats above all model windows and can be positioned anywhere on the screen. To move it, simply drag it by its move bar. Its hide/show status is retained between sessions, so if it is open when you quit the application, it will be open when you launch StudioPro the next time.

Select the **SHOW STATISTICS PALETTE** command from the Windows menu to display the Statistics palette. To close the palette, select **HIDE STATISTICS PALETTE** from the menu. You can also close the palette by clicking the close button.

This palette contains two tabs. When the *Model Statistics* tab is active, the informa-

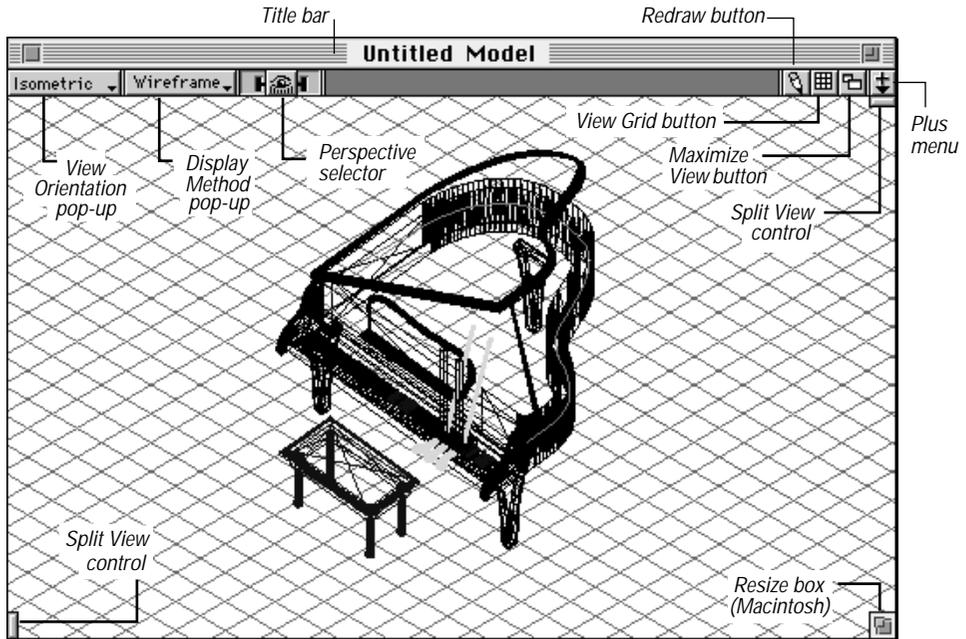
tion displayed relates to the entire model. When the *View Statistics* tab is active, the same information is displayed, but it relates to the active view only.

Click the *Collect* button to update the data contained on this palette. The information does not continually update.

You can collapse the palette to display the tabs only by double-clicking on a folder tab or by selecting the **COLLAPSE PALETTE** command from the Plus menu. This allows you to free up valuable screen space while leaving the palette readily available for reference purposes, when needed.



Once collapsed, you can expand it again by double-clicking on either tab or by selecting **EXPAND PALETTE** from the Plus menu.



The Modeling window is the most commonly used window in StudioPro. It contains the standard interface elements, as well as some specialized controls to adjust the way objects are displayed.

You can resize the Modeling window and position it anywhere on the screen. It contains one or more views of the model's three-dimensional space. The space occupied by the model is unlimited in size.

When you select the **NEW** command from the File menu, a Modeling window opens for the new model. The **OPEN** command in the File menu opens the model with the

same Modeling windows that were open at the time the file was last saved.

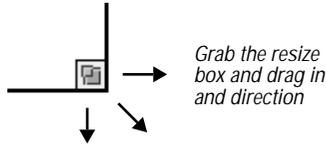
MODELING WINDOW CONTROLS

The Modeling window provides controls that allow you to customize the way you view your model.

The size of a Modeling window is completely adjustable. Resizing the Modeling window simply enlarges, or magnifies, the view. It does not enlarge the modeling space.

To resize the Modeling window:

Macintosh: Use the Resize control in the lower right corner of the window.



Windows: Place the cursor over any edge or corner of the window and drag to resize.



To expand the Modeling window to fill the available screen space:

Macintosh: Click the zoom box.



Click the zoom box again to reduce it back to its original size.

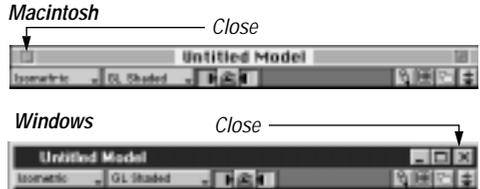
Windows: Click the Maximize button.



Then, to restore the previous window size, click the button again.

- **Title Bar.** You can reposition the Modeling window anywhere on your desktop by grabbing the title bar and dragging it to another location.

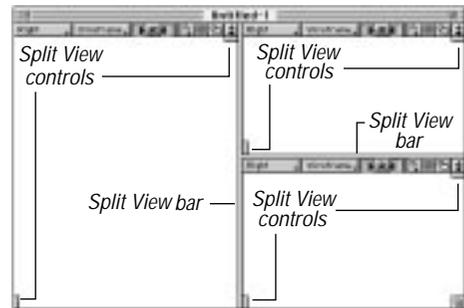
- **Close button.** To close the Modeling window, click the close button in the title bar. This is the same as selecting the **CLOSE** command from the File menu.



At least one window must remain open for a model to remain open. Closing the last window of a model closes the model as well.

In addition to the standard controls described above, each view contains its own set of specialized controls. The settings within each view are independent of any other views.

- **Split View control and Split View bar.** You can split the window into multiple view panes by grabbing a *Split View Control* and dragging it to the desired size.



The Tab key allows you to cycle through all of the views in the window.

The Shift+Tab keys allow you to cycle through the views in reverse order.

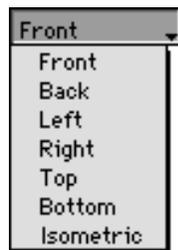
To resize the view pane, drag the *Split View Bar* to the desired position.

You can also split the active view in half by double-clicking on one of the *Split View Controls*. If the size of the active view is too small to split, the system beep sounds. Selecting the **SPLIT VIEW** command from the Plus menu also splits the active view into half.

Each view pane has its own set of controls, allowing you to view your model from several different angles at once. You can also specify a different display method for each view.

To delete a view pane, drag its split bar to the edge of the window, or select the **DELETE VIEW** command from the Plus menu.

- **View Orientation.** A pop-up menu is provided that lets you choose the direction that you want to display your model from. You can choose from seven different preset positions.



If you customize the view by rotating it with the View Move tool, *Custom* appears in the view title area. To return again to a preset position, simply select one of the view orientation titles.

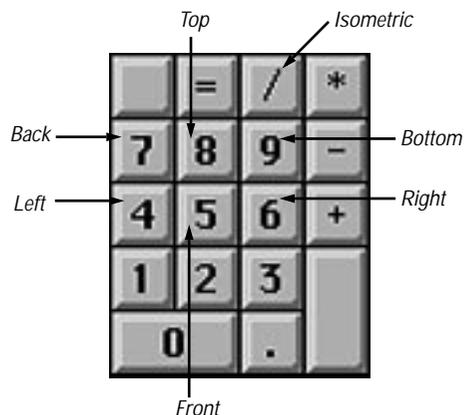
Hotkeys are provided that allow you to easily switch the view orientation of

the active view in the Modeling window.

View Orientation Hotkey

Left	4
Front	5
Right	6
Back	7
Top	8
Bottom	9
Isometric	/

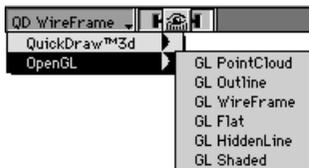
The position of the numbers on the numeric keypad correspond to the relative view orientation position. (The 1, 2, and 3 keys are already reserved for the Object Move, Rotate, and Scale tools.)



You can also use the **Option + Tab** keys (Macintosh) or **Alt + Tab** keys (Windows) to cycle through the various orientations within the active view.

The **Shift + Option + Tab** keys (Macintosh) or **Shift + Alt + Tab** keys (Windows) allow you to cycle through the view orientations in reverse order.

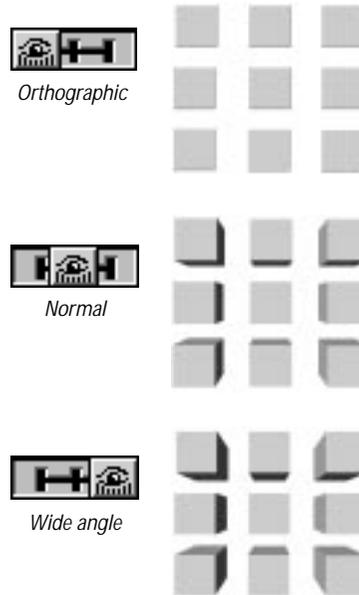
- **Display Method.** A list of the available display methods appears in this pop-up list. (Renderers enabled in the *Display Method* pop-up on the Windows tab of the Preferences dialog appear in this pop-up. For more information, see page 26.) If more than one type of renderer is enabled, the renderer types appears in this menu, and the rendering choices appear in a pop-out sub-menu.



- **Perspective selector.** You can choose to display the view in orthographic (no perspective), normal perspective, or wide angle perspective.

Views without perspective display the model in an orthographic projection. Parallel lines of objects in the model appear parallel in the view. The objects

always appear their true size relative to one another.



Perspective adds the element of depth to views. Objects closer to the view plane appear larger than those farther away. Views with perspective appear more natural, because this is the way your eye sees images in the real world.

- **Redraw button.** Clicking this  button forces StudioPro to redraw the window.

Occasionally, you will notice a “revolving beach ball” spinning in the middle of the window after you’ve performed

a specific task that requires numerous calculations be made by StudioPro.

If you select another command or perform another operation while the beach ball is spinning, or while StudioPro is still busy performing the last command, the screen may not refresh before continuing on with the next instruction. In this case, you can click the redraw button at the top of the window to force StudioPro to refresh the screen.

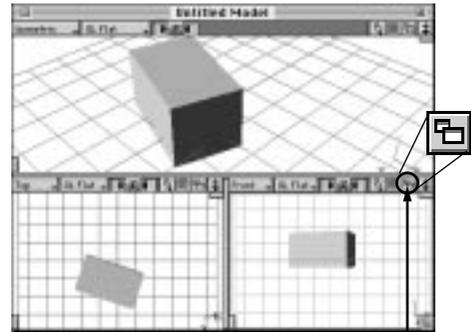
 StudioPro makes its best guess as to whether or not you may need to refresh the screen. If the redraw icon appears with a small rectangle behind the pencil, as shown, chances are good that the window needs to be refreshed. There may be times, however, when StudioPro is unable to detect a need to refresh. You can click the redraw button at any time to refresh the screen.

- **View Grid button.** Each view contains a *View Grid* button. Unlike other grids in StudioPro, these grids are view-relative, so they track when you move in the window.

View grids are drawn parallel to the view plane with a coordinate system of 0,0,0. See **Grids** on page 250.

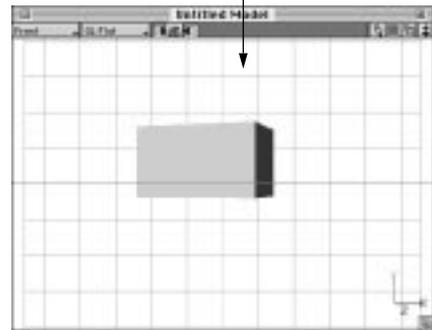
- **Maximize View button.** If you have split your Modeling window into more than one view, this button tog-

gles between split views and a large (maximized) single view.



Click this button

to maximize this view to a larger, single view



Then, to return to the window's previous state (back to split views), click the button again.

NOTE: Don't confuse this button with the *Maximize* button on the title bar (Windows only). This button doesn't change the size of the Modeling window; it just toggles between split views and single views.

GRIDS

Grids allow you to more accurately create and position the objects in your model. StudioPro has three different types of grids to use in your modeling: World grids, User-defined grids, and View grids. Each one provides a special purpose.

All modeling takes place on the active grid only. However, you can change grids at any time, even in the middle of drawing or inserting an object in your model.

Only one grid can be active in a view at a time. The inactive grids are dimmed.

To hide the grids, select the **HIDE GRIDS** command from the Edit menu. When this command is enabled, the View grid becomes the active grid, even though it is hidden. When the grids are hidden, a check appears beside the **HIDE GRIDS** command in the menu.

To display the grids, select the **HIDE GRIDS** command again. The grid that was active when you chose the command becomes the active grid again, and the check is removed from beside the command name in the menu.

World Grids

There are three World grids to use for modeling in 3-D space. Each appears a different color; the Z grid is tan, the Y grid is blue, and the X grid is purple.

By default, each new model opens with the Y grid as the default grid. This grid appears blue. The center of the grid represents 0,0,0 in 3-D space. You can change the default grid in the Preferences dialog.

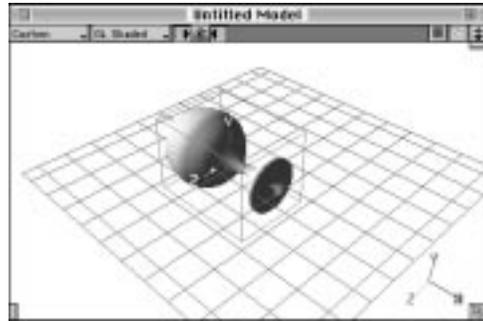
See **Preferences** on page 23 for more information.

World grids are displayed at a specific size, but they are actually infinite in size. The **SET UNITS** command determines the units and subdivisions used for World grids. See **Set Units** on page 20.

Tridents

Tridents provide a visual indication of the orientation of grids and objects in your model.

You can display world tridents and/or object tridents by enabling these options on the *Windows* tab of the Preferences dialog.



Tridents make it much easier to keep track of an object's orientation in the Modeling window. This option is especially useful when using the Transform tab of the Object Properties palette to move, scale, or rotate objects.

It's much easier to change grids because you only need to glance at the world tridents in the lower right corner of the window to determine which grid you want to switch to.

For more information about this option, see page 29.

Switching Grids

The following hotkeys are provided for selecting any of the three World grids:

- **X key** selects the grid perpendicular to the X axis. It appears purple in the Modeling window.
- **Y key** selects the grid perpendicular to the Y axis. It appears blue.
- **Z key** selects the grid perpendicular to the Z axis. It appears a tan color.

In addition to the X, Y, and Z hotkeys, you can also use the plus (+) or minus (-) keys to cycle forward or backward through all world and User-defined grids.

NOTE: You should note that ALL modeling occurs on the active grid. Therefore, if the active grid appears edge-on, or nearly edge-on, you may want to switch to a different grid.

Also, be cautious when moving objects in a NEARLY edge-on orientation to the active grid. When moving objects in this orientation, what appears to be a very short distance may actually be an extremely long distance. You may want to change the view orientation before moving objects to achieve more predictable results.

The area below the Button bar provides feedback to indicate when you're modeling in an edge-on orientation to the active grid.

Automatically Switching Grids

If the *Auto grid* option in the Preferences dialog is enabled, any time you switch

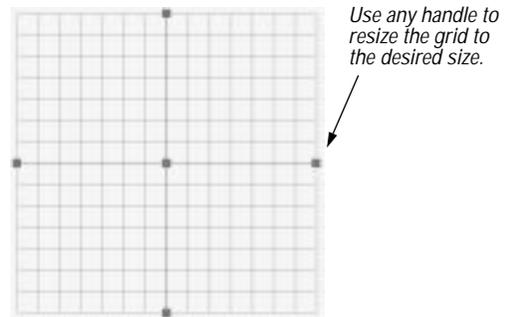
views, the face-on grid automatically becomes the active grid. If you switch to a top, bottom, or isometric view, the Y grid becomes the active grid. If you switch to a front or back view, the Z grid becomes the active grid. And if you switch to a right or left view, the X grid becomes active.

Using this option greatly reduces the possibility of accidentally modeling edge-on to the active grid.

For more information, see page 30.

Resizing World Grids

To resize a World grid, select the Grid tool from the Tool palette. You can increase or decrease the visible portion of the World grids, but they can't be rotated or moved.



Grab a side handle and drag to resize it. You can only size the *visible* portion of the grid; it is actually infinite in size.

View Grids

Unlike other grids in StudioPro, these grids are view-relative, so they track when you move in the window. View grids fill

the entire modeling view; they cannot be resized.

Each view in the Modeling window contains a *View Grid* button. Clicking the button inserts a grid in the active view.



Clicking the button again returns to the grid that was last active.

