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Infini-D 4.5
User's Manual

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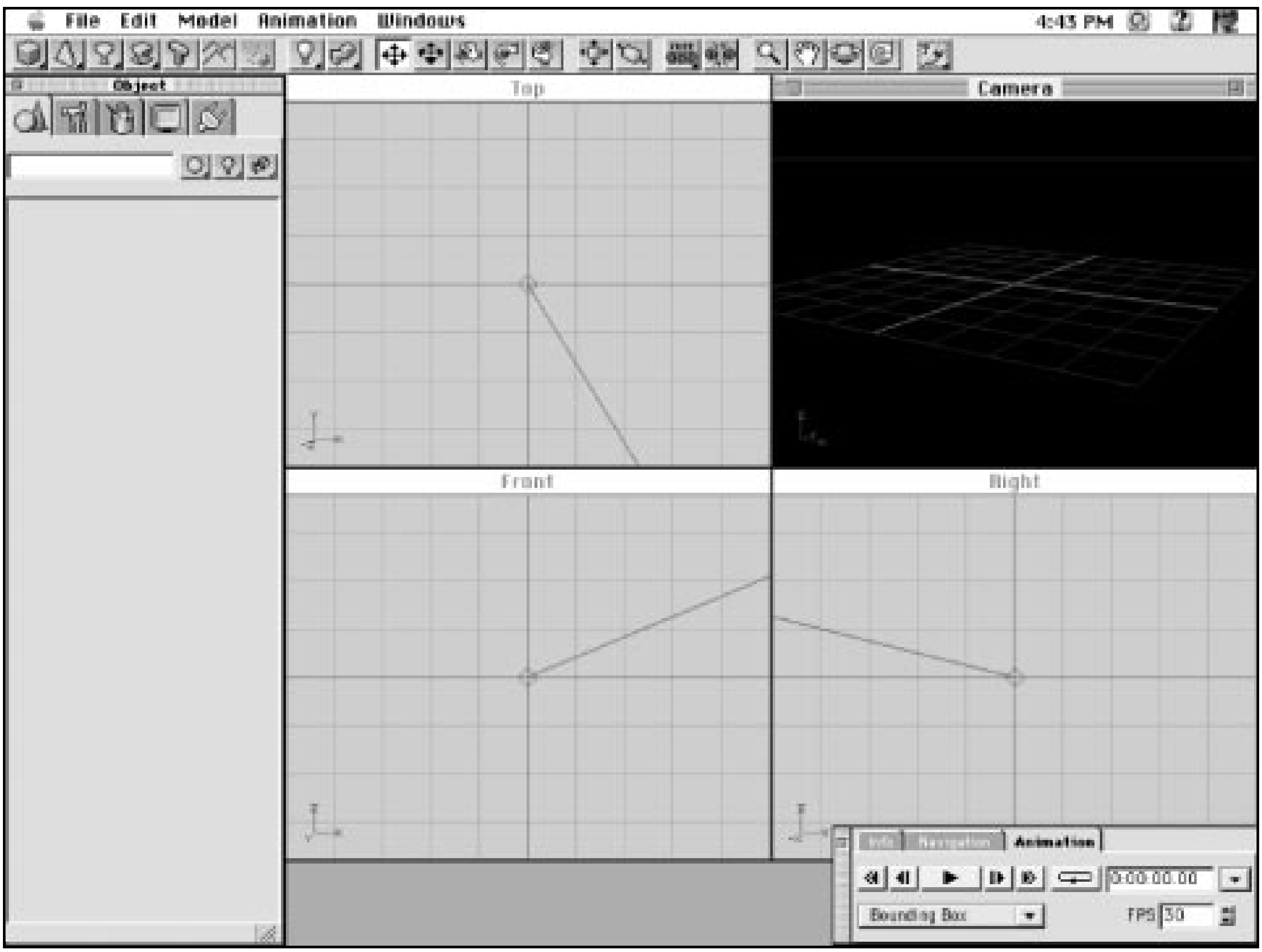

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Section 1

Welcome

Welcome to Infini-D. Infini-D is designed to be a powerful, flexible, intuitive 3D creation environment that lets you bring your ideas to life in the form of stunning 3D images and animations. Infini-D is used all over the world for creating graphics and animations for broadcast television, corporate video, CD-ROM games, multimedia titles, print, and more.

We have worked hard throughout the development of Infini-D to provide you with an environment that is logical and easy to understand, and to make the transition from beginner to expert or from 2D design to 3D design as smooth as possible. However, as with any complex application, there is a learning curve associated with becoming proficient in the various aspects of Infini-D and (if you are new to 3D) with learning how to work in three dimensions. This manual is designed to be the first step in learning to create 3D scenes and animations, and will introduce you to the basic concepts, tools, and techniques you will need. Please take the time to read through this manual thoroughly, it will be time well spent, and your experience using Infini-D will be more rewarding and productive for it.

Good luck, and thank you for choosing Infini-D!

Chapter

1

Introduction to Infini-D

This chapter provides an overview of Infini-D, how to get the most out of this manual, and some basic concepts to keep in mind when using the program.

This chapter covers the following topics:

• What's New in Infini-D 4.5

• Changes from Version 3.x to 4.0

• Rendering Speed

• About this Manual

• Conventions Used in this Manual

• Where to Get Additional Help

• Where to Send Feedback

WHAT'S NEW IN VERSION 4.5

Infini-D 4.5 builds on the new interface and features introduced in version 4.0, providing greatly enhanced performance, rendering management features, and many smaller enhancements. The major improvements in version 4.5 are as follows:

- Optimized renderer—Rendering performance has been the major focus of this revision, and final rendering speed with Phong shading has been improved dramatically.
- Integration of a full-featured render queue —Previously only available in the separate application BackBurner™, a render queue has been incorporated directly into Infini-D. New features include:
    - Batch rendering
    - Suspend and resume any job
    - Fault tolerant rendering

    (See Chapter 24 for details.)
- Distributed network rendering (Mac only—see the *Infini-D 4.5 User's Manual Addendum* on the Infini-D CD for details)
- MetaStream export—This allows you to export your models to the new MetaStream format for progressive downloading and interactive viewing over the Internet. (See the Infini-D User's Manual Addendum on the Infini-D CD for details.)
- U/V texture coordinates (for imported image maps) and UVW texture coordinates (for procedural surfaces) have been implemented for all objects, providing realistic texture behavior on all deformed objects.
- After Effects-compatible plug-in filter support now available on Windows as well as Macintosh (See Chapter 25 for details.)
- New particle system effects controls including collision color, die on impact, freeze, and spawn. (See the *Infini-D 4.5 User's Manual Addendum* on the Infini-D CD for details.)
- New particle warp objects—gravity, turbulence, wind, etc.—for applying realistic forces to particle systems. (See Chapter 7 for details.)
- New Custom Presets—allows saving and naming custom particle systems and lens flare effects. (See the Chapters 7 and 16 for details.)
- Dynamic multi-resolution support now available on Macintosh as well as Windows. (See Chapter 12 for details.)
- Interactive rendering improvements: improved interactive rendering performance; background image and grid planes now visible in interactive mode.
- New texture mapping mode pop-up on the Object tab of the Command Floater. Allows you to change the mapping mode of an object's texture without having to create a composed surface. (See Chapter 9 for details.)
- Active view switching during animation playback.

MAJOR FEATURES ADDED IN VERSION 4.0

Version 4.0 was a major upgrade from previous versions, and those of you coming from an older version of Infini-D will see quite a few changes to the overall interface and feature set. Here is a brief overview of the main new features and interface elements introduced in version 4.0 and where to read about them in this manual:

- New interface elements including:
    - Toolbar *(Chapter 4)*
    - Command Floater *(Chapter 4)*
    - Control Floater *(Chapter 4)*
    - Grids/ground plane *(Chapter 4)*
    - Audio track in sequencer *(Chapter 20)*
    - Target cameras and spotlights *(Chapters 16 and 17)*

- New mesh editor *(Chapter 11)*
- Enhanced lighting techniques *(Chapter 16)* including:
    - Visible light beams and rays
    - Tube lights
    - Soft shadows

- Enhanced rendering including:
    - New scanline renderer
    - MIP mapping and summed area tables for textures *(Chapter 14)*
    - Support for Adobe After Effects™-compatible plug-in filters *(Chapter 25)*
    - Linear & exponential fog *(Chapter 17)*

- New features for broadcast/video users *(Chapter 24)* including:
    - Field rendering
    - NTSC/PAL color correction
    - Non-square pixels

- New animation effects including:
    - Particle systems *(Chapter 7)*
    - Deformations *(Chapter 12)*

NOTES ON 3D RENDERING PERFORMANCE

The process of rendering a 3D scene is a complex process that involves many steps and calculations that are invisible to the user. Stunning results are often easy to achieve in the 3D environment largely because the computer does a lot of work for you: automatically calculating shadows, reflections, transparencies, light glows, procedural surfaces, deformations, etc. One thing that you will quickly discover (if you are not already familiar with working in 3D) is that it takes time to render your scene, and the more complex the scene is (in terms of number and kind of objects, number of lights, which options and effects are used, etc.), the longer it will take to render. This is a basic, inescapable fact of working in 3D. Faster machines will render faster, and there are various things you can do to speed up the rendering of a scene, but you should always be aware that the more you add to a scene the longer it will take to render. Infini-D 4.5 has been greatly optimized to render more quickly and efficiently, so you will see marked speed improvements over version 4.0/4.1. However it is still important to keep render time in mind when you are constructing your scene.

Throughout this manual, as the various features and capabilities of Infini-D are discussed the impact that each feature will have on final rendering time will be mentioned. The best advice, however is to just use common sense: don't add unneeded complexity to your scene.

Note

Final rendering is discussed in detail in Chapters 23, 24, and 25.

ABOUT THIS MANUAL

This User's Manual is designed to give you a working knowledge of all the features and interface elements in Infini-D. It is important that you at least familiarize yourself with all the major sections of the manual and ideally you should read it in its entirety. You may also find the manual useful as a reference resource when using Infini-D. It includes a comprehensive table of contents and index to help you find the information you need.

The manual has been designed around a typical work flow (See *Chapter 5: Project Basics* for more information). This work flow is meant to provide you with a starting point for your projects and to give meaningful structure to the manual. As you use the program, you will likely develop your own work flow that suits your unique work habits.

The manual is divided into sections that follow the work flow. There is a copy of the work flow at the beginning of each chapter with the relevant section highlighted to illustrate where you are in the flow. As you use the manual, you may want to refer to

Chapter 5 from time to time to reacquaint yourself with the overall work flow.

This manual assumes that you are familiar with the Macintosh® or Windows™ operating system. If you need help with features specific to either system, refer to the documentation that came with your computer.

Note

CONVENTIONS USED IN THIS MANUAL

This manual uses the following conventions to identify information:

- Whenever you must execute a command by clicking the mouse, the manual displays the command in **bold** text (for example, click on **OK** to continue).
- Menu items and buttons also appear in **bold** text for easy identification.
- Chapter cross references are displayed in *italics* (for example, *Chapter 1, Introduction).*
- This manual combines Windows and Macintosh instructions. In most cases, these overlap, but in those instances where there are differences (most often with key commands), the manual lists both commands with an abbreviation of each system in parentheses next to the command (Mac) or (Win).
- For consistency, all the graphics in this manual were created on one platform (Macintosh). For the most part, interface elements look identical on Windows, the only difference being the style of checkboxes, buttons, etc. In the few cases where an interface element is actually different on Windows, both examples are shown.

WHERE TO GET ADDITIONAL HELP

Check the Table of Contents or Index in this manual whenever you need to locate information about a particular function. If you have trouble locating the information, there are other ways to get help:

- **Quick Reference Card**—Use this to learn about basic Infini-D functions or as a quick reminder of certain commands and keyboard shortcuts.
- **Tutorial Manual—**Use this to get an organized introduction to the main functions of the program. The Tutorial provides step-by-step instructions for using many Infini-D features. If you are new a user, this is a great place to start.
- **MetaCreations Web Site**—The Internet provides a quick way to get answers to questions. You can use the MetaCreations web site at www.metacreations.com as a technical support resource.
- **Customer Support**—Technical Support is free* to registered users of Infini-D. There are many easy options to obtain technical support for questions about installation, configuration or functionality. These options are Web, e-mail, fax and phone support. For questions about creative technique, please see the Creative Support section below.

- **Web Support**—Many of the answers to your questions are available 24 hours a day on our web site: www.metacreations.com/support

  In addition to frequently asked questions, our web site provides troubleshooting techniques, late breaking product news, and other resources to get the most out of Infini-D.

- **E-mail Support**—To answer your technical support question most effectively and quickly, please use the e-mail form provided to you on our web site: www.metacreations.com/support.

- **Phone Support**—Phone support hours are Monday-Friday, 8:00 AM-5:00 PM Pacific Standard Time, excluding holidays. Call (408) 430-4085. When calling, please have your serial number handy and be at the computer that you need assistance. Fax (408) 438-9672

Please include your name and serial number on all correspondence.

- **Creative Support**—If you have questions regarding creative technique, please refer to our message boards on our web site: www.metacreations.com. This area is available to you to meet and talk with other users of Infini-D. to share knowledge, technique, and inspiration.

- **MetaCreations Sales**—Our friendly and knowledgeable sales force can answer basic questions about product capabilities and inform you of other MetaCreations products which may fit your needs. You may contact sales by sending e-mail to sales@metacreations.com or by calling 800-472-9025.

Note

MetaCreations does not currently charge for technical support for Infini-D. The only expense to the user is the telephone toll charges. MetaCreations reserves the right to change its support policies at any time.

FEEDBACK

We are very interested in hearing your feedback. Many of Infini-D's changes and improvements over the years have been based upon user requests and input. If you have comments or feature requests, please send them to us via the World Wide Web:

http://www.metacreations.com/feedback.html

You may send also send physical mail to us:

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Carpinteria, CA 93013

Tel: (805) 566-6200
Fax: (805) 566-6385

Chapter 2

Installation

This chapter provides general installation requirements and instructions. Each section provides instructions for both Windows and Macintosh users. Find the section that is appropriate for your operating system.

This chapter covers the following topics:

- System Requirements
- Installation Instructions
- Registering Infini-D

SYSTEM REQUIREMENTS

This section lists the minimum system requirements for Windows and Macintosh users. Refer to the section that is appropriate for you. Also, see the section on Infini-D and memory usage in *Chapter 3: Getting Started*.

Windows

- Pentium Processor
- 32 MB RAM
- Microsoft Windows™ 95 or Windows NT 4.0 operating system
- Super VGA display (16” or larger recommended)
- CD-ROM drive

Macintosh

- Power Macintosh or compatible
- MacOS System 7 or newer
- 24 MB Available RAM (32 MB recommended)
- Color Display (16” or larger recommended)
- CD-ROM drive

INSTALLATION

This section provides installation instructions for each operating system. Refer to the one that is appropriate for you.

Windows

Follow these steps to install Infini-D on your Windows system:

Step 1: Insert the Infini-D CD-ROM into your CD-ROM drive.

Step 2: Choose Run from the Program Manager **Start** menu.

Step 3: Type d:\infini-d\setup.exe (where d: is the CD-ROM drive) and click on **OK** or **Next**.

Note

*You can also open the Infini-D folder on the CD and double-click on the **SETUP.EXE** icon. Windows 95 users can open the Control Panel and double-click on the **Add/Remove Programs** icon. Click on **Install**, then follow on-screen prompts.*

Step 4: Follow the on-screen instructions to complete the installation.

Macintosh

Follow these steps to install Infini-D on your Macintosh:

Step 1: Insert the Infini-D CD-ROM into your CD-ROM drive and double-click on the **Infini-D Installer** icon.

Step 2: When the installer screen appears, click on **Continue**, then follow on-screen instructions.

REGISTERING INFINI-D

To be eligible for technical support, as well as receive notices of bug-fix updates and feature upgrades, you must register your copy of Infini-D. Please complete and return the registration card that came in your box of Infini-D. Be sure to retain a copy of your serial number for your records. You may register by fax or mail. If you change your address after registering, you may call or e-mail us so we can update your record, or send us a standard Post Office change of address notice. See *Feedback* in *Chapter 1: Introduction* for more information on how to contact MetaCreations directly.

Chapter 3

Getting Started

This chapter explains how to get started using Infini-D by introducing some basic program concepts. It covers the following topics:

- Launching the Program
- Setting Preferences
- Working with Scenes
- Infini-D and Memory
- Exiting Infini-D

LAUNCHING THE PROGRAM

This section explains how to launch Infini-D on Macintosh or Windows 95 computers. This assumes you installed the program correctly as explained in *Chapter 2: Installation*. Refer to the instructions for your platform.

Windows

Follow these steps to launch Infini-D from Windows:

Step 1: Click on the **Start** menu. Note that the installation program places Infini-D in the **Programs** sub-menu of your Start menu automatically.

Step 2: Click on **Infini-D**, and Infini-D opens. See *Chapter 4: Infini-D Tools and Interface* for more information.

Macintosh

Follow these steps to launch Infini-D on the Macintosh:

Step 1: Locate the **Infini-D** folder on your hard drive.

Step 2: Double-click on the **Infini-D** icon to start the application. See *Chapter 4: Infini-D Tools and Interface* for more information.

SETTING PREFERENCES

This section explains how you can customize your copy of Infini-D by changing the preferences in the Preferences dialog box. You should check these preferences the first time you use Infini-D, but you may want to revisit them to fine-tune your settings for individual situations or to reflect changes in your work style. It is important to keep in mind that the settings you select here provide default settings for your entire scene. Infini-D saves your preferences so they apply to every scene you open.

The Preferences dialog box is divided into a number of logical tabs. Each one has several settings related to the type of information for the chosen tab. Click on a tab to move between preference types, then adjust the settings as needed.

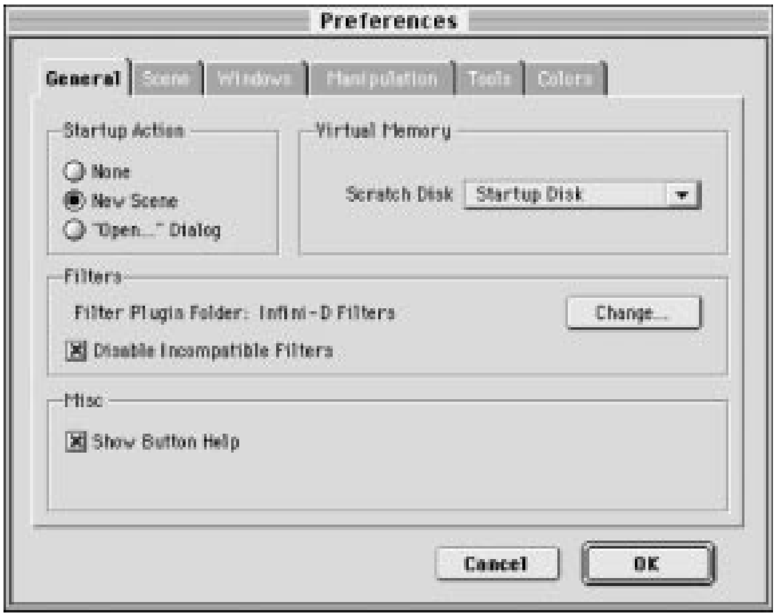
This section covers the following topics:

- Accessing the Preferences Dialog Box
- General Settings
- Scene Settings
- Windows Settings
- Manipulation Settings
- Tools Settings
- Colors Settings

Accessing the Preferences Dialog Box

This section explains how to begin setting preferences by accessing the Preferences dialog box: Follow these steps:

Step 1: Click on **Edit** in the menu bar and select **Preferences**. The Preferences dialog box opens.



Step 2: Adjust the preferences as explained in the sections that follow.

Step 3: When you are finished, click on **OK** to save the changes and Infini-D applies them immediately. Click on **Cancel** if you decide to exit without saving the changes.

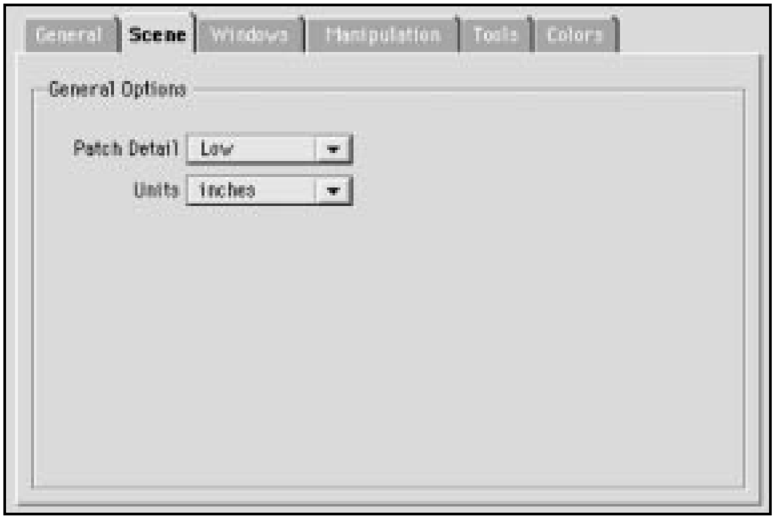
General Settings

This section explains how to adjust the settings in the General tab of the Preferences dialog box. These options are described below:

- **Startup Action**—This setting determines how you wish to start Infini-D. Click on the radio button next to your choice. These are described below:
  - None: Select this option if you want to start Infini-D with no scene open. In this case, you have to click on **File** and select **New** to start a new scene, or **Open** to choose an existing scene.
  - New Scene: Select this option if you want Infini-D to open with a new scene.
  - Open Dialog**:** Select this option if you want to select a scene from a standard File/Open dialog box upon startup.

- **Virtual Memory**—Select the hard drive that Infini-D uses to store large imported images. The default is Start-Up Disk, but you will probably want to select a hard drive with a significant amount of available space. See *Infini-D and Memory* later in this chapter for more information.
- **Filters**—This option indicates the location of the Plug-in filters. You must select the correct location or you will not find any filters in the Filters command tab in the Command Floater. Click on the **Change** button to select the correct location from a standard File/Open dialog box. See *Chapter 4: Infini-D Tools and Interface* for more information on the Command Floater.
- **Show Button Help**—Leave this option checked if you want to see the name of a button or tool when you move the mouse over it. This can be helpful in identifying interface elements, but you can uncheck it to turn it off if you do not like it.

Scene Settings



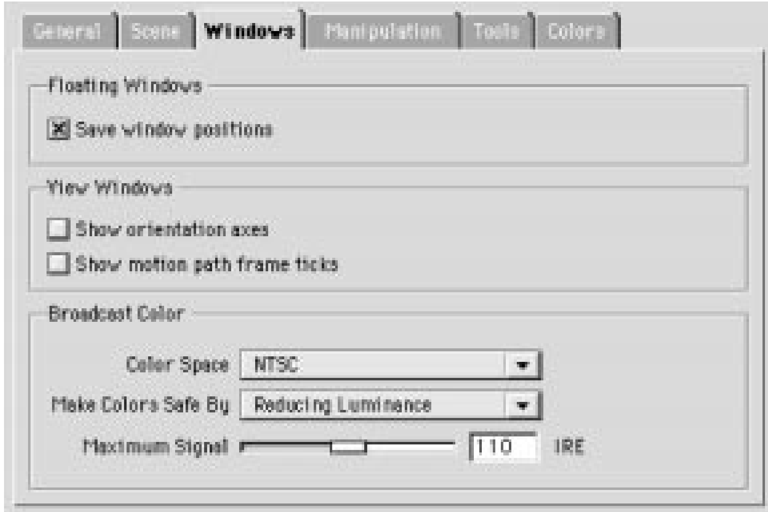
This section explains how to adjust the settings in the Scene tab of the Preferences dialog box. These options are described below:

- **Patch Detail**—This setting determines the default level of detail for SplineForm objects—that is, any object you created in the Workshop or any default Infini-D SplineForm object from the tool bar. The Patch Detail setting looks at each spline segment of an object and turns it into an appropriate number of polygons for shading. The higher the level of detail, the smoother the surface looks, but the longer the rendering time. For this reason, you may want to keep the default low, then select a higher level in the Render Setup dialog box when you render the scene.

  See the discussion on *Quality Versus Speed* in *Chapter 1:Introduction* for more information. See *Chapter 10: The SplineForm Workshop* for more information on SplineForm objects and the Workshop. See *Chapter 24:Final Rendering* for more information on the Render Setup dialog box.

- **Units**—This setting determines the unit of measurement you wish to use for the rulers in the Workshop. Note that these settings are for the Workshop only and have no effect on the size of an object in a View window in your scene. The Units setting is global to the scene. All objects are measured in the same unit.

Windows Settings



This section explains how to adjust the settings in the Windows tab of the Preferences dialog box. This tab is divided into three sections:

- Floating Windows
- View Windows
- Broadcast Color

Floating Windows

This setting determines whether Infini-D saves the position of Floating windows such as the Command Floater across Infini-D sessions. In most cases, you will probably want to leave this checked, but if you want to adjust your Floating windows for each session, then uncheck it. In some rare instances, you may find that the floating windows have become "lost" on your monitor. If you uncheck this option, quit Infini-D, and then relaunch it, the floating windows should reappear.

View Windows

These settings determine the View window defaults in Infini-D. Each option is described below:

- **Show Orientation Axis**—When this option is checked you see an icon with axis labels in each View window. Uncheck it to hide it.
- **Show Motion Path Ticks**—When this option is checked, you will see tick marks along motion paths to indicate the location of the object at each frame. This is useful for testing motion during animation but is much slower to draw. See *Chapter 21: Advanced Animation* for more information on Motion Paths.

Broadcast Color

These settings are for users who are creating graphics or animation for video. Computers reproduce color differently than television, so you have to make some adjustments to make the finished Infini-D image look right for broadcast. In addition, there is a legal broadcast frequency limit that you can exceed easily with computer-generated graphics. You can use these settings to ensure your output falls within the legal limits.

Each option is described below:

- **Color Space**—Select the broadcast type appropriate for your broadcast location. Your choices are NTSC or PAL. NTSC is the standard used in the United States and Japan. PAL is used throughout most of Western Europe.
- **Make Colors Safe By**—Select the method you wish to use to make the colors in your computer-generated graphics fall within the legal broadcast limits. Your choices are described below:
    - Reducing Luminance: This method reduces the overall brightness of each pixel by adjusting the color towards black. This is the default and tends to produce the best result. If you select NTSC as the Color Space type, you should probably pick this as the Color Safe method.
    - Reducing Saturation: This method reduces the saturation of each pixel by making them look more uniform or gray. This could result in a washed out look when your image is broadcast.
    - Keying Out: Select this method to test whether or not your image falls with in the legal broadcast color range. This method works in the alpha channel by keying out pixels that fall outside the legal color range, so that unsafe pixels are black in both your image and the alpha channel.

      This means if you composite your image over a highly-contrasting background, the unsafe colors show through. If you find you have a significant area of unsafe colors, you may want to adjust the color levels yourself by decreasing light intensities, adjusting surface properties, changing surfaces altogether or changing any effect that reduces the overall colors to safe broadcast levels. This can produce a more controlled result than letting Infini-D do it for you.
- **Maximum Signal**—This setting determines the numerical level considered unsafe. The range is from 100 to 120 IRE (Institute of Radio Engineer) units. The default of 110 is considered a reasonable level that has the least effect on the quality of your rendered image. A value off 100 IRE reduces the color or saturation of your image the most, but might produce an image that is too washed out. A value of 120 IRE changes your image the least, but the result might be considered too “hot” for broadcast use.

  Drag the slider or enter a number in the field adjacent to the slider to change this setting.

Manipulation Settings

This section explains how to adjust the settings in the Manipulation tab of the Preferences dialog box. This tab is divided into four sections:

- Active View
- Inactive Views
- Draw Selection As
- Miscellaneous

Active View

This setting indicates how the chosen object displays when *dragged* in the active View window. Click on the radio button next to the one you wish to select. You can also turn Shaded QD3D manipulation on or off. It is checked by default indicating it is on. See *Chapter 25: Advanced Rendering* for more information on QuickDraw 3D.

Inactive Views

This setting indicates how the chosen object displays in the inactive View windows when manipulated. Click on the radio button next to the one you wish to select. Since working in 3D space on a two-dimensional monitor can be challenging, it is often useful to see your objects moving in all views at once to aid in positioning them relative to one another. If you are working in a very complex scene, however, you may wish to turn this option off to increase screen re-draw speed.

Draw Selection As

This setting indicates how the chosen object displays when *selected* in the active View window. Click on the radio button next to the one you wish to select. If you select

BBox, you can also indicate whether you want the bounding box to include resizing handles. There are two other choices described below:

- **Selection Color**—Click on the color swatch to change the color of the selected object. You make a selection from a standard Macintosh or Windows color picker.
- **Handle Color**—Click on the color swatch to change the color of the resizing handles. This is useful for identifying the handles, so you don't drag them accidentally when you are trying to move the object. Note that this is only relevant if you selected BBox above and checked the Handles check box.

Miscellaneous

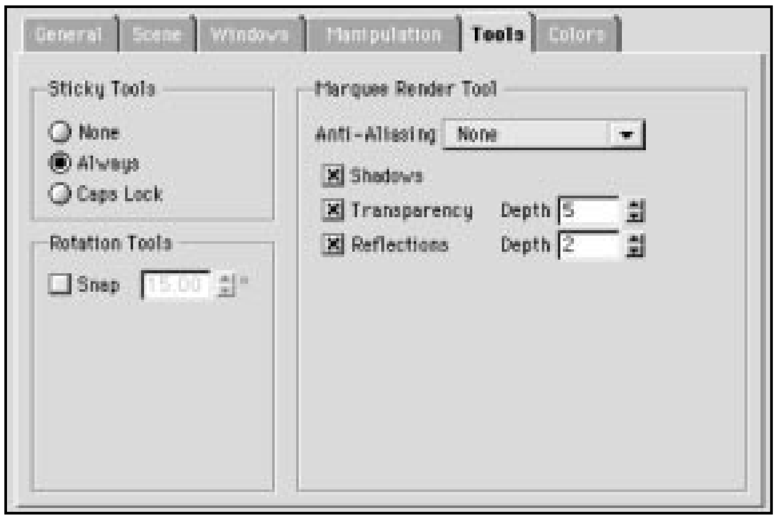
These check boxes turn on various features in your scene. They are all unchecked by default. Each one is described below:

- **Drag and Drop Objects (Macintosh Only)**—Click on this check box and you can drag objects from Infini-D into other applications that support both drag-and-drop and 3DMF such as the Scrapbook, the Finder or other 3D applications. This function is available in System 7.5 or above, or in System 7.0 or 7.1 with the Drag and Drop extension. Keep in mind the following as you use this feature:
    - With this option turned on, you can click on an object in Infini-D and drag it into a window of the receiving application. The window border of the receiving application highlights to indicate that it accepts the dragged object.
    - You can also drag objects from other 3D applications into Infini-D. The dragged objects always import as 3DMF files and no import/export dialog appears. Instead Infini-D uses default settings or those from the most recent 3DMF import.
    - Note that you can also drag PICT files (images saved in the PICT file format) into Infini-D from the desktop or from applications which support drag-and-drop to use as surfaces or background images. This is available on both Macintosh and Windows.
        - If you drag a PICT file and drop it onto an object, the object highlights with a bounding box to indicate that it is the receiving object. Infini-D then adds the image to the Surface Library and it becomes that object's surface. This is a very convenient way to get images to use as surfaces. If you wish to change the filtering process of the imported image, access the Surface Library dialog box and **Edit** the imported image. See *Chapter 14: Procedural Surfaces and Textures* for more information.
        - If you drop the PICT into a View window (and not onto any object), it becomes the background image. See *Selecting Settings in the Environment Dialog Box* in Chapter 25 for more information on background images.
- **Show Child Objects While Dragging**—Check this check box if you want to show child objects in a hierarchy when you drag the parent. If you leave this unchecked, you move the parent, then after a brief delay the children follow.
- **Add Null Events to Timelines**—Check this option if you want to add null events to an object's timeline in the Sequencer. When you move an object, Infini-D adds a

position eventmark to the time line in the Sequencer. Normally, it does not add eventmarks for other attributes such as rotation, scale or deformation because you didn't effect these attributes with your action. If, however, you *want* to include eventmarks, even when Infini-D does nothing, then check this check box. Otherwise, leave it unchecked. See *Chapter 21: The Sequencer* for more information.

- **Show Every Nth Face** Check this item when working with scene files that contain particularly complex SplineForm objects to make manipulation much faster. You must enter a number that represents how many faces you wish to skip before showing the next one. With this item checked, Infini-D will only draw every Nth face of an object while dragging it in wireframe mode.

Tools Settings



This section explains how to adjust settings that affect tool defaults. These are described below:

- **Sticky Tools**—Click on the radio button that indicates how you wish to deal with sticky tools. If the tool is sticky, it means it stays the selected tool until you select another. If it is not sticky, you use the tool once and then it reverts to the **V-plane** tool. If you select Caps Lock, click on the Caps Lock button to turn sticky tools on. Release it to turn it off. This is a good compromise if you want to use sticky tools some of the time.

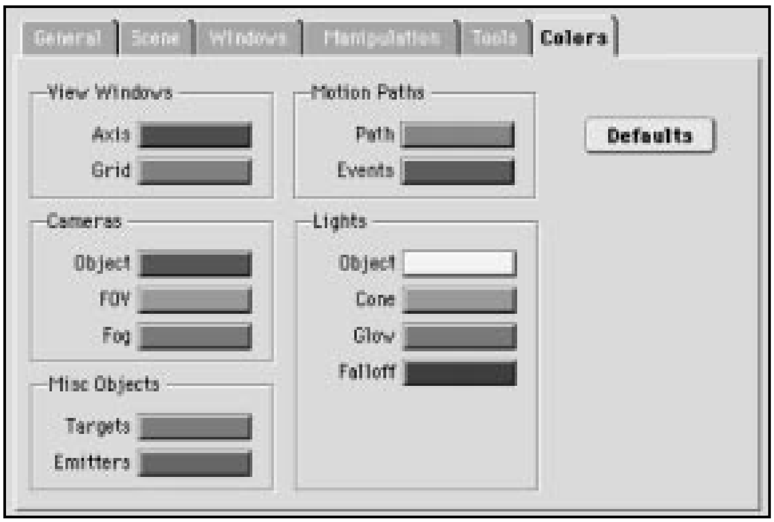
- **Rotation Tools**—Check this check box and enter a number that represents the number of degrees you want to snap an object when using the **Rotate** tool. This could be useful if you want to adjust rotation precisely a certain number of degrees.

- **Marquee Render Tool**—You can select a number of options related to the Marquee Render Tool. These are described below:

    - **Anti-Aliasing**—Indicate the level of anti-aliasing you want, if any, when using the Marquee Render tool. Anti-aliasing refers to how much you want to smooth the image by reducing jagged edges. The higher the level, the smoother the image, but the slower the rendering time. Note that you could leave this low here, and select a higher level in the **Display** command tab in the Command Floater (for rendering an entire view window) or at the time of final rendering. See *Chapter 18: Adjusting View Settings* for more information.

- **Shadows, Transparency, Reflections**—Check the check box next to each item you wish to see when you use the Marquee Render Tool. You can also enter a number that represents the depth of transparency or reflection you want for your image. Remember, the more effects you have, the higher the quality of the rendered image, but the slower the rendering time.

Colors Settings



This section explains how to change the colors of various interface items. To change the color of an interface item, click on the color swatch and choose a new color from the color picker dialog box. Click on the **Defaults** button to return all of the colors to their preset values.

The Colors tab is divided into five sections:

- View Windows
- Motion Paths
- Cameras
- Lights
- Misc. Objects

View Windows

These colors affect interface items which are visible in all view windows.

- **Axis**—Click on the color swatch to change the color of the axis orientation icon that appears in the lower left corner of the view windows. This icon can be turned on or off in the Windows tab of the Preferences dialog box.
- **Grid**—Click on the Grid color swatch to change the color of the grid plane. Note that you can turn the grid on or off for a given View window via the Display command Tab in the Command Floater. See *Chapter 18: Adjusting View Settings* for more information.

Motion Paths

The following items affect the color of the motion path for an animated object. Motion paths are turned on and off for a specific object from the **Model** menu and are described in *Chapter 22:Advanced Animation*.

- **Path**—Click on this swatch to change the color of motion paths in your scene.
- **Events**—Click on this swatch to change the color of the eventmark indicators along the motion path.

Cameras

These items affect the colors of a camera object and its associated interface items.

- **Object**—This item changes the color of the camera object in your scene.
- **FOV**—Click on this swatch to change the color of the Field of View indicators for cameras. FOV indicators can be turned on or off for a selected camera in the Object tab of the Command floater.
- **Fog**—Click on this swatch to change the color of the Fog Radius indicators for cameras. Fog indicators can be turned on or off for a selected camera in the Object tab of the Command floater. Note that this swatch does not affect the color of the fog itself. Fog color is set in the Object tab of the Command Floater with a camera selected.

Lights

These items affect the colors of a light object and its associated interface items.

- **Object**—This item changes the color of the light object in your scene.
- **Cone**—Click on this swatch to change the color of the Cone indicators for spot-lights. Cone indicators can be turned on or off for a selected light in the Object tab of the Command floater.
- **Glow**—Click on this swatch to change the color of the Glow Radius indicators for lights. Glow indicators can be turned on or off for a selected light in the Object tab of the Command floater. Note that this swatch does not affect the color of the Glow itself. Light color is set in the Object tab of the Command Floater with a light selected.

• **Falloff**—Click on this swatch to change the color of the falloff indicators for lights. Falloff indicators can be turned on or off for a selected light in the Object tab of the Command floater.

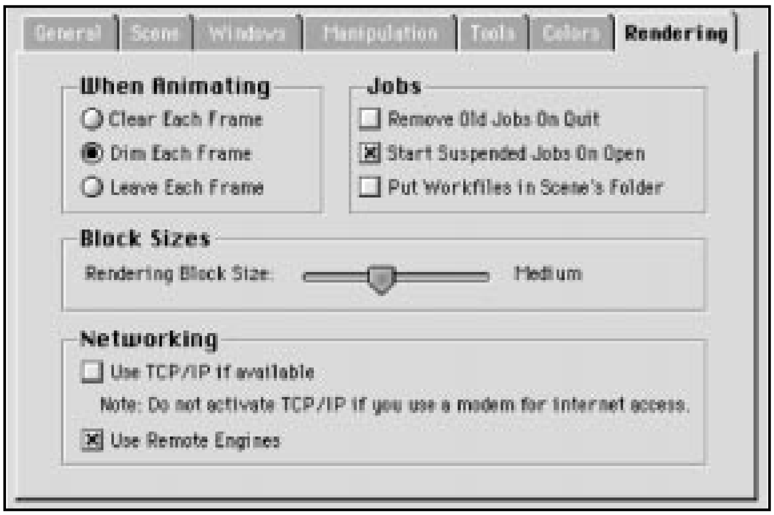
Misc. Objects

These items affect the colors of objects that only have interface applications.

• **Targets**—This swatch changes the color of target objects that are created when adding Target Cameras and Spotlights.

• **Emitters**—Click on this swatch to change the color of particle system emitter objects.

Render Settings



This section explains how to adjust settings that affect the final render area. These are described below:

• **When Animating**—Choose a method for Infini-D to update the render window with progressive frames of an animation.

  • **Clear Each Frame** blanks the previous frame completely out when starting the next frame.

  • **Dim Each Frame** (the default) reduces the brightness of the completed frame and renders the next frame over it.

  • **Leave Each Frame** simply renders each frame directly over the previous frame.

• **Jobs**—These settings determine how Infini-D handles jobs in the render queue.

  • **Remove Old Jobs on Quit** tells Infini-D to delete all completed jobs from the render queue when you quit Infini-D.

    - **Start Suspended Jobs on Open** resumes rendering the current suspended job (if any) when entering the render mode.
    - **Put Workfiles in Scene's Folder** tells Infini-D to put the workfiles for each job in their respective scene's folder instead of in the Render Queue folder.
- **Block Size**—The **Rendering Block Size** slider determines how small Infini-D will subdivide each frame for rendering. There is an important relationship between block size, rendering speed, and fault recovery. At a small block size setting, Infini-D will require longer to render an image due to the increased overhead of rendering and saving many smaller blocks, but in the event of a mishap (power outage, system crash, etc.) relatively little work will be lost. At a large block size, Infini-D will render more efficiently but will lose more work in the event of a mishap. For optimal performance in a single machine environment, set the block size to Gargantuan (but be aware that you are foregoing better fault tolerance).
- **Networking**—These settings are for network rendering on Macintosh only.
    - **Use TCP/IP if Available** tells Infini-D to use the TCP/IP protocol for communicating with remote Macintoshes. Use this only if you are in a network environment that uses TCP/IP and/or have a dedicated connection to the Internet and wish to use Macintoshes at another location. We recommend not using Internet rendering over a modem connection. (Note: If you have this option checked, and you do use a modem for Internet access, Infini-D will attempt to establish a PPP connection upon launching.)
    - **Use Remote Engines** tells Infini-D to look for and use any networked Macintoshes that are available and have Infini-D Engines installed for rendering.

WORKING WITH SCENES

This section explains how to work with scenes in Infini-D. Scenes are analogous to documents in a word processor. Just as you may create several documents to make a complete book, you may have to create several scenes to make a complete project in Infini-D. Just as in a word processor where you can move among different open documents, you do the same with scenes in Infini-D. You can open and close scenes without exiting the program, and if you make changes that you wish to discard, you can revert to the previously saved scene. These commands are covered in detail in *Chapter 4: Infini-D Tools and Interface.*

The main difference between an Infini-D scene file and a word processing document is that an Infini-D scene uses multiple windows to show the 3D environment, while a typical word processor only needs one window to display the 2D layout. Closing a window in Infini-D does not close the document as it would with a word processor.

INFINI-D AND MEMORY

This section explains how to adjust the memory settings for the Infini-D application. This section is more relevant to Macintosh users, since Windows does not allow you to control memory at the application level, but Windows users may want to review the section on *Virtual Memory* below to learn how it affects the performance of Infini-D.

This section covers the following topics:

- Virtual Memory
- Changing Infini-D Memory Partition
- Infini-D's Memory Status Dialog Box

Virtual Memory

Computers can use a hard disk drive to extend available memory past the limit of installed RAM. In Windows, virtual memory is on by default (and you should leave it on) whereas the Macintosh OS allows you to turn Virtual memory on and off.

Virtual memory is by nature much slower than the equivalent RAM. Since Infini-D frequently accesses memory, relying on virtual memory makes the program operate extremely slow. We recommend using virtual memory only in cases where it is absolutely essential. Install as much physical RAM as you need to accommodate your scenes, both on Macintosh and Windows.

Infini-D's Image-Import Virtual Memory

Infini-D implements its own internal virtual memory scheme when importing large pictures for mapping onto objects. In most cases, Infini-D's virtual memory implementation is more efficient than that of the operating system because it is geared specifically to handling image management. You need to use virtual memory only if Infini-D informs you that there is not enough RAM to proceed.

Changing Infini-D's Memory Partition (Mac only)

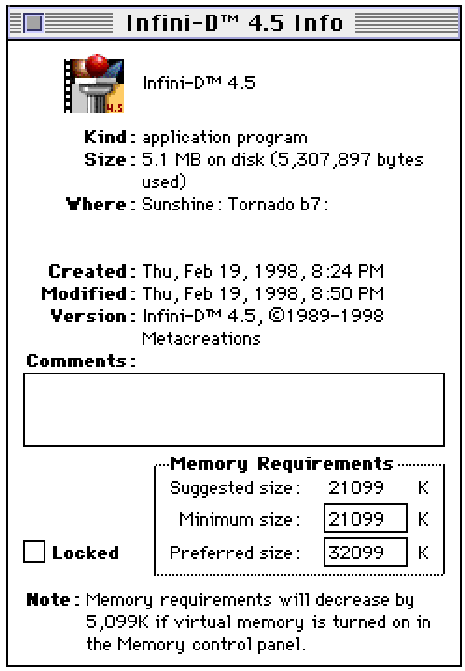
Each Macintosh application has its own memory partition size, which tells the system how much memory to allocate to the application when it is launched. Once launched, an application cannot adjust this size no matter how much free memory is available. Infini-D is an application that can require a great deal of memory. When you are working on large projects, you may need to increase the Infini-D partition size.

Follow these steps to change the memory partition size:

Step 1: Select the Infini-D application icon in the Finder when Infini-D is not running.

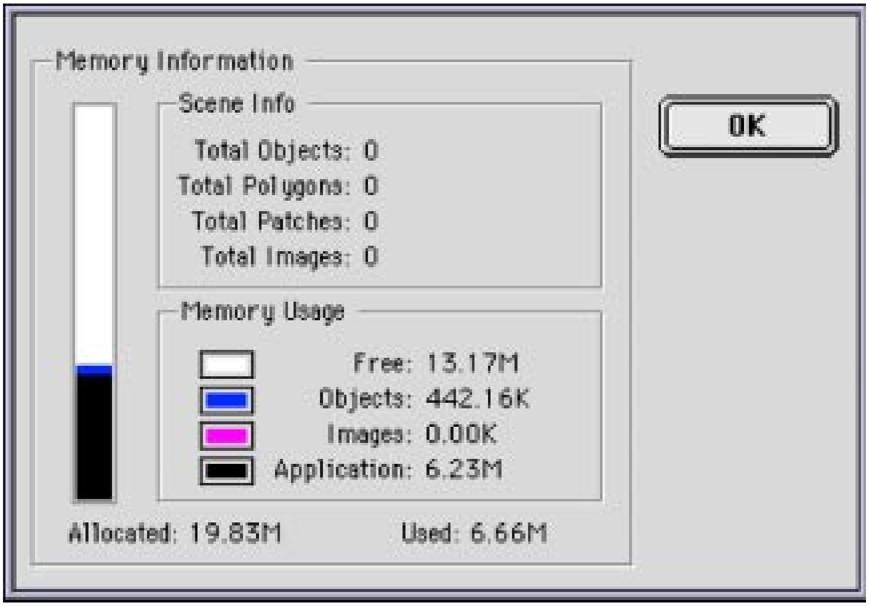
Step 2: Click on **File** in the Finder menu bar and select **Get Info**. The Info dialog box opens.

Step 3: This dialog box lists the minimum size and preferred size of the memory partition. You can change these numbers as needed to increase the available memory for Infini-D. Remember to leave at least 1 MB of memory available for the operating system or the system could crash. Also, if you have QuickDraw 3D installed (for interactive rendering), you must leave additional memory free for the system to use (at least 3 MB).



Infini-D's Memory Information Dialog Box

Because having sufficient memory is critical to so many 3D operations, Infini-D provides its own Memory Information dialog box for checking on memory usage. In addition to this memory status dialog box, the Rendering window also provides its own memory information in the Memory Status panel. This is useful because the system may be tied up during rendering making it difficult to access the Memory Information dialog box.



Follow these steps to access the Memory Information dialog box:

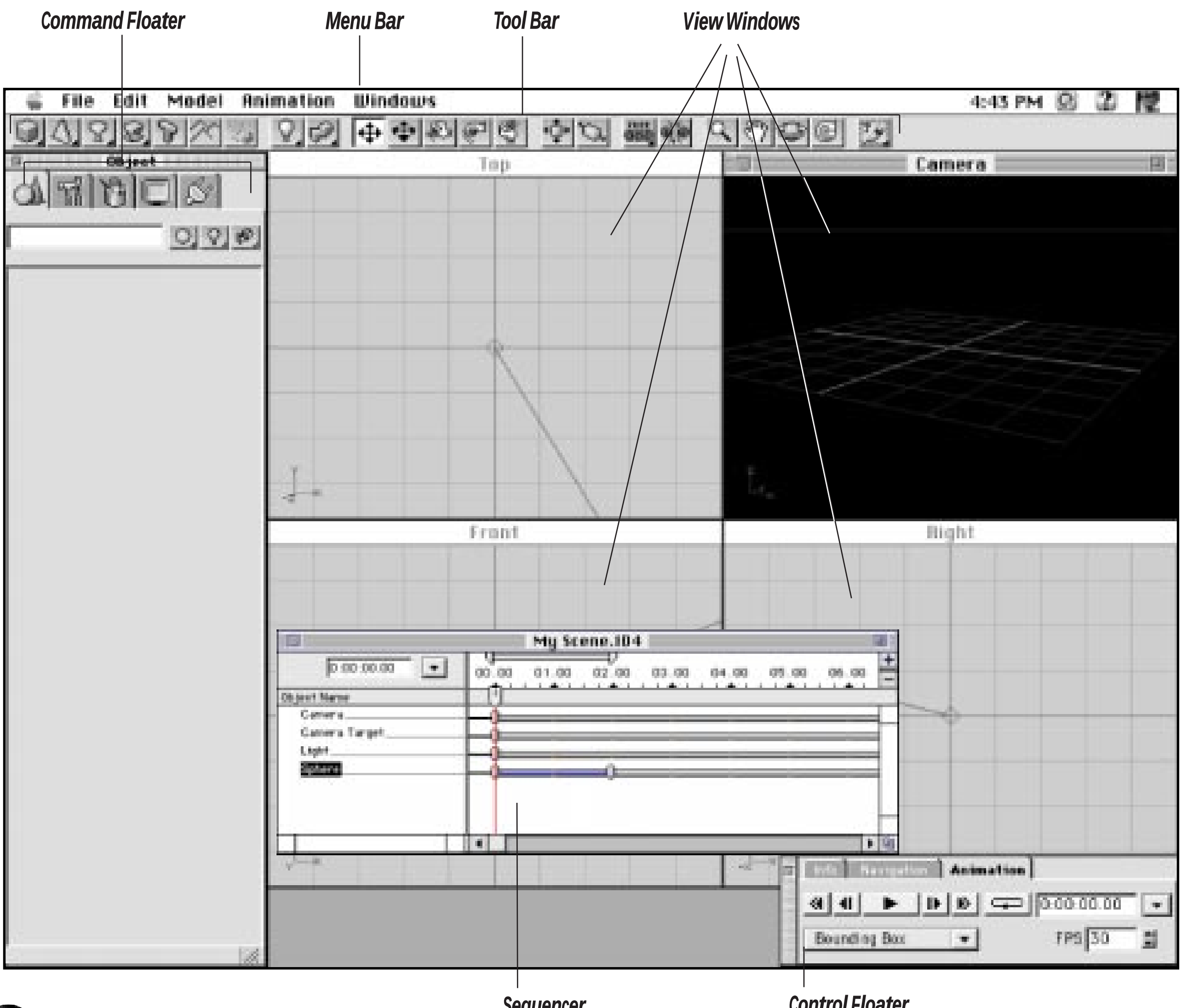
Step 1: **Mac:** Click on the **Apple** menu and select **About Infini-D....**
Windows: Click on the **About** menu and select **About Infini-D...**.
The About dialog box opens.

Step 2: Click on the **Memory** button and the Memory Information dialog box opens where you can view the status of the memory.

*Since the Windows operating system is designed to always use virtual memory, there is no way to tell for certain how much physical RAM is available. The Memory Information dialog will show the total memory available, including both physical RAM and hard disk swap space. Keep in mind that when physical RAM is full and Windows starts using disk space during rendering, there will be a performance slow-down. You can tell the total memory that your scene is using in the **Used** field, and you can compare this to the amount of physical RAM installed in your machine.*

EXITING INFINI-D

To exit Infini-D, click on **File** in the menu bar and select **Quit** (Mac) or **Exit** (Win). If you have any unsaved open scenes, Infini-D prompts you to save these before exiting.


Command Floater
Menu Bar
Tool Bar
View Windows
File
Edit
Model
Animation
Windows
4:43 PM
Object
Top
Camera
Front
Right
My Scene.3D4
Object Name
Camera
Camera Target
Light
Sphere
Info
Navigation
Animation
Bounding Box
FPS
30
Sequencer
Control Floater

Chapter

4

Infini-D Tools & Interface

This chapter guides you on a tour of the Infini-D interface. Before you actually begin working with the program, you should familiarize yourself with the various parts of the interface, which is shown on the opposite page. The screen is divided into five parts as follows:

- Menu Bar
- Tool Bar
- View Windows
- Control Floater
- Command Floater
- Sequencer

The remainder of this chapter covers each of these parts in detail.

MENU BAR

The menu bar is located across the top of the screen or window and contains six items. On Macintosh the menu bar looks like the following:

On Windows the menu bar looks like the following:

Below, you will find a description of each of these menus and their corresponding commands.

Apple Menu (Mac)/Help Menu (Win)

Click on the **Apple** Menu **(Mac)** or the **Help** Menu **(Win)** in the menu bar. It contains the following command:

- **About Infini-D—**Select this command to view the About Infini-D dialog box, which contains the version number, the name and organization the software is registered to, the credits for the design of the application, and the **Memory...** button that brings up the Memory Information dialog box. (See *Infini-D's Memory Information Dialog Box* in *Chapter 3* for more information.)

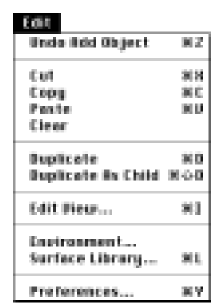
File Menu

Click on **File** in the menu bar. It contains the following commands:

- **New—**Select this command to create a new scene. Note that selecting this command does not close other open scenes.
- **Open**—Select this command to open an existing scene. After you create a scene, you can save it with **Save** command described below, then access it again using this command.
- **Scenes**—Select this command to move between scenes you have currently open. Infini-D lists all the open scenes on a sub-menu. Select the one you want and Infini-D switches to the chosen scene. Note that having many scenes open at the same time can quickly use up available memory.
- **Close**—Select this command to close the current scene. Infini-D prompts you to save any changes you may have made. Note that this command does not close other open scenes or exit the program.
- **Close View—**Select this command to close the front-most View window. All other windows remain open, as does the scene. If you want to close a scene, use the **Close** command described above.

- **Save**—Select this command to save your work. You should save your work frequently throughout the scene creation process. If you make changes to a scene that you are not happy with, you may use the **Revert** command described below to return the scene to its previous state.
- **Save As**—Select this command to save the current scene under a different name. You could use this, for example, to save the current scene to a different drive or to save the changes under a different name, thereby keeping the original scene intact.
- **Save Image As**—Select this command to save the currently selected View window as an image file such as a BMP or PICT file. See *Chapter 24: Introduction to Rendering* for more information.
- **Revert**—Select this command if you make changes to a scene that you do not wish to save. Infini-D returns the scene to its condition the last time you saved it. You should use this command with caution if you made a lot of changes since the last save.
- **Render**—Select this command to access the Render Setup dialog box where you can select parameters to render the scene to disk. See *Chapter 25: Final Rendering* for more information.
- **Enter Render Mode**—This command brings you into the final render mode without adding the current scene to the render queue. Use this command to access the render mode to resume jobs in the queue.
- **Import**—Select this command to import an object, EPS file, image, or audio file. You could use this, for instance, to import an image to use as a surface on an object in your scene. See *Chapter 14: Surfaces and Texture Maps* for more information.
- **Export**—Select this command to export your current scene to 3DMF or DXF format.
- **Page Setup**—Select this command to access the standard print options dialog box.
- **Print**—Select this command to print the current window.
- **Quit (Mac)/Exit (Win)**—Select this command to exit from the Infini-D program altogether. Note that if you have one or more open scenes that you have not yet saved, Infini-D will prompt you to save your changes prior to exiting.

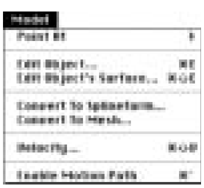
Edit Menu



Click on **Edit** in the menu bar. It contains the following commands:

- **Undo**—Select this command to undo your previous action. This menu item changes depending on what action you last performed. For instance, if you placed a geometric object in your scene, it reads **Undo Add Object** and Infini-D removes the object from the scene when you chose this command. Select this again and it changes to **Redo Add Object**.
- **Cut**—Select this command to cut material between scenes or within a scene in Infini-D. When you cut an object, for example, you copy any related information such as surfaces along with the object. Unlike some programs, you cannot paste Infini-D material into another program. You must use the **Export** command explained below to do this.

- **Copy**—Select this command to copy material between scenes or within a scene.
- **Paste**—Select this command to paste material you have cut or copied between scenes or within a scene.
- **Clear**—Select this command to delete any selected object in the scene. Note that you can change your mind by selecting the **Undo** command defined earlier.
- **Duplicate**—Select this command to duplicate any selected object in the scene.
- **Duplicate as Child**—Select this command when using Object Hierarchies to make a duplicate child of the original—that is, you make an identical sibling of the original. This means that the duplicate object is linked to the parent just as if you had linked it with the **Link** tool with all the same properties such as surface or link type. See *Chapter 8: Object Hierarchies* for more information.
- **Edit View**—Select this command to access the Edit View dialog box where you can edit characteristics about the active View window. See *Chapter 18: Adjusting View Settings* for more information.
- **Environment**—Select this command to access the Environment dialog box where you can modify certain general characteristics about the scene. See *Chapter 26: Advanced Rendering* for more information.
- **Surface Library**—Select this command to access the Surface Library where you can manage collections of surfaces for the entire program—the default surface library—or for an individual scene. Furthermore, you can create custom surface libraries to use for certain types of scenes. See *Chapter 14: Surfaces and Texture Maps* for more information.
- **Preferences**—Select this command to access the Preferences dialog box where you can set Infini-D program preferences. See *Chapter 3: Getting Started* for more information.



Model Menu

Click on **Model** in the menu bar. It contains the following commands:

- **Point At**—Select a camera or spotlight object, then select this command to access a list of objects in the scene. Select an object and Infini-D points the camera or spotlight at the chosen object. This is useful for fixing the focus of the spotlight or camera at a particular object at a single point in time. Selecting this command does not keep the focus of the spotlight or camera on the object through time. You need to select a target camera or spotlight to do this. See *Chapter 16: Working with Lights* or *Chapter 17: Working with Cameras* for more information.
- **Edit Object**—Select this command to access the Workshop where you can create different objects from the generic objects that are on the toolbar. You can also access the Workshop by double-clicking on any geometric object (any object that was created in Infini-D and not converted to a mesh). Note that you cannot bring text created with the text tool, particles or terrains into the Workshop. See *Chapter 10: The SplineForm Workshop* for more information.
- **Edit Object's Surface**—Select this command to access the Surface Information dialog box where you can adjust surface characteristics. Note that if you make

changes to a surface, the changes apply to all objects that have that surface now and in the future. If you have not applied a surface yet, this command will be grayed out. See *Chapter 14: Surfaces and Texture Maps* for more information.

- **Convert to SplineForm**—Select this command to convert a Primitive Object to a SplineForm object. SplineForm is an Infini-D term that refers to any object created in the Workshop. You can also covert a Primitive Object to a SplineForm by double-clicking on it. A dialog box appears where you must confirm that you want to convert the object. Click **OK** to enter the Workshop.
- **Convert to Mesh**—Select this command to convert an object into an editable mesh. This allows you to enter the mesh editor and change the shape of an object by dragging points on the object's surface. You can select how much surface information you want for the object in the Convert to Mesh dialog box. After you make your selections, you enter the Mesh Editor where you can then alter the object as you wish. See *Chapter 11: The Mesh Editor* for more information.
- **Velocity**—Select this command to access the Velocity dialog box where you can control the animation velocity of the chosen object. Velocity refers to the speed at which changes occur to an object—movement, rotation, etc.
- **Enable/Disable Motion Path**—Select this command to enable a motion path. This provides a visible path for you to see the movement of an object when animating a scene. Once selected, you can remove the motion path by selecting **Disable Motion Path** (this only hides the path, it does not alter the animation in any way).

Animation Menu

Click on **Animation** in the menu bar. It contains the following commands:

- **Animation Assistants**—Select this command to access a list of tools that help you perform complex animation tasks. See *Chapter 23: Animation Assistants* for more information.
- **Eventmark Info**—Select this command to access a dialog box that provides control over the chosen eventmark(s) in the Sequencer. Eventmark Info controls can be used to alter how an object animates—for example making an object follow a smooth, spline-based path versus a sharp-angled, linear path. See *Chapter 21: The Sequencer* for more information
- **Snapshot Increment**—Select this command to choose a snapshot interval. This determines how much time you want to pass between snapshots in your animation.
- **Snapshot**—When creating an animation, select this command to move the time marker ahead by the Snapshot Increment explained above. This command will also create a null eventmark for each object at the original time marker location. This is useful for setting up animation sequences in which you want to space events evenly.
- **Animate**—Select this command to preview your animation in the current View window according to the settings in the Animation tab of the Control Floater. This is identical to clicking the Play button on the Control Floater.
- **Step Forward**—Select this command to move the World Time Marker forward by one frame.

- **Step Backward**—Select this command to move the World Time Marker backward by one frame.
- **Stop**—Select this command to stop playback of the animation.

Note: The three previous commands are also available as tools in the Animation Player in the Control Floater. See the Control Floater section later in this chapter for more information.

- **Show/Hide Enabled Paths**—Select this command to show or hide any enabled motion paths in your scene. Unless you have chosen **Enable Motion Path** from the Model menu for at least one object in your scene, this item will be grayed out.

Windows Menu

Use these commands to show or hide windows in Infini-D. Click on **Windows** in the menu bar. It contains the following commands:

- **Show/Hide Floating Windows**—Select this command to show or hide all floating windows in Infini-D.
- **Command Tabs**—Use this list to move between command tabs in the Command Floater. You can also click directly on the tabs in the Command Floater .
- **Tool Bar**—Click on this command to show or hide the tool bar.
- **Information**—Click on this command to switch to the Info tab in the Control Floater. You can also click on the tab itself to do this.
- **Navigation**—Click on this command to switch to the **Navigation** tab in the Control Floater. You can also click on the tab itself to do this.
- **Animation**—Click on this command to switch to the **Animation** tab in the Control Floater. You can also click on the tab itself to do this.
- **Views**—Select this command to show or hide individual View windows. See *View Windows* later in this chapter for more information.
- **Cameras**—Select this command to show or hide individual Camera view windows.

TOOL BAR

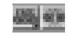
The tools in the tool bar provide quick access to many common Infini-D functions. Place the cursor on each tool to reveal the tool name. The tools are divided into five main categories as follows:

Object Tools—Use these tools to place objects in your scene.

Camera and Light Tools—Use these tools to place new cameras and lights in your scene.

Object Manipulation Tools—Use these tools to manipulate the placement or size of a selected object.

Object Linking Tools—Use these tools to link or unlink objects.



View Manipulation Tools—Use these tools to manipulate a given View window without affecting the objects in the View. Note that when working in the Camera View windows, these tools move the camera object to change the point of view.

Marquee Render Tool —Use this tool to select and render a portion of a View window.

Object Tools

These tools comprise the set of basic default objects that you can add to your scene. The geometric objects displayed in the top row of tools each contain several choices. Click on any geometric object type to reveal additional choices, and a list of object types for the given category appears.

Click on any object tool to select it, then click in a View window to place the object. When you place the object, the panels appropriate for that type of object appear in the Object tab of the Command Floater. See The Command Floater later in this chapter for more information.

Note

This section describes each of the object tools. Refer to *Chapter 6: Geometric 3D Objects* and *Chapter 7: Other 3D Object Types* for more information.

Primitive Objects

Infini-D includes six primitive objects: cube, sphere, cylinder, cone, two-dimensional square and infinite plane. These objects represent the most basic, easily-recognizable building blocks of everyday objects.

Primitive Tools

Extrude Objects

Infini-D includes three pre-defined extruded objects: a triangular prism, a circular prism with a triangular hole punched through it, and an s-shaped path extrusion.

Extrude Tools

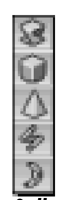
Lathe Objects

Infini-D includes four lathe shapes: donut, wine glass, partial cylinder and tapered cylinder.

Lathe Tools

SplineForm Objects

Infini-D includes five SplineForm objects: banana, spiral, lofted, twisted and pyramid. These shapes illustrate some of the advanced modeling effects possible in the Infini-D Workshop. See *Chapter 10: The SplineForm Workshop* for more information.

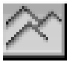


SplineForm Tools


Text Tool

Text Objects

Click on this tool to add text to your scene. When you click in a View window to place a text object, the Text dialog box appears so that you can enter text and select text parameters. See *Chapter 7: Other 3D Object Types* for more information.


Terrain Tool

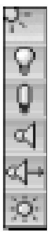
Terrain Objects

Click on this tool to add a terrain to your scene. The terrain appears as a grid, which you can alter by making a selection in the Terrain panel in the Object Tab of the Command Floater.


Particle Tools

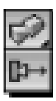
Particle Systems

Click on this tool to add a particle system or a particle warp object to your scene. A particle system enables you to show particles spewing from a source such as sparks from a fire. A particle warp allows you to affect the motion of particle systems in a variety of ways—wind, gravity, turbulence, etc. See *Chapter 7: Other 3D Object Types* for more information.


Light Tools

Lights

Click on the Light tool to reveal a list of available light types: Distant, Point, Tube, Spot, Target Spot, and Ambient. See *Chapter 16: Working with Lights* for more information.

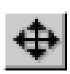

Camera Tools

Cameras

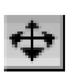
Click on this tool to place additional regular or target cameras in the scene. See *Chapter 17: Working with Cameras* for more information.

Object Manipulation Tools

Use these tools to move, rotate, or change the size of an object. They are described below.



Use the V-Plane tool to select and move an object along a vertical plane (up, down, left and right relative to the screen). After you move it in one View window, notice that the object also updates in other View windows. Keyboard shortcut: **A**.



Use the H-Plane tool tool to move an object along a horizontal plane (left, right, in and out relative to the screen). Keyboard shortcut: **A** (x2).

You can also change the size of an object with these tool by dragging a corner handle or center handle of the selected object's bounding box.

Note: Notice that as you move an object using the two tools referenced above, the Object Position values in the Info tab of the Control Floater adjust accordingly. You can also change an object's position by entering Object Position values directly into the Control Floater. See The Control Floater section later in this chapter for more information.

The rotate tools described below all work in the coordinate system relative to the screen, where the X axis extends left to right, the Y axis extends in and out, and the Z axis extends up and down.

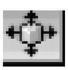
Use the X-Rotate tool to rotate an object from top to bottom around the horizontal axis. Keyboard shortcut: **R.**

Use the Y-Rotate tool to rotate the object left to right around an axis perpendicular to the screen. Keyboard shortcut: **R** (x2).

Use the Z-Rotate tool to pivot the object left to right around the vertical axis. Keyboard shortcut: **R** (x3).

The rotate tools can be made to work in the object's own coordinate system by holding down the SHIFT key. With any rotate tool selected, hold the SHIFT key and click and drag on a face of the object's bounding box to make the object rotate around the axis perpendicular to that face. This is useful for adjusting the rotation of objects that are already at an angle to the view window.

Note: Notice that as you move an object with the three rotation tools referenced above, the Object Rotation values in the Info tab of the Control Floater change accordingly. You can also change an object's rotation by entering Object Rotation values directly into the Control Floater.



Use the Uniform Scale tool to change the size of an object uniformly in all three dimensions. Click and drag the mouse toward the top or to the right of the View window and the object grows. Drag the mouse down or to the left of the View window and the object shrinks. For example: used on a cube, this tool would make it larger or smaller, but not fundamentally change its shape.

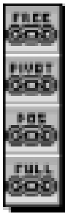
Use the Squash & Stretch tool to change the shape of an object by scaling it in any one dimension. Click on any face of the object's bounding box and drag to resize along the axis perpendicular to that face. Click on an edge of the object's bounding box and drag to resize along two axes at once. Used on a cube, this tool would change its shape to rectangular by stretching it.

Note: Notice that as you change the size of an object with the two tools referenced above, the Object Scale values in the Info tab of the Control Floater change accordingly. You can also change an object's scale by entering Object Scale values directly into the Control Floater.

Also, you can use the handles on an object's bounding box to scale the object. See *Chapter 6* for more information.

Object Linking Tools

Use these two tools to link objects to create object Hierarchies or to break the connection between linked objects. See *Chapter 8: Object Hierarchies* for more information.

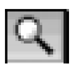


Use the Link tools to link two objects together using one of the four link types. Click on the child object first, select a link tool, then click on the parent object. These two objects are then linked. The behavior of the linked object is determined by the link type. See *Chapter 8: Object Hierarchies* for more information.

Use the Unlink tool to unlink two linked objects. Click on the parent object first, then click on the child object, the two objects become unlinked.

View Manipulation Tools

Use these tools to change the magnification level of a standard view or to change the focal length of a camera when used in a camera view:



Use this magnify tool to magnify the scene. Drag the mouse left to zoom out or right to zoom in.

Use this magnify tool to magnify the scene by clicking to zoom in, or drag a marquee to zoom into a particular area. Hold the OPTION key (Mac) or the ALT key (Win), then click to zoom out. Note that you cannot drag a marquee when zooming out.

Note

Note: See tool bar Keyboard Commands in the section that follows for other key commands you can use in conjunction with the tool bar functions.

Use the Hand tool to move the point of vision in a View window. This could be useful when magnifying to move the scene so you can see the object you have magnified or if you have a lot of objects in the scene and you want to see a particular one. When you select this tool, the cursor turns into a hand. By clicking the mouse and dragging the hand, you can move around the View window.

When you use the **Hand** tool in a Camera View window, you move the actual camera object, so it is the same as dragging the camera or using the controls in the **Navigation** floater explained later in this chapter.