You can select the *Use View Grids Always* option in the Preferences dialog if you prefer. For more information on this option, see **Preferences** on page 23.

When you select the **HIDE GRIDS** command from the Edit menu, the View grid becomes the active grid, even though this grid is also hidden. All modeling is done relative to the active view.

View grids are drawn parallel to the view plane. They appear gray in color.

User-defined Grids

You can create your own grids with the Grid tool. User-defined grids appear orange. They are initially attached directly to an object, but they can be positioned anywhere in your model.

Like all grids in StudioPro, User-defined grids are infinite in size, but you can resize the visible portion of the grid. You can also rotate, tilt, or move User-defined grids.

You can cycle forward or backward through the User-defined grids with the **Option-Plus** or **Option-Minus** keys (Macintosh) or the **Alt-Plus** or **Alt-Minus** keys

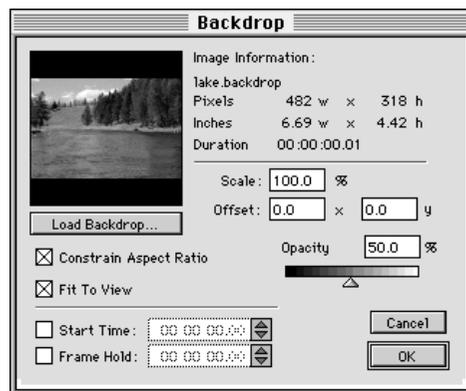
(Windows). To cycle through both the User-defined grids AND World grids, use only the plus (+) or minus (-) keys (without the **Option** or **Alt** key).

For more information on User-defined grids, see **Grid tool** on page 145.

BACKDROPS

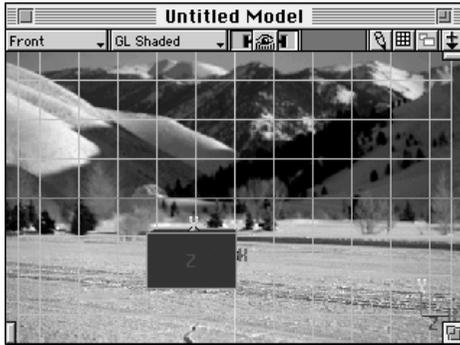
StudioPro allows you to place an image or animation in the Modeling window to assist you in the modeling process. (This feature is only available if the interactive renderer you're using is capable of displaying backdrops.)

Backdrops are accessed through the Plus menu in any view of the Modeling window. Selecting the **SET BACKDROP** command displays a dialog that lets you adjust the size, aspect ratio, opacity, and frame number (if the file is an animation).

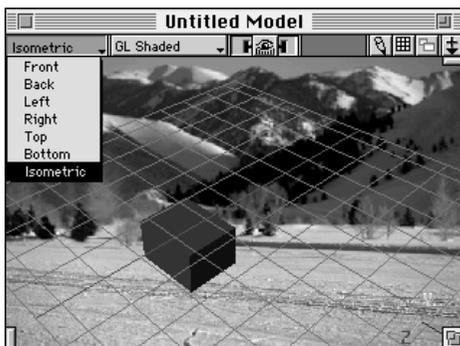


Backdrops are provided for modeling purposes only; they do not appear in rendered images. The image is placed at the back of the Modeling window, and

remains in a fixed position relative to the view plane.



If you change the viewing orientation, or rotate or move the view with one of the view manipulation tools, the backdrop still remains in the same position relative to the view plane.

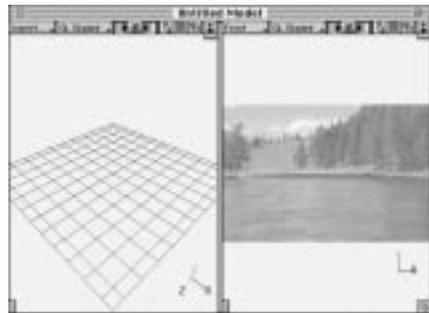


Backdrops are explained fully in the Camera window section of this manual. See **Backdrops** on page 283 for complete details.

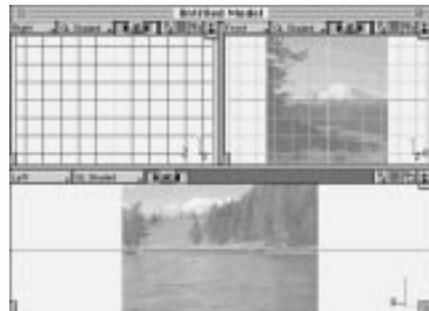
If both the *Constrain Aspect Ratio* and *Fit to View* options are enabled in the Backdrop dialog, the window resizes to fit the size of the image. The aspect ratio of the image is maintained, even if the window is later resized.

In most cases, using a backdrop in the Modeling window is the same as using one in a Camera window. There are a few exceptions, however:

- Camera windows can't be split, but Modeling windows can. If both the *Constrain Aspect Ratio* and *Fit to View* options are enabled, the size of the view doesn't change to fit the backdrop when views are split.



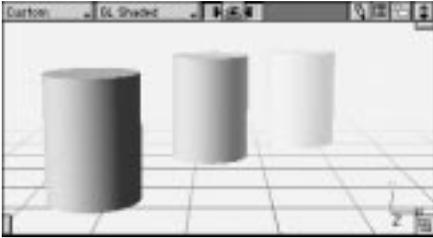
- Each view in the Modeling window can have its own backdrop.



Commands are provided in the Plus menu that allow you to hide or remove the backdrop from any view.

DEPTH CUEING

Depth cueing provides a visual indication of the distance of an object from the view plane. Objects farther away from the view plane appear less visible than objects closer to it.



This effect can be seen in the Modeling, Camera, or Spotlight windows, but it doesn't appear in rendered images.

You can enable *Depth Cueing* on the *Windows* tab of the Preferences dialog. See page 29 for details. (This option is only available if the interactive renderer you're using supports depth cueing.)

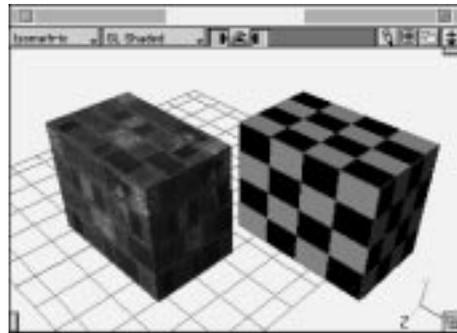
TEXTURE DISPLAY

If you're using an interactive renderer capable of displaying textures in the Modeling window, this option allows you to see surface textures that have been applied to objects in your model. (You must also have the *Show Textures* option enabled in the Preferences dialog. For details, see **Show Textures** on page 28.)

Textures appear on objects in the Modeling window when the Display Method is *Shaded* or *Flat*. Textures also appear on objects displayed in *HiddenLine*, but only if the *Shade HiddenLine* option is enabled in

Preferences (Windows tab). In any other display mode, the texture is represented by a single color.

If all of the textures applied to an object use UV mapping, a composite of all the textures appears on the object in the Modeling window. (Remember, only surface textures use a mapping type, so all of the textures must *also* be surface textures.) If any of the textures use any mapping style other than UV, then only the top texture is displayed.



If the top texture is a surface texture, the texture's surface map, along with the diffuse color, are displayed on the object. If the top texture is a *Solid* texture (wood, stone, or marble) or a *Simple Color* texture, the object appears as a single color.

Only surface textures are displayed; solid textures (marble, stone, wood) appear as a single color. However, you can make a surface texture that resembles wood or marble by using a map that looks like wood or marble, so you may not be able to determine the type of texture by merely looking at the preview on the Resource palette. If you're not sure if the texture is a surface texture or a solid texture, open its

texture editing dialog. If it says *Wood*, *Stone*, or *Marble* at the top of the dialog, it's a solid texture. If it says *Surface Texture* at the top, then it's a surface texture, and you'll be able to see the texture map on objects that this texture has been applied to.

Plus Menu

The Plus menu is located in the upper right corner of each view. It contains entries that are context-sensitive.



The following commands appear in the Modeling window's Plus menu.

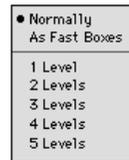
NEW WINDOW FROM VIEW. This command opens a new window with the same configuration as the view.

NEW CAMERA FROM VIEW. This command inserts a new camera in your model. The view is what's seen in the camera's window.

SPLIT VIEW. This command splits the view in half vertically or horizontally, depending on which dimension is larger. It is the same as double-clicking on either of the Split Bars in the Modeling window.

REMOVE VIEW. This command removes the view from the Modeling window.

DISPLAY OBJECTS. This command lets you set the level of detail displayed in the view. The submenu allows you to choose the display detail. The higher the level, the less detail displayed in the window.



A bullet (•) next to the menu entry indicates the current level of detail display.

The *Normally* setting displays all objects in the model in full detail. Use this setting to see exactly how each object appears.

If your model is so complex that the redraw times begin to take an extra long time, you can choose to display the objects as fast boxes. Fast boxes are essentially bounding boxes that represent the size and proportions of each object. This reduces the amount of time required for the redraw.

Each level setting moves the point at which fast boxes appear further down the hierarchical structure. If you choose *1 Level*, objects in the model appear normal, but shapes in the model appear as fast boxes; *2 Level*, first level shapes display normally, but any second level shapes display as fast boxes; and so on. The level you choose should depend on how interested you are in viewing subparts of shapes.

This command doesn't affect renderings in any way. If you're using fast boxes for displaying objects in the Modeling windows, they will still render the scene in full detail.

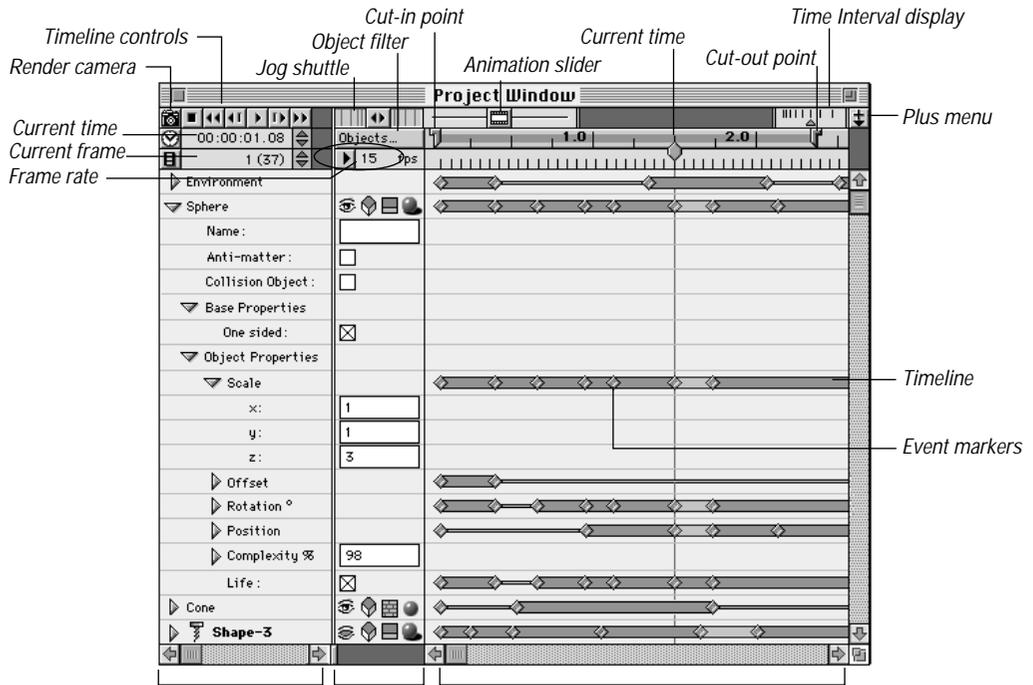
SET BACKDROP. This command allows you to put a backdrop in the Modeling window to use for modeling purposes. The backdrop doesn't appear in renderings.

SHOW/HIDE BACKDROP. Use this command to show or hide the backdrop in the

Modeling window. The command name toggles between Show and Hide, depending on the backdrop's current hide/show status.

REMOVE BACKDROP. Use this command to remove the backdrop from the model.

RENDER. Use this command to open the Render dialog and begin the rendering process. This is the same as the **RENDER** command in the Rendering menu. *See Render on page 57* for complete details.



This part of the Project window contains a list of all the objects and their properties.

The fields in this section allow you to edit the properties.

This section contains all of the animation information for the objects in your model.

The Project window provides another means of controlling the objects in your model. You can do many of the same things in the Project window that can be done in the Modeling window. You can edit, select, position and scale objects, control animations, etc.

The Project window is also another method of displaying the data contained in the active window. If a Shapes window is active, the Project window contains only information about the contents of that Shape window. If the Modeling window is active, the contents of that window are reflected in the Project window.

PROJECT WINDOW CONTROLS

All of the controls you need to create an animation are located in the Project window. Objects, light sources, and cameras can all be animated.

Normally, the Project window floats in front of the Modeling window only when it's the active window, and the palettes always float above the Project window. However, a command is provided in the Plus menu to change this behavior, and make it float above the Modeling window at all times.

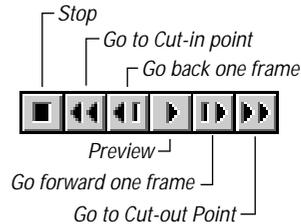
This window contains the standard controls found on all desktop windows, including a title bar, close box, resize control, scroll bars, etc.

You can size and position the Project window any way you like. The resize control works both horizontally and vertically. Notice there are two separate scroll bars at the bottom of the window. You can scroll horizontally through each section separately.

The upper section of the window contains controls for creating and previewing your animations.

 **Rendering tool** lets you render your animation directly from the Project window. When you click this button, the Render dialog appears. This is the same as selecting the **RENDER** command from the Rendering menu. See **Render** on page 57 for more information about this command.

Timeline controls allow you to move around in your animation, or preview any part of the animation.



When you click one of these buttons, the *Current Time* pointer repositions itself to the location indicated by the button.

If you hold down the **Option** key (Macintosh) or the **Alt** key (Windows) while clicking the *Forward Frame* or *Backward Frame* buttons, you will move forward or backward one **SECOND** at a time, instead of one **FRAME** at a time.

Jog shuttle moves the animation forward or backward from your current position.



Dragging the Jog Shuttle slider slightly to the left displays frames before the current frame. Dragging it to the right displays frames after the current frame. Moving the shuttle closer to the center moves the animation more slowly; moving the shuttle further from the center moves the animation faster.

Animation slider allows you to move to a specific position relative to the Cut-in and Cut-out points.

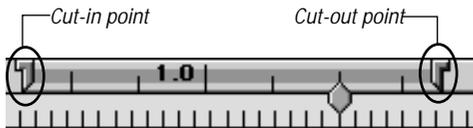


Moving the slider all the way to the left displays the beginning frame (Cut-in point), and dragging the slider all the way to the right displays the last frame of the animation (Cut-out point). The *Current Time* field updates to show your new position in the animation.

Time Interval display allows you to increase or decrease the number of seconds displayed in the Project window. Moving the arrow to the left displays several seconds of your animation. Moving it to the right stretches the timeline out to show only one or two seconds.



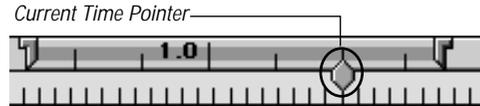
Cut-in point marks the position on the timeline where you want the rendered animation to begin. There can be animation scripted before this point, but portions of the animation that occur before the *Cut-in* point do not render.



Cut-out point marks the position on the timeline where you want the rendered animation to end. There can be animation scripted after the cut-out point, but any part of the animation that occurs after the *Cut-out* point does not render.

Current Time pointer marks the position of the current time. Notice that the Modeling window also updates to display the model as it appears at this point in time.

Drag the pointer to the desired position with the cursor or adjust it with the *Timeline* controls.



Current time displays the position of the current time marker on the animation timeline. The time is displayed in SMPTE (Society for Motion Picture and Television Engineers) time code.



Frames are numbered according to the actual time it takes to reach that point from the first frame.

If you change the value in this field, the *Current Time* pointer moves along the timeline to the specified time. You can change the time by using the spinner controls to the right of the time code. You can also change the current time in this field by entering a new time directly from the keyboard.

Object filter allows you to specify the types of objects that are listed in the Project window. This lets you reduce the number of entries in the Project window, helping you manage complex models.

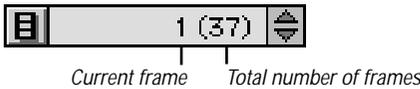


When you click this button, a dialog is displayed.



You can choose to display all of the objects in your model, or only specific object types.

Current frame displays the frame number at the position of the current time marker.