Use the Orbit tool to move the point of view of a camera in an orbiting motion. When you select this tool, the cursor turns into a hand. This tool works differently for the two types of cameras. For a target camera, clicking the mouse and dragging in the camera View window will orbit the camera around its target object, always keeping the camera pointed at the target. For a regular camera, clicking and dragging will simply change the angle the camera is pointing without moving the camera object itself. This tool works in Camera

View windows only.

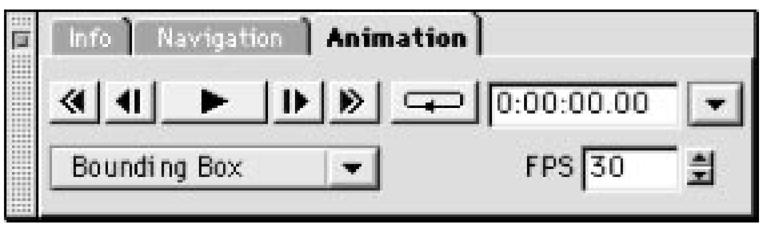
Use the Roll tool to in a Camera View window to twist the camera left or right in a rolling motion.

Use the Marquee tools to select a specific portion of an object or scene for rendering. Click the mouse tool, then drag a marquee around the area you wish to render. You can choose either Phong Shading or Ray Tracing as your render method. See *Chapter 24: Introduction to Rendering* for more information.

Tool Bar Keyboard Commands

Infini-D uses a variety of keyboard shortcuts that you can use to easily select a tool on the tool bar and to modify the actions that the tools perform. The Infini-D Quick Reference card lists all the keyboard shortcuts as well as shows a chart of modifier keys that you use to change the behavior of the tools. These modifier keys are explained in detail in the appropriate parts of the text.

THE CONTROL FLOATER



This section explains how to use the Control Floater. This floating dialog box appears by default when you first open Infini-D and contains three useful control elements. By clicking on the tab that represents each type, you can adjust the controls associated with the given tab.

You can remove a tab from the Control Floater by clicking and dragging it anywhere on the screen thereby making it a stand-alone floater. This could be useful if you want to see more than one set of controls at the same time to make multiple adjustments without constantly switching between the tabs.

The three tabs are:

- **Info**—Use this tab to view or control an object’s position, rotation, scale or center-point.
- **Navigation**—Use this tab to control the point of view of a standard view or the position of a camera. These are similar to the View Manipulation tools in the tool bar described earlier.
- **Animation**—Use this tab to access the Animation player. This resembles the controls on a tape recorder or VCR, which you can use to play back your animation.

The Info Tab

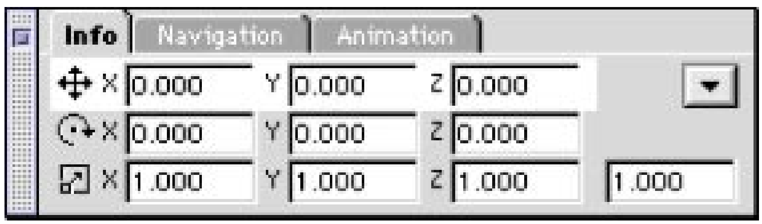
The values in the Info tab enable you to view interactively the actions you are taking with certain tools from the tool bar. In addition, you can alter these settings numerically by entering information directly into the different fields. If you are in a different Control Floater tab, click on the **Info** tab to display it.

Note

Note: If you want to lock or constrain movement of these settings, click on the Constraints command tab in the Command Floater. See the Command Floater section later in this chapter for more information.

There are four settings in this tab, although either Scale or Offset settings is hidden. (Toggle between the two by clicking on the pop-up list on the right side of the Tab and making a selection.) You can enter whole numbers or fractional values in any field. The four parameters are described below:

Object Position

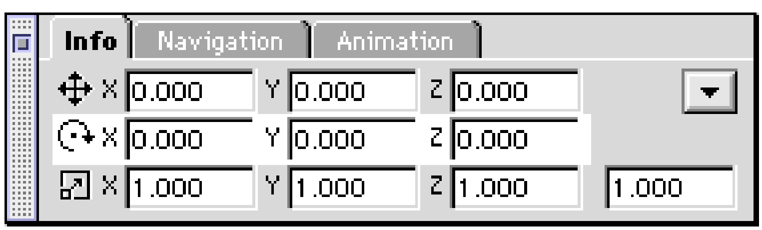


This section displays the current position values for the selected object. You can change an object's position and see the values change by clicking on one of the **Move** tools in the tool bar and dragging the object, or by entering a new position directly in the X, Y or Z fields.

TIP

Tip: Align two objects by entering identical coordinates in the appropriate X, Y or Z field. OR: Link one object to the other, set the child object's X, Y and Z position values to 0 and then unlink the two objects.

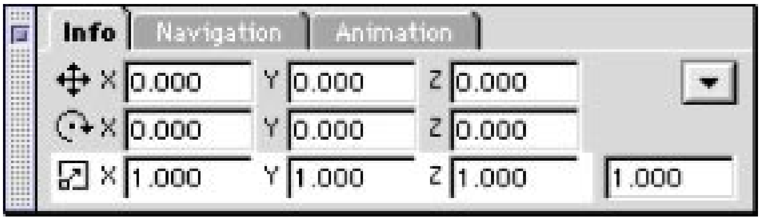
Object Rotation



This section displays the current rotation values for the selected object. You can rotate an object using one of the **Rotate** tools and see the values change here, or you can enter rotation values directly into the X, Y or Z fields.

Infini-D displays rotation values as degrees in a range from -180 to 180. Thus, Infini-D displays a rotation value of 200 degrees as -160 degrees. It is useful to understand that the program calculates the rotation of an object in the following order: X, followed by Y, followed by Z. This order helps smooth out rotation during animation, but could cause unexpected results. For example, if, you enter the Z rotation first, you will find Infini-D changes the Z value to 0 and represents the same orientation through a combination of X and Y rotation values.

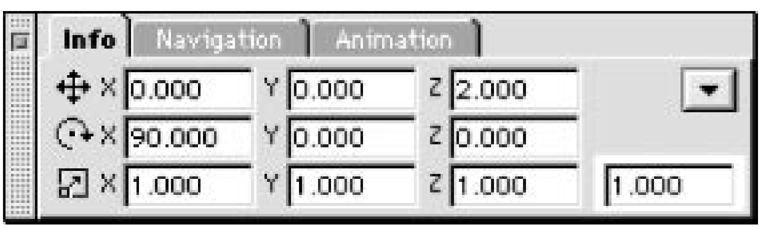
Object Scale



This section displays the current scale values for each axis of the selected object. You can scale an object along an axis using the Squash & Stretch tool or by dragging a handle on the object's bounding box and see the values change here. Or you can enter values directly into the X, Y or Z fields. Objects have a default value of 1 in all three fields.

Note: If you change a value to zero (0) in any field, the object virtually disappears. Though the object still exists, it has become so thin that it seems invisible. In these cases, the object will be difficult or impossible to select by clicking in a View window, and may not appear at all when rendered.

Object Uniform Scale



This field displays the overall scale factor of the object, and displays the current value when using the **Uniform Scale** tool in the tool bar. You can use the tool or enter numeric values directly in the field. Objects have a default value of 1. As with the Object Scale fields, a value of zero (0) makes the object seem to disappear.

The Uniform Scale value is a relative scaling factor, meaning it does not display or set the true size of an object but instead is a scalar or multiplier to the existing size of an object. This means that a shape that is normally 1 unit across will become two units across if the Uniform Scale value is set to 2. If, however, the object has a scale of 2 units across, and you change the Uniform Scale value to 2, then the object becomes 4

Note

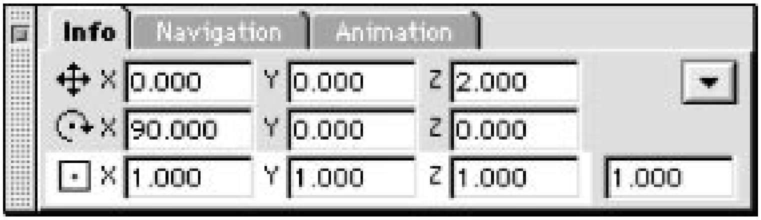
units across because it multiplies the two values.

Further, the Uniform Scale value acts as a multiplier on top of the Object Scale values described above. If an object has a Uniform Scale value of 2, and X, Y, and Z Object Scale values of 1, 1, and 2, respectively, then it will have an overall size of 2 in the X and Y dimensions and 4 in the Z dimension.

Note

*Note: If the Uniform Scale values are not visible, click on the Info Tab pop-up menu (on the far right side of the Floater) and select **Show Scale**. This hides the Offset setting information.*

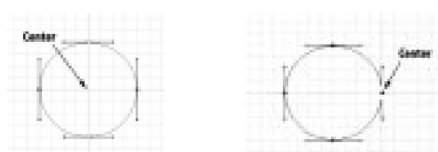
Object Offset



This section explains how to adjust the offset of the object in order to move the centerpoint. The centerpoint is the point around which the object rotates and scales. Click on the Info Tab pop-up list to make the Offset fields visible. When you do this, you hide the Scale fields.

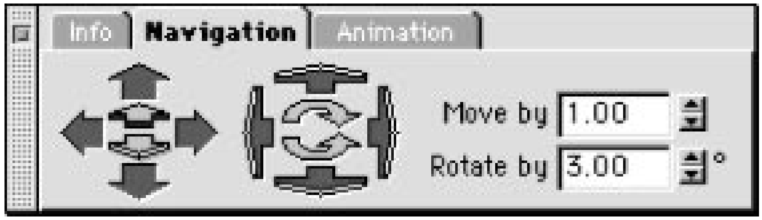
Before you adjust the offset, there are three concepts with which you should familiarize yourself:

- **Position—**This represents the geographical center of the object with zero offset. By default the centerpoint of an object is in the exact center.
- **The Workshop and the Centerpoint**—You can change the centerpoint of the object by adjusting the paths or rails so that you shift the point where the object rotates or scales. For example, you could move it from the center of the object to the edge. When you go back to your scene, the object will rotate and scale around the edge, rather than the center of the object. See *Chapter 10: The SplineForm Workshop* for more information.



- **Offset**—Enter numbers to change the offset of the object from its centerpoint. When you do this, the object moves and the centerpoint remains behind. This has essentially the same effect as changing the centerpoint in the workshop, with one important distinction: This setting is merely a transformation on the original position of the centerpoint and does not affect the actual location of the centerpoint in the Workshop—similar to the way in which scaling an object using a Scale tool does not affect the underlying geometry of the object or how large it appears in the Workshop.

The Navigation Tab



Use the controls in the **Navigation** tab in the Control Floater to move around a scene. There are two controls.

- **View Manipulation Controls—**These controls behave like the **Hand** tool in the tool bar. As with this tool, the controls behave differently depending on whether you select a Standard or Camera View window.
- **Camera Rotation Controls**—These controls manipulate movement of the camera in a Camera View window. They operate in the same manner as the **Orbit** and **Roll** tools in the tool bar. These controls are grayed ut when a standard view is active.

By entering numbers in the **Move by** and **Rotate by** boxes, you can control the amount of movement of either control. The Rotate by field is grayed out when you select a Standard View window.

Note

Note: See View Windows later in this chapter for additional information on the different View windows in Infini-D.

View Manipulation Controls

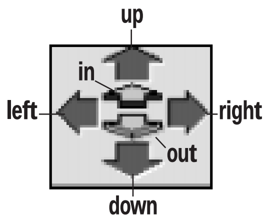
Use these controls to change the point of view of your scene without actually changing the position of any objects (when used in a standard view) or to move the camera (in a camera view), just as with the **Hand** tool in the tool bar. Note that the direction the camera moves is relative to its own coordinate space, not absolute coordinates in the scene. So up doesn't necessarily move positively along the Z-axis—instead, it moves along the camera's own upward direction. Also note that the behavior of the move controls is different for target and non-target cameras (since a target camera is constrained by its link to the target object).

Follow these steps to use these controls:

Step 1: Click in a View window.

Step 2: Click on an arrow that corresponds in the direction you wish to move. If you click and hold an arrow, you move multiple units. You define the unit of movement in the **Move by** field. Remember, if you are in a Camera View window, you are changing the actual position of the camera when you click on these controls.

Each arrow is described below, all directions are relative to the screen:



• **Move Up**—Click on this arrow to move the point of view up in a Standard View. The result is that the objects in your scene appear to move down because your point of view is shifting up. If you are working in a non-target Camera View window, you move the camera up. If you are working in a target Camera View, you orbit the camera up around its target.

• **Move Down**—Click on this arrow to move the point of view down in a Standard View. The result is that the objects in your scene appear to move up because your point of view is shifting down. If you are working in a non-target Camera View, you move the camera down. If you are working in a target Camera View, you orbit the camera down around its target.

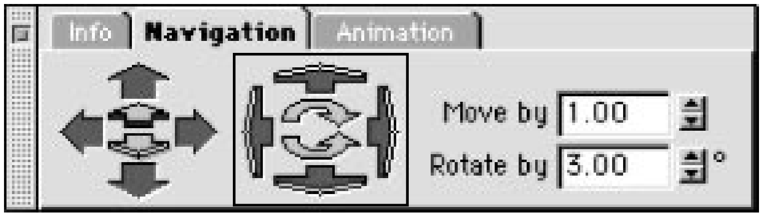
• **Move Left—**Click on this arrow to move the point of view left in a Standard View. The result is that the objects in your scene appear to move right because your point of view is shifting left. If you are working in a non-target Camera View, you move the camera to the left. If you are working in a target Camera View, you orbit the camera left around its target.

• **Move Right**—Click on this arrow to move the point of view right in a Standard View. The result is that the objects in your scene appear to move left because your point of view is shifting right. If you are working in a non-target Camera View, you move the camera to the right. If you are working in a target Camera View, you orbit the camera right around its target.

• **Move In/Out**—Click on these arrows to move the point of view in or out from the Origin in a Standard View. (This is the same as adjusting the Origin Distance in the Edit View dialog box and may have no apparent effect. See *Chapter 18: Adjusting View Settings* for more information.) If you are working in a non-target Camera View, you move the camera forward or backward. If you are working in a target Camera View, you move the camera closer to or farther from its target.

You can also navigate in Camera Views using the Hand tool and the Command key (Mac) or Control key (Win). The Hand tool moves the camera left right, up and down. The Hand tool with the modifier key moves the camera in and out. For target cameras, moving in and out in this manner moves both the camera and its target.

Camera Rotation Controls



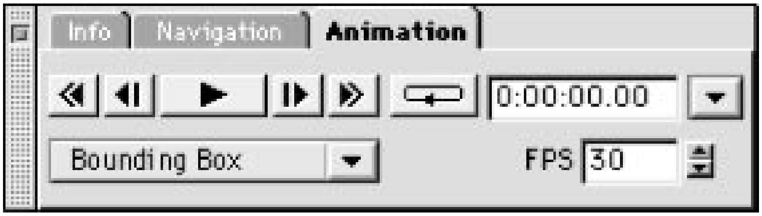
Use these controls to pan or roll the camera in the same way you use the **Orbit** and **Roll** tools in the tool bar. You must click in a Camera View window to activate these control. The controls are described below:

- The set of four arrows on the outside are the **Pan** controls. For a non-target camera, clicking the left or right arrows pans the camera to the left or right, and clicking the top or bottom arrows pans the camera up or down. For a target camera, clicking any of these arrows orbits the camera in the indicated direction around its target.
- The inner two arrows are the **Roll** controls—they roll the camera around its central axis (the axis perpendicular to the camera view window). This is identical to using the Roll tool on the toolbar. Clicking the upper roll arrow rolls the camera to the right. Clicking the lower roll arrow rolls the camera to the left. The behavior of the Roll arrows is identical with both types of camera

Keep in mind the following when using these controls:

- When using the rotation controls, you are rotating the camera in the given direction, causing the objects in your scene to appear to rotate in the opposite direction. For example, if you pan right, your scene appears to shift to the left.
- You can change the number of degrees by which you rotate with each click in the **Rotate by** field.

The Animation Tab



Use the controls in the **Animation** tab to preview your animation in the View windows. Note that you use Infini-D's animation features to record the animation and these controls to play it back on screen. See *Chapter 19: Introduction to Animation* for more information.

The animation controls are described below (starting on the left-hand side of the tab):

- **Rewind**—Click here to move the Time marker back to time zero (or back to the Punch-In Marker).
- **Step Backward**—Click here to move back through your animation one frame at a time.
- **Play**—Click here to play your animation (behaves according to the settings in the pop-up menu described below). Note that while playing, this button turns into the **Stop** button.
- **Step Forward**—Click here to move forward through your animation one frame at a time.
- **Fast Forward**—Click here to fast forward to the end of the animation (or to the Punch-Out Marker).
- **Loop Animation**—Click here before clicking Play and Infini-D plays your animation in a continuous loop. Press it again to turn looping off.
- **Animation Timer**—This indicates the current time in the animation.
- **Animation Player Pop-up List**—Select play-back options and methods from the pop-up list adjacent to the Timer. Your choices are described below:
  - Motion Test: Choose this selection to play your animation while showing only movement, rotation, scale and centerpoint changes. This is good for getting a quick preview of how motions and rotations are going to look. This does not show surface morphing, deformations or any other advanced animation effects. See *Chapter 22: Advanced Animation* for more information.
  - Play Every Frame: Click on this if you want to force Infini-D to display every frame, regardless of the playback rate. If this is unchecked, Infini-D plays in real time, meaning it may have to skip some frames to keep accurate time. If it is checked, it plays every frame, but may not reflect true time.
  - Return to Original Time: Check this to return the Time Marker to the original time after playing the animation. If you leave this unchecked, the animation stops after the last event and the Time Marker remains there.

– Play Here Forward: Play from the current time to the end of the animation.

– Play Animation Range: Play from time zero to the last event—that is, the entire animation.

– Play Work Area Range: Play from the Punch-In marker to the Punch-Out marker. These are controls in the Sequencer that enable you to mark a section of the animation that you wish to play or render. See *Chapter 20: The Sequencer* for more information.

• **Render Mode Pop-Up Menu**—Click here to select whether you want to play back the animation in bounding box mode, wireframe mode or at the current rendering quality set for the selected View window. Bounding box is the fastest and may be more useful for quickly testing motion. See *Chapter 24: Introduction to Rendering* for more information.

• **FPS**—Click on the up or down arrow or enter a value to change the frame rate for the animation. The default is 30 frames per second. (Note that this does not effect final rendering or the timing of events relative to each other.)

When you click the play button, your animation will begin playing in the active View window. To switch active View windows during playback, click on the title bar of a different View window, and the animation will continue to play in that View window.

COMMAND FLOATER

The Command Floater provides quick access to the core functions and settings in Infini-D. Each of the Command Tabs at the top of the floater reveals a set of controls relating to a specific aspect of the program. Some of the tabs are subdivided into sub-tabs. The contents of each tab is organized into Panels of related controls that can be expanded or collapsed individually.

Use these controls when working in the Command Floater:

• To change command tabs, click on the command tab you want or click on the **Windows** menu and select one.

• If a command tab is divided into sub-tabs as with Modifiers, click on a sub-tab to reveal its contents.

• The panels within a tab can be expanded and collapsed using the triangle in the left hand corner of the panel's title bar. When it is facing right and blue, the panel is hidden. When it is pink and facing down, the panel is showing.

• If the contents of a tab extend below the visible portion of the Command Floater, the entire contents can be scrolled using the cursor. Position the cursor over any empty area on the Command floater, click, and drag up or down to scroll the contents.

• The Command Floater can be re-sized vertically by clicking and dragging in the lower-right corner of the floater.

Note that some command tabs are context sensitive. For example, the Object command tab changes depending on wat type of object you have selected. If you have a camera selected, the Object command tab displays panels related to camera information. If you have a geometric object selected, it displays panels related to that type of object (Text, Bevel, etc.).

Note

There are five command tabs in the Command Floater. These are (from left to right):

- Objects
- Modifiers
- Surfaces
- Display
- Filter Plug-ins

The Command Floater also has a progress bar that will appear at the bottom which shows the progress of rendering in the View windows.

Command Floater—Objects Tab

The **Objects** command tab contains settings related to the type of object you select. Refer to the following examples:

- If you select a geometric object, it displays panels relating to the type of object you have selected. Panels include: Object, Text, Bevel, Terrain, and Particle. See *Chapter 9: Object Settings* for more information.
- If you select a camera, it displays controls related to camera information. *See Chapter 17: Working with Cameras* for more information.
- If you select a light, it displays panels with controls for light information—Light, Light Attributes and Light Effects. See *Chapter 16: Working with Lights* for more information.

Command Floater—Modifiers Tab

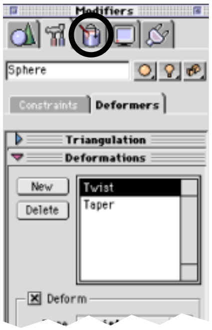
This command tab is divided into two tabs: Constraints and Deformers. They are described below.

Constraints Tab

Use this tab to set constraints on position, rotation, and scale values for any object. Minimums and/or maximums can be set for any parameter, or a parameter can be locked to a specific value. You can set values along the X, Y or Z axis or any combination of the three.

- At the top of the tab are the **Position**, **Rotation** and **Scale** buttons. Clicking these reveals its corresponding parameters. Click the one you want to work with.
- The first set of fields shows the **Current Orientation** of the selected object (these are the same values shown in the Info Tab of the Control Floater). You can enter numbers directly into the fields or click on the Up/Down arrows to change the current values. If you change the values, note that the object also changes, as does

the corresponding information in the Info tab of the Control Floater. To lock a parameter to its current setting, click on the X, Y or Z buttons and the button changes to a lock icon indicating the parameter is locked. To unlock a parameter, click on the lock and it changes back to the given axis letter.



- The second and third sets of fields show the **Minimum** and **Maximum** settings for the parameter in each axis. (By default the values are set to a Minimum/Maximum of: Position -1000/1000; Rotation -180/180; Scale 0.010/100.) To set a new minimum or maximum value for any parameter, enter a value in a field or use the up/down arrows adjacent to the field. To set a minimum or maximum value to the current orientation value, click on the axis letter next to the field you wish to set. The value is replaced with the current orientation value.

Deformers

Use this tab to add deformation effects to objects. You can use a single deformation to create a custom object—for example, a tapered wine glass—or you can create a list of up to eight deformations per object for extremely complex animation effects.

This command tab is divided into two panels: Triangulation and Deformations. See *Chapter 12: Object Deformations* for more information.

Command Floater—Surfaces Tab

Select this command tab to apply surfaces to your objects. See *Chapter 14: Surfaces and Texture Maps* for more information. This is divided into three tabs:

- **Basic—**This contains all the default surfaces for your scene, as well as any new procedural surfaces you create.

- **Textures—**This contains any imported images.
- **Composed**—This contains any composed surfaces. See *Chapter 15: Surface Composition* for more information.

Command Floater—Display Tab

Select this command tab to access rendering options for the active View window. There are two rendering panels: View and View Detail. *See Chapter 18: Adjusting View Settings* for details.

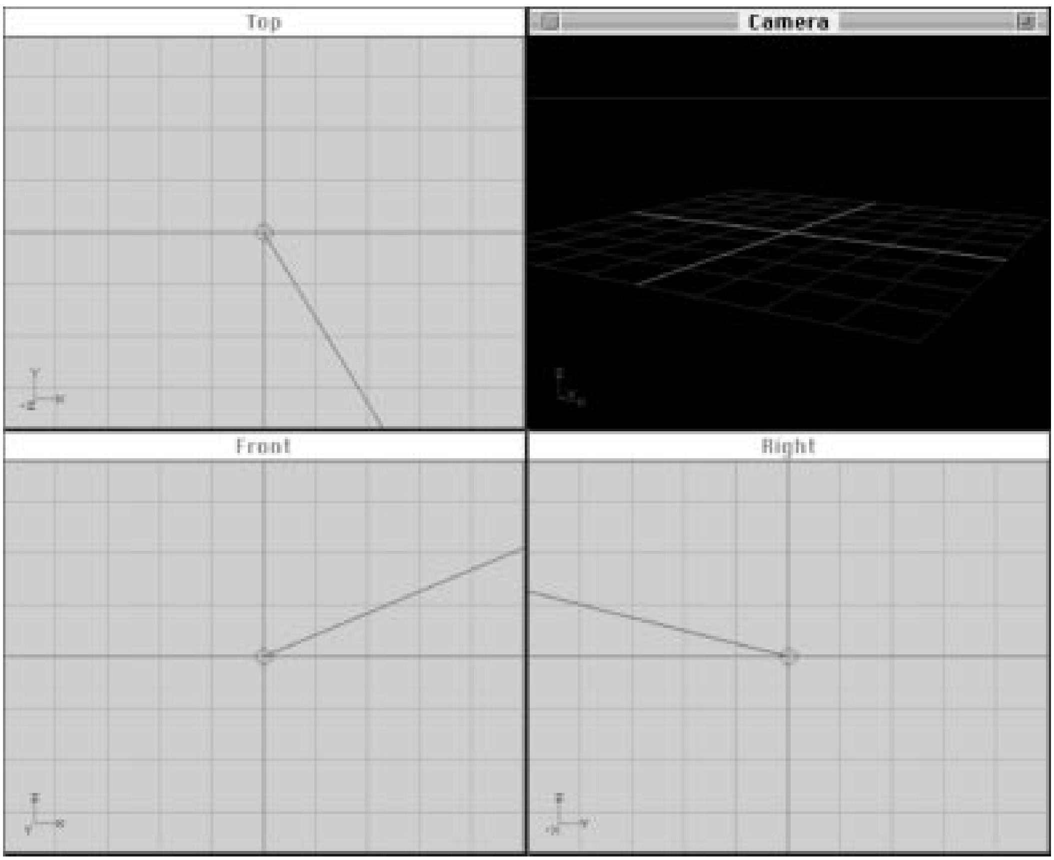
Command Floater—Filter Plug-Ins Tab

Select this command tab to access plug-in filters. This enables you to apply special effects by using Adobe After Effects™-compatible filters directly within Infini-D. Once you select a filter, you can edit its parameters to customize it for your needs. See *Chapter 25: Advanced Rendering* for more information.

Command Floater—Progress Bar

At the bottom of the Command Floater is a gray area that displays a progress bar when appropriate. This progress bar shows you the status of rendering in any of the View Windows. If you select a shaded rendering mode from the Display Tab of the Command Floater, or use the Marquee Render Tool, the progress bar will appear to indicate how long the render is taking. See *Chapter 24 Introduction to Rendering* for more on the different rendering modes and options.

VIEW WINDOWS



When you create a new Infini-D scene, the four view windows shown above appear by default. In addition to these, you can access the other available Standard View windows—bottom, back and left—by making a selection from the **Windows** menu. These windows can be opened, closed, resized and re-arranged as desired.

Because the computer screen is two-dimensional, Infini-D projects the three-dimensional scene onto the screen from a number of different angles to allow you to see the relative positions of different objects. View windows serve this purpose by providing windows onto the 3D scene that allow you to see and manipulate objects in your scene.

View windows fall into two categories—Standard and Camera View windows. They are similar in function but each has certain unique features. Standard View windows are most helpful when manipulating the objects in a scene. Camera View windows provide the same range of features available when using a camera in a physical scene to set up and frame a shot.

You can edit the parameters of an individual View window in the Edit View dialog box. as described in *Chapter 18: Adjusting View Settings*.

Standard View Windows

There are six different Standard View windows available: Top, Bottom, Front, Back, Left, and Right. Each offers a different view of the 3D scene. For instance, the Top view shows a view of the 3D scene as if looking down from above; the Front view window shows a view from the front, and so on. These six view windows are permanent; meaning you can never delete them, and each has an unalterable, fixed orientation.

You can move within the View windows to view different areas of the scene. To do this, you can use the controls in the Navigation tab of the Control floater, or you can use the View Manipulation tools in the tool bar. Each of these methods is described earlier in this chapter. You can not rotate a standard view in any way. To view your scene from a non-standard angle, you must use a camera, which can be freely positioned and rotated.

Infini-D displays Standard View windows using an orthographic projection, which means there are no perspective effects in the scene (i.e., no vanishing point). Thus, objects will always appear to be their true scale regardless of their distance from each other. This feature allows you to precisely align objects in relation to each other.

Camera View Windows

Camera View windows are different from Standard View windows in that you can rotate the point of view. With Camera View windows, you can look at the scene from any position and orientation, including the direction corresponding to each of the Standard Views. In addition, each Camera View is associated with an actual camera object that you can see and manipulate as an object in the scene. When you move a camera object, its corresponding View window updates accordingly. A scene can contain up to 20 different Camera View windows , although you will rarely need that many.

Infini-D displays Camera View windows using a perspective projection, meaning it uses a vanishing point to give the scene a sense of depth. Objects which are farther away from the camera will appear smaller than objects of a similar scale that are closer to the camera.

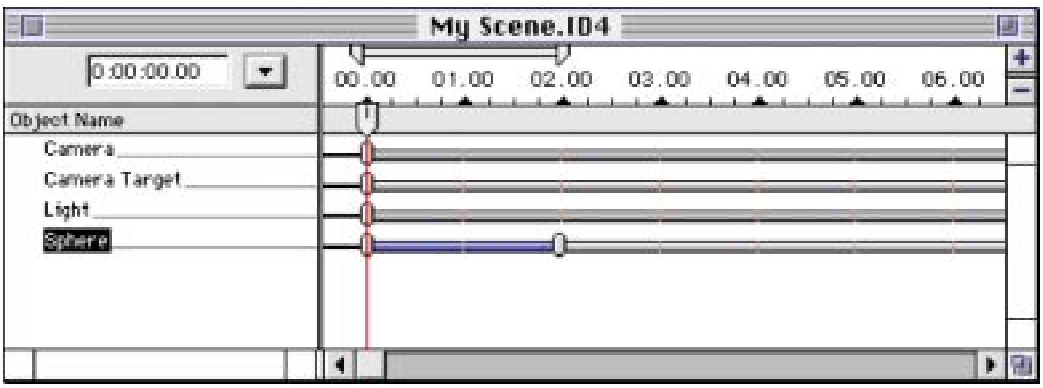
When you add a camera object to the scene as explained in *Chapter 17: Working with*

Cameras, Infini-D does not display a Camera view window automatically. Instead, you must select it from the **Cameras** sub-menu on the **Windows** menu.

Note: See Chapter 17: Working with Cameras for more information.

THE SEQUENCER

The Sequencer is the mechanism for creating animation and for viewing object hierarchies. Along the top of the Sequencer window are the scene time field and the timeline, along which the Time Marker moves, indicating the current scene time.The left side of the Sequencer window is a list of every object, camera and light in your scene. To the right of the object list is the track area, where each object has its own set of tracks for recording and editing animation. (See *Chapter 20 - The Sequencer* for more information.)



Chapter

5

Project Basics

This chapter provides a basic work flow for an Infini-D project. This manual is organized around the typical work flow you might follow in creating a 3D scene. This workflow incorporates each of the tasks you will undertake as you use this program and provides you with a starting point to help you organize your initial projects. As you become more familiar with the software, you will likely develop a work flow that suits your own unique working style.

Infini-D uses a scene creation metaphor. This means you create scenes just as you would were you producing a video, film or play. You should create your own project plan or story board that outlines each of the scenes in your overall production. This could be just one or many, depending on the complexity of your production. Once you complete your project plan, you are ready to create a scene.

You begin by adding, importing or creating geometric objects to which you can then apply surfaces and textures. Next, you place light sources to create desired lighting effects and shadows. You then position your camera or cameras to frame your scene appropriately; perhaps you need a long shot of a house that you've created or maybe a dramatic, close-up, cant angle for a corporate logo. If you wish, you can add special effects such as particles, lens flares, or filters. These last three steps—lighting, placing cameras and applying effects—are collectively called scene composition in the project work flow. You will find that you come back to these steps frequently to achieve specific results.

With your scene complete, you can animate as suits the needs of your project. This model assumes you will animate, but this is optional. Whether you animate or not, you must render the scene to an output format. You might choose a still image format for a print advertisement or web graphic or you could render to an animation to integrate into video or film. Further, you could use the rendered image or animation as part of a multimedia project combining it with sound, graphics and other elements.

Note that this is a dynamic process, meaning you may move back and forth between different parts of the flow as you get into the project. For instance, you may get to Part 3 and decide you need another geometric object and return to Part 1, or you could get to Part 4 and decide you need more or different lighting and return to Part 3. It is important to understand that the process is flexible and you should be prepared to move among the different parts as your project dictates.

Each task major part of the work flow is described below. Note that these descriptions may introduce terms or concepts with which you are not yet familiar. See the relevant chapter later in this manual for additional information on these items.

- **Add Objects**—Begin by adding objects to your scene by making a selection from the Object tools in the tool bar or by importing objects from other sources. These can be geometric objects, lights, cameras, text, terrains, particle systems or objects imported from other programs.

- **Edit Objects**—After you add objects you have the option of bringing them into the Infini-D Workshop or mesh editor where you can change the object or create entirely new objects. You can also use Boolean operators on intersecting objects to create complex 3D shapes.

- **Add Surfaces & Textures**—You can apply surfaces and textures to objects by clicking on the **Surfaces** command tab in the Command Floater and making a selection from the list. For example, you could apply blue plastic, gold or lead crystal. You can modify any surface by choosing a new color map or effect or by altering surface properties. Further, you can import your own images and movie files and apply these to objects.

- **Add Lighting**—With your objects in place, you can adjust the lighting in your scene. This may involve adjusting the lighting options such as intensity, or falloff; or using lighting effects such as a lens flare, gels and masks, or visible light beams. You will likely return to this step several times and adjust lighting to suit your needs.

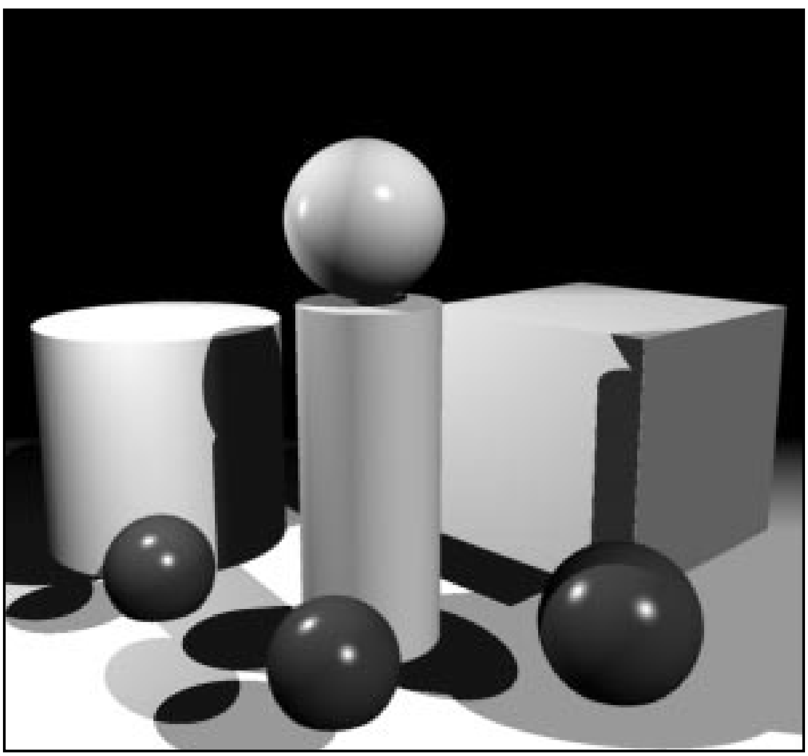
- **Place Cameras**—With your objects in place and your lighting set, you compose the final scene by directing camera angles, moving the various objects around your scene and adjusting lighting as needed. You will likely return to this step several times and adjust cameras to suit your needs.

At this point, the work flow becomes more fluid. You could, for instance, decide to perform a test rendering or you could begin animation or you could return to Part 1 and add more objects. Let your own project needs and work style govern the process. The remaining steps are explained below:

- **Animate**—After you are satisfied with the scene you've created, you are ready to animate the objects, lights, cameras and effects in your scene. Not all projects include this step. If yours does not, then move onto Part 7.

- **Rendering & Output**—Rendering can be done within any view window for a preview, or in the final render mode. Using plug-in filters, a variety of effects can be achieved by combining the rendering effects of the filters with the 3D rendering in your scene. Once the scene is complete it is time to do a final rendering. If you have an intricate scene and select a high-quality rendering method, this may take quite some time (depending on the complexity of the scene, the effects used, your hardware setup, etc.). It is, therefore, typical to perform a set of test renderings. For example, on a still image, you might choose to render at a lower quality to speed up the process or render certain objects in your scene with the **Marquee Render Tool** to test textures or lighting effects. For an animation, you might render a wireframe version to test the overall motion, and a small, high-quality version at a low framerate to check textures and lighting. When this is done, you may return to Part 1 and place additional objects in your scene, you may need to create additional scenes as part of your whole project, or you may commit to the final rendering. Let your project plan lead you. If your plan is complete, your final step is to select a delivery method. Digital video users will need to output to animation format for integration into video. If you are creating a graphic for the web or for print, you would choose a still image format at the proper resolution.

The remainder of this manual will explain each of the steps in the work flow in detail. Each section will focus on a particular portion of the work flow. As you use the manual, you may want to refer to this chapter from time to time to reacquaint yourself with the work flow outlined here.



Section
2

Adding Objects to your Scene

In this first part of the Infini-D workflow you add 3D objects to your scene. Objects include geometric shapes, text, terrains, particles, lights and cameras. You choose these items by clicking on one of the object tools in the tool bar as explained in *Chapter 4: Infini-D Tools and Interface*.

You can also import objects from other programs into Infini-D. For example, you could create an object in another 3D modeler, then bring it into Infini-D and use it in your scene.

Infini-D enables you to link objects together into object hierarchies. This provides an easy way to create complex models from simple component parts. For example, you could build a bicycle by creating individual parts such as the wheels and the frame, then link them together in an object hierarchy.

You can use Infini-D's default objects to create a model or you can bring the objects into the Workshop where you can create your own custom object. You can also use the Mesh Editor to modify an object's shape. The Mesh Editor gives you control over individual points on an object, so that you can stretch a point or a group of points to create effects such as dents and bumps. See the chapters in Section 3 for more information on creating custom objects.

This section covers the following topics:

- **Geometric 3D Objects**—This chapter defines each type of geometric object and explains how to place objects in your scene, as well as how to manipulate the objects in various ways.
- **Other 3D Object Types**—This chapter explains about objects other than geometric objects such as text, particles, terrains and imported objects.
- **Object Hierarchies**—This chapter explains how to create and use object hierarchies in Infini-D.
- **Object Settings**—This chapter explains how to adjust objects settings in the Command Floater.

Chapter 6

Geometric Objects

This chapter explains how to use geometric objects in your scene. Infini-D provides these objects as a starting point for your work. You find standard Infini-D objects in the tool bar. Click on an object in the tool bar to select it, then click in any View window to place it. Once you add an object to the scene, you can work with it in a number of ways such as giving the object a meaningful name.

Note: There are some differences among objects when placing them in a scene. See Placing Objects in a Scene later in this chapter for more information.

Note

You can use these objects as is or you can alter them with the Object Manipulation tools described in *Chapter 4: Infini-D Tools and Interface*, or you can access the SplineForm Workshop or Mesh Editor described in *Section 3: Editing Objects* to create custom objects. Further, you can combine objects to make complex models. For example, you could create a guitar by creating the neck, the body and so forth; then combine these items to make the whole guitar. See *Chapter 8: Object Hierarchies* for more information.

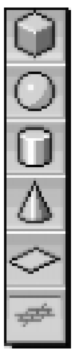
This chapter covers the following topics:

- Geometric Object Types
- Placing Objects in Your Scene
- Working with Objects

GEOMETRIC OBJECT TYPES

Infini-D includes several geometric object types including:

- Primitive Objects
- Extrude Objects
- Lathe Objects
- SplineForm Objects
- Mesh Objects

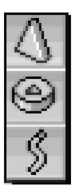


Primitive Objects

Infini-D includes six primitive objects: cube, sphere, cylinder, cone, two-dimensional square, and infinite plane. These objects represent the most basic, easily-recognizable building blocks of everyday objects and afford two great advantages: speed and convenience. Since primitives objects are mathematically defined, they provide fast calculation and rendering time, which is especially important when you select Ray Tracing or Phong Shading as your rendering mode. These objects are convenient because you do not have to create simple objects from scratch every time you need them.

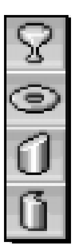
Note

Note: When you modify a primitive object in the Workshop, it loses the speed benefit for Ray Tracing or Phong Shading described above. See Chapter 10: The SplineForm Workshop for more information. See Chapter 24: Introduction to Rendering for more information on rendering modes.



Extrude Objects

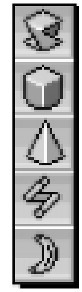
Infini-D includes three predefined extruded objects: a triangular prism, a circular prism with a triangular hole punched through it and an s-shaped path extrusion. Extrusion is the process of raising a two-dimensional shape such as a rectangle or circle from the two-dimensional plane, thereby giving it a third dimension—height. A cinder block is a simple real-world example of an extrusion. The basic shape of the block, or “cross-section,” is pulled along the third dimension to give it depth.



Lathe Objects

Infini-D includes four predefined lathe shapes: wine glass, torus, tapered cylinder and partial-lathe cylinder. Lathing refers to the process of taking an outline and revolving it around one axis to create a three-dimensional object. This process is particularly useful when creating symmetrical shapes.Simple lathe object examples include a lamp shade or a bowl.

SplineForm Objects



Infini-D includes five predefined SplineForm objects: banana, spiral, lofted, twisted cube, and pyramid. These shapes demonstrate some of the advanced modeling effects possible in Infini-D. Technically, any shape you alter in the Workshop becomes a SplineForm object. Infini-D provides these standard SplineForm objects for your convenience.

PLACING OBJECTS IN YOUR SCENE

Now that you are familiar with the geometric object types, you are ready to place them in your scene.

Note: These instructions assume you are familiar with the Infini-D interface. If not, review Chapter 4: Infini-D Tools and Interface before proceeding.

Follow these steps to place an object:

Step 1: Click on the geometric object tool you want in the tool bar.

Step 2: Click in any View window to place the object. Keep in mind the following:

- When placing an object, you click to place; drag to change the size.
- When you place an object in a Camera View window, Infini-D places it at a Z value of 1, and X and Y values based on where you click relative to the ground plane—the closer to the horizon you click, the farther away from the camera the object will be, the closer to the bottom edge of the camera View window you click, the closer to the camera the object will be.
- All objects (except text) are placed into the scene at default scale values of 1in all dimensions and a default size of 2 units along the main axis. (Text is placed with a Z scale value of 0.2, and a size determined by the font selected.) This puts their bottom edge on the ground plane, and their centerpoint at a Z value of 1. To scale an object while placing it, click to place the object and drag to scale up or down. You can see the scale values update as you drag in the Info tab of the Control Floater.

Step 3: Repeat Steps 1-2 to add more objects. You can combine several objects to create a complex model. See *Chapter 8: Object Hierarchies* for more information.

WORKING WITH OBJECTS IN YOUR SCENE

Once you place an object in the scene, Infini-D gives it a generic name such as *Object 1*. You should change this to a more meaningful name to help keep your scene organized. After you have several objects in the scene, it can be increasingly difficult to select the object you want by simply clicking on it. Infini-D provides several ways to select an object. Finally, sometimes you may add an object in error or are unhappy with the results of your object manipulation. In these cases, you can delete the object from the scene.

Infini-D uses the cut, copy and paste commands in a unique fashion from other programs. With Infini-D, you cannot copy items to the Macintosh or Windows clipboard to use in other programs. Instead, you can only use them internally to cut, copy and paste items between scenes or within scenes.

Note

Note: See Chapter 9: Object Settings for information on working with the Object panel in the Objects command tab of the Command Floater.

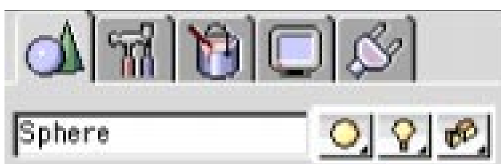
This section covers the following topics:

- Selecting Objects
- Naming Objects
- Manipulating Objects
- Deleting Objects
- Cutting, Copying and Pasting in Infini-D

Selecting Objects

As you populate your scene, it can be increasingly difficult to select the object you want by simply clicking on it. Infini-D therefore supplies several methods to make it easier to select objects. They are:

- **Selection List Buttons**—Click on one of these buttons—**Object**, **Light** or **Camera**—then make a selection from the list that appears. These are found in the **Object** command tab in the Command Floater. See *Chapter 4: Infini-D Tools and Interface* for more information.



- **Sequencer**—You can also click on an object name in the Sequencer described in *Chapter 20: The Sequencer* to select an object in the scene.
- **Key Commands**—With the COMMAND key (Mac) or the RIGHT MOUSE BUTTON (Win) click and hold the mouse anywhere in your scene and a list of objects that exist at that point appears. Select the desired object from the list.

Naming Objects

After you place an object in your scene, Infini-D gives it a generic name, which it displays in the **Object Name** field in the **Object** command tab in the Command Floater. You can give it a more meaningful name, which makes it easier to locate and select as your scene becomes more populated with objects.

Follow these steps to name an object:

Step 1: Select the object as described in *Selecting Objects* in the previous section.

Step 2: Click on the **Object** command tab in the Command Floater.

Step 3: Click in the **Object Name** field.

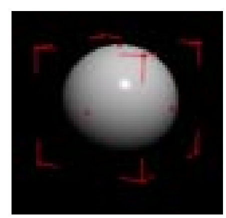
Step 4: Enter a new name. For example, if you were creating a guitar neck, you could name it *Neck*.

No two objects in the same scene can have identical names. If you create multiple spheres, for example, Infini-D will name them Sphere 1, Sphere 2, etc.

Manipulating Objects

The most fundamental task in creating a 3D scene is manipulating objects into the proper orientation in relation to other objects. Infini-D provides tools for moving, rotating, scaling, squashing and stretching your 3D objects. These functions can be performed visually by using the tools from the tool bar or they can be done numerically using the Info tab of the Control floater. These tools and functions are all described in detail in *Chapter 4: Infini-D Tools and Interface*. You should be familiar with using them in order to create scenes of any sophistication.

Bounding Box Manipulation



Infini-D gives you the option of drawing a bounding box around the selected object in all View windows (See *Chapter 3: Getting Started* for more information on setting the manipulation preferences.) When an object's bounding box is displayed with scaling handles, the object can be scaled by dragging on the appropriate handle:

- Click and drag on any **corner handle** to scale the object up or down uniformly.
- Click and drag on any **face handle** to scale the object along the axis perpendicular to that face.
- With the Squash & Stretch tool selected, click and drag on any **edge** of the object's bounding box to scale the object along the two axes that intersect at that edge.

Deleting Objects

As you compose your scene, you may find you wish to delete objects that you added in error or that you no longer find useful.

Follow these steps to delete an object:

Step 1: Select the object by clicking on it or by using one of the methods described in *Selecting Objects* above.

Step 2: Click on the DELETE key (Mac) or BACKSPACE key (Win) on your keyboard or click on **Edit** in the menu bar and select **Clear**. Infini-D deletes the object without prompting you.

TIP

You could also click on an object name in the Sequencer, then press the DELETE key on your keyboard. If you use this method, be certain that no eventmarks are selected or you will delete these instead. See *Chapter 20: The Sequencer* for more information.

Cutting, Copying, Pasting and Duplicating

You can cut, copy and paste objects among different Infini-D scenes or within a scene, but you cannot copy an Infini-D object directly into another program. You can duplicate an object within a scene. When you cut, copy or duplicate an object, you also copy all associated surface and animation information. Any child objects (and their associated information) are also copied. This can be useful for creating multiple instances of a complex model and also for bringing complex models from different scenes together into one scene.

Note

Note: If you want to move an object to another program, you must use the Export command described in Chapter 7: Other 3D Object Types or the drag-and-drop method described in Chapter 3: Getting Started.

Follow these steps to cut, copy or paste an object:

Step 1: Select the object you wish to cut or copy as explained in *Selecting Objects* above.

Step 2: Click on **Edit** in the menu bar and select the **Cut** or **Copy** commands (**Command-X** (Mac), **Control-X** (Win) to cut or **Command-C** (Mac), **Control-C** (Win) to copy).

Step 3: If you want to paste into another scene, switch to the scene where you wish to place the object by clicking on **File** in the menu bar and selecting the scene from the **Scenes** sub-menu.

or

If the file is not yet open, open it with the **File/Open** command.

Step 4: Click in any View window, then click on **Edit** in the menu bar and select **Paste** (or press **Command-V** (Mac) or **Control-V** (Win)).

Step 5: The object will be pasted into the scene at it's original position, adjust as needed to fit in your scene.

Follow these steps to duplicate an object:

Step 1: Select the object you wish to cut or copy as explained in *Selecting Objects* above.

Step 2: Click on **Edit** in the menu bar and select **Duplicate** (Command-D (Mac), Control-D (Win)). Infini-D creates an exact duplicate of the object, slightly offset from the original.

Another quick way to duplicate an object is to click and drag it while holding the OPTION key (Mac) or ALT key (Win). This method works with any of the move, rotate, or scale tools.

Chapter 7

Other 3D Object Types

In addition to the geometric objects covered in *Chapter 6: Geometric 3D Objects*, there are other objects you can use as you create a scene in Infini-D, and there are ways to use Infini-D objects in other programs. These include:

- Text
- Terrains
- Particles
- Cameras & Lights
- Imported 3D Objects
- Exporting 3D Objects

This chapter covers each of these items in detail, except lights and cameras, which are covered in *Chapter 16: Working with Lights* and *Chapter 17: Working with Cameras*.

TEXT

You can add text objects to Infini-D to create 3D text and flying logos for video, print or as part of a multimedia presentation. Click on the Text tool in the tool bar, then click in any View window to create a text object.

When the Text dialog box appears, you can enter your text and select text properties. After you place the text in a View window, three panels appear in the **Object** command tab in the Command Floater: Text, Bevel and Object, which you can adjust as needed to alter your text.

The text you add appears as a single, 3D object to make manipulation easier, but you can change this by clicking on the Break Into Characters button in the **Object** command tab-Text panel.

This section covers the following topics:

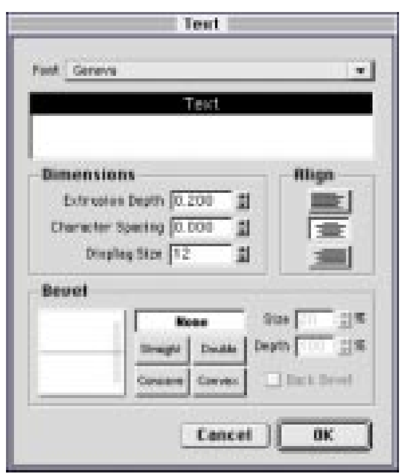
- Adding a Text Object
- Editing Text
- Adjusting Text Bevels
- Breaking Text into Individual Characters
- Applying Surfaces to Text
- Applying Deformations to Text

Adding a Text Object

This section explains how to add a text object to your scene. Follow these steps to add a text object:

Step 1: Click on the **Text** tool in the tool bar.

Step 2: Click in any View window and the Text dialog box opens with the default text highlighted.



Step 3: Delete the default text (or simply start typing) and enter the text you want. You can adjust the other properties as described below.

- **Font**—Click on the Font pop-up list and select the one you want. (Infini-D can use TrueType and Postscript fonts installed in your system.)
- **Extrusion Depth**— The extrusion depth is the extent to which the letters will be pulled into the third dimension. Click on the arrows to increase or decrease the text depth or click in the **Extrusion Depth** field and enter the depth you want. You can also change this value dynamically using the **Squash and Stretch** tool in your scene.
- **Character Spacing**—Click on the arrows to increase or decrease the spacing between the letters of your text or click in the **Character Spacing** field and enter an amount.
- **Display Size**—Click on the arrows to increase or decrease the point size of your font or click in the **Display Size** field and enter a point size.

Note: The Display Size affects only the size of the display in the Text dialog box, not the size of the Text object as it appears in your scene.

Note

- **Alignment**—Select whether you want left, right or center alignment for your text by clicking on the appropriate choice. This indicates where to place the text relative to the spot where you clicked in your scene.
- **Bevel**—You can adjust the bevel of the text object as explained later in this chapter.

Step 4: Click on **OK** and Infini-D places your text in the scene. After you close the Text dialog box, you can click on the **Object** command tab in the Command Floater to see the three text object panels: **Text**, **Bevel** and **Object.** These panels are covered later in this chapter.

Note: The centerpoint of a text object is located in the lower left corner of the object. The centerpoint offset setting is automatically changed to be at the center of the text object, so that rotation occurs more naturally. See the discussion on Object Offset in Chapter 4: Infini-D Tools and Interface for more information on these concepts.

Note

Editing Text

After you place the text in the scene, you may want to adjust it. For example, you may decide to adjust the spacing or change the text altogether. To edit text, you make your changes in the Text panel in the **Object** command tab.

Follow these steps:

Step 1: Select the Text object in any View window.

Step 2: Click on the **Object** command tab in the Command Floater.

Step 3: Make any changes in the **Text** panel in the Command Floater. Each field is defined above in *Adding a Text Object*.

*Note: Use the **Break into Characters** button to break the text into individual characters. See **Breaking Text into Characters** below for more information.*

Step 4: After you make your changes, click on the **Apply** button at the bottom of the panel and Infini-D applies any changes you made.

Breaking Text into Individual Characters

After you create a text object, you can break the object into individual letters to manipulate or apply surfaces to each character. This command divides the Text object into a group of individual characters, where all the letters are linked to the first letter in an object hierarchy. (See *Chapter 8: Object Hierarchies* for more information.)

Keep in mind the following when using this command:

- Infini-D saves any animation information (such as position, rotation, or scale) when you use this command by creating individual letter objects and placing them in the Sequencer to preserve the animation information. You can then manipulate the letters individually any way you wish. See *Chapter 20: The Sequencer* for more information.
- After you select Break into Characters, you cannot undo it.
- If you have used the text in an animation, breaking the text into characters applies to all points in time.
- Once broken into characters, text can no longer be edited as text (although individual letters can be edited in the Workshop).
- If you have concerns, save your scene file before using this command.

Follow these steps to break a text object into individual letters:

Step 1: Save your scene. This step is optional, but highly recommended.

Step 2: Select the Text object in your scene.

Step 3: Click on the **Objects** command tab in the Command Floater.

Step 4: Click on the **Break into chars** button in the **Text** panel. Infini-D displays a dialog box warning you about this action.

Step 5: Click on **OK** to break the text object into characters. Click on **Cancel** if you decide not to do this.

Adjusting the Text Bevel

The bevel refers to the subtle angled detail along the edges of an object. A bevel adds an additional surface that can reflect the objects surroundings, providing more highlights, particularly on reflective objects. When you create a bevel, Infini-D actually adds material to the object, rather than subtracting it as you may think. The resulting object is bigger than your original design. You can apply a bevel to a Text object or any other extrusion object. You can also import EPS outlines and apply a bevel to these objects. See *Importing Objects* later in this chapter for more information.

As part of the text creation process, you can adjust the bevel of the text in the Text dialog box when you first add your text or in the **Bevel** panel in the Object command tab of the Command Floater. Infini-D includes a variety of predefined bevels, but also provides the tools to customize the bevel settings to suit your own creative needs.

This section covers the following topics:

- Selecting a Predefined Bevel
- Customizing a Bevel

Selecting a Predefined Bevel

This section explains how to select a predefined bevel for your text. Infini-D includes four predefined bevel styles. Customizing bevels is explained in the next section.

Follow these steps to select a predefined bevel:

Note: If you are adjusting the Bevel in the Text dialog box, rather than the Bevel panel, then proceed to Step 5.

Note

Step 1: Select the text object in any View window.

Step 2: Click on the **Object** command tab in the Command Floater.

Step 3: Scroll down to the **Bevel** panel.

Step 4: Click on the blue triangle to open the Bevel panel if it is not yet open.

Step 5: Click on one of the predefined bevel choices. These are:

- Straight
- Double
- Concave
- Convex

Note: Concave or Convex bevels add many more polygons to your object than Straight or Double, and therefore increase rendering time.

Note

Step 6: Click on the **Apply** button to add the chosen bevel to your text object. Notice that the text updates in your View windows.

Customizing the Bevel

Infini-D provides several controls that allow you to customize each predefined bevel shape. You can adjust the bevel size and dimension graphically or numerically.

Infini-D does not add Bevels to the face of an object, but instead affects the extrusion on the X and Y axes that angles up to the face of the object in the shape and size you choose. This is an important distinction to remember when customizing the shape of a bevel.

Follow these steps to customize your bevel choice:

> *Note: If you are adjusting the Bevel in the Text dialog box, rather than the Bevel panel, then proceed to Step 5.*

Step 1: Select the text object in any View window.

Step 2: Click on the **Object** command tab in the Command Floater.

Step 3: Scroll down to the **Bevel** panel.

Step 4: Click on the blue triangle to open the Bevel panel if it is not yet open.

Step 5: Click on one of the predefined bevel buttons.

Step 6: Click on the red control point in the Bevel Preview window, then drag your mouse to change the shape of the bevel. Notice that as you do this, the numbers change in the **Size** and **Depth** fields.

or

Click on the arrows or enter a number in the **Size** and **Depth** fields to change the values numerically. As you change the numbers in these field, the bevel graphic changes in the Bevel Preview window. Each selection in the Bevel panel is described briefly below:

- **Size**—This number represents the thickness of the bevel. A bevel of zero results in no bevel, while 100% produces a very exaggerated bevel
- **Depth**—This number determines the angle of the bevel along the side of the object. As you drag the control point in a downward motion, the depth increases. A setting of 100% causes the bevel to stretch down halfway along the side of the object. If the Back Bevel option is checked (see below), and the Depth is set to 100%, the two bevels meet in the center along the side of the object.
- **Back Bevel**—When you select this option, Infini-D creates bevels on both sides of the object, making it symmetrical. If this box is unchecked, the bevel will appear only on the front surface, leaving the corners around the back face at 90°.

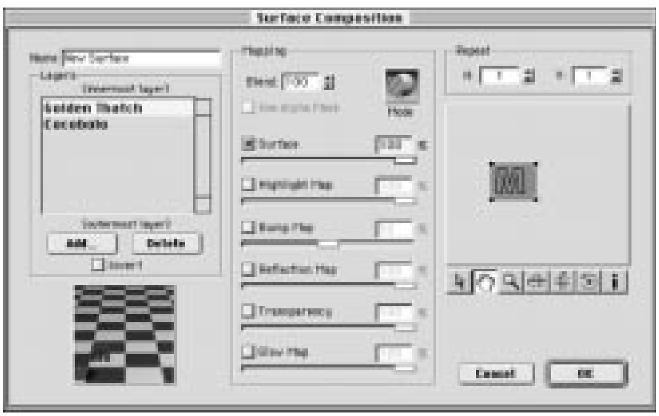
Step 7: Click on the **Apply** button and Infini-D applies your changes to your text object. Notice that the text updates in your View windows.

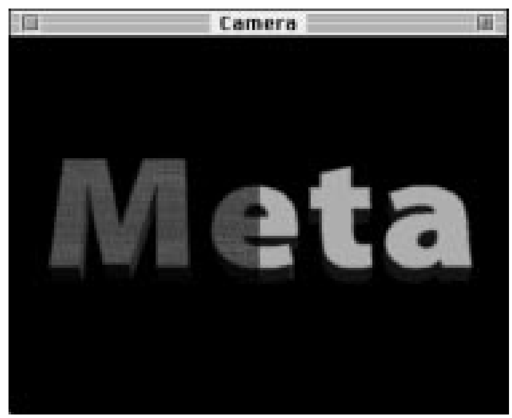
Applying Surfaces to Text

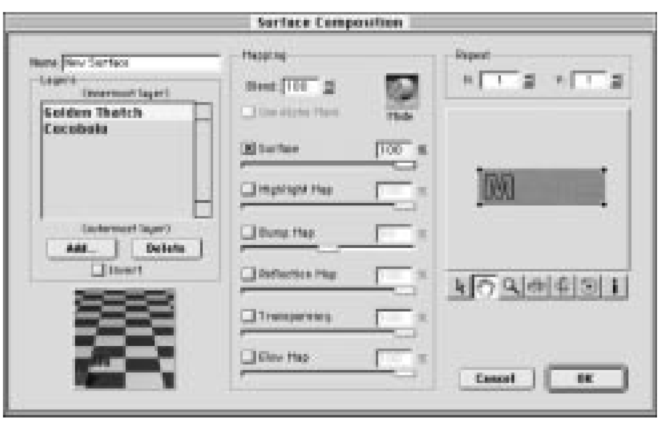
Text objects behave like any other object in Infini-D. If you apply a standard surface such as blue plastic, it covers the entire text object. If you break it into individual characters, you can apply a surface to each letter.

If you try to compose a surface for a text object, however, it's somewhat different from other objects. Since a text object is made up of several distinct shapes—the individual letters—it is difficult to compose a surface for an entire text object. Therefore, keep in mind the following points:

- When you access the Compose Surface dialog box, you see only the *first* letter of your text. (This is because text is technically a hierarchy of multiple objects, and the preview window in the Compose Surface dialog only shows one object at a time.)
- To apply a composed surface to the entire text object hierarchy, drag out the rectangle representing your image in the object preview window until you think you have covered the entire text object. This may involve a bit of trial-and-error. You will need to return to your scene and render the object in order to see if it has been completely covered. The graphics below illustrate this.



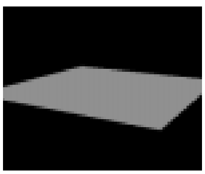




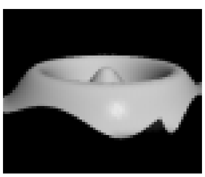
It is probably easier to break the text into characters as described earlier in this chapter, then apply your composed surface to each individual character. For more information on composing surfaces, see *Chapter 15: Surface Composition*. See *Chapter 24: Introduction to Rendering* for more information on rendering options.

Applying Deformations to Text

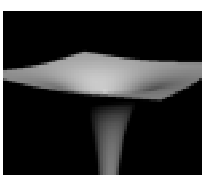
Text objects do not behave like other objects in Infini-D when it comes to deformations. Text objects are a variation on object hierarchies, which can not have a deformation applied throughout. To deform text, you must either break the text into characters and apply the deformation separately to each character or create the text as a single extrusion object in the Workshop. See *Chapter 10 The SplineForm Workshop* for more information on creating text as an extrusion object.



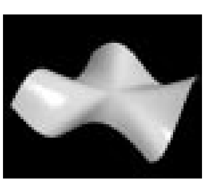
Square Terrain



Ripple Terrain



Black Hole Terrain



Starr Function Terrain

TERRAINS

This section explains how to work with terrain objects. A terrain is similar to a basic square shape, except that the points that make up the surface of the square can be lifted or depressed from the central plane to create a variety of shapes. The eight preset terrain types make it easy to create effects ranging from mountains to fractal landscapes to black holes.

This section covers the following topics:

- Terrain Types
- Specialty Terrains
- Adding a Terrain Object
- Modifying Terrain Options
- Selecting an Image to use as a Terrain Map
- Editing Terrain Information
- Rendering Terrains

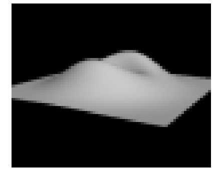
Terrain Types

There are nine terrain types available

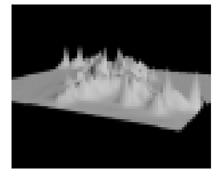
- Square
- Ripple
- Black Hole
- Starr Function
- Two Bumps
- Julia Set
- Mandelbrot Set

- Noise
- Image

For all terrain types, you can edit the grid density—this setting determines how many points make up the terrain, and therefore how much detail is present. The grid density can be set to any value from 10 to 128. (Keep in mind when setting the grid density that you are increasing the number of polygons exponentially as you increase the grid density, because it indicates the number of grid points both across and down your terrain, so rendering times can increase quickly.) Terrains can also be scaled using the scale tools or scale fields as you would any other object. Certain types of terrains also have additional editable parameters, these include: Fractal terrains (Julia Set or Mandelbrot Set), Noise terrains, and Image terrains. These are described below.



Two Bumps Terrain

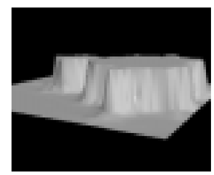


Julia Terrain

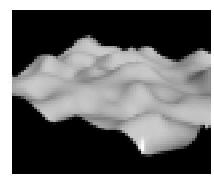
Specialty Terrains

The terrains you can edit—Fractal, Noise and Image—enable you to create interesting landscapes in Infini-D. This section describes each special terrain type and ways you can use them in your scenes.

- **Fractal Terrains**—Choose either the Julia Set or the Mandelbrot Set terrain type to create fractal terrains. This feature is useful for creating unique and exciting landscapes, mountain ranges, ocean cliffs, and so on.
- **Noise Terrains**—Infini-D allows you to use the noise surface generator as the source of a terrain shape. The noise generator creates a random pattern of heights across the terrain, creating natural and unpredictable landscapes. This is probably the easiest way to create a terrain with the effect of naturally smooth, rolling hills.
- **Image Terrains**—You can create a terrain that is based on a grayscale image map. This is useful if you need to create a landscape based on a topographical map that has been converted to grayscale.



Mandelbrot Terrain



Noise Terrain

Adding a Terrain Object

This section explains how to add a terrain object to your scene. Follow these steps to add a terrain object:

Step 1: Click on the **Terrain** tool in the tool bar.

Step 2: Click in any View window, drag to scale it. The terrain is a square grid by default.

Step 3: Click on the **Object** command tab in the Command Floater and the **Terrain** and **Object** panels appear. From here, you can edit the terrain settings or select a different terrain type as explained in the next section.

Modifying Terrain Options

This section explains how to modify terrain options. You could, for instance, select a different type or adjust the grid size. Follow these steps to modify terrain information:

Step 1: Select a Terrain object in any View window

Step 2: Click on the **Object** command tab in the Command Floater

Step 3: From here you can alter any setting in the **Terrain** panel. All changes are interactive, meaning they apply to the terrain immediately. There is no OK or Apply button. Each option is defined below:

- **Type**—Select a type from the **Type** pop-up list. If you select a specialty terrain you can edit it further by clicking on the **Edit** tool just below this field. All other types are fixed and you cannot edit them.

Note

Note: If you select Noise or one of the fractal terrains you access a dialog box where you can edit the look of the terrain. See Chapter 14: Surfaces and Texture Maps for information on the Fractal and Noise editors.

- **Grid**—The default grid size is 10— that is, the object is formed out of a 10 X 10 grid. You can adjust the size to any value from 10 to 128; the higher the grid size value, the more detailed and realistic the terrain object.

  It is important to note, however, that as you increase the grid size, rendering time increases exponentially. For example, an object with a grid size of 20 has four times as many sections and will take four times as long to draw as an object with a grid size of 10.

Note

Note: The following options are active only if you select one of the fractal terrains—Mandelbrot Set or Julia Set.

- **Matching Fractal Surface**—Since fractal terrains are based on a specific portion of the Mandelbrot or Julia Sets, it is often desirable to color the terrain based on the same values of the set used to determine the height of the various points on the terrain. You can do this by checking this selection. Infini-D then creates a surface in the surface library that is identical to that of the terrain object.
- **Cliffs**—If you check this selection, Infini-D creates a sheer drop-off wherever a flat plane exists around the edges of the terrain object. This is helpful in creating steep slopes, ocean cliffs, and so on. This option is most effective with the Mandelbrot Set.

Creating an Image Terrain

When you choose Image as the terrain type, you must select an image. For example, you may want to use a topographical map as your terrain. Note that grayscale images work best. If you use a color image, Infini-D uses only the lightness values from the image, so you may end up with unexpected results. You should therefore use grayscale whenever possible.

Follow these steps to select an image terrain:

Step 1: Add a terrain to your scene as explained earlier in *Adding a Terrain Object*.

Step 2: Click on the **Object** command tab in the Command Floater

Step 3: Select **Image** from the **Type** pop-up menu in the Terrain panel as explained in *Modifying Terrain Options* above.

Step 4: Click on the **Edit** button just below the **Type** field and the Image Info dialog box opens. Locate the image you wish to use. Remember that grayscale works best. *See Chapter 14: Surfaces and Texture Maps* for information on importing images.

PARTICLE SYSTEMS

Particle systems enable you to create complex and interesting particle effects such as sparks, fountains, or explosions. There are many predefined particle systems to choose from—these can either be used as they are, or you can use them as a starting point for creating your own custom particle systems. You have complete control over every aspect of the system, including emitter, atmosphere, collision, and effects settings. You can adjust the basic controls directly in the **Object** tab of the Command Floater, and you can access the complete set of controls in the particle dialog. This section covers the following topics:

- Creating a Particle System
- Modifying Basic Particle Options
- Editing Particle Settings in the Particle Dialog
- Rendering Particles

Creating a Particle System

This section explains how to add a particle system to your scene. Follow these steps to add a particle system:

Step 1: Click on the **Particles** tool in the tool bar and select the **Particle** tool.

Step 2: Click in any View window to place a particle emitter.

Step 3: Click on the **Object** tab in the Command Floater to view the **Particle** panel. From here, you can edit basic particle settings or select a different preset particle system as explained in the next section.

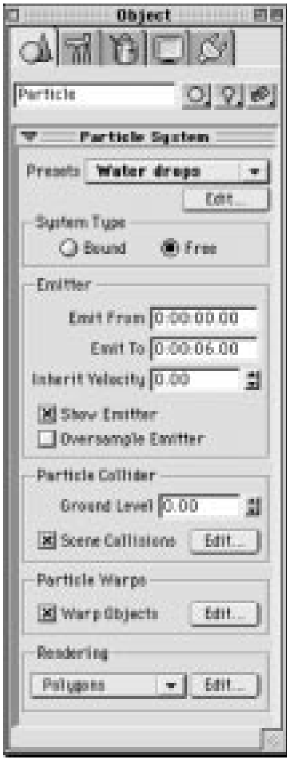
Modifying Basic Particle Options

After you add a particle system to your scene, you can modify certain options. Follow these steps to modify particle options:

Step 1: Click on the particle object in any View window.

Step 2: Click on the **Object** tab in the Command Floater.

Step 3: You can alter any setting in the **Particle System** panel. All changes are interactive, meaning they apply to the particle system immediately. There is no OK or Apply button. Each option is defined below:



- **Presets**—Select a type from the **Presets** pop-up list. After you make a selection, you can edit the Particle System as explained in *Editing Particle Information* later in this chapter.
- **System Type**—These two choices affect how the particles behave relative to the emitter. Click on the radio button next to the one you wish to use.

  – *Bound*: With a bound system, emitted particles move with the emitter. Example: When creating exhaust from a rocket engine, you want the stream of particles to stay within a certain area behind the engine, you don't want the particles flying off into space as the rocket moves.

  – *Free:* With a free system, emitted particles do not move with the emitter. If you move the emitter to a new position, the particles continue to fall at their originally-emitted position. Example: When animating a hose spraying water as it whips back and forth, you want the particles to fly out and fall where they are emitted, to simulate their natural motion.
- **Emitter Options**—These options provide direct control over particle system options:

  – *Emit From/To:* Enter values to set the time range over which particles are emitted. (This is different from the Lifetime setting in the particle dialog, which measures how long a particle lasts after it has been emitted. See *Editing Particle Information* below for more information.)

  – *Inherit Velocity*: This number determines what percentage of the emitter's velocity you want to add to the particle's velocity. This can be a positive or negative number. Try starting with positive or negative 50 and watch the results. Once you understand the effect, you can experiment with the values. A positive number provides the effect of the particles spiraling away from the emitter, while a negative number provides the effect of the particles trailing behind the emitter. Note that you must select **Free** as the System Type for this option to be enabled. If the emitter is not animated at all, this control will have no effect upon the particles.

  – *Show Emitter*: This is checked by default, meaning the emitter shows in your scene. If you want to hide the emitter, uncheck this check box. (Note that the emitter will not be visible in your final rendering in either case, and that this setting has no effect on the particles themselves.)

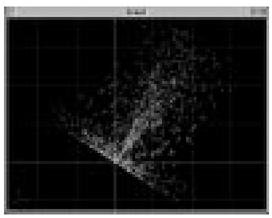
  – *Oversample Emitter:* If the particle emitter is moving very quickly in the animation, the particles can appear to be emitted in 'puffs', with breaks between them. Checking this check box will help smooth out the flow of particles so that there are not gaps and so that it emits particles evenly over the change in distance. (Note that this option is only available for **Free** systems.)

- **Particle Collider Options**—Use these options to determine if your particles collide with a ‘ground’ or with other objects.

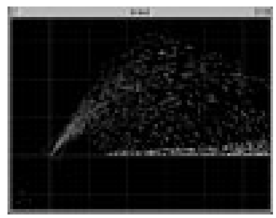
  – *Ground Level:* This determines the imaginary plane in your scene that is considered ground level. Particles will always collide with the ground plane, so if you d not want your particles to collide with anything, set the ground plane to a value that puts it out of view (eg: -100). The default setting is zero. Note that the ground level behaves differently for the two different types of systems:

  • For **Bound** systems, the ground level moves and rotates with the emitter, and the setting determines its distance from the emitter along the emitter’s Z axis. (See example images.)

  • For **Free** systems, the ground level is always a plane in the X and Y axes of the world, and the setting determines its Z height. If the emitter is rotated, the ground plane does not change. If the emitter is placed below ground level, no particles will be emitted.

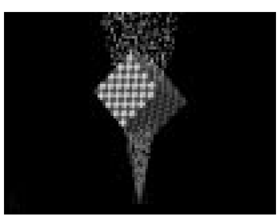


Bound system rotated

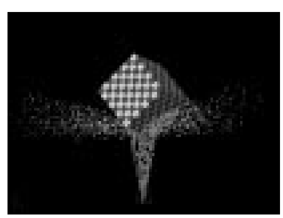


Free system rotated

  – *Scene Collisions:* Select **Free** as the System type, then check this check box to have particles collide with other objects in the scene, in addition to the ground. Click on the **Edit** button adjacent to this field to select the objects with which you wish the particles to collide. Each particle system has its own list of collision objects. See *Editing Collision Options* below for more information.



Particles without collisions



Particles with collisions

- **Rendering**—Click on the pop-up list to choose how you want the particles to render—lines, dots or polygons. If you select polygons, you can choose the shape of the polygons by clicking on the **Edit** button adjacent to the pop-up list. See *Editing Polygon Particles* below for more information.

> **Note** *Lines and dots render significantly faster than polygons, because polygons are actual objects in the scene that respond to light, cast shadows, and have surfaces. Be aware of the rendering time trade-offs when selecting a rendering method for your particle system.*

Editing Collision Options

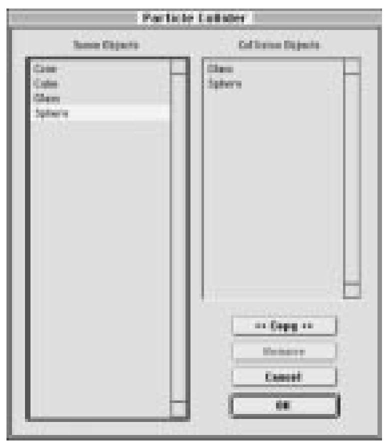
You can make particles collide with other objects in your scene, in addition to the ground. If you click on the **Scene Collisions** check box as explained above, you can select the objects you want your particles to collide with by clicking on the **Edit** button adjacent to the **Scene Collisions** check box.

Follow these steps:

Step 1: Click on **Free** in the System Type section at the top of the panel. If you fail to do this, the **Scene Collision** check box remains grayed out.

Step 2: Check the **Scene Collisions** check box and the **Edit** button adjacent to it activates.

Step 3: Click on the **Edit** button and the Particle Collider dialog box opens.



Step 4: On the left side of the dialog box is a list of all the objects in your scene. On the right is a list of objects you want the Particle system to collide with.

- Click on an object in the Objects list, then click on the **Copy** button to move an object to the Collision Objects list on the right side of the dialog box. Or you can simply double-click on an object in the Objects list to add it to the Collision Objects list. A particle system can collide with up to 20 objects in your scene.
- Click on an object in the Collision Objects list, then click on the **Remove** button to remove it from the list.

Step 5: Click on **OK** to exit and Infini-D determines how the particles will bounce off the given objects. Click on **Cancel** to exit without applying any changes.

Note: Particles do not bounce off of Boolean objects as you might expect. Instead of bouncing off the surface that results from performing the Boolean operation, they will instead bounce off the surface of the whole object, even if it is not visible in the final rendering. For this reason, you may want to avoid using Boolean objects in the Collision Objects list. See Chapter 13: Boolean Operators for more information.

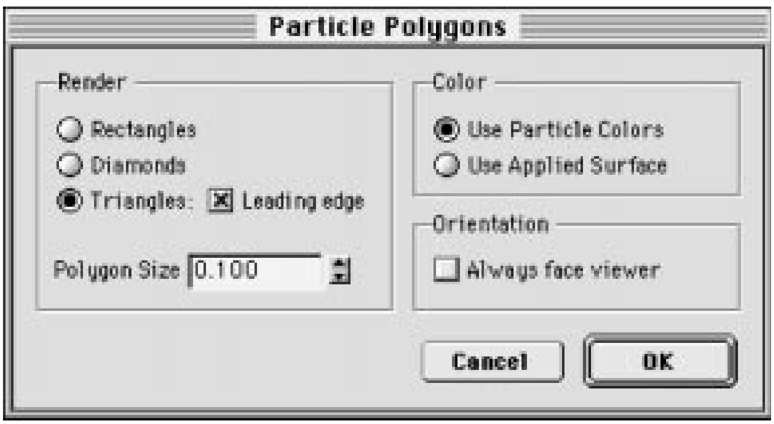
Note

Editing Polygon Particles

If you decide to use polygons as the particle shape, you can control how you want the particles to look. Follow these steps:

Step 1: Click on the pop-up list in the Rendering section of the Particles panel and select **Polygons**.

Step 2: Click on the **Edit** button adjacent to the pop-up list and the Particle Polygons dialog box opens.



Step 3: Adjust the settings for the polygon particles. Each option is described below:

- **Shape**—Click on the radio button next to the shape you want for your polygons.
- **Leading Edge**—Check this check box with triangle polygons, to make the edge of the triangle move forward with the point in back. If this is unchecked, the point moves forward with the flat edge in back.
- **Polygon Size—**Click on the arrows or enter a number that represents how big you want the polygons to be. The default size is 0.1.
- **Color**—Click on the radio button next to Use Particle Colors to use the same particle colors you selected in the Particles dialog box described below. Click on the radio button next to Use Applied Surface if you would rather use the surface you have applied to the Particle object instead. See *Chapter 14: Surfaces and Texture Maps* for more information.

- **Always Face Viewer**—Click on this check box if you want the particles emitting from the particle object to always face the camera. With this unchecked, the polygon particles will move and rotate freely through 3D space.

Step 4: Click on **OK** to apply your changes. Click on **Cancel** to exit without saving your changes.

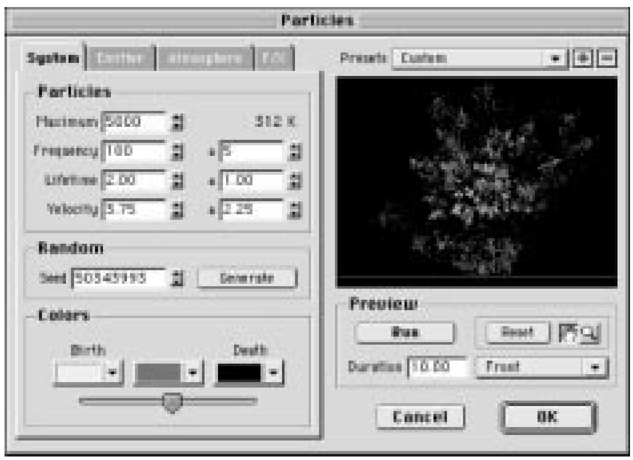
Editing Particle Settings

After you select a particle type, you can edit particle settings to suit your design needs. Follow these steps to edit particle information:

Step 1: Select the Particle object you wish to edit.

Step 2: Click on the **Object** command tab in the Command Floater.

Step 3: Click on the **Edit** button below the **Presets** field in the **Particle System** panel. The Particles dialog box opens.



Step 4: Make your adjustments as explained in the sections that follow. This dialog box is divided into two parts. On the left are the Particle Information tabs and on the right is a Preview area.

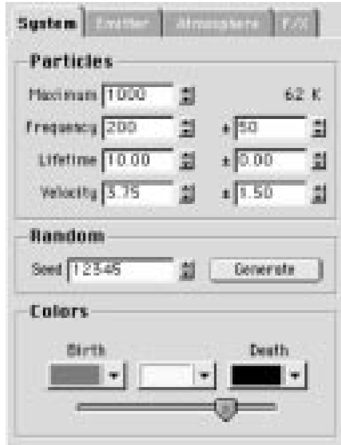
As you make changes in the tabbed sections, you can see the results in the Preview window.

Step 5: After you make your changes, click on **OK** to apply them to the particle system. If you decide to discard your changes, click on **Cancel**.

Note

Note: For Bound particle systems, the scale of the emitter object affects the size and shape of the particle system. For example, if you use the Squash & Stretch tool to shrink the emitter along the Z-axis (make it shorter) the entire system will become shorter. If you use the Uniform Scale tool to make the particle emitter larger, the entire particle system will get larger, as will the actual particles themselves. Emitter scale has no effect on Free particle systems.

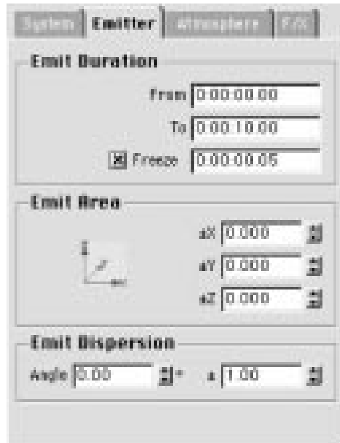
Editing Particle System Settings



These settings define the look of your particle system. There are two sections: Particles and Colors. In the Particles section you define particle speed and timing. In the Colors section you can select the colors of the particles as they move through their life cycle. You can edit the default settings as you wish. Each field is defined below:

- **Maximum**—This number indicates the maximum number of particles you want to display at one time. Keep in mind that the higher you set this value, the more calculations Infini-D has to perform at each frame of your animation, so a high value can slow performance.
- **Frequency**—This number indicates how many particles will be emitted per second. You can enter a +/- factor in the field next to this to make the frequency fluctuate randomly within the values you specify.
- **Lifetime**—This number indicates how many seconds the particles will exist before they disappear. Changing the +/- factor makes some particles disappear sooner or live longer than others, within the values you specify.
- **Velocity**—This number indicates how fast the particles travel as they come out of the emitter. Changing the +/- factor alters this speed randomly within the values you specify.
- **Random**—The seed value is used to determine the nature of the random order in which particles are emitted from an emitter. Changing the seed value changes the appearance of the particle system, while still obeying all the other parameters set for the system. As an example, if you create one particle system to simulate a water fountain, and then duplicate it to make another, the two will be identical, particle for particle—this is going to look rather artificial. To make them appear more natural, you would change the seed value of the duplicate so that it varies from the first.
- **Colors**—You can select the colors for birth, life, and death of particles from the standard Windows or Macintosh color pickers. Use the slider below this field to indicate at what stage the particles spend the most time: birth, death or mixed equally (the default setting).

Editing Particle Emitter Settings



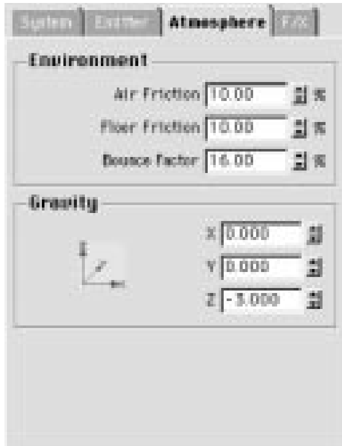
These numbers edit the emitter, or the rules under which the particles are added to the scene. This is different from the life cycle of the particles themselves, which spew out, fall and then die. These numbers refer only to the first part of the life cycle. The fields in this tab are described below:

- **Emit Duration**—These two numbers measure how long the particles spew out. This usually starts at zero. These settings correlate directly with the **Emit From/Emit To** settings in the Particle System panel. If you don't want particles to start at the beginning of your animation, make the start time later. Check the **Freeze** checkbox and enter a time value to freeze a particle system at a particular point. The Freeze feature can be used to generate complex objects (a galaxy of stars for instance) or to create the effect of a stream of particles coming to a sudden halt, as if frozen in time.

- **Emit Area**—These numbers measure the area of the emitter as the particles come out. For instance, if the emitter is a garden hose, these numbers measure the area of the opening where the water comes out. The emit area is centered on the base of the emitter object; enter a +/- value to increase the emit area along any or all of the three axes.

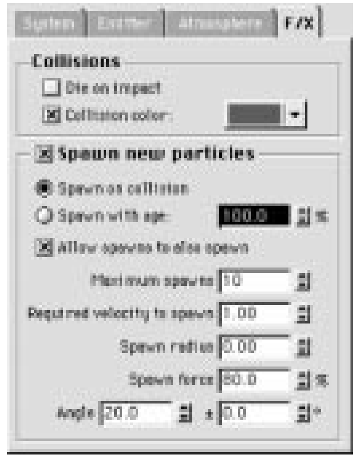
- **Emit Dispersion**—This number measures the angle of dispersion (in degrees) of the particles as they move out from the emitter. Using the garden hose as an example, if you were to place your thumb on the nozzle on the hose, you could change the dispersion angle of the water without actually changing the opening of the hose—that is, the area of the water as it exits the hose. In the second field, you can enter a +/- factor to introduce some randomness.

Editing Particle Atmosphere Settings

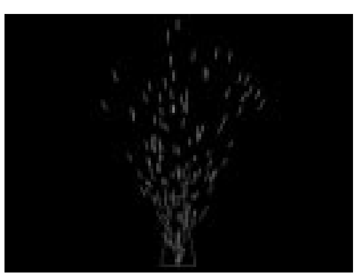


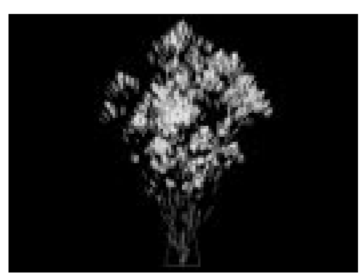
The numbers in this section determine environmental and gravity factors that influence your particle system. Each setting is defined briefly below:

- **Air Friction**—This number determines the percentage of air friction you want to apply to your system. Positive numbers slow the particles down, and negative numbers speed the particles. At 0%, the air has no affect upon the speed of particles.
- **Floor Friction**—This number determines the percentage of friction the particles encounter when they hit the floor or ground level. Higher values make particles slow more in their outward travel as they hit the floor. A value of 0% means that particle speed is not affected by the floor. Floor Friction does not affect bounce height.
- **Bounce Factor**—This number indicates how much you want the particles to bounce as they hit the floor and bounce into the air. The higher the number, the higher they bounce.
- **Gravity**—These numbers indicate how much you want gravity to affect the particles as they move through the air along the X, Y and Z axes. Positive gravity pulls the particles faster in the positive direction along the selected axis, while negative gravity pulls the opposite direction. For example, -Z pulls the particles downwards.

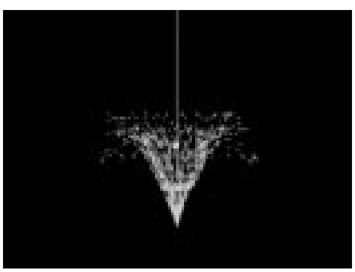


- **Collisions**—There are two collision effects that you can choose to activate for the particle system.
    - Checking the **Die on impact** checkbox makes the particles disappear when they impact either the ground level or (if scene collisions are active) a collision object. This is useful for creating a stream of particles that is limited to a certain area, for example, because the particles will not bounce and spread after impact. This effect also allows the particles to emit continuously because the particles that collide are continuously being removed, so the emitter can emit new particles and is less likely to hit the maximum value set in the System panel.
    - Checking the **Collision color** checkbox allows you to specify a specific color for the particles to take on at the moment of impact (either with the ground level or with a collision object). Each particle will briefly change to the color specified here on collision—the color will only occur for one frame of the animation. Click on the color swatch to choose a color from a standard color picker.
- **Spawn new particles**—The controls in this section allow you to achieve great variety and complexity in your particle system by allowing each particle to generate further particles according to the parameters you establish. Check the **Spawn new particles** checkbox to activate spawning for the system.

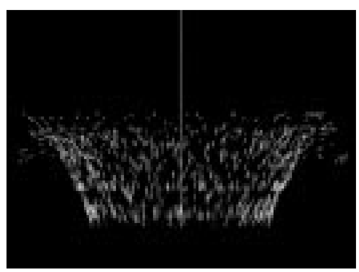

Particles without spawning


Particles with spawning

- The two choices for when the particles will spawn are **Spawn on collision** and **Spawn with age**. Spawn on collision makes the particles spawn (generate additional particles) when they impact either the ground level or a collision object. Spawn with age makes the particles spawn spontaneously when they reach a certain percentage of their lifetime. Setting the percentage in the adjacent field to a lower value will make the particles spawn sooner, a higher value makes them spawn later.
- **Allow spawns to also spawn** creates a series of spawns in which the newly-spawned particles also themselves spawn (this option works only with the **Spawn on collision** setting). Using this option can quickly lead to a very large number of particles, so be aware that you may need to set the Maximum value in the System panel very high and that performance may slow down.
- **Maximum spawns** sets the maximum for the number of new particles created when each particle spawns. The actual number will be a random value between 1 and this maximum.
- **Required velocity to spawn** sets the minimum velocity at which the particles must be traveling in order to spawn. An example of where this might be useful is in creating a fountain in which the particles spawn to create splashes when they hit the ground—setting this value up a bit will make it so that only the fastest-moving particles will 'splash', which will look more realistic.
- **Spawn radius** is the distance from the original particle at which the spawned particles will be created. A low value makes the spawns appear close to the same location as the original particle. A high value makes the spawns appear farther from the original particle.



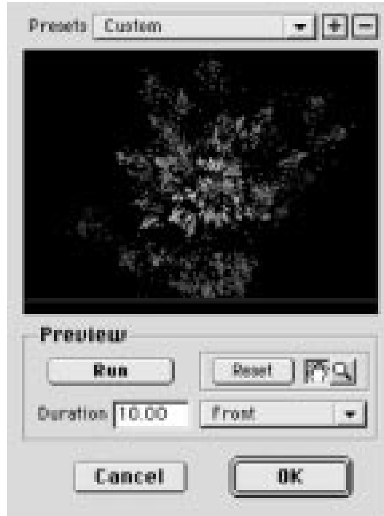
Spawn radius zero



Higher spawn radius

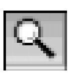
- **Spawn force** sets the speed at which the spawns will travel, as a percentage of the original particle's speed. Set this value low to make the spawns be left behind by the original particle. Set this value higher to make the spawns shoot ahead of the original particle.
- **Angle**—this setting determines the arc in which the spawns will be emitted. This setting works in the same manner as the Angle setting for the entire system (in the Emitter panel), except it applies only to spawned particles. The **+/-** field determines how much variation there will be in the emit angle.

Previewing the Particle System



As you change information in the tabs on the left of the Particle dialog, you can view how your changes will affect the particle system here. In addition to the Preview window, there are several controls. The different controls are defined below:

- **Presets**—This is the same as the **Presets** pop-up list in the Particle System panel. Make a selection and the settings in the tabs change accordingly. Note that if you have entered any custom settings, choosing a new preset will override these and they will be lost. Click the **+** button to add the current settings to the presets list, you will be prompted to give it a name. Click the **-** button to remove a setting.



- **Preview Window**—As you make changes, you can view the results here by clicking on the **Run** button below this window. When you select a new Preset, a preview displays here automatically. You can see different parts of this window with the **Hand** and **Magnify** tools.
- **Run**—Click here to view a preview of your particle system in the Preview window defined above. Click anywhere outside of the Preview window to stop the preview.
- **Reset**—Click here when you zoom or pan to return the preview to its default zoom level.
- **View**—Click here to select a view from the pop-up list. This alters the angle from which you view the particle system in the Preview window.
- **Duration**—Enter a number here that indicates how long the preview will last in the Preview window.

Note

Note: None of the controls in the preview box of the Particle dialog affect how the particle system will render in your scene—they are solely for adjusting how you preview the system in the preview window. The Presets pop-up at the top of the dialog does actually change the type of particle system.

PARTICLE WARPS

This section explains particle warps and how they are used in conjunction with particle systems. Particle warps are areas of influence that affect the flow of particles from particle systems. They can be used to simulate a wide variety of effects, including wind blowing a stream of particles (smoke, for example), gravity pulling particles into an area (to create a galaxy, for example), or turbulence that disturbs the flow of particles to make it appear more natural. There are two steps to using particle warps: first you create the warp object, and then you assign particle systems to be affected by the warp. Only Free particle systems can be effected by particle warps, and particle warps will affect only those particle systems which have been specifically assigned to them via the Particle Warps Dialog (see below). The area that the particle warp affects in the scene is represented by a green cube. Scaling the up increases the area of affect; likewise, scaling the cube down shrinks the area of affect. The cube itself will not appear in the final render. Follow these steps to create a particle warp:

Step 1: Select the Particle tool and click just above the center of the Front view window to create a particle system. With the Hand tool, pan the Front view down so that the particle emitter is now towards the bottom of the view.

Step 2: Select the Particle Warp tool and click above the particle emitter that you just created to create a particle warp object (clicking and dragging allows you to adjust the size of the warp object as it is created). The warp object appears as a green cube.

Step 3: In the Object tab of the Command Floater, select Wind from the particle warp Type pop-up menu. Set the Force value to 150%.

Step 4: Select the particle emitter and click the Free radio button in the Object tab of the Command Floater.

Step 5: Click the Warp Particles checkbox in the Particle Warps section of the Object tab. Then click the Edit button.

Step 6: In the Particle Warps Dialog box that appears, select the particle warp object from the list on the left and either double-click it or click the Copy button to copy it to the list on the right. Click OK.

Step 7: Open the Sequencer and drag the Punch Out marker on the time bar to the right (this is just to give a range of time to preview the particles). Open the Animation Floater and press the Play button to preview the particles. Notice how the flow of particles travels up and then is blown to the left by the particle warp. To see the particles without the warp effect, select the warp object and click the Enabled checkbox in the Object tab so that it is off. Then preview again.

The twelve different types of particle warps are explained below:

- **Attractor:** Pulls particles toward the center by changing the particle's direction only. Unlike the Gravity Field warp, the particles are not accelerated over time and the force exerted on the particles is uniform across the entire warp space—meaning that the distance from the center of the warp object does not affect force. Enter a force value which ranges from -10,000% to 10,000%. A force of zero has no affect on particles, and a negative value repels particles away from the center.
- **Cloak:** Hides particles as they pass through the field. Particles continue to move, age and collide as normal while cloaked, but they do not appear in the scene. Enter a force amount in the range of 0% to 100%. A force of zero has no affect, 50% cloaks half the particles and 100% cloaks all particles.
- **Destructor:** Similar to cloak except it permanently kills the particles. Particles that enter the destruction field no longer exist. Enter a force amount in the range of 0% to 100%. A force of zero has no affect, 50% kills half the particles and 100% kills all particles.
- **Expander:** Scales particle positions in the X/Z directions as they move along the y-axis of the field's bounding box (in the warp's local coordinates). Enter a force amount in the range of -10,000% to 10,000%. Negative values collapse particle positions toward the Y-axis.
- **Friction:** Applies a braking force to particles that enter the field. Enter a force amount in the range of -10,000% to 10,000%. Negative values accelerate the particle instead of slowing them down.
- **Gravity Field:** Pulls particles toward the center by changing the particles' direction. Particles are accelerated toward the center point, and the strength of the field diminishes to zero at it's perimeters. This is a true gravitational field and a careful balance of particle velocity and field strength (force) can place particles into orbit around the center of the warp. (When creating an orbit, be sure to turn Air Friction off for the particle system or else the particle orbits will decay and particles will be sucked into the center and ejected at very high velocities.) Enter a force value which ranges from -10,000% to 10,000%. A force of zero has no affect on particles, and a negative value pushes particles away from the center.
- **Repel:** Attempts to keep particles from entering the field. Particles that attempt to enter are pushed around the perimeter of the bounding box instead. Enter a force value which ranges from -10,000% to 10,000%. A force of zero has no affect on particles, and a negative value sucks particles to the center.
- **Rotation:** Rotates particle positions around the Z axis of the warp as the particles move through the field. Enter a force value which ranges from -10,000% to 10,000%. A force of zero has no affect on particles, and a negative value rotates particles in the opposite direction.
- **Sphere: F**orces particles to travel around the perimeter of a sphere. Enter a force value which ranges from 0% to 200%. A force less than 100% tends to keep the particles on the sphere, even when they pass the equator. Larger forces attempt to push particles away from the sphere as the cross the equator.

- **Turbulence:** Moves the particle positions in a turbulent pattern as they pass through the field. Enter a force value which ranges from -10,000% to 10,000%. A force of zero has no affect on particles and values closer to zero perturb the particle paths the least.
- **Turbulent Sphere:** A mixture of **Sphere** and **Turbulence**—particles are pushed around the outside of a sphere and turbulence is introduced into their paths.
- **Wind:** Turns the particle directions down the X axis of the warp. Particles are accelerated while inside the field. Enter a force value which ranges from -10,000% to 10,000%. A force of zero has no affect on particles, and negative values blow the particles down the -X axis.

Warp fields can be animated to create interesting effects like tornados and vortices. You can animate the position, rotation, and scale of a particle warp. The Force, Type, and Enabled settings, however, cannot be animated.

Note

LIGHTS & CAMERAS

This section discusses cameras and lights. You can add additional cameras to your scene and you can light the scene according to your preference. This section only explains how to place a camera or light in your scene. See *Chapter 16: Working with Lights* or *Chapter 17: Working with Cameras* for more information.

Adding Light Objects

This section explains how to add light objects to your scene. After you add lights, you can alter them in many ways as described in *Section 5* of this manual.

Follow these steps to add a light to your scene:

Click on the **Light** tool in the tool bar and select the type of light you want.

Click in any View window to place the light, then adjust its placement as needed. You can click-and-drag with a light tool to help position the light when adding it to the scene. The behavior changes based upon the light type you choose. With point lights and non-targeted spotlights, dragging changes the height of the light source from the ground plane. With targeted spotlights and tube lights, dragging changes the position of the target object.

Adding Camera Objects

This section explains how to add camera objects to your scene. Follow these steps:

Step 1: Click on the **Camera** tool in the tool bar and select the target or regular camera tool.

Step 2: Click in any View window to place the camera, then adjust its placement to suit your needs.

You can click-and-drag with a camera tool to help position the camera when adding it to the scene. The behavior changes based upon the camera type you choose. With regular cameras, dragging changes the height of the camera from the ground plane. With targeted cameras, dragging changes the position of the target object.

IMPORTING OBJECTS FROM OTHER PROGRAMS

Infini-D enables you to import objects from other 3D programs or from collections of models that you may wish to purchase. You can import the following object types:

DXF™ Files (Release 10 or 11 format as specified by AutoDesk, Inc.)

3DMF™ Files

DXF File Format

The DXF file format provides a general means of transporting data between CAD applications. It supports both 2D and 3D scene descriptions, but since the 2D elements of a DXF file are meaningless to Infini-D, the Infini-D DXF import filter only recognizes those files with 3D object definitions. These files generally contain the 3D Face and 3D Polyline commands, which provide the actual position and orientation of polygons and polygonal objects in three-dimensional space. If the object contains other types of information such 3D Line and 2D Point commands, Infini-D ignores these.

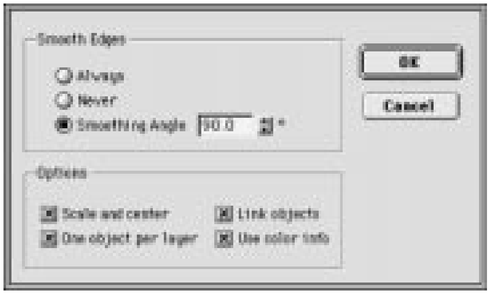
Both 2D and 3D DXF files will appear in the Import dialog box, but Infini-D can import cleanly only those files that contain 3D Face or 3D Polyline information. Since DXF is a general standard, each program tends to use it in slightly different ways. You should, therefore use these files with caution. If you get unexpected results, your file probably contains 2D information.

Follow these steps to import a DXF file:

Step 1: Click on **File** in the menu bar and select **Import**, then select **Object** from the sub-menu. A standard File/Open dialog box appears.

Step 2: Click on the down arrow next the **File Type to Import** field and select **DXF** from the pop-up list.

Step 3: Select your file, then click on **Open** and the Options for DXF Import dialog box opens.



Step 4: Select a smoothing option, your choices are described below:

- **Smooth Edges—**Click on the radio button next to the option that indicates how you wish Infini-D to smooth the edges of the imported object. Your choices are described below:

  – Always: Click on this option to make all the faces of the imported object as smooth as possible.

  – Never: Click on this option to make the faces of the imported object faceted.

  – Best Guess: Click on this option and Infini-D determines whether or not to smooth a given face based on the angle between two adjacent faces.

- **Smoothing Angle**: Click on this option, then enter a smoothing angle, which overrides Infini-D's default best guess angle. This number determines how Infini-D decides which angles are smooth and which are sharp. See *Smoothing Angle* below for more information.

- **Options Check Boxes**—These check boxes are all checked by default. Each one is described below:

  – Scale and Center: By default, Infini-D imports objects scaled to fit and centered in the current View windows. With this option turned off, Infini-D imports objects at their original scale. This enables you to import multiple objects from different DXF files and maintain the scale relationship between them.

Note: The unit of measurement in a DXF file may be completely arbitrary, so objects imported at their own scale may appear very small, very large or very far away.

  – One Object Per Layer: Check this option and Infini-D imports the object with one object per layer. This enables you to import objects more quickly, but only in those applications that export DXF objects as separate layers. If they do not do this, you get no speed benefit by checking this option. Check the Export function in the application from which you are exporting for information on how the given application deals with layers.

  – Link Objects: Check this option to make Infini-D link all the objects in a DXF file to an invisible parent object that Infini-D creates. This allows you to manipulate the entire DXF model as a single unit, rather than as many different objects.This option also makes each linked child object have the parent's surface unless the Use Color Info (defined below) is checked, in which case the linked objects use their own individual color information.

– Use Color Info: Check this option and Infini-D imports the object's color information, providing any exists. Infini-D imports the color information and adds it to the Surface list for the given scene. See *Chapter 14: Surfaces and Texture Maps* for additional information.

Smoothing Angle

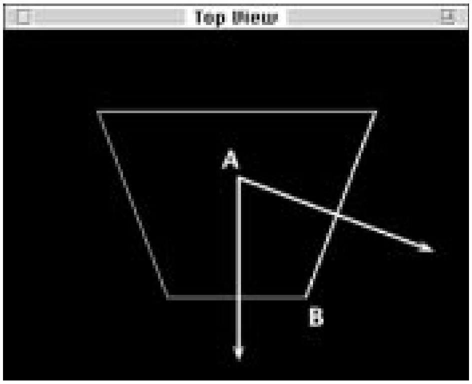
This section provides additional details about the Smoothing Angle option described earlier. This allows you to select an angle for smoothing DXF objects, which overrides the Best Guess option. The smoothing angle is the way Infini-D decides which angles are rounded and which are sharp. A wine glass, for example, has both sharp and smooth angles. The polygons on the rounded bell must be smooth, while the base needs to have sharp angles.

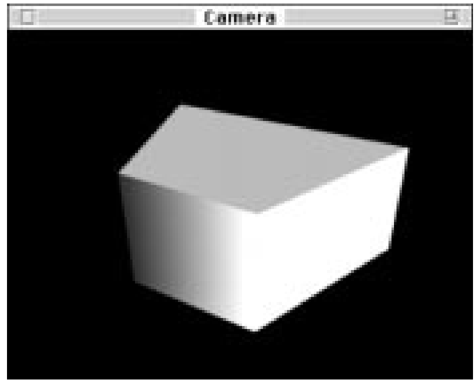
In order for an object to be smoothed, the angle between any two adjacent polygons must be greater than this amount. For example, suppose you were importing a perfect cube. All the angles of a cube are 90°. If the smoothing angle was 80°, then all edges of the cube would be creased. If the smoothing angle was 100°, then Infini-D would attempt to smooth out the place where the edges of the polygons meet. The smoothing can only be seen in rendering modes above flat shading mode (Gouraud, Phong or Ray Tracing).

It may take some experimentation to find the right smoothing angle for a model. A good rule of thumb is to start with a smoothing angle of 90°, and then to increase the angle as needed.

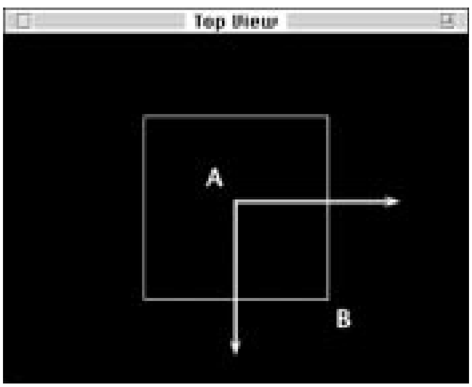
Smoothing Angle Example

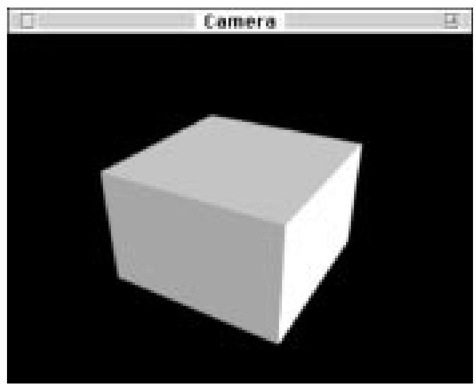
The smoothing angle is actually not the angle created between two adjacent faces of an object. Rather, Infini-D uses the angle created by the *surface normals* of the two faces. A surface normal is an imaginary line drawn perpendicular to the polygon. For two adjacent faces, these surface normals intersect at one point. The angle that forms at the meeting point of these two surface normals is the one that Infini-D uses to determine the smoothing. For Infini-D to smooth these polygons, the smoothing angle must be greater than the angle formed by the intersecting surface normals. Refer to the graphic below:





Suppose you are importing a cube, if Infini-D draws the surface normals for any two sides of the cube (remember, all angles in a cube are 90°), then the angle formed by the intersection of the surface normals will be 90°. If you wanted Infini-D to smooth the cube, the smoothing angle, therefore, would have to be larger than 90°. Refer to the graphics below:





3DMF File Format

This file format was developed by Apple Computer to provide an easier and more stable process for moving 3D information between programs.

Infini-D can currently import the following 3DMF object types: Mesh and TriGrid, as well as the following QD3D primitives: Box, Cone, Cylinder, Ellipsoid, Polygon, and Triangle. It can not import files saved as NURBs. It will also import image maps and surface information such as diffuse color, specularity, and reflectivity, but will not import cameras and lights from other programs.

Follow these steps to import a 3DMF file:

Step 1: Click on **File** in the menu bar and select **Import**, then select **Object** from the sub-menu. A standard File/Open dialog box appears.

Step 2: Click on the down arrow next the **File Type to Import** field and select **3DMF** from the pop-up list.

Step 3: Select your file, then click on **Open** and the 3DMF File Import dialog box opens. The options here are exactly the same as those described in the DXF section above.

EXPORTING OBJECTS TO OTHER PROGRAMS

This section explains how to export the models that you have created. After you create a model, you may want to export it to another program where you can work with it further. Infini-D supports DXF and 3DMF as export formats. These are described below.

Exporting DXF Files

This section explains how to export files in the DXF Release 11 format. This format is defined by AutoDesk, Inc. Just as Infini-D can import only 3D Face and 3D Polyline portions of the DXF file format, it exports only 3D Faces and/or 3D Polylines.

It is important to note that objects exported as DXF remain at the point in time indicated by the Scene Time Marker in the Sequencer. See *Chapter 20: The Sequencer* for more information.

Follow these steps to export to a DXF file:

Step 1: Click on **File** and select **Export**. From the Export sub-menu, select **Objects** and the Export Object dialog box opens. This resembles a standard Save dialog box.

Step 2: Click on the **Format** pop-up list at the bottom of the dialog box and select **DXF**.

Step 3: Give the file a name and select a destination, then click on **Save**.

Exporting 3DMF Files

This section explains how to export in the 3DMF file format. When a scene is saved as a 3DMF file, everything in the scene is saved, including objects, cameras (with position, orientation and focal length) and lights (with light type, color and intensity).

Follow these steps to export a file in 3DMF format:

Step 1: Click on **File** and select **Export**. From the Export sub-menu, select **Objects** and the Export Object dialog box opens. This resembles a standard Save dialog box.

Step 2: Click on the **Format** pop-up list at the bottom of the dialog box and select **3DMF**.

Step 3: Click on the **Options** button adjacent to the Format pop-up list and the 3DMF Export Preferences dialog box opens.

Step 4: Select your options, then click on **OK**. These are described below.

- **Kind—**You can save 3DMF files as either a Text or Binary file. Binary files are generally smaller and faster to read and write, while text files are more versatile since they can be used on other computer platforms. In addition, you can view a text file using a word processor.
- **Format**—You can save objects as Meshes Only, which is the most widely accepted format, or as Patches, which writes information as both spline patches and TriGrids.
- **QD3D 1.0 Compatible—**You can make a file QD3D 1.0 compatible by checking this check box. You should only select this option if you selected a QD3D renderer. See *CHAPTER 26: Advanced Rendering* for more information on QD3D.

Step 5: Give the file a name and select a destination, then click on **Save** to save the file in the chosen format.

Exporting Via Drag-and Drop (Macintosh Only)

If you are working on a Macintosh, you can export individual models directly to other programs using the drag-and-drop method. You can also drag-and-drop an object to the desktop to create a 3DMF clipping file which can then be dragged into another program. You must have the Drag and Drop Objects item checked in the Manipulation tab of the Preferences Dialog. See *Chapter 3 Getting Started* for more information on setting preferences.

Chapter

8

Object Hierarchies

One of Infini-D's most useful modeling features is the ability to link objects together to form object hierarchies. Building object hierarchies is a convenient way to create complex models from simpler component parts. For example, if you want to model a bicycle, it would be practically impossible to create a single bicycle shape of any useful detail— it would be like trying to carve an entire bicycle from of a single piece of wood! A better approach would be to create each component of the bicycle—wheels, frame, handlebars, and so on—then link these components in an object hierarchy to create a complete bicycle model.

You can also use object hierarchies to set constraints. For instance, using the bicycle example, you could constrain the bicycle model-hierarchy so that the wheels will spin on only one axis.

This chapter covers the following topics:

- Overview of Object Hierarchies
- Creating a Link
- Links and Constraints
- Creating a Custom Link
- Links & Centerpoints
- Breaking a Link
- Working with Object Hierarchies (includes duplicating, resizing and applying surfaces)

OVERVIEW OF OBJECT HIERARCHIES

You form object hierarchies by linking one or more child objects to a parent object. A child is dependent on the parent, so Infini-D figures the position and orientation of the child relative to the parent. The links and constraints that you apply to the child restrict its motion relative to the parent. When you move the parent object, the child or children always follow. An object may be the child of a parent, and at the same time be a parent to any number of child objects. Objects can also have grandparents, great-grandparents and so on (although they can have only *one* parent object). You can form complex and realistic models quickly in this manner. In the bicycle example referenced earlier, the wheel is a child of the axle, which is a child of the fork, which is a child of the frame, and so on.

CREATING A LINK

When creating object hierarchies in Infini-D, you first select the child, then select the Link tool and lastly select the parent. This section explains the linking procedure. By repeating this procedure throughout the modeling process, you can create ever-more complex models quickly.

> *Note: You can also form links between objects using the object list in the Sequencer, as described in Chapter 27. Select an object's name in the list and drag and drop it onto the name of the object to which you want to link it. This is often a more convenient way to create and manipulate object hierarchies.*

Follow these steps to form a link between two objects:

Step 1: Select the object that you want to be the child.

Step 2: Click on the **Object Link** tool in the tool bar and make a selection. There are four link types. These are defined below:

- **Free Link**: Whenever you move or rotate the parent, the child moves or rotates with it, but the child can move freely without affecting the parent. This is the default.

- **Pivot Link**: Whenever you rotate the parent or the child, both objects rotate around the centerpoint of the parent, but as with the Free Link above, the child can *move* freely without affecting the parent.

- **Position Link**: This link locks the position values of the child in relation to the parent, so if you move either parent or child both will move. When rotating, however, the child can rotate independently of the parent.

- **Full Link**: This link locks both the position and rotation values of the child in relation to the parent. When you move or rotate the child, the parent will follow and vice-versa. A full link effectively creates one single object from two component objects for the purposes of movement and rotation. Each object still maintains its own individual scale, surface information and so forth.

Step 3: Click on the parent object and a line appears briefly between the two objects indicating a relationship has been established. If the parent object is hidden by other objects in front of it, do the following:

- Press the COMMAND key (Mac) or CONTROL key (Win) while clicking the mouse. A pop-up menu appears with a list of objects.
- Select the name from the list and this becomes the parent object.

LINKS AND CONSTRAINTS

When you link one object to another with the **Link** tool, you are in effect setting parameter locks for one object relative to another, instead of relative to the scene. The Lock icons (in the Current Orientation section) of the **Constraints** tab in the Modifiers command tab (See *Chapter 4: The Infini-D Interface* for more information) reflects the type of link you chose to link a child to its parent. Consider these examples:

- For example, if you chose a pivot link, click on the **Rotation** icon at the top of the **Constraints** tab and notice that the three rotation axis icons are locked. Click on **Position** and notice that the three Position axis icons appear unlocked (that is, the axis labels appear rather than the lock icons).
- With a full link, all of the Position and Rotation axis icons are locked.

You can adjust the lock icons to change the way a child is linked to its parent. Follow these steps to make a pivot link into a full link:

Step 1: Click on the **Position** icon at the top of the **Constraints** tab.

Step 2: Click on each axis label in the Current Orientation section to lock the current positions, thereby creating a full link.

CREATING A CUSTOM LINK

In addition to the standard links described in the preceding section, you can create custom link styles by accessing the Constraints tab in the Command Floater. Setting minimum and maximum Linking Constraints is particularly useful when working with object hierarchies. This allows you to limit the motion of a child object relative to it's parent rather than to the scene (e.g.: a hinge on a door.)

There are two types of custom links:

- You lock only certain axes instead of all three. For example, a wheel would have full lock to the axle, but the axle would have rotation locks only in X and Y.
- You can constrain the movement along certain axis such as a drawer in a desk. In this instance, you would lock all three Rotation axes, then lock two Position axes, while constraining the third.

Follow these steps to create a custom link:

Step 1: Place two cubes in your scene.

Step 2: In the **Information** tab of the Control Floater, set the X position value of one cube to -1.0. Set the X position value of the other to 1.0.

Step 3: Set the Y and Z position values of both objects to 0.

Step 4: Select the **V-Plane** tool and select the cube on the right in the Top View window.

Step 5: Select the **Link** tool and click on the cube on the left. A tie-line will shoot from child to parent, indicating that the cube on the right is the child of the other cube.

Step 6: Select the **V-Plane** tool again and select the cube on the right.

Step 7: Click on the **Modifiers** command tab in the Command Floater, then click on **Constraints** to open the linking constraints panel.

Step 8: Click on the X axis button in the Minimum section. This sets the minimum X value to the current X value.

- Now drag the cube on the left (the parent object) around in the top view window. It is completely unconstrained, but the child object always moves with it.
- Now drag the right hand cube (the child object.) Notice that it can move independently of the parent, but can only move a certain distance to the left. The specific restriction is relative to the parent object, not the entire scene.

Links & Centerpoints

When one object is linked to another, they are connected by their centerpoints.

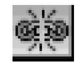
If you change the centerpoint of an object that is part of a hierarchy, the object will drag independently; while any children remain stationary. This is because objects are linked from centerpoint to centerpoint, and when you change the centerpoint of an object, the object itself moves, while the centerpoint remains stationery. If it is important for two objects to keep the same relative position, it is a good idea to set their centerpoints before you link them together. See *Chapter 4: The Infini-D Interface* for more information.

BREAKING A LINK

After you create a link, you may find you wish to break it. To do this, you can unlink the child from the parent either by using the **Unlink** tool in the Toolbar, or by moving the objects' name in the Sequencer object list.

Follow these steps to break a link:

Step 1: Click on the **Unlink** tool in the tool bar.



Step 2: Click on the child object and the link is broken.

or

Step 1: Click on the object's name in the Sequencer object list.

Step 2: Drag it to any area on the lis that is not within the current hierarchy (and not onto another object name) .

Note: You cannot add or change a link over time in animation. If you link an object at one point in time, it is linked for all points in time. You cannot, for instance, morph from one link type to another. Conversely, breaking a link, breaks it for all time.

Note

WORKING WITH OBJECT HIERARCHIES

After you create an object hierarchy, you can work with it in a number of ways including:

- Duplicating the entire hierarchy or a portion of it.
- Resizing the object hierarchy so that children resize along with the parent.
- Applying surfaces and composing surfaces for an object hierarchy.
- Cutting, copying and pasting object hierarchies.

Each of these functions is explained in the sections that follow.

Duplicating Object Hierarchies

You can use the **Duplicate** command on the **Edit** menu to copy an entire object hierarchy. In addition, you can select a child object, then select the **Duplicate as Child** command to copy only that child and its relationship information, so the duplicate has the same links as the original to its parent.

This section provides instructions on how to:

- Duplicate an Entire Hierarchy
- Duplicate as Child

Duplicating an Entire Hierarchy

You can duplicate an entire object hierarchy including the parent and all children in the same manner that you would duplicate an individual object. Follow these steps to duplicate an entire hierarchy.

Step 1: Click on the parent object in any View window.

Step 2: Click on **Edit** in the menu bar and select **Duplicate** (Command-D (Mac), Control-D (Win)). Infini-D creates an exact duplicate of the hierarchy, slightly offset from the original.

or

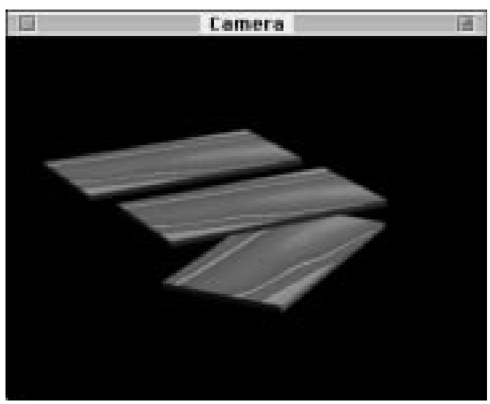
Click on **Edit** in the menu bar and select Cut (Command-X (Mac), Control-X (Win)) or Copy (Command-C (Mac), Control-C (Win)). Then Click on Edit in the menu bar and select **Paste** (Command-V (Mac), Control-V (Win)).

or

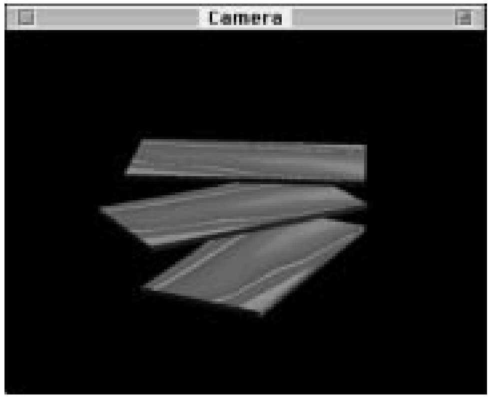
With a move, rotate or scale tool selected, hold down the OPTION key (Mac) or ALT key (Win), and click on the parent object and drag it to create a copy.

Duplicate as Child

You can duplicate a child object and establish the same links as the original to its parent. This is particularly useful for creating a hierarchy such as a spiral staircase. You begin by creating a parent step, then create a second step as a child. Suppose you want to create a third step. If you use the **Duplicate** command, you get another step slightly offset from the original. This means that you have to do some work to get it to line up correctly. The graphic below illustrates this:



By using **Duplicate as Child**, however, the new object (the third step) has the same relationship to the original (the second step) as the original has to its parent. This makes the third step line up in the proper position automatically. You can repeat this command to create an entire spiral staircase. The graphic below illustrates a staircase with three steps using Duplicate as Child:



Follow these steps to duplicate a child object:

Step 1: Click on the child object in any View window.

Step 2: Click on **Edit** in the menu bar and select **Duplicate as Child** (Command-Shift-D (Mac), Control-Shift-D (Win)). Infini-D creates an exact duplicate of the child, offset from its immediate parent by the same values as its parent is offset from its grandparent.

Resizing Object Hierarchies

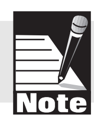
You can use the **Uniform Scale** tool described in *Chapter 4: Infini-D Tools and Interface* to resize an entire object hierarchy. When you change the scale of the parent, the children scale in proportion.

Follow these steps to resize an object hierarchy:

Step 1: Click on the **Uniform Scale** tool in the tool bar.

Step 2: Click on the parent object and resize it as desired. Notice that the children scale in relation to the parent object as you do so.

Note: The Squash & Stretch tool works with individual objects only, thereby ignoring the object hierarchy. There is no way to apply a similar effect to the entire object hierarchy.



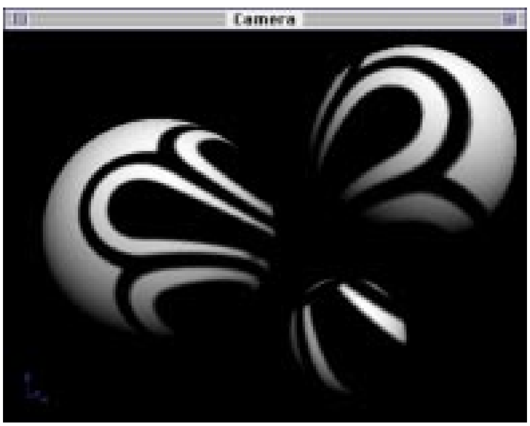
Applying Surfaces to Object Hierarchies

When you apply a surface to a parent object, by default it applies only to the parent object (as if it were just a single, unlinked object).The same holds true for a child object. However, using the **Use Parent's Surface** option in the Surfaces tab of the Command Floater, you can set child objects to share the parent's surface. When using this option, not only do parent and child use the same surface, but the surface is applied to both at once, not just to each individually—the child becomes a part of the parent's texture space (see example below). Keep in mind that the parent can be the child of another parent, and could also use its parent's surface and so on, so you can apply surfaces to individual parts of a complex hierarchy or to the whole thing.

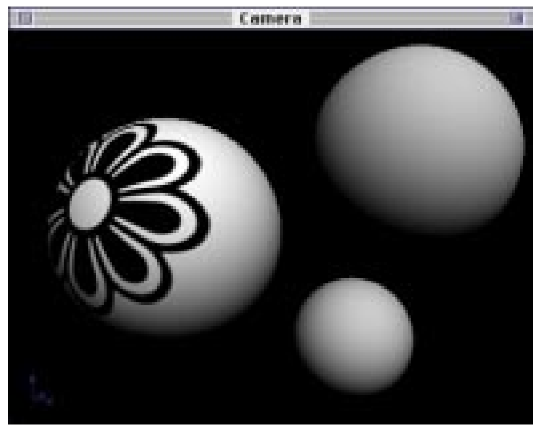
When you are creating a composed surface for an object hierarchy, the process becomes slightly more complicated. Keep in mind the following points:

- When you access the Compose Surface dialog box, you only see the parent object. (If you don't see the parent object, exit and select it.)
- To apply a composed surface to the entire object hierarchy, drag the rectangle representing the layer you are working with in the preview window beyond the parent object until you think you have covered the entire object hierarchy. This may require some trial-and-error.
- You must return to your scene, render the object hierarchy and see if the composed surface was stretched out enough to cover the entire object hierarchy. If not, you will have to repeat this process until the composed surface covers the entire object hierarchy.

You may find it easier to compose a surface for each individual object. For more information on composing surfaces, see *Chapter 15: Surface Composition*.



Hierarchy with "Use Parent's Surface" ON.



Hierarchy with "Use Parent's Surface" OFF.

Chapter 9

Object Settings

This chapter explains how to adjust object settings in the Object command tab of the Command Floater. You can select an object and adjust the rendering level and turn certain effects such as shadows on or off for each object individually.

Note: this chapter may discuss some concepts such as rendering covered elsewhere in this manual. If you encounter unfamiliar concepts, refer to the appropriate section in the manual.

This chapter covers the following topics:

- Accessing the Object Panel
- Options Check Boxes
- Effects Check Boxes
- Boolean Modes
- Spline Detail Levels
- Ray Trace Modes
- Mapping Modes

ACCESSING THE OBJECT PANEL

This section explains how to access the Object panel in the Command Floater. When you want to adjust the settings for an individual object, follow these steps:

Step 1: Select an object in your scene.

Step 2: Click on the **Object** command tab in the Command Floater

SHOW CHECK BOXES

This section explains how to turn certain attributes on or off for the given object. For example, you can show or hide the object. Note that these items can not be animated over time. They are either on or off for the entire length of the animation.

Follow these steps to set object attributes:

Step 1: Select the object in your scene

Step 2: Click on the **Object** command tab. If the Object panel is closed, click the blue triangle to open it.

Step 3: Check each check box to turn on the attribute. Uncheck a check box to turn it off. Each option is defined below:

- **Object**—Leave checked (the default) if you want your object to be visible in the scene. Uncheck it to make an object invisible. This can be useful during scene composition to show and hide objects in a cluttered scene. It can also be used to hide interface objects such as camera targets while you're working. Note that you can not use this check box to make an object appear or disappear in the middle of an animation. To do so, you would use birth and death events, described in *Chapter 20: The Sequencer.*

- **Backfaces**—When Infini-D draws an object, it assumes that you cannot see the faces of that object which are pointing away from you. Therefore, to save time, the program does not draw these back faces. To force the program to draw back faces, turn this option on.

  This could be useful, for example, when you place a camera inside an object, and you need to see the entire object from that vantage point. This option is also useful when manipulating objects imported from other programs via DXF Import (described in Chapter 7), which do not necessarily describe object faces the same way as Infini-D.

- **Bbox Only**—Check this check box to display the object as a bounding box only. This can help you reduce scene clutter or speed on-screen rendering time in a very complex scene.

OPTIONS CHECK BOXES

This section explains how to turn shadow effects on or off at the object level.

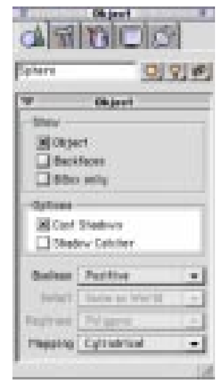
Follow these steps:

Step 1: Select the **V-plane** tool in the tool bar, then click on an object to select it.

Step 2: Click on the **Object** command tab.

Step 3: Click on the blue triangle in the Object panel to open it if it is not already open.

Step 4: Check each check box to turn on the effect. Uncheck a check box to turn it off. Both options are described below:

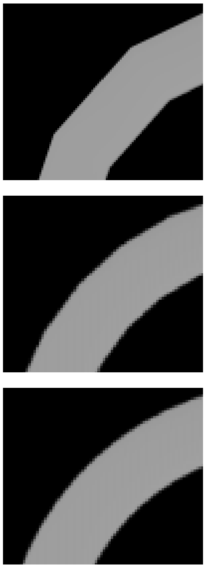


- **Cast Shadows**—Check this check box if you want the object to cast shadows on other objects in your scene. You can only see shadows when all of the following conditions exist: you render in Phong shading or ray tracing mode; you have a light source with Sharp or Soft Shadows turned on in the Light Effects panel as explained in *Chapter 16: Working with Lights*; you have an object that is casting shadows; you have an object for the shadows to be cast upon (or the object's geometry is such that it will be shadowing itself in places); and you have shadows turned on for the View window as explained in *Chapter 18: Adjusting View Settings*.
- **Shadow Catcher**—Check this check box to make the object a Shadow Catcher object. This makes the object not render as a normal object, rather appear only in places where it is in shadow. ShadowCatcher objects save time when you want to composite a rendered 3D graphic over digitized photographs, other still imagery, animation segments or video. See *Chapter 25: Advanced Rendering* for details on applying the Shadow Catcher effect.

SELECTING A BOOLEAN MODE

This section explains how to select a boolean mode for a given object. In order to see the effects of Boolean operations, you must use Ray Tracing as the rendering mode. See *Chapter24: Introduction to Rendering Modes* for more information.

Booleans enable you to add, subtract, or intersect object geometry to create complex shapes from simpler objects. You can designate any object as a positive, negative or intersection object. The default for al objects is positive. To select a Boolean mode for an object, select the object, and choose a mode from the Boolean pop-up menu in the Object panel. Keep in mind that you can animate Boolean objects (to create all kinds of interesting effects like one object carving into another), but you can not change the Boolean mode of an object over time. See *Chapter 13: Booleans* for more information.



SPLINE PATCH DETAIL SETTINGS

This section explains how to select a patch detail setting for SplineForm objects. Note that if you select a primitive, a terrain, an imported DXF/3DMF file, or any object that has been converted to a mesh, this item is grayed out, meaning you cannot access it. The setting you select here determines how Infini-D breaks down the splines that define an object into polygons. The higher the setting, the more polygons Infini-D uses, the smoother the object will appear (when shaded or ray traced as polygons), and the longer the rendering time.

By default, all objects use the Same As World setting, which means they correspond to the setting in the Scene tab of the Preferences dialog box. If you select a different setting here, it overrides the Preferences dialog box setting. Note that patch detail applies to Wireframe, Flat, Gouraud and Phong shading modes, as well as ray tracing—but only when ray tracing as polygons. It does not, however, apply when using bounding box rendering mode or when ray tracing as splines.

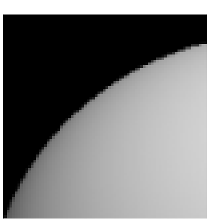
Note: See the next section for a discussion of object-specific Ray Tracing modes. See Chapter 3 for information on setting preferences.

Follow these steps to select a patch detail mode:

Step 1: Select a SplineForm object. Remember a SplineForm object is any object you alter in the Workshop, as well as the standard Infini-D SplineForm objects. See *Chapter 4: Infini-D Tools and Interface* for more information on the default Infini-D objects.

Step 2: Click on the **Detail** pop-up list and select a detail level. The higher the level, the more polygons Infini-D uses, which results in a smoother object in the final rendered image when shading or ray tracing as polygons, but a slower rendering time.

Ray Trace as Polygons



Ray Trace as Splines

SELECTING A RAY TRACE MODE

This section explains how to select a ray trace mode for an individual object. (As with the Detail mode, this is only relevant for SplineForm objects.) Infini-D's ray tracer is capable of rendering a spline object directly from the spline data that describes its shape, rather than converting the splines into a polygonal representation as is required for any of the shading modes. Ray tracing as splines results in a perfectly smooth object, but can take longer to render, and is often not necessary for objects that are less important or far from the camera in the scene. Ray tracing as splines can be useful if you have an object that comes very close to the camera and is curved. In this case you may want to ray trace as splines to get the smoothest possible result. When ray tracing as splines, the patch detail setting is ignored. The ray trace setting is also honored when rendering in a shading mode, but using sharp shadows, true reflections, or transparency with refraction. In these cases, the ray tracer is employed as needed along with the shader. So, for example, when Phong shading with sharp shadows turned on, this setting may affect rendering speed somewhat—ray tracing as polygons is generally somewhat faster than ray tracing as splines.

It is important to keep in mind that ray tracing as polygons, although generally somewhat faster, can require significantly more memory than ray tracing as splines. If you are rendering a very complex scene with a lot of spline objects, setting the spline objects to ray trace as splines will reduce memory requirements substantially.

Note

Follow these steps to select a Ray Tracing mode:

Step 1: Select a SplineForm object. Remember a SplineForm object is any object you alter in the Workshop, as well as the standard Infini-D SplineForm objects.

Step 2: Click on the **Ray Trace** pop-up list and select a ray trace mode. Your choices are Polygons or Spline Patches. Ray tracing as Polygons is faster than ray tracing as splines, but can require more memory, and sometimes shows facets around the edges of objects. Ray tracing as Spline Patches produces smoother objects, but at the cost of speed. During scene composition, you may want to Ray Trace at a lower level to increase speed. When you are ready for final rendering, you can increase the quality.

In the case of a spline object that has a large scale value (in the Info floater) and appears faceted when rendered, try building the object to the desired size in the modeler (by scaling the object's path, rails and cross sections) and leaving its scale values at 1.

TIP

MAPPING MODE SETTING

This section explains how to select a texture mapping mode for an individual object. When you apply a procedural surface or texture map surface to an object by simply dragging it from the Surfaces tab onto the object (or double-clicking on a surface in the Surfaces tab), Infini-D uses its best guess to decide how to map the texture onto the surface of the object. For example, if you drag an imported image onto a sphere, Infini-D will use the Spherical mapping mode to wrap the texture around the object. Spline objects use the Decal mapping mode by default. The **Mapping** pop-up menu in the Object tab lets you change the mapping mode for any object to get different results. In the case of the sphere, you could change the Mapping mode to Straight to have the image applied from the top, straight down through the object. The Mapping pop-up does not apply to objects that are using a composed surface. (See *Chapter 15—Surface Composition* for more on mapping modes and composed surfaces.)

Follow these steps to select a mapping mode for an object:

Step 1: Select an object in your scene.

Step 2: Click on the **Mapping** pop-up menu in the Object panel and choose a different setting. The new mapping mode is applied immediately, set any view window to Phong shading mode or use the marquee render tool to see the results.

Note

Changing the mapping mode setting may have no apparent effect for objects using certain procedural surfaces. Wood, Natural Wood, Marble and Noise surfaces are calculated in three dimensions and so do not use a mapping mode to wrap onto the surface of objects. Mandelbrot, Julia and Tile surfaces on the other hand are flat, two-dimensional procedural surfaces that do use a mapping mode to apply to an object, so the mapping mode setting will effect how these surfaces appear.

Section

3

Editing Objects

In Section 3 of the Infini-D Workflow you customize and manipulate objects you placed in your scene in Section 2, or create entirely new objects from scratch.

You have four options for editing objects. You can bring spline objects into the SplineForm Workshop to be edited or completely re-built. You can convert an object to a mesh and use the Mesh Editor to modify its shape by editing points on the surface in a variety of ways. You can deform an object using the deformation tools in the Modifiers command tab of the Commands Floater. Or, you can use Boolean operations to create complex shapes out of multiple objects.

These four methods of editing objects will be covered in separate chapters. Section 3 covers the following topics:

- **The SplineForm Workshop**—This chapter describes the types of objects you can create in the Workshop and the Workshop interface and provides instructions on how to create custom objects.
- **The Mesh Editor**—This chapter introduces you to the Mesh Editor and provides instructions on how to manipulate objects by dragging points on the object's surface.
- **Deformations**—This chapter explains how to access and use the deformation tools in Infini-D to alter objects in your scene. For example, you could twist or bend an object using deformations.
- **Booleans**—This chapter explains how to apply Boolean operations to intersecting objects to create complex shapes.

Chapter 10

SplineForm Workshop

This chapter explains how to use the SplineForm Workshop (referred to as the Workshop) to create and modify 3D shapes from objects in your scene. Think of the Workshop as a carpenter's workbench. A carpenter usually works on only one part of the total object at a time. For example, a carpenter does not normally build a chair from a single block of wood, but instead constructs the individual parts at a bench, and then assembles these parts into a chair. In Infini-D, you construct your objects in the Workshop using a modeling approach called path/cross section—also known as path modeling for short—to create a wide range of shapes. You then assemble your objects into more complex hierarchies of objects in your scene.

This chapter covers the following topics:

- Basic Workshop Concepts
- Accessing the Workshop
- Workshop Interface
- Workshop Preferences
- Advanced Workshop Concepts
- Modeling with Workshop Tools
- Modeling with Workshop Menus
- Using Other Objects in the Workshop
- Reverting an Object
- Exiting the Workshop

BASIC WORKSHOP CONCEPTS

Before you begin working in the Workshop, you need to understand some key concepts. Once you are familiar with these concepts, you can work more effectively in the Workshop. This section covers the following topics:

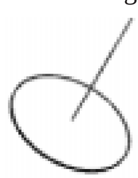
- What is Path Modeling?
- 3D Objects You Can Create in the Workshop

What is Path Modeling?

The key to working in the Workshop is understanding the path modeling concept. Using Infini-D's path/cross section method, you can start with a very simple shape and add detail rapidly to make a wide range of shapes. This involves three key concepts, which are defined briefly below. Each of these concepts is covered in detail later in this chapter in *Advanced Workshop Concepts*.

- **Cross Section**: A two-dimensional outline you use to make basic shapes in the Workshop.
- **Paths**: A three-dimensional line you use in the Workshop to give dimension to a cross section.
- **Rails**: A set of four three-dimensional lines that follow the path, defining the outer silhouette of the object.

To create Path/cross section objects, take one or more cross sections, then sweep them along a spine or path. Using this method, you can produce a very simple shape such as a cylinder (a circular cross section extended along a short, straight-line path) or a very complex shape such as a human arm (comprised of several cross sections blended together along a bent path). The graphic below illustrates these examples.



A 2D Circle pulled along a straight path creates a cylinder

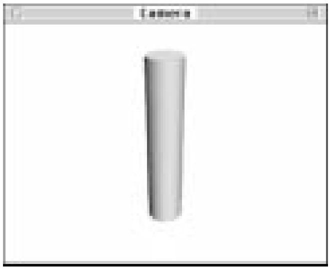
Multiple 2D cross sections can be blended along a 3D path to make more complex objects, such as an arm.

Path Modeling Example

Perhaps the easiest way to understand the interaction of the three major parts—cross section, path and rails—is with an object that uses them all: a banana.

These are the steps you might follow to create a banana object in the Workshop:

Step 1: Start with a cylinder, which is a circle pulled along a straight vertical line (the path).



Step 2: Add several cross sections along that line or path.

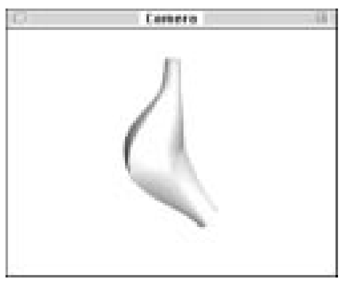
Step 3: At the bottom, create a small circle for the base of the banana.