There are several ways to move to a different frame:

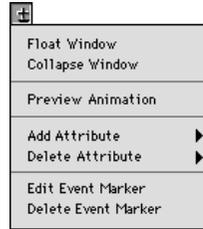
- Use the *Timeline* control buttons to move forward or back any number of frames.
- Manually drag the *Current Time* pointer to another frame.
- Use the spinner controls to move forward or backwards to other frames.
- Enter the number of the frame you want to move to in the *Current Frame* field.
- Hold down the **Command** key (Macintosh) or **Ctrl** key (Windows) and click on a timeline. The *Current Time* pointer moves to the position where you click.

 **Frame Rate field** displays the current frame rate setting. You can enter a value in this field, or select one from the *Frame Rate*

pop-up list. This list contains several of the most commonly-used frame rates.

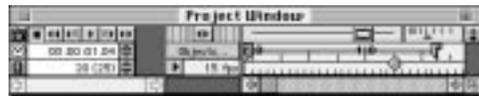
Plus Menu

The Plus menu contains commands that apply to the Project window.



FLOAT WINDOW. This command makes the Project window float above the Modeling window, even when the Modeling window is the active window. The Project window also floats above the palettes when it's the active window.

COLLAPSE WINDOW. This command collapses the Project window to display only the controls at the top of the window. This allows you to free up valuable screen space, but still have access to the *Cut-in* and *Cut-out* points, *Current Time* pointer and other controls.



PREVIEW ANIMATION. This command lets you preview the animation in the Modeling window. It is the same as clicking the *Preview* button in the Timeline controls.

ADD ATTRIBUTE. This command allows you to add an additional attribute to the selected object in the Project window. Select an attribute from the command's pop-up menu.

- *Life* - This option adds a *Life* attribute to the object. It appears in the Project window hierarchy, under *Object Properties* of the selected object. You can then specify whether or not the object exists at that moment in time on the animation timeline. See **Life** on page 275 for details.
- *URL* - This option adds a *URL* address field to the selected object in the Project window. The address appears as a property of the object in the Project window. See **URL Address** on page 275.
- *Cycle* - This option allows you to repeat an animation sequence or instantaneously jump forward in time. For more information, see **Cycle** on page 275.

DELETE ATTRIBUTE. To delete an existing attribute from the selected object, select it from this command's submenu.

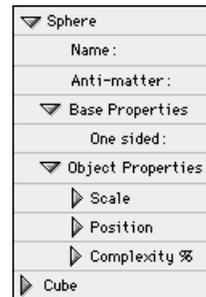
EDIT EVENT MARKER. This command lets you precisely position the selected marker on the timeline. If the marker also represents an object's motion, it allows you to control the motion on the animation path. For complete information, see **Editing Event Markers** on page 267.

DELETE EVENT MARKER. This command allows you to delete the selected marker from the timeline.

OBJECTS & PROPERTIES

The first two sections of the Project window contain a list of all the objects in your model, as well as editable fields that allow you to change any of these objects' properties.

OBJECT LIST

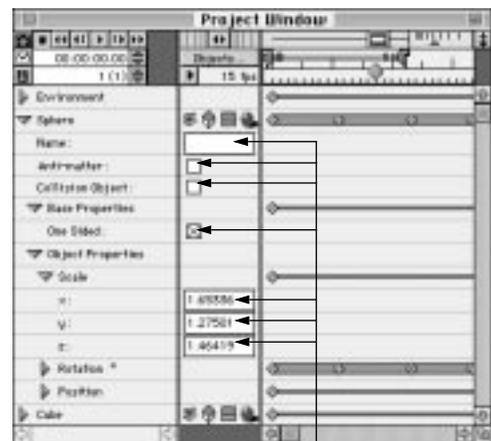


All of the objects in your model appear in this hierarchical list, including cameras and light sources. You can select objects in your model from this section of the Project window. When you select an object here, it becomes selected in

the Modeling window, and vice versa. To select multiple objects, hold down the Shift key as you click the objects.

EDIT FIELDS

Any of the data in the entry fields can be edited. You can also change the status of any of the checkboxes.



Edit fields

These icons appear in the middle section of the Project window, directly across from each object. They allow you to control the way the object is displayed in either the

Modeling window or in the rendered image.



 **Hide/Show** icon is used to hide or show the object in BOTH the Modeling window and the rendering. Click the icon to toggle between states.

 **Display method** icon determines how the object appears in the Modeling window. You can display the object according to the display method selected in the Modeling window, or as a wireframe bounding box. This setting overrides the display method selected in the Modeling window. Click the icon to toggle between display methods.

Shy icon determines whether or not the object appears in the Modeling window and/or in the rendering. Each time you click the icon, it cycles through the various states.

-  Display in Modeling window and rendering.
-  Appears in rendering but not in Modeling window.
-  Display in Modeling window, but don't render. This option is used mainly for construction geometry.

Shadow icon determines whether or not the object renders with shadows.

-  Force shadows on this object, even if disabled elsewhere - overrides other settings.
-  Suppress shadows on this object.
-  Don't override settings elsewhere.

The *Force Shadows* and *Suppress Shadows* icons override any other settings. However, even when the *Force Shadows* icon is selected, shadows only appear if the rendering algorithm used is capable of rendering shadows. Click the *Shadow* icon to cycle through the various states.

Object Information

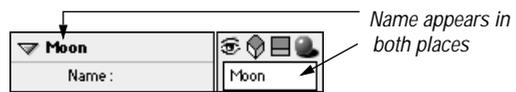
A right arrow (triangle) next to the object name (or object *Type*, if unnamed) indicates that more information is available. Click the triangle to open it; information about the object is displayed.

Naming an object

If the object has not been named, its object type appears in the Object list.



If the object has been named, it appears in the Object list by that name. You can add a name or change the existing name in the Project window or on the Object Properties palette.



If an object has been assigned a name, its name appears in **bold** type. This includes shapes, groups, cameras, lights, etc.

Anti-Matter

Anti-matter checkbox indicates the status of the object. However, for anti-matter to

have any effect, it **MUST** be created as a one-sided object.



When this box is checked, StudioPro performs a Boolean rendering operation. Do not confuse Boolean rendering with actual Boolean operations.

When performing a Boolean rendering, StudioPro does not create the geometry which accompanies Boolean operations; it only calculates which portions of the object appear when rendered.

The *Anti-matter* object itself will not render, nor will any portion of other objects that it overlaps. This rendering effect *appears* the same as an actual Boolean Subtract operation.

If two *Anti-matter* objects overlap, the overlapping portions will render. **ONLY** the overlapping portions render; all other portions of the anti-matter objects will not be visible when rendered. This rendering effect *appears* the same as an actual Boolean Intersect modeling operation.

Collision Detection of Particles

This feature enables the object to detect particles such as those generated by a Fountain effect. Then, whenever a particle encounters this object, the particle bounces off its surface.

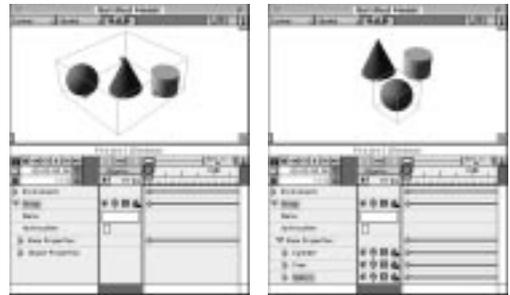


If this box is not checked, particles pass through the object.

Base Properties

Items appearing in this list include things such as: *One-sided*, *End caps*, or *Filled* checkboxes, *Corner radius* or *Inner Radius* (2-D objects), *Radius of Influence* (Meta-balls), etc.

It is important to note that if the *Base Properties* of a group or shape is "open" (turned down), the individual components of the group or shape can be individually selected and manipulated.



Base Properties "closed"

Base Properties "open"

Compare the bounding boxes.

This can be an extremely useful feature and makes editing much easier, without the necessity of ungrouping first. But be sure to close the *Base Properties* when you're finished editing, or you may end up editing the components of the group unintentionally.

Object Properties

You can also edit any of the Object Properties of an object. These include items such as: *Scale*, *Rotation*, *Position*, *Offset*, *Link nodes*, *Cycle attributes*, *Complexity*, etc.

Only properties that apply to the object appear in the *Base Properties* or *Object Properties* fields. For example, if the origin

point of an object has never been moved, *Offset* will not appear under the Object Properties. Once you move the origin point, however, the *Offset* entry is added, and the object's position, relative to the origin point, appears here.

ANIMATION & TIMELINES

This section of the Project window is used for scripting animations. Animations are simply actions that are scripted to take place over time.

ANIMATION BASICS

Normally, we think of animation as the motion of an object. But animation can be *anything* that changes over time.

You can render animation sequences from any view. The active view determines the viewing position; it can be a view from the Modeling window, or from a Camera or Spotlight window.

To add camera motion to an animation, insert a camera in the model and animate the camera just as you would any other object in your model. Then, render the animation from that camera's window. The viewing position of the animation will change as the camera moves.

The following actions are examples of properties that can be scripted to occur over time:

- **Position.** You can move an object from one location to another over time. The speed is determined by the distance it travels and the time given for it to move.

- **Rotation.** You can rotate an object on any axis or combination of axes over time. The speed of the rotation is determined by the angle specified between event markers and the time given for the rotation.
- **Scale.** You can change the size of the object over time, causing the object to "grow" or "shrink" over time.
- **Life.** The *Life* checkbox allows you to specify whether or not the object exists in the model at any given time. By changing the status of this checkbox, an object can appear and disappear at any time during the course of an animation.
- **Reshape.** You can reshape an object at different time intervals so that its shape changes over time.
- **Texture.** You can change the texture of an object over time. It can be changed as often as you wish. You can also use an animation file in a texture definition.

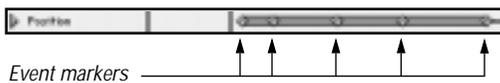
You can modify the texture itself to change over time. The Texture Editing dialog provides an *Edit At* field that allows you to define how the texture appears at any given point in time.
- **Effects.** Effects can also be edited so that changes occur at different times. The Effects dialogs all provide an *Edit At* field that allows you to define the parameters of the effect at any given time.
- **Camera focal length.** You can change the Camera window's focal length over time, as well as all its other parameters.
- **Light intensity.** The intensity of light sources can be changed over time. This

includes global lights as well as spotlights and point lights.

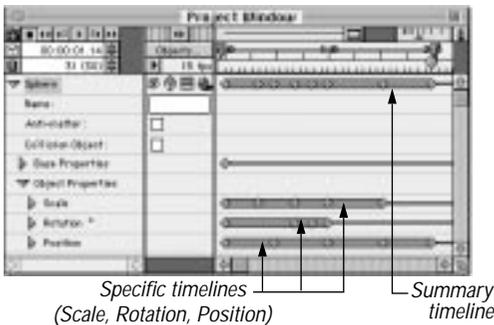
- **Background.** You can change the background environment over time by loading an animation to “play” as a background in your model.

THE TIMELINE

Animation Timeline represents any animation that is associated with the object. If any of the properties of an object are capable of changing over time, an associated timeline appears next to the property name in the *Animation* section of the window.



Event markers are used to script the animation paths of objects, light sources, or cameras in a model. They are created as objects are positioned, rotated, scaled, or given textures. Event markers are also created for light sources as they are positioned, rotated, and adjusted for illumination intensity, and when gels are applied to them.



The **SUMMARY** timeline is a composite of ALL of the object's event markers.

You can **Option-click** or **Alt-click** on the **SPECIFIC** timeline to add an event marker.

Event markers can be added to a *specific* timeline by **Option-clicking** (Macintosh) or **Alt-clicking** (Windows) the position on the timeline (scale, rotation, etc.) where you want the new event marker placed.

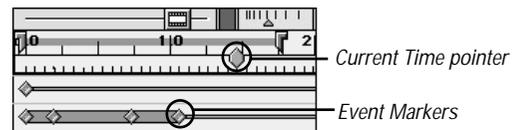
NOTE: You cannot add an event marker to an object's summary, or composite, timeline; but only to its specific timeline (position, scale, texture, etc.).

WORKING WITH EVENT MARKERS

StudioPro uses “event markers” for generating a series of frames to make an animation. Then, based on the spacing of the event markers and the number of frames per second, StudioPro calculates how each in-between frame should render to achieve a fluid motion. Calculating the in-between frames is called “tweening.” The more frames per second, the smoother the animation, but the longer it takes to render.

Creating Event Markers

You can control an object's position, size, texture, etc. at different times during the animation sequence by adjusting the position of the *Current Time* pointer in the Project window, then changing the object's position, scale, texture, etc., in either the Modeling window or the Project window, as desired. An event marker appears on the timeline, indicating that a change has taken place.



At least two event markers at different points along the timeline are required for animation. There is no limit to the number of event markers you may use, as long as there is sufficient memory available.

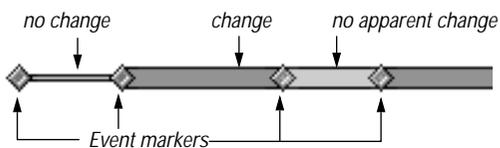
Adding Event Markers

You can add a new event marker by simply **Option-clicking** (Macintosh) or **Alt-clicking** (Windows) the position on the specific timeline where you want an event marker placed. (Hold down the **Option** key (Macintosh) or **Alt** key (Windows), then click on the timeline.)

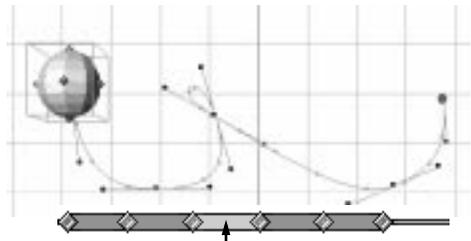
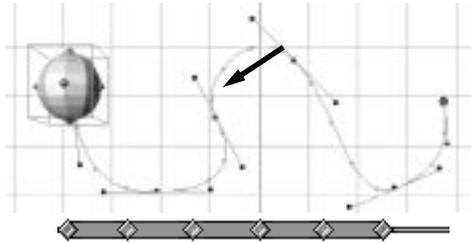
For example, if you want to ensure that the object maintains its position at the current time, hold down the **Option** key (Macintosh) or **Alt** key (Windows), then click on the *Position* timeline. An event marker is placed at the exact location on the *Position* timeline where you click, marking the object's current position.

This feature allows you to generate an “anchor” event marker, allowing the object to make a sudden change later in time. Anchor-type event markers are used to keep later event markers from causing the object to change before you want it to.

The appearance of the timeline indicates whether or not any changes take place between event markers. Any changes that are not apparent are indicated by a lighter color on the timeline.



For example, an object's motion is determined by its animation path. In most cases, it is apparent when changes occur because each event marker indicates a new position along the path.



This indicates that a change occurs even when both markers represent identical positions in space.

An example of an unapparent change is demonstrated in the previous illustration. If you place one event marker (control point) on top of another, both markers indicate the same position in space. However, the force exerted by the direction handles still require that StudioPro interpolate the motion between event markers. This type of change is indicated on the timeline by its lighter color.

Selecting Event Markers

Event markers are selected by clicking them. Selected event markers appear red. You can select multiple event markers by holding down the Shift key while clicking

each marker icon. However, multiple selections must be from only one timeline.

When you select an event marker, it does not automatically move the *Current Time* pointer to that position on the timeline. If you hold down the **Command** key (Macintosh) or the **Ctrl** key (Windows) while clicking an event marker, the time pointer moves to that position, and all modeling views redraw to show the model at that point in time.

Deleting Event Markers

To delete an event marker, select it, then select the **DELETE EVENT MARKER** from the Plus menu on the Project window. You can also delete a selected marker with the Delete key.

Adjusting the Spacing between Event Markers

You can uniformly increase or decrease the spacing between event markers. Just select the event markers you want to adjust, then hold down the **Control** key (Macintosh), or the **Right-Mouse button** (Windows) and grab and drag any of the selected markers. All of the selected event markers maintain their relative distances between each other as they are spread out or compressed along the timeline.

Editing Event Markers

You can grab an event marker on the timeline in the Project window and drag it to a new position anywhere along its timeline. Or, you can change its position in the Event Options dialog.

The Event Options dialog

You can move an event marker to a precise position on the timeline in the Event Options dialog. Double-click the event marker on the timeline, or select the event marker, then select the **EDIT EVENT MARKER** command from the Plus menu of the Project window.



This allows you to move the event marker, along with all its associated data, to any location on the timeline. Enter the time in the entry field, or use the arrows to scroll to the time where you want the event marker placed.