Step 4: Near the center, add a larger pentagonal shape.

Step 5: Near the top, add a smaller, slightly rounded, pentagonal shape

Step 6: Slightly above the shape created in Step 5, add a circle of roughly the same size to make the top of the stem.

Step 7: You should now have a banana-like shape, except that it's straight. The next step is to bend the path in order to curve it like a banana.

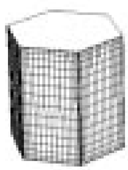


Step 8: In your final step, you need to make the outer curve of the object a little more exaggerated than the inner curve, just like a banana. To do this, use the Rails to modify the outer hull of the object. The Rails allow precise changes to the object's profile without creating additional cross sections. The final banana should look like this:

Types of 3D Spline Objects

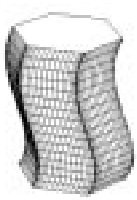
You can classify the objects you can build in the Workshop into several categories. Infini-D's Workshop provides a common environment for creating all of these object types. The most common methods for creating 3D objects are as follows:

- extrusion
- path extrusion
- loft
- lathe
- sweep



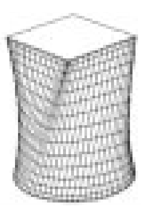
Extrusion

You construct an extruded object from a 2-dimensional shape that is pulled straight up (extruded) along the third dimension to give it height. A cylinder, for example started out as a flat circle until it was "extruded" to give it height. To create an unsharpened pencil that has no eraser, you would extrude a flat hexagon along a straight line. In the Workshop, the basic 2D shape that you extrude is the cross section.



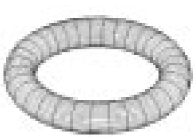
Path Extrusion

When you extrude an object along a path, you begin with a two-dimensional shape, just as you would with a regular extrusion. Unlike a regular extrusion, however, the height of the extrusion does not have to be in a straight line. A garden hose, for example, is a circle that follows an arbitrary path through 3D space. In Infini-D's Workshop, the 2D shape corresponds to the cross section, while the height (of arbitrary length and direction) corresponds to the path.



Loft

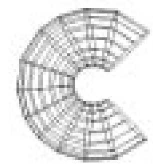
A loft object is a special kind of extrusion. The 2D shape is pulled straight up as with a regular extrusion, but there are multiple 2D shapes that blend across the height, rather than a single shape. A common drinking glass might have a star-shaped base with a perfectly round rim. One shape blends into the other along the height of the glass. In the first step of the banana example above, you made a regular extrusion (the cylinder) into a loft object by adding several cross sections.



Lathe

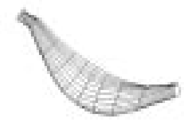
Create a lathe object by taking a two-dimensional profile and rotating it 360° around a central axis. Common examples include a wine glass, a bowl or a lamp shade. In the Workshop, you construct the lathe with the rails. The path is the central axis of rotation, while the cross section is a circle representing the 360° rotation.

Sweep



A sweep object is a combination of a lathe and extrusion; it is a limited case of path extrusion. With a sweep object, you pull or lift the two-dimensional outline to add height, while revolving or spinning the object around a central axis. You could also think of it as adding an offset value and rotation value while extruding. Seashells, threads of a screw, and spirals, are examples of sweep objects.

SplineForm™



SplineForms use paths, cross sections and rails together in one object. All object types are a subset of SplineForm objects. You can create a variety of these object types in the Workshop ranging from a simple extrusion to an object with multiple cross sections, a bent path and a modified rail. Start with a simple lathe or extrusion and make it more complex by adding to the path, manipulating the rails or inserting cross sections.

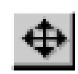
Note: The term SplineForm is used throughout this text to indicate either a type of object that uses a combination of path, rails and cross sections or any object you create in the Workshop.

Note

ACCESSING THE WORKSHOP

Before you enter the Workshop, select an object that most closely resembles what your final object will look like. See *Chapter 6: Geometric 3D Objects* for more information.

Once you place your object in your scene, do one of the following to enter the Workshop:



• Select the **V-Plane** tool in the tool bar, then double-click on the object.

or

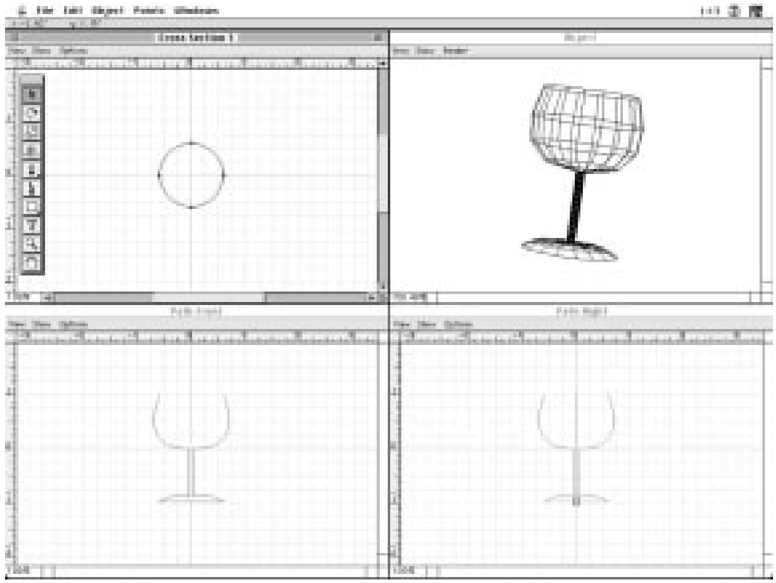
• Select the **V-plane** tool and click on the object, then click on **Model** in the Infini-D menu bar and select **Edit Object**.

In either case, the Workshop opens. See the next section for an overview of the Workshop interface.

If you start with a primitive object (Sphere, Cube, etc.), when you double click to enter the Workshop, you will be asked if you want to convert this object to an editable spline object. Click OK. It is important to note that by converting a primitive into a spline object, you are increasing you rendering time since primitives are highly optimized, whereas spline objects are "freeform" and can not necessarily be optimized in the same way.

Note

WORKSHOP INTERFACE



Since the Workshop windows and tools you see vary depending on your object, this section provides a broad overview of the different parts of the Workshop interface including the following topics:

- Workshop Windows
- Workshop Window Menus
- Rulers, Grids, Guides and Templates
- Information Bar
- Workshop Toolbox
- Window Layouts
- Setting Workshop Preferences

Workshop Windows

The Workshop has its own set of five main windows including:

- Object View Window
- cross section Window
- Three Path Windows (Top, Right, Front)

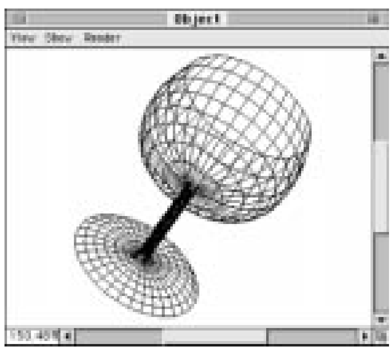
Different windows may be visible when you enter the Workshop, depending on the type of object you selected when you entered. For example, if you are editing a lathe object, the Workshop displays the Path-Front window and the Object View window.

Working with Workshop Windows

You can save window layouts, zoom, show/hide windows and control windows as explained below.

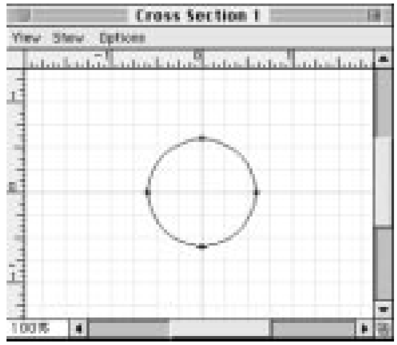
- **Saving Window Layouts**—You can save and restore particular window settings such as window position and visible paths using Layouts, described later in this chapter.
- **Setting the Window Zoom Level**—You can set the zoom level in each window by entering a percentage, in the lower left corner of the window. Type any number (from 12.5% to 800%) directly into this box to change the zoom level, then press ENTER to apply the changes. Or, use the **Zoom** tool described later in this chapter.
- **Show/Hide Windows**—From the **Windows** menu, you can quickly show or hide windows, as well as the Toolbox and the Info Bar. Select the menu item that corresponds to the desired window name to show a hidden window or to hide a visible window.
- **Window Controls**—Each window has standard controls for scrolling, moving, resizing and closing.

Object Window



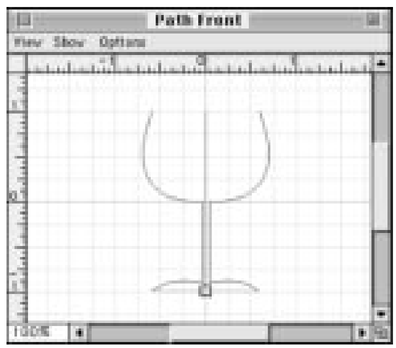
The Object window displays a wireframe representation of your 3D object as your are building it. There is only one Object window. You can increase or decrease the quality of the wireframe or display it in a shaded mode as explained in the *Rendering Menu* section later in this chapter.

Cross Section Window



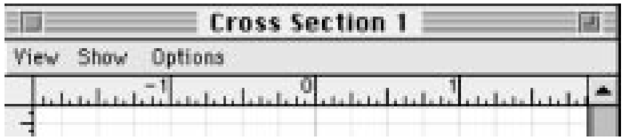
The cross section window shows the 2D cross sections of your SplineForm object. Though you can have multiple cross sections, you can display only one cross section at a time. You can then select different cross sections from the **Windows** menu.

Path Window



The Path window shows the path, rails, cross section marker, cross sections (from the edge), end caps or any combination of these items. You can have up to three Path windows on the screen at once and each one can display one of six different viewpoints. Since the vantage point of the Path window can change, it's possible to make all three Path windows have the same point of view (e.g., three views from the Front).

Workshop Window Menus



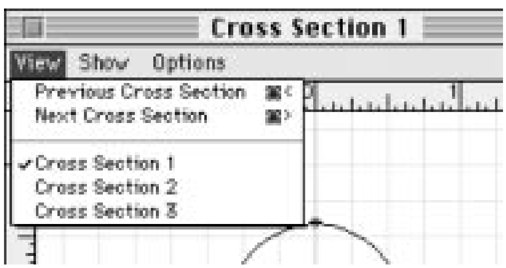
Each window also has its own menus, located directly below the title bar. These menus provide access to a set of commands and options applicable to the given window. As with much of the Workshop, the menus you see depend on the Window you select.

The Path and cross section windows contain the following menus:

- View
- Show
- Options

The Object window displays the **View** and **Show** menus as well, but includes a **Render** menu instead of Options. Each of these menus is described below.

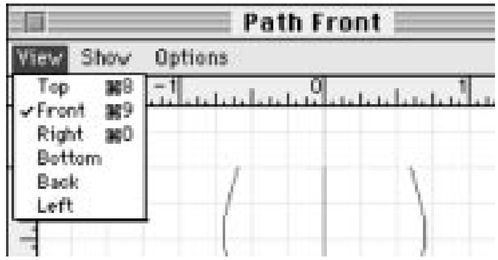
View Menu



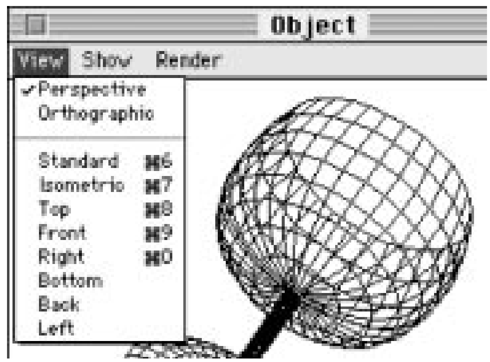
You can use the **View** menu in all three types of windows. These options and how they behave in each window are described below.

- **Cross section Window—**Use the **View** menu in this window to switch between different cross sections quickly. Remember, you can use multiple cross sections to create complex shapes, but you can only display one at a time. Use this menu to display a different cross section. You can also step through your cross sections as follows:
  - Press COMMAND **-** < (Mac) or CONTROL **-** < (Win) to switch to the previous cross section
  - Press COMMAND **-** > (Mac) or CONTROL **-** > (Win) to switch to the next cross section in the sequence.

  The Cross Section Marker moves in the Path window to reflect the current cross section.

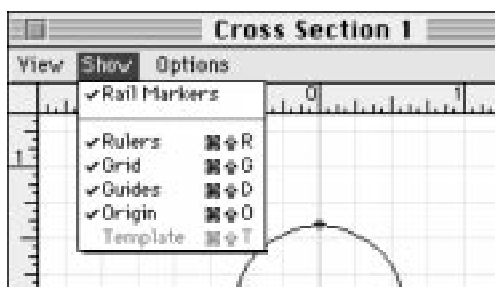


• **Path Window—**Use the **View** menu in this window to switch among the six orthogonal directions—top, bottom, left, right, front, back—in any Path window. Note that you can view the same direction in multiple windows if you so desire.



• **Object Window—**Use the **View** menu in this window to switch between perspective and orthographic projections or to align the object quickly with one of the six orthogonal directions—top, bottom, left, right, front, or back.

Show Menu



You can use the **Show** menu in all three types of windows. These options and how they behave in each window are described below.

• **cross section Window**—Use the **Show** menu to show or hide certain items. If you choose an item that is visible, it hides it. If you choose a hidden item, it shows it. This menu contains the following commands:

  • **Rail Markers**: Select this option to see the location of the rails in relation to the cross section. The point at which each rail passes through the current cross section is indicated by a colored dot. There are two different colors, one for each pair of rails. Rails are described in detail later in this chapter.

- **Rulers, Grids, and Guides**: These help with precise alignment. They operate in a similar fashion to other drawing packages and are described later in this chapter.
- **Origin**: The origin represents the object's centerpoint. See *Chapter 4: Infini-D Tools and Interface* for more information on centerpoints.
- **Template**: Showing a template enables you to display a black and white image template in the background of the window, which you can use to trace when creating your outline. Templates are described later in this chapter.

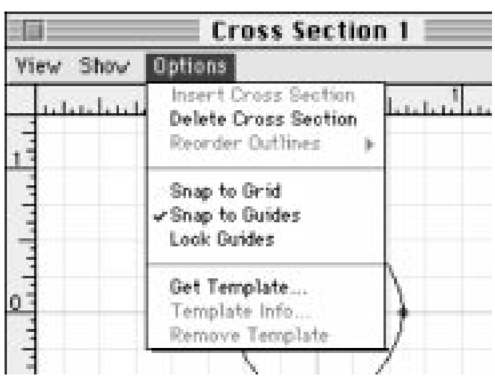
- **Path Window**—Use the **Show** menu in this window to show or hide various parts of the object. This menu works exactly as in the cross section window described above, though some of the menu choices change. The Rulers, Grid, Guides, Origin and Template options are identical to those of the cross section window.

  Path, Rails Pair 1, Rails Pair 2, End Caps, Cross Section, Cross Section Marker, and Cross Section Details each correspond to a particular part of the SplineForm object and are helpful when manipulating the shape of an object. It is often useful to hide parts of the object while modeling to reduce clutter and confusion in the window. Keep in mind that when you hide an element, you can no longer directly manipulate it. See *Modeling with Workshop Tools* later in this chapter for details on using these options.

- **Object Window**—Use the **Show** menu in this window to show or hide the Origin (defined earlier) Paths, Rails Pair 1, and Rails Pair 2.

  Selecting any of these items shows or hides markers that help clarify how they interact with the object.

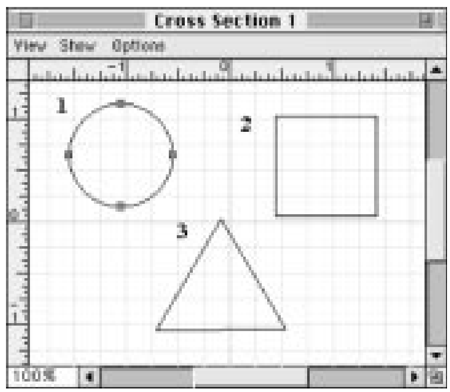
Options Menu (Path and Cross Section Windows Only)



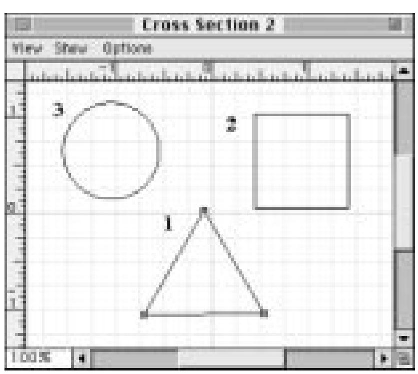
Use the items on the **Options** menu to perform various tasks such as retrieving a template or deleting a cross section while working in the Path or cross section windows.

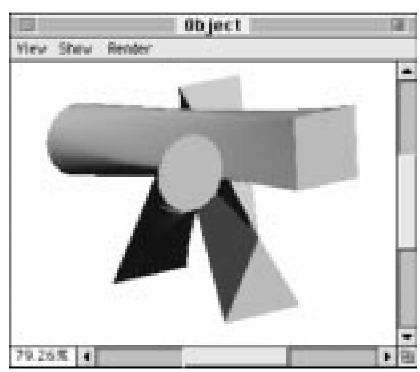
- **Insert cross section**—Use this command when modeling to add a cross section at the current position of the cross section Marker. If a cross section already exists, this item is grayed out, meaning you cannot access it.
- **Delete Cross Section**—Use this command to remove the current cross section from the object. If there is no cross section at the current position of the cross section marker, this item is grayed out. See *Modeling with Workshop Tools* later in this chapter for more information.
- **Reorder Outline (cross section window only)—**If you have cross sections that contain multiple, distinct curve elements (see example below), use this command to change the order that Infini-D connects the curves in one cross section to those in the next. The order that Infini-D connects curves between cross sections depends on the order in which the curves are drawn. When each curve is drawn, it is assigned a number, starting with one.

  For example, imagine an extrusion with three distinct curves in the cross section, created in the order indicated in the graphic below:

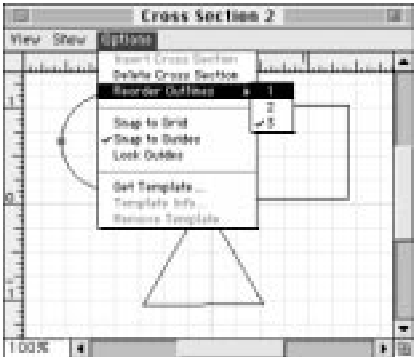


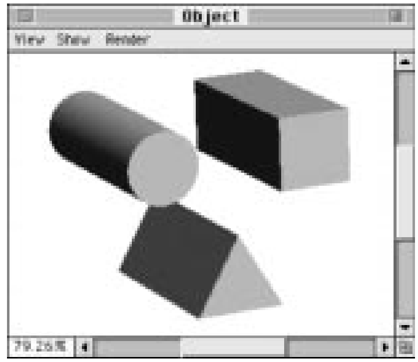
  If you added a second cross section with the same curves, but drew them in a different order (as below), the resulting object would not appear as expected (see below). This is because Infini-D connects curves with like numbers.





  To reorder the curves, select a curve in a cross section, click on **Reorder Outline,** and assign it a new order number. The graphic below illustrates how the objects look after reordering them correctly.





- **Snap to Grid**—Use this command to precisely align points or spline handles using the drawing grid.
- **Snap to Guides**—Use this command to to precisely align points or spline handles using guides. (See Guides later in this chapter for more information.)
- **Lock Guides**—Use this command to lock the guide lines in place, preventing accidental movement.
- **Get Template**—Use this command to import a black-and-white (1 bit) image to place in the background of the given window. (Useful for tracing.) If you import a color image, Infini-D will convert it to black-and-white.
- **Template Info**—Use this command to access a dialog box where you can precisely position the template. Templates are discussed in detail later in this chapter.
- **Remove Template**—Use this command to remove a template from the background of the given window.

Render Menu (Object View Window Only)

Use this menu to change the rendering mode in the Object View window. Your choices are described below:

- **Wireframe**—Select this mode to see the object in Wireframe mode. You can adjust the level of detail with the Detail Levels explained below.
- **Shaded—**Select this mode to use QuickDraw 3D Shading, provided you have QD3D installed on your machine.
- **Detail Levels**: Select a detail level. The preset detail levels available are Low, Medium, and High. You can increase or reduce the amount of detail by selecting the **Less Detail** or **More Detail** commands. There are five levels of detail with the lowest being extremely faceted and the highest being smooth.

Note: These rendering modes only affect the drawing in the Workshop and have no effect on the render detail you choose when you render your final image or movie.

Note

- **AutoSpin—**Select this option to have your object spin continuously while you work on it. Using the rotate tool, start your object rotating in the desired direction—the faster your initial “push” with the cursor, the faster the object will rotate. This allows you to see all sides of a model while editing it.

Rulers, Grids, Guides and Templates

These items help you with the precise alignment of the elements of an object. As explained earlier, you can show or hide these elements with the **Show** menu. These aids are critical when designing objects that require any degree of precision. Each one is described below:

Rulers

Change the ruler measurements in the Workshop to create objects of different scales. This does not, however, directly affect your object size or the scale in your scene once you exit the Workshop. It simply changes the scale of the rulers in the Workshop to give you more or less working space. The ruler unit of measurement is the same for every object in a scene.

Follow these steps to change the default unit of measurement:

Step 1: Click on **Edit** in the Workshop menu bar and select **Rulers**. The Ruler Setting dialog box opens.

Step 2: Enter the scale, then select the units of measurement you want to use for this screen from the **Screen** pop-up list.

Grids

The grid is a series of equally spaced vertical and horizontal lines to be used as a reference for positioning points, lines, and spline handles. To place points at a precise position on the grid, choose **Snap to Grid** from the **Options** window menu as described earlier. You can change the color and spacing of the grid in Workshop Preferences, explained later in this chapter for information.

Note

Note: When you turn on Snap to Grid, it has no affect on anything already in the window. It comes into play only when you drag an item, causing it to snap to the grid.

Guides

Guides are additional horizontal or vertical lines that you can place anywhere in a View window to help align objects. Keep in mind the following:

- To create a guide, make sure the Ruler is showing, then click on the ruler bar and drag a guide into the window. These can be horizontal or vertical.
- You can move guides around a window by clicking and dragging them.
- Remove a guide by dragging it back to the ruler bar.
- Use **Snap to Guides** on the **Options** window menu to snap dragged points to the guide.
- Use **Lock Guides** to prevent accidental movement of the guide lines.
- Uncheck the **Guides** option on the Show window menu to hide the guides without actually removing them from the window.

Templates

Templates enable you to use an image to trace over to create the path, rails, or cross sections of your object. This can be very useful when creating complex models. For example, if you were designing an airplane, you could import front and side view images of an actual plane into the Path windows and then trace the rails around the contour of the plane.

*Note: Infini-D does **not** trace outlines automatically.*

Keep in mind the following about templates:

- Use the **Get Template** command on the **Options** menu to retrieve an image file using a standard File/Open dialog box.
- You can open any color or black and white image file for a template, but Infini-D always draws the template in black-and-white.
- Replace an existing template by choosing **Get Template** again and importing a new image.
- Remove a template by selecting **Remove Template** on the **Options** menu.
- Show or hide a template with the **Show** menu. Hiding a template does not actually remove it—you can choose to show it again later.
- Use **Template Info** to access a dialog box where you can specify the exact location of the template in the window in pixels, as well as change the opacity of the image to make it easier to see what you are doing in the window.
- Manipulate a template directly in the window by holding down the CONTROL and COMMAND keys (Mac) or CONTROL and F2 keys (Win) and clicking and dragging in the window to position the template.

The Menu Bar

The menu bar is located across the top of the screen (Mac) or main window (Win) and contains the following items: **File**, **Edit, Object, Points** and **Windows**. Below you will find a description of each of these menus.

- **File Menu**
  - **Revert Object:** Reverts the object to the state in which it entered the modeler. Use this command if you want to discard all changes made to the object since entering the modeler.
  - **Import EPS...:** Use this command to import an EPS outline (from Adobe Illustrator, for example) to use as a rail or cross section.
  - **Object Library...:** Use this command to access Infini-D's library of spline objects. Objects cam be copied from the library and placed in the modeler, or copied from the modeler, given a name, and saved in the library.
  - **Exit Workshop:** Use this command to exit the workshop and return to the scene when you are finished modifying your object.
- **Edit Menu**
  - **Undo, Cut, Copy, Paste, Clear, Select All, Select None:** These commands all work in the standard way in the active view and on the current selection. Note that you can cut or copy parts of an object for use elsewhere in the current object, within another object in the same scene, or within another object in a different scene.
  - **Rulers...:** Use this command to access the Ruler Settings dialog box. (See *Rulers* earlier in this chapter for more information.)
  - **Preferences:** Use this command to access the workshop Preferences dialog box. (See *Workshop Preferences* later in this chapter for more information.)
- **Object Menu**
  - **Information...:** Use this command to access the point and cross section Info dialog for a selected point or cross section (See *Workshop Menus That Aid in Modeling* later in this chapter for more information.)
  - **Rails Active:** Use this command to turn the rails on or off. Turning the rails off is useful for creating path extrusion objects in which you only wish to work with the path.
  - **Path Active:** Use this command to turn the path on or off. Turning the path off is useful when working with lathe-like objects in which you only want to modify the rails.
  - **Pipeline** and **Flat:** Use these commands to switch between the two methods of translating the cross sections along th path. (See *Flat vs. Pipeline* later in this chapter for more information.)
  - **Bevel...:** Use this command to access the Bevel dialog (This command is only available for simple extrusion objects.)
  - **Endcaps:** Use the commands in this sub-menu to turn endcaps on or off for the beginning and the end of the object.

- **Spiral...:** Use this command to access the Spiral dialog for automatically creating spiral objects.
- **Twist:** Use this command to access the cross section Twist dialog to rotate a cross section in the cross section view. (This command is only available when a cross section is selected.)
- **Simplify:** Use the commands in this sub-menu to straighten your object or to simplify it to a lathe, extrusion or pipeline object.
- **Reverse Path:** Use this command to reverse the order in which the path is drawn along the length of the object—the first cross section will become the last, etc.
- **Flip Object** Use this command to flip the entire object horizontally (in the X-axis, or left-to-right when seen from the Path Front view). This is useful for creating mirrored pairs of objects. For example, to model a pair of human hands, you could model the left hand, duplicate it, and then use the Flip Object command on the duplicate to create the right hand.

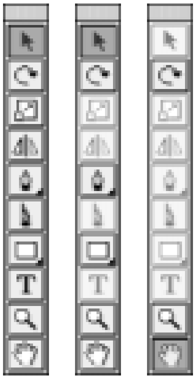
  Also note that the **Flip Tool** can be used in a cross-section window to flip portions of an object. (See *Flip Tool* later in this chapter for details.)

- **Points**
  - **Join** and **Split:** Use these commands to join nearby points into one or split apart a point into two points.
  - **Plain, Corner, Curve** and **Smooth:** Use these commands to change the type of the selected point(s).
  - **Mirror 4-ways, Mirror 2-ways,** and **Mirror None:** Use these commands to control how Infini-D mirrors your modifications to the rails.

- **Windows**
  - **Hide Toolbox:** Use this command to hide the Workshop toolbox if you prefer to select tools with their keyboard shortcuts.
  - **Hide Info:** Use this command to hide the Information Bar (see below).
  - **Layout:** Use the commands in this sub-menu to switch between the different preset and custom window layouts.
  - **Object, Cross Section, Path Top, Path Front,** and **Path Right:** Use these commands to show or hide the desired windows.

The Information Bar

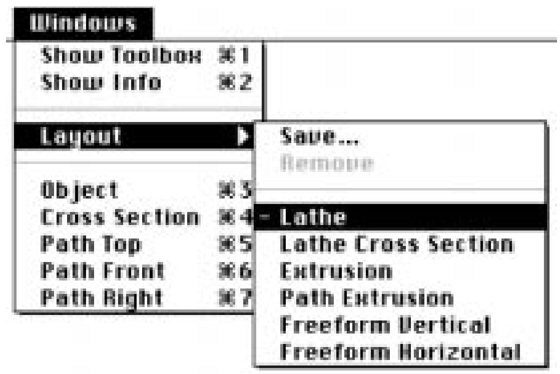
The Information Bar, the thin bar located under the Workshop menu bar, displays numerical information as you manipulate an object. The Info Bar always shows the location of the mouse cursor in the window, and shows additional information, such as rotation degrees or scaling percentage, depending on the tool you are using. See *Modeling with Workshop Tools* later in this chapter for more information.



Workshop Toolbox

The Workshop has its own Toolbox for creating and modifying outlines. The set of tools that is active and accessible changes depending on the active View window. For example, when the Object window is active, all the drawing tools are grayed out since this window is used for viewing objects, not drawing them. The tools themselves are described later in this chapter in *Modeling with Workshop Tools*.

Workshop Layouts



The Workshop contains a number of predefined layouts that display the View windows you need to create certain types of objects. To access a layout, click on **Windows** in the Workshop menu bar and select a layout from the **Layout** submenu.

These layouts provide a simplified approach to working with various classes of objects. The objects themselves are still general SplineForm objects; but the layouts display only the necessary windows for editing the given object type. For example, if you are working on a lathe shape, you can concentrate entirely on the profile you want to sweep around the lathe axis. In this instance, you would not need the cross section window at all. This section covers the following topics:

- Using Layouts
- Saving Layouts
- Creating Custom Layouts
- Removing Custom Layouts

Using Layouts

There are six predefined window layouts in the Workshop: Lathe, Lathe cross section, Extrusion, Path Extrusion, Freeform Horizontal and Freeform Vertical.

The Lathe cross section layout is particularly versatile because it allows you to create lathe objects, lathe objects with a bent path, lathe objects that don't have a completely circular cross section (such as a partial lathe) and loft objects which use multiple cross sections along the path.

All predefined layouts show the Object view and a subset of the editing windows. Each standard geometric object (as described in *Chapter 6: Geometric 3D Objects*) uses one of these predefined layouts. When you choose a layout from the **Layout** submenu, the appropriate windows open with the proper window menu options. Keep in mind the following about layouts:

- Every object you create in the Workshop has a corresponding layout.
- Each time you enter the Workshop, Infini-D uses the layout associated with the given object.
- If you re-arrange the windows or change any of the options, you can save the new information as a custom layout (as explained below).
- A dash appears next to the layout name in the menu to mark which layout you are currently using (or most recently used).

Saving Layouts

Some Workshop settings are saved with the Workshop, some are saved with the object, and some are saved with the layouts. These are described below:

- **Workshop—**The information saved with the Workshop is related to measurement and alignment: grids, guides, rulers, and the origin. If the rulers are visible in the cross section window of one object, they are visible in the cross section window of all objects. Changing layouts has no effect on these options.
- **Object—**The information saved with the object includes whether it is in Flat or Pipeline mode, which End Caps are set and the Template settings for Path and cross section windows. Flat and Pipeline modes and End Caps are described later in this chapter.
- **Layouts—**The following settings are saved with the layout:
  - which windows are visible
  - the position of the windows on the screen
  - the zoom level of windows
  - which options are visible from the **Show** window menus (except those pertaining to alignment)
  - the mirroring setting for rail points
  - whether the path and rails are active.

Note: If an option is turned on or off in a window menu, then the setting is saved with that particular window.

Creating Customized Layouts

You can customize the Workshop by adding your own layouts to the Layout menu. This allows you to quickly change the Workshop environment to fit your particular needs. You can save up to 20 customized layouts.

Follow these steps:

Step 1: Click on the **Windows** menu, then select a standard Layout from the **Layout** sub-menu.

Step 2: Make any changes you wish to this layout.

Step 3: Select **Save** from the **Layout** sub-menu to save the current window arrangement and appropriate object settings. The New Window Layout dialog box opens.

Step 4: Give the new layout a name and click on OK.

Removing Custom Layouts

You can remove a custom layout, but you cannot remove one of the predefined layouts. Follow these steps to remove a custom layout:

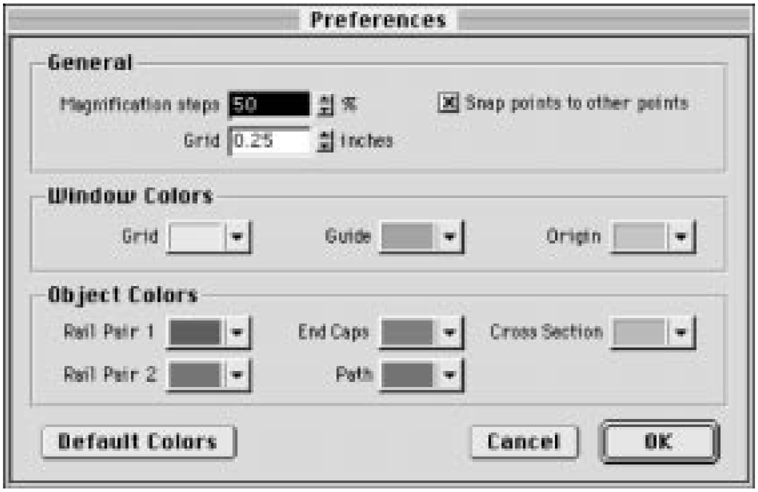
Step 1: Click on the **Windows** menu, then select a custom layout from the **Layout** sub-menu. Remember, you cannot remove a Predefined layout.

Step 2: Click on the **Windows menu** again and select **Remove** from the **Layout** sub-menu. The Workshop removes the layout without prompting you. If you check the Layout sub-menu again, notice that the layout is no longer there.

Workshop Preferences

The Workshop has its own set of preferences separate from the scene preferences. These settings have no effect on anything outside the Workshop. Follow these steps to set Workshop preferences:

Step 1: Click on **Edit** in the Workshop menu bar and select Preferences. The Workshop Preferences dialog box opens.



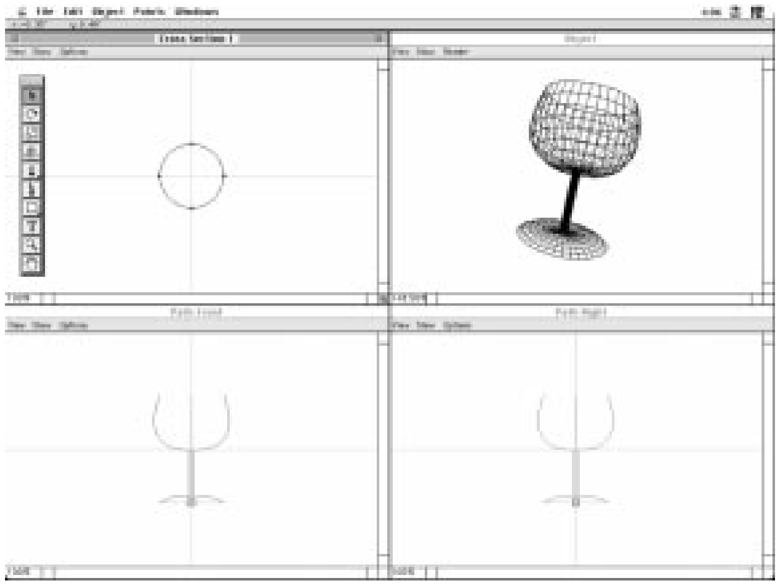
Step 2: Change your settings as follows:

- **Magnification Steps**—Enter the percentage you want to magnify with each click of the **Zoom** tool.
- **Grid**—Enter the spacing interval for the grid. This uses the unit of measurement as set in the scene Preferences dialog box. See *Chapter 3: Getting Started* for more information on setting scene preferences.
- **Snap Points to Other Points**—Check this check box to snap points to other points when dragging them. This is useful for aligning points in order to join them together, for example.
- **Colors**—Change the color of any Workshop interface element by clicking on the color swatch and making a selection from the standard Windows or Mac color picker.
- **Default Colors**—Click here if you change your colors and you want to return the colors to their original settings.

Step 3: Click on **OK** to apply your changes. Click on **Cancel** if you decide not to save your changes.

Workshop Concepts

You build SplineForm objects in the Workshop using a path/cross section approach to modeling as described earlier in this chapter. You create shapes by taking a series of 2D cross sections and placing them along a 3D path. Therefore, to create a shape in the Workshop, begin by defining the path, then set up the cross sections, and finally use Rails as needed to define the profile of an object. The graphic below illustrates this process:

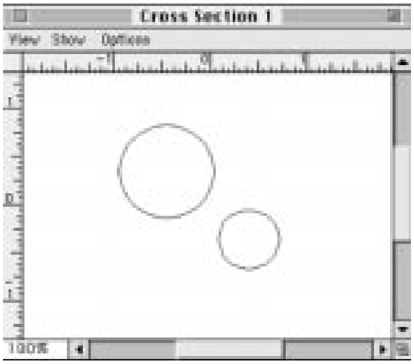


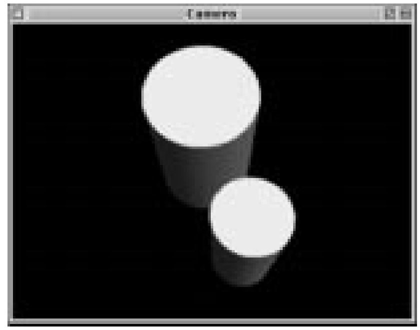
You can also use several short-cuts to alter the object in a variety of ways. When you manipulate objects in the Workshop, it is mostly in two dimensions. With cross sections, this is natural because the cross sections themselves are two-dimensional, but a path is different because the Workshop manipulates the path using three 2D projections, similar to the way Infini-D displays objects outside the Workshop in Standard View windows.

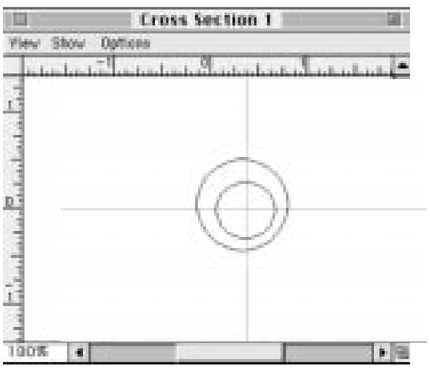
This section covers the following topics:

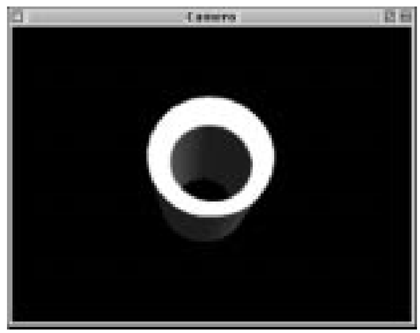
- Cross Sections
- Paths
- Rails
- Cross Section Marker

Cross Sections







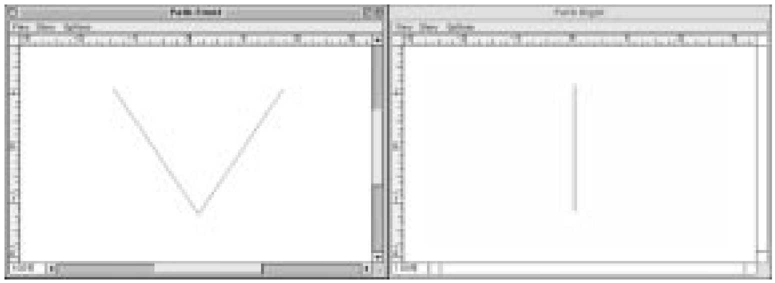


Cross Sections determine the shape of the object to be swept along the path. Every object has at least one cross section. A simple example is a cylinder, which you can think of as a circular cross section (the base) swept along a straight path (the height). You can create increasingly complex shapes such as the banana discussed earlier by altering the cross section at various points along the path.

Keep in mind that a single cross section can contain more than one outline. If you have two circles next to each other, then your object is made from two parallel cylinders instead of just one. If one outline is inside another, it creates a hole. The letter O, for example, is a small circle inside a larger one.

Paths

The path is a 3D curve that determines the spine of the object. You edit the path in the three Path windows: Path Top, Path Front, and Path Right. These are similar to the Top, Front, and Right View windows in your scene. Editing paths requires multiple views because you are working with a 3D line in a 2D screen space. Imagine a line in the shape of the letter V. Viewed from the side, it would appear as a single vertical line, so there would be no way to visualize its true shape without additional views. The graphic below illustrates this:

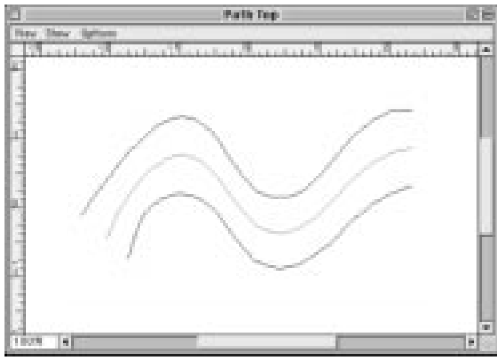


Keep in mind the following points about paths:

- The path is a spline curve determined by a series of control points. You can manipulate the control points in the same way you would manipulate a curve in a 2D illustration program such as Adobe Illustrator™.
- Every object has exactly one path. It always exists, regardless of whether you are editing or viewing it.
- The path is a continuous line throughout 3D space that you can bend in any direction to make bent objects, tubes, spirals, and self-intersecting objects.
- The path passes through the cross sections at the origin of the cross section window—not necessarily through the geometric center of the cross section shape.
- Paths can only exist as a single line—they cannot fork or split. (Although you can create objects that fork using cross sections with multiple outline elements.)

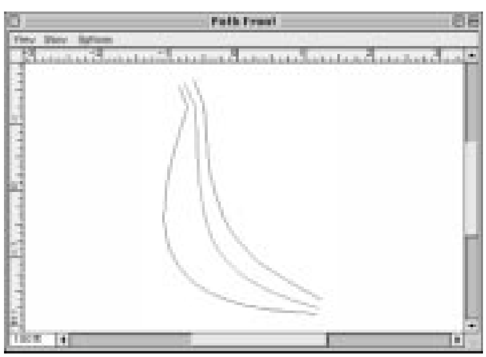
Rails

The rails mark the outline of a SplineForm shape. There are four rails which you can view and edit in the Path views. The rails follow the path along the outer shell of the object. In Path windows, this is represented by drawing the path with the rails on either side of it. The size of the cross section determines the distance of the rails from the path. The graphic shown below illustrates this:



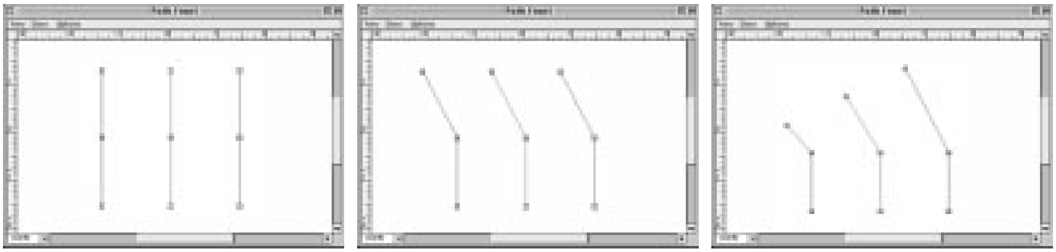
Keep in mind the following points when using rails:

- The rails actually squash and stretch the cross sections, blending one cross section into the next. This helps to define rapidly the basic shape of an object without creating additional cross sections. In the earlier banana example, you used rails to make the outer curve wider than the inner curve. Without rails, you would be forced to add several cross sections, which you would have to size and shape at precisely the right angle. This would be very difficult to do without rails. The graphic below illustrates this point:

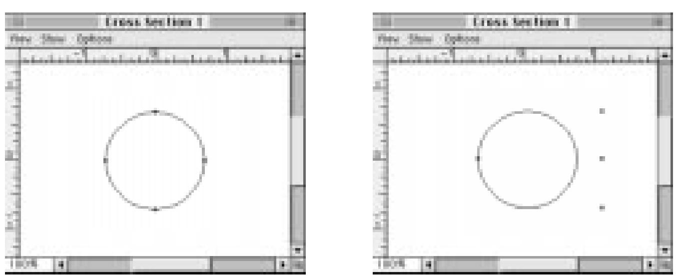


- If you modify a rail at a point where a cross section exists, the shape of the cross section will change. If the cross section window is visible, you will be able to see this change.
- The path and any single rail always have the same number of control points. If you move a point on the path to a different height, then the corresponding rail points move, as well.

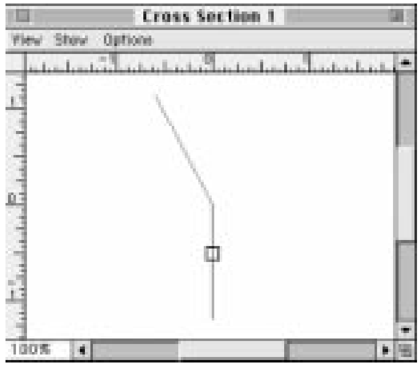
- The five control points (the path point and the corresponding points on the four rails) are always co-planar, meaning that if one is adjusted, the others must compensate to ensure that all five exist on the same 2D plane. This common plane does not need to be strictly horizontal, but it is always flat. You can angle the plane by rotating the cross section on the path. The result is that the rail on one side will be longer than on the other side.



- If any of the five corresponding points on the path and four rails are of different types (e.g., plain, corner, smooth or curve), there will be a crease in the object at that point.
- You can view the point at which the rails pass through a cross section in the cross section window by selecting **Rail Marker** from the **Show** menu. Four dots appear indicating the points through which the four rails pass. (Note that the rails do not necessarily pass directly through the outlines in a cross section.)
- You cannot directly manipulate these rail markers. They are there as a visual aid to help you understand how an object is constructed. When you move the outline in the cross section window, the rails, and therefore the Rail Markers adjust as needed. The rails are always at the outermost boundaries of the object. It is important to note that the path always passes through the origin of the cross section window and the rails always surrounding the path.
- Two rails can never exist on one side of the path, so the Rails and Rail Markers will always remain part of the cross section (i.e., the Rail Marker on the top of the cross section window can never be on the bottom).



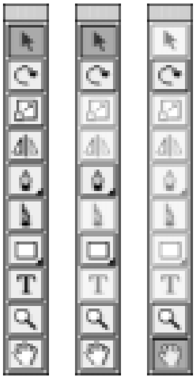
Cross Section Marker



The Cross Section Marker is a small indicator box which moves along the path, marking the location along the path of the outline in the cross section window. To move the marker, click on it with the **Arrow** tool and drag it to a new location on the path. The marker follows the movement of the cursor, yet always remains on the path. See *Modeling with Workshop Tools* in the section that follows for more information on using the **Arrow** tool.

You can show or hide the cross section Marker by selecting it in the **Show** menu in any Path view. You can use the following keyboard commands in conjunction with the cross section marker

- Press the OPTION key (Mac) or the ALT key (Win) while dragging the Cross Section Marker to change the movement of the marker to directional tracking.
    - As you move the mouse to the right, the marker moves toward the end of the path—not necessarily to the right in the window as you may think.
    - As you drag to the left, it moves toward the beginning of the path. Since the path is a 3D line, it can double-back on itself as in the example of the letter V referenced earlier.
    - Directional tracking makes it easier to identify on which part of the path you are placing the Cross Section Marker. It also indicates the beginning and the end of the path. (Knowing the direction of the path is important for end caps, image mapping and object morphing.)
- Press the SHIFT key while dragging the marker to snap the marker to the closest cross section.
    - After the marker moves to a new location on the path, the cross section window updates, displaying the shape of the cross section at that point on the path.
    - If no cross section exists at that point, the outline in the cross section window appears gray. Choose **Insert cross section** from the **Options** window menu in either the Path view or the cross section view to add a cross section at the current point of the cross section Marker. You are then able to edit the cross sections.
- Press COMMAND - < or - > (Mac) or CONTROL - < or - > (Win) to move the Cross Section Marker to the previous or next cross section on the path.



MODELING WITH WORKSHOP TOOLS

Use the tools in the Workshop Toolbox to create and manipulate shapes. The toolbox changes depending on which window is active, only the tools that work in the selected view are available. The specific function of the tools themselves may also change depending on the window, although they work in a way consistent with most common 2D drawing packages.

Follow these steps to use a tool:

Step 1: Select a window.

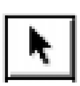
Step 2: Select a tool from the window's Toolbox.

Step 3: Use the tool in the active window.

You can select each tool through the keyboard by pressing Option 1-9 (Mac) or Alt 1-9 (Win) where the numbers correspond to the order the tools appear in the Toolbox. If a tool is not available when you switch windows, the Workshop uses the most-recently selected tool. You can also select a tool by pressing the key in parentheses below.

This section covers the following tools:

- Arrow (A)
- Rotate (R)
- Scale (S)
- Flip (F)
- Pen and Pencil (P)
- Razor (Z)
- Polygon (G)
- Text (T)
- Zoom (M) [to Magnify]



Arrow Tool

Use the **Arrow** tool to select and manipulate the various elements of an object. This tool is available in the Path and cross section windows, but the items you can select and move vary depending on the window.

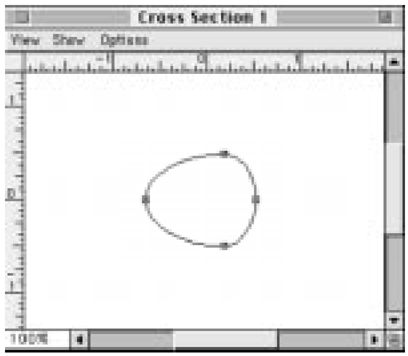
When you are manipulating a selection with the **Arrow** tool, the Info Bar (discussed earlier in this chapter) displays the X and Y position of the cursor in the window. It also displays the total change in distance from the original cursor position to the current position when dragging. This information appears in the measurement unit set in the Infini-D Preferences dialog box. See *Chapter 3: Getting Started* for more information on setting preferences.

Arrow Tool - Cross Section Window

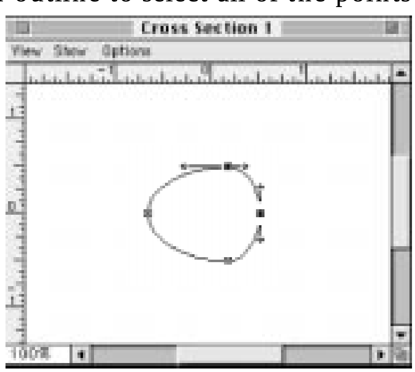
In the cross section window, use the **Arrow** tool to select and position anchor points, direction handles and entire outlines. Points can be in one of three states: de-selected, highlighted or selected. When the Arrow tool is over a point, handle or outline; it becomes white, which indicates that you can select or move something.

Use the tool as follows::

- Click once on a deselected outline to highlight all of the points on that outline. When you select the entire outline, any operation you perform applies to the entire outline including moving it, which you can accomplish by clicking and dragging anywhere on the outline other than a point. A selected outline is shown below:



- Click on a highlighted or unselected anchor point to select only that point. A selected point is represented by a filled square. If there are direction handles associated with a point, they will become visible when the point is selected. (Direction handles are described in the *Pen Tool* section later in this chapter.)
  - – Press SHIFT then click on a point (or outline) to select or deselect it (depending on its state when you click on it).
  - – Drag a marquee around an area to select multiple points within the marquee's area.
  - – Double-click on an outline to select all of the points on that outline.



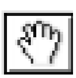
- Click outside all points and outlines to deselect everything in the window.
- Select the entire contents of a window by choosing **Select All** from the **Edit** menu. Choose **Select None** to deselect everything in the active window.
  - Once you select a point or group of points, you can move it by clicking and dragging one of the selected points. You can manipulate the direction handles of an anchor point by clicking and dragging them.
  - Press the SHIFT key *after* clicking on a point, handle or outline to constrain movement to 45° angles emanating from the point. Eight lines appear in the window indicating the permitted directions of movement.
- Press the OPTION or SHIFT keys (Mac) or the ALT or SHIFT keys (Win) while simultaneously pressing one of the ARROW keys on your keyboard to move the selection five screen pixels. Hold the COMMAND key (Mac) or CONTROL key (Win) while simultaneously pressing one of the ARROW keys on your keyboard to move the selection 25 screen pixels.

Arrow Tool - Path Window

Use the Arrow tool in a Path window to define curves by selecting and positioning points. You select and move points in the same manner as in the cross section window described in the previous section.

In addition, use the Arrow tool to select cross sections and move the Cross Section Marker. (See the *Cross Section Marker* earlier in this chapter for additional information on this concept.)

You cannot directly edit a cross section in the Path window although you can move it with the Arrow tool, and you can rotate it as described in the *Rotate Tool* section below.

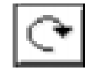


Hand Tool - Object Window

In the Object window, the **Hand** tool replaces the Arrow tool. Click and drag in the Object window with the Hand tool to scroll through the contents of the window. As with the Hand tool in Standard views in your scene, you alter only your point of view in the window. You do not move the object.

If another tool is selected, you can temporarily switch to the Hand tool at any time by holding the Space Bar.

Rotate Tool



Use the **Rotate** tool to rotate a selection or an object in any view. As with the **Arrow** tool, it works differently in each type of window. When using the Rotate tool in either the Path or the cross section windows, the Info Bar displays the position of the cursor in the window, the number of degrees that you have rotated from your original cursor position, and the total distance the cursor has moved from your original cursor position. In the Object window, the Info Bar displays the X, Y, and Z rotation of the object.

The sections that follow explain how to use the Rotate tool in each of the Workshop windows.

Rotate Tool - Cross Section Window

Use the **Rotate** tool in the cross section window to rotate the selection around a centerpoint that you specify. You can apply rotation to a single point, a group of points, an outline or group of outlines. Rotating is a three-step process. You begin by selecting points with the **Arrow** tool, then select the rotation center point as represented by a cross-hair, and finally rotate the selection.

Follow these steps to rotate a selection in a cross section window:

Step 1: Select the desired control points with the **Arrow** tool, described above.

Step 2: Select the **Rotate** tool in the Toolbox.

Step 3: Click once in the window to specify the reference centerpoint for rotation. A cross-hair marker appears marking the centerpoint. (By default, the centerpoint is at the window origin. If you do not wish to move the center of rotation, skip this step and proceed to Step 4.)

Step 4: Click and drag the mouse to rotate the selected points around the centerpoint.

- Press the SHIFT key while using the **Rotate** tool to constrain rotation to 45° increments.
- Move the cursor further from the centerpoint when rotating to give you more precision and control.

Rotate Tool - Path Window

Use the **Rotate** tool in the Path window to rotate cross sections along the path or any selection of path and rail points. You rotate points and outlines in this window as you do in the cross section window. An easy way to bend an object is to rotate a selection of points on the path and rails. To do this, follow these steps:

Step 1: Place the default wine glass lathe object in your scene, then double-click it to enter the Workshop.

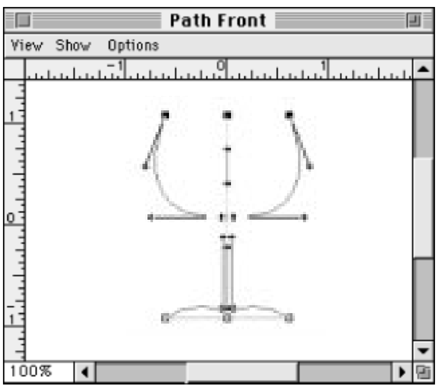
Step 2: Make the path active by choosing **Path Active** from the **Object** menu.

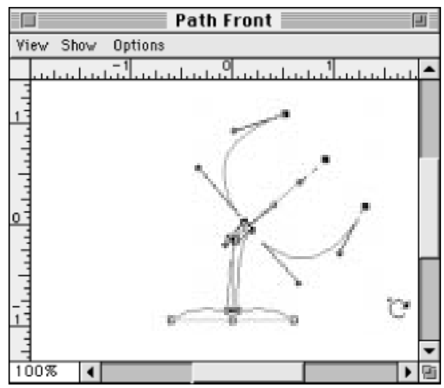
Step 3: Use the **Arrow** tool to drag a marquee around the path and rail points of the bell-shaped top of the glass.

Step 4: Select the **Rotate** tool and click once near the top of the stem of the glass to set the center of rotation.

Step 5: Click and drag with the **Rotate** tool to rotate the selected points.

The graphic below illustrates this procedure:





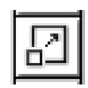
Note: When bending the path in the workshop, use care not to bend it too far. If you bend the path more than 130°, Infini-D thinks you are trying to create an object that folds in on itself. This also applies if you wish to turn an object upside-down. Rather than selecting the path and rotating 180°, instead rotate in two steps of 90° each.

Rotate Tool - Object Window

Use the **Rotate** tool in the Object window to initiate a track ball rotation that rotates the object in three dimensions. A red circle in the center of the Object view divides the window into two sections (the inside and outside of the circle). You can use the Rotate tool as follows:

- Drag the mouse outside the circle in either a clockwise or counter-clockwise motion to rotate the shape in those directions.
- Drag the mouse inside the circle to rotate the object as if the mouse were on the surface of a sphere.
  - If you move the mouse left to right, the object rotates around the vertical axis.
  - If you move the mouse up and down, the object rotates around the horizontal axis.
- Press the OPTION key (Mac) or the ALT key (Win) while using the **Rotate** tool in the Object window to constrain rotation strictly around the horizontal axis.
- Press the COMMAND key (Mac) or the CONTROL key (Win) while using the **Rotate** tool to constrain rotation strictly around the vertical axis.
- Press the SHIFT key to constrain rotation strictly around the axis perpendicular to the view. The cursor changes when using these keys to indicate the proper direction of rotation.

Scale Tool



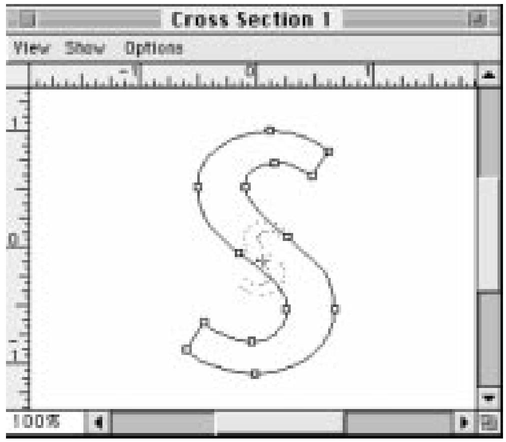
The **Scale** tool is only available in the cross section window. Use it to scale the currently selected outlines or points. Like the **Rotate** tool, using the Scale tool involves a three-step process. You begin by selecting points with the **Arrow** tool, then select the scaling reference point as represented by a cross-hair, and finally scale the selection.

When you use the Scale tool, the Info Bar displays the X and Y positions of the cursor in the window, the percentage of scaling in the X and Y directions, and the overall distance the cursor has moved from your original position.

Follow these steps to use the Scale tool:

Step 1: In the cross section window select an outline or group of points with the **Arrow** tool.

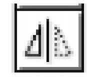
Step 2: Choose the **Scale** tool and click once to set the scaling reference point. A small cross-hair marks this reference point.



Step 3: Click and drag in the window to scale the points.

- Dragging up or down scales them vertically.
- Dragging to the right or left scales them horizontally.
- As you drag with the Scale tool, the selection scales relative to the reference point. Points close to the reference point scale less than those far away.
- Drag along the 45° diagonal lines to maintain the aspect ratio of the object being scaled.
- Press the SHIFT key while dragging with the **Scale** tool to constrain movement to the eight horizontal, vertical and diagonal directions from the point where you clicked. This also produces uniform scaling.
- Start the scaling further away from the reference point along one of the 45° diagonals for more precision and control.

Flip Tool



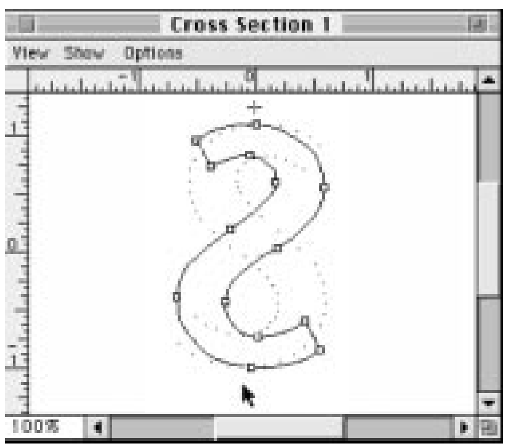
The **Flip** tool is only available in the cross section window. Use this tool to mirror the selection of points around an arbitrary line that you define, and then rotate the flipped points. As with the **Rotate** and **Scale** tools, this tool uses a three-step process: click once to set a reference point, and then click and drag to flip and rotate. Unlike the Rotate and Scale tools, however, the second click has special significance—it causes an imaginary line to be drawn between the reference point and the point where you clicked, which is the axis around which you flip the outline. The midpoint of the line is used as the centerpoint for rotation while dragging, so if you move the reference marker away from the center, you offset the object from its default centerpoint.

When using the Flip tool, the Info Bar displays the X and Y positions of the cursor in the window, the number of degrees that you have rotated from where you first clicked, and the total distance the cursor has moved from where you first clicked.

Follow these steps to use the Flip tool:

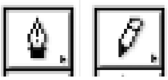
Step 1: In the cross section window, select an outline or group of points with the **Arrow** tool.

Step 2: Choose the **Flip** tool and click once in the cross section window where you want to set the reference point.



Step 3: Click and drag to flip and rotate the selected points or outlines. As you do so, notice that a line appears in the window around which the object flips. When you release the mouse, this line disappears.

- Press the SHIFT key while using the **Flip** tool to constrain rotation to 45° increments.
- To flip an outline around the vertical axis, place the reference point directly on the vertical origin line. Press the SHIFT key, then click and drag to flip the outline and constrain the rotation to 0°.



Pen and Pencil Tools

Use the Pen and Pencil tools in the Path and cross section windows to draw new outlines and to add points to existing outlines. These two tools share a space on the toolbar, clicking and holding on the one that is visible will pop up the other. This section describes each tool, keyboard shortcuts and their use in the Path or cross section windows.

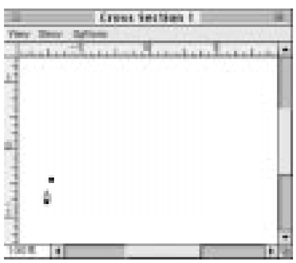
Pen Tool

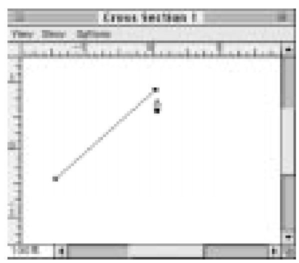
Create outlines by clicking with the Pen tool to place a series of anchor points. Each point you place is connected to the previous point by a line.

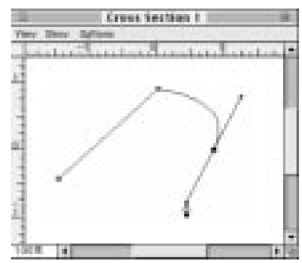
Note

Any time you select an endpoint of a line, click with the Pen tool to place another point to connect them, adding to the line and leaving the new point selected.

If you click and drag when placing a point, direction handles appear which make a smooth curve to the previous point, rather than a straight line. The position and orientation of the direction handles relative to the anchor point determines the size and shape of the curve. (Direction handles and point types are described below in the *Points Menu* section.)

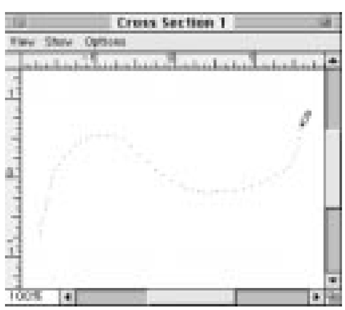






Pencil Tool

Use the Pencil tool to draw freehand outlines. Click with the Pencil tool and drag the mouse to draw an outline. This creates anchor points and fits a smooth curve between them.



Once you create an outline, use the **Arrow** tool to manipulate the anchor points and direction handles.

Pen and Pencil Tools Keyboard Shortcuts

You can use the following keyboard commands while using the Pen or Pencil tools:

- Press the OPTION key (Mac) or the ALT key (Win) and click on an outline with the Pen or Pencil tool to add an anchor point on the outline. A plus (+) symbol will appear next to the cursor indicating you are adding points.
- Press the OPTION key (Mac) or the ALT key (Win) and click on an anchor point to delete that point. A minus (-) symbol will appear indicating that you are removing points.
- Press the SHIFT key while dragging to constrain the angle of the direction handle to 45° increments.
- Remember, you can add to the end of a curve by selecting an endpoint and drawing with the Pen tool.

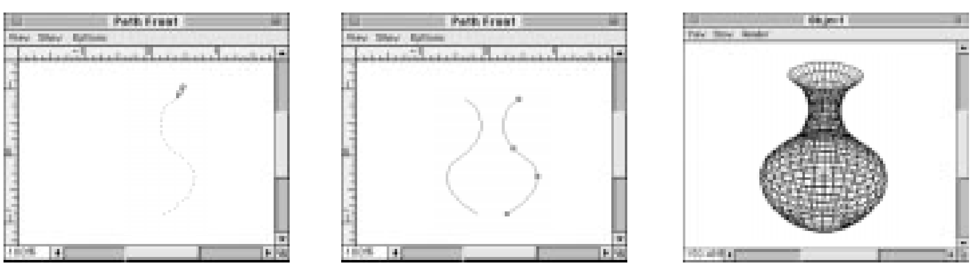
Pen and Pencil Tools - Cross Section Window

Use the Pen and Pencil tools in the cross section window to draw the outlines of the cross sections. When you draw new outlines, they are added to the window with any existing outlines. To draw in an empty cross section window, choose **Select All** from the **Edit** menu and press the DELETE key.

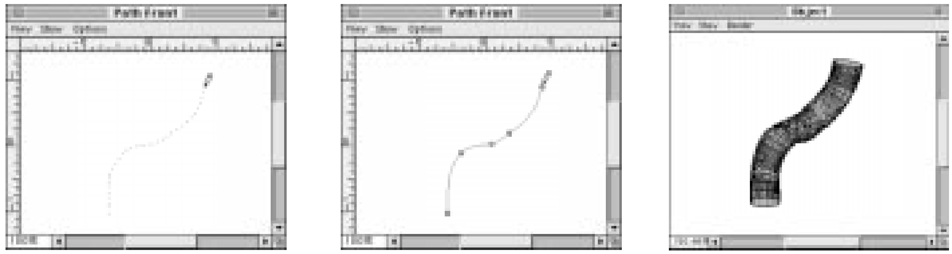
Pen and Pencil Tools - Path Window

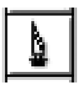
Use the **Pen** and **Pencil** tools in the Path window to draw and edit the curves that make up the rails and the path.

If the rails are active and visible in the window, drawing with either tool replaces the rails (unless you first select an endpoint, in which case drawing with the pen tool adds to the existing curve). This is ideal for creating lathe objects, since the rails determine the profile of the lathe shape. When you draw new rails, the object's path is replaced with a straight line. The graphic below illustrates this:



If the rails are not active, drawing with the Pen or Pencil tool replaces the path (unless you first select an endpoint, in which case drawing with the pen tool adds to the existing curve). Anytime you draw a new path, the rails are recreated to follow the path exactly. The graphic below illustrates this:





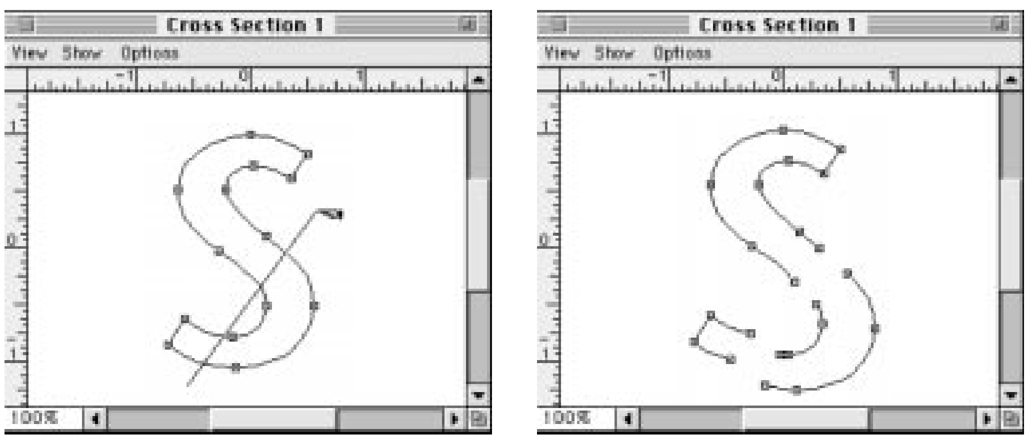
Razor Tool

Use the **Razor** tool in the cross section window to split outlines. Follow these steps:

Step 1: Select the object with the **Arrow** tool in the cross section window.

Step 2: Select the **Razor** tool.

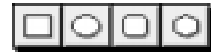
Step 3: Click and drag a straight line across the portion of the curve you wish to split. The curve splits at all points that the line has crossed. The graphic below illustrates this:



or

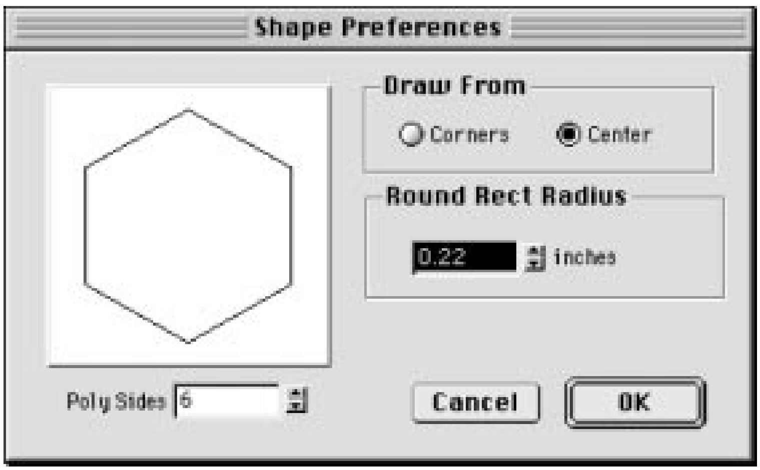
Click at any point on a line to split it at that one point. (The cursor changes to a razor with a minus (-) sign under it to indicate that you are over the line and can click to split.)

Polygon Tools



Use the Polygon tool to create simple closed-path polygon shapes in the Path and cross section windows. You can choose from a list of shapes by clicking and holding the tool. When you do this, all the available shapes appear on a pop-up menu. The shapes are: rectangle, oval, rounded rectangle, and regular polygon (with any number of sides). Create the shape by clicking in a window and dragging the shape to the desired scale. (Hold the SHIFT key while dragging to scale the shape uniformly.)

Shape Preferences



Double-click on the **Polygon** tool in the Toolbox and the Shape Preferences dialog box appears. From here you can do the following:

- Choose whether to draw the shape from the center or from a corner.
- Specify the radius you wish to use for the corners of a rounded rectangle shape.
- Indicate the number of sides to use when creating a regular polygon.

Polygon Tool Keyboard Commands

You can use the following keyboard commands in conjunction with the Polygon tools:

- Press the SHIFT key while dragging with the Polygon tool to constrain the shape so that it has equal height and width. This creates perfect circles and squares, for example.
- Press the OPTION key (Mac) or the ALT key (Win) to switch temporarily the setting for drawing from the corner or the center. If the shape is currently set to draw from the center, for example, pressing the OPTION key (Mac) or the ALT key (Win) changes the setting to draw from the corner.
- Press the COMMAND key (Mac) or the CONTROL key (Win) to draw the shape with its center directly on the origin of the window.

Polygon Tool - Cross Section Window

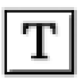
Use the **Polygon** tool in the cross section window to draw the outlines of the cross sections. When you draw new outlines, they are added to the window with any existing outlines. To draw in an empty cross section window, choose **Select All** from the **Edit** menu and press the DELETE key.

Polygon Tool - Path Window

Use the Polygon tool in the Path window to draw and edit the curves that make up the rails and the path of an object.

If the rails are active and visible in the window, drawing with the Polygon tool replaces the existing rails. This is particularly useful for creating lathe objects (such as a donut shape), since the rails determine the profile of the lathe shape. When you draw new rails, you replace the path with a straight line.

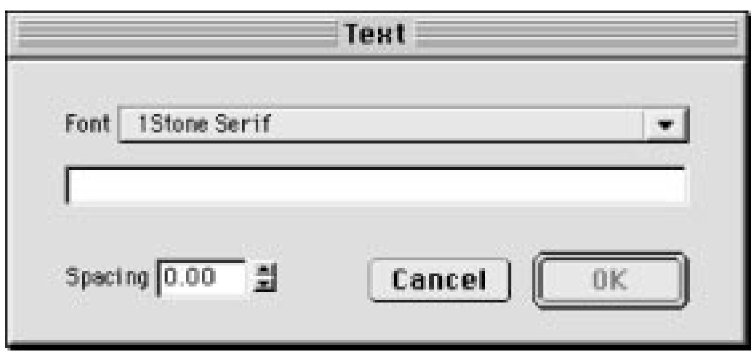
If the rails are not active, drawing with the Polygon tool replaces the path. Anytime you draw a new path, the rails are recreated to follow the path exactly.



Text Tool

Use the Text tool in the cross section window to create text outlines. Follow these steps to create text:

Step 1: Click on the **Text** tool, then click in the cross section window. The Text dialog box opens.

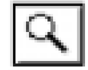


Step 2: Enter your text, then select the font and character spacing you want to use.

Step 3: Click on **OK**.

Step 4: Once you place text, manipulate it with other tools as with any outline.

Zoom Tool



Use the Zoom tool to zoom in and out of a window to see more detail or more of your image. Click in the desired window to Zoom in a specified amount. You can change the magnification increments in the Workshop Preferences dialog box. See *Workshop Preferences* earlier in this chapter for more information.

Keep in mind the following as you use the Zoom tool:

- Click and drag a rectangle around a specific area to view that specific area.
- Press the OPTION key and click in a window to zoom out.
- Double-click on the Zoom tool to reset the zoom level for the current window to 100% and re-center the origin.
- Change the magnification level by entering a magnification value in the box in the lower-left corner of any window and pressing the ENTER key.

WORKSHOP MENUS THAT AID IN MODELING

Two menus in the menu bar are particularly useful when manipulating objects. These are:

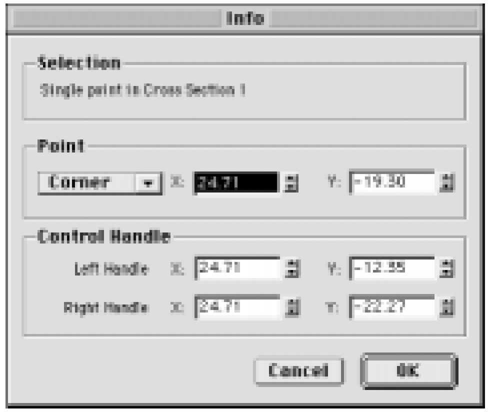
- Object Menu
- Points Menu

Object Menu

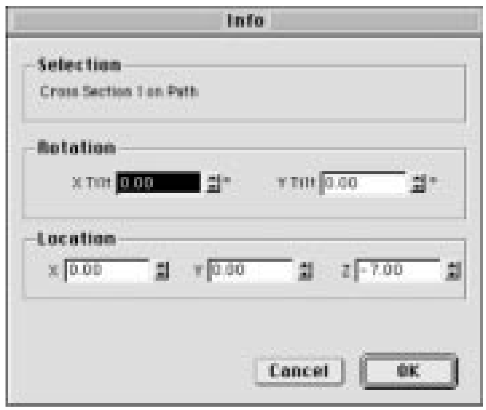
The Object menu includes a set of commands which help define the shape of the object you are creating. Each command is described below:

Information

Use the Information dialog box to view numerical position and rotation values for points and cross sections. The menu item becomes available when you select a single point in a Path or cross section window, or when you select a cross section in the Path window. The information you see depends on the what you selected.



- **Point**—When a point is selected, use the Information dialog box to change the type of point, the position of the point, and the position of the direction handles.



- **Cross Section**—When you highlight a cross section in any Path window, use the Information dialog box to change its position and degree of rotation numerically. Note that you set rotation values only for the two axes that you can manipulate with the **Rotate** tool. You rotate around the third axis with the **Twist** command, described below.

Path Active

Use this command to toggle between making the path active or inactive. Note that this is distinct from making the path visible or invisible, which is done with the **Show** window menu in the Path window. When the path is inactive, you cannot manipulate it directly. Changing the rails alters the path as necessary, but otherwise the path remains unchanged. An inactive path is light gray. The color can be modified in the Workshop Preferences dialog box.

When the path is active, you can modify it with the tools in the Toolbox. The drawing tools, described earlier, each have different functions based on whether the path is active or not.

Rails Active

Use this command to toggle between making the rails active or inactive. This is different from making the rails visible or invisible, which is done from the **Show** window menu in the Path window. When the rails are not active, you cannot manipulate them directly. Changing the path alters the rails as necessary, but otherwise they always try to maintain their shape. Inactive rails are light gray. The color can be modified in the Workshop Preferences dialog box.

Keep in mind the following:

- When the rails are active, you can modify them with the tools in the Toolbox. The drawing tools, described earlier, have a different function based on whether the rails are active or not.
- When rails are active, modifying a cross section will alter the rails only at that point. If, however, they are inactive, Infini-D changes the rails by making them straight (assuming the object is an extrusion).

Flat vs. Pipeline

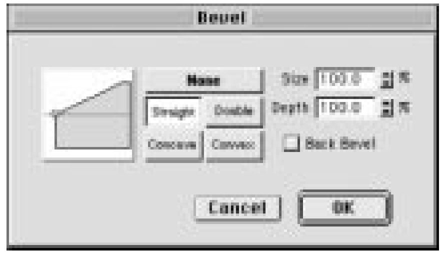
The cross sections on any SplineForm object can interact with the path in one of two ways. They can either be always parallel to each other or they can follow the path, remaining perpendicular to it. The two modes are mutually exclusive. Each option is described below:

- **Flat Mode**—In Flat mode, the cross sections are always parallel to each other, regardless of the movement of the path. Changing the path so that it is no longer straight creates a sheared object with straight horizontal (or vertical) cross sections. You can rotate the cross sections from the natural position using the **Rotate** tool or via the Information dialog box.
- **Pipeline Mode—**In Pipeline mode, the cross sections are always perpendicular to the path. Any change to the path makes the cross sections rotate automatically, so that the object will bend with the path. You can rotate the cross sections from the natural position using the Rotate tool or via the Information dialog box.

Note: The Pipeline setting cannot be animated over time. If the object is set to Pipeline at one point in time, it will be Pipeline at all points. A workaround is to simulate a flat object in Pipeline mode by rotating the cross sections to align them with the horizontal (or vertical) axis.

Note

Bevels



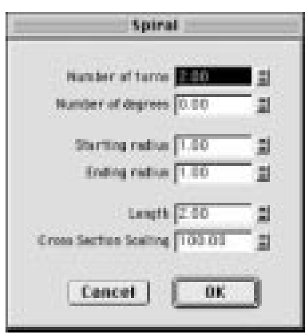
Use this command to add a bevel to an extruded shape. You can add a bevel only to a true extrusion. The object must have a completely straight path with only two points (beginning and ending) and a single cross section. For any other object type, the menu item will be disabled.

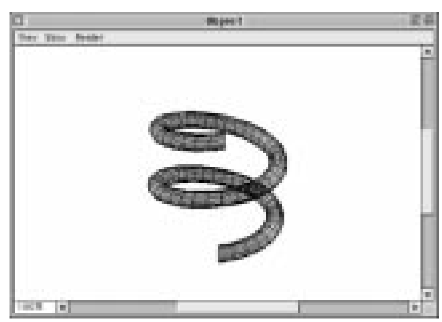
When you select this item, the Bevel dialog box opens and you set the Bevel as described in *Chapter 7: Other 3D Object Types.*

End Caps

End Caps are the flat faces that cap or close either end of the path. Using the **End Cap** sub-menu on the **Object** menu, you can specify that your object have an end cap at its beginning, at its end, at both ends or on neither end. If the object does not have caps, it will appear hollow. One note: End caps do not morph over time. If an object has an end cap at one event, and at the next event it does not, the cap will suddenly disappear at the second event mark, with no transition.

Spiral





Select this command to access the Spiral dialog box, for creating spiral objects automatically. The spiral replaces the current object. The settings are described below:

- **Turns and Degrees—**These values determine how many times the shape spirals. The two values are cumulative, and values can be entered in either field or both fields, whichever is more convenient: typing 2 turns and 180 degrees yields 2.5 turns total.
- **Starting Radius and Ending Radius**—This determines how far from the center axis the spiral is at the beginning and end.

- **Length**—This value determines the overall length of the spiral along a straight line. This value is also measured in pixels.
- **Cross Section Scaling Value**—This value sets the diameter of the spiral at the end as a percentage of its size at the beginning.

Twist

Use this command to twist the active cross section (as indicated by the cross section marker) in order to twist the object's shape. This command performs a twist on the object between the active cross section and the previous cross section.

Follow these steps:

Step 1: Select an object that has at least two cross sections.

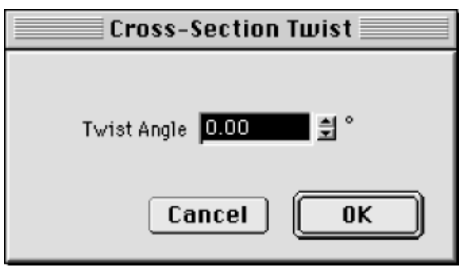
Step 2: Select one cross section in one of the following ways:

Select a cross section in the Path window.

Make sure the cross section marker is on a cross section.

Display a cross section in the cross section window.

Step 3: Click on the **Objects** menu and select **Twist** and the Twist dialog box opens.



Step 3: Enter the number of degrees you wish to twist the cross section.

Step 4: Click on **OK** to apply the twist. Click on **Cancel** to exit without applying the twist.

Simplify

The Simplify sub-menu provides several commands to return the object to a more basic shape: lathe, extrusion or pipeline. It also allows you to straighten the path or the cross sections.

- **Straighten Path—**This command makes the path completely straight, keeping the rails in the same relative position.
- **Straighten Cross Sections**—This command removes all rotation and twist values from the cross sections.

- **Simplify to Lathe**—This command is only available when you select a single rail. It makes the other three rails identical to the selected rail, and then straightens the path.
- **Simplify to Extrusion**—This command straightens the path and rails and removes all but the first cross section to make an extrusion object.
- **Simplify to Pipeline—**This command reconstructs the rails so that they follow the path exactly.

Reverse Path

Choose this command to reverse the direction in which the object's path is drawn.

Each object has an implicit start and end. The start point is defined by the location of the first cross section when you first create the object. Cross sections are numbered in order beginning with cross section 1, which is always at the start of the path. Further, an object has two end caps: a starting cap and ending cap, each referring to their location on the path.

This command is most useful when morphing, since it switches the order of the starting and ending caps to fix morphing problems. Often, when you morph one object into another, it crosses over itself, creating an undesirable animation. This happens because the objects' paths are starting on opposite sides of each other.

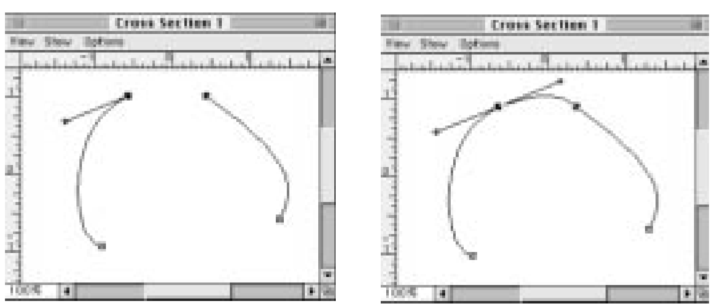
Note

Note: When you reverse the path of an object, it sometimes appears as if it is being drawn inside-out. You can fix this easily when you return to your scene, by clicking on the ***Object*** *command tab in the Command Floater and checking the* ***Back Faces*** *check box.*

Points Menu

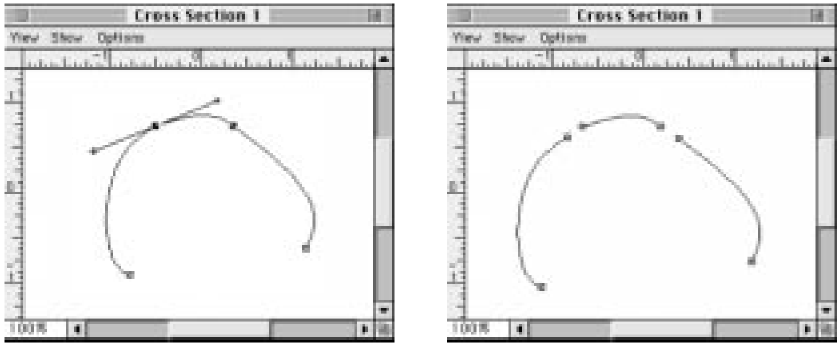
Use the Points menu commands to change the types of points on an outline and control the behavior of points when editing.

Join



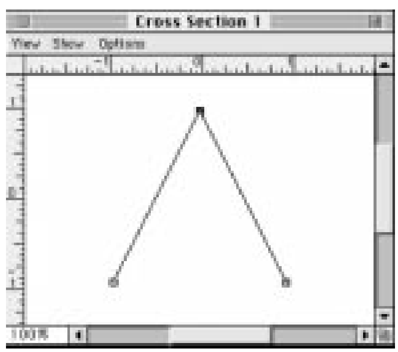
With exactly two endpoints selected, choose **Join Points** to connect them by a line. If they are near each other, they become a single point. The Join command is available only in the cross section window, since a Path cannot have disjointed segments.

Split



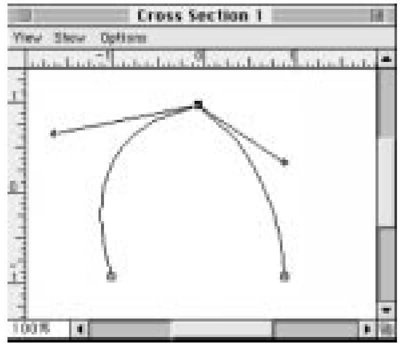
Use this command with any number of points selected to turn each point into two separate pair of points. The two points will be in the same place, giving the appearance that they are still connected. Drag one with the **Arrow** tool to separate them. The Split command is available only in the cross section window, since a Path cannot have disjointed segments.

Plain Point



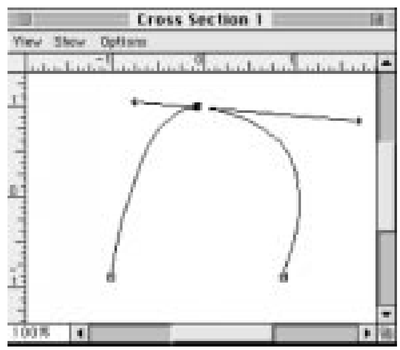
A plain point is completely sharp and has no curves on either side of the point. You can create this type of point when you click once with the **Pen** tool.

Corner Point



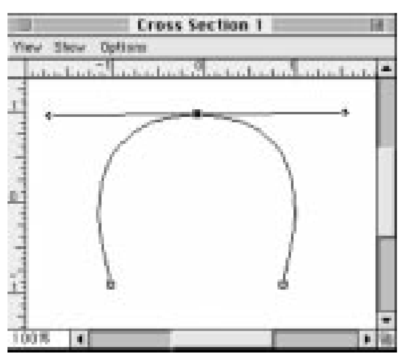
A corner point has curves on both sides, but the direction handles are controlled independently, allowing for a curve that is not continuously smooth.

Curve Point



A curve point is curved on both sides. The direction handles are connected but can be of different lengths. You create curve points when clicking and dragging with the **Pen** tool.

Smooth Point



Smooth points have the same size curve on either side. They are similar to curve points, except that the direction handles on each side of the point are always the same length.

Mirroring

You can also use the **Points** menu to control the way you drag correlating points on the rails. Note that these are editing modes that affect the next action, not commands to change the shape of the object. Each mode is described below:

- **Mirror 2-Ways**—This command causes the corresponding point on the other rail of the pair to maintain an equal distance from the path. The points on the other pair of rails remain unchanged.
- **Mirror 4-Ways**—This command mirrors all four rails to each other, maintaining the same distance from the path. This is the proper mode for editing a lathe object.
- **Mirror None**—This command turns off any previously-enabled mirroring, allowing you to create asymmetrical objects. This means that editing a point on one rail will not affect any others.

Note: When you mirror points, Infini-D creates the mirroring effect in relation to the distance of the points from the path. Remember, that the four rail points and corresponding path point must remain co-planar. Therefore, when you move a rail point along the path (as opposed to away from it), you must move the other rail points and path point, regardless of the Mirroring settings, in order to keep all elements on the same plane.

Note

USING OTHER OBJECTS IN THE WORKSHOP

In addition to creating your own objects, you can also import EPS outlines or use existing objects from the Object Library. The remainder of this section covers each of these topics.

Importing EPS Outlines

You can import shapes into the Workshop that have been saved in the EPS (Encapsulated PostScript) file format as written by Adobe Illustrator, Macromedia FreeHand, or Deneba Canvas. Use the **Import EPS** command in the **File** menu to import an EPS shape you wish to use as an outline. If the cross section window is active, the Workshop imports the outline as a cross section. If a Path window is active, the Workshop imports the EPS shape as the left-hand rail in that window. This is mostly useful for creating lathe objects.

Follow these steps to import an EPS outline:

Step 1: Click on **File** in the Workshop menu bar and select **Import EPS**. A standard File/Open dialog box appears.

Step 2: Select your file and click on **Open**. Once opened, Infini-D converts the EPS file to a series of points. Once imported, you edit the shape as though you had created it in the Workshop.

Note: Infini-D can import only those EPS documents that are saved in FreeHand, Illustrator, or Canvas format. Many drawing packages have their own variations on the EPS file format which Infini-D cannot read. You can, however, often save files in these packages in Illustrator or FreeHand format.

Opening and Saving Objects

Infini-D can store 3D models in a special Infini-D model file format (.ido). When Infini-D is first installed, a folder called “Object Library” is created with a collection of models inside. You can add your own models to this folder or create your own folders.

Follow these steps to open a model file:

Step 1: Place a spline object in your scene. Double click on it (or select **Edit Object** from the Model menu) to enter the Workshop.

Step 2: Click on **File** in the Workshop menu bar and select **Open Object**. A standard open file dialog box appears.

Step 3: Navigate through the directories to find the object you want. Click Open.

Step 4: The chosen object is placed into the modeler, replacing any existing object.

Follow these steps to save a model file:

Step 1: Create the spline object you wish to save. Double click on it (or select **Edit Object** from the Model menu) to enter the Workshop.

Step 2: Click on **File** in the Workshop menu bar and select **Save Object As**. A standard save file dialog box appears.

Step 3: Navigate through the directories to find the folder you wish to save the object into. Click Save.

Step 4: The object is saved as an Infini-D object file.

Note: Infini-D stores objects in a proprietary Infini-D object file format. These objects are not readable by other 3D applications. To use Infini-D models in other 3D applications, use the ***Export*** *command to export models in either DXF or 3DMF format. (See* Chapter 7, Other 3D Object Types *for details on exporting models.)*

REVERTING THE OBJECT

You may find after you manipulate an object that you are not happy with the results. You can revert the object to its form when you entered the Workshop by clicking on **File** in the menu bar and selecting **Revert Object**.

EXITING THE WORKSHOP

When you are finished working on your object in the Workshop, exit by choosing the **Exit Workshop** command from the **File** menu. The Workshop closes and the object in your scene automatically updates to reflect the changes made in the Workshop.

Chapter 11

The Mesh Editor

This chapter explains how to use Infini-D's mesh editor for editing objects at the vertex level. The mesh editor works with 3D objects in a manner fundamentally different from that of the spline Workshop. Whereas in the spline workshop, curves are used to define cross sections, paths and rails that are then used to create the object, the mesh editor provides direct access to the mesh of points that form the object's surface, giving great freedom for creating organic, non-uniform shapes. The two modelers are often used together, with the basic overall shape being modeled in the workshop, and then surface details being sculpted in the mesh editor.

The mesh editor also allows you to edit non-spline objects such as imported DXF and 3DMF files and terrains, which are not editable in the spline Workshop. Any infini-D object can be converted to a mesh and edited in the mesh editor with the following exceptions: text objects created with the text tool (because these are really multiple objects, see note below), infinite planes, particle systems, and certain spline objects that contain overlapping path, rail, or cross section points (these objects can be corrected in the spline Workshop so that they will then convert to a mesh). If you attempt to use an invalid object type, Infini-D displays an error dialog box.

Note: To edit text in the Mesh editor, you must create it as an extrusion object in the Workshop. See Chapter 10: SplineForm Workshop for more information.

Note

When converting a primitive or a spline object to a mesh in order to edit it in the mesh editor you will be prompted to choose the detail level for the surface mesh.For spline objects there are two settings: patch detail and polygon detail. The patch detail setting determines how finely Infini-D converts the spline outline curves to polygon mesh—the higher the setting, the smoother the surface will be, and the more polygons and the more surface points to work with. The polygon detail setting determines how finely each polygon is triangulated—a higher setting results in more triangles and more surface points to work with. Although high patch and polygon levels produce the highest quality results, keep in mind that the more polygons and triangles there are in your object, the longer it will take to render.

Remember, once you select a patch detail level and proceed with the conversion to mesh, the patch detail level becomes fixed because the spline data is then lost. Polygon level can be increased at a later time (but it can not be decreased). Therefore, you may want to make a copy of an object before converting it to a mesh. If after entering the mesh editor, you find that the object is not smooth enough or does not contain enough points to manipulate, you can delete the copy and start again.

Note

Note: When you convert an object to a mesh, you lose all spline and spline morphing data. Also, the changes you make in the mesh editor apply to all time, there is no morphing capability with mesh objects (although deformations can be used at any time). See Mesh Editor and Animation later in this chapter for more information.

This chapter covers the following topics:

- Accessing the Mesh Editor
- A Tour of the Mesh Editor Interface
- Using the Mesh Editor
- Reverting an Object
- Exiting the Mesh Editor
- Editing a Mesh Object
- Mesh Editor and Animation

ACCESSING THE MESH EDITOR

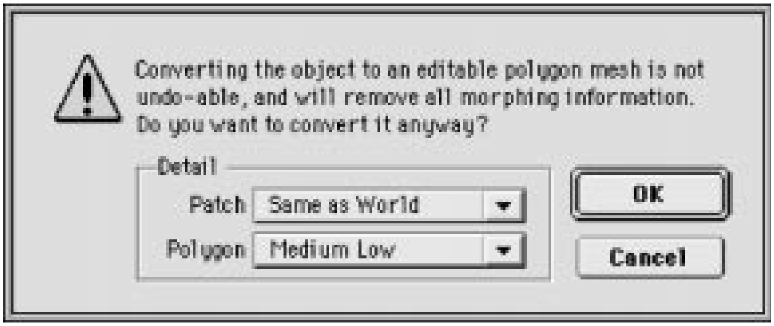
This section explains how to access the mesh editor. You may want to make a copy of the object before converting it to a mesh since the process of converting to mesh fixes its patch detail level and removes all Spline and morphing data.

Follow these steps to access the mesh editor:

Step 1: Select the object you wish to edit in the mesh editor.

Step 2: Make a copy of the object by clicking on **Edit** in the menu bar and selecting **Duplicate**. This step is optional, but highly recommended.

Step 3: Click on **Model** in the menu bar and select **Convert to Mesh**. The Convert to Mesh dialog box opens.

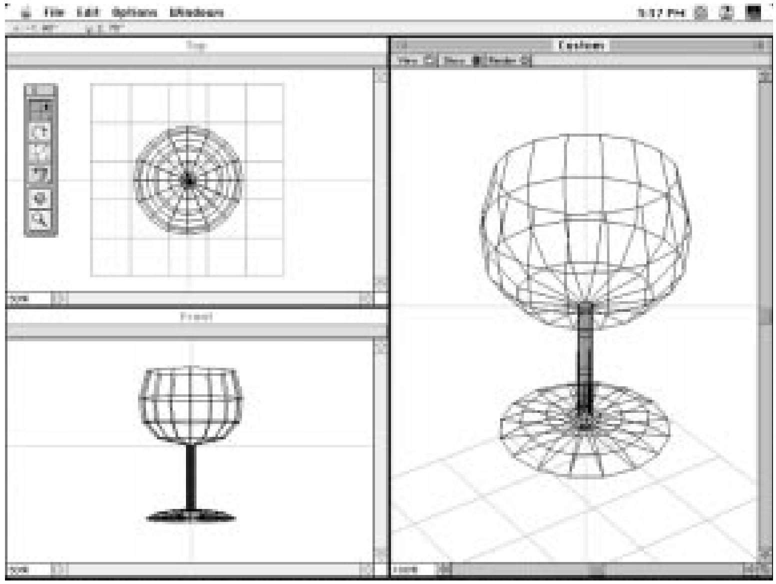


Step 4: Select the patch and polygon level for this object. The higher the polygon level, the easier it is to manipulate the object in the mesh editor since a higher level increases the number of points on an object. Keep in mind that a higher level also increases final rendering time. Remember, once you select a patch detail settings here, it becomes fixed and you can no longer change it, so give this some thought before making a selection. The settings are described below:

- **Patch**: (For spline objects only.) This setting defines how many polygons each spline patch is broken into. The higher the patch level, the smoother the object, but the longer the rendering time. An object with a low patch level can sometimes appear faceted. The default setting is Same As World, which tells Infini-D to use the same Patch level that is selected in the Scene tab of the Preferences dialog box.
- **Polygons**: This setting defines the level of triangulation detail for the polygons of an object. The Polygon level determines how many triangles Infini-D uses for each polygon. Higher levels result in more triangulation, and therefore create more vertices for you to work with in the mesh editor. Conversely, a low triangulation level may make it more difficult to locate a point to manipulate.

Step 5: Click on **OK** and the mesh editor opens. Proceed to the next section for more information. If you decided not to enter the mesh editor, click on **Cancel** to return to your scene.

A TOUR OF THE MESH EDITOR INTERFACE



This section provides a broad overview of the mesh editor. You will notice that it has a similar look and feel to the Workshop, but there are differences. For example, there are no rulers or grids in the mesh editor. As with the Workshop, you can change the windows you see, but unlike the Workshop, the Window menus and tool bar remain the same no matter which view you select.

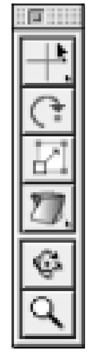
This section covers the following topics:

- Mesh Editor Menu Bar
- Mesh Editor Toolbox
- Mesh Editor Windows
- Mesh Editor Window Menus
- The Information Bar

Mesh Editor Menu Bar

The menu bar is located across the top of the screen (Mac) or the mesh editor window (Win) and contains four items—**File**, **Edit, Options** and **Windows**. These menu items will be described throughout this chapter whenever they are relevant.

Mesh Editor Toolbox



The mesh editor has its own Toolbox that contains tools for creating and modifying objects in 3D space. The contents of the toolbox remains the same for all mesh editor windows. The tools themselves are described later in this chapter in *Modeling with Mesh Editor Tools*.

Mesh Editor Windows

As in the Workshop, you can view your object in various ways. This section describes each window type and also provides an overview of the Window controls.

The mesh editor has its own set of four main windows including:

- Top View
- Front View
- Side View
- Custom View

The Top, Front and Custom views appear by default when you bring an object into the mesh editor. Note that you can use the **View** window menus described below to change these views to provide a different 3D perspective. For example, you could click on the **View** window menu and select **Back** to see the object from the back.

Working with Mesh Editor Windows

Each window in the mesh editor can have its own zoom level and can be shown or hidden as necessary:

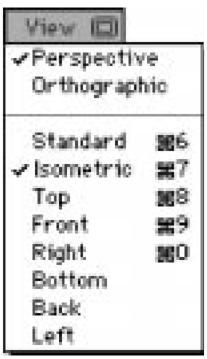
- **Setting the Window Zoom Level**—You can set the zoom level in each window by entering a number, measured in percent, in the lower left corner of the window. Type any number from 12.5% to 800% directly into this box to change the zoom level, then press ENTER to accept the changes. You could also use the **Zoom** tool described later in this chapter in *Modeling with Mesh Editor Tools*.
- **Show/Hide Windows**—From the **Windows** menu, you can quickly show or hide windows including the Toolbox and the Info Bar. Select the menu item that corresponds to the desired window name to show a hidden window or to hide a visible window.
- **Window Controls**—Each window has standard controls for scrolling, moving, resizing and closing.

Mesh Editor Window Menus

Each window also has its own menus located directly below the title bar. These menus provide access to a set of commands and options you can use as you work in the mesh editor.

Each window has the following menus:

- View
- Show
- Render



View Menu

Use the View menu to switch the window between different preset views and perspective modes. The menu is divided into two sets of choices. You can choose one from each section. A check mark appears next to your choice.

- **Perspective**—Select this option to show perspective in the view—parts of the object that are farther away look smaller. The scene camera views behave this way.
- **Orthographic**—Select this option to view your object without perspective—distance from the camera will not affect apparent size. The scene standard views behave this way.
- **Standard**—This is the same viewing angle used by the default camera in a new Infini-D scene.
- **Isometric**—This is a standard view type (often used in architectural drawings) that views the object from an angle of 45 degrees in all three axes.
- **Top, Front, Right, Bottom, Back, Left**—These are preset positions that are useful for viewing your object straight on from different sides.

Show Menu

Use the Show menu to toggle the origin marker on or off. The origin marker indicates the centerpoint of the object. This is useful for positioning the object's centerpoint—in to alter the point around which the object rotates, for example.

Click on **Origin** and an origin marker appears in the window and a check mark appears next to the item on the Show menu. Click on it again and the check mark disappears from the menu and the origin marker disappears from the window.

Render Menu

Use this menu item to change the rendering mode in the window. You can choose either wireframe or shaded. The rendering quality is only relevant within the mesh editor itself. It has no effect on the render mode you choose when you render your final object in your scene.

The Information Bar

The Information Bar is a thin bar located under the mesh editor menu bar, which displays numerical information pertaining to the tools as you edit an object. The Info Bar always displays the location of the mouse cursor in the window, and shows additional information, such as rotation degrees or scaling percentage, depending on the tool you are using. See *Modeling with Mesh Editor Tools* in this chapter for more information on what you see in the Info Bar for each tool.

*Note: You can hide the Info Bar by selecting **Hide Info** from the mesh editor **Windows** menu.*

Note

USING THE MESH EDITOR

This section explains how to use the mesh editor to manipulate objects. It begins by introducing some key concepts you need to understand to use the mesh editor most effectively. Once you understand these concepts, you can use the tools in the mesh editor toolbox to manipulate objects in a variety of ways. You can manipulate a single point or multiple points. You can also control how pulling one or more points affects neighboring points.

This section covers the following topics:

- Mesh Editor Concepts
- Modeling with Mesh Editor Tools
- Setting Magnetic Pull Parameters
- Setting Deformation Parameters

Mesh Editor Concepts

Before you begin using the mesh editor, there are several concepts you should understand. These include:

- Triangulation
- Single versus Multiple Points
- Working Plane
- Magnetic Pull
- Deformers

Triangulation

When you bring an object into the mesh editor, Infini-D converts it into a mesh (if necessary) which involves converting the surface from spline patches or irregular polygons to a mesh of triangles. You can control the number of triangles in the resultant mesh object using the Detail settings in the Convert to Mesh dialog box.

If you select a setting that is too low, you may find you don't have enough surface point to edit the object with the desired amount of detail. This is a good reason to make a copy of your object before converting it to a mesh, however it is possible to increase the Polygon detail level of an object that has already been converted to a mesh. To do this, exit the mesh editor, hold down the OPTION key (Mac) or ALT key (Win), and select Edit Object from the Model menu again. This will display the Convert To Mesh dialog once again, and you can select a higher Polygon detail level.

Remember, the higher the detail settings, the more points there are on the surface mesh to manipulate but the slower the manipulation process and the longer the rendering time

Single versus Multiple Points

You can manipulate one point at a time or you can select several points by dragging a marquee over the object or by holding the SHIFT key and clicking to select specific additional points. When there are multiple points selected, dragging one point causes all the selected points to move as one. You can affect the way you select points using several options on the Options menu including:

- **Magnetic Pull**—Select this option to turn on magnetic pull. This means when you move one or more points, you pull neighboring points along. You can manipulate the way the magnetic pull works in the Magnetic Options dialog box. See *Setting Magnetic Options* later in this chapter for additional information.
- **Select Through Object**—Select this option to select points on both sides of an object. When you drag a marquee, all points within the marquee area will be selected, regardless of their position on the object. Turn this option off to select only points that are on the side of the object facing you.

- **Show Back Faces**—Select this option to show the faces behind or underneath the object that would normally not be visible. This option is on by default for open objects, off by default for closed solid objects. With a very complex object, you might choose to turn this off to simplify what you see in the window.
- **Deformation Options**—Select this option when you have selected the **Deformation** tool in the mesh editor toolbox to access the Deformation Options dialog box, where you can select the axes along which the mesh editor applies the deformation. This works in a similar fashion as described in *Deformations* in Chapter 12.

Working Plane

The working plane is an imaginary floor or wall to help orient you in the 3D working environment. It is primarily used as a guide for point manipulation, described later in this chapter in *Modeling with Mesh Editor Tools*. The working plane is represented as a blue grid in the mesh editor view windows. You can re-orient the working plane to four different positions by clicking on the **Options** menu and choosing one of the four options from the **Working Plane** hierarchical sub-menu. The options are:

- View Plane. This orients the working plane so it is parallel to the active view window.
- X-axis (Left). This option orients the working plane so it is perpendicular to the X-axis, at the left side of the object.
- Y-axis (Back). This option orients the working plane so it is perpendicular to the Y-axis, at the back of the object.
- Z-axis (Bottom). This option orients the working plane so it is perpendicular to the Z-axis, at the bottom of the object. This is the default setting.

Magnetic Pull

The magnetic pull options allow you to adjust the extent to which surrounding points are affected when selected points are moved. This is important for getting smooth surfaces and gradual transitions between areas of an object. Turn the option on by selecting **Magnetic Pull** from the **Options** menu. When you select one or more points, the primary (selected) points are highlighted in red and the secondary points that will be affected by magnetic pull are highlighted in green. Turn the option off to affect only the selected points.

The Flip Object Command

Use the Flip Object command in the **Edit** menu to flip the entire object horizontally across the X-axis (left-to-right when seen from the Front view). This is useful for creating mirrored pairs of objects. For example, to model a pair of human hands, you could model the left hand, duplicate it, and then use the Flip Object command on the duplicate to create the right hand.

Modeling with Mesh Editor Tools

Now that you are familiar with some basic mesh editor concepts, you can use the mesh editor tools to manipulate the objects in a variety of ways. This covers the following topics:

- Move Tools
- Rotate Tool
- Scale Tool
- Deformation Tools
- Rotate View Tool
- Zoom Tool

Move Tools

The mesh editor toolbox has four move tools:

- **Move Parallel to View Window.** This is the default tool. When you move points with this tool, they will move in a plane parallel to the view window, up and down and left and right on your screen. This means that moving a point in one window will have a different effect from the same action in a different window. This is sometimes a difficult way to accurately manipulate points.
- **Move Parallel to Working Plane.** This tool moves the selected points along an imaginary plane that is parallel to the working plane. The orientation of the working plane can be changed as described earlier in this chapter. No matter which direction you move the points, or which window you use, the points will always remain in a plane parallel to the working plane.
- **Move Perpendicular to Working Plane.** This tool works in a similar fashion to the tool above, but the points will only move along the line (not a plane) that is perpendicular to the working plane. This tool move points toward or away from the working plane.
- **Move Perpendicular to Face.** This tool will move the selected points along the line perpendicular to the surrounding faces. In essence, this tool moves the point away from the object. If you have multiple points selected, they can all move in a different directions. This tool has a similar affect as the Scale tool, described later.

Use these tools to select one or more points, then drag a point to alter the object. You can select multiple points by clicking on one of the Move tools, then dragging a marquee around the area you wish to select or by pressing SHIFT while clicking on each point you wish to select.

The mesh editor displays selected points in red. When you select more than one point, dragging one point affects all of the selected points. If magnetic pull is on, it also affects the neighboring points (shown in green). See *Setting Magnetic Options* later in this chapter for additional information.

Follow these steps to use a Move tool:

Step 1: Click and hold on the **Move** tool at the top of the toolbox and a menu opens.

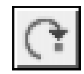
Step 2: Choose the Move tool you want.

Step 3: You select points in either of the following ways.

- Click on the object to select a single point. Press SHIFT and click to add more points to your selection or to remove selected points from the selection.
- Drag a marquee around the object to select multiple points. Press SHIFT and drag a marquee to add to your selection.

Step 4: Click on a red point and drag in the direction for the given Move tool.

The Rotate Tool



Use this tool to rotate the selected points along the view plane. You can twist or bend the object with this tool. Select multiple points to rotate a portion of the object. Note that this bends the object, which is distinctly different from the **Rotate view** tool explained below, which changes the perspective from which you are viewing the object.

Follow these steps to rotate points on an object:

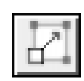
Step 1: Select points on the object as explained in the *Move Tools* section above.

Step 2: Click on the **Rotate** tool.

Step 3: Click once in the window to specify the reference centerpoint for rotation. A cross-hair marker appears marking the centerpoint. You can continue to click to change the position of the marker.

Step 4: Click and drag the mouse anywhere in the window to rotate the selected points around the centerpoint. The more you rotate, the more it deforms or bends the object. Note that if you click far away from the chosen centerpoint, a more subtle rotation occurs, giving you more control.

The Scale Tool



Use this tool to scale points in or out from a chosen centerpoint. It operates similarly to the Rotate tool, above. Select one or more points, then select the centerpoint and move in or out. This scales the selected points toward or away from the chosen centerpoint. Note that this is different from the Deformation Scale tool described below.

Follow these steps to use the Scale tool:

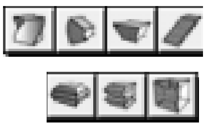
Step 1: Select points on the object as explained in the *Move Tools* section above.

Step 2: Click on the **Scale** tool.

Step 3: Click once in the window to specify the reference centerpoint for scaling.

A cross-hair marker appears marking the centerpoint. You can continue to click to change the position of the marker.

Step 4: Click and drag anywhere in the window to scale the selected points toward or away from the chosen centerpoint. Note that if you click far away from the chosen centerpoint, a more subtle scaling occurs, giving you more control.



The Deformation Tools

This section explains how to use the deformation tools. These work in a similar fashion to the deformations described in Chapter 12, but there are distinct differences.

- In the mesh editor, you use a deformation tool to permanently alter the geometry of your object. You use a deformation in your scene to create an animated effect, or an effect that can be edited later.
- The mesh editor uses a pop-up tool to choose between the different deformation tools, and once the tool has been used, the change is permanent. In the scene, there is a **Deformers** tab in the Command Floater and you select deformations from a pop-up list and add them to the stack of deformations. An object can have multiple deformations, and these can all be changed at any time..
- The mesh editor allows you to make an arbitrary selection of points to deform. In the scene you deform the entire object, or a percentage of the object from bottom to top.

Select a deformation type from the pop-up tool and a bounding box appears around the selected points. If no points are selected, Infini-D applies the deformation uniformly to the entire object. Drag the mouse and the mesh editor deforms the object accordingly.

You can change the axis along which the mesh editor applies the deformation as explained in *Setting Deformation Parameters* later in this chapter.

Follow these steps to select a deformation tool:

Step 1: Click and hold on the **Deformation** tool and the seven deformation tools appear. Each is described below:

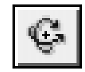
- **Twist**—Use this tool to twist the points within the bounding box. Note that depending on the object and your perspective, this can be difficult to see. Try using a cube to better understand the effect.
- **Bend**—Use this tool to bend the object or selection.
- **Taper**—Use this tool to taper the width of your selection at the top.
- **Shear**—Use this tool to tilt the object while leaving the top and bottom parallel to each other. This creates a sort of “windblown” effect.
- **Bulge**—Use this tool to bulge the middle of the selection in or out in a uniform fashion. The bulge occurs most in the middle of the selection and not at all at the very top and very bottom. You can bulge in or out,

and the selection bulges uniformly based on the chosen axis and points.

- **Linear Wave**—Use this tool to deform the selection using a wave effect in which the surface ripples in a uniform fashion.
- **Scale**—Use this tool to change the size of the selection uniformly. Unlike the **Scale** tool defined above, you do not control the origin.

Step 2: Drag the mouse to deform the object.

Rotate View



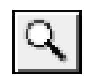
Use this tool to rotate the view of the object. This tool does not affect the points on the object in any way. It only rotates the camera, so you can see the object from different angles.

Follow these steps to rotate the view:

Step 1: Click on the **Rotate View** tool and a red circle appears around the object that represents a rotation sphere.

Step 2: Click anywhere in the window to rotate the point of view. If click inside the circle, the object pivots in all directions in 3D space. If you click outside the circle your movement is limited to left and right, around the axis going in and out of the view window.

Zoom Tool



This tool works similar to other Zoom tools in Infini-D. Use it to zoom into your object. This is a good way to get a closer look at a particular area on your object.

Keep in mind the following as you use the Zoom tool:

- Click and drag a marquee around an area to zoom into exactly that area.
- Press the OPTION key (Mac) or the ALT key (Win) and click to zoom out.
- Double-click on the Zoom tool to reset the zoom level for the active window to 100% and re-center the origin.
- You can change the magnification level by entering a magnification value into the box in the lower-left corner of any window and pressing the ENTER key.

Setting Magnetic Pull Options

This section explains how to select parameters for magnetic pull in the mesh editor. You can turn on magnetic pull by clicking on **Options** in the menu bar and checking **Magnetic Pull**. When you do this, the mesh editor pulls green neighboring points along with the chosen red points. You can modify the settings the mesh editor uses to select and move the neighboring points in the Magnetic Options dialog box. Note that any changes to these setting apply immediately, the next time you drag a point. Changing the parameters has no effect on points you have already altered.

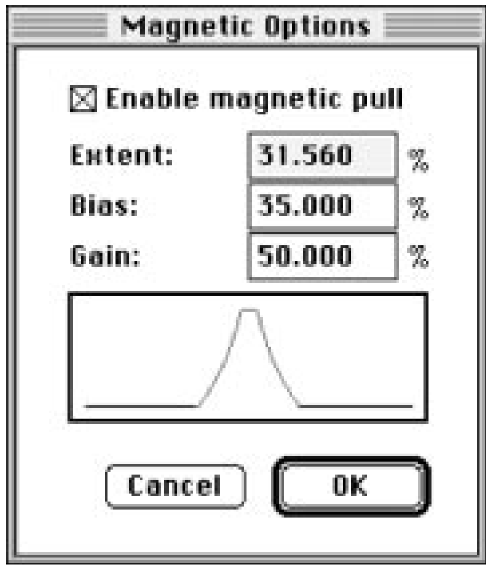
If you open the Magnetic Options dialog with points selected, the selection will update as you change the settings. This is useful for seeing how much of your object will be affected by your new settings.

Follow these steps to set magnetic pull parameters:

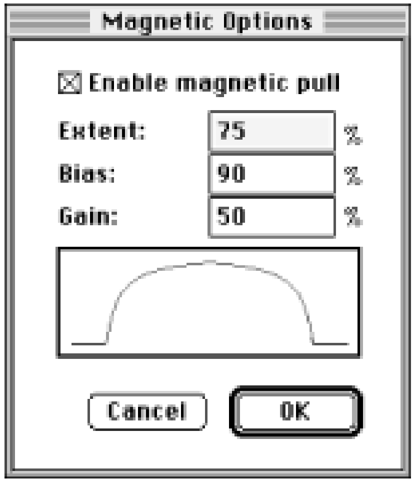
Step 1: Double click on the **Move**, **Rotate** or **Scale** tools.

or

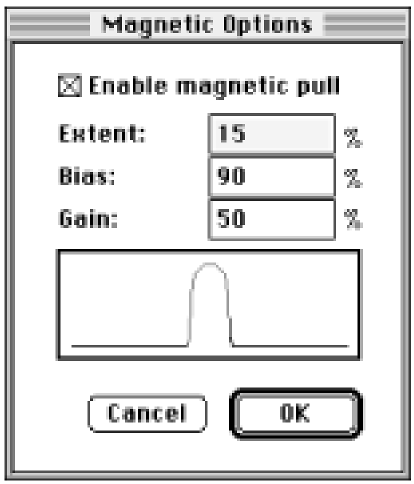
Click on **Options** in the menu bar and select **Magnetic Options**. In both cases the Magnetic Options dialog box opens.



Step 2: You can alter the Magnetic Options as follows: (As you alter the numbers, the graphic changes accordingly.) The red mark in the middle of the graphic represents the selected point(s). The black lines at the edges represent the points furthest from the chosen point, and the green dots in between represent the secondary points that will be affected by magnetic pull. Refer to the graphics below.



A wide hump means more points will move with the selected points.



A narrow hump means that fewer points will move with the selected points. The settings affect the shape of this graphic. Keep this graphic in mind as you read these descriptions.

- **Enable Magnetic Pull Checkbox**: The default is checked, meaning that you wish to use magnetic pull. Uncheck it to turn off magnetic pull and only affect selected points.
- **Extent**: This number indicates how far from the selected point or points neighboring points will be affected. In other words, it determines how many secondary points are selected. Extent is measured as a percentage of the total size of the object. For example, if the object is 10 units across and you enter 20%, then the all points within 2 units of the selected point are affected. A value of 50% will affect points halfway across the object, and a value of 100% will affect all points.

- **Bias**: This number represents how much the secondary points will move with the selected points. A high number means more points move with the selected point. This creates a bulge where most points move with the selected point and then rapidly drop off to farthest points. A low number means more points will stay where they are. This creates a curved peak where more points stay with the farthest points and then rapidly ramp up to the selected points. A value of 50% creates a straight linear ramp between the selected points and the farthest secondary points.
- **Gain**: This number indicates the maximum amount the furthest points can move relative to the selected points. It therefore indirectly affects how far all points in between can move.

Step 3: Click on **OK** to apply your settings. Click on **Cancel** if you want to exit without saving your settings.

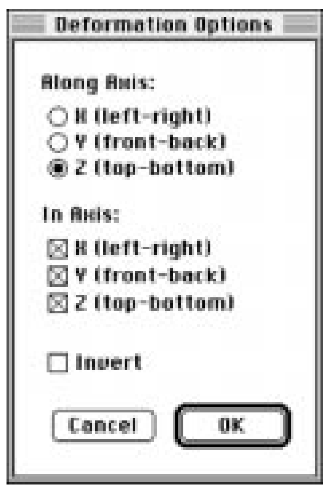
Setting Deformation Parameters

Use these options to change the axes along which the mesh editor applies the deformation. Follow these steps to set deformation parameters:

Step 1: Double-click on the **Deformation** tool

or

Click on **Options** in the menu bar and select **Deformation Options**. In either case, the Deformations Options dialog box opens:



You can alter the options by clicking on a radio button or check box next to the desired axis. Check the **Invert** check box to reverse the direction of the deformation. For example, a bend naturally starts at the bottom of the object and bends more as you move toward the top. Inverting the deformation causes the bend to begin at the top of object and bend more at the bottom.

Step 2: Click on **OK** to save your changes. Click on **Cancel** to exit without saving your changes.

Note: Although the Deformation Options dialog box does not change name, it is tool dependent. There are different settings for each deformation tool, so changing the primary axis in one will not affect the primary axis of another.

REVERTING THE OBJECT

You may find that after you manipulate an object you are not happy with the results. You can easily revert the object to its original form by clicking on **File** in the menu bar and selecting **Revert Object**. This will return the object to its original state when you first entered the mesh editor.

EXITING THE MESH EDITOR

When you are finished working in the mesh editor, you can exit by choosing the **Exit Workshop** command from the **File** menu. The mesh editor closes and you return to your scene. Infini-D automatically updates your object with any changes you made in the mesh editor.

EDITING A MESH OBJECT

If at any time you wish to return to the mesh editor to make more changes to the object, follow these steps:

Step 1: Select the object you wish to edit by any of the methods described earlier.

Step 2: Click on **Model** in the menu bar and select **Edit Object**. The mesh editor reopens and you can further manipulate the object as you wish.

Note: You can press the OPTION key while choosing Edit Object to access the Convert to Mesh dialog box again. At this point the only change you can make is to increase the Polygon level to create more triangles. You can not adjust the Patch setting or decrease the Polygon level.

MESH EDITOR AND ANIMATION

Although the mesh editor gives you powerful control over an object's shape, you *cannot* animate changes to an object over time. When you alter an object in the mesh editor, you alter it across time regardless of the location of the Scene Time Marker, so you cannot use the mesh editor to morph an object over time. See *Chapter 21: The Sequencer* for more information on animation and morphing.

Note that you can use the Deformations feature to create effects similar to those that you can make in the mesh editor and you can animate deformations over time.

Chapter
12

Object Deformations

This chapter explains how to work with Infini-D's object deformation capabilities to create custom object shapes and animated object deformations. Deformations can be applied to any object with the following exceptions: infinite planes, text created with the text tool, and SplineForm objects with any overlapping path, rail, or cross section points. (If you select an object that can not be deformed, the Deformations panel grays out, and you cannot access it.) All deformations can be animated to create objects that change shape over time—rippling, bending, twisting, etc.

Note: In order to deform text you must create it as an extension object in the Workshop. See Chapter 10: SplineForm Workshop for more information.

Note

You can use a single deformation to reshape an object in one specific manner—for example, a tapered wine glass—or you can create a stack of up to eight deformations per object for much more complex object manipulation. In addition, any or all of the deformations can be animated simply by changing the parameters— in this way, you have a powerful set of tools to change your objects over time. See *Chapter 20: Introduction to Animation* for more information.

This chapter will also cover the Real Time Geometry dynamic multi-resolution controls found on the Modifiers tab of the Command Floater.

Note: It is important to understand the difference between using deformations to change the shape of an object and editing an object in the mesh editor. Deformations are transformations, meaning that they are mathematical formulas that are applied to the base geometry of the object, resulting in a new shape—similar to the scale effects that you can apply using the Squash & Stretch or Uniform Scale tools. Deformations do not actually alter the underlying geometry of the object, this geometry is always retained and used as the basis for calculating the shape. Editing an object in the mesh editor actually changes the geometry of the object permanently and at all points in time. Although in some cases you could achieve the same shape either by using a deformation or by working in the mesh editor, the advantages of using Deformations are that they are animatable, they can be removed at any time, and you can apply more than one. It is important to keep the distinction between deformations and mesh editing in mind when deciding how to manipulate the shape of an object.

When you select a deformation and apply it to an object, Infini-D triangulates the object similar to the way in which it converts an object to a mesh to enter the mesh editor (however this triangulation is purely for the purposes of the deformations and can be undone at any time). This means it breaks the surface of the object into a grid of triangles to use when deforming and then rendering the object. You can control the patch detail level (for spline objects) and the polygon detail level for each object. The higher the patch and polygon detail level, the smoother the deformation, but the longer the rendering time. It is therefore important to keep this trade-off in mind as you set up your scene and apply deformations to different objects—some objects may need the highest settings while others may be fine at lower settings. In addition, the more deformations you add to a scene, the longer it will take to render.

Note: Although you can bring an object into either the Workshop or the mesh editor (whichever applies) after you have applied deformations to it, remember that in the Workshop and the mesh editor you are working with the actual geometry of the object, so it will appear undeformed. The deformations will be re-applied to the new geometry when you exit the Workshop/mesh editor and return to your scene.

This chapter covers the following topics:

- Adding a Deformation
- Creating a Deformation Stack
- Altering Deformation Parameters
- Deleting a Deformation

ADDING A DEFORMATION

This section explains how to add a single deformation to an object. You can add up to seven additional deformations to create a stack of deformations as explained in the section that follows. Once you add a deformation, you can alter its parameters as explained in *Altering Deformation Parameters* later in this chapter.

Follow these steps to add a deformation to an object:

Step 1: Select the object you wish to deform.

Step 2: Click on the **Modifiers** command tab in the Command Floater.

Step 3: Click on the **Deformers** tab within the Modifiers tab and the Deformation panel appears. The Triangulation panel also appears, but in the closed position. Your screen should look like the following graphic:

Step 4: Click on the **Type** pop-up list and select a deformation type from the list.

Step 5: Click on the **New** button and Infini-D applies the selected deformation to the object. (You will need to enter a value for the level of deformation as described below in *Altering Deformation Parameters* in order to see any affect on the object). Notice that Infini-D triangulates the chosen object, meaning that it divides the surface into a grid of triangles. You can alter the triangulation detail as well as other deformation parameters as explained in *Altering Deformation Parameters* below.

CREATING A DEFORMATION STACK

This section explains how to create a stack of deformations. A stack is a list of multiple deformations that you can apply to an object for complex effects that would be difficult or impossible to achieve using the modeler alone.

Infini-D allows you to add up to eight deformations in a stack, which it applies one at a time from top to bottom. You can change the order of deformations within the stack by dragging the names on the list. You can delete an unwanted deformation as explained in *Deleting a Deformation* later in this chapter.

Follow these steps to create a stack of deformations:

Step 1: Access the **Deformers** tab as explained in *Adding a Deformation* above.

Step 2: Click on the **New** button.

Step 3: Click on the **Type** pop-up list and select a deformation type from the list.

Step 4: Repeat Steps 2 and 3 for each deformation you wish to include in the stack.

ALTERING DEFORMATION PARAMETERS

This section explains how to alter deformation parameters in order to create a custom deformation. When you select a deformation and apply it to your object, Infini-D uses default settings for the triangulation, percentage, axis and limits. In addition, waves have other parameters. You can alter these settings to suit your own creative needs.

This section covers the following topics:

- Deformation Parameters
- Wave Parameters
- Offset, Rotate and Scale Deformations
- Triangulation Settings

Deformation Parameters

This section explains how to alter all deformation settings except wave and triangulation settings, which are covered later in this chapter. Keep in mind that this section discusses the full range of deformation parameters available. Not all will be available for every deformation type. If a particular type is not relevant to a given deformation, Infini-D grays it out, meaning you cannot access it.

This section covers the following topics:

- Turning a Deformation On or Off
- Setting the Level of Deformation
- Selecting Axes for the Deformation
- Setting Limits on the Deformation

Turning a Deformation On or Off

This section explains how to turn a deformation on or off. You may do this, for instance, if you have a stack of deformations and you want to see the effect of just one. By turning off all deformations but one, you can see how it behaves on its own.

Note that when you turn off a deformation, Infini-D still remembers all of the deformation settings—it simply ignores them until you turn the deformation on again.

Follow these steps to turn a deformation on or off:

Step 1: Click on the deformation you wish to turn on or off in the Deformation Stack.

Step 2: Click on the **Deform** check box. It is on by default. Uncheck it to turn off the deformation.

Setting the Level of Deformation

This section explains how to set the amount of deformation you want. This enables you to customize the degree or percentage of deformation Infini-D applies to the object. After you select a deformation type, the field just below this changes to reflect the type of deformation. For example, if you select Bend, it changes to Bend degrees. If you select Taper, it changes to Taper percentage. By entering a new number or dragging the up or down arrows, you can change the setting. When you enter a new setting, notice that the object deforms accordingly—there is no OK or Apply button.

Follow these steps to set the level of deformation:

Step 1: Click on the object you wish to deform.

Step 2: Click on the **Modifiers** command tab in the Command Floater.

Step 3: Click on the **Deformers** tab and the Deformation panel appears.

Step 4: Click on the **Type** pop-up list and select a deformation type from the list. The field below changes to reflect the type of deformation you selected.

Step 5: Click on **New** to add the deformation to the stack. When you do this, the field below the **Type** field becomes active and the default setting appears. For example, if you select Taper, the default is 100%.

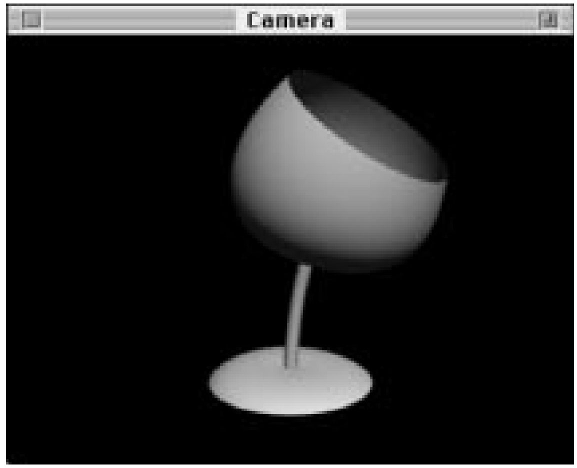
Step 6: To alter the default settings, enter a new number or drag the up or down arrows until you achieve the level of deformation you desire.

Selecting Axes for the Deformation

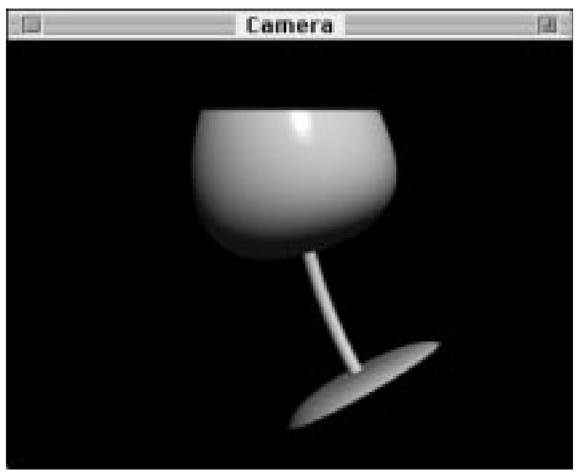
This section explains how to select axes for your deformation. Along with other deformation parameters, you can control along which axis Infini-D applies the deformation. There are two axis selections:

- **Along**—This defines which axis of the object you want to use as the basis for the deformation. For example, to bend a wine glass, you would choose to bend along the Z axis (length) of the object.
- **In**—This axis defines the direction towards which you deform the object. Taking our example of the wine glass above, if we were looking from the front, choosing to bend in the X axis would bend it towards the left or right, and choosing the Y axis would bend it towards the front or back. Note that you can not deform an object in the same axis that you are deforming along.

In addition, you can invert the axis by clicking on the Invert check box when it is available. Taking our example of the wine glass from above, bending it along Z in X would bend the top of the wine glass to the right as shown below.



By checking the **Invert** check box , you invert the point where Infini-D bends the object, so you bend the *bottom* of the wine glass instead. The graphic below illustrates this.



Follow these steps to select the axes:

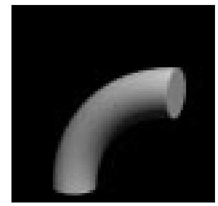
Step 1: Click on the deformation you wish to work with in the stack.

Step 2: Scroll down to the axis section, then click on the radio button or check box next to the axis you wish to select. Notice that the deformation changes when you change the axes.

Step 3: If you wish to invert the deformation, then check the **Invert** check box if available. Note that for some deformations such as Bulge, this check box is grayed out.

Setting Limits on the Deformation

This section explains how to limit your deformation. Normally, Infini-D applies the deformation to the entire object. By entering limit values, you can limit the effect of the deformation to a percentage of the object's length. The limit is based on the bounding box of the object.



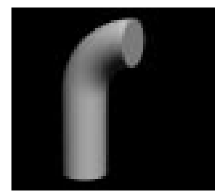
90° Bend, no Limits

Follow these steps to limit the deformation:

Step 1: Click on the deformation you wish to limit in the stack.

Step 2: Scroll down to the Limits section and check the **Limits** check box.

Step 3: Enter an Upper and/or Lower percentage for the limit. Notice that the deformation changes as you change the number. You can also change the number by dragging the up or down arrows.



90° Bend with Limits: Upper 100%, Lower 50%

Wave Parameters

This section explains how to set wave parameters. When you select a wave as the deformation type, you can set the amplitude of the wave in the Deformation section. In addition, in the Wave section at the bottom of the Deformations panel you can set the number of waves, the position of the waves and whether the waves follow a 1-cosine or sine function.

When you adjust the wave parameters, Infini-D applies them immediately. There is no OK or Apply button.

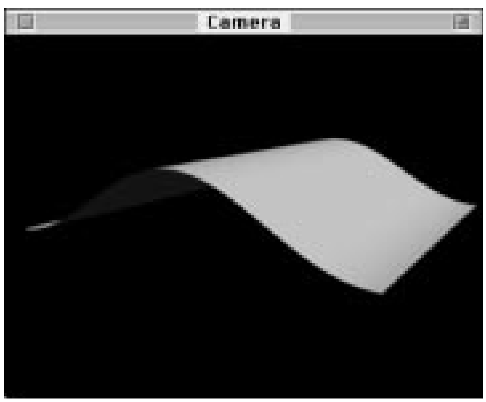
Follow these steps to adjust a wave:

Step 1: Select a wave from the **Type** pop-up list. Your choices are Linear and Circular.

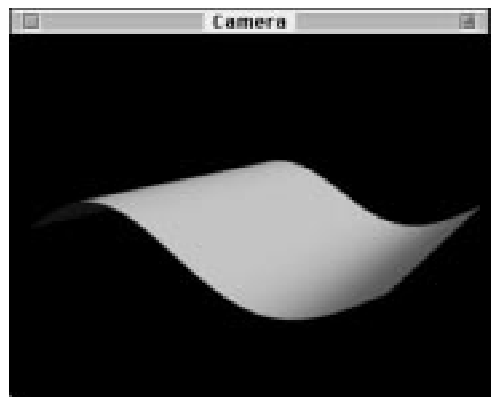
Step 2: Enter the amplitude (or height) of the wave by entering a number in the **Amplitude** field or dragging the up or down arrows.

Step 3: Scroll down to the Wave section at the bottom of the panel and change the parameters as follows:

- **Number**—Enter the number of waves you want across the length of the object.
- **Phase**—Drag the phase pointer to offset where the wave begins. You can also enter a number. If you use the graphic, the number adjusts as you drag the pointer. If you enter a number, the graphic adjusts accordingly.
- **Function**—Click on the type of function you wish to use to build this wave. 1-cosine creates a wave that remains completely to one side of the axis of the object, while the sine creates a wave that extends to both sides of the axis. Refer to the graphics below.



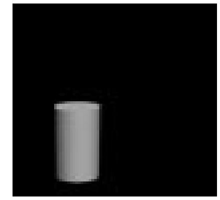
Cosine



Sine

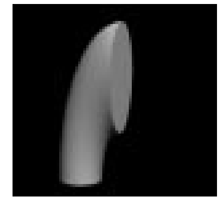
Offset, Rotate and Scale Deformations

Infini-D includes the ability to change an object's offset, rotation and scale settings using deformations. When you apply various transformations to an object, Infini-D applies them in a certain order—deformations are applied first and then changes to any of the parameters in the Info Floater. This may lead to unexpected results, so Infini-D gives you the option of applying offset, rotation, and scale changes as deformations so that you can control the order in which they are applied to the object (by positioning them where you want in the deformation stack).



Original Object

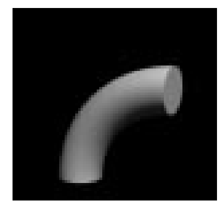
For example, imagine that you want to elongate an object, then bend it. You may try stretching the object by entering a higher Z scale value in the Info Floater, then applying a Bend deformation. Doing it this way, you would find that the object is first bent, and then scaled up, so that the end result is distorted. For a better result, try first applying a Scale deformation on the Z axis, and then applying the Bend deformation.



Undesired Result: Bend deformation and scale applied via Info Floater

Triangulation Settings

This section explains how to adjust the triangulation settings. When you select an object for deformation, Infini-D triangulates its surface, making it a triangular grid. The triangulation setting refers to the level of detail you want to use for this triangulation process. The higher the triangulation setting, the smaller the grid, meaning the greater the number of triangles. As you increase the number of triangles, you increase the detail, which raises the quality but increases the rendering time as well. Applying Deformations slows the rendering process in general, and increasing triangulation causes a further increase in the rendering time.



Desired Result: Scale deformation and Bend deformation

Infini-D divides triangulation into two settings. The first, Patch, applies only to SplineForm objects created within Infini-D. This setting takes the spline patches that make up the surface of the object and breaks them into polygons according to the level you choose. The second setting is Polygons, which applies to any type of object and determines how finely Infini-D subdivides the polygons into triangles. This second setting also allows for the triangulation of the end caps of SplineForm objects, which are not subdivided by the Patch setting.

When you access the **Deformation** tab in the Command Floater, the Triangulation panel is closed by default. Click on the blue triangle and the panel opens revealing the settings.

Follow these steps to adjust the triangulation settings (this example is for a SplineForm object):

Step 1: Select an object to which you have applied a deformation.

Step 2: Click on the blue triangle in the Triangulation panel to open the panel if it is not open already.

Step 3: Click on the Patch pop-up list and choose a setting. Infini-D displays the number of triangles below the pop-up lists. By choosing a higher Patch setting, you increase both the number of polygons and the number of triangles.

Step 4: Click on the Polygons pop-up and choose a setting. Choosing a higher setting increases the number of triangles.

DELETING A DEFORMATION

This section explains how to delete a deformation from the stack. Since deformations require a fair amount of computation time, you may decide to delete one or more from your stack to reduce the rendering time, or you may decide you are unhappy with a particular deformation. Whatever the reason, you can delete a deformation from the stack if you decide you don't want it.

Follow these steps to delete a deformation:

Step 1: Click on the deformation you wish to delete in the deformation stack.

Step 2: Click on the **Delete** button next to the stack and Infini-D deletes the deformation without prompting you.

DYNAMIC MULTI-RESOLUTION

This section discusses the use of the Multi-Res controls found in the Triangulation panel of the Deformers tab in the Command Floater.

This section covers the following topics:

• What is the New Multi-Resolution Feature?

• Real Time Geometry Explained

• Changing the Resolution of an Object

• Important Considerations

What is the New Multi-Resolution Feature?

Infini-D is the first application to take advantage of an exciting new technology from MetaCreations called Real Time Geometry. We have incorporated this technology into Infini-D in the form of a new Multi-Res feature that allows you to select any object and change its 3D resolution (how many vertex points and polygons make up its surface) dynamically. This can be especially useful when working with large models that are cumbersome and redraw slowly. RTG allows you to down-res the object without losing fidelity or rendered image quality. One of the most useful applications of this is to decrease the resolution of objects that are in the distance, and so don't need a large amount of detail, thereby increasing rendering speed.