Velocity control

If the event marker you select represents the motion of an object, the Event Options dialog also allows you to control the velocity of the object as it approaches and leaves each event marker.

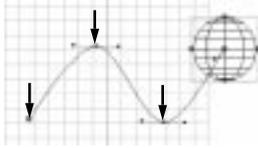
To edit the velocity of an event marker, select the marker on the *Position*, *Rotation*, or *Scale* timeline in the Project window, then select the **EDIT EVENT MARKER** command from the Project window's Plus menu. Or, you can simply double-click the event marker on the timeline.

You can also double-click the event marker (control point) on an animation path in the Modeling window to open the Event Options dialog. However, these

event markers represent the object's *Position* only.



You can edit event markers, or key frames, by double-clicking them in the Modeling window or in the Project window.



The Event Options dialog that appears allows you to control the velocity of the object as it passes through the selected marker.

Velocity window



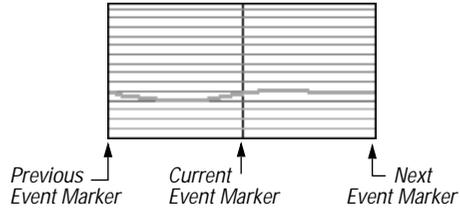
NOTE: If the path type is TCB, this dialog contains additional controls for controlling the tension, continuity, and bias of the path.

Velocity Window. The blue line in the graph represents the velocity of the object as it approaches and leaves the event marker. An object's velocity doesn't change the path of the object in any manner, but only the speed that the object travels along the path.

The vertical line in the center of the window represents the current event marker. The left side of the window represents the OUT velocity of the previous

event marker, and the right side represents the IN velocity of the next event marker.

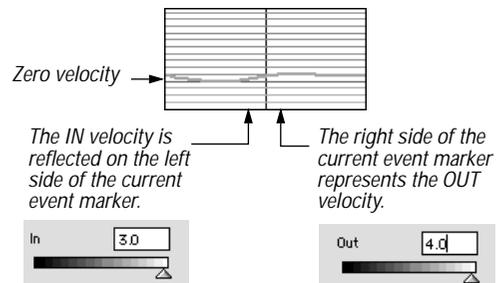
Velocity window



The values you specify for the IN and OUT velocities define the blue line that runs across the width of the graph.

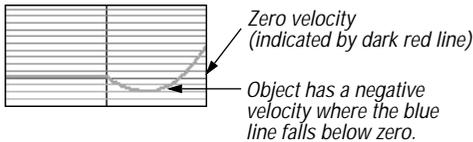
You can use the sliders to select a value for the velocity, or you can enter larger values than those allowed by the sliders, if necessary, directly in the fields above the sliders.

Notice the appearance of the blue line as you adjust the IN or OUT velocities with the sliders.



Sections of the blue line that reside on the dark red **zero velocity** line indicate time periods where the object is motionless, or actually stops moving, rotating, or scaling.

Negative Velocity. Any portion of the line falling below zero velocity represents a negative velocity.

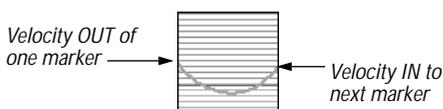


A negative velocity on the *Position* timeline causes the object to actually reverse directions and travel backwards. A negative velocity on the *Rotation* timeline causes the object to rotate in the opposite direction. And a negative velocity on the *Scale* timeline scales the object in the opposite direction.

Even though you can't enter a negative value into the IN or OUT fields, sometimes the values you enter cause parts of the velocity graph to fall below the zero velocity point.

Remember, if you change either the distance the object travels between event markers (distance) or the position of the event markers on the timeline (time), it will affect the velocity. The velocity controls are constrained by the distance and time you have already set: the object **MUST** travel the distance you have specified in the time allowed.

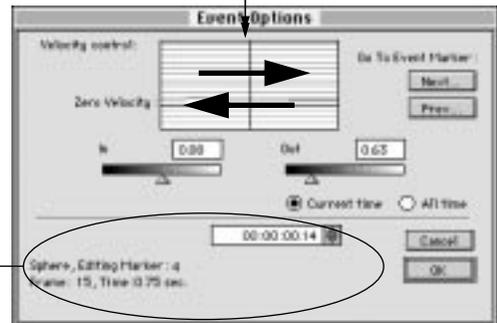
For example, if you specify a high velocity OUT of one marker and a high velocity IN to the next marker, StudioPro must compensate to prevent the object from arriving at the next marker too soon. This may cause part of the curve to fall below the zero velocity point.



If the velocity out of the first marker was maintained, the object would arrive at the second marker ahead of time. So, the velocity **MUST** decrease enough to assure the object doesn't arrive too soon – in this case, causing the velocity to fall below zero.

Editing the Velocity of Additional Event Markers. *Next* and *Previous* buttons are also provided so you can continue to select and edit adjoining markers without leaving this dialog.

Go To Event Marker:
 When you click the NEXT or PREVIOUS button, the Velocity window scrolls to reveal the next or previous event marker.



The number of the event marker being edited, as well as the time and frame number, appear at the bottom of the dialog.

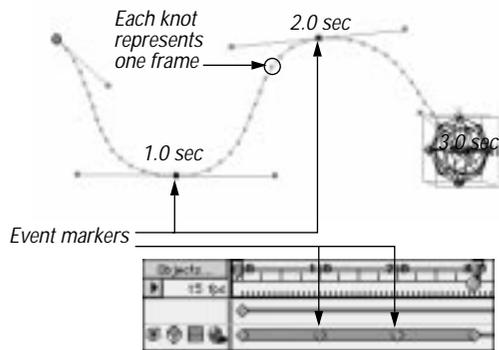
Click the *Current Time* button to set the velocity of the current event marker only, or the *All Time* button to assign all event markers on this timeline the same IN and OUT velocity.

WORKING WITH ANIMATION PATHS

As you animate an object by moving it from one location to another at different points in time, an animation path appears in the Modeling window. (You must have

the **SHOW ANIMATION PATHS** command in the Selection menu enabled in order for animation paths to show.) This path represents the *Position* of the object at different points in time.

Each time you move the object, an event marker is placed at the current time on the timeline in the Project window, and a control point appears along the path in the Modeling window.



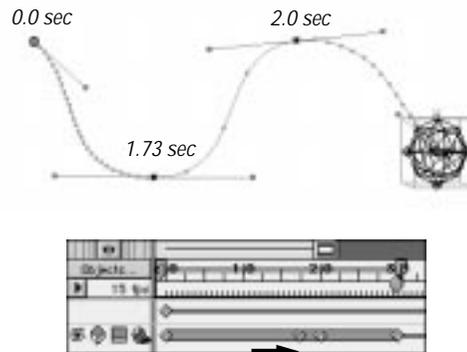
Blue knots between the event markers represent frames. For example, if the frame rate is set at 15 frames per second, and the event markers are placed at precisely one-second intervals, then 15 knots are placed along the path between each event marker. The distance between these knots indicates the distance the object travels between frames.

You can move the event markers along the timeline in the Project window to change the object's pacing or its sequence in the animation. Just grab the marker on the timeline in the Project window and slide it to position it anywhere along its timeline.

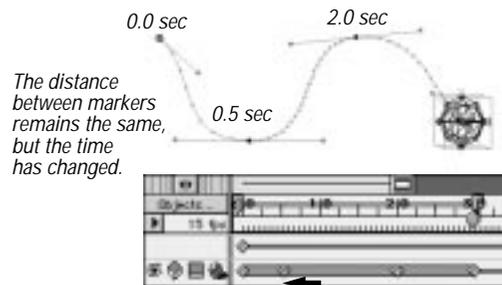
The object's velocity is determined by the distance it travels during a specific period of time. (Velocity = distance/time.) So the greater the distance between markers (the

more distance the object travels), the higher the velocity of the object. The closer together the event markers, the slower the speed of the object.

If you change the spacing between event markers, the spacing of the knots also changes to reflect the change in time.



In the above example, the frame rate is still 15 frames per second. Now there are 26 frames between the first two event markers, and only four frames between the second and third event markers. So, the sphere's motion would be uniformly slow between the first two markers, and then move much faster between the second and third marker.



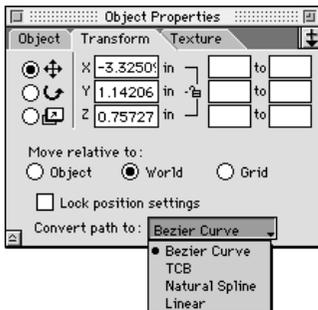
Moving the second marker the other direction, to approximately one-half second,

has the opposite effect. Now the sphere's motion is faster in the first half-second, then moves slower (but at a uniform velocity) between the second and third event markers. The distance between markers remains the same, but the time between markers has changed.

Animation Path Types

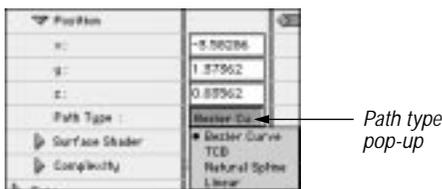
You can specify what type of path you want your objects to follow. StudioPro offers four different types of paths to choose from: *Bézier Curve*, *TCB*, *Natural Spline*, or *Linear*.

You can change the path type of any object on the Transform tab (Expert mode) of the Object Properties palette.

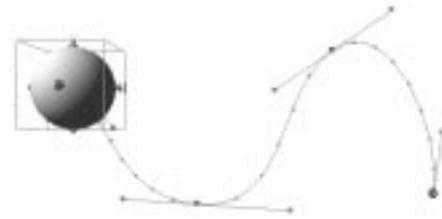


NOTE: If necessary, select the **Expert Mode** command from the Plus menu to expand the palette and reveal the expert settings.

You can also convert the path to another type in the Project window under the object's *Position* entry.



Bézier Curve

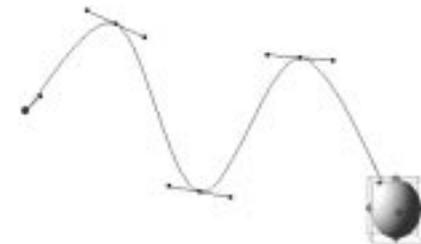


This is the most commonly used type of path. Each control point along the path in the Modeling window has handles that allow you to control the curvature of the path. StudioPro uses Bézier curves as the default animation path.

To change the curvature of the path, grab a control handle to position and adjust it as desired. If you're not familiar with how these handles affect the path, see **Working with Bézier Splines** on page 41.

Smoothing the Animation Path (Bézier Curve)

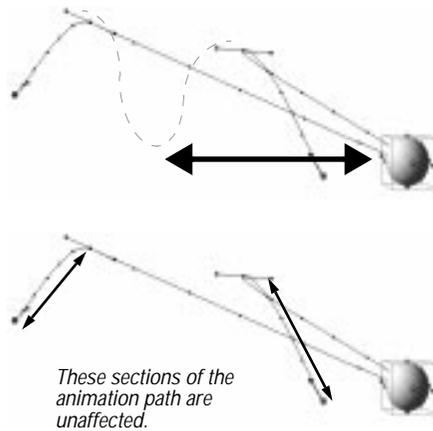
When you first animate an object in your model, StudioPro automatically adjusts the animation path to create a smooth, flowing motion from one event marker to the next.



StudioPro automatically smooths the animation paths of objects as you animate them.

This auto-smoothing occurs every time a new event marker is generated.

However, when you edit the position of an object, no automatic path smoothing occurs. This ensures that any changes you make affect only the event marker being edited. All other event markers along the path remain fixed in place.



This allows you to fine-tune the control points along the path and ensures that no unintentional changes occur to any of the other control points.

Auto-smooth hotkey

There may be times, however, when you want StudioPro to smooth the path as you edit an existing control point. To force StudioPro to smooth the path, hold down the "S" key as you move the object from one

location to another in the Modeling window.

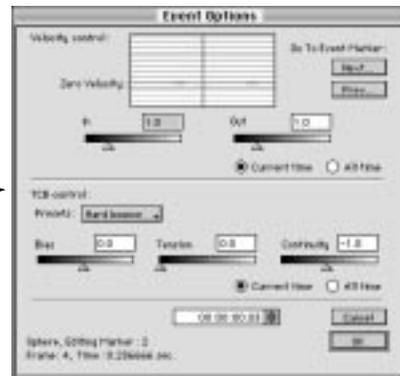


Holding the "S" key down while dragging the sphere to its new position forces StudioPro to smooth the path.

TCB (Tension, Continuity, Bias)



When this type of animation path is used, controls for *Tension*, *Continuity*, and *Bias* are provided in the Event Options dialog. Instead of handles, these controls are used to control the curvature of the animation path.



If the event marker is on a TCB animation path, the Event Options dialog also provides controls for editing the path of the object.

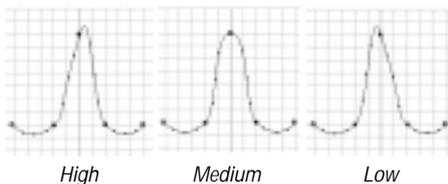
The *TCB* (Tension, Continuity, Bias) controls allow you to realistically simulate inertia resulting from the object's mass, or other physical motion effects such as a collision or the bounce of a ball.

Presets. When you select one of the presets from this pop-up list, the *Tension*, *Continuity*, and *Bias* settings update to reflect your selection.

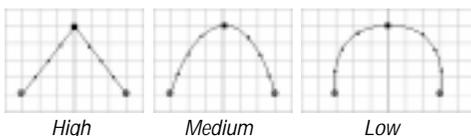
The *Bias*, *Tension*, and *Continuity* settings control the object's path. Acceptable values for each of these sliders range from -1.00 to 1.00.

Click the *Current Time* button to edit only the marker at the current time, or the *All Time* button to edit all of the markers at once.

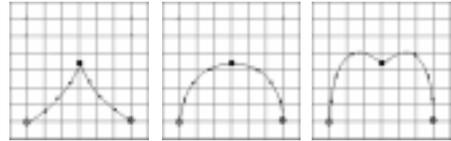
- **Bias.** This setting can be used to represent the effect of exaggerating a movement by creating a bulge on one side or the other of the event marker.



- **Tension.** This field is used to adjust how taut the spline path flows from one event marker to the next. A setting of 1.00 is equivalent to a linear path.



- **Continuity.** This setting determines how evenly the motion appears as the object travels through this event marker on the animation path.



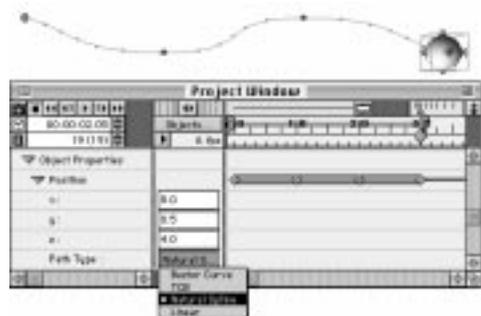
Examples of varying degrees of continuity.

Natural Spline



This type of animation path forms smoothest path possible, based on the velocity of the object as it passes through the control points along the animation path.

StudioPro attempts to maintain a continuous velocity between event markers on a *Natural Spline* path.



Event markers are evenly spaced, so the sphere requires the same amount of time to travel between each key frame on the animation path.

If you change the spacing of the event markers, StudioPro tries to compensate for the change in time by changing the curvature of the path.



The time between the second and third key frames has been reduced, so StudioPro tries to compensate by altering the curvature of the path.

Notice the changing curvature of the path in the previous and following illustrations.



Now the time between the third and fourth markers has been reduced, and the curvature of the path is again adjusted to compensate, providing the smoothest path possible.

Linear



This type of path forces the object to travel along the shortest possible path between

control points, creating sharp corners whenever the object changes direction.

Modifier keys that apply to event markers:

- **Shift key**

Extends the selection of event markers on the palette. Multiple event markers may be selected at one time for copying, deleting or moving in unison.

- **Option key (Macintosh)**

Alt key (Windows)

Leaves original event marker in the original location and creates a copy of that event marker as you drag it to a new location.

- **Option-clicking (Macintosh) or Alt-clicking (Windows)** on a timeline in the Project window adds a new event marker at the exact position on the timeline where the click occurs.

- **Command key (Macintosh)**

Ctrl key (Windows)

Moves the time pointer to the position of the event marker when you click to select it.

- **“S” key**

When editing an existing control point on a Bézier Curve path in the Modeling window, this key forces StudioPro to smooth the animation path.

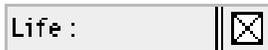
ADDING ATTRIBUTES TO AN OBJECT

An **ADD ATTRIBUTE** command is provided in the Plus menu of the Project window that allows you to add various attributes to the selected object.

Life

If you add an object to a model while the *Current Time* pointer is at a position other than zero on the timeline, that object is assumed to have existed in that same position from time zero. This is the default for each object. However, you can designate whether or not it exists at any point in time by adding a *Life* attribute to the object.

The *Life* checkbox does not automatically appear as a property of an object unless you specifically add this attribute. To add a *Life* attribute to the selected object, select **ADD ATTRIBUTE > LIFE ATTRIBUTE** command in the Plus menu. An entry is added to the *Object Properties* in the Project window.

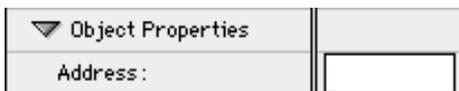


The status of the *Life* checkbox indicates whether or not the object exists in the model at the time indicated by the *Current Time* pointer. Then, by changing the status of this checkbox at different times, an object can appear and disappear at any time during the course of an animation.

To remove a *Life* attribute, select the object, then select **DELETE ATTRIBUTE > LIFE ATTRIBUTE** in the Plus menu of the Project window.

URL Address

This option adds a *URL* address field to the selected object. An *Address* field appears in the Project window in the hierarchy as a property of the selected object.



An URL (Universal Resource Locator) address allows you to link to a specified location on the Internet when the model is saved in VRML format. Viewers could then click an object which would act as a hot spot, launching them to another location on the Web.

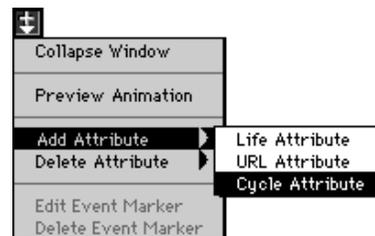
Enter the URL address in this editable field. The URL address is saved with the model.

To remove the URL address from an object, select **DELETE ATTRIBUTE > URL ATTRIBUTE** command in the Plus menu. The URL address field is removed from the selected object's properties in the Project window.

Cycle

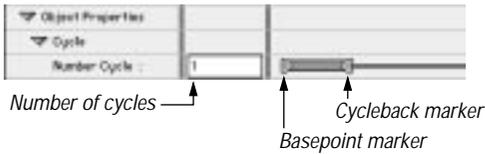
The Cycle attribute gives you the ability to repeat, or cycle, specified animation sequences over and over again. An object can repeat its motion a single time, or it can cycle endlessly through the entire animation.

To add a Cycle attribute to an object, select **ADD ATTRIBUTE > CYCLE ATTRIBUTE** from the Project window's Plus menu.



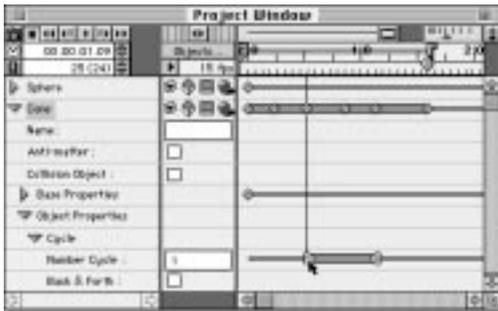
When you select this command, a cycle entry appears in the Project window

below the *Object Properties* of the selected object.

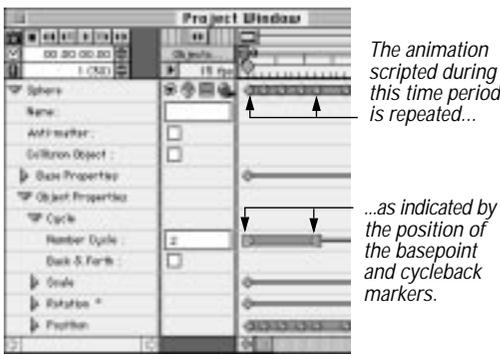


You can specify the number of times to repeat an animation sequence in the entry field provided. Enter any value from zero to INF (infinity). A value of zero ignores the cycle attribute altogether.

You can grab the basepoint or cycleback marker and position it where desired.



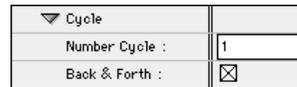
The region between the **basepoint** marker and the **cycleback** marker is the region of the animation sequence that is repeated.



Animation proceeds until a cycleback marker is encountered. StudioPro then repeats the indicated timespan by jumping back to the time indicated by the basepoint marker and continuing forward. Each time a cycleback marker is encountered, one cycle is subtracted from the total number of cycles specified. In the above example, the animation specified in the first 0.5 seconds is repeated two times, then the object continues along the remainder of the animation path.

Cycle Back & Forth

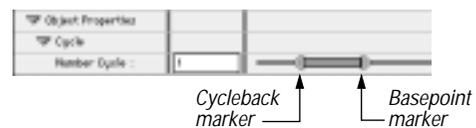
A *Back & Forth* checkbox is provided with each *Cycle* attribute.



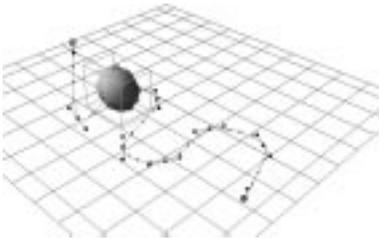
When this box is checked, the animation proceeds until the cycleback marker is encountered, then StudioPro reverses the animation back to the basepoint marker, and forward again to the cycleback marker. This action is repeated the total number of times indicated in the *Number Cycle* box.

Jumping forward

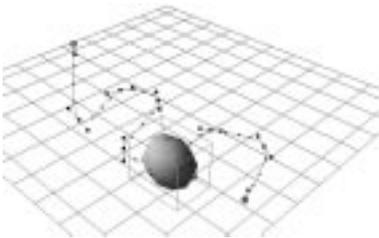
You can move the basepoint past the cycleback point. This causes a “jump” in time, instantly moving forward.



The animation sequence begins at the *Cut-in* point and continues until a cycleback marker is encountered.



Then, at the next frame, the animation immediately jumps to the event marker specified by the basepoint marker. In the previous illustration, any animation scripted to occur between 0.5 seconds and 1.25 seconds is completely ignored.

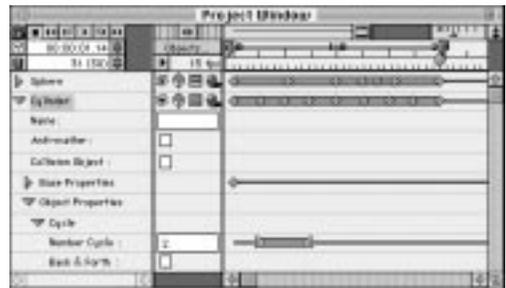


Keeping track of time

It is important to note that once a cycle marker is used, for either repeating motion or jumping forward, the times

indicated on the controls at the top of the Project window become *relative* times only, not actual times. You must keep track of the time required for the specified action, and adjust the time accordingly.

In the following example, 0.5 seconds of the animation sequence is repeated two times; therefore, one additional second is added to the total time to repeat the animation. The sphere's animation completes in two seconds, but three seconds are required to complete the animation sequence scripted for the cylinder.

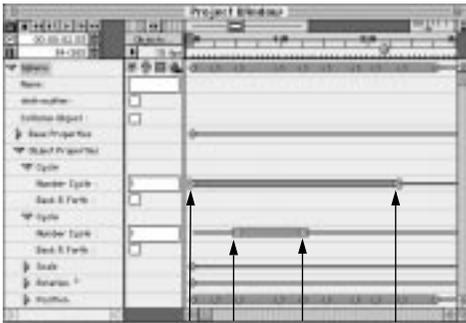
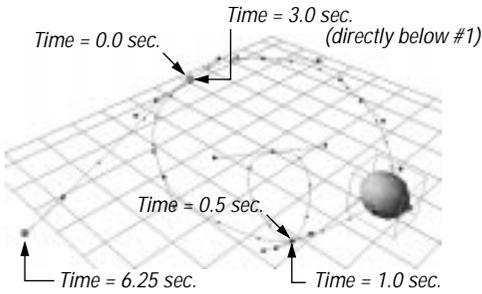


In contrast, when jumping forward (by placing the cycleback marker BEFORE the basepoint marker), 0.5 seconds are subtracted from the total time required to complete the animation sequence. The cylinder's animation completes in 1.5 seconds, and the sphere's animation sequence requires 2.0 seconds.



Multiple levels of cycles

You can also utilize multiple levels of cycling by nesting cycles within other cycles. There is no limit to the level of cycles used; you can use as many levels of cycles as you want.



Basepoint markers Cycleback markers

In the above example, the animation sequence begins at time zero and continues around the outer circular path, then around the smaller inner loop.

At 1.0 second, a cycleback marker is encountered. The sphere jumps back to its previous position at 0.5 seconds, and cycles two more times around the smaller loop (for a total of three times around the inner circle).

It requires 0.5 seconds to complete each cycle around the inner loop, adding one additional second to complete both repetitions. This brings the total time thus far to 2.0 seconds.

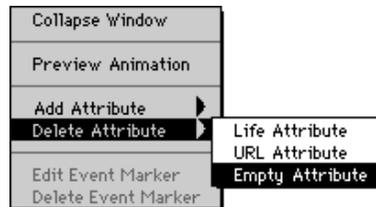
The sphere then continues on its path around the larger circle. When it reaches the cycleback marker at 3.0 seconds, it repeats this ENTIRE sequence one more time (an additional 3.0 seconds), then continues on to the end of the scripted animation path.

Because of the additional time required to perform the specified number of cycles, the total time required to complete the animation sequence is 6.25 seconds, not the 2.25 seconds required if no cycle attributes had been added. The *Cut Out* point must be placed at 6.25 seconds or later in order to view the entire animation sequence.

As you can see, it is very important to keep track of any additional time required to perform the specified cycles, especially when placing cycles within other cycles.

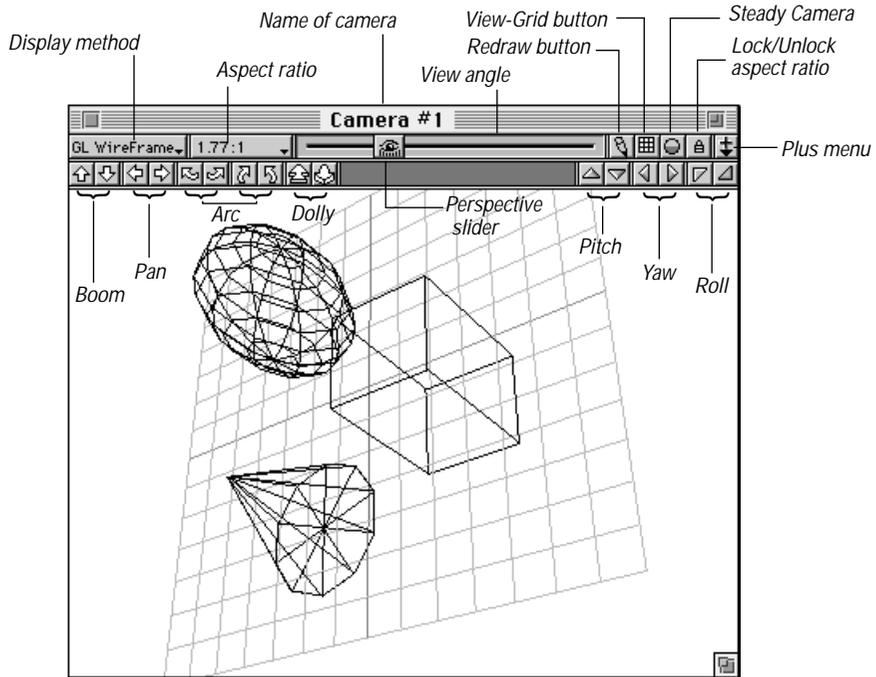
Removing Cycle Attributes

To remove cycle attributes from an object's animation sequence, select **EMPTY ATTRIBUTE** from the **DELETE ATTRIBUTE** command in the Plus menu in the Project Window.



Selecting this command removes ALL UNUSED cycles from the selected object's animation. If the number of cycles is set to zero, the cycle attribute is removed from the object and no longer appears in the Project window. If the number of cycles is set to any value other than zero, it is unaffected by this command.

Therefore, if you want to remove a cycle attribute, set the number of cycles to zero, then select this command. This command removes unused cycles from the SELECTED object only; empty cycles associated with other objects are not deleted.



Each camera object you insert in your model has its own Camera window. When you look at your model from a Camera window, it's as though you are actually viewing it through the camera's viewfinder.

To view the model through the Camera window, double-click on the camera object's icon in the Modeling window, or select the camera object by name from the **CAMERA WINDOW** command's pop-up menu in the Windows menu.

Camera windows are similar to Modeling windows, but they are linked to the camera objects. Each camera can contain only one view; Camera windows cannot be split.

The following controls, found at the top of the Camera window, allow you to have full control over the behavior of the camera:

- **Display method.** All available display methods appear in this list. Select the one you want to use from the pop-up list.

- **Aspect ratio.** This field indicates the ratio of the width of the Camera window to its height. You can select any aspect ratio listed in the pop-up menu.

0.77 : 1	(Page 8.5 × 11)
1.00 : 1	(Square)
1.25 : 1	(D-1 PAL)
1.33 : 1	(NTSC 4 × 3)
1.49 : 1	(Classic)
1.66 : 1	(PAL 5 × 3)
1.77 : 1	(HDTV 16 × 9)
1.85 : 1	(Movie)
2.00 : 1	(Double Wide)
2.35 : 1	(Wide Screen)
3.25 : 1	(Panorama)

If you resize the Camera window to a size that does not match any of those aspect ratios listed, *Custom* appears as the selected aspect ratio.

- **Perspective slider.** The perspective slider on the Camera window is fully variable, instead of the three-position perspective selector on the modeling window. The slider control is located horizontally across the top of the window frame.



When positioned to the far left, the Camera window view is at maximum telephoto, which translates into essentially no perspective at all. When positioned to the far right, the Camera window is at ultra-wide angle. The view angle is so extreme in perspective that objects appear distorted.

- **Redraw button.** This button forces StudioPro to redraw the Camera window.

 If the redraw icon (pencil) appears in color, with a frame around it, chances are good that the window needs to be refreshed.

- **View grid.** Each camera view contains a *View Grid* button. Unlike other grids in StudioPro, these grids are view-relative, so they track whenever you move in the window. They are drawn parallel to the view plane with a coordinate system of 0,0,0. View grids appear gray in the Camera window.

- **Steady Camera.** When this option is enabled, the camera's "up" vector always remains in the "up" position. Click the button again to disable this option.

- **Lock/Unlock.** You can lock the aspect ratio so that resizing the window prevents the ratio from changing.

- **Control buttons.** Use these buttons to control the position of the camera. The longer you hold down the button, the faster the motion of the camera.

 **Boom.** The Boom controls move the camera up or down. If the camera's *Look At* point is not locked onto a target, the *Look At* point also moves up or down.

 **Pan.** The Pan controls move the camera left or right. If the camera's *Look At* point is not locked onto a target, the *Look At* point also moves left or right.

 **Arc.** These controls move the camera in an arc around the *Look At* point.



Dolly. The Dolly controls move the camera toward or away from the *Look At* point. If the camera's *Look At* point is not locked onto a target object, the distance between the camera and the *Look At* point is maintained.



Pitch. Use these controls to tilt the camera along its X axis. If *Steady Camera* is enabled, these controls cannot be accessed.



Yaw. These controls tilt the camera along its Y axis.



Roll. These controls tilt the camera along its Z axis. If *Steady Camera* is enabled, the *Roll* controls are unavailable.

RESIZING THE WINDOW

If the aspect ratio is locked, the Camera window maintains the selected aspect ratio when you resize the window. If the aspect ratio is unlocked, then you can resize the window to any size.

When you resize the Camera window, StudioPro checks to see if the new size matches any of the preset aspect ratios. If it matches any of the presets, it displays that aspect ratio on the pop-up. If it doesn't match any of the presets, *Custom* appears as the selected size on the *Aspect Ratio* pop-up.

BACKDROPS

StudioPro allows you to place an image or animation in the Camera window to assist you in the modeling process. (This feature is only available if the interactive renderer you're using is capable of displaying backdrops.)

To add a backdrop to a Camera window, select the **SET BACKDROP** command from the Camera window's Plus menu. You can add a different backdrop to each Camera window, if you want. The backdrop is provided for modeling purposes only; it does not appear in rendered images.