Real Time Geometry Explained

The fundamental building blocks of most 3D computer graphics are polygons, usually triangles. Most 3D models consist of grids, or “wireframes,” built of these polygons, and a “texture map,” or picture, that is wrapped around that structure.

Because a computer's ability to display polygons rapidly (and therefore create convincing 3D scenes) is limited, it is important to be able to change this polygonal wireframe to meet the needs of the situation. It would be very wasteful to represent an object with, say 5,000 polygons when it occupies only a few pixels on the screen. However, objects that are very close to the viewer and occupy a large percentage of the frame, do need to be at a high resolution in order to have enough detail to be convincing.

Real Time Geometry is a technology that allows the dynamic adjustment of a 3D object's resolution. RTG's special capabilities revolve around its ability to build these wireframe structures from a set of points in real time (hence, the name). It stores 3D models not as a single polygonal model, but as a series of compressed instructions about how the polygonal model should be built; the actual polygonal model is built to the desired complexity (in real-time) when needed. As a result, its files are very small and occupy very little memory.

The number of points of the model actually displayed at any time changes according to the value selected by the user. To start with, the polygonal model may be built from the first half of the instructions. If the user then increases the desired resolution, more instructions will be followed and the model will become more detailed. If the user decreases the desired resolution, instructions will be undone to make the model simpler.

The most powerful capability of RTG technology is its ability to decide which points are most important in a 3D model. RTG technology provides the ability to rapidly, and automatically, analyze 3D models to determine in what order the object should be built. This analysis ensures that increasing the resolution of an object adds finer and finer details, while the underlying structure is visible at even the lowest resolutions.

In contrast, imagine a model of a table in which, at low resolutions, and as the resolution is increased, the front-left leg becomes more and more detailed. The front-right leg would not be drawn until all possible details was added to the front-left. While such an example is ridiculous, it is very important to avoid such problems on smaller scales where they are not as noticeable. RTG technology goes to great lengths to ensure that 3D models look their best at every resolution; and does so without sacrificing speed.

Changing the Resolution of an Object

The implementation of the new RTG multi-res feature is quite simple. A checkbox has been added to the Triangulation panel of the Deformers tab (found under the Modifiers Command Tab). This checkbox determines whether or not the object selected has been processed into the RTG format (internally) and so can be multi-resed. To change the resolution of an object try the following example:

Step 1: Launch Infini-D 4.1.

Step 2: If there is not a blank scene open already, click on **File** in the menu bar and select **New.**

Step 3: Click on the SplineForm Object tool and select the twisted cube.

Step 4: Click in any View window to place a twisted cube into your scene.

Step 5: Click on **Model** from the menu bar and select **Convert To Mesh...** Click **OK.**

Step 6: Click on **File** in the menu bar and click **Exit.**

Step 7: With your object still selected, click on the **Modifiers** command tab in the Command floater. Click on the **Deformers** tab within the **Modifiers** tab. Click on the triangle to open the **Triangulation** panel of the **Deformers** tab.

Step 8: Click on the checkbox marked **Triangulate**. Click on the checkbox marked **Multires.** The program will now process the object into RTG format so that it can then change the resolution as desired.

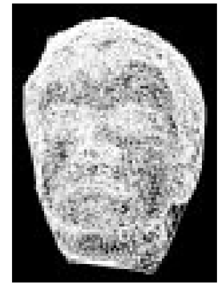
Step 9: After the processing is complete, the value in the percentage field next to the **multires** checkbox will become active. To change the resolution of the object, either type a new value less than 100% into the field, or click and drag on the arrows next to the field. You will see the number of polygons that make up your object change as you change the value.

There are several numbers displayed in the space below the multires checkbox. These are explained below:

Patches: This applies only to SplineForm objects, and so is dimmed out when an object is multiresed (because it has been converted to a mesh).

Polygons: For objects created within Infini-D, this number is determined by the settings chosen for Patch and Polygon detail when the object was converted to a mesh. For imported DXF or 3DMF objects, this number is fixed (determined by whatever application created the object).

Triangles: This number is determined by the setting chosen from the Polygon detail pop-up menu above. The higher the setting, the more triangles the polygons are divided into. When you Multires an object, there will be two numbers displayed in this field: the number of triangles present at the current level of resolution followed by the total number of available triangles (at 100% resolution, these two numbers will be the same).



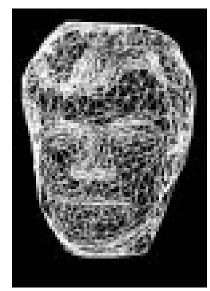
100% - 12,371 triangles

100% - 12,371 triangles

Important Considerations

There are several things to keep in mind when changing the resolution of an object. These are:

• **Geometry types.** An object must be a triangulated mesh before it can be multiresed. This means that any object created within Infini-D must first be converted to a mesh via the **Convert To Mesh..** command in the **Model** menu, and then triangulated by checking the **Triangulate** checkbox (Command Floater->**Modifiers** tab->**Deformers** tab->**Triangulate** panel). Any imported geometry (DXF or 3DMF) need not be converted to a mesh, but must first be triangulated.



30% - 3,711 triangles

• **Triangulation level.** Keep in mind that the maximum number of points on the surface of the object is determined by the level of triangulation you have selected. The Multires feature can reduce the number of points, but it can not add to it. If you find that you need more triangles on the surface of an object, increase the Polygon detail setting in the Triangulation panel. For SplineForm objects that you are converting to a mesh, remember that the Patch detail level you choose when you first convert it to a mesh cannot be changed, so think ahead when you are converting to a mesh.

30% - 3,711 triangles

• **Processing time.** There are an enormous number of calculations that go into processing an object into the RTG format, even for what appears to be a “simple” object. The software has to look at and analyze the importance of each point on the surface of the object. Keep in mind that the more complex the object (ie the more polygons it has) the longer it will take to process. Do not be alarmed if once you have clicked the **Multires** checkbox, there is a slight delay before you can enter any value in the percentage field.

Chapter 13

Booleans

This chapter explains how to use Infini-D's Boolean operators to create shapes that would be difficult or impossible to create through modeling alone and to achieve interesting animation effects. Infini-D allows you to use any object to "carve" out from the shape of another object, resulting in a new, more complex shape. Booleans in Infini-D are a rendering effect, the results are only visible when the image is ray traced. Booleans work best when the objects are connected in a hierarchy as explained in *Chapter 8: Object Hierarchies*. Boolean settings are located in the Object Tab of the Command Floater, see *Chapter 9: Object Settings* for more information.

This chapter covers the following topics:

- What are Boolean Objects?
- Creating a Boolean Object
- Surfaces with Booleans
- Hierarchies with Booleans
- Objects that Do Not Work as Booleans

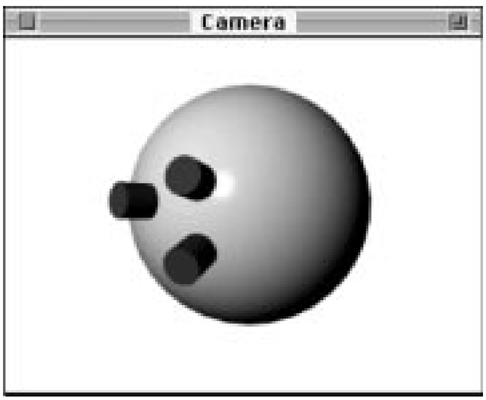
Note: See Chapter 22: Advanced Animation for information on how to animate Booleans.

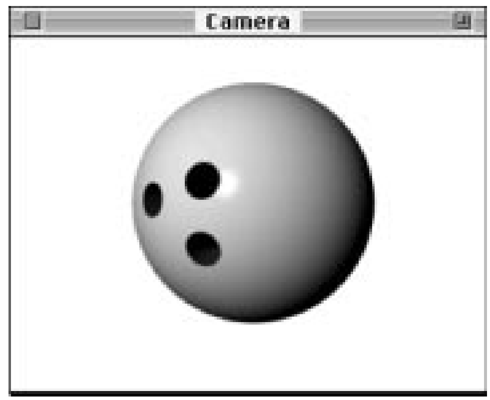
Note

WHAT ARE BOOLEAN OBJECTS?

This section introduces the concept of Booleans and provides some examples to help illustrate this. Boolean objects are complex objects created by a mathematical interaction of two simple objects. They are actually set operations, where each object is considered a set that acts upon the other object. The most useful operations, and those typically used in 3D modeling, are subtraction (or negation) and intersection.

Negative objects subtract or remove material from other objects. Wherever the negative object exists, the overlapping positive object is missing (has a hole, indentation, etc.). If they are not overlapping and in an object hierarchy, then the positive object is unaffected and the negative object is invisible. One example of Boolean subtraction is a bowling ball, which can be built as a sphere that has three cylinders subtracted from it to make the finger-holes. The graphic below illustrates this.





The result of a Boolean intersection is the common area where two objects overlap or intersect. All other parts of the intersection object and the positive object are invisible. You can think of Intersection objects as “subtract-everything-but-me” objects. The graphic below illustrates this.

CREATING A BOOLEAN OBJECT

This section explains how to create a Boolean object. Follow these steps:

Step 1: Create an object hierarchy for the objects you wish to intersect. See *Chapter 8: Object Hierarchies* for more information.

Step 2: Select the object that you want to designate as the negative or intersection object.

Step 3: Click on the **Object** command tab in the Command Floater.

Step 4: Click on the **Boolean** pop-up list and make a selection. Your choices are described below:

- **Positive—**This is the default setting, meaning you are selecting no Boolean operator at all.
- **Negative—**This choice causes the selected object to be subtracted or negated from the object hierarchy. It will affect its immediate parent (but not grandparents), as well as any other objects that are linked to that parent (called siblings), as well as all objects linked to its siblings. Negative objects do not subtract from their own children. Rather, all objects linked to a negative object combine to form a single, more complex, negative object.

  If a negative object is not linked to another object, it will subtract from any and all objects it touches in the entire scene. This is known as global negation.
- **Intersection—**This choice creates an object that is made of only the overlapping parts of the intersection object and the object hierarchy. All other parts are invisible. It will intersect with its immediate parent (but not grandparents), as well as all sibling objects, and all objects linked to its siblings. It will not intersect with its own children. Rather, all objects linked to an intersection object combine to form a single, more complex intersection object.

  If an intersection object is not linked to another object, it will intersect with every other object in the scene. This means that no objects will be visible except where they overlap the intersection object.

Note: You can see a Boolean only if you select Ray Tracing as the rendering mode. The Boolean effect is not visible in other rendering modes. See Chapter 24: Introduction to Rendering for more information.

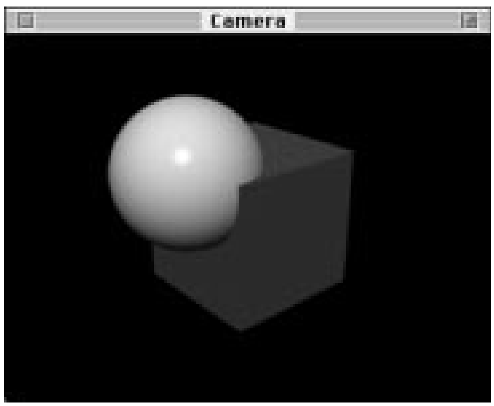
Note

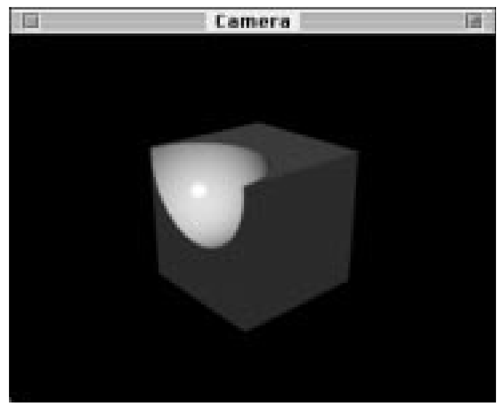
SURFACES WITH BOOLEANS

This section explains how the surfaces on two objects behave when you apply a Boolean operator. See *Chapter 14: Surfaces and Texture Maps* for more information.

When two objects combine to form a Boolean object, the resulting object uses surfaces from both. The part of the object which remains from the positive parent object retains its own surface. The area that was created by a negative or intersection child object uses the surface of that object. This also applies if you are using a QuickTime movie as a surface.

For example, if you subtract a white sphere from the edge of a red cube, the result will be a white divot in the edge of the cube, somewhat like the holes in a die. The graphic below illustrates this.



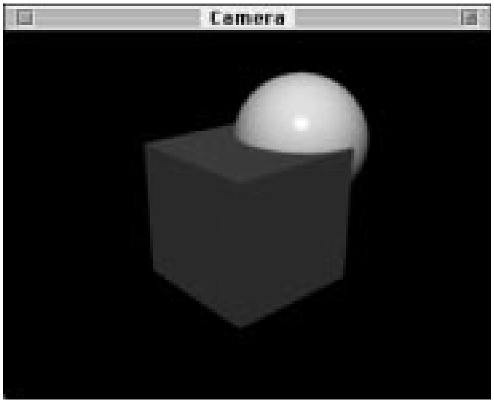


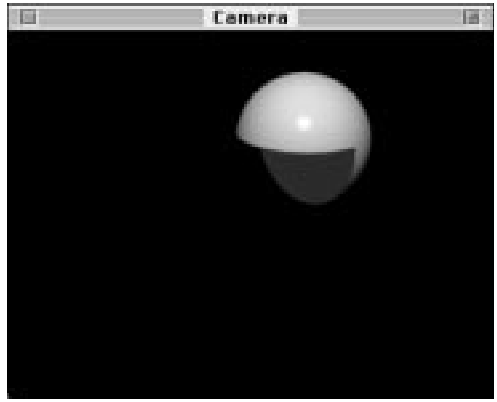
HIERARCHIES WITH BOOLEANS

This section explains how hierarchies behave with Booleans. As you combine multiple Boolean operators into a single object hierarchy or tree, it can quickly become difficult to visualize the result. The following examples will help clarify the behavior.

As a general rule, the order of operations on Booleans begins at the lowest part of an object tree (that is, the youngest child object) and works its way up to the parent. If any other object in the tree is both a parent and a Boolean operator itself, then all of its children combine to form a single Boolean operator within the tree. Another way to consider this is that any object linked to a Boolean parent acts as a Boolean itself and does not render normally.

A simple example using a hierarchy is a negative cube that is linked to (and overlapping) a positive sphere. The result is a sphere with a cubical chunk removed. The graphic below illustrates this.

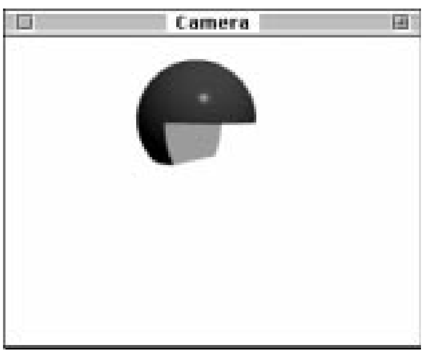


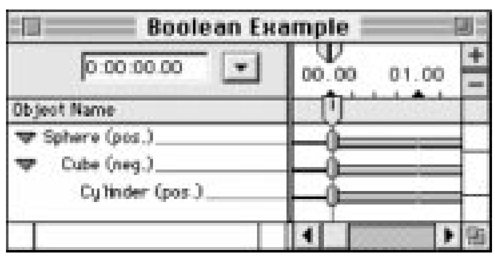


Adding more objects to the hierarchy provides five general classes of possible results. Look at each case with a cylinder added to the hierarchy.

Case 1

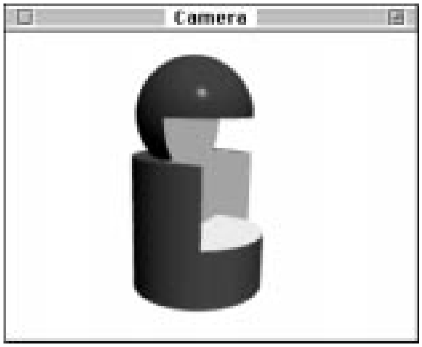
If the cylinder is a positive object and is linked to the cube (which is itself a child object of the sphere) , then it combines with the cube to make a single negative object. This compound negative object is subtracted from the sphere.

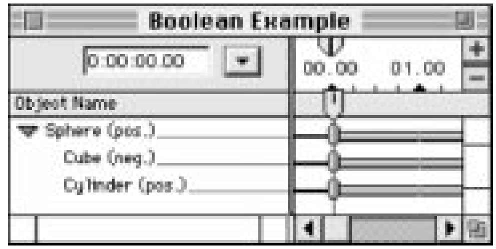




Case 2

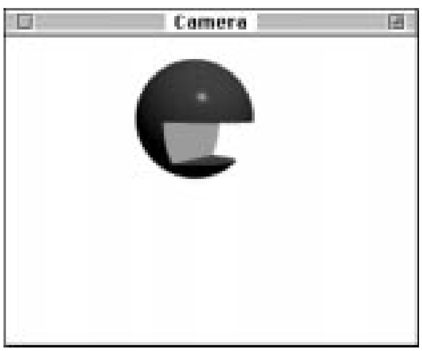
If the cylinder is a positive object and is linked to the sphere (the same parent that the cube is linked to) then the negative cube subtracts from both the sphere (its parent) and the cylinder (its sibling).

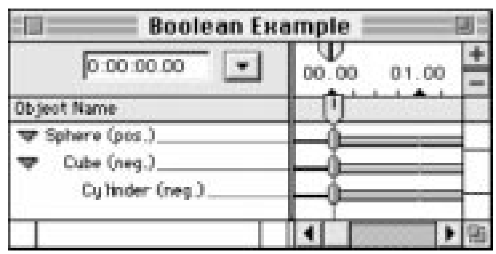




Case 3

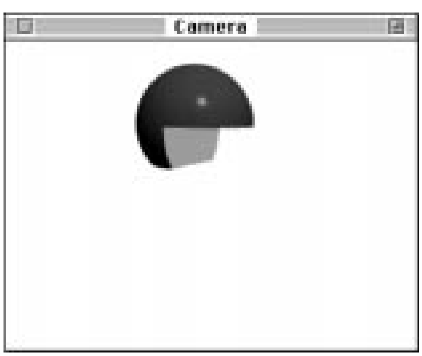
If the cylinder is a negative object and linked to the cube, then it first subtracts from the cube. The resulting object then subtracts from the sphere.

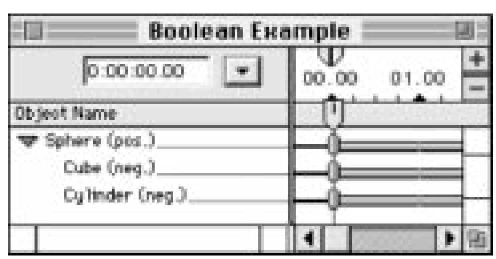




Case 4

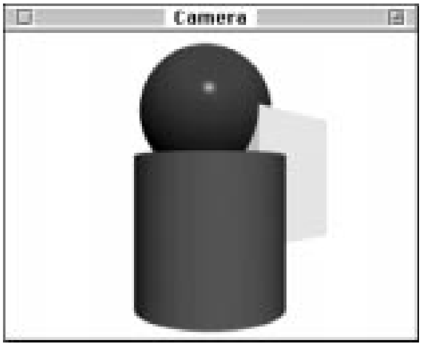
If the cylinder is negative and linked to the sphere (making it a sibling of the cube) then both objects subtract from the sphere individually.

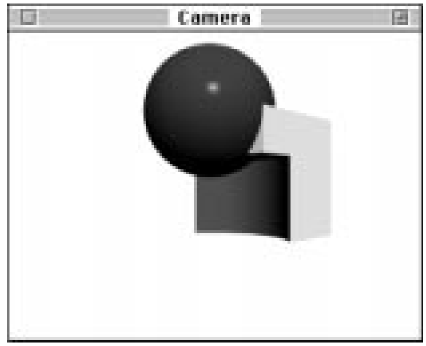




Case 5.

This example modifies the original hierarchy by making the cube a positive object. This demonstrates that a Boolean operator affects its direct parent, but not any of the grandparents. If the cylinder is a negative object and linked to the cube, then only the cube is affected. The sphere (grandparent) is unaffected.





Boolean Tips

Keep in mind the following as you apply Booleans.

- All of the cases above illustrate that an object that has a negative or intersection object above it in a hierarchy (parent, grandparent, etc.) will never render normally—that is, it will always be part of a Boolean operator.
- If an object is a Boolean operator but is not a child in a hierarchy, it becomes a "global" Boolean operator. This means that it, and all of its children, will subtract from or intersect with any object which it overlaps.
- Note that in the case of "global" intersection objects, there will never be anything visible unless the intersection object overlaps another object.

LIMITATIONS OF BOOLEANS

This section describes some objects and effects that do not behave well when used with Booleans. Any object can be designated as a Boolean operator or acted upon by a Boolean operator, although some objects may produce undesired results. These include:

- Objects which do not have a well-defined inside and outside can be particularly troublesome. These include squares, planes, terrain objects, some imported DXF or 3DMF objects, complex SplineForm objects that have overlapping paths and rails, and objects that do not have closed cross sections.
- Particles do not recognize Boolean effects for collisions. See *Chapter 7: Other 3D Object Types* for more information.

- Boolean objects do not cast soft shadows as expected. Negative objects will still cast a shadow. To use shadows with Boolean objects, use sharp shadows. See *Chapter 16: Working with Lights* for more information.
- Visible light rays do not interact with Boolean objects as expected. That is, if you have an object that has a hole cut out with a boolean, light rays will not be seen through the hole.
- Objects without endcaps do not work well as Boolean objects. For best results, turn end caps on.

Section 4

Surfaces & Textures

With the objects in your scene modeled the way you want them, you are ready to add surfaces and textures to these objects. Surfaces are like the glaze applied by a potter to a new bowl. The surface, like the glaze, determines how the finished object looks and provides object realism and character. Infini-D provides a great deal of flexibility and control when creating and editing surfaces.

You create and edit surfaces independently of objects and Infini-D treats surfaces and objects as separate entities. Applying a new surface to an object does not affect the shape or dimensions of an object. Conversely, when you edit a surface, the edited surface replaces the previous surface globally on every object to which you have applied that surface across all points in time.

You select surfaces from the Surfaces command tab in the Command Floater. Infini-D includes an extensive collection of predefined surfaces such as metal, crystal, wood, clouds and marble. You can use these as is, alter them to make new surfaces or create entirely new surfaces from scratch. Infini-D adds each new surface you create to the appropriate tab: procedural surfaces in the Basic tab, imported surfaces (also known as texture maps) in the Texture tab and composed surfaces in the Composed tab. (These terms are defined further in *Chapter 15: Working with Surfaces*.)

Note: If you are unfamiliar with the Surfaces command tab, see Chapter 4: The Infini-D Interface for more information.

Section 4 covers the following topics:

- Surfaces and Texture Maps
- Surface Composition

Chapter

14

Surfaces & Texture Maps

This chapter explains how to work with surfaces in Infini-D. Surfaces fall into three categories.

- **Procedural Surfaces**—Procedural surfaces get their surface color properties algorithmically. Procedural surfaces are three-dimensional; instead of wrapping around an object, they actually run *through* it, allowing you to create very realistic models. Woods and marbles are two examples. Infini-D displays procedural surfaces in the **Basic** tab.
- **Texture Maps**—Texture maps are two-dimensional images that Infini-D maps onto objects using a variety of techniques. You may create a texture map in another 2D drawing program or scan an existing image to use as a texture map. Since they are two-dimensional, Infini-D wraps texture maps around a three-dimensional shape in the same way you would wrap a gift with wrapping paper. Infini-D stores texture maps that you use in your scene in the **Textures** tab.
- **Composed Surfaces**—These are surfaces you create from more than one surface type. Infini-D stores composed surfaces that you use in your scene in the **Composed** tab

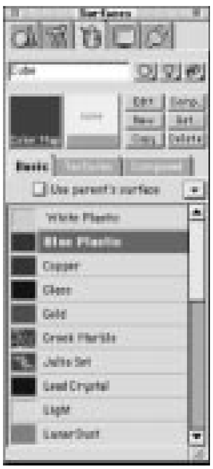
Note: See Chapter 15: Surface Composition for more information on composed surfaces.

Note

Select the surface type that suits your needs. If you are not happy with the resulting surface, you can edit surface properties or you can create an entirely new surface from scratch. You can also import an existing image or texture to use as a surface. As you create new surfaces, you may want to organize them in Surface Libraries. This provides a convenient way to create groups of surfaces for different types of projects.

This chapter covers the following topics:

- The Surfaces Tab of the Command Floater
- Selecting a Surface
- Editing a Standard Surface
- Creating a New Surface
- Duplicating a Surface
- Importing an Image File
- Deleting a Surface
- Working with Surface Libraries



THE COMMAND FLOATER SURFACE TAB

This section explains the displays and controls on the Surface tab. The Surface tab provides a list of all the surfaces available in the current scene and controls for editing surfaces and creating or importing new surfaces. The various parts of the Surface tab are described below.

- **Color Swatch:** Shows the color map method used for the selected surface, eg: Marble, Wood, or Color Map. If the selected surface is an imported image, this swatch will display “Image”. If the selected surface is a composed surface, this swatch will display “Composed”.
- **Effect Swatch:** Shows the surface effect for the selected surface, if any, eg: Bump, Wave, Noise. If the selected surface is an imported image or a composed surface, it is blank.
- **Basic, Textures, Composed:** These tabs switch the displayed list between the three types of surfaces.
- **Edit:** Opens the appropriate editing environment for the selected surface. If a procedural (Basic) surface is selected, the Surface Info dialog will open. If an imported image is selected, the Image Info dialog will open. If a composed surface is selected, the Compose Surface dialog will open.
- **New:** Creates a new, default procedural surface and opens the Surface Info dialog.
- **Copy:** Creates a duplicate of the selected surface with a number added to the name.
- **Comp...:** Creates a new, default composed surface and opens the Compose Surface dialog.
- **Get...:** Opens the Image Info and Import Image dialogs for loading a new image into the scene.
- **Delete:** Permanently deletes the selected surface from the scene. A warning dialog will ask for confirmation of the deletion.

SELECTING A SURFACE

This section explains how to select and apply a surface onto an object. When you want to apply a surface, you select the Surfaces command tab in the Command Floater and make a selection from the list of surfaces. Infini-D displays the list of all surfaces in the Default Surface Library along with any surfaces that have been created and added to the current scene.

Follow these steps to select a surface:

Step 1: Select an object in your scene.

Step 2: Click on the **Surfaces** command tab in the Command Floater and a list of surfaces appears.

Step 3: Scroll through the list until you locate the surface you want.

Step 4: Double-click on the surface to apply it to your object.

or

Drag the desired surface from the list and drop it onto the object. (Note that with this method, you do not have to select the object beforehand.)

EDITING A SURFACE

This section explains how to edit an existing surface. You may want to change the properties of a procedural surface. For example, you may want to increase the glow or decrease the specular highlighting. Infini-D gives you control over these and a variety of other surface properties in the Surface Info dialog box.

It is important to understand that a change to a surface property applies to *all* objects in your scene that use that surface—not just to an individual object. If you wish to apply a unique surface to a given object, you either duplicate an existing surface or create a new surface as explained in *Creating a New Surface* later in this chapter.

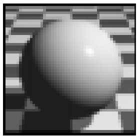
This section also explains how to edit the surface color map and surface effect.

Follow these steps to edit a surface:

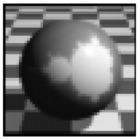
Step 1: Click on the **Surfaces** command tab in the Command Floater.

Step 2: Click on the surface you wish to edit.

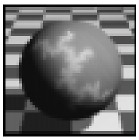
Step 3: Click on the **Edit** button in the Surfaces button bar and the Surface Info dialog box opens.



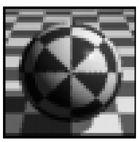
Flat Color



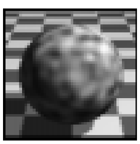
Mandlebrot



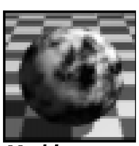
Julia



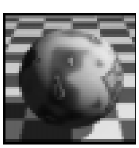
Tile



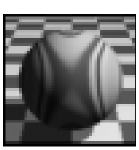
Noise



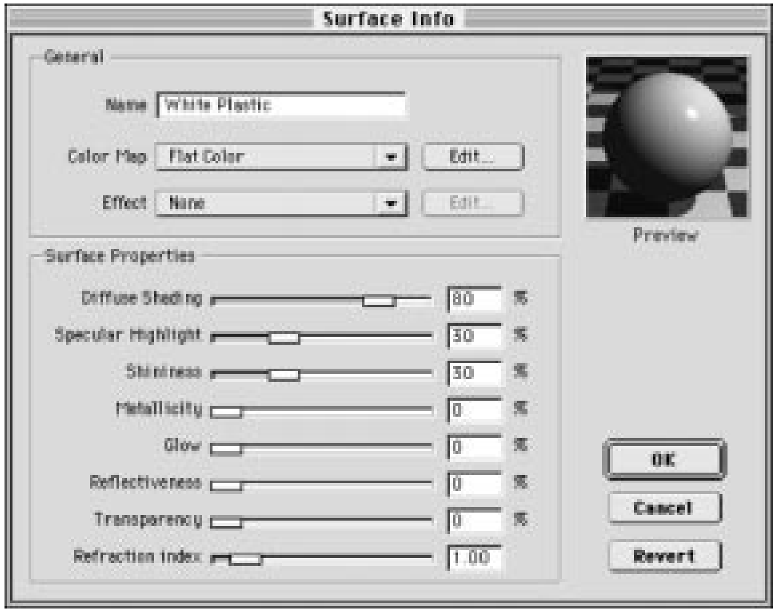
Marble



Wood



Natural Wood



*Note: You can also access this dialog box through the Surface Library as explained in **Working with Surface Libraries** later in this chapter.*

Step 4: From this dialog box, you can edit any of the surface properties and view the changes in the Preview box. If you are unhappy with the results of your changes, click on the **Revert** button and the surface reverts to its original settings.

Remember, if you selected a default surface, you are changing the properties for all objects to which you have applied this surface and all future objects. If you would rather keep the original surface intact, see *Duplicating Surfaces* later in this chapter for information on how to create a duplicate surface before editing it.

Each property in this dialog box is defined below:

- **Name**—This field lists the current name. You can change the name by typing in a new one. If this is the original surface, the old name will no longer appear in the list of surfaces.
- **Color Map**—The color map determines the general look of the surface. By changing this, you change the very essence of the surface. Make a selection from the **Color Map** pop-up list. You can edit a color map by clicking on the **Edit** button next to this field. See *Editing Color Maps* in the section that follows for more information.

  Your choices are described below:

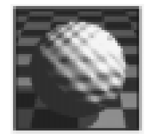
  - *Flat Color*: Creates a simple colored surfaces such as blue or red plastic.
  - *Mandlebrot Map*:- Creates a colorful rendition of the Mandlebrot set

fractal pattern.

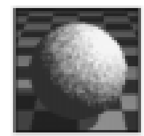
- *Julia Map*: Creates a colorful rendition of the Julia Set fractal pattern.
- *Tile Map*: Creates tile effect by alternating two “basic” surfaces. You can customize these tile shapes.
- *Noise Map*: Creates a surface with a colorful, mathematically-defined random pattern.
- *Marble Map*: Creates a 3D marble surface.
- *Wood Map*: Creates a 3D wood surface that resembles wood veneer.
- *Natural Wood Map*: Creates a more natural looking 3D wood surface.

• **Effect**—In addition to the color map, you can apply an effect to your surface by making a selection from this pop-up list. As with color maps, you can edit effects as explained in *Editing Surface Effects* later in this chapter.

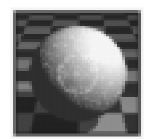
Your choices are described below.


Wave

Wave Map: Applies one or more sine waves to the surface to simulate a liquid surface.


Bump

Bump Map: Applies bumps to the surface to give a rough appearance.


Corrosion

Corrosion Map: Applies effects to the surface to make it appear corroded or pitted.

• **Surface Properties**—Surface properties determine how the surface reacts to light. You can change the property by moving the slider backward or forward or entering a number directly into the space provided. All but Refraction Index are measured in percentage. Each property is defined below.

- *Diffuse Shading* : This property describes what happens when light hits the surface and scatters uniformly so that the whole surface illuminates equally. If you select 100% diffuse shading, when a light shines upon an object with this surface, it will appear smoothly shaded: brightest in the direction of the light source, while completely in shadow opposite the light source.

  The lower you set the percentage for diffuse shading, the less illuminated the object appears. If you select a diffuse shading level of zero, for example, objects with this surface would appear mostly black when you render them (although they could still have reflective-like properties in the form of a specular highlight or true mirror-like reflection—both described below).

- *Specular Highlight*: This property controls the brightness of the surface's specular highlighting. You often see a specular highlight as a small, round, white spot reflected from a shiny object at the point on the object which is closest to the light. It is essentially a distorted reflection of the light source itself.

  Although specular highlight is a very subtle detail, it provides a strong sense of photo-realism and the object's environment. For example, if you see an object with a very bright specular highlight, you could immediately determine that the object is smooth rather than rough.

- *Shininess*: This property determines how shiny the surface appears by altering the size of its specular highlight. A large specular highlight makes an object with this surface appear out of focus or less shiny, while a small specular highlight makes an object with this surface appear sharp and distinct or more shiny.

  The number representing the level of shininess indicates to what extent the Shininess feature is sharpening the specular highlight. A value of 100% means that the specular highlight is reduced as much as it can be to create a sharp edge, while a value of 0% means that the size of the specular highlight is extremely large and diffuse on the object.

- *Metallicity:* This property controls how the specular highlight inherits the color of the object, rather than the color of the light source. Typically, specular highlights appear white in the real world because lights are most often white. Metallic surfaces such as copper, gold and silver; however, have specular highlights that are the same color as the surface. The more closely a specular highlight approximates the color of the surface, the more metallic it appears.

- *Glow*: This property controls how much internal glow an object with this surface has without actually giving off light. When you give an object Glow, it appears to have a light inside it. If you want to model a light bulb, for instance, you would create a glass bulb, then give it a high Glow percentage.

- *Reflectiveness*: This property controls how much an object reflects adjacent objects. As the percentage of Reflectiveness increases, so does the surface reflection. Specular Highlight and Shininess have no affect on Reflectiveness since these controls affect only the specular highlight itself. Reflectiveness, on the other hand, acts on the entire surface. You can only achieve true reflection when using Phong Shading or Ray Tracing as the rendering mode, though you can simulate reflectivity in other shading modes using an environment map. See *Chapter 25: Advanced Rendering* for more information.

- *Transparency*: This property controls the transparency of an object. The higher the transparency value, the more you can see through the object. Note that a transparent object can still have color—for instance, a green bottle—and it can also have other surface attributes objects such as a metallic nature, surface maps, etc. that you may not normally associate with Transparency.
- *Refraction Index*: This property controls how an object with this surface refracts light. If your object is at all transparent, then you can use the Refraction Index to control how much the light bends as it passes through the object. A crystal ball, for instance, is transparent, but light bends as it passes through it. Thus the crystal ball would have a high percentage of Transparency along with a moderately high Refraction Index.

  Refraction Index values in Infini-D correlate exactly with real-world index of refraction values, so you can look up these values in a physics text book that lists such values. See Appendix B for a list of common Refraction Index values.

Rendering transparency without refraction is considerably faster than rendering transparency with refraction. If the scene does not require refraction, you should consider giving your transparent surfaces a refraction index of 1 to improve rendering performance.

Note

Step 5: When you are finished editing your surface, click on **OK** to save the changes. If you decide to exit without saving, click on **Cancel**.

Editing Color Maps

This section explains how to edit color maps in the Surface Info dialog box. When you select a color map from the Color Map pop-up list, you have the option of editing the properties of the color map, much in the same way you edit the surface properties as a whole.

Follow these steps to edit a color map:

Step 1: Access the Surface Info dialog box as explained in the previous section.

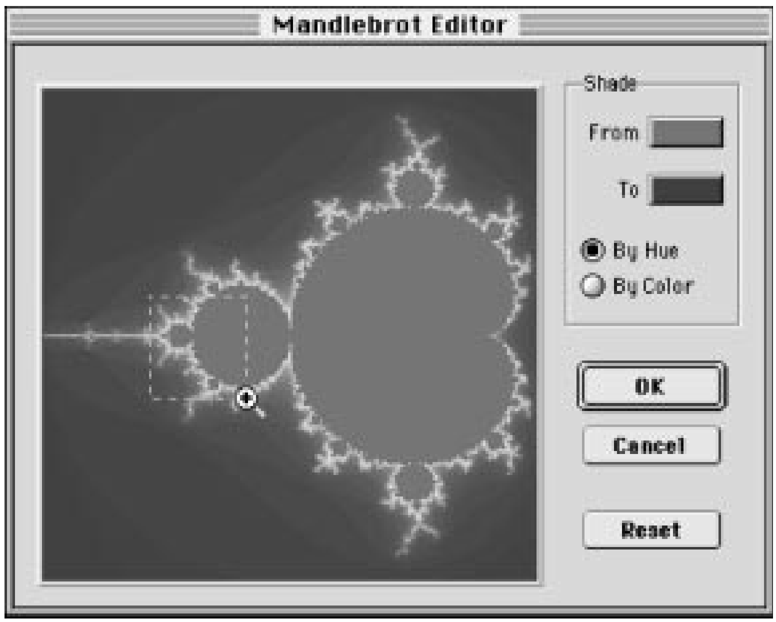
Step 2: Select a Color Map from the **Color Map** pop-up list, then click on the **Edit** button adjacent to the Color Map field to customize the effect. Each type of color map has its own editing controls. The sections that follow explain how to edit each one.

Editing a Flat Color Map

When you edit a flat color map, you access the standard Macintosh or Windows color picker. Select a new color or enter the values in the various fields. If you are not familiar with the color picker for your operating system, see your system documentation for details.

Editing a Mandlebrot Map

The Mandlebrot Map uses the Mandlebrot set to mathematically generate a fractal pattern that has a contour of infinite complexity. The closer you zoom in to look at the image, the more detail you see. This is similar to looking at a jagged coastline from high above in that the lower you move, the more detail you see. By the same token, as you zoom into the Mandlebrot image, you see the original shape of the Mandlebrot set occurring over and over in increasingly smaller versions. This phenomenon is called self-similarity, and it is part of what makes the Mandlebrot map so visually interesting. The Mandlebrot and Julia Set surfaces provide a great way to create colorful patterns for your objects.



Use the Mandlebrot Set dialog box to control the look of the Mandlebrot set. Keep in mind, if you don't like the changes you make, click on the **Reset** button to return the image to its original state.

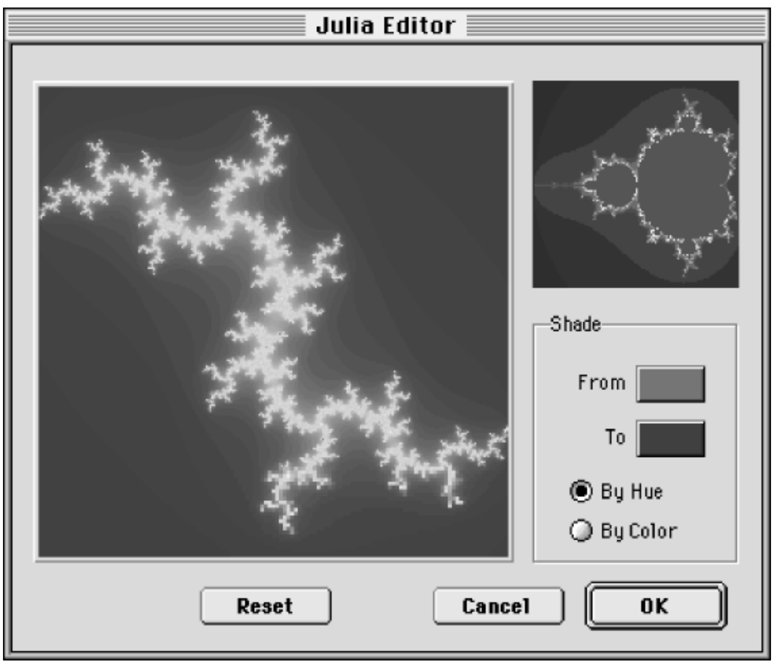
The Mandlebrot set controls are defined briefly below:

- **Zoom in/out**—By default the cursor becomes a magnifying tool when you move it over the Mandlebrot map. You can do the following:
    - Click on the image to zoom in.
    - Click and drag a marquee over any portion of the image to zoom into the chosen area.
    - Press OPTION (Mac) or ALT (Win) while clicking to zoom out. Notice that the symbol on the cursor changes to a minus (-) sign.
- **Shade**—Click on either the From or To swatch to access a Macintosh or Windows color picker where you can alter these colors.

- **Blend by Color or Hue**—Click on the radio button next to the selection you wish to use for this Mandlebrot set. Your choices are described below.
    - By Color: Infini-D blends from one color into the next by using the most direct path in the Color Picker. It only uses the colors that lie directly between the starting and ending colors when shading from one color to the other. This direct path if drawn on the color wheel would be a straight line between the starting and ending color.
    - By Hue - Infini-D blends the colors by beginning at the starting color and rotating counter-clockwise around the color wheel until it reaches the ending color. Blending by hue creates a Mandlebrot map that includes a greater variety of colors, although the starting and ending colors will be the most prominent colors in the image.

Editing a Julia Map

The Julia Map is a mathematically-generated fractal pattern based on the Mandlebrot set. Since Infini-D calculates the Julia Map based on the Mandlebrot map, you have the option of choosing the point on the Mandlebrot map where the Julia Map calculation starts. You generate very different images by changing the starting point.

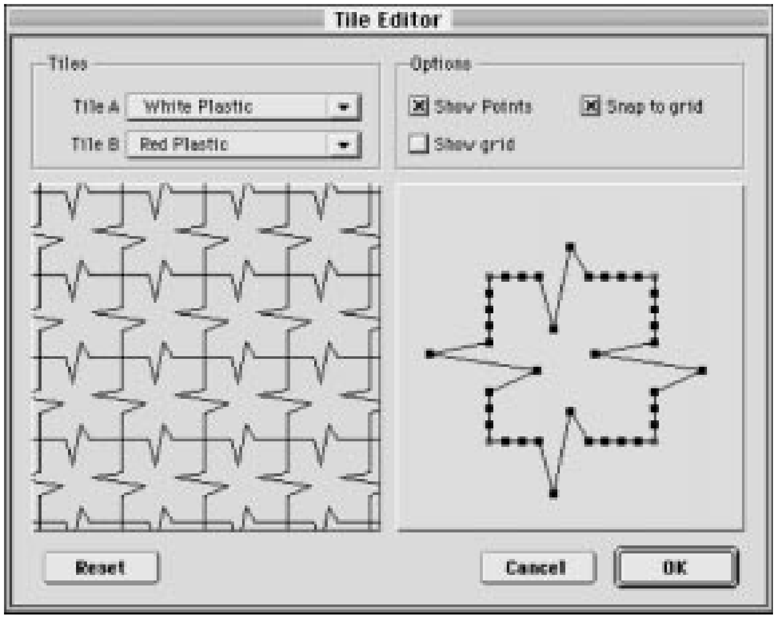


Infini-D displays an image of the Mandlebrot set in the upper right-hand corner of the Julia Map Editor. To adjust the Julia Set generation point, drag the Selector Dot to any point on the Mandlebrot image. You can generate the most interesting effects by moving the generation point to the colorful edge of the Mandlebrot Set.

The remaining controls in the Julia Set dialog box work exactly as described in *Editing a Mandlebrot Map* in the previous section.

Editing a Tile Map

The Tile Map automatically creates a surface comprised of alternating square tiles. Use the Tile Map Editor to change the look of these tiles and also to edit the tile contours to create a variety of complex interlocking surface types.



Follow these steps to edit a tile map:

Step 1: Select a surface for each tile—A or B—from the appropriate pop-up list. Infini-D incorporates all of the surface properties for each of the surfaces you select. This allows you to use tiles with different properties for each tile type. For example, you could have one tile that is reflective and another that is transparent.

Step 2: Drag any point in the grid to change the tile contour. As you do so, the Preview window to the left of the grid updates to reflect your changes. If you want to discard your changes and work on the original again, click on **Reset** and the tile reverts to its original settings. There are three check boxes above the grid which affect your work here. Note that they are all checked by default.

These are described below:

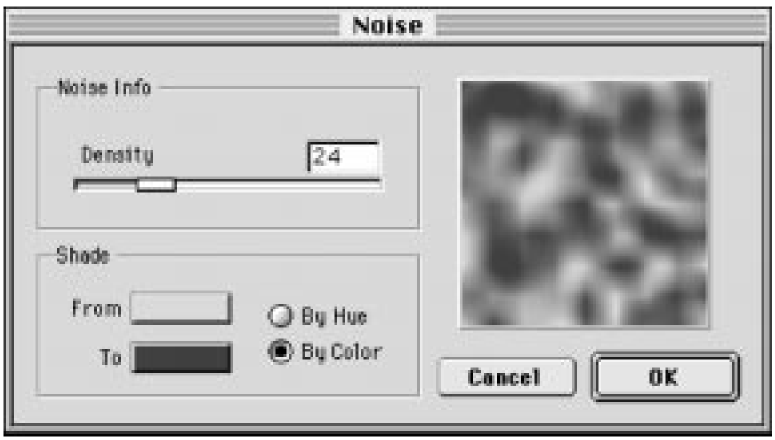
- **Show Points**: Check this box to see the points on the grid. If you wish to hide the points, uncheck it.
- **Show Grid**: Check this box to see the grid. If you wish to hide the grid, uncheck it.

- **Snap to Grid**: Check this box to precisely position tile points. This makes it impossible to place a tile point between increments, since the points line up precisely with the tile grid.

Step 3: When you are finished editing the tile, click on **OK** to save your changes. Click on **Cancel** to exit without saving.

Editing a Noise Map

Noise is a mathematically-defined pattern that employs a certain amount of randomness to generate chaotic patterns between two colors. Use the Noise dialog box to create a variety of abstract surface patterns. Noise maps help to create surfaces which appear gritty or dirty.

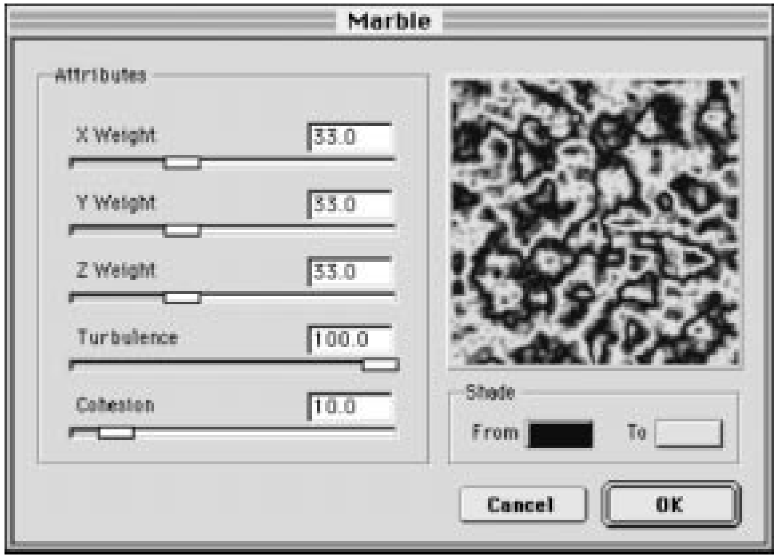


You can control the density of the noise by dragging the **Density** slider or entering a number in the adjacent field in the Noise dialog box. The higher the number, the denser the noise level.

The remaining controls in the Noise dialog box work exactly as described in *Editing a Mandlebrot Map* earlier in this chapter.

Editing a Marble Map

The Marble Map is a mathematically-defined pattern that generates colors and shapes similar to some types of marble. The settings in the Marble dialog box control the look of the marble surface.

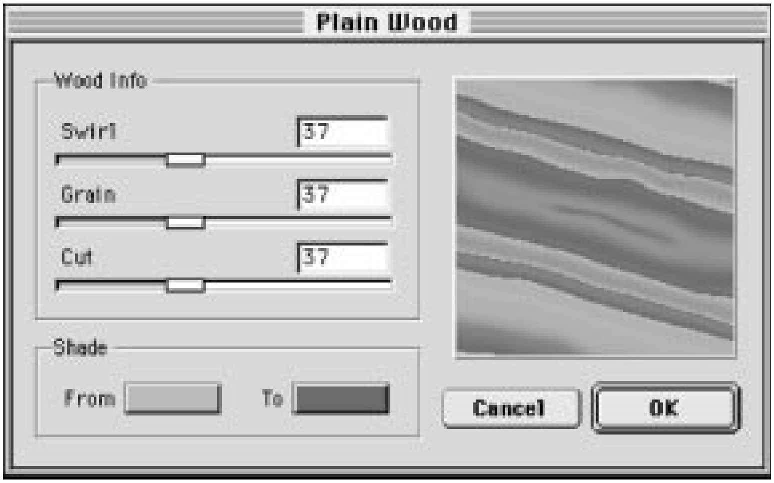


You alter the look of the marble by dragging each slider control in the Marble dialog box. These controls are described below.

- **Weights**— X weight, Y weight, and Z weight determine the relative height, width, and depth of shading emphasis for the marble. Increasing the X weight, for example, makes the marble colors appear more dominant along the X axis.
- **Turbulence**—Turbulence affects how Infini-D shades starting and ending colors across the entire marble surface. A low turbulence value creates a surface that gradually blends from light to dark across the entire surface, while a high turbulence value causes sharply mixed starting and ending colors.
- **Cohesion**— Cohesion determines the size of the marble pattern and the integrity of its veins. A high cohesion value produces a surface with a broad pattern and large veins, while a low cohesion value creates a more intricate and detailed surface.
- **Shade**— Click on either the From or To swatch to access a Macintosh or Windows color picker where you can alter these colors

Editing Plain Wood map

The Plain Wood Map is a mathematically-defined pattern that combines two colors in a variety of ways to simulate wood veneer, rather than a more naturally cut piece of wood.

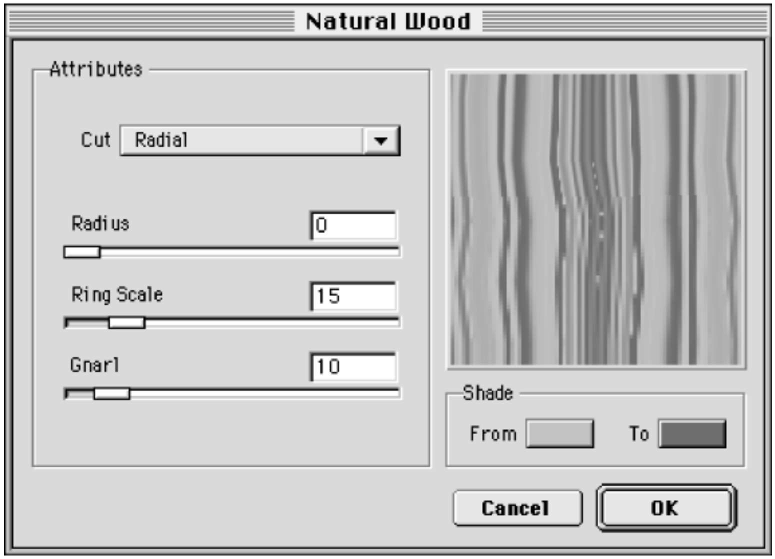


The Wood dialog box includes controls for editing Swirl, Grain, and Cut. These controls are similar to the X, Y, and Z weight controls in the Marble dialog box described earlier in this chapter. Change the characteristics of the wood grain by dragging the slider or entering a value in the field adjacent to each setting. The From and To color swatches control the colors used to generate the wood grain pattern.

Note: Try using values of 33 for each of the wood parameters to achieve a relatively straight wood grain.

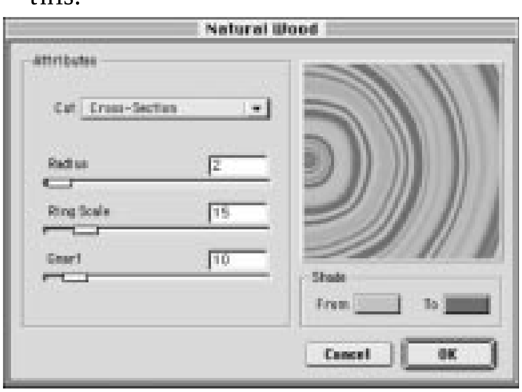
Editing Natural Wood

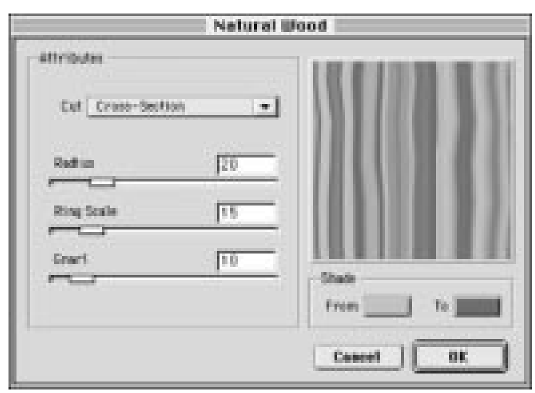
This function works in the same way as Plain Wood described in the previous section, but offers different settings that provide more realistic looking wood surfaces



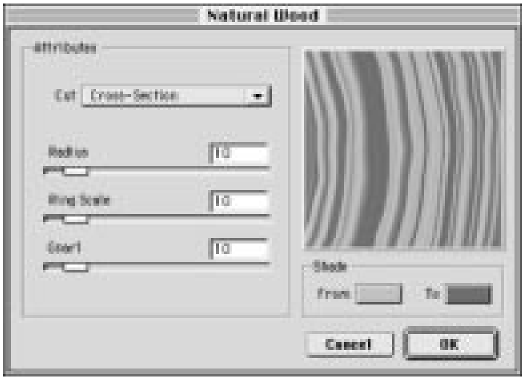
The settings in the Natural Wood dialog box are described below:

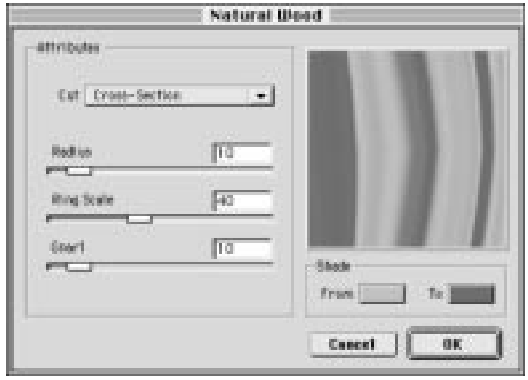
- **Cut**—Select the type of cut you want for your wood from this pop-up list. When Infini-D applies the surface to an object, the cut setting determines the direction of the rings. Your choices include:
    - Radial: The result of cutting along the length of the wood, but 90° from Tangential. Radial and Tangential cuts often look similar.
    - Tangential: The result of cutting along the length of the log.
    - Cross-section: The result of cutting the log straight across and looking at its end.
- **Radius**—This setting controls the distance of the pattern from the center of the log. A radius of zero places your wood sample at the exact center of the trunk of the tree, while a radius of 100 places it farthest from the center. The graphics below illustrate this:



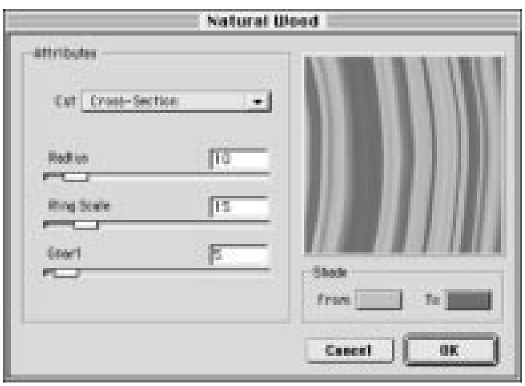


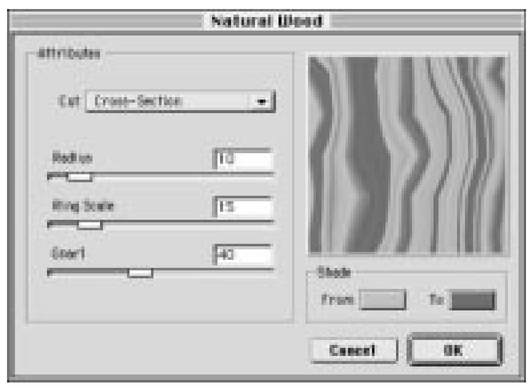
• **Ring Scale**—This setting determines the spacing of the rings in the tree. A low ring scale setting results in many rings spaced closely together, while a high setting produces fewer rings spread out over a greater distance. The graphics below illustrate this:





• **Gnarl**—This setting determines how much the rings are deformed. This approximates real wood in which the circles of the rings are not perfectly formed. A gnarl setting of zero indicates no gnarl effect, while a gnarl setting of 100 resembles an extremely knotted wood pattern. Lower gnarl settings result in more realistic looking wood. The graphics below illustrate this:





• **Shade—**The From and To color swatches control the colors used to generate the wood grain pattern.

Editing Surface Effects

This section explains how to edit the surface special effects you select in the **Effect** pop-up menu of the Surface Info dialog box. Surface special effects give an object's surface the appearance of having undergone a three-dimensional change. Infini-D provides three special effects: Wave Map, Bump Map, and Corrosion Map.

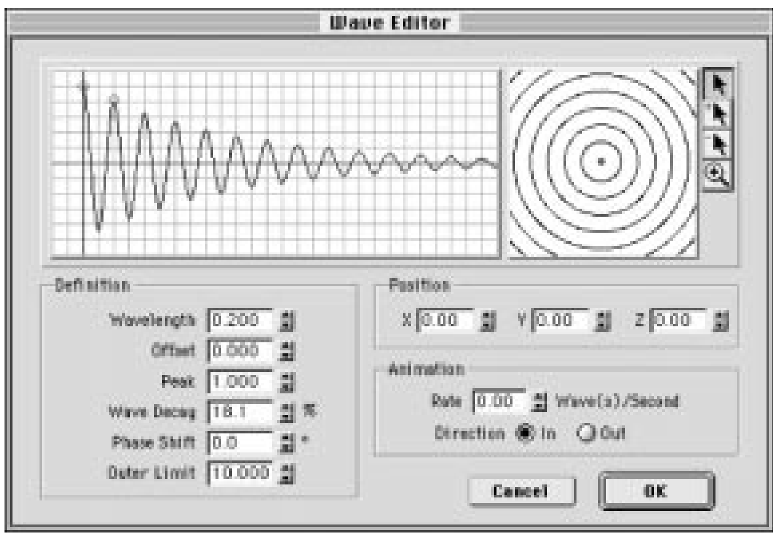
Though these special effects give the illusion of a change in a 3D shape, they do not actually change an object's geometry. If, for example, you apply a water ripple to a 2D square and view the 2D square edge-on, it would appear completely flat.

Follow these steps to edit a surface effect:

Step 1: Access the Surface Info dialog box as explained earlier.

Step 2: Select an Effect from the **Effect** pop-up list, then click on the **Edit** button adjacent to this field to customize it. Each type of effect has its own editing controls. The sections that follow explain how to edit each one.

Editing a Wave Effect



The wave surface effect produces the effect of a rippling liquid surface. You can control the characteristics of the ripple effect by entering numbers to adjust the various parameters or by adjusting the waveform and wave center graphically. The side view on the left hand side of the dialog shows a graphical representation of the selected waveform, with handles for adjusting wavelength, peak, decay, and offset. The top view on the right shows the relative positions of the wave emitters.

You can control the number of waves that are in a ripple effect and individually control the characteristics of each. Finally, you can adjust how each wave animates with the rate and direction controls. All the controls are defined below:

- **Adjusting Graphically**—Notice the two red editing handles in the Side View window. Drag these to change the wave; the numbers in the Definition section below it change accordingly. If you enter numbers directly into the Definition fields, waveform graphic changes accordingly Dragging the left hand control point adjusts the Peak (vertically) and Offset (horizontally). Dragging the right hand control point adjusts the Decay (vertically) and the Wavelength (horizontally).
- **Adjusting Numerically**—You can alter the wave by entering numbers in the Definition fields below the side view or top view areas. As you enter new numbers, the graphics change accordingly.
- **Adding Waves**—You can add wave emitters by clicking in the top view area with the **Add** tool (plus arrow). Select and re-position wave emitters with the **Move** tool (plain arrow).
- **Subtracting Waves**—You can subtract waves by selecting the **Subtract** tool (minus arrow) and clicking on the center point of any wave. You may have to use the **Zoom** tool (explained below) to see the center point.
- **Zooming In/Out**—Zoom into the top view of the wave by clicking on the **Magnify** tool, and then clicking in the top view area. Press the OPTION key (Mac) or ALT key (Win) while clicking to zoom out.
- **Positioning the Wave**—You can set the position of a wave emitter either numerically by entering numbers directly in the **X**, **Y** and **Z** position fields or using the Move tool (plain arrow).
- **Animating the Wave**—Animate the wave surface by entering a wave rate and choosing a direction (In or Out) for each emitter.

Editing a Bump Effect

A Bump Map creates surface roughness that makes surface detail stand out three-dimensionally. Select the density of the effect by dragging the **Density** slider in the Bump Map dialog box. You can also enter a number directly in the field adjacent to the slider. The higher the number, the more dense the effect.

Editing a Corrosion Map

A Corrosion Map creates surface roughness that makes surface detail look corroded or pitted. Select the density of the effect by dragging the **Density** slider in the Corrosion Map dialog box. You can also enter a number directly in the field adjacent to the slider. The higher the number, the more dense the effect.

CREATING A NEW SURFACE

This section explains how to create an entirely new surface. As you work with Infini-D, you may find you want to create surfaces other than those that come with the software. You can do this by accessing the Surface Info dialog box and selecting all the settings for your surface.

Remember that you can also duplicate an existing surface or import an image map to create a new surface. These functions are explained later in this chapter.

Follow these steps to create a new surface:

Step 1: Click on the **Surfaces** command tab in the Command Floater.

Step 2: Click on the **New** button in the Surfaces button bar and the Surface Info dialog box opens

Note

Note: You can also access this dialog box through the Surface Library as explained later in this chapter.

Step 3: Enter a meaningful name for the surface in the **Name** field.

Step 4: You can edit any of the surface properties from this dialog box and view your changes in the Preview box. If you are unhappy with the results of your changes, click on the **Revert** button and the surface reverts to its default settings.

This dialog box is described in detail in *Editing a Surface* above. If you want to edit a color map, See *Editing a Color Map*. If you want to edit an effect, see *Editing An Effect*.

Step 5: When you are finished creating your surface, click on **OK** to save it. Click on **Cancel** to exit without saving the surface.

DUPLICATING A SURFACE

This section explains how to duplicate a surface. This may be preferable to creating a surface from scratch when an existing surface includes many of the settings you want anyway. This also provides a way to create alternative surfaces while keeping the original surface intact.

Follow these steps to duplicate a surface:

Step 1: Click on the **Surfaces** command tab in the Command Floater.

Step 2: Click on the surface you wish to duplicate.

Step 3: Click on the **Copy** button in the Surfaces button bar and Infini-D creates a duplicate of the surface just below the original with the same name incremented by one. For example, if you copy Blue Plastic, Infini-D names the duplicate Blue Plastic 1. You can then edit this surface including the name as explained in *Editing a Surface* earlier in this chapter.

IMPORTING AN IMAGE MAP

Infini-D allows you to import any image file that is in either PICT, PICS or QuickTime Movie format on the Macintosh and AVI, QuickTime, PICT, TIFF, BMP, DIB, WMF, WPG, TGA, SD, PCX, and RAS on Windows. If, for instance, you are having problems generating a particular marble surface using the Marble Map Editor, you could digitize a real marble texture and save the digitized image as a PICT file. You could then import this image into Infini-D and apply it to an object.

Once you import the image, it appears in your list of surfaces and you can apply it to objects just as you would any other surface in Infini-D.

This section includes the following topics:

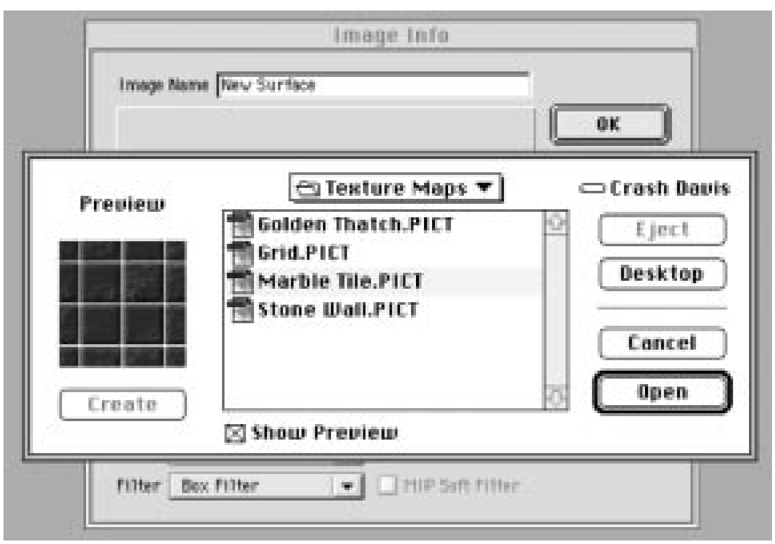
- Importing an Image
- Memory Management Issues and Image Maps

Importing an Image

This section explains how to import an image for use as a surface (or other purpose including as a gel, mask, background or environment). This works in the same fashion as any import in Infini-D.

Follow these steps to import an image as a surface:

Step 1: Click on the **Get** button in the Surfaces tab of the Command Floater.. The Image Info dialog box opens and a standard File/Open dialog box overlays it.



Step 2: Locate the file you wish to import and click on **Open**. You return to the Get Image dialog box and the file name appears in the **Image Name** field at the top of the dialog with a preview just below. If you are unhappy with the image you selected, you can return to the File/Open dialog box by

clicking on the **Load** button to the right of the Image Preview.

Step 3: If the image you load has an alpha channel, you can use the alpha information for masking effects in the Surface Composition dialog box described in *Chapter 15: Surface Composition*.

If you want Infini-D to use the alpha channel, select either Straight or Multiplied from the alpha channel pop-up list. Since Infini-D cannot automatically detect what kind of alpha channel your image uses, you must specify the type in order for the masking effects to work properly. If you don't know the image's alpha type, refer to the documentation that came with the graphics program in which it was created.

If you want Infini-D to ignore the alpha channel information, select **None** from the **Alpha Channel** pop-up menu.

Step 4: Select a filter from the **Filter** pop-up list. This determines the method how Infini-D uses to determine color at any given point on the object's surface. The choices provide varying degrees of accuracy and realism. Remember, the more realistic an image appears, the longer it will take to render. Your choices are described below:

- **Nearest Neighbor**—Select this filter for draft renderings when you want to get a quick idea of what the image looks like when applied as a surface. Note that this filter causes images to look quite jagged because there is no anti-aliasing, and animations are quite noisy. Still, this is effective for drafts because it is fast. This choice is available in any rendering mode.
- **Bilinear**—Select this method to smooth out jagged edges in still images. It works best when the on-screen size of the texture map, as it is applied onto an object, is not dramatically different from the original texture map. Note that with animation this method is better than Nearest Neighbor, but is still somewhat noisy. This choice is available in any rendering mode.
- **MIP Map**—Select this method to significantly reduce noise in animation, and aliasing in still images. Click on the Soft Setting check box and the filter favors pixels with a softer effect. Leave it unchecked and it favors pixels with a harder effect. This choice is available in shading modes only and is ideal for reducing flicker in animated textures that move horizontally or vertically.
- **Summed Area Table**—Select this method to deliver the highest quality mapping available in Infini-D. You pay a price for this quality, however, by increasing memory consumption, system resources and overall rendering time. This choice is available in shading modes only and is ideal for animated textures that tilt toward or away from the camera.

Step 5: Click on **OK** to import the image. Click on **Cancel** if you decide not to import the image at this time. If you click on OK, Infini-D displays the name of the imported image in the Textures tab. You can apply the imported image to an object as you would any other surface.

Importing a Movie File

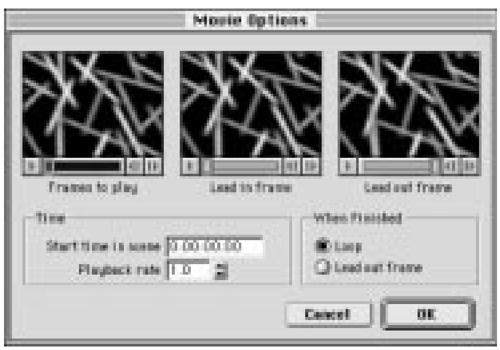
This section explains how to import movie files for use as surfaces (or other purposes including gels, masks, background or environment map). This works the same as importing an image described above. Simply use the Import command and choose the movie file to import. When importing a QuickTime movie, however, there is an additional set of controls which you can use to control how the movie plays in your scene. This is described below.

Note: QuickTime options do not control the behavior of your final Infini-D rendered animation. They affect only how the imported QuickTime movie behaves within your animation.

Follow these steps to import a QuickTime movie:

Step 1: Select a QuickTime movie file as explained in the previous section.

Step 2: Click on the **Options** button on the right side of the Image Info dialog box and the Movie Options dialog box opens.



Change the settings in this dialog box as needed. Your options are described below.