NOTE: *If you want the image to also appear in the final product, you can use a backdrop to properly align objects against it, then render your model with the Alpha channel. (There's a "Render Alpha Channel" checkbox in the Render dialog. Be sure it's enabled when you render your model.) You can then composite the images together in an image processing application, such as Strata's VideoShop™ or MediaPaint™.*

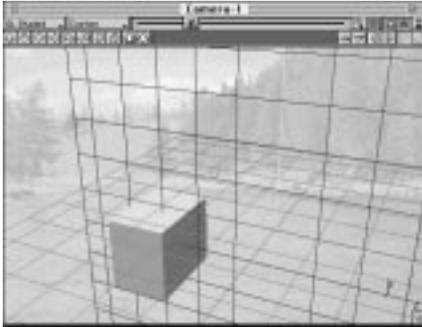
When you select this command, the Backdrop dialog appears. Click the *Load Backdrop* button to locate and load an image or animation file to use as your backdrop.



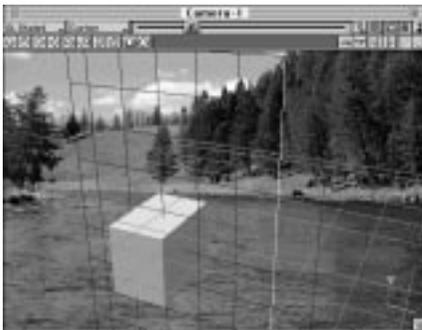
The top of the dialog contains information about the image. The *Duration* field shows the total number of frames contained in the file.

You can scale the image larger or smaller. You can also change its position in the view by indicating the total number of pixels to offset it from center.

The *Opacity* slider lets you adjust the transparency of the image. If opacity is less than 100%, the background color used in the Modeling window blends with the backdrop image.



Backdrop opacity = 25%



Backdrop opacity = 100%

If both the *Constrain Aspect Ratio* and *Fit To View* boxes are checked, the Camera window resizes according to the aspect ratio of the backdrop image, and the aspect ratio of the window becomes locked.



If you're using an animation file, you can specify the start time of the first frame you

want to use. For example, to ignore the first three seconds, select 00:00:03.00 as the *Start Time*.

You can also specify the last frame number that you want to use. As you advance the *Current Time* pointer in the Project window, the animation in the backdrop advances also, until it reaches the frame specified in the *Frame Hold* field. Then the image in this frame number appears as the backdrop in all subsequent frames.

This image remains in a fixed position, relative to the camera. If you rotate the camera, the backdrop rotates with it.



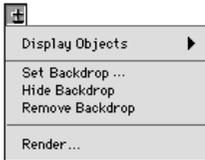
If you rotate the camera...



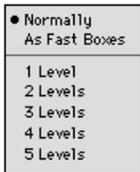
...the backdrop rotates with it. The backdrop always remains in the same position, relative to the camera.

Plus Menu

This menu provides easy access to commonly used commands that relate to the Camera window.



DISPLAY OBJECTS. Select the level of detail displayed in the Camera window from the submenu. The higher the level, the less detail displayed in the window. A bullet (•) next to the menu entry indicates the current display detail.



The *Normally* setting displays all objects in the model in full detail. Use this setting to see exactly how each object appears.

If your model is so complex that the redraw times begin to take an extra long time, you can choose to display the objects as fast boxes. Fast boxes are essentially bounding boxes that represent the size and proportions of each object. This reduces the amount of time required for the redraw.

Each level setting moves the point at which fast boxes appear further down the hierarchical structure. If you choose *1 Level*, objects in the model appear normal, but shapes in the model appear as fast boxes; *2 Level*, first level shapes display normally, but any second level shapes display as fast boxes; and so on. The level you choose should depend on how interested you are in viewing subparts of shapes.

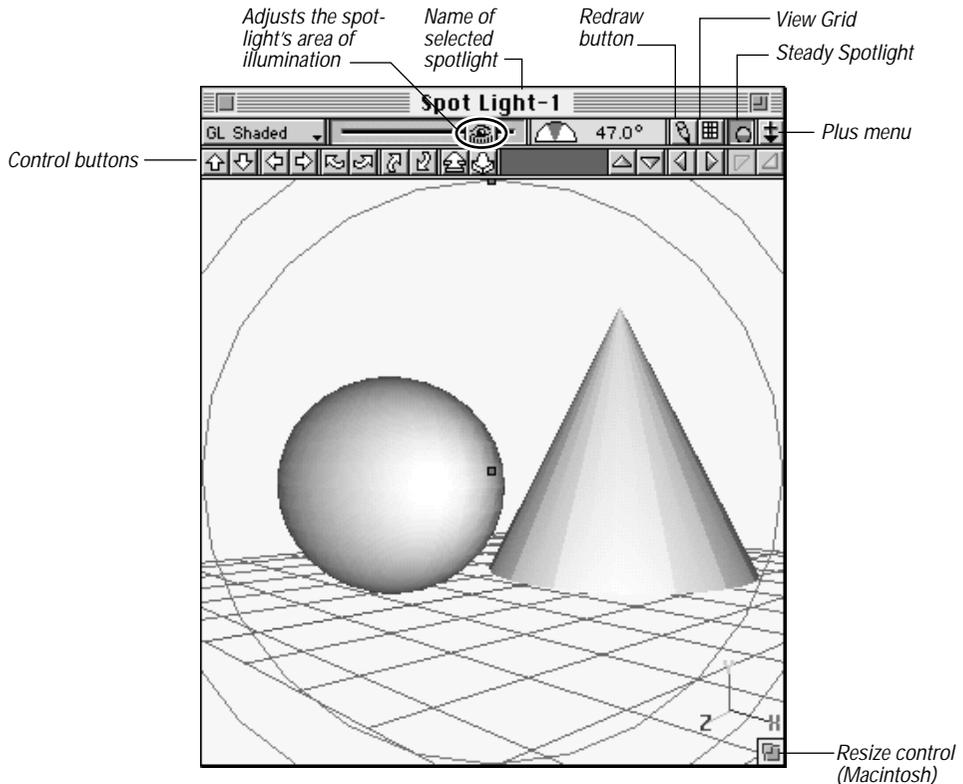
This command doesn't affect renderings in any way. If you're using fast boxes for displaying objects in the modeling windows, they will still render in full detail.

SET BACKDROP. This command allows you to place an image or animation in the Camera window to use for modeling purposes. It won't appear in rendered images.

SHOW/HIDE BACKDROP. Use this command to show or hide the backdrop in the Camera window. The command name toggles between Show and Hide, depending on the backdrop's current hide/show status. Hiding the backdrop doesn't remove it from memory; it merely hides it so it's not visible in the Camera window.

REMOVE BACKDROP. Use this command to remove the backdrop from the window.

RENDER. Use this command to open the Render dialog and begin the rendering process. This is the same as the **RENDER** command in the Rendering menu. See **Render** on page 57 for complete details on this command.



The Spotlight window is provided to assist you in accurately positioning spotlights in your model. After inserting a spotlight, you can open the Spotlight window and “see” which objects are illuminated by the light. This window shows that area of the model that is fully illuminated by the spotlight. If the spotlight is currently selected, you’ll also see the inner ring that indicates the area of full illumination.

The Spotlight window provides the following controls:

- **Slider.** You can use the slider at the top of the window to reduce or increase the area illuminated by the spotlight.
- **Name.** The name of the spotlight is displayed at the top of the window. You can change the name of the spotlight on the Object Properties palette.

- **Control buttons.** Use these buttons to control the position of the spotlight. The longer you hold down the control buttons, the faster the motion of the spotlight. The following buttons are provided for positioning the spotlight:

 **Boom.** The Boom controls move the spotlight up or down. If the spotlight's *Look At* point is not locked onto a target object, the *Look At* point also moves up or down.

 **Pan.** The Pan controls move the spotlight left or right. If the spotlight's *Look At* point is not locked onto a target object, the *Look At* point also moves left or right.

 **Arc.** These controls move the spotlight in an arc around the *Look At* point.

 **Dolly.** The Dolly controls move the spotlight toward or away from the *Look At* point. If the *Look At* point is not locked onto a target, the distance between the spotlight and the *Look At* point is maintained.

 **Pitch.** Use these controls to tilt the spotlight along its X axis. These controls are unavailable when the *Steady Spotlight* option is enabled.

 **Yaw.** These controls tilt the spotlight along its Y axis.

 **Roll.** These controls tilt the spotlight along its Z axis. Normally, rotating a spotlight has no apparent effect. However, if a gel containing an image map has been applied to the spotlight, you may want to rotate the gel. The gel itself cannot be rotated,

but rotating the spotlight has the same effect. These controls are disabled when the *Steady Spotlight* option is enabled.

- **Resizing the window.** Resizing the window enlarges, or magnifies, the view. It does not enlarge the range of illumination. It always maintains a 1 : 1 aspect ratio.
- **Redraw button.** Click this button to force StudioPro to redraw the Spotlight window.

 If the redraw icon (the pencil) appears in color with a frame around it, the window probably needs to be refreshed.

- **View Grids.** When *View Grids* is enabled, all modeling occurs relative to the active view. To disable *View Grids*, click on the button again.
- **Steady Spotlight.** When this option is enabled, the spotlight always maintains its “up” position, relative to world coordinates. To disable this option, click on the button again.

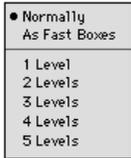
Plus Menu

This menu provides easy access to commonly used commands that relate to the Spotlight window.



DISPLAY OBJECTS. Select the level of detail displayed in the Spotlight window

from the submenu. The higher the level, the less detail displayed in the window. A bullet (•) appears next to the menu entry to indicate the current display detail.



The *Normally* setting displays all objects in the model in full detail. Use this setting to see exactly how each object appears.

If your model is so complex that the redraw times begin to take an extra long time, you can choose to display the objects as fast boxes. Fast boxes are essentially bounding boxes that represent the size and proportions of each object. This reduces the amount of time required for the redraw.

Each level setting moves the point at which fast boxes appear further down the hierarchical structure. If you choose *1 Level*, objects in the model appear normal, but shapes in the model appear as fast boxes; *2 Level*, first level shapes display normally, but any second level shapes display as fast boxes; and so on. The level you choose should depend on how interested you are in viewing sub-parts of shapes.

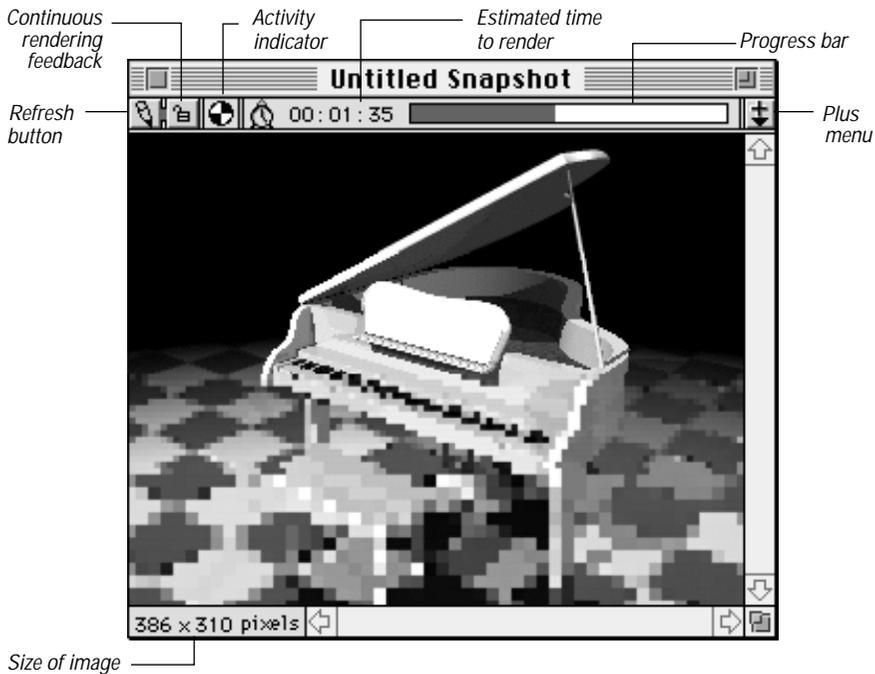
This command doesn't affect renderings in any way. If you're using fast boxes for displaying objects in the Spotlight windows, they will still render in full detail.

SET BACKDROP. This command allows you to place a backdrop in the Spotlight window. A backdrop is an image or animation file that appears at the back of the window. This backdrop always remains fixed in place relative to the view plane. If you rotate the spotlight window, the backdrop rotates with it. Backdrops are used for modeling purposes only; they do not render. See **Backdrops** on page 283 for more information.

SHOW/HIDE BACKDROP. Use this command to show or hide the backdrop in the Spotlight window. The command name toggles between Show and Hide, depending on the backdrop's current hide/show status.

REMOVE BACKDROP. Use this command to remove the backdrop from the window.

RENDER. Use this command to open the Render dialog and begin the rendering process. This is the same as the **RENDER** command in the Rendering menu. See **Render** on page 57 for complete details on this command.



RENDERING SNAPSHOTS

When you begin a rendering, StudioPro opens a separate Rendering window. You can think of a rendering as simply taking a photograph of your model. You may watch the image develop, if you wish, by turning on the preview option. Turning off the preview option, however, speeds up the rendering process.

A Rendering window contains some specific controls that are unique to this type of

window. These controls allow you to watch the rendering process as it occurs.

If the size of the image being rendered is larger than the screen, you can use the scroll bars or the resize button to view hidden areas of the window.

A Rendering window can be moved around the screen as it is rendering. It can also be moved to the background, even though the rendering continues.

An explanation of the specialized controls follows:

- **Refresh button** – With the continuous rendering feedback turned off to speed up the rendering process, you can update the Rendering window as often as desired by clicking the refresh button. Each time you push the button, the image redraws once in its current state.
- **Continuous rendering feedback** – Click the *Lock* icon to display in a “locked” position to continuously update the image, in real time, as it is being rendered. This option may significantly slow the rendering process. To decrease the time required for rendering, click the *Lock* icon so that it appears in an “unlocked” position.
- **Activity indicator** – This control is located to the right of the refresh button. Its appearance is similar to a “beach ball.” The ball rotates as the image renders. The speed at which the ball rotates is an indication of rendering speed.
- **Estimated time to render** – A estimate of the time required to complete the rendering is displayed and continuously updated in the feedback portion of the window. The time is displayed in minutes and seconds or in hours and minutes, depending on the interval of time. Keep in mind, though, that this is just an estimate.
- **Progress bar** – The bar moves to the right as the rendering proceeds in the window. StudioPro makes a “best estimate” of the amount of work completed at any point during the rendering process. When the bar reaches the right edge of the window,

the beach ball stops turning, and the rendering is complete.

LOW MEMORY

If StudioPro encounters a low memory condition during rendering, it displays the low memory icon at the top of the Rendering window.

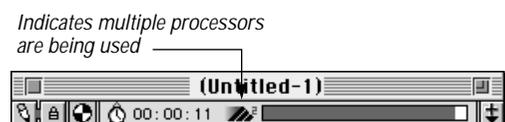


If the rendering process is progressing slowly, the memory chip icon appears at the top of the Rendering window.

In most cases, a slow rendering process is caused by a low memory condition. However, certain *Esoterica* settings can dramatically increase the time required for rendering. Volumetric textures, such as fog or mist, may also require additional rendering time. In most cases, the higher the quality of the image, the more time required to render.

MULTI-PROCESSING

StudioPro automatically supports multiple processors if the required hardware and software extensions are available. If multiple processors are being used to render the image, the MP icon appears at the top of the Rendering window.



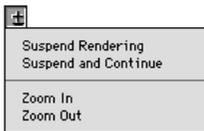
 The number of processors being used is indicated to the right of the MP (multi-processor) symbol. If fewer processors are being used than the total number present, the number appears in red. This condition may occur when the system is unable to allocate memory to additional processors, possible due to a low memory condition.

Number appears in red, indicating that not all processors are being used



Plus Menu

The Plus menu contains frequently used commands that pertain to the Rendering window.



SUSPEND RENDERING. Use this command to save a rendering in progress. You can then restart it later and continue rendering. This command is the same as selecting the **SUSPEND RENDERING** command from the Rendering menu. For a full description of this command, see **Suspend Rendering** on page 74.

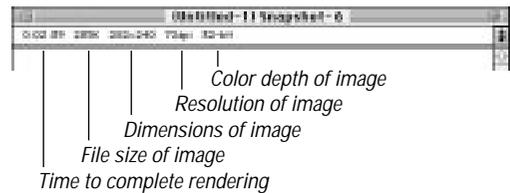
SUSPEND AND CONTINUE. Use this command to save the rendering in its current state of completion, and then automatically continue on with the rendering process. This is the same as choosing **SUSPEND AND CONTINUE** from the Rendering menu. See **Suspend and Continue** on page 76.

ZOOM IN. Use this command to zoom in on the rendering at the center of the view.

ZOOM OUT. Use this command to zoom out.

SNAPSHOT WINDOW

When the rendering completes, the Rendering window converts to a Snapshot window. The rendering controls are replaced with information about the rendered image. This information includes the time required to render, file size, dimensions of the image, resolution, and color depth.



Basically, a snapshot is an unsaved rendering. Once you save a snapshot, when you open the file, it is then placed in an Image window.

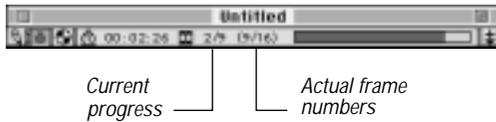
If you start and complete a rendering in the same session (without suspending and restarting), the rendering remains in a Snapshot window until you close it or until you quit StudioPro. When you close your model, you will be asked if you want to save the snapshot if it hasn't already been saved.

NOTE: *If the rendering required less than 30 seconds to complete, StudioPro assumes the rendering was for preview purposes only, and you will not be asked if you want to save before closing.*

The image will save automatically if you suspend the rendering. This can be done either by choosing the *Suspend* option in the Render dialog or by using the **SUSPEND RENDERING** command from the Rendering menu on an in-progress rendering.

RENDERING ANIMATIONS

When rendering animations, the Rendering window has one additional control. In addition to the time estimate (for the total animation), additional numbers appear between the time estimate and the progress bar. These numbers indicate the current frame being rendered and the total frames to render.



If the animation you're rendering is actually a sub-set of the total frames in the animation, two sets of numbers appear. The first set indicates how many frames have completed rendering, out of the total number of frames being rendered. The second set (in parenthesis) shows where the frames being rendered occur in the entire animation sequence.

In the previous illustration, nine frames are being rendered: frames eight through 16. Currently, two of the nine frames have completed rendering. The numbers in the parenthesis indicate the actual frame number, frame nine, that is currently rendering, and the last frame number to be rendered is frame 16.

When an animation has completed rendering, the Rendering window converts to an Animation window. See **Animation Window** on page 297.

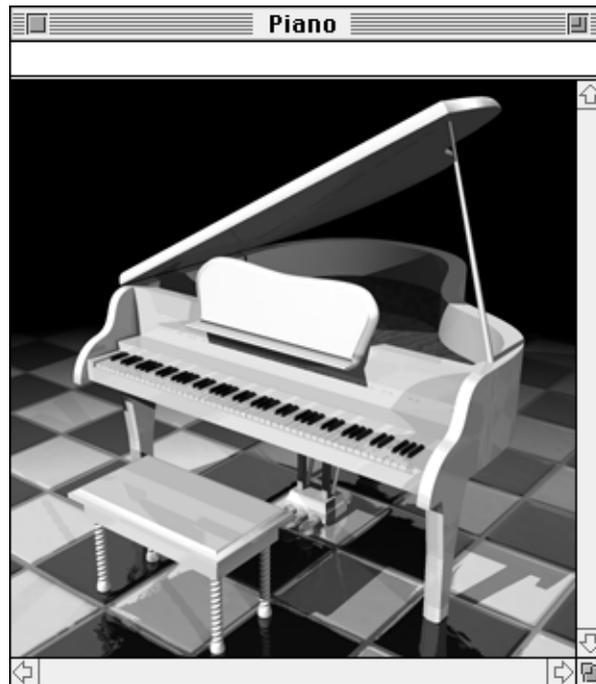


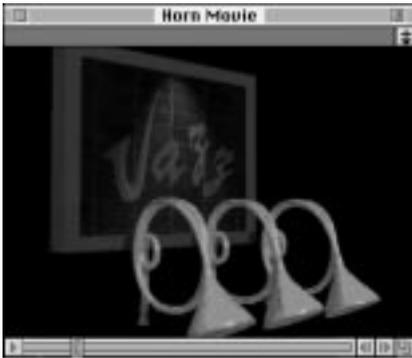
Image windows are used to display images on the screen. You can have as many Image windows open at a time as memory allows.

The image contained in the Image window can be from any source, not just from images produced in StudioPro. These images can be in any format that StudioPro supports.



MACINTOSH

Animation windows are provided for playing back QuickTime movies once they've been rendered.



When you render a set of frames in an animation sequence using the QuickTime format, the files are automatically assembled and saved as the frames are rendered. You can specify the total number of frames to be rendered and the starting frame through the **RENDER** command in the Rendering menu.

Plus Menu

The Plus menu contains commands that deal with playing back animations.



HALF SIZE. This command displays the frame size of the animation file at one half of its normal size.

NORMAL SIZE. This command displays the actual frame size. This is the default size used when playing an animation.

DOUBLE SIZE. This command displays the frame size of the animation at twice its actual size. Displaying the animation with this option enabled uses additional memory.

LOOP. This command toggles on and off each time you select it. This command causes the movie to repeat playing over and over again, each time from the beginning to the end, until you click the *Stop* button or until you select the command again to disable it. When **LOOP** is enabled, a check appears to the left of the command.

LOOP BACK AND FORTH. This command toggles on and off each time it is selected. When this command is selected, the animation first plays forward, then reverses and plays backwards. The cycle repeats until you click the *Stop* button or select the command again to disable it. When this command is enabled, a check appears to the left of the command.

PLAY EVERY FRAME. This option toggles on and off each time you select it. Select this command to enable or disable frame skipping in QuickTime movies.

When this option is disabled, any sound channel(s) that may be part of a movie file are given priority. The sound is then played at the correct

speed and the frames are played as they can to keep up, sometimes requiring a frame to be skipped occasionally to maintain the correct time sequence.

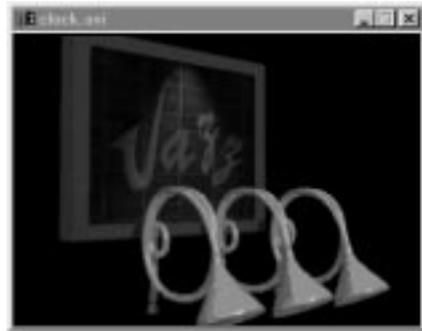
PLAY WHEN INACTIVE. Use this command if you want the movie to continue playing the QuickTime movie even when the Animation window is no longer the active window. Unless **LOOP** or **LOOP BACK AND FORTH** is also enabled, the animation plays to the last frame, then ends. If either *Loop* option is enabled, the movie continuously plays in the background.

WINDOWS

As you render an animation sequence in StudioPro, each frame is automatically saved to the hard disk drive. The animation can then be opened for viewing in an Animation window.

The animation window used to display an animation depends on the type

of media player installed on your computer.



Controls are provided for playing back the animation, and commands for controlling the playback appear in the menu above the controls.



REFERENCE MATERIAL



File formats that are currently supported for both the Macintosh and Windows versions of StudioPro are listed below. Other formats may be included in the future.

MACINTOSH

Image Formats:

PICT
TIFF
Targa
JPEG
BMP
EPS
QuickTime

Animation Formats

Sequentially-numbered PICT files
Sequentially-numbered TIFF files
Sequentially-numbered Targa files
Sequentially-numbered JPEG files
Sequentially-numbered BMP files
Quicktime Movie

3D Formats

StudioPro
3DMF
Amapi
IGES
3DS
DXF
VRML 1.0
VRML 2.0

WINDOWS

Image Formats:

PICT (.pct, .pict)
TIFF (.tif)
Targa (.tga)
JPEG (.jpg, .jpeg)
BMP (.bmp, .dib)
EPS (.eps)
QuickTime (.mov, .qt)

Animation Formats

Video for Windows (.avi)
Sequentially-numbered PICT files (.pct, .pict)
Sequentially-numbered TIFF files (.tif)
Sequentially-numbered Targa files (.tga)
Sequentially-numbered JPEG files (.jpg, .jpeg)
Sequentially-numbered BMP files (.bmp, .dib)
Quicktime Movie (.mov, .qt)

3D Formats

StudioPro (.smd, .spro)
3DMF (.3dm)
Amapi (.x)
IGES (.igs)
3DS (.3ds)
DXF (.dxf)
VRML 1.0 (.wrl)
VRML 2.0 (.wrl)



QUICKTIME

The QuickTime extension provides several software compression methods that are listed in the pull-down menu of the *Compression Settings* dialog. Each codec (Compressor/DECompressor) is designed for a specific type of use. Using a compressor not intended for your needs is not necessarily wrong, but using the right compressor can significantly improve playback performance.

The following are the most common compression methods; however, others may be available. These explanations are provided for background:

VIDEO

Of all the available compressors, the *Video* compressor is best suited for capture and compression of analog video, high-quality playback from hard disk, and moderate to high quality playback direct from CD-ROM. This compressor can play back at frame rates of 10 fps or better, and can be transcoded to achieve further compression and to permit the ability to play back directly from CD-ROM. A file compressed with this method is re-compressible with minimal or no quality degradation, allowing digital effects processing and editing to be applied in repeated passes. This format plays well on lower-end

machines. Quality is slightly less than Cinepak.

COMPONENT VIDEO

This compressor is an extension of the *Video* compressor. All characteristics and uses identified for the *Video* compressor apply here as well. It can improve capture frame rate. Component Video is capable of eliminating degradation when it is used as an interim storage format.

ANIMATION

The *Animation* compressor is best suited for images that are originally created in digital form, such as renderings. It performs best on images that have no noise. The *Animation* compressor can be used to compress digitized analog video, but it may not produce high compression ratios from that type of material. If the *Animation* compressor is used for captured analog video, it will produce very good picture quality which can be played from a hard disk. It is unlikely that this compressor will be fast enough to compress and/or play analog video sequences from CD-ROM at sufficient speed.

CINEPAK

This compression method is used primarily for CD-ROM video. It plays on a wide range of computers. Cinepak generally gives acceptable image quality. However, compression may be slow.

PHOTO - JPEG

Of all the currently available compressors, the *Photo* compressor produces the highest quality images at the best compression ratios. It is better known as *JPEG* compression. However, it is not currently fast enough to play back moving image sequences with sound at acceptable frame rates. Because it does achieve such a good result at high compression ratios, the *Photo* compressor can be used effectively as an archival method for video clips with high disk space requirements. *JPEG* is supported on several platforms, making this compressor a viable interchange format between computers of different manufacturers.

NONE

The *None* compressor is a very good format to use for acquisition of analog video. It is also good for digitally-generated animations. It has the advantages of having a very good image quality (since no compression is applied), it can capture in real-time with sound on higher-

end machines, and it can be further transcoded off-line to produce movies with much better compression ratios. The disadvantage is the high disk space requirement.

GRAPHICS

The *Graphics* compressor is a good format for acquisition of analog video when there is a need to have very good picture quality for playback on eight-bit displays. To achieve the best results, it is necessary to capture the video at 24 bits per pixel, apply error diffusion dithering as it is converted to eight bits per pixel, then compress the result. Although the *Graphics* compressor was intended primarily for use with 8-bit source material, it can be effective for video in this context. It does not achieve high compression ratios for video, so it is not currently suitable for playback directly from CD-ROM. It will work well for play back from hard disks.

YUV

The *YUV* compressor is somewhat specialized. It is useful with certain video-editing solutions. It makes a good intermediate storage format if you are applying multiple effects or transitions to an animation. The compression ratio is always 2:1 and the image quality is extremely high. However, it does not support frame differencing.

VIDEO FOR WINDOWS (AVI)

Several *Compression* methods appear in the Video for Windows (AVI) dialog. Each compressor is designed for a specific use.

A brief explanation of some of the more common compression formats appear below. However, other formats may also be available.

MICROSOFT VIDEO 1

This compressor is commonly used for the capture and compression of analog video and high-quality playback from hard disk. Files can be re-compressed with little or no loss of quality.

CINEPAK CODEC BY RADIUS

This compressor allows play back at higher frame rates on most systems. It is widely used for compressed video on CD-ROM and on the Internet. When played back, this codec uses minimal band-width which leaves more processor power available for other tasks, making this a good choice for applications with interactive content.

MICROSOFT RLE

Microsoft's RLE (Run Length Encoding) video compression algorithm compresses eight-bit sequences only. This method is used primarily for base level multimedia computers. Playback is also in eight bit, and isn't scalable for higher-end PCs.

INTEL INDEO® VIDEO

Intel's digital video codec. This codec provides a wide variety of features specifically designed for multimedia applications. This is the most popular type of compression for video files in AVI format.

FULL FRAMES (UNCOMPRESSED)

This compressor is a good format for digitally-generated animations. Because no compression is applied, it has a very good image quality. However, it creates considerable files and requires a large amount of disk space.



The aspect ratio provides you with the width and height frame dimensions of an image.

Various video signal formats allow you to print digital data to a videotape. There are several different video signal formats that can be used. A videotape recorded using one format cannot be viewed on a videotape player or monitor of a different format.

Common Aspect Ratios

The following is a list of common aspect ratios:

- Small (160 x 120)
- Medium Small (180 x 135)
- Medium Large (240 x 180)
- Large (320 x 240)
- Classic (512 x 342)
- Powerbook (640 x 480)
- 13" Standard (640 x 480)

NTSC and PAL Formats

NTSC

NTSC stands for the National Television Standards Committee. It is a video signal standard used by the color television industry in the United States and Japan.

The NTSC is a common format used by many video compression boards.

NTSC video contains frames and fields. Most NTSC video frames consist of two

interlaced fields. Each field is displayed as alternating horizontal lines across the screen. Most computer video formats are non-interlaced.

The frame aspect ratio used by the NTSC standard format is 4:3. This format uses a 640 by 480 resolution.

By using the NTSC standard for digital video, there are two areas of concern when dealing with aspect ratios. They are as follows:

- Pixel aspect ratio
- Frame aspect ratio

There are various divisions within the NTSC standard which determine what pixel and frame aspect ratios are used. These formats are as follows:

- NTSC (resolution 648 x 486 - preferred format)
- D-1 NTSC (resolution 720 x 486)
- D-1 NTSC Square Pix (resolution 720 x 540)

NTSC (Preferred Format)

This NTSC format uses a 648 by 486 resolution format. This format makes an allowance for a few additional pixels to be created on the screen edge that may be cut off when displayed. This format is also commonly used by many video compression boards.

Because this format allows you to display a video without losing the "edges" of your video during playback, this resolution

seems to be the preference within the industry.

D-1 NTSC

The D-1 NTSC format uses the same standard frame aspect ratio as the NTSC format. Unlike the NTSC format, the D-1 NTSC format uses a 720 by 486 resolution using rectangular pixels.

The D-1 pixels used in the NTSC format are displayed using a vertical axis.

D-1 NTSC Square Pix

This format uses the same standard frame aspect ratio as the NTSC format. Unlike the NTSC format, the D-1 NTSC Square Pix uses a 720 by 540 resolution using rectangular pixels.

PAL

PAL stands for the Phase Alternating Line. This is a video standard used by the color television industry and is the common standard used in Europe. This video signal format sets the video to playback at 25 frames per second which contain 625 lines of pixels in each frame.

There are various divisions within the PAL standard which determine what pixel and frame aspect ratios are used. These formats are as follows:

- PAL (resolution 720 x 486)
- D-1 PAL (resolution 720 x 576)

- D-1 PAL Square Pix (resolution 768 x 576)

D-1 PAL

The D-1 pixels used in the PAL format are displayed using a horizontal axis. This format uses the same standard frame aspect ratio as the PAL format. Unlike the PAL format, the D-1 PAL uses a 720 by 576 resolution.

D-1 PAL Square Pix

This format uses the same standard frame aspect ratio as the PAL format. Unlike the PAL format, the D-1 PAL Square Pix uses a 768 by 576 resolution using rectangular pixels.

HDTV (1280 x 720)

The HDTV stands for High Definition Television. This format is a proposed definition which displays at 1280 by 720 resolution.

HDTV (1920 x 1080)

The HDTV stands for High Definition Television. This format is a proposed definition which displays at 1920 by 1080 resolution.

Film (Academy)

This format uses 2048 x 1536, a standard resolution used for digital film.



COMMON MATERIAL TEXTURE SETTINGS

Appendix D

The following information is provided as a guide for designing texture maps for real-world materials you may want to simulate in your models. Other factors in your model may require that you fine-tune

some of these settings to produce the effect you want in the finished rendering. Still, the information in the following list will provide a good starting point from which you can build.