- **Frames to Play**—Select a range of frames by holding down the SHIFT key and dragging the controller. Infini-D will play only those frames in the selected range. The default is select all frames.
- **Lead in Frame**—If the imported movie does not start at the beginning of the Infini-D sequence, select the frame you want to display until the movie begins playing. The default is the first frame.
- **Lead Out Frame**— If the imported movie is not set to loop, this frame will be displayed after the movie plays through, until the end of the Infini-D sequence. The default is the last frame. The default is the last frame.
- **Start Time in Scene**—Enter the time you want the imported movie to begin playing.
- **Playback Rate**—Enter a time scaling factor to indicate the speed at which the imported movie plays. A value of 2.0 will play at twice the

speed (and finish in half the time); 0.5 will play at half the speed, taking twice as long to play. Negative values make the imported movie play in reverse.

- **When Finished**—Click on a radio button to indicate whether you want the movie to loop (play continuously) or display the Lead Out Frame when the movie finishes playing.

Step 3: Click on **OK** to save your settings. Click on **Cancel** to exit without saving the settings.

Memory Issues and Importing Images

It is important to keep in mind that imported images use additional memory. For the most efficient use of memory, use images that are square and have dimensions that are an even power of two (in pixels)—128x128, 256x256, etc. Also, be aware of how large the texture map will be displayed in the final render. For example, if your final rendered frame size is going to be 720x486 pixels, and the object using an image map only ever appears half as large as the frame, using an imported image that is 1,024x1,024 pixels would be wasteful—512x512 pixels would suffice. In addition, keep in mind that MIP mapping and Summed Area Tables require more memory than Nearest Neighbor or Bilinear.

Infini-D employs a virtual memory management system for handling large images. It is important to have sufficient hard disk space available for Infini-D to use as a scratch disk. As an example, a 1024x1024 pixel image can require as much as 8 megabytes of disk space. Infini-D saves virtual memory files by default to the same folder as the currently active scene file. If you have not yet saved the scene file, then Infini-D saves these files in the same folder as the Infini-D application. You can specify which drive should be used as a scratch disk in the Preference dialog.

DELETING A SURFACE

This section explains how to delete a surface from the scene. You can do this in the Surfaces command tab or from the Surface Library explained in the next section. The default White Plastic surface can not be deleted. Follow these steps to delete a surface:

Step 1: Click on the **Surfaces** command tab in the Command Floater.

Step 2: Click on the surface you wish to delete.

Step 3: Click on the **Delete** button in the Surfaces button bar and Infini-D prompts you with a dialog box to be sure your are certain you wish to delete the surface.

Tip! Press OPTION (Mac) or ALT (Win) while clicking on the Delete button to delete without a prompt dialog box.

Step 4: Click on **OK** to delete the surface and Infini-D erases it from the list. Click on **Cancel** if you decide not to delete the surface.

WORKING WITH SURFACE LIBRARIES

The Surface Library dialog allows you to view all the surfaces in the current scene and open, edit and save custom surface libraries that can be used with any scene. These libraries allow you to create surface collections you can organize in any way—by project, by category, etc..

To access the Surface Library dialog box, click on **Edit** in the menu bar and select **Surface Library**.

The dialog box and its commands are described below:

- **Scene List**: When you access this dialog, all the surfaces in the current scene are listed here—this includes procedural, imported and composed surfaces. Click on a surface to see a preview of it in the preview window.
- **Surface Preview Area:** A sample object is rendered here with the selected surface.
- **Library List:** If a surface library is open, its contents will be listed here. If no library has been opened, this list will be empty.
- **Open Library** (changes to Close when a library is open)—Click on this button to open a surface library from a standard File/Open dialog box. You can open an existing library including the standard surface library that comes with Infini-D, or you can create an entirely new library as explained below:
  - Click on the **Open Library** button and a standard File/Open dialog box appears.
  - If you want to open the default surface library (this is the library that is used to generate the default surface list in a new scene), locate it in the Infini-D folder (Mac) or in the Infini-D Program Files folder (Win). See *The Default Surface Library* in the next section for more information.

- If you want to open a library you saved previously, locate it and open it.
- If you want to create a new surface library, click on the **New** button in the Open File dialog box. Infini-D creates an empty Surface Library to which you can add surfaces from the current scene with the **Copy** button explained below.

- **Close** (changes to Open Library when no library is open)—Click on this button when you are finished working with a surface library file. If you made any changes to the library, Infini-D prompts you to save the file before closing.
- **Copy**—Click on a surface name or names, then click on this button to copy them from one library to another. The surface you selected is copied to the opposite surface list.
- **Edit**—Click on this button to access the Surface Info, Image Info, or Compose Surface dialog box (depending on the type of surface selected).
- **Rename**—Click on a surface name, then click on this button. A dialog box opens where you can enter a new name for the chosen surface.
- **Duplicate**—Click on a surface name, then click on this button to create a copy of the surface. This works in the same way as described in *Duplicating a Surface* earlier in this chapter.
- **Delete—**Click on a surface name, then click on this button to delete a surface. Note that you cannot delete white plastic. Also, if you delete a surface which is in use, all objects that had that surface applied will revert to white plastic.
- **Select Unused**—Click on this button to select any surfaces that have not been applied to an object in the current scene. This is useful for quickly removing unwanted surfaces and cleaning up the surface list. Click on the **Delete** button to remove the unused surfaces from the Surface Library.
- **Get Image**—Click on this button to import an image. This works in exactly the same fashion as described in *Importing an Image* earlier in this chapter.
- **Done**—Click on this button to exit. If you made changes, Infini-D prompts you to save your changes before exiting.

The Default Surface Library

When you create a new scene in Infini-D, the scene contains a default list of predefined surfaces. Infini-D finds this list in one of two places.

The program first checks for the Default Surface Library. This is a surface library file that resides in the Infini-D Folder (Mac) or in the Infini-D Program Files folder (Win). You can customize the Default Surface Library using the Surface Library dialog box described above. In this way, you can create your own standard set of surfaces, which will appear in the Surfaces command tab in every new scene.

If Infini-D cannot locate the Default Surface Library file, it instead generates a predetermined list of surfaces on its own.

It is important to understand the distinction between custom surface library files and the surface list for the current scene. When you open a new scene, Infini-D copies the contents of the Default Surface Library into the surface list of the new scene. These appear in the Surfaces command tab. When you manipulate the surface list on the left side of the Surface Library you are modifying the surface list for that scene only. The standard list that comes with the program remains unchanged.

If you wish to modify the Default Surface Library itself, follow these steps:

Step 1: Create a surface that you wish to copy into the Default Surface Library for regular use.

Step 2: Click on **Edit** in the menu bar and select **Surface Library**. The Surface Library dialog box opens.

Step 3: Click on the **Open Library** button and a standard File/Open dialog box appears.

Step 4: Locate the Default Surface Library file on your hard drive and click **Open**. If no default surface library exists, click on **New** to create a new surface library. Be sure to save it exactly under the name Default Surface Library in the Infini-D folder (Mac) or Infini-D Program Files folder (Win).

Step 5: Select the desired surface from the list on the left-hand side of the dialog box.

Step 6: Click on the **Copy** button to copy the surface from the Scene Surface list on the left to the Default Surface Library on the right.

Step 7: Click on **Done**. When Infini-D asks you if you want to save the surface library file, click on the **Save** button. The next time you open a new scene file, the new surface appears in the Surfaces command tab along with the other surfaces from the Default Surface Library.

Chapter 15

Surface Composition

This chapter explains how to create multi-layered (known as composed) surfaces in the Surface Composition dialog box. In Chapter 14 you learned how to work with procedural surfaces and imported 2D images (also known as texture maps). Composed surfaces are created using procedural surfaces and/or images as layers. Each layer can contain different surface information, and you can graphically manipulate your object and surface layers in order to place images precisely onto objects. Composed surfaces are a powerful way tool for creating complex, realistic surfaces for your objects.

This chapter covers the following topics:

- Accessing the Surface Composition Dialog Box
- Working with Layers
- Selecting Mapping Modes
- H and V Repeat Controls
- Graphically Manipulating a Layer

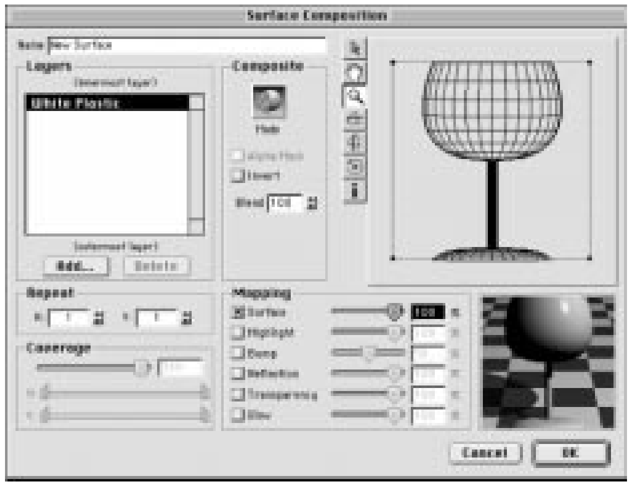
ACCESSING THE SURFACE COMPOSITION DIALOG BOX

This section explains how to begin working creating a composed surface by accessing the Surface Composition dialog box.

Follow these steps:

Step 1: Click on the **Surfaces** command tab in the Command Floater.

Step 2: Click on the **Comp** button in the Surfaces button bar and the Surface Composition dialog box opens.



If you have an object selected when you enter the dialog, you will see that object in both the wireframe preview and the rendered preview. If you have no object selected, a default sphere will be pictured. Since composed surfaces are generally specific to the shape of a certain object, it is usually best to enter the Surface Composition dialog with your object selected.

Step 3: Enter a name for your composed surface in the **Name** field, then proceed to the next section to learn how to add and manipulate layers.

WORKING WITH LAYERS

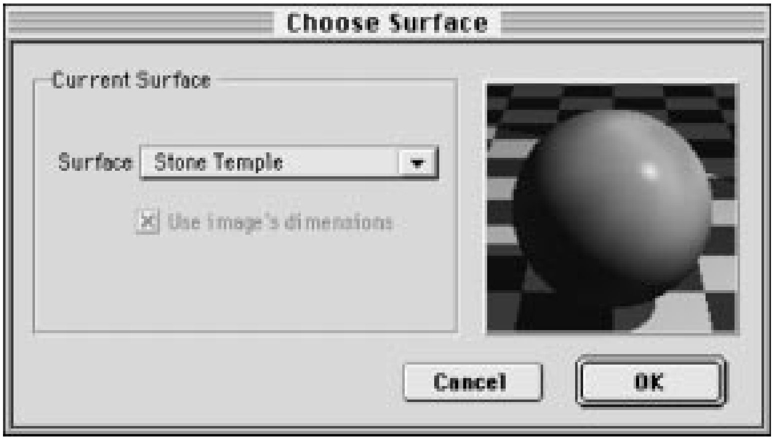
This section explains how to add and delete layers from your composed surface. You can add as many layers as you like. White Plastic always appears as the default first layer.

Note

Note: You cannot delete the first layer (a composed surface must have at least one layer), but you can change white plastic to a different surface by double-clicking on it and choosing a new surface. Or, you can add a second layer and then delete the first.

Follow these steps to work with layers in the list:

Step 1: Click on the **Add** button just below the Layers list and the Choose Surface dialog box opens



Step 2: Click on the **Surface** pop-up menu and make a selection from the list. Infini-D displays a preview of the surface in the Preview box. Click on **OK** to add the surface to the layers list. Once added, you can customize each layer's properties as explained in *Selecting Mapping Information* below.

- If you want to use an image that has not already been imported, select **Load Image** from the pop-up list and make a selection from the dialog box that opens. See *Importing an Image File* in *Chapter 14: Surfaces and Texture Maps* for more information.
- If you want to maintain the aspect ratio of an image, click on the check box next to **Use Image's Dimensions**. (This option will be grayed out if a procedural surface is selected.)

Step 3: You can continue to add layers in this fashion, You can also work with layers in the list in the following ways.

- If you want to delete a layer from the list, select it and click on the **Delete** button and Infini-D removes the layer without prompting you.
- If you want to change the order of a layer, click and drag it where you want it in the Layer list. A line indicates where it will be placed in the list as you drag.
- If you want to replace a surface, double-click on it and make a new selection from the Choose Surface dialog box.
- Click on the **Invert** check box to invert the chosen layer's color and grayscale values. This is particularly useful when you create a layer for transparency for bump mapping and you wish to reverse the brightness values.

SELECTING MAPPING SETTINGS

Each layer in a composed surface has its own set of mapping settings. When you select a layer, its mapping settings will be displayed. The different settings and choices are described below.

Blend

This setting determines how each layer blends with the layer underneath it. A blend value of 100 means it completely obscures the lower layer, while a blend of 0 allows the lower layer to show through completely. This setting applies to all channels.

Use Alpha Mask

Check this check box to make the selected layer reveal or mask the layer beneath it using its alpha channel information. This is useful for wrapping a circular label onto a wine bottle, for example. The bottle would have a glass surface on the first layer, and then the label on the second layer. The label would be created in an image editing application so that it had a circular mask in the alpha channel. When composed using “Use Alpha Mask”, the label would apply correctly to the bottle, instead of covering a solid rectangle of the layer beneath. If constructed correctly, the alpha channel also contains anti-aliasing information to enable Infini-D to smoothly blend the edges of the top layer with the underlying layer, so that there are no visible jagged edges.

If the layer contains no alpha channel, this option is dimmed.

Mapping Mode

The mapping mode determines how Infini-D projects your layer onto your object. Since images are two-dimensional and your object is three-dimensional, there are multiple ways to apply the image to the object, with differing results. Different modes are appropriate for different object types and different effects. Mapping modes are important to understand, because, for example, the way you place a stamp on an envelope, for example, is quite different from the way you attach a label to a beer bottle, and both differ from the way that a peel wraps around an orange.

Most procedural surfaces—Marbles, Woods, Colors, etc. are not affected by the different mapping modes. These surfaces are actually calculated in 3D, so there is no need to map them to an object in any particular fashion. An exception is the Fractal surfaces (Mandelbrot and Julia) these are 2D surface, and so will appear differently when mapped using different modes.

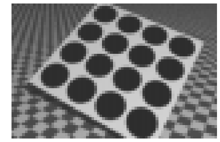
You will sometimes find it necessary to apply different mapping types to parts of the same object. For example, when modeling an airplane, you could apply a straight map to the flat side of the tail fin and apply a cylindrical map to the cylindrical body of the plane.

Follow these steps to apply a mapping mode:

Step 1: Select a layer in the Layers list.

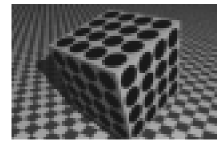
Step 2: Click on the Mode pop-up menu and make a selection. Your choices are defined below:

- **Straight**—Use a straight map to apply a flat image to a flat surface. This is useful for most extruded objects. You can reposition and resize a straight map anywhere on the object. Note that a straight map travels completely through an object in one direction. This can cause the sides to appear streaked, while the image appears backwards on the reverse side of the object.



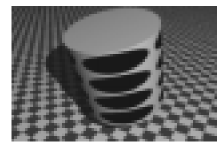
Straight

- **Cubical**—Use a cubical map to apply a copy of a surface layer to each of the six sides of a cube. Note that the cube must be aligned straight-on for this map type to be effective. If you first rotate the cube, the six images will not align properly with the six sides of the cube.



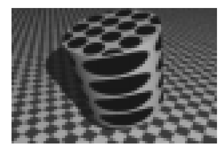
Cubical

- **Cylindrical**—Use this mode to map a layer onto a cylindrical object such as a bottle, jar or baseball bat. This map type tells Infini-D to wrap the surface layer around the object as a label would be wrapped onto a soup can. Cylindrical mapping is useful for most lathe objects. By default, this mode wraps the layer 360 degrees around the object. You can adjust the degree of wrapping with the Coverage Control setting explained later in this chapter.



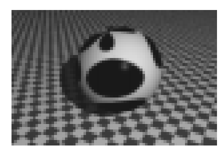
Cylindrical

- **Cylindrical Cap**—This mode is similar to a Cylindrical map, except the layer also appears on the top and bottom of the object. The extent of the wrap on the sides can be controlled as with the Cylindrical mode, however there is no control over the placement on the endcaps. To control placement on the endcaps, make a surface with two layers: one Cylindrical for the sides, and the other straight for the endcaps.



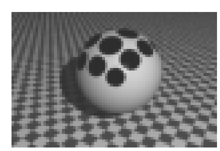
Cylindrical Cap

- **Spherical**—This mode wraps the surface layer around an object and crimps the top edges of the layer together at the top of the object and the bottom edges of the layer together at the bottom of the object. This is particularly useful for mapping images onto spheres (eg: a world map onto a globe). As with Cylindrical mode, you can adjust the extent to which the layer is wrapped around the object.



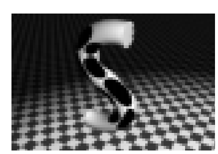
Spherical

- **Wrap**— Using Wrap mode is like wrapping an object in newspaper: all four sides of the newspaper come together at one side of the object. Wrap is handy for such tasks as wrapping surfaces that have no boundaries (such as fractal surfaces) around spheres. It is also useful for placing images onto sphere-shaped objects—for example, placing a number patch onto a billiard ball.

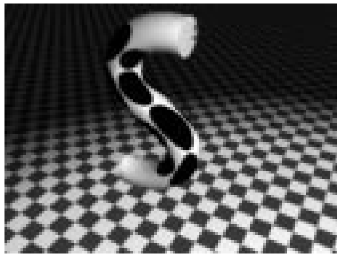


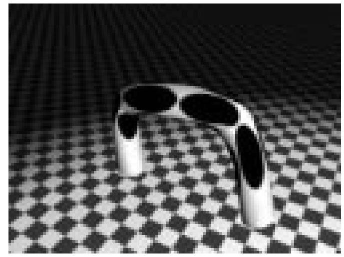
Wrap

- **Decal—**For use with splineform objects only, Decal mode is similar to Wrap, but gives you additional control over the exact positioning of the surface relative to the shape of the objet. Decal mapping uses the spline data of the object (its path, rails, and cross sections) to position the layer precisely at any point along the length and width of the object. (See *Decal Controls* later in this chapter for details.)



Decal





Keep in mind the following when decal mapping:

- Decal mapping will not map an image onto the endcaps of an object. You will need to create a second layer beneath the decal layer to map a surface onto the endcaps (using a Straight map, for example).
- Infini-D wraps each segment of an object with multiple-outline profiles (e.g., a fork) individually, rather than around the entire object. To apply distinct textures to a multiple-outline shape, you should construct individual parts as separate models.
- Manipulating the object in the Object View window has no effect on the way the image appears on the object when using Decal mode. The **Arrow** and **Rotate** tools simply provide the ability to look at your object from different angles. See *Graphically Manipulating an Object* later in this chapter for more information.

Mapping Type

Use the mapping settings to control how the selected layer affects the surface characteristics of the object. There are six mapping types—Surface, Highlight, Bump, Transparency, Reflection and Glow. Each mapping type affects the rendered surface in a different manner. A single layer can use all of the mapping types. Or, multiple layers can be used, with each affecting only one specific mapping type.

This section covers the following topics:

- About the Surface Mapping Type
- Selecting a Mapping Type

About the Surface Mapping Type

The first mapping type, Surface, operates differently from the other types when using procedural surfaces. If you use a procedural surface as a layer, and check the Surface checkbox, all the properties of that procedural will be used. For example, if you use Infini-D's default Glass surface in a layer, and you check the Surface option and set it to 100%, then Infini-D uses all of the properties of the Glass surface for that layer, resulting in a transparent surface, even though Transparency map is unchecked. Continuing this example, if you then were to check the Transparency checkbox, Infini-D would use the base color of the Glass surface as a transparency map, and add that transparency value to the transparency derived from the procedural itself.

When using an imported image, the Surface map controls how much of the color of the image is used for the base color of the surface. It will not apply to any other map types unless they are specifically activated.

By allowing you to use properties of procedural surfaces, surface composition becomes an even more powerful surface creation tool. For instance, if you wish to apply a label to a bottle, you can create the glass texture complete with transparency and reflection with Infini-D's internal surface editing capabilities, load the image of the label, then use surface composition to apply both to the object.

Other Mapping Types

The five other mapping types (Highlight, Bump, Reflection, Transparency, and Glow) all work strictly work with the color (or more specifically brightness) of the layer to produce their effects—regardless of whether the layer is an imported image or a procedural surface generated within Infini-D. (The one exception to this rule is Bump mapping and procedural surfaces, see below for more.) All of these five mapping types operate on lightness and darkness values, with the darker areas receiving the maximum effect and the lightest area none. When you use a color image, it is actually the brightness of the color that has an effect, not the color itself. Because of this, you may get better results using grayscale instead of color images. For example, if a layer contains a procedural marble, and the Transparency checkbox is checked, Infini-D will create transparency based on the brightness of the marble at each point on the surface, and a “marbled” transparency will result.

As noted above, there is one exception to the behavior of the different mapping types with respect to brightness of color. If a layer contains a procedural surface that uses a Bump effect, this effect will be used when the Bump checkbox is checked, not the brightness of the layer’s color. In the case of an imported image used as a Bump map, the brightness of the image *will* be used to generate the bump.

Selecting a Mapping Type

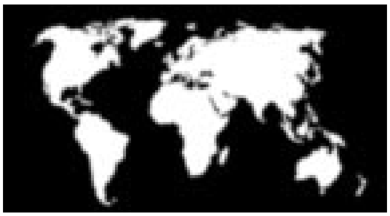
This section explains how to select a mapping type. Click on the check box next to the type you wish to select. You can enter a percentage value in the field adjacent to each mapping type or you can move the slider up or down to change the percentage. The percentage determines how pronounced the effect is.

Follow these steps to select a mapping type:

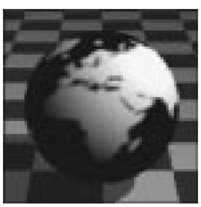
Step 1: Click on a layer in the Layers list.

Step 2: Click on the check box next to each mapping type you want to use, then enter a percentage or drag the slider to indicate what percentage of the effect you wish the chosen layer to apply. Each of the mapping types is described below.

Right: Surface Composition Slider Controls; Bottom: Image being mapped onto the sphere



Surface Map



Highlight Map

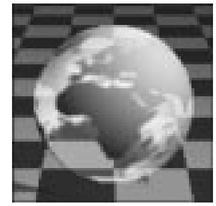
Bump Map

Reflection Map

- **Surface**—Use this type to add a layer to your composed surface without adding any additional effects. Images apply only color information with this selection, while procedural surfaces apply all of the surface settings from the Surface Info dialog box. Adjusting the Surface percentage affects all values of the surface equally. With image maps, the percentage determines how much color Infini-D displays. As you decrease the percentage, the colors get darker. With procedural surfaces, as you change the percentage, you affect how much Infini-D applies all of the surface properties such as specular highlight diffuse shading, etc. to the chosen layer.
- **Highlight**— Use this map type to create areas with shiny highlights on the surface. The darker the surface, the stronger the highlight.

  The Highlight map is particularly useful when it is used with a Transparency map. If, for instance, you want to make a window with a Transparency map without creating the geometry of the window, having a specular highlight on the object helps indicate that the window has glass between the panes. If, however, you want to make the same window but without the glass, you could turn on the Highlight map and set it to 0% to remove any specular highlight.
- **Bump Map**—Use this map type to create a raised or embossed surface effect. Bump mapping works across light-to-dark gradients: wherever the surface is brightest it appears raised.
- **Reflection Map**—Use this map type to create areas that reflect like a mirror. The darker the layer, the more pronounced the reflection.
- **Transparency Map**—Use this map type to make the object transparent, so you can see right through to the other side. If you apply a Transparency map to a black surface layer, it appears transparent, like a

sheet of glass, while a white layer appear opaque and a gray surface appears translucent.


Transparency Map

If you make a layer using both a Transparency map and a Surface map, then the given layer uses the color information as well as the light-to-dark information to generate the effect. For example, a dark red surface used as both a Transparency and a Surface map would look like a sheet of red glass.

Because of its ability to combine color and transparency, you must turn on the Surface map and set it to 0% in order to make a black layer completely transparent. Without this setting, you cannot achieve 100% transparency.


Glow Map

- **Glow Map**—Use this map type to make the object glow. The surface appears to emit light like a light bulb or a neon tube. Note, however, that this glow does not light up other objects as the glow from a light would. The darker the surface, the brighter the glow. As with a Transparency map, when you make a layer using both a Glow map and a Surface map, Infini-D uses light-to-dark information and color information of the layer to create the effect. For example, if you use a blue surface as both a Glow map and a Surface map, the object appears to emit blue light.

H AND V REPEAT CONTROLS

The Horizontal and Vertical repeat controls, located in the upper right-hand corner of the Surface Composition dialog box, enable you to turn any 2D image into a multiple picture grid of any size. For example, a horizontal repeat of 1 and a vertical repeat of 7 would create a surface layer composed of seven identical pictures, arranged vertically. A horizontal repeat of 4 and a vertical repeat of 4 will produce a square containing sixteen images. Typing in 0 makes the image repeat infinitely in the given direction. This effect is particularly striking on infinite planes and is most useful when using a Straight map.

If you use repeat values with the Cylindrical mapping mode (and other mapping modes that use Coverage Control, described below), you must adjust the coverage to compensate for the number of repeats. For example if you had an image that you did not want to repeat, you could wrap it 360° around a cylinder. If, however, you want to repeat it twice in the horizontal direction, you would change the coverage to 180°. Repeat values have no effect if you select Decal as the mapping method.

GRAPHICALLY MANIPULATING A LAYER

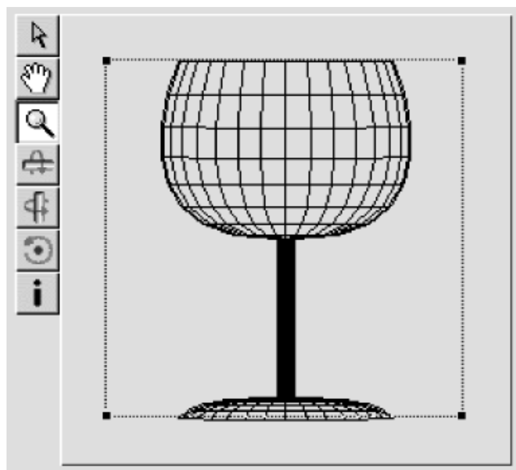
Once you select the layer and its various mapping effects, you can use the tools in the Object View window on the right side of the dialog box to apply the layer precisely onto the object. If you entered the Surface Composition dialog with an object in your scene selected, the object appears in the Object View window. This makes it easier to apply a composed surface to a particular object. If you did not have an object selected upon entering, a default sphere appears.

This section covers the following topics:

- Object View Window Tools
- Layer Information

Object View Window Tools

The tools located just below the Object View window help you manipulate the object and the layer to apply the surface more precisely. Each tool is described below:



The Arrow Tool

This section explains how to use the **Arrow** tool.

Follow these steps to work with the Arrow tool:

Step 1: Select a layer in the Layers list and Infini-D superimposes a representation of that layer on the object in the Object View window.

Step 2: Select the **Arrow** tool, then click and drag the surface layer to position it precisely onto the object. You can also click and drag the corners of the representation to stretch or resize the layer on the object, but keep in mind that this changes the proportions of the surface on the object. Holding the SHIFT key while resizing the layer will preserve its proportions.

Note: Procedural surfaces cannot generate a representation of the surface within the Object View window. This is because procedural surfaces are calculated in three dimensions. Therefore, there is no accurate way of portraying the surface in 2D within the Object View window. You can still manipulate the orientation, size and position of procedural surfaces within the Object View window.

Note

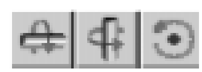
The behavior of the Arrow tool depends on which mapping method you choose. When you select cylindrical mapping, for example, the Arrow tool can only stretch and move the layer vertically, as cylindrical mapping adjusts the amount the layer wraps around the object through Coverage Control. (This is true for all mapping modes that use Coverage Control. See *Coverage Control* below for additional information.)

The Object View window also behaves differently when you use Decal mapping. The position of the image or the orientation of the object has no effect on the position of the image on the object; that is controlled entirely by the Decal sliders. (See *Decal Controls* below for more information.) Feel free, however, to move, rotate and scale the object in the Object View window in order to get a better view of the beginning and ending points of your decal map.

Moving within the Object View

Use the **Hand** tool to change your point of view within the Object View window. Click on the tool, then drag along anywhere within the window to move the view point. This does not affect the object or surface in any way; it only changes your view point.

Rotating the Object View



Use the three **Rotation** tools below the Object View window to rotate your object around any axis. Note that unlike the **Arrow** tool which positions the layer on the object, the Rotate tools rotate the object underneath the layer.

- To rotate the object, click on a Rotation tool, then click and drag the object in the Object View window.
- Hold the SHIFT key while you rotate the object to snap the object in 45° increments. This allows you to align an object precisely before you map surface layers onto it. Infini-D applies the image layer based on the new orientation of the object (except in the case of Decal mapping described above).

Magnifying the Object View

Use the Magnifying Glass tool to zoom in or out in the Object View window

- Select this tool, then click in the Object View window to zoom in and make the object appear larger.

• Hold the OPTION key (Mac) or the ALT key (Win) and click in the Object View window to zoom out and make the object appear smaller.

COVERAGE CONTROLS

Angular Coverage Control

Decal Coverage Controls

Angular Coverage Control

If you choose the Cylindrical, Cylindrical Cap or Spherical mapping mode, the angular coverage control slider becomes active. This control allows you to adjust the distance that the layer wraps around the object, in degrees. By default, coverage is set to 360. Drag the slider to adjust how far a layer will wrap around an object or enter a number in the field adjacent to the slider.

Decal Coverage Controls

If you select Decal as the mapping mode, Infini-D replaces the wireframe drawing of the object with a spline patch representation of the model and the two decal coverage control sliders become active. The V slider controls the vertical starting and ending point and the H slider controls the horizontal starting and ending point. The two together allow you to precisely position the layer on the object.

Keep in mind the following when working with the Decal mapping mode:

• The H slider controls how the surface covers the profile of the model, or how far around the cross-sections the image wraps. Infini-D displays the width values in the Object View window in green outlines.

• The V slider controls how the surface covers the model along the model's path. In the Object View window, Infini-D displays the beginning and ending height values in red outlines.

Note

Note: The two controls referenced above are different from the H and V Repeat controls described earlier in this chapter.

• Decal mapping works only on SplineForm objects made in the Workshop. It does not work on primitives, terrains or imported geometry.

• Decal-mapped surfaces will not project through the object as Straight mapping would. When you edit an object using Decal mapping, the surface continues to conform to the new shape. In other words, the surface appears the same even if the object changes. This can be very useful when animating an object.

• The beginning value for the Height slider corresponds to the beginning of the path in the Workshop. If you were to draw the path from top to bottom, then the top of the object is the beginning.

• For each slider, the left-hand control indicates the beginning point and the right-hand control indicates the ending point. You can enter these values directly in the Layer Info dialog box explained below.

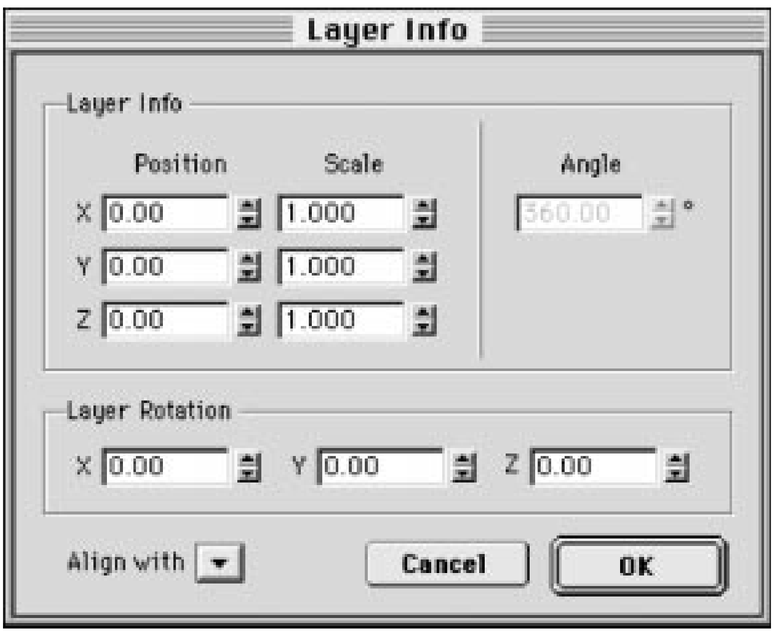
NUMERICAL INPUT FOR LAYERS

This section explains how to access the Layer Info dialog box, where you can numerically position and align multiple layers. By clicking on the **i** tool in the Object View tool bar, you can access this dialog box and adjust these settings.

Follow these steps:

Step 1: Click on the Layer you wish to adjust in the Layers list.

Step 2: Click on the **i** button in the tool bar and the Layer Info dialog box opens. Each of the settings in this dialog box is described below.



• **Layer Info**—Enter the values for the X, Y and Z position and X, Y and Z scale of the layer as it relates to the Object View window. You can enter the exact number of degrees a layer wraps around an object when using Cylindrical, Cylindrical Cap or Spherical mapping.

Note that when images are imported into the surface composition dialog box, they are normalized to fit into a square 2 units on a side. The scale and position values in the layer info dialog box are relative to this size, not to the actual size of the image.

- **Angle**—Use this field to enter the coverage setting for the object if applicable. This item is grayed out if the mode does not use coverage control.
- **Layer Rotation**—Use this setting to change the orientation of the object relative to the texture being applied. For example, you can orient an object under a procedural to change the direction of a wood grain.
- **Align With—**Use this function to precisely align one layer with another. Select a layer from the pop-up list and Infini-D enters the values for the chosen layer. This lines up both layers exactly.

Note

Note: When you are using a Cylindrical, Cylindrical Cap or Spherical Map, you cannot adjust the X position or scale. These characteristics are set by using the degree control to determine the amount that layer will wrap around an object.

Numerical Input for Decal Mode Layers

The Surface Layer Info dialog box works slightly differently for layers using Decal mode. Rather than position and scale values for the layer, the dialog box displays Beginning and Ending values for the image along the vertical and horizontal directions of the object (corresponding to the path and cross-sections) in a range of 0.0 to 1.0. For example, setting the vertical Begin value to 0.2 means the image should start 20% along the path; setting the End value to 0.8 means it will end 80% along the path. You can also flip or rotate the image by making a selection from either pop-up list.

Numerical Input for Procedural Surfaces

You can also use numerical input for layers when scaling or rotating a procedural surface on an object. You can scale the image on the object or rotate the object beneath the image. Notice that when you apply a procedural surface to an object in your scene, the surface scales with the object. This makes animation look more natural; when an object stretches, the surface stretches with it. Sometimes you may want the scale of a procedural surface to be initially independent of the object. For example, if you enlarge a 2D square to make a marble floor, you may not want the marble to stretched with the object. If this is the case, bring the procedural surface into the Surface Composition dialog and scale it down to suit your needs.

Section 5

Composing a Scene

Once you have completed all of the preliminary work of creating your scene—creating and positioning objects, altering them as needed, and applying surfaces—you can turn your attention to lighting and camera placement.

Appropriate lighting is one of the most crucial elements in creating a believable scene. Infini-D provides a set of flexible lighting controls designed to produce a wide range of real-world lighting effects.

Lights in Infini-D are actual objects in the scene that you can see and manipulate. You control lights as any other object. You can position and rotate lights and you can include as many light sources as you like. Infini-D provides the ability to adjust the position, orientation, intensity and color of each individual light.

Light in an Infini-D scene behaves just like the real thing—you have the option of letting Infini-D create reflection, refraction, and shadow effects for realistic renderings. Infini-D includes five different light types: distant, point, tube, spot, and target spot.

In addition, you can apply special lighting effects such as lens flares, gels, and masks. You can choose to have your lights cast shadows, and (for spot lights) choose between hard-edged or soft-edged shadows. Soft shadows create a more realistic-looking shadow and render quicker, but they require more memory.

When using spotlights, you can choose to make the actual light beam visible either as a solid beam or as rays. Visible beams are useful for creating a solid spotlight cone, for example, while visible rays split up in a realistic manner as they pass around objects (like light filtering through a jungle canopy) but take longer to render.

After creating and adjusting the lighting in the scene, you can move on to deciding where to place cameras and how to orient them. When everything is where it should be, you may want to do a test rendering.

As you compose the scene, you may find it useful to adjust what you see in each View window, as well as how you see each object. You can adjust settings for an entire View window or for a single object within that View window. (See *Chapter 9: Object Settings* for more information.)

Section 5 covers the following topics:

- Working with Lights
- Working with Cameras
- Adjusting View Settings

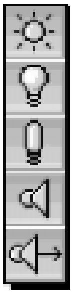
Chapter 16

Working with Lights

Lighting is one of the key ingredients in a 3D scene. Well executed lighting can make the difference between a lifeless, sterile scene and a rich, believable scene. Infini-D provides six different light source types and a wide variety of lighting effects for creating a virtually unlimited range of lighting effects. Lights are represented by actual objects in the scene, and creating and positioning lights in your scene is like working with any other type of object. You can add, edit or delete lights and each type of light has its own unique set of controls. When you create a new, empty scene, Infini-D includes one Distant light and one Ambient light by default. These can be edited or deleted. A scene can have as many lights of each type as desired, and these lights can be static or animated.

This chapter covers the following topics:

- Adding a New Light
- Editing Light Settings
- Adding Special Lighting Effects
- Deleting a Light from Your Scene



ADDING A NEW LIGHT

This section explains how to add a new light to your scene. You can add as many lights as you like in this manner. Infini-D includes six types of lights. Each time you select the light tool and place a light into your scene (or select an existing light), Infini-D displays the controls appropriate to that light type in the **Object** tab of the Command Floater.

Follow these steps to add a new light to your scene:

Step 1: Click on the **Light** tool in the tool bar and select a light from the Light pop-up list. Your choices are described below.

- **Distant Light**—This light casts parallel light from a single point far away in the scene. This type of light is useful for simulating sunlight, for example, by giving the impression that the light source is far from the object. Changing the position of the light object itself has no effect, only the direction setting matters. Click to place the light in the scene.
- **Point Light—**This light emanates from a single point and casts light evenly in all directions, like a classic light bulb without a shade. Click to place the light in the scene; drag to change the height.
- **Tube Light**—This light uses a light object and a target object to produce a two-dimensional light source over the length of a line. This type of light is useful for simulating fluorescent lights or laser beams. Also useful for illuminating oblong objects (such as text) evenly over their entire length. Click to place the light in the scene; drag to place the target (which determines the length of the tube light).
- **Spot Light**—This light emanates from a single point, and casts light in a particular direction. It works in the same fashion as a stage spot light in a real theater by making whatever appears in the light the center of attention. Click to place the light in the scene; drag to change the height.
- **Target Spot Light**—This is identical to a regular spot light, but is linked to a target object (which you can specify) at which it always points. This is useful if you want to have a light always point at a particular object as it moves. Click to place the light in the scene; drag to position the target. This is similar to a target camera. See *Chapter 17: Working with Cameras* for more information.
- **Ambient Light**—This light simply adds an equal amount of the chosen color to all objects in the scene. It has no controls of any kind except for color. This type of light is useful for adding an overall level of non-directional base illumination to your scene, so that objects that do not have another light shining directly on them are not in complete blackness. Changing the position of the ambient light object has no effect.

Step 2: Click anywhere in the scene to place the selected light type. Click on the

Object tab in the Command Floater to display the light settings for the chosen light type. You can edit this information as explained in the next section.

EDITING LIGHT SETTINGS

This section explains how to edit light information in your scene. After you place a light, you can change a variety of characteristics related to the light including the type of light itself. You can also adjust lighting attributes graphically or numerically. All changes are interactive, meaning they apply immediately; there is no OK or Apply button.

Follow these steps to edit a light:

Step 1: Click on the light in the scene.

or

Click on the **Light** list in the Command Floater and select a light from the list. The light's name will be displayed in the name field. Lights can be named in the same way that any object can be named.

Step 2: Click on the **Object** command tab in the Command Floater to display lighting information.

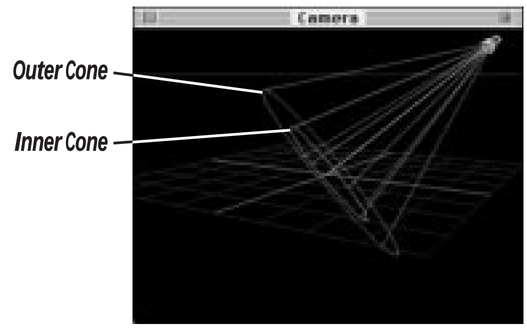
Step 3: You can adjust the light information for each type of light as follows:

- **Type**—Click on this pop-up list to change the type of lighting. Lighting types are defined in the previous section. You can change between Target Spot and Tube light, or between Distant, Point and regular Spotlight; but you cannot switch a light from one category to another. For example, you cannot change a Target Spot light to a Point light. You would have to delete the Target Spot light, then add the Point light.
- **Light Graphic**—By manipulating the control points on each lighting type, you can graphically adjust the light effect. As you do this, you can watch the appropriate numbers change in the Light Attributes panel. Conversely, if you change a number in the Attributes panel, you can see the results of your change in the light graphic.
- **Show Check Boxes**—Click on the check box next to each item you wish to show for this light. When you check an attribute, Infini-D adds graphical elements to the View windows to indicate a particular attribute of the light. Your choices are defined below. If a choice is grayed out, it means it is not available for the type of light you selected.

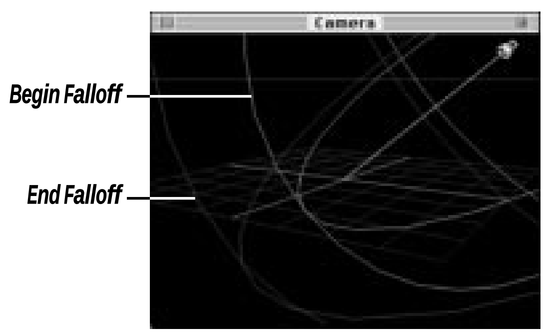
  – Light: Check this to display the light object itself. Unchecking this option hides the light object, but the light continues to shine in the scene. The light must be showing to see the next three options.

If you want to turn off a light so that it does not illuminate anything in the scene (to use it just as a lens flare, for example), set the Intensity to zero.

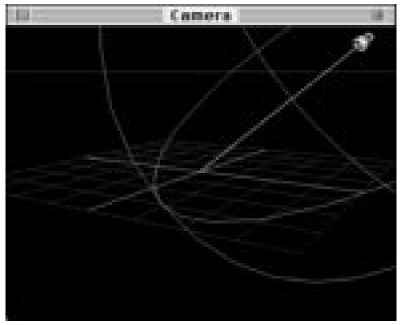
– Cones: (Only available for Spot and Target Spot lights.) Check this option to see wireframe representations of the Inner and Outer spotlight cones. The Outer cone represents the outer edge of the light cone, outside of which no illumination is cast. The Inner cone represents the bright core of the light—within this cone, the light is uniformly at full brightness (determined by the Intensity setting), between the two cones, the light blends smoothly from the Inner Color to the Outer Color as it diminishes in intensity. (See below for details.)



– Falloff: Check this option to see a wireframe representation of the inner and outer Falloff diameters of the light. Inside the inner diameter, the light is cast at uniformly full brightness. Between the inner and outer diameters, the intensity of the light gradually decreases. Beyond the outer diameter, no light is cast.



– Glow: Check this option to see a wireframe representation of the glow radius. Beyond this radius, no glow is visible. See *Visible Glow* later in this chapter for more information.



• **Color**—Click on either field in this section to access a standard Macintosh or Windows color picker to select an inner and outer color for your light. The light will blend between the two colors, starting with the inner color in the center, and ending with the outer color.

Click on the Lock icon to make the outer and inner colors always the same. If you change either one, both will change. Outer color is not available for distant lights.

Editing Light Attributes

In addition to the light options described in the previous section, you can also edit light attributes. Though all the light attributes are visible, some may be grayed out, depending on the type of light you select. Each of the light attributes is described below:

• **Intensity—**This value determines the brightness of a given light relative to other lights in the scene. Values can be less than or greater than the default setting of 100%. For example, to make a light extremely bright, you could enter a value of 300%.

The various lights in an Infini-D scene have a cumulative illumination effect. Too many bright lights may cause objects in the scene to appear washed out. For this reason, you may wish to decrease the intensity of some of the lights in your scene when adding a new light source.

• **Begin/End Falloff**— These values determine where the light effect begins to fall off (or fade) and at what point it falls off completely (or no longer casts light). You can enter figures in this field or drag the control points on the lighting graphic to change the numbers. You can see the range of the falloff effect in the View windows if you check the **Show Falloff** check box described above. Minimum 0, maximum 100,000.

The following settings are grayed out unless your choice is a spot light.

Note

• **Softness**—The softness value determines how rapidly the spotlight beam drops off between the inner and outer cone angles. A value of 0% produces a spotlight beam with sharp, well-defined boundaries, while a value of 100% causes the edges of the light beam to gradually fade out, rather than cut off sharply. Minimum 0, maximum 100.

- **Inner Cone**—The inner cone angle determines the radius for the bright area of the spotlight. All illumination within this radius will be equal to the intensity level of the light. Minimum 0, maximum 65.
- **Outer Cone—**The outer cone angle determines the ending radius for illumination from the spotlight. The spot light cannot generate illumination outside of this radius. The intensity of the light will decrease between the inner and outer cones as determined by the Softness setting above. Minimum 0, maximum 65.
- **Roll Angle—**Use this setting to adjust the Z rotation value of a Target Spotlight. This is useful with a gel or mask to change the angle at which the gel or mask casts onto the scene.

LIGHTING EFFECTS

This section explains how to add and control lighting effects. When you add a light to your scene, the Light Effects panel appears in the Command Floater in the closed position. Click on the blue triangle and the Light Effects panel opens to reveal the different effects you can apply to a light. These include:

- Shadow
- Visible Glow
- Lens Flare
- Gel
- Mask

The remainder of this section covers each of these in detail.

Shadow

This section explains how to turn on and control shadow effects. This option determines whether or not the illumination from a particular light casts shadows. In the real world, an object in the path of any light casts shadows. In Infini-D, however, you have the option of preventing shadows. This can be useful, for example, if you wish to illuminate an object from a particular direction but do not wish to have the object cast shadows upon adjacent objects. This is similar to the effect of a Fill light in theater design, which a lighting director uses to brighten dark areas without causing more dark areas.

Note

You can also determine whether individual objects cast their own shadows by checking the Cast Shadows option in the Object panel of the Command Floater. This allows you to have a light that is casting shadows but have certain objects in your scene not cast a shadow.

Follow these steps to turn on shadows for a light:

Step 1: Select the light as explained in *Editing Light Information* above.

Step 2: Scroll down to the Light Effects panel in the Command floater. (If necessary, open the Effects panel by clicking on the blue triangle.)

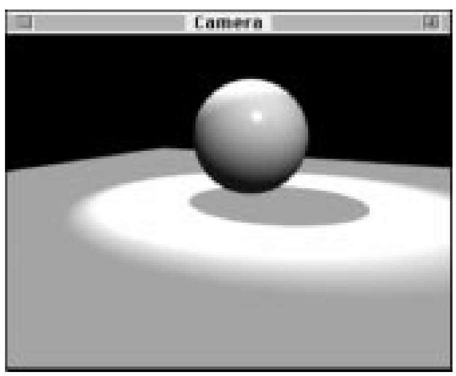
Step 3: Click on the **Shadow** pop-up list and make a selection. The default choice is None. If you leave the default, it means this light will cast *no* shadows in your scene.

Your other choices are:

- Sharp Shadows
- Soft Shadows (for spot lights only)

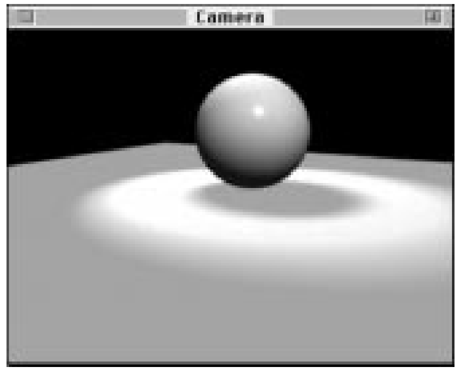
Sharp Shadows

Sharp shadows produce a hard-edged shadow with no gradation between areas that are in shadow, and areas that are not. This is not always realistic, but does create a very precise shadow (useful for objects that have a lot of small details in scenes with high-contrast lighting). The graphic below illustrates this effect. Hard shadows also have the advantage that they take on the color of transparent objects. An object that has a red glass surface will cast a red sharp shadow. It is important to note that sharp shadows can take considerably longer to render than soft shadows (although they require less memory.)



Soft Shadows

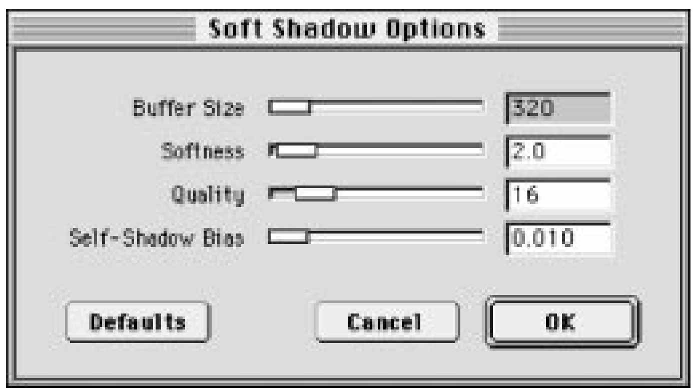
Soft shadows are often a more realistic effect, producing gradual gradation between areas in shadow and those not in shadow. An example is shown below. Soft shadows render significantly faster than sharp shadows, however they require additional memory for each light casting soft shadows. There are several parameters that control the appearance of the soft shadows. Each light that is casting soft shadows has its own set of parameters.



Follow these steps to adjust soft shadow settings:

Step 1: Select a Spot or Target Spot light. Click on the **Shadow** pop-up in the Light Effects panel of the Object tab in the Command Floater. Select **Soft Shadows**.

Step 2: Click on the **Edit** button adjacent to the pop-up list and the Soft Shadows dialog box opens.



Step 3: Enter a value into each field. These are described below.

- **Buffer Size**—In order to create soft shadows, Infini-D creates a shadow map of the scene in memory. The buffer size determines how big that map is (in pixels—320x320 pixels, for example) and therefore how much detail it can resolve. If the buffer is set too small, your shadows may appear pixelized. Use the size of your final rendered image to determine the proper size. For example, if you plan to render your final image at 720x486 (the standard for NTSC video output), you should make your buffer *at least* 720, but no more than 1440. The larger the buffer size, the more memory required.

Note

Keep in mind that there is a direct correlation between the buffer size and the amount of memory required. Also, each light that is casting soft shadows creates its own shadow map, so each requires memory according to its own buffer size setting, and they are cumulative.

- **Softness**—This determines how sharp or soft the edges of the shadows are. A low number makes the shadows sharper (a very low number would approximate Sharp Shadows), while a high number makes the edges very soft and the transition from shadow to light very gradual. Note that if you enter a very high softness value, you may have to increase the Quality setting (defined below) to compensate.
- **Quality**—Enter a number to indicate how many times you want Infini-D to look at (over sample) a pixel to determine the degree to which it is being shadowed. The higher the number, the more accurate the soft shadow, but the longer the rendering time
- **Self-Shadow Bias**—Depending on the size of your scene and the location of your light in relation to your objects, shadows may appear at the intersection of two objects facing the light. Increase the Bias value to decrease or eliminate the shadow. Note that a rate that is too high can shift the shadow to an unrealistic location. For example, if you have a pencil standing on a table, and you enter a Bias rate that is too high, the shadow will not meet the pencil as it should. You may need to try different settings until you reach the right balance.

Step 4: Click on **OK** to save your changes. Click on **Cancel** to exit without saving your changes. Click on **Defaults** to revert all settings to their default values (Buffer Size 320, Softness 2.0, Quality 16, Bias 0.010).

Boolean objects may not cast soft shadows correctly. See Chapter 13: Boolean Operators for more information.

Note

Visible Glow

This section explains how to add visible glow effects to your lights. As with shadow, it is off by default. All light types except Distant and Ambient can have a visible glow effect. Spot lights and Target Spot lights can have either a visible beam or visible rays.

Visible Beams

This section explains how to activate and edit a Visible Beam. Visible Beams are a solid light glow effect in the shape of the type of light they are emanating from (spherical for point lights, conical for spot lights, cylindrical for tube lights). Visible beams are visible at all times, they are not obscured by objects. This means they render significantly faster than visible rays, which interact with objects in the scene.

Follow these steps to create a visible beam:

Step 1: Select a light. Click on the **Visible Glow** pop-up in the Light Effects panel of the Object tab in the Command Floater. Select **Visible Beam**.

Step 2: Enter a value in the **Glow Radius** field, this determines the size of the glow effect. Glow radius is independent of the Falloff settings for the light.

Step 3: Click on the **Edit** button adjacent to the pop-up list and the Glow Options dialog box opens. For visible beam, the only setting that is active is **Use Light's Intensity**. This field is defined in *Editing Visible Rays* below.

The color of the visible beam is based on the Inner and Outer color settings for the light. The beam will blend between the two colors.

Visible Rays

This section explains how to create and edit Visible Rays. Visible Rays are only available for Spot and Target Spot lights. The advantage of visible rays is that they interact with the objects in your scene, being blocked by any object. This could work well in a jungle scene, for example, where you want to simulate realistic light filtering through the trees. The tree leaves and limbs would block the light as it shines down through them, creating authentic lighting.

Note

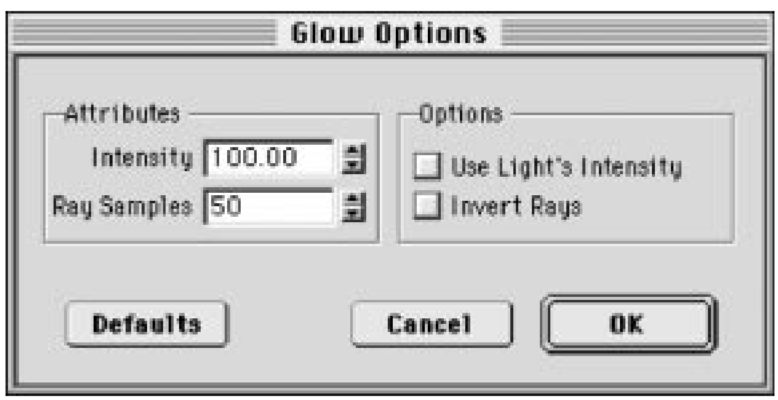
Visible rays may not interact correctly with with Boolean objects. See Chapter 13: Boolean Operators for more information.

Follow these to activate and edit visible rays:

Step 1: Select either a Spot or Target Spot light. Click on the **Visible Glow** pop-up in the Light Effects panel of the Object tab in the Command Floater. Select **Visible Rays**.

Step 2: Enter a value in the **Glow Radius** field. This determines the range of the glow effect in your scene. Glow radius is independent of the Falloff settings for the light.

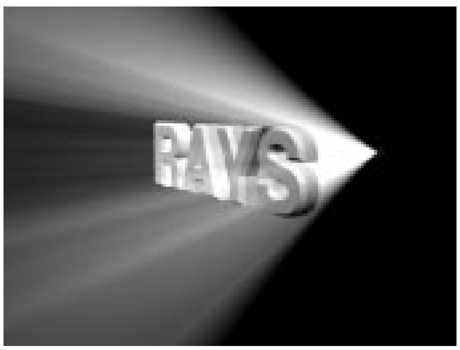
Step 3: Click on the **Edit** button adjacent to the pop-up list and the Glow Options dialog box opens.



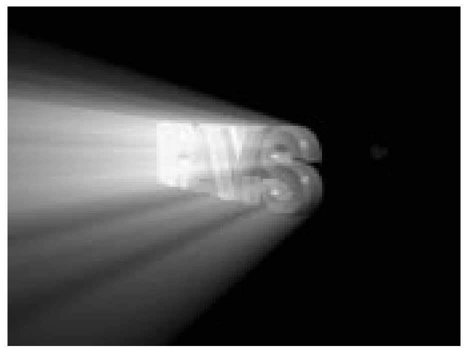
Step 4: Select your settings. Each is described below:

- **Use Light's Intensity**—Leave this box checked if you want to use the light's intensity as set in the Light Attributes panel to cast the light glow. If the glow is not bright enough but you do not want to increase the light's intensity, uncheck it, then enter the level of intensity you want in the **Intensity** field (defined below). This will make the glow brighter without increasing the illumination cast by the light.

- **Invert Rays—**If you check this option, the rays will appear inverted from how they would normally appear. For example, if you have a light behind an object, the object would normally block the rays, and rays would only appear behind the object and around the edges of the object. With this option checked, the object would appear to be emanating light, with the rays coming off the surface of the object, and no rays visible behind or around the object. The graphic below illustrates this.



Normal Rays



Inverted Rays

- **Intensity**—If you uncheck **Use Light's Intensity**, use this field to define the level of intensity you wish to use for the glow.
- **Buffer Size**—In order to create visible rays, Infini-D creates a map of the scene in memory (similar to the soft shadow buffer). The buffer size determines how big that map is (in pixels—320x320 pixels, for example) and therefore how much detail it can resolve. If the buffer is set too small, your light rays may not be visible through very small openings. Use the size of your final rendered image to determine the proper size. For example, if you plan to render your final image at 720x486 (the standard for NTSC video output), you should make your buffer *at least* 720, but no more than 1440. The larger the buffer size, the more memory required.
- **Ray Samples—**This field determines how many times the rays will be sampled. The higher the number, the smoother the rays and the more realistic the effect, but the longer it takes to render.

Step 5: Click on **Defaults** to return the settings to their defaults. Click on **OK** to exit and save your changes. Click on **Cancel** to exit without saving your changes.

The color of the visible rays is based on the Inner and Outer color settings for the light. The rays will blend between the two colors.

Lens Flares

This section explains how to apply lens flare effects to a light. Lens Flares produce realistic-looking glows, halos, and lens reflections. These effects simulate the reflection of a bright light on a camera lens or the lens of your eye.

Lens Flares are a post-process effect, meaning that Infini-D renders all of the 3D information, then calculates the appropriate Lens Flare on top of the image. Lens Flares do not affect the shading of any objects in the 3D scene, and the illumination from the light continues to behave according to its settings.

Infini-D remembers all of the attributes of a Lens Flare with the associated light making it possible to animate a Lens Flare over time. For example, You could create an explosion effect by starting with a small Lens Flare which grows larger over the course of an animation.

This section covers the following topics:

- Choosing a Lens Flare
- Editing Lens Flare Information
- Lens Flares and the Alpha Channel

Selecting a Lens Flare

This section explains how to select a Lens Flare effect. Follow these steps to add a Lens Flare effect to a light:

Step 1: Select a light as explained in *Editing Light Attributes* earlier in this chapter. (Ambient and Tube lights can not have lens flare effects.)

Step 2: Open the **Light Effects** panel in the Object tab of the Command Floater.

Step 3: Click on the **Lens Flare** pop-up list and select the type of lens flare you want for this light. Infini-D applies the effect immediately. If you wish to modify default Lens Flare information, proceed to the next section. (Be sure to have **Lens Flares** checked for at least one view in the Display tab of the Command Floater in order to see the lens flare on screen.)

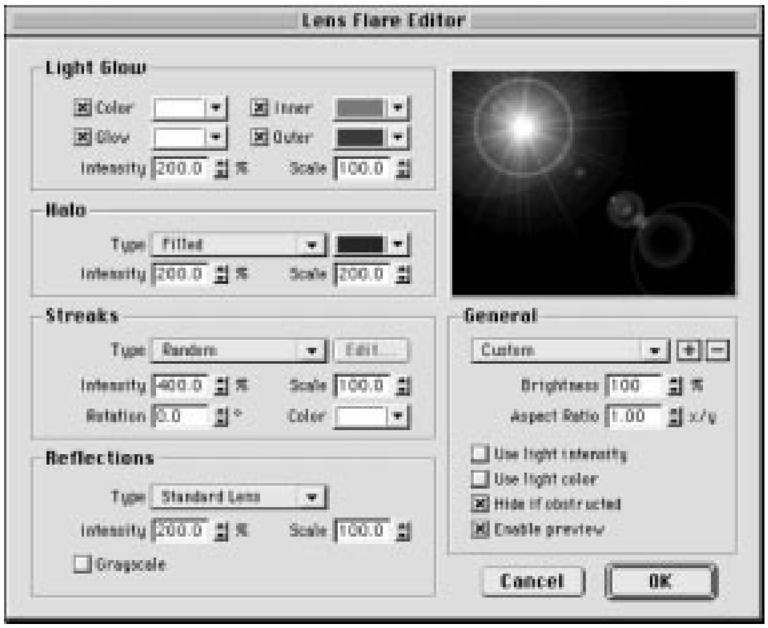
Editing Lens Flare Settings

This section explains how to modify lens flare attributes. Each Lens Flare has default settings, which you can alter to suit your creative needs. As you make changes, Infini-D displays the changes in the Lens Flare Preview window (as long as the **Enable Preview** check box is checked).

Follow these steps to edit Lens Flare information:

Step 1: Select a Lens Flare as explained in the previous section.

Step 2: Click on the **Edit** button next to the **Lens Flare** pop-up and the Lens Flare Editor dialog box opens.



Step 3: You can edit any of the information you see here. Each section of this dialog box is described below (all of these update immediately in the preview window):

- **Light Glow**—The settings in this section determine the basic glow from the light itself. You can control the light color, the main color of the glow or aura immediately surrounding the light, and the color of the inner and outer glow gradation. You can turn each of these attributes on or off by clicking on the adjacent check boxes. You can also select a color for each individual attribute.
  - You can set the glow intensity from 0% (the equivalent of off) to 1000%.
  - You can set the glow scale from 0% to 400%.
  - It is important to remember that these settings only affect the Lens Flare itself—not the light source in the 3D scene nor the objects that are receiving the light.
- **Halo**—The halo is the thin ring that you often see when looking directly at a light source. Infini-D offers two types of halos—filled and lenticular—which you select from the **Type** pop-up list in the **Halo** section. A filled halo is a solid color ring, while a lenticular halo is a

ring in the full spectrum of the rainbow that gradually fades in intensity.

– You can select a color for the halo (or a starting color in the case of a lenticular halo) by clicking on the color swatch adjacent to the Type field.

– As with the Light Glow parameter, you can alter the scale and intensity of the halo.

– You can animate all of the attributes of a Halo, but you cannot change the type of halo over time in an animation.

- **Streaks—** Streaks are another common effect one sees when looking at a light—particularly a car headlight or street lamp. Infini-D provides a variety of streak types to simulate the real-world effects of different light sources or different lenses such as flashlight, searchlight, home video camera lens or zoom lens. You select the streak type from the **Type** pop-up list in the Streak section. The default is Random, which creates random spikes all around the light source.

– If you select Custom, the **Edit** button becomes active and you can enter the number of degrees between spikes, along with the width of each spike.

– You can set the intensity of the streak from 0% to 1000%

– You can set the scale of the streaks from 0% to 400%.

– You can set the Rotation Degrees for a streak, which is most useful for animation when you want to create something like a “photon torpedo”, which spins as it moves.

– You can animate all of the attributes of a Streak including the width and rotation of Custom Streaks, but you *cannot* change streak types over time in an animation.

- **Reflections**—This refers to the set of circles that emanates from the light on a line toward the camera lens. As with streaks, there are a variety of reflection types to simulate different light sources. Keep in mind the following:

– As with all the other parameters, you can set the scale and intensity of the reflection.

– The **Grayscale** check box, which is off by default, turns color for the reflections on or off.

– You can animate all of the attributes of a Reflection, but you cannot change reflection types over time in an animation.

- **General**— The Lens Flare dialog box includes a selection of other general attributes you can add to the lens flare. These include:

– Presets: You can select an entirely new preset from this pop-up list.

All of the parameters revert to the Preset defaults when you make a choice. Click the **+** button to add the current settings to the presets list, you will be prompted to give it a name. Click the **-** button to remove a preset.

– Brightness: This affects overall intensity of the entire flare. You can set Brightness on a scale from 0% to 300%. If you check the **Use Light Intensity** box, Infini-D combines the values of the light intensity and the flare intensity by multiplying the two percentages together. If both values are set at 100%, the overall brightness will be 100%, but if both are set to 200%, the overall value will be 400%.

– Aspect Ratio: This determines the dimension of the flare, allowing you to create squashed or stretched lens flare effects.

– Use Light Intensity: When this box is checked, the Lens Flare uses the intensity of the light source in addition to the overall brightness value set for the Lens Flare. This makes it easier to animate a Lens Flare and have it respond to your scene lighting.

– Use Light Color: When this box is checked, the color of the Light Glow, Halo and Streaks are tinted with the color of the light source. This makes it easy to animate the Lens Flare color by animating the light's color, and have it more closely match the lighting in your scene.

– Hide if Obstructed: In the real world, lens flares are only visible when the light source itself is visible or unobstructed. When this box is checked, Lens Flares obey this behavior, but unchecking this box causes the Lens Flare effect to be visible at all times, whether or not the light object is visible from the camera's point of view (except, of course, if the light is completely out of the frame). This can be useful, since a frequent use of light sources is to place them inside a light bulb object. Without this option, the Lens Flare would not be visible.

– Enable Preview: Checking this box causes the preview box in the upper right-hand side of the dialog box to update as you change settings or drag in the preview window itself. You can shut previewing off if there is a noticeable delay when updating. To force the preview to update, check the box, then uncheck it again.

The preview window allows you to see an instant preview of the lens flare at the current settings. In the window, click on the lens flare and drag it to see how the flare will look from different angles or when moving. Moving the flare in this window has no effect on its position in the scene, it is solely for preview purposes.

Step 4: If you create a lens flare that you wish to add to the list of default settings for future use, click the **Plus** sign button next to the pop-up list. Infini-D will prompt you for a name and then add it to the list. To remove a name from the list, select it and click the **Minus** button.

Step 5: Click on **OK** to save your changes. Click on **Cancel** to exit without saving your changes.

TIP

To use a light purely as a lens flare object, turn the Light Intensity to 0. This will reduce rendering time since the light will not be affecting the shading of the objects in your scene.

Some notes on Lens Fare behavior:

- Lens flares always obey the Falloff settings for the light. The lens flare will start to dim as the light moves beyond its Begin Falloff radius relative to the camera, and it will completely disappear once beyond the End Falloff radius.
- For spotlights, the lens flare will only be visible if the spotlight is pointing towards the camera (if the camera falls within the spotlight cones). This is not affected by the Hide if obstructed option.
- Lens flares can be used to generate a light glow effect similar to visible beam for point lights, and they generally render much faster.

Lens Flares and Alpha Channel

This section explains how lens flares interact with alpha channel information. There are three ways to composite an image with a Lens Flare over a background picture or video. If you render with a background image from within Infini-D, you will get a perfect composite of the Lens Flare over the background image.

If you are not sure what your background is going to be, you should use an alpha channel for compositing. Lens Flares work with both straight and multiplied alpha channels. Each has its advantages and disadvantages.

When you render an image with a Lens Flare and save it with a multiplied alpha channel, the resulting image file looks as though you rendered it on-screen, but the Lens Flare information is not stored in the alpha channel. This means Infini-D cannot composite over a background image in areas where the flare exists but there is just background color with no objects. If the flare is only visible on top of other objects, this is not an issue.

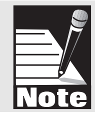
The converse is true for straight alpha channels. Infini-D stores all parts of a Lens Flare in a straight alpha channel, enabling you to seamlessly composite the image, including objects and flares, over any background you choose, but an image with a straight alpha channel and a Lens Flare looks incorrect in the resulting image file until you composite it over a background.

You should choose your output style (against a background, with a straight alpha channel or with a multiplied alpha channel) based upon your intended use of the resulting image or animation.

Gels

A gel is an image, surface or movie file used to modify the color of a spotlight. You could use a gel, for example, to create the effect of a slide projector or light passing through a stained glass window. The gel changes the color of the light. White light is most common, but you can create interesting effects by combining colored lights with various gels.

You cannot change between gels over time. If your gel is a movie, it will be animated, but you can not change to a different gel over time—if you change the gel on a spotlight, it changes for all points in time.



Follow these steps to add a gel to a spotlight:

Step 1: Select the light as explained in *Editing Light Information* earlier in this chapter.

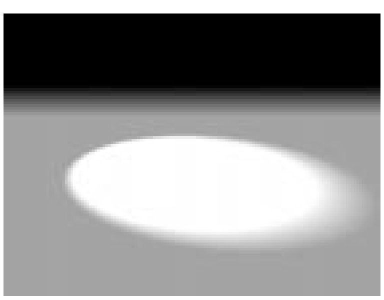
Step 2: Scroll down to the Light Effects panel in the Command floater.

Step 3: Click on the **Gel** pop-up list in the Light Effects panel and make a selection. You can use an existing surface or import an image to use as a gel as explained in *Importing an Image* in Chapter 15.