	Ceramic	Paint	Paper	Plastic	Plexiglass	Rubber	Titanium	Chrome	Glass
Diffuse	60	50	100	100	20	70	0	80	20
Ambient	55	35	100	100	0	15	100	80	20
Glow	0	0	0	0	.33	0	0	0	0
Opacity	100	100	100	100	0	100	100	100	10
Refraction	1.00	1.00	1.00	1.00	1.20	1.00	1.00	1.00	1.50
Specular	95	33	5	90	100	5	100	100	80
Reflectivity	25	15	0	15	15	0	30	100	20
1st Smoothness	800	256	30	512	1024	6	900	1100	850
2nd Smoothness	0	0	0	0	0	0	6	0	0
1st Weight %	100	100	100	100	100	100	35	75	100
2nd Weight %	0	0	0	0	0	0	65	25	0



The following list of indexes of refraction was compiled and edited from the 63rd Edition of the Handbook of Chemistry and Physics published by CRC Press. This list is offered as a guide only in applying custom refractive indexes to textures which will be simulating these materials.

MINERALS

Amber	1.455	Hematite	3.220
Amethyst	1.544	Lazulite	1.604
Argonite	1.530	Leucite	1.508
Azurite	1.730	Magnetite	2.020
Bentonite	1.757	Moss Agate	1.540
Beryl	1.565	Onyx Marble	1.486
Borax	1.447	Opal	1.450
Brucite	1.560	Quartz	1.544
Calcite	1.658	Rose Quartz	1.550
Calomel	1.973	Rhodonite	1.711
Celestite	1.621	Ruby	1.766
Chlorite	1.570	Sapphire	1.770
Chromite	2.160	Serpentine	1.530
Diamond	2.418	Smoky Quartz	1.550
Dolomite	1.679	Spinel	1.719
Emerald	1.576	Sulfur	1.958
Erythrite	1.626	Talc	1.539
Fluorite	1.433	Topaz	1.606
Gypsum	1.519	Turquoise	1.610
Halite	1.544	YAG Rhodochrosite	1.830
Helvite	1.728	Zircon	1.923

INORGANIC COMPOUNDS

Air	1.0003	Manganese Borate	1.617
Aluminum Chloride	2.700	Manganese Chloride	1.555
Aluminum Oxide	1.665	Mercury Cyanide	1.645
Barium Oxide	1.980	Mercury Iodide	2.748
Calcium Borate	1.540	Potassium Cyanide	1.410
Calcium Carbide	1.750	Potassium Fluoride	1.352
Calcium Sulfite	1.590	Sodium Bromide	1.479
Copper Chloride	1.644	Sodium Cyanide	1.452
Common Glass	1.600	Sodium Nitrate	1.587
(ranges from 1.5 to 1.9, depending on composition)		Sodium Phosphate	1.440
Ice	1.305	Strontium Fluoride	1.442
Iron Sulfate	1.802	Strontium Oxide	1.870
Lead Nitrate	1.782	Tin Iodide	2.106
Lithium Bromide	1.784	Water	1.333
Lithium Chloride	1.662	Zinc Bromide	1.545
Lithium Oxide	1.644	Zinc Silicate	1.616

ORGANIC COMPOUNDS

Methanol	1.326	Sulfuric Acid	1.427
Ethyl Ether	1.352	Ethelene Glycol	1.434
Acetone	1.357	Chloroform	1.444
Ethanol	1.359	Fluorobenzene	1.463
Ethyl Acetate	1.370	Toluene	1.494
Acetic Acid	1.370	Benzene	1.498
Propionic Acid	1.385	Methyl Benzoate	1.515
Butyric Acid	1.397	Benzyl Alcohol	1.538

REALISTIC GEMS

You should note that in order for polygonal objects in StudioPro to realistically render with the type of complex crystalline appearance of precious and semi-precious gems, they must contain an interior structure of transparent surfaces through which the light can interact and refract realistically. Also, pay special attention to the following points:

1. You must model the correct geometry for the gem(s) you wish to simulate. For example, does the gem have a Cubic, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic, or Triclinic crystalline shape?
2. You must create and apply a texture that uses a second smoothness value corresponding to the internal crystalline structure. (This is definitely one of those trial and error type of projects.)
3. You must increase the value in the transparency recursion field of the Raytracer Esoterica dialog box (opened through the Render command's dialog box) so that the multiple transparent surfaces will be fully noted and rendered by the raytracer.



FILE MENU

New	Command	N
Open	Command	O
Close	Command	W
Save	Command	S
Import	Command	I
Print	Command	P
Quit	Command	Q

EDIT MENU

Undo	Command	Z
Cut	Command	X
Copy	Command	C
Paste	Command	V
Duplicate	Command	D

SELECTION MENU

Select All	Command	A
Select None	Command	1
Hide Selected	Command	3
Show Hidden	Command	4

Make Shy	Command	5
Make Shy Normal	Command	6
Make Construction	Command	7
Make Construction Normal	Command	8

RENDERING MENU

Render	Command	R
--------	---------	----------

MODELING MENU

Reshape	Command	L
End Reshape/Edit	Command	E
Align	Command	/
Group	Command	G
Ungroup	Command	U

WINDOWS MENU

New Window	Command	\
Fit Views To All	Command	=
Fit Views To Selection	Command	-

SELECTING OBJECTS

Extend Selection	Shift
List objects on depth axis	Command

MOVING OBJECTS

Move origin point	Command
Move perpendicular to active grid	Command +Shift

NUDGING OBJECTS

(Relative to active grid)

Negative Z direction	Up arrow
Positive Z direction	Down arrow
Positive X direction	Right arrow
Negative X direction	Left arrow
Positive Y direction	Command-Shift Up arrow
Negative Y direction	Command-Shift Down arrow

WORKING WITH BÉZIER HANDLES

Hinge direction handles	Option
Disjoint hinged handles	Command

2-D RESHAPE

Add a vertex point	Option
--------------------	--------

TOOL PALETTE

Select Object Move Tool	1
Select Object Rotate Tool	2
Select Object Scale Tool	3
Toggle between current tool and last selected object manipulation tool	Space bar

CHANGING VIEW ORIENTATION

Left	4
Front	5
Right	6
Back	7
Top	8
Bottom	9
Isometric	/

CHANGING GRIDS

Make X Grid active	X
Make Y Grid active	Y
Make Z Grid active	Z
Cycle forward between all grids	+
Cycle backward between all grids	-
Cycle forward between User grids only	Option +
Cycle backward between User grids only	Option -



FILE MENU

New	Ctrl	N
Open	Ctrl	O
Close	Ctrl	W
Save	Ctrl	S
Import	Ctrl	I
Print	Ctrl	P

EDIT MENU

Undo	Ctrl	Z
Cut	Ctrl	X
Copy	Ctrl	C
Paste	Ctrl	V
Duplicate	Ctrl	D

SELECTION MENU

Select All	Ctrl	A
Select None	Ctrl	1
Hide Selected	Ctrl	3
Show Hidden	Ctrl	4

Make Shy	Ctrl	5
Make Shy Normal	Ctrl	6
Make Construction	Ctrl	7
Make Construction Normal	Ctrl	8

RENDERING MENU

Render	Ctrl	R
--------	------	----------

MODELING MENU

Reshape	Ctrl	L
End Reshape/Edit	Ctrl	E
Align	Ctrl	/
Group	Ctrl	G
Ungroup	Ctrl	U

WINDOWS MENU

New Window	Ctrl	\
Fit Views To All	Ctrl	=
Fit Views To Selection	Ctrl	-

SELECTING OBJECTS

Extend Selection	Shift
List objects on depth axis	Ctrl

MOVING OBJECTS

Move origin point	Ctrl
Move perpendicular to active grid	Ctrl + Shift

NUDGING OBJECTS

(Relative to active grid)

Negative Z direction	Up arrow
Positive Z direction	Down arrow
Positive X direction	Right arrow
Negative X direction	Left arrow
Positive Y direction	Ctrl+Shift Up arrow
Negative Y direction	Ctrl+Shift Down arrow

WORKING WITH BÉZIER HANDLES

Hinge direction handles	Alt
Disjoint hinged handles	Ctrl

2-D RESHAPE

Add a vertex point	Alt
--------------------	-----

TOOL PALETTE

Select Object Move Tool	1
Select Object Rotate Tool	2
Select Object Scale Tool	3
Toggle between current tool and last selected object manipulation tool	Space bar

CHANGING VIEW ORIENTATION

Left	4
Front	5
Right	6
Back	7
Top	8
Bottom	9
Isometric	/

CHANGING GRIDS

Make X Grid active	X
Make Y Grid active	Y
Make Z Grid active	Z
Cycle forward between all grids	+
Cycle backward between all grids	-
Cycle forward between User grids only	Alt +
Cycle backward between User grids only	Alt -



GLOSSARY

Algorithm – a recursive mathematical procedure.

Alpha channel – an eight-bit channel in the 32-bit color image which is used to store transparency data.

Ambient light – light that is present in the environment. It has no focus or direction.

Anti-aliasing – a mechanism to prevent or remove the jagged appearance of diagonal lines or edges in an image. Anti-aliasing can be achieved in rendered images by averaging adjacent pixels with sharp variations in color and brightness or by increasing the resolution of the image to meet or exceed the resolution of the device displaying or printing it.

Aspect ratio – the width and height of the frame dimensions of an image.

AVI – (Audio Video Interleaved). This is a Windows file format for digital video and audio.

Bézier splines – lines that are curved or capable of being curved. The curve of the line is defined by vertex points.

Bitmap – also known as a pixel image. An image composed of pixels. May be any resolution or color depth.

Bounding Box – an imaginary rectangle that exactly encloses the geometry of an object or group of objects. When an object is selected, handles appear at the corners and midpoints of the sides of this rectangle. When an object is manipulated using one of the object-handling tools, its bound-

ing box appears to interact with the tool and provide visual feedback during the tool operation.

CAD – an acronym that stands for Computer-Aided Design.

Click – the act of positioning a tool cursor in a view, and usually on an object, then pressing the mouse button. This event initiates a process or operation related to the tool's function.

Click-and-Drag – the process of clicking the mouse button and, while holding the mouse button down, dragging the cursor in the view. For example, this procedure would be used to move an object from one location to another in a view.

Codec – compression/decompression of video.

Color Depth – the number of bits required to define the color of each pixel in an image. Black and white images use one bit. Grayscale images use eight bits (256 shades of gray). Eight-bit color images provide 256 colors. Images with 24-bits provide millions of colors (eight bits for each color: red, green, blue). Images with 32 bits provide an additional eight bits for alpha data.

Cursor – an icon indicating the current tool selected and/or the current focus of the program. StudioPro uses different cursors to indicate the selected tool.

Database – the area of memory within the program while it is running that is set

aside to keep track of objects within a model.

Default – a parameter or setting pre-defined in the program which may be changed by the user.

Diffuse Reflection – that component of the light reflecting from a surface caused by its dull or matte nature. Dull or matte surfaces reflect the light striking them in random angles over a large area, giving the surface an equally-bright appearance from a wide range of viewing positions.

Dither – to blend transitions between colors by placing small dots of black, white, or other colors to simulate those colors that can't be represented because of limits on the numbers of colors available.

Double-click – the act of positioning the cursor on an object in the active view or an icon in the interface, then pressing and releasing the mouse button twice in rapid succession.

dpi – an abbreviation for dots per inch.

EPS – short for encapsulated PostScript™, a file format for graphics. EPS format contains all of the code necessary to print a file.

Extension – a modular software program that expands the capabilities of the existing software. The extension functions as if it were part of the original program.

Extrusion – a method of creating a 3-D object using a 2-D template; giving depth to the 2-D shape.

File compression – the process of reducing the amount of storage space used by a file.

Filter – a routine for altering images.

Flat Shading – shading by filling each facet of a surface with a single color.

Gradient – a feature that adds color or tint that varies smoothly from one color or brightness to another.

Group – a collection of objects that act as one.

Hierarchical Object – creating an object shape in a separate work space which, when inserted into the model, retains a link to the shape. Changes made to the shape are automatically applied to the instances.

Hue – the property of color which corresponds to the frequency or wavelength of the light.

Instance – a replica of a shape. Each time a shape is inserted into a window, an instance of that shape is actually inserted. Any changes made later to the original shape are reflected in each instance, or occurrence, of the shape. Changes made to the instance, however, do not in any way affect the root shape.

Jaggies – refers to the jagged edges formed in the diagonal or circular lines of bit-mapped images.

JPEG – short for Joint Photographic Experts Group, a committee that has been developing a compression standard for still images. This term also refers to the

compression method developed by that group.

Lathing – a method of creating a 3-D object by revolving a 2-D profile about a designated axis.

Luminance – the amount of light radiated by a monitor. It refers to intensity or brightness.

Marquee – a rectangular dotted box created by dragging the cursor. Marquees appear in the programs windows or views to provide visual feedback during various tool operations.

Mesh Surface – a surface that has common vertex points between adjacent polygons. Mesh surfaces are typically used to define complex forms. The surface also provides smoothing information for the rendering algorithms.

Normals – the mathematical value that indicates the direction a surface is facing in 3-D space. Normals may be attached to individual polygons or to the vertex points that define the polygons.

Octree – an internal data structure used to subdivide the model space for more efficient handling.

Orthographic – a method of displaying objects in a view where parallel lines do not converge. Orthographic projections are used to compare object's absolute dimensions, without the confusion of relative distance from the view.

Parent/Child Link – an internal connection between two objects, in which the child is linked to the parent for constraint pur-

poses. Various uses exist in different applications for linked objects, but are usually related to animation.

Perspective – a depth cue available in StudioPro in which parallel lines converge to align with a designated vanishing point. Perspective is a product of several parameters in the displayed view: Lens focal length, camera size, and distance from objects.

Penumbra – A partial shadow between regions of total shadow and total illumination.

PICT – the standard file format used by Macintosh for storing graphics using Apple's QuickDraw imaging routines.

Pixel – an acronym that stands for Picture Element. It is the smallest component which makes up the display on a computer monitor. Each dot on the screen is a pixel. Many images displayed on the screen are likewise stored in a pixel form that is mapped to the screen pixels for viewing.

PointCloud – a rendering method used primarily for displaying the model in the modeling window. Only the vertices are rendered.

Point light – a local source of illumination that shines in all directions from a single point.

Polygon – a closed plane bounded by three or more line segments.

Primitives – basic geometric elements from which complex objects can be built.

Radiosity – the process of determining how light is transferred between surfaces based on their color and proximity. Radiosity is capable of producing remarkable realism.

Raytracing – a rendering algorithm which simulates the physical and optical properties of light rays as they reflect off objects in a 3-D model. This method of rendering typically traces rays of light backward from the imaging plane toward the light sources.

Reflectivity – the percentage of the total amount of light striking the surface that reflects from, or bounces off, the surface of the object.

Refraction – the change in direction of light as it passes from one transparent material to another. This causes an apparent shift in the image showing through the transparent material.

Rendering – a visual representation of the model. This is accomplished by combining a geometric model with descriptions of its surface properties, lighting, etc. to generate a photorealistic image of the model.

Resolution – the number of pixels per unit. The higher the number of pixels, the higher the resolution, and the greater the capability to display details.

RGB – a method of representing all colors as the combination of red, green, and blue light.

Saturation – the extent to which a color is made purely or a particular hue; the vividness of the hue.

Specular Reflection – that component of the light reflecting from a surface caused

by its shiny or glossy nature. Shiny surfaces reflect light striking them in clearly defined angles of incidence; resulting in “hot spots” corresponding to the direction of the light sources providing the illumination.

Surface Mapping – a process in which an image is used to define an object’s surface properties. A separate map is used to define color, texture, reflectivity, transparency.

Spotlight – a local source of illumination which shines in only one direction

Sweep – a method of creating a 3-D object from a 2-D template using a combination of lathe and extrude. The template is both pushed through space and revolved around an axis at the same time to create a geometrically complex shape. This type of modeling would be used to create the threads on a bolt, for example.

TIFF – short for *Tagged-Image File Format*. This format was developed by Aldus® and Microsoft® to represent pixel-based images, such as those produced by scanners.

Tile – to fill an area with small, regular shapes or blocks of patterns.

Transparency – the characteristic of allowing an underlying image to show through, either partially or totally.

Vertex – a point of intersection of two vectors or a point used to define a polygon.

Volumetric Mapping – a process in which a map is defined as a 3-D volume, but which is only visible on the surface of an object. The object has the appearance of being

carved out of the volume. Volumetric maps may also be used to define multiple surface characteristics.

Window – an element of a desktop interface that contains one or more views of the 3-D model. There are several types of windows used in StudioPro.

Wireframe – a fundamental rendering method that represents 3-D objects with

connecting lines. No surfaces are shown, but may be implied if hidden lines are removed for the resulting image.

X-axis – the horizontal axis which represents width.

Y-axis – the vertical axis which represents height.

Z-axis – the axis which represents depth.



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