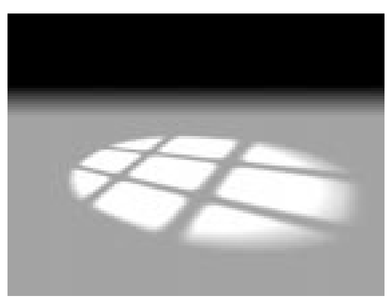
Step 4: Infini-D stretches the gel to cover the outer cone of the spotlight. The gel shrinks or grows whenever you modify the size of the outer cone. The cone of the light fits inside the square of the gel, to prevent the corners of the gel from projecting into the scene.

Masks

A mask is an image, surface or movie file that is used to alter the shape of the light cast by a spotlight. A mask in the shape of a window-frame, for example, would mimic the effect of a light shining through a window. (This is sometimes referred to as a gobo in theater.) Infini-D uses only the brightness of the mask image to modify the spotlight. Dark areas in the mask image allow no light to pass through, while white areas allow all light to pass. Gray areas dim the light that passes proportionately. Is it often easiest to convert an image to grayscale before using it as a mask in order to get an accurate idea of how it will work.



Spotlight Without a Mask



Spotlight With a Mask

• If you use a color mask, Infini-D uses only the brightness information to determine the masking effect, and ignores the color information.

• Like gels, you cannot animate changing between different masks (although the mask itself can be a QuickTime movie). If you change the mask on a spotlight, it changes for all points in time.

• Select a mask in the same manner described in the *Gels* section above.

DELETING LIGHTS

This section explains how to delete a light from your scene. Follow these steps to delete a light:

Step 1: Click on the light in the scene.

or

Click on the **Light** list in the Command Floater and select a light from the list.

Step 2: Press DELETE or BACKSPACE on your keyboard

or

Click on **Edit** in the menu bar and select **Clear**. Infini-D deletes the light without prompting you.

Note that when deleting a target light (a Target Spot or Tube light), the target is a separate object and so will not be deleted at the same time. To delete a target object, select it and press DELETE.

Chapter

17

Working with Cameras

This chapter explains how to work with cameras in your scene. As with lights, cameras are actual objects in Infini-D. Cameras and their associated Camera View windows allow you to control how you create models and animation sequences.

Because cameras are actual objects in the world, you can manipulate them in much the same way that you manipulate other objects. You can rotate cameras around their centerpoint or around other objects. You can also animate cameras, which means you can animate not only the motion of objects in the scene, but also the motion of cameras toward or away from objects. In addition, cameras have variable lens focal lengths, which you can also animate.

This chapter covers the following topics:

- Adding a New Camera
- Editing Camera Information
- Aiming Cameras with the Point At Command
- Deleting a Camera

ADDING A NEW CAMERA

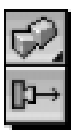
This section explains how to add a new camera to your scene. When you create a new scene file, Infini-D places a default Target camera in your scene, which enables you to see what is happening there. You can add additional cameras to view the scene from different angles.

Each time you add another camera, Infini-D adds a new Camera View window, which you can open by selecting it from the **Cameras** submenu on the **Windows** menu. With your camera selected, you can access information about the camera by clicking on the **Objects** panel in the Command Floater. You can have an unlimited number of cameras in your scene, though no more than 20 Camera View windows can be open at one time.

Note

View windows are described in Chapter 4: Infini-D Tools and Interface.

Follow these steps to add a new camera to your scene:



Step 1: Click on the **Camera** tool in the tool bar and choose a camera type from the pop-up list. There are two choices:

- **Regular**—This type of camera can be freely rotated and aimed in any direction.
- **Target**—This type of camera, also known as point of interest or center of interest camera, is always pointed at a target object (by default it is pointing at the target object that is created with it, however this can be changed to be any object in your scene). Whenever the camera or the object moves, the camera adjusts to keep the object in the center of its view. The default camera in a new Infini-D scene is a target camera.

Step 2: Click anywhere in your scene to place the camera and Infini-D adds a new Camera to the scene.

- With a regular camera, click to place it and drag to change its height in the Z axis.
- With a target camera click to place the camera and drag to position the default target object. If you do not drag, the target will be placed at the same position as the camera. (Note that the target object is not visible in the final rendering.)

Note the following:

- You can open the View Window for the new camera by clicking on the **Cameras** submenu in the **Windows** menu and choosing the appropriate one.
- You can access information about the camera by clicking on the Camera object, then clicking on the **Object** command tab in the Command Floater. Camera settings are described in the next section.

EDITING CAMERA SETTINGS

This section explains how to edit camera information. When you select a camera, the Camera panel appears in the Object command tab in the Command Floater. From here, you can adjust camera parameters, choose between different types of camera lenses, and apply Fog effects to the camera. When you make a change to these settings, Infini-D applies the change immediately. There is no OK or Apply button. If you wish to undo any changes, click on **Undo** in the **Edit** menu or change the settings accordingly.

If you want to change the name of the camera, select a camera by clicking on the **Camera List** button in the Command Floater, then enter a new name in the **Object Name** field adjacent to this button.

Follow these steps to edit camera information:

Step 1: Click on the **V-plane** tool in the tool bar, then click on the camera in your scene.

or

Step 2: Click on the **Camera List** button in the Command Floater and select a camera from the list.

You can edit the information in the Camera panel as follows:

- **Show**—Click on the check box next to each item to hide or show these items in the View windows.
  - **Camera:** Check this check box to make a camera visible as an object in your scene. Uncheck it to make the camera invisible. During scene composition you can hide the camera to reduce scene clutter, then show it to make camera adjustments. (Note that in your final rendered image, cameras are not rendered unless you check the Render Interface Elements check box in the Render dialog.) This option in ON by default.
  - **FOV:** Click on this check box to view a wireframe representation of the camera's field of view in the View windows. This can be very useful when composing your scene to set the camera to include those objects you wish to see. When you change the FOV setting in the Lens section, the FOV indicator changes in the scene to reflect

this. This option is OFF by default.

– **Fog Radius:** Click on this check box if you are applying a fog effect and want to see the inner and outer boundaries of that effect in the View windows. Anything inside the inner radius is completely visible, while anything outside the outer radius is completely obscured. Those objects in the middle become more obscured the further away they get from the inner radius. The Fog effect is explained below.

- **Lens**—Select a lens type from the pop-up list and the **Focal Length** and **FOV** fields change to reflect the chosen lens type. You can change these numbers to make this a custom lens. If you have FOV checked in the Show section, then you can see the field of view change in the View windows when you select a new lens. The higher the focal length, the greater the view magnification. The higher the FOV, the more you can see within the camera's field of view.

- **Roll** (Applies only to Target Cameras)—Determines the camera's rotation around the axis that extends from the camera to its target. Enter a new roll setting or adjust the roll graphic. If you adjust the roll numerically by entering a number or clicking on the up and down arrows, the graphic changes accordingly. You can also roll a camera with the **Roll** tool in the tool bar or by clicking on the inner arrows of the Camera navigation arrows in the Navigation tab of the Information Floater. See *Chapter 4: Infini-D Tools and Interface* for more information.

- **Fog**—Check the **Fog** check box to add a fog effect to your scene when viewed from the selected camera. This effect simulates diminishing visibility with distance by gradually fading objects out to the selected color as they get farther from the camera (the default color is the background color). Select the type of fog from the **Ramp** pop-up list, then enter a starting and ending point for the fog. The **Start** field represents how far from the camera the fog effect starts, while the **End** field indicates at what point objects become completely obscured. You can choose a color other than the background color by checking the **Color** box and choosing a new color. (See Chapter 26 for more on background color.).

  You can see a visual representation of the fog radius in the View windows by checking the **Fog Radius** check box in the Show section as explained earlier.

- **Target**—If you are using a Target camera, select a target object for the camera by clicking on the **Target** button and making a selection from the list. When you do this, the camera always points at this target, so that if you move the target object, the camera rotates to keep it centered in the view, likewise if you change the camera position, the camera rotates as needed to keep the target object centered within its field of view.

  When you first place a target camera, by default there is a null object attached that is the target. With the target camera tool, you first click to place the camera, and than drag to position the target object (if you fail to drag, the null object is still there, but is in the same position as the camera). Note that the null object is visible and selectable as any other object in your scene (although it is not visible in the Camera View window).

If you delete the null object, the target camera points at the origin until you select another target.

AIMING REGULAR CAMERAS WITH THE POINT AT COMMAND

This section explains how to use the Point At command to aim a regular camera automatically. (This does not work with Target cameras.) This could be particularly useful for locating a lost object or when animating to point the camera at a particular object. This is different from the Target camera, which keeps an object within its field of vision constantly through all points in time—a camera using the Point At command points at the object for only one moment in time.

When you use this command, the object appears in the center of the Camera View window. Infini-D orients the camera so that its natural upward direction corresponds with the Z axis.

The Point At feature points the camera at the centerpoint of the object in the scene. If you have offset an object from its centerpoint, the Point At command takes this into account and points at the object itself. See *Chapter 4: Infini-D Tools and Interface* for more information on centerpoints.

Follow these steps to aim a camera automatically:

Step 1: Click on the **V-plane** tool in the tool bar, then click on the camera you wish to aim

or

Click on the **Cameras List** button in the Command Floater, then select a camera from the list.

Step 2: Click on the **Model** menu, then select **Point At** and a sub-menu appears. Select the object you wish to point at from this list and Infini-D aims the camera at this object automatically.

To make a target camera point at a specific object, you can either move the camera's target to the same position as the object, or you can make the object be the camera's target. (See Target earlier in this chapter for details.)

Note

DELETING A CAMERA

This section explains how to delete a camera from your scene. You can delete a camera just as you would any object in Infini-D.

Follow these steps to delete a camera:

Step 1: Click on the **V-plane** tool in the tool bar, then click on the camera you wish to delete.

or

Click on the **Cameras List** button in the Command Floater, then select a camera from the list.

Step 2: Press DELETE on your keyboard

or

Click on **Edit** in the menu bar and select **Clear**. Infini-D deletes the camera object without prompting you.

Note that when deleting a target camera, the target is a separate object and so will not be deleted at the same time. To delete a target object, select it and press DELETE.

Chapter

18

Adjusting View Settings

This chapter explains how to adjust the settings in any View window. Each view window has its own settings for rendering mode and for what interface elements and effects are displayed in the view. Select the Display command tab in the Command Floater to access the Display settings. There are two panels in this command tab: View and View Detail. You can adjust various details about what you see in the View window and you can also set bookmarks.

In addition, you can adjust window details such as the window size and the clipping plane using the **Edit View** command on the **Edit** menu. When you select this command, the Edit View dialog box appears for the active view.

This chapter covers the following topics:

- Adjusting View Settings
- Adjusting View Detail Settings
- Editing Window Information

ADJUSTING VIEW SETTINGS

Note: Theses settings affect only the active View window. All settings are overridden by any selections you make in the Render Setup dialog box during final rendering. See Chapter 25: Final Rendering for more information.

This section covers the View panel in the Display tab of the Command Floater. You can adjust the following settings in the View panel:

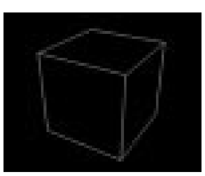
- Rendering Mode
- Renderer
- Anti-Aliasing Level
- Bookmarks

Selecting a View Rendering Mode

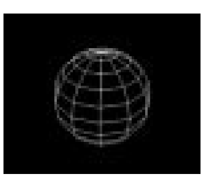
This section explains how to adjust the rendering mode for the chosen View window. Note that this affects the rendering only in the active window. It does not affect the final rendering of your scene (although, you can save a View window as an image at any time if you are happy with results). *See Chapter 23: Introduction to Rendering* for more information. Keep in mind that although you can set any view window to any rendering mode (including final quality with full reflections, transparency and shadows), it is generally not practical to keep a view window in a high-quality mode while working because the view will take too long to update. The high-quality modes are generally used to periodically render the scene in order to see how it will look in final rendering.

Follow these steps to select the render quality for the active View window:

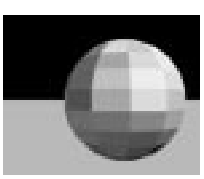
Step 1: Click on the **Render** pop-up list and select a render mode. Your choices are:



- **Bounding Box**: This is the simplest draft mode. Bounding box displays your objects in the given View window using only their bounding boxes—that is, cubes roughly the same scale as the given object. Since Infini-D doesn't have to worry about the detail of any given shape, this is by far the fastest rendering mode.

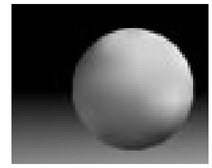


- **Wireframe**: This is the default rendering mode, which is slightly more complex than bounding box. It is particularly useful for scene composition, since it allows you to align objects precisely.

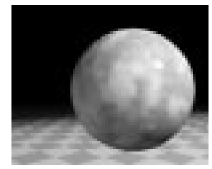


- **Flat**: This is the simplest shading mode. Infini-D finds the center pixel of a polygon, determines the location of the light source, then colors the entire polygon based on the color of the center pixel and the effect of the light source. The disadvantage of this effect is that most shapes appear quite faceted—thus the name flat shading—but Infini-D displays rough lighting and shading effects, which can be particularly useful during scene composition.

- **Gouraud**: This method uses the colors at the corners of a polygon to determine the shading for the entire polygon. It determines the colors at the corners and then blends the color across the polygon from the corners to shade the polygon. This produces an effect which is more accurate than flat shading by smoothing out the edges between polygons without calculating every pixel on the face of each polygon as Phong shading does. The disadvantage of this mode is that objects often display a slightly faceted effect and surface detail is generally imprecise.



- **Phong**: This is a final-quality rendering mode that checks every pixel within a polygon, uses its surface information, and based on the lighting, gives it a color. Phong shading can display all surface detail including true reflections, transparency and shadows. Though considerably slower than the other shading modes, Phong shading provides a far superior level of surface detail. You can also Phong shade any part of a View window using the **Marquee Render** tool in the tool bar.



Step 2: Click on the down arrow to the right of the **Render Mode** pop-up and select a renderer from the pop-up list. You can select either the standard MetaCreations renderer or choose one of the QuickDraw 3D rendering modes. These employ Apple's QuickDraw 3D technology, which provides fast, interactive rendering for scene manipulation and previews of animations. Note that QD3D does not support anti-aliasing or ray tracing and is not a final-quality rendering mode (except possibly using a third-party plug-in renderer purchased separately). See *Chapter 26: Advanced Rendering* for more information. There are two QD3D rendering choices:

- **QD3D Software**—Select this option and Infini-D renders the image using QD3D software only. If you do not have a 3D accelerator board installed, this is your only option. Although it is slower than hardware assisted mode, one advantage of this mode is that certain effects not supported by QD3D can still be seen, including lens flares.
- **QD3D Hardware**—Select this option if you have a QuickDraw 3D-compatible 3D accelerator board installed. With this setting, Infini-D will take advantage of the hardware to render your scene as fast as possible. In addition, hardware boards can support additional rendering features such as transparency, that are not available in QD3D software mode. If you choose this setting and do not have an accelerator board installed, or if the board is not working, Infini-D will revert to QD3D software mode. Consult the documentation that came with your accelerator board to learn which features it supports, and at what resolutions it provides 3D acceleration.

Because of the design of QuickDraw 3D and RAVE (the layer between QD3D and the hardware), hardware-supported features (such as transparency) are not visible in the view window until you drag an object, navigate the view, or play back an animation. When the view is idle, it is drawn using QD3D software, which does not support transparency, for example.

Note

Anti-Aliasing

Anti-aliasing compensates for the limitations of rendering images using square pixels by smoothing the edges of rendered objects and removing the jagged appearance of diagonal lines. It does this by determining the surface color on either side of diagonal lines, then applying a sophisticated interpolation procedure to blend the two colors together so that the eye perceives a smooth line.

Anti-aliasing can be a time-consuming process, but it can produce a superior image. The more similar two adjacent colors are, however, the less necessary it is to use anti-aliasing. For example, a diagonal edge that separates two shades of brown will not appear as jagged as the same edge separating black from white.

There are four levels of anti-aliasing available in the shading modes: none, low, medium and high. The higher the setting, the better an image will look, but the longer it will take to render.

Follow these steps to apply anti-aliasing:

Step 1: Click in a View window.

Step 2: Click on the **Display** command tab in the Command Floater.

Step 3: Select a Render quality as explained in *Selecting a View Rendering Mode* above. If you can apply anti-aliasing for the chosen rendering quality and renderer, the Anti-aliasing field activates. Otherwise it is grayed out.

Step 4: Click on the down-arrow next to this field and select the anti-aliasing quality you want from the pop-up list. Remember, the higher the quality, the longer it takes to render the View. During scene composition, you will probably want to select a lower quality. The graphics illustrate anti-aliasing at each of the levels.

Bookmarks

This section explains how to use bookmarks in Infini-D. Just as bookmarks enable you to find your place in a book, Infini-D bookmarks make it easier to find your place in a complex scene. When you create a bookmark, you save the position of a particular View window. In the case of a camera view window, a bookmark is an actual camera position, and switching between bookmarks moves the camera to different locations. In a complex scene, bookmarks can make it easier to navigate among different parts of the scene, or to create a camera fly-through animation of the scene.

This section covers the following topics:

- Adding a Bookmark
- Selecting a Bookmark
- Deleting a Bookmark

Adding a Bookmark

This section explains how to add a bookmark to the Bookmark list. Infini-D includes a list of standard bookmarks that come with the program. As you create a scene, you may find it useful to add new bookmarks to the list that are relevant to your scene creation process.

Follow these steps to add a bookmark:

Step 1: Click in the View window you wish to mark.

Step 2: Click on the **Add** button in the Bookmarks section of the View panel and the New Name dialog box opens.

Step 3: Enter a relevant name for the bookmark, then click on **OK** to add it to the Bookmark list for the chosen View window. You can select the new bookmark as explained in the next section.

Selecting a Bookmark

This section explains how to select a bookmark. Each time you add a bookmark, Infini-D saves it in the Bookmark list. Follow these steps to retrieve a bookmark:

Step 1: Click on the down-arrow adjacent to the **Delete** button in the Bookmarks section of the View panel and the Bookmark pop-up list appears with a list of bookmarks for the chosen View window. The list includes your new bookmarks, as well as the defaults that come with Infini-D.

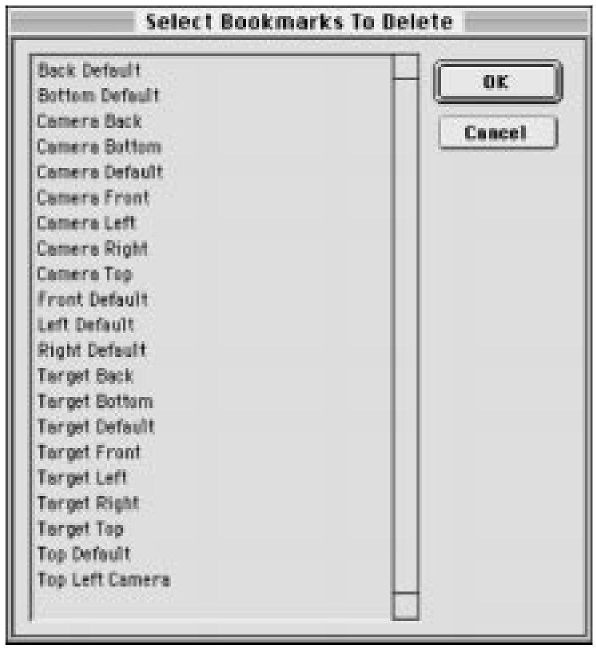
Step 2: Drag down through the list until you locate the bookmark you want, then select it. Infini-D switches you to that view automatically.

Deleting a Bookmark

This section explains how to delete a bookmark from the Bookmark list. As you add bookmarks, your list could become quite long and difficult to manage. You can delete bookmarks that are no longer relevant.

Follow these steps to delete a bookmark:

Step 1: Click on the **Delete** button in the Bookmarks section of the View Panel and the Select Bookmarks to Delete dialog box opens.



Step 2: Click on the bookmark you wish to delete.

- If you wish to delete a series of consecutive bookmarks, click on the first one, then press SHIFT and click on the last one.
- If you wish to delete several bookmarks in different positions in the list, click on the first one, then press COMMAND (Mac) or CTRL (Win) and click on each bookmark you wish to delete.

Step 3: Click on **OK** and Infini-D deletes the bookmarks without prompting you.

ADJUSTING VIEW DETAIL SETTINGS

This section explains how to adjust the settings in the View Detail panel in the Display command tab of the Command Floater. In this panel, you can check various check boxes to turn effects on or off for the given view. As you compose the scene, you may find it useful to turn certain effects on or off to see how it affects the scene in the given View window, then you can make adjustments as needed.

This section covers the following topics:

- Accessing the View Detail Panel
- Wireframe Details
- Shaded Details
- Show Details

Accessing the View Detail Panel

This section explains how to access the View Detail panel, which allows you to turn various effects on or off for the given view.

Follow these steps to access the View Detail panel:

Step 1: Click on any View window.

Step 2: Click on the **Display** command tab in the Command Floater

Step 3: Click on the blue triangle to open the View Detail panel if it is not already open.

Step 4: If you can't see all of the settings, scroll down to the bottom of the panel.

Wireframe Details

This section explains how to turn wireframe details on or off. You can use these settings only when you select Wireframe as the rendering mode in the View panel. See *Selecting a View Rendering Mode* earlier in this chapter for more information.

Follow these steps to select wireframe details:

Step 1: Click in the View window where you wish to work.

Step 2: Click on the **Display** command tab in the Command Floater.

Step 3: Select **Wireframe** as the rendering mode from the **Rendering** pop-up list in the View panel.

Step 4: Click on the blue triangle to open the View Details panel if it is not already open.

Step 5: Click on the check box next to each of the settings to turn it on or off. Your choices are as follows.

- **Draft Detail**—If you are using SplineForm objects—that is, any object you created in the Workshop or any default Infini-D SplineForm object from the tool bar—check this check box to view only the end caps and rails of the objects. This can be useful in a busy scene to reduce the level of detail.
- **Depth Cue**—Check this check box to make objects get darker the further away they get from the camera. Enter a number that indicates how far away the object must be before Infini-D cues it. Enter a low number if you want to cue only those objects that are farthest away. Enter a high number if you want to cue all objects in the window. Note that this only works in Wireframe mode in Camera View windows.

Shaded Details

This section explains how to turn on or off certain details in the chosen View window when you select a shaded rendering mode. Note that some of these details also work when you use the Ray Trace Marquee Rendering tool, but this depends on how you set up shadows, transparency and reflections in the Tools tab of the Preferences dialog box. See *Chapter 3: Getting Started* for more information.

Note

Note: You can override the settings you select here in the Render Setup dialog box when you perform final rendering. See Chapter 25: Final Rendering for more information.

Follow these steps to select shaded details:

Step 1: Click in the View window where you wish to work.

Step 2: Click on the **Display** command tab in the Command Floater.

Step 3: Select a **Shaded** mode as the rendering quality from the **Rendering** pop-up list in the View panel. *See Chapter 23: Introduction to Rendering* for more information.

Step 4: Click on the blue triangle to open the View Details panel if it is not already open.

Step 5: Scroll down to the Shaded section if you cannot see it. Click on the check box next to each of the settings to turn it on or off. When these settings are on (checked), you can see the effect so long as an object in the active View window has the effect associated with it. If these settings are off (unchecked), then the effect does not show in the active View window, regardless of whether an individual object has the effect turned on or not. Your choices are described below:

- **Shadow**: Check this check box to show shadows if an object has shadows turned on as part of its individual object settings. You can adjust object settings as explained in *Chapter 9: Object Settings*. Note that shadows only appear if you choose Phong shading as the rendering mode, and you must have a light in your scene that is set to cast shadows as described in *Chapter 16: Working with Lights*.

- **Reflections**: Check this check box to show reflections in the given View window if an object in the window has reflection turned on, then enter a number that indicates the depth of reflections. Note that you get true reflections only in Phong shading. In other shaded rendering modes, you can use an environment map to simulate the reflection. See *Chapter 26: Advanced Rendering* for more information. You must have a reflective surface on your object to see reflections as described in *Chapter 14: Surface and Texture Maps*.
- **Transparency**: Check this check box to show transparency in the given View window in objects that have transparency turned on, then enter a number that represents the number of consecutive transparent objects that you can see through (the higher the number the longer the rendering time). Transparency indicates how much you can see through an object. You can see transparency in all shaded rendering modes. You must have a transparent surface on your object to see transparency as described in *Chapter 14: Surface and Texture Maps*.

Show Check Boxes

This section explains how to turn various effects and indicators on or off by checking or unchecking the check boxes in this section. Check a check box to show the effect; uncheck it to hide the effect. Each of the Show items is defined briefly below:

- **Grid Plane**—Check this check box to show the grid plane. This may be useful during scene composition to align objects more precisely. If you don't want to see the grid, leave this unchecked.
- **Underground**—This item is only active when you select a Camera View window. Leave it unchecked to hide any objects or parts of objects that extend beneath the grid plane. This is useful for positioning objects in your scene. Check it to show objects and parts of objects that extend below the grid plane. Both settings apply whether or not the grid plane is visible.
- **Drop Shadows**—This item is only active when you select a Camera View window. Check it to show wireframe drop shadows from your objects on the grid plane. This is another feature that makes positioning and aligning objects easier. Uncheck it to hide drop shadows. Both settings apply whether or not the grid plane is visible.
- **Invisible Objects**—If you make one or more objects in your scene invisible in the Object command tab, click on this check box if you wish to see these objects in the selected View window. During scene composition, this can be useful for placing objects that would otherwise be invisible. (Note that this will not affect whether or not the object is visible in a final render.) See *Chapter 9: Object Settings* for more information on making objects visible and invisible.

- **Background Image**—If you are using a background image, use this option to show or hide it. You may find it easier, for example, to hide the background image during scene composition in order to see all the objects better. Check this option to show the background image. Uncheck it to hide it.
- **Lens Flares**—If you are using lens flares in your scene, check this item to show them or uncheck it to hide them. See *Chapter 16: Working with Lights* for details on lens flares.
- **Light Glows**—If you have light glows in your scene, check this check box to see them. If you leave it unchecked, the light glows will not be visible, regardless of their presence in the scene. See *Chapter 16: Working with Lights* for more information.
- **Filters—**If you have applied plug-in filters in your scene, check this check box to show the filter effect. Uncheck it to hide the effect. During scene composition, you may find it useful to turn filters on and off to view the scene with and without the effect. See *Chapter 25: Advanced Rendering* for more information on applying filters in a scene.
- **Broadcast Safe Colors**—If you are producing a scene for a broadcast medium, you can turn this option on to see safe colors. Uncheck it to remove safe colors. You can adjust safe color options in the Preferences dialog box. See *Chapter 3: Getting Started* for more information on setting preferences.

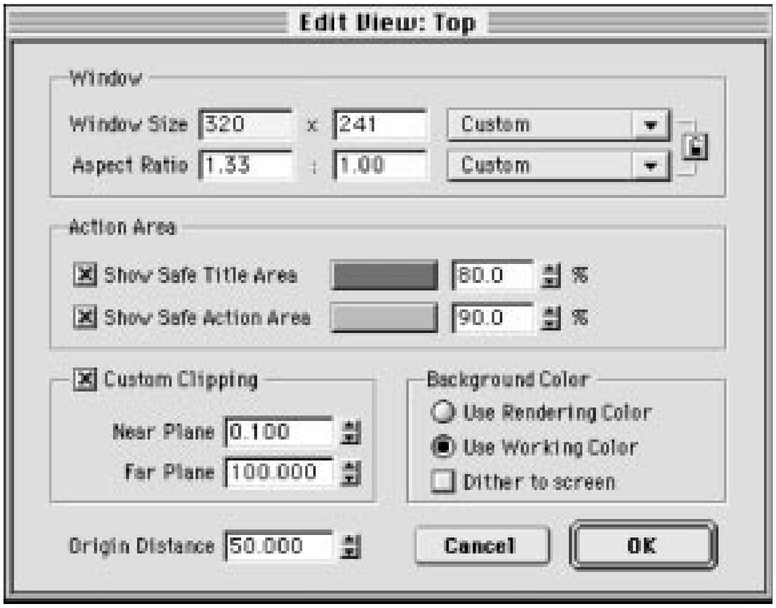
EDITING WINDOW SETTINGS

This section explains how to adjust certain window settings in the Edit View dialog box. This can be useful during scene composition to see what the final rendered scene would look like at different sizes. In addition, you can choose to show safe title and action indicators—a feature useful if you are creating an animation for video—and you can adjust the clipping plane, the background colors and the origin distance. Each of these options is described below.

Follow these steps to adjust window information:

Step 1: Click on the window you wish to adjust.

Step 2: Click on **Edit** in the menu bar and select **Edit View** or press COMMAND-] (Mac) or CONTROL-] (Windows). The Edit View dialog box for the chosen view opens.



Step 3: You can edit each of the settings in this dialog box as explained below:

- **Window Size**—Click on the pop-up list adjacent to this field to select a predefined window size setting. If you do not wish to choose from the predefined list, you may enter the width and height for the current window manually in the **Width** and **Height** fields. Note that these values are measured in pixels only.

  This can be useful to see what your final rendered scene could look like at different sizes. You can also set an aspect ratio as explained below.

- **Aspect Ratio**—Click on the pop-up list next to this field to select a standard aspect ratio for the medium in which you intend to render your final scene. When you select an aspect ratio, Infini-D calculates the height based on the current width. If you click on the **Lock** icon, Infini-D locks the window size to the aspect ratio, so that if you change one Window size setting (width or height), the other changes to conform to the chosen aspect ratio.

- **Show Safe Title Area**—Check this check box if you want to include an indicator in your View that outlines the safe title area of the frame. The safe title area represents the portion of the frame that is considered safe for important elements in your animation such as text or logos, and will be free from the distortions that can occur towards the edges of a video monitor. You can then select a color for the safe title indicator and enter a percentage that measures how much space the indicator occupies in your scene. This is generally only relevant for video and broadcast users. (Note that this indicator will not appear in final renderings.)

- **Show Safe Action Area**—Check this box if you want to include an indicator in your scene that outlines the safe action area. The safe action area represents the portion of the frame that will reliably be visible when played back on a video monitor (a portion of the outer edges of the frame will always be be obstructed due to the way video is projected in a TV tube). You can then select a color and enter a percentage that indicates how much space the safe action area occupies in your View. As with Show Safe Title Area above, this is generally only relevant for broadcast and video users. (Note that this indicator will not appear in final renderings.)
- **Custom Clipping**—Click on this check box if you want to define a custom clipping plane. The clipping plane determines at what depth objects in the given View window are visible. Objects that appear between the two planes are visible, so that if an object is farther than the number in the **Far Plane** field or nearer than the number in the **Near Plane** field, it is not visible in the scene.
- **Background Color**—Click on the radio button next to the desired item to use the background color that corresponds to your choice. These colors are set in the Environment dialog box. During scene composition, for example, you may want to switch between these two colors to see what the background will look like in the final rendered scene.
- **Origin Distance**—This field is only active for the Orthographic Views. The number you enter here determines the point of reference for the near plane and far plane. It is actually the distance from the origin of the scene (0, 0, 0).
- **Dither to Screen—**Dithering tricks the eye into seeing a greater range of colors than are actually present in an image. For images with less than millions of colors, and for viewing on monitors that do not support millions of colors, dithering can improve image quality dramatically. You may want to leave this item checked all the time in case you need to view an image in an environment with fewer than millions of colors. Note that the dithering applies to the entire View window.

Step 4: Click on **OK** to save your settings and return to the View window. Click on **Cancel** to exit without saving the new settings.

Section 6

Animation

This chapter explains how to animate in Infini-D. Infini-D's animation tools make you the director creating your scenes, adding and positioning lights and placing your cameras. The program provides the tools to control and manipulate all the elements in your animation.

Infini-D uses a time-based or event-driven approach to animation (as opposed to a traditional keyframe approach). An event occurs each time you change the position, orientation, scale, shape or surface characteristics of an object. Infini-D tracks every event individually in your animation and plots the changes along object timelines in the Infini-D Sequencer. Each time an event occurs to an object, Infini-D places an eventmark on that object's timeline at the precise moment it happens. You can then manipulate these events in the Sequencer by adding, moving or even deleting them.

There are several advantages to using an event-driven approach to animation.

- It allows you to look between events to see the status of each object at any point in time, so you can return to your completed animation sequence and edit specific events or add new ones at any point on the timeline.
- Since you can add objects to your animation at any time, it is easy to place a new camera or light object into your animation. Thus, it is always possible to view your animation from a different angle. If, for example, you have just finished a complicated animation sequence that shows a front view of a person walking across a room, you may now want to see the entire sequence from a side view. All you need to do is place a new camera object into your animation and aim it at your model from the side.
- You can step through your animation and view or edit each animation frame indi-

vidually. If you see a frame you like, you can save it as a picture file such as a Macintosh PICT or a Windows BMP.

- You can set the length of your animation in seconds, minutes or hours. You are not limited to measuring your animation in frames, although you can do this, as well.

Section 7 covers the following topics:

- Introduction to Animation
- The Sequencer
- Advanced Animation
- Animation Assistants

Chapter 19

Introduction to Animation

This chapter provides an overview of animation tools and explains how to complete a simple animation. Infini-D has a variety of tools that you can use during the animation process including the:

- Animation Menu in the Menu Bar (See *Chapter 4: Infini-D Tools and Interface* for more information.)
- Animation Player in the Control Floater (See *Chapter 4: Infini-D Tools and Interface* for more information.)
- Sequencer Window (See *Chapter 20: The Sequencer* for more information.)

This chapter covers the following topics:

- Overview of Animation Tools
- Creating a Simple Animation
- General Animation Rules

OVERVIEW OF ANIMATION TOOLS

This section provides an overview of the animation tools available in Infini-D, including:

- Snapshot
- Preview
- Animate

When you first create an animation, you may want to start with a simple animation, so you can get comfortable with the tools. Using these three tools, you can create an animation before you are even familiar with the Sequencer, which is covered in *Chapter 20: The Sequencer*.

Snapshot

This section explains how to use the Snapshot command in the Animation menu. This command provides an easy way to set up an animation. When you use the Snapshot command, Infini-D adds eventmarks for all objects in a scene at the same point in time. You can take an unlimited number of snapshots.

Follow these steps to animate with the Snapshot command:

Step 1: Set up your scene as you wish.

Step 2: Click on **Animation** in the menu bar and select **Snapshot**. Infini-D takes a snapshot of the scene, adds an eventmark to the Sequencer for every object and moves the Scene Time Marker ahead by the set time increment.

Step 3: Manipulate the objects in your scene any way you want. For example, you could deform the object with a Deformation effect, then click on Animate/Snapshot. You could then apply a surface and click on Snapshot again.

Step 4: Repeat Steps 1 and 2 until you are finished. You can then view this animation as explained later in this section.

Snapshot Increment

Whenever you take a snapshot, Infini-D moves you ahead in time by a specific time increment. The default snapshot increment is 1/2 second. Follow these steps to change the increment:

Step 1: Click on **Animation** in the menu bar and select **Snapshot Increment**. A sub-menu appears.

Step 2: Click on the new increment you want and a check mark appears next to it, indicating it is selected. The next time you select the Snapshot command, Infini-D will use the new increment amount.

Preview

This section explains how to see a bounding box or wireframe preview of your animation. This is particularly useful for testing the motion of objects in your animation quickly without going through the time-consuming process of rendering the entire scene.

Follow these steps to preview an animation:

Step 1: Select the **Animation** tab in the Control Floater, then select **Bounding Box** or **Wireframe** from the Rendering pop-up and click the **Play** button. See *Chapter 4: Infini-D Tools and Interface* for more information on using the Information floater.

Step 2: Infini-D plays the animation, while representing all objects as bounding boxes or wireframes. You can interrupt the preview in the following ways:

- Click on the **Play** button again.
- Press COMMAND - . (Period) Mac or Esc Win.

Animate

This section explains the Animate command. Use this command to view an animation interactively. The Animate command does not save the frames to disk and can be slow, so it doesn't show motion well. Still, it can be useful for object placement and camera framing.

Follow these steps to use the Animate command:

Step 1: Select **Current Quality** from the Rendering pop-up list in the Animation tab of the Control Floater.

Step 2: Choose **Animate** from the **Animation** menu in the menu bar.

or

Click the **Play** button in the Animation tab of the Control Floater.

Step 3: Infini-D plays the animation at the current rendering quality for the given View window. As with Preview, you can interrupt the **Animate** command in the following ways:

- Click on the **Play** button again.
- Press COMMAND - . (Period) Mac or Esc Win.

SIMPLE ANIMATION EXAMPLE

This section provides you with a simple animation example. By following the steps outlined here, you can begin to understand the basics of creating an animation in Infini-D. Once you are comfortable with this basic technique, you can move on to more complex animation functionality, as explained in the chapters that follow.

You can animate just about every effect in Infini-D. For example, you could use the **Squash and Stretch** tool to animate an object changing shape, such as making a bouncing ball that squashes as it strikes a table. You can animate cameras and send them flying over mountain ranges or send a light zooming down a black hole by using cameras and lights along with the **Terrain** tool.

Through a process called metamorphosis or morphing for short, you can change any object into an entirely new object—for example, an aluminum can turns into a glass bottle. You can also combine effects into a series. For example, you could fly over and circle a wooden baseball bat, which then morphs into a copper serving bowl, while the overhead light changes from magenta to white. You can create an animation using all of these effects with the **Snapshot** command on the **Animation** menu.

Follow these steps to create a simple animation:

Step 1: Select the **Sphere** tool in the tool bar, then click in any View window to place a sphere in your scene.

Step 2: Click on the **Animation** menu and select **Snapshot**.

Step 3: Click in any View Window.

Step 4: Select the **V-plane** tool, then drag the sphere to another location in the window

Step 5: Click on the **Animation** menu and select **Animate**. A bounding box representation of your sphere should move from the original location to the new location.

Step 6: Select the sphere again in any View window. Click on the **Surfaces** command tab in the Command Floater and choose a new surface from the surface list. See *Chapter 14: Surfaces and Textures* for more information.

Step 7: Click on the **Animation** tab in the Information floater. Select **Wireframe** if it is not already selected, then click on the **Play** button. Notice how the wireframe changes from white to the base color of the new surface.

Step 8: Choose **Snapshot** again and move the sphere to a new location. This creates a third event for your animation. This process can continue as long as you want.

This is only the beginning. Infini-D gives you precise control over each object in your animation as that object changes over time. You can move events in time, change the duration of individual events, add and remove events and much more. The next two chapters discuss animation control in depth.

GENERAL ANIMATION RULES

Before you begin animating in Infini-D, you should be aware of general rules. In general, most parameters can change over time, but it is not always clear which parameters you can animate and which you cannot. Refer to this section whenever you have a question. It is divided into the following categories:

- Modeling
- Surfaces/Environment
- Lighting
- Filters

Rules for Animating Objects

This section lists parameters you cannot animate when Modeling. You CANNOT animate the following items:

- Parameters in pop-up lists or check boxes.
- An object's triangulation parameters.
- Morph a SplineForm object between Pipeline and Flat modes.
- Bevels attributes including type, size and depth.
- Morph terrains (*except* fractal terrains, which can have the starting point within the fractal set change over time), although you can animate the scale in any dimension to simulate rising mountains, etc.
- Particle dialog box fields (although you can animate the particle emitter).
- Add a new Deformation mid-sequence in the Sequencer (although you can animate and change Deformations over time). You can achieve the effect of a deformation appearing by keeping the deformation amount set to zero until the desired time.
- Deformation type. If you change the type of a deformation (from Twist to Bend for example) at any point in time, it changes to the new deformation for *all* points in time.

Rules for Animating Surfaces and the Environment

Keep in mind the following when animating surfaces or editing settings in the Environment dialog box:

- Cannot morph from one mapping mode to another either for the object in general or within a composed surface.
- Cannot animate Environment dialog settings (although you can use a movie file as a background image or environment map).

Rules for Animating Lights

Keep in mind the following when animating lights:

- In general, you *can* animate any text field.
- You *can* animate any light parameter (such as position, color, intensity, cone angle, etc.).
- You *can* animate pop-up menu items within the Lens Flare dialog, although they will not interpolate between settings, they will simply snap from one setting to the next.
- You *can* animate any text fields in the Lens Flare dialog.
- Cannot animate pop-up lists or check boxes.
- Cannot animate between light types (for example, you can't animate from a Point light to a Spot light).
- Cannot animate between shadow types (none, sharp and soft).
- Cannot animate between different gel and mask types (although you can use a movie file for a gel or mask).
- Cannot animate soft shadow parameters
- Cannot animate visible ray samples or inverted rays setting (although you can animate intensity).

Rules for Animating Filters

You can change filter parameters over time, but you cannot add or change filter type in the middle of an animation sequence. (Again, you can achieve the effect of a filter turning on or off by setting its parameters to zero (or whatever is appropriate for the specific filter) at the desired time.)

Chapter

20

The Sequencer

This chapter explains how to use the Sequencer—the primary animation tool in Infini-D. The Sequencer gives you precise control over every animation event, including the duration of that event. Imagine, for instance, that you are creating an animation of a person juggling five beanbags. Using the Sequencer, you can access your animation at any point in time and manipulate the individual position of each beanbag.

This makes it a relatively simple matter to create animations that require exact timing. In fact, using the Sequencer, you can edit past events in any way you like. For instance, you could change two of the juggler's beanbags to bowling balls, or make the character juggle the beanbags faster. The Sequencer also allows you to add or delete events and helps you organize complex models.

This chapter covers the following topics:

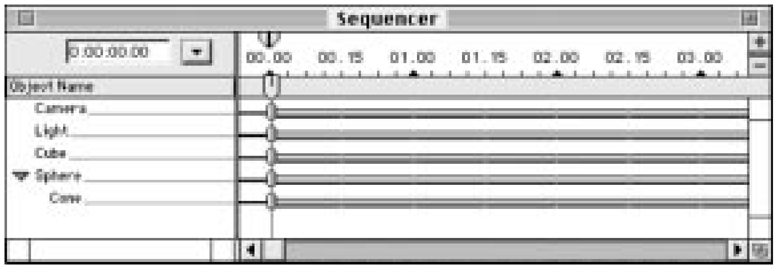
- Accessing the Sequencer
- Sequencer Controls
- The Sequencer and the Animation Floater
- Working with Eventmarks
- Working with Objects in the Sequencer

ACCESSING THE SEQUENCER

This section explains how to access the Sequencer window. Before you can begin using this tool, you have to make it visible.

Click on **Windows** in the menu bar and select **Sequencer**. The Sequencer window opens. The different parts of this window are explained in the next section.

SEQUENCER CONTROLS

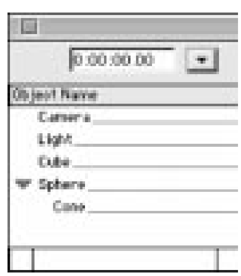


This section explains the different parts of the Sequencer window:

- Object List
- Scene Time Field
- Scene Time Marker
- Time Bar
- Punch In/Punch Out Markers
- Timelines

In addition to these controls, you can use the Sequencer in conjunction with the Animation floater. *See The Sequencer and the Animation Floater* later in this chapter.

Object List

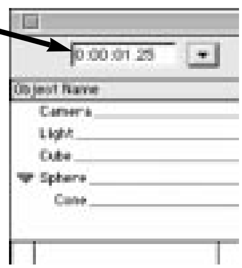


This section provides a general description of the Object list in the Sequencer. See *Working with Objects in the Sequencer* later in this chapter for more information on manipulating objects in the Sequencer.

On the left side of the Sequencer window is the Object List, where the names of all objects, cameras and lights in the scene appear. You can use the Object list in the following ways:

- Click on an object name to select that object both in the list and the scene.
- Click on an object's name and drag it onto another object name to link it to that object. Unlink it by dragging the name to any empty space in the list.
- Child objects are indented beneath their parent object in the list, so you can identify object hierarchies more easily.
- Double-click on any object name to reveal its parameters on individual timelines. (See *Eventmarks* later in this chapter for details.)
- Click and drag the tab at the bottom of the right edge of the Object List box to make it bigger. This is helpful when working with large object trees that may otherwise disappear from view.

Scene Time Field



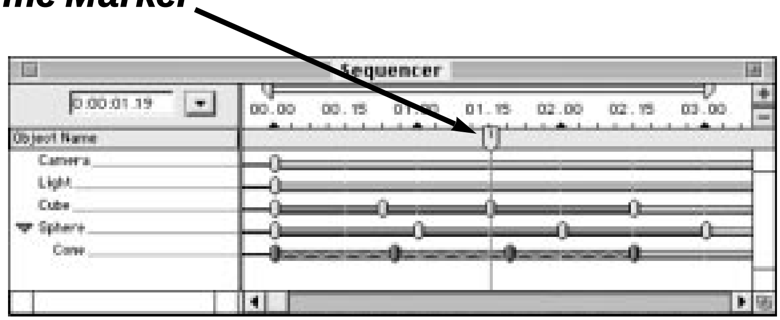
This section explains the Scene Time field. Just above the Object list is the Scene Time field, which displays the current time in your scene in hours, minutes, seconds and frames (by default). You can change the format in which the current time is displayed by selecting from the different time modes in the pop-up menu next to the time field. The Scene Time field always shows the current position of the Scene Time Marker (described below). Dragging this marker changes the time you see in the Scene Time field. You can also enter the time manually and the marker changes accordingly.

Follow these steps to change the scene time manually:

Step 1: Type the time value into the Scene Time field.

Step 2: Press the ENTER key. For example, if you click in this field, type 5 then press ENTER, the Scene Time Marker jumps to the fifth frame. You could also enter 1:10, for example, to move to Second 1, Frame 10. You can use a colon (:) or a period (.) as separators.

Scene Time Marker



This section explains the Scene Time Marker in the Sequencer. The position of the Scene Time Marker determines the current time in the scene. It is important to note that you are always editing the moment in time where the Scene Time Marker currently points, so if the scene time marker is pointing to 1.5 seconds, anything you do in the scene will happen at 1.5 seconds in the animation.

Animating with the Scene Time Marker

This section explains how to move the Scene Time Marker to change the animation interactively. All animation is driven by the position of the Scene Time Marker, so if you move it, and then adjust an object in your scene, Infini-D places an Eventmark (defined later) on the Object's timeline at the specific placement of the Scene Time Marker.

Follow these steps to create an animation using the Scene Time Marker:

Step 1: Starting with a new, empty scene, place a sphere in any view window.

Step 2: Click and drag the Scene Time Marker to a new time.

Step 3: Manipulate the object any way you want, such as changing its position or applying a new surface.

Note that Infini-D creates an eventmark at the new time, and draws a blue line (indicating animation) in the object's timeline between the original time and the new time. Keep in mind the following as you work with the Scene Time Marker:

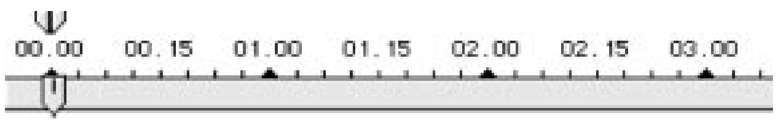
- You can jump to a specific point in time by entering the time and frame number in the Scene Time field, described above.
- You can snap the Scene Time Marker to specific Eventmarks by pressing the SHIFT key while dragging the marker.
- Press the CONTROL key (Mac) or the F2 key (Win) while dragging the marker to snap to the increments specified by tick marks on the Time Bar. See *Snap To Events* later in this chapter for more information.

- Drag the Scene Time Marker back and forth and the currently active View window animates the objects in Bounding Box mode to correspond with the timing of the Scene Time Marker. This "scrubbing" effect allows you to see where you are, as you move through your animation.

- Press the OPTION key (Mac) or ALT key (Win) while "scrubbing" (moving the Scene Time Marker back and forth) to force the entire scene to update in the current shading mode.

- When using a movie file as a background image, scrubbing the time marker while holding the OPTION or ALT key will provide you with a preview of your animation composited over background video. By using a low-resolution version of the intended final background video, you can get instant feedback about how the animation will look when composited. This can save a lot of time that would otherwise have to be spent on test rendering and compositing.

Time Bar



This section explains the Time Bar in the Sequencer. The Time Bar across the top of the Sequencer window displays the time of your animation. It is important to note that the Sequencer works with time, not frames (unless you select frames as the time display type). This means that when you drag Eventmarks or the Scene Time Marker through time, they may or may not land at a specific frame.

For example, while the Scene Time field may show an event occurring at 0:00:01:05 (which translates to the event occurring at Second 1, Frame 5), the event may actually occur between two frames. In this case, the final animation will not contain the frame which corresponds exactly to the given Eventmark.

You can use the Step Forward and Step Backward commands in the Animation menu or in the Animation tab of the Control Floater to ensure that the Scene Time Marker rests exactly on a frame. Alternatively, you can hold the Control key (Mac) or F2 key (Win) while dragging the Scene Time Marker to snap to time bar increments (which will show individual frames if zoomed in sufficiently).

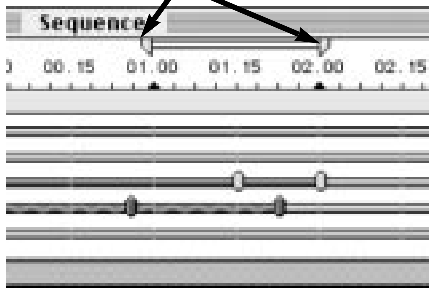
Keep in mind the following about the Time Bar:

- Scene time begins at Time 0 and reads from left to right across the Time Bar.

- You can display the time in hours, minutes, seconds or frames of animation. Click on the down arrow next to the Scene Time field to choose the time display type.

- Click on the plus (+) and minus (–)magnifying tools at the end of the Time Bar to provide more or less time detail. Click on **+** to zoom in or increase the time detail. Click on **–** to zoom out or decrease the time detail.

Punch In/Punch Out Markers



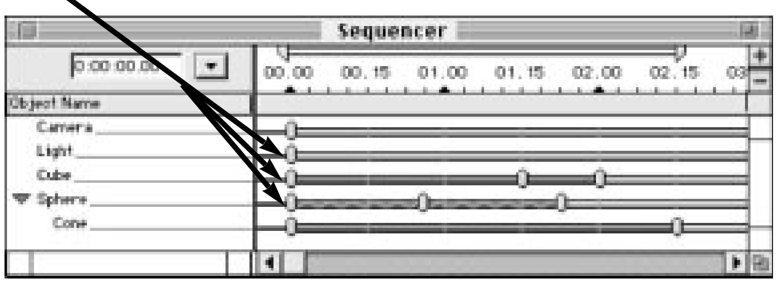
This section explains how to use the Sequencer Punch In/Punch Out Markers. The Punch In/Punch Out Markers are located above the Sequencer Time Bar. Use these markers to select a portion of your animation for viewing or rendering. Slide the Punch In marker to the time you wish to start previewing or rendering the animation, then slide the Punch Out marker to the time you want to end the preview or render.

Select **Work Area Range** in the Animation floater, then click on **Play**, and Infini-D plays only the portion of the animation that appears between the Punch In and Punch Out markers. Similarly, when setting up your final render, choose **Punch In** and **Punch Out** as the starting and ending point for the render to render only that section.

Keep in mind the following about Punch In/Punch Out Markers:

- You can snap the Punch In/Punch Out markers to eventmarks by pressing the SHIFT key while dragging the markers.
- You can snap to Time Bar increments by holding the CONTROL key (Mac) or F2 key (Win) while dragging the markers.

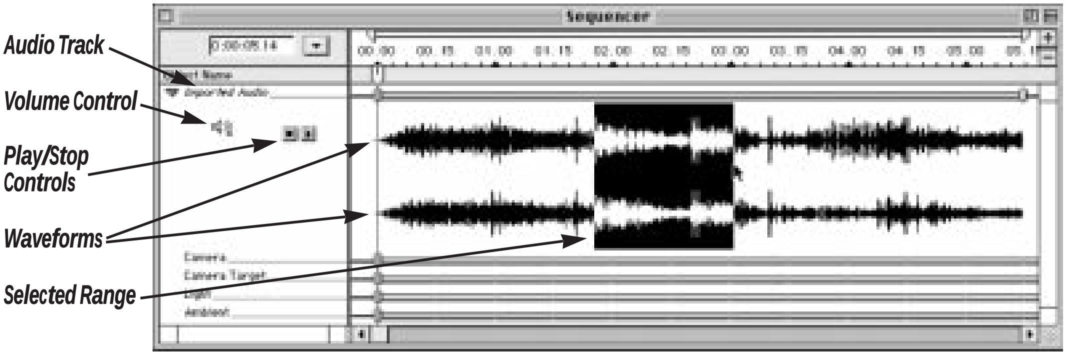
Timelines



This section explains timelines in the Sequencer. Every object in the scene has an object timeline. This timeline begins at time 0, just to the right of the object in the Object list and runs from left to right beneath the Time Bar.

The Object Timelines are the central feature of the Sequencer. It is here that the Sequencer displays all the changes or events you make to an object. Each time you alter an object, the Sequencer places an Eventmark on that object's timeline at the placement of the Scene Time Marker. Each timeline shows a complete history of all the events that have occurred to that object. Double-clicking on an object’s name reveals its individual parameter timelines. See *Working with Eventmarks* below for more information on working with timelines.

Audio Track



This section explains the audio track in the Sequencer. Infini-D allows you to import an audio file or the audio track from a QuickTime movie file that has audio in it. This is useful if the animation you are creating will be used with an audio track and you need to time events in your animation to events in the audio track.Follow these steps to import an audio file:

Step 1: Create a new scene or open an existing one.

Step 2: From the **File** menu, select **Import**->**Audio**.

Step 3: In the Audio Import dialog, navigate through the directories, locate the file you want and click **Open** (or **Convert** if it is a file type that QuickTime can convert for use within Infini-D such as AIFF.)

Step 4: An audio track is added to the Sequencer with the name of the file that was imported.

When you import an audio file, a new track is added to the Sequencer showing the name of the file you have imported. This track has two fixed eventmarks representing the beginning (time 0) and ending of the audio. A green bar is drawn between the two eventmarks. The entire audio track can be moved forward or backward along the time-line by clicking on the green bar and dragging. Clicking on the triangle next to the audio track reveals the waveform representation of the actual audio content (there will be one waveform for a mono audio file, and two for a stereo file). In addition, the following controls appear:

- **Volume Control:** This controls the volume for playing back the audio. Click on the icon and a volume slider appears. Drag up or down to adjust the volume.
- **Play/Stop Controls:** These controls allow you to play the entire audio track or

a portion of it from within Infini-D. To select a portion of the audio track, click and drag along the waveform—the area selected will be drawn inverted, and when the Play button is clicked, only the selected area will play. Pressing the **Space Bar** during playback will stop the playback and move the Time Marker to the point at which you stopped. This is locating a specific portion of the audio track.

Note

It is important to remember that the audio track feature in Infini-D is designed to simply let you see how the timing in your animation is matching up with the timing in your audio. Although the audio file will be added to your rendered movie if you render as a QuickTime movie, this feature is not intended to be used for final-quality audio.

THE SEQUENCER AND THE ANIMATION FLOATER

This section discusses the relationship between the Sequencer and the Animation tab of the Control Floater. These controls are similar in operation to those on a video-cassette recorder. They allow you to preview your animation sequences in various ways. Users of versions of Infini-D prior to version 4.0 may recall that there were animation player controls built into the Sequencer. With version 4.0 of Infini-D, the controls were expanded and moved to the Animation tab of the Control Floater. See *The Animation Tab in Chapter 4: Infini-D Tools and Interface* for more information on these controls.

WORKING WITH EVENTMARKS

This section explains how to work with Eventmarks in the Sequencer. Each Eventmark depicts an object at a particular moment in time. Whenever you move, scale, add a surface texture, or otherwise change an object in the scene, Infini-D places an Eventmark on that object's timeline at the current position of the Scene Time Marker. (Unless the Scene Time Marker is currently directly on an existing eventmark.)

You can expand each timeline by double-clicking on the object name to display time-lines and Eventmarks for all the object's main parameters. It is important to under-stand that there is only one Eventmark for each attribute, so for example, you cannot add more than one Position to an object at the same time. If you want to add more than one attribute such as multiple positions, you must use an invisible parent object. See *Using Invisible Parent Objects to Control Complex Animation* in *Chapter 21: Advanced Animation* for more information.

You can add, delete or duplicate Eventmarks or move them along the object timelines.

This section covers the following topics about Eventmarks:

- Manipulating Eventmarks
- The Eventmark Info Dialog Box
- Eventmarks and Individual Object Attributes
- Eventmarks and the Snapshot Command
- Adjusting Timing with Eventmarks

Manipulating Eventmarks

This section explains how to manipulate Eventmarks. You can work with Eventmarks on the object timeline to perform such tasks as adding or deleting Eventmarks.

This section covers the following topics:

- Adding Eventmarks
- Selecting Eventmarks
- Duplicating Eventmarks
- Moving Eventmarks
- Deleting Eventmarks
- Snapping to Eventmarks
- Overlapping Eventmarks

Adding Eventmarks

This section explains how to add an Eventmark to an object's timeline.

Follow these steps:

Step 1: Drag the Scene Time Marker to a new position.

Step 2: Click in any View window and change the object any way you like. For instance you could add a new surface or Deformation or change the position, rotation or scaling of the object. The Sequencer automatically creates a new Eventmark when you do this.

Step 3: Keep in mind the following about adding Eventmarks:

- You can use any View window to add an event to your animation or view that animation. The animation plays in the View window that is currently active.
- When two events happen to different attributes of a single object at the exact same moment, the timeline still represents these actions with a single Eventmark. Double-click on the object name in the Object list to access a list of sub-Eventmarks that you can edit to control the two actions separately.

Selecting Eventmarks

This section explains how to select an Eventmark. Before you manipulate Eventmarks as explained in the sections that follow, you need to be able to select an Eventmark in a timeline.

You can select an Eventmark in the following ways:

- Click on the Eventmark you wish to select.
- Select multiple Eventmarks by pressing the SHIFT key and clicking on each Eventmark you wish to select.

  or

  Drag a marquee to select all of the Eventmarks that fall within the rectangle.
- To select all of the Eventmarks for an object, press the COMMAND key (Mac) or the CONTROL key (Win), then double-click on the name of the object in the Sequencer Object list.

Duplicating Eventmarks

This section explains how to duplicate an Eventmark. This is particularly useful for creating repeating motion.

Follow these steps to duplicate an Eventmark:

Step 1: Select one or more Eventmarks you wish to duplicate as explained in *Selecting Eventmarks* above.

Step 2: Press the OPTION key (Mac) or the ALT key (Win) and drag the chosen Eventmarks to the new position. (It is often useful to use the SHIFT key or the CONTROL (Mac) or F2 (Win) key to snap the new eventmarks to the desired new location, either another eventmark or a certain time bar increment.)

Moving Eventmarks

When you move an Eventmark, you cause that event to occur at another point in time. Note that this also affects the time between events. After moving an Eventmark, Infini-D automatically recalculates the animation based on its new position on the timeline. This enables you to place events in any relative position in time.

You can move Eventmarks to any point on a timeline as follows:

- Click and drag an Eventmark where you want it on the timeline.
- To move multiple eventmarks simultaneously, select an eventmark, press the SHIFT key, then click on each Eventmark you wish to drag. Or, click and drag a marquee around the eventmarks you wish to select.
- There are two useful modifier keys for precisely aligning eventmarks to certain locations as you drag them:

- **SHIFT**—snaps to other eventmarks in any timeline.
- **CONTROL** (Mac) or **F2** (Win)—snaps to time bar increments.

Deleting Eventmarks

This section explains how to delete Eventmarks from the timeline. You may find, for example, that you have added one or more events that you no longer want in the animation. Follow these steps to delete unwanted Eventmarks.

Step 1: Select one or more Eventmarks as explained in *Selecting Eventmarks* above.

Step 2: Press the DELETE key on your keyboard

or

Click on **Edit** in the menu bar and select **Clear**.

Snapping to Eventmarks or Time Bar Increments

This section explains how to snap the Scene Time Marker to a specific Eventmark or tick on the timeline.

- **Snapping to an Eventmark**—As your timeline becomes more crowded with events, it can be increasingly difficult to line up the Scene Time Marker with a given Eventmark exactly.

  Press the SHIFT key, then click and drag the Scene Time Marker to the desired Eventmark to align the Scene Time Marker with that Eventmark. Thus you can ensure that you are editing only the Eventmark you want. This is also known as "snapping to the event" because you snap the Scene Time Marker to the Eventmark. With a crowded Sequencer, it may be useful to zoom in significantly in oder to more accurately see individual eventmarks.

- **Snapping to a Tick on the Time Line**— It is sometimes difficult to line up the Scene Time Marker to the exact tick on the time line you want, and you may need to be at an exact moment in time, especially if this involves time between seconds.

  Press the CONTROL key (Mac) or the F2 key (Win) and the Scene Time Marker snaps to the closest tick mark on the timeline.

The tick marks on the Time Bar do not always line up directly with frames. For example, when you first open the Sequencer, there are always four ticks between each second. At 30 frames per second, this means that the first tick will correspond to frame 7.5. Thus, an Eventmark placed exactly on the first tick mark will fall between frames 7 and 8. To make tick marks correspond to individual frames, zoom in on the timeline (See Time Bar section above).

Note

Overlapping Eventmarks

This section discusses overlapping Eventmarks in the Sequencer. It is sometimes impossible to tell when multiple Eventmarks are very close together in time—particularly when you zoom out to show a large stretch of time. This can be problematic, as hidden Eventmarks can produce undesirable effects.

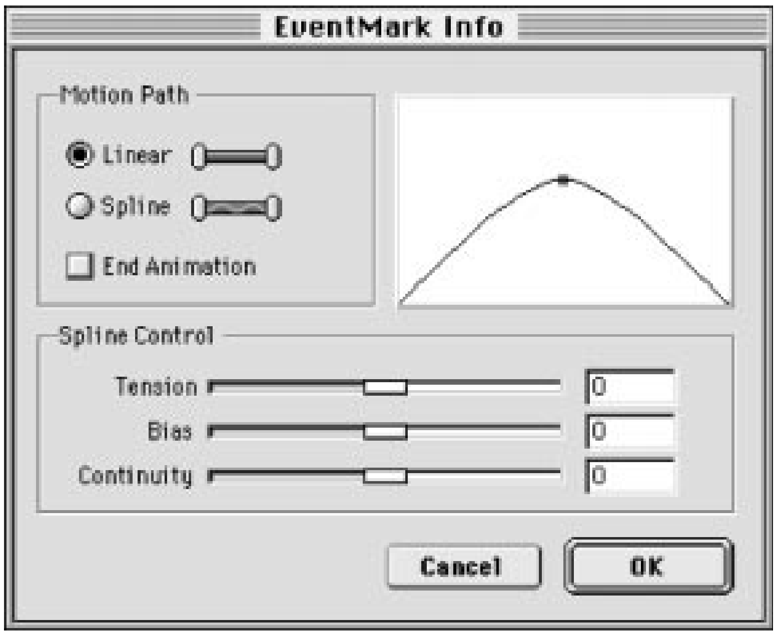
Therefore, Infini-D displays overlapping Eventmarks as two adjacent Eventmarks, regardless of the amount of overlap.

Eventmark Info Dialog Box

This section explains how to access and use the Eventmark dialog box, where you can adjust settings for an individual Eventmark.

Follow these steps to access the Eventmark dialog box:

Step 1: Double-click on any selected Eventmark or group of eventmarks and the Eventmark dialog box opens.



Step 2: You can change the settings for the selected Eventmark(s) as explained below:

- **Motion Path**—If an object changes during the time between two Eventmarks, the Sequencer connects them with a Motion Path indicator. This indicator shows the type of motion path the object uses between the two Eventmarks.

  Click on the radio button next to the type of motion path you wish to use for the chosen Eventmark. These are explained below:

  – Linear:- Select this option if you want a motion path with sharp movements. Infini-D displays a straight blue bar in the object's timeline. A Linear motion path is sharp without rounded corners, so that the object changes direction abruptly.

– Spline: Select this option when you want a motion path that is smooth, even and rounded. Infini-D displays a pink bar with a wavy line in the object's timeline. In order to produce this smooth motion effect, you must place at least three consecutive Eventmarks in the object's timeline.

- **End Animation Check Box**— An often useful trick during animation is to make an object appear and disappear instantly over the course of an animation. When you make an object disappear, this is known as "ending animation". Check the **End Animation** check box to make the object disappear from the scene between the chosen Eventmark and the next regular Eventmark. Note that in the Sequencer, End Animation events are rectangular instead of oval and the motion path following an end animation appears as a black line.

  End animation events do not affect lights and cameras. Though an object is not visible, the camera and the lights still perform their given functions.

- **Spline Control**—The Tension, Bias, and Continuity sliders in this section enable you to customize how the path passes through the events. Each setting uses a scale from -100 to 100. The default value of 0 is a neutral setting.

  To change a setting, click and drag the slider to the desired position. As you move the slider, the number in the field adjacent to each setting changes along with graphic above the Spline Control section. In all cases— regardless of the motion path settings—the motion path always passes directly through the event.

  Each motion path setting is defined briefly below:

  – Tension: This setting determines how tight or loose the Spline-based motion path is. A value of -100 causes an exaggerated curve, while a setting of 100 makes it appear almost linear.

  – Bias: This setting determines at what point, relative to the corresponding event the curve reaches its maximum peak. A value of -100 causes the curve to peak far ahead of the event, while a setting of 100 makes it peak after the event.

  – Continuity: This setting controls how evenly the object passes through the event. A value of -100 results in sharp and constant motion, while a setting of 100 results in an almost unnatural break or discontinuity.

Step 3: Click on **OK** to save your changes. Click on **Cancel** to exit without saving.

Eventmarks and Individual Object Attributes

This section explains the relationship between Eventmarks and individual object attributes such as size, rotation, scaling, deformations, surfaces, etc. Eventmarks represent any change made to an object at that point in time

If you double-click on an object's name in the Sequencer Object list, Infini-D displays separate timelines for the object's position, rotation, scale, centerpoint, uniform scale, surface and other information. These sub-Eventmarks allow you to control precisely the timing of events on each attribute's timeline, and to separate different parts of an animation.

For example, suppose you have an animation of a soda bottle morphing into a soda can while falling off the edge of a table. In order to fine-tune the timing of the fall so that it looks realistic, you may wish to add or adjust Eventmarks in the middle of the sequence. The morphing effect, however, is a simple effect which lasts for the duration of the fall. By manipulating the Position information in the Position timeline for that object, you can ensure that you will not affect the timing of the morph.

Keep in mind the following when working with sub-Eventmarks:

- Sub-Eventmarks are smaller than regular Eventmarks in Sequencer Timelines.
- Their timelines are red to help differentiate them from the main timelines.
- Each sub-Eventmark on an Object Attribute Timeline corresponds with an Eventmark on the object's main timeline. For example, if you have an event for rotation and position that occur at the exact same time, there will be a single Eventmark in the main timeline to represent this and a corresponding eventmark on both the rotation timeline and the position timeline. If, however, you move one of these sub-eventmarks, a new, corresponding eventmark is added on the main timeline.
- The Other Information timeline contains information specific to the object type as follows:
    - **SplineForm Models**: This represents any change made to the object in the Workshop. See *Chapter 10: The SplineForm Workshop* for more information.
    - **Light Objects**: This represents changes made in the Light panel of the Command Floater including intensity, fall-off, etc. See *Chapter 16: Working with Lights* for more.
    - **Cameras**: This contains the focal length value and other camera settings from the Camera panel in the Command Floater. See *Chapter 17: Working with Cameras* for more information.

Eventmarks and the Snapshot Command

This section explains the relationship between Eventmarks and the Snapshot command on the Animation menu. The Snapshot command was described briefly in *Chapter 19: Introduction to Animation.*

When you take a Snapshot, keep in mind the following:

- Infini-D examines each object in the scene to determine whether or not the object has changed since the original Eventmark and the current position of the Scene Time Marker. If the object has changed, Infini-D adds an Eventmark at the current time. If the object has not changed, Infini-D does nothing.
- If you modify the individual animation attributes for an object, Infini-D does not add additional Eventmarks for that object when you use the Snapshot command.
- When you use the Snapshot command, Infini-D moves the Scene Time Marker ahead by whatever increment is currently set under Snapshot Increment on the Animation menu.

Adjusting Timing with Eventmarks

This section explains how to manipulate Eventmarks to adjust the timing of events automatically. When scripting an animation, you may want to change the length of time it takes for a series of events to occur.

For instance, if you create a ball bouncing up and down, you may have the ball bounce over 4 seconds of an animation. Suppose you decide that the ball should perform these actions in 1 second, rather than 4. With a traditional keyframe system, you would have to script the animation again, but with Infini-D's time-based method, you can adjust the animation over time to expand or compress the amount time it takes for a series of events to take place.

This feature enables you to script your animation without worrying about the specific timing of individual events. For example, when creating the bouncing action of the ball, you can work with the events on an increment of time that is easily divisible such as 1 second, 2 seconds, 3 seconds and so forth. You can then snap the Scene Time Marker to these increments and set the Eventmarks you need to make the ball bounce. Once you have the correct motion, you can then adjust the animation in time by changing the timing of each event.

If you wish to adjust a series of Eventmarks proportionately to take more or less time, follow these steps:

Step 1: Select a series of eventmarks

Step 2: Press the COMMAND key (Mac) or the CONTROL key (Win) and click and drag on the first or last eventmark in the series. The entire selection will scale longer or shorter proportionately.

WORKING WITH OBJECTS IN THE SEQUENCER

This section explains how to use the object list to organize your objects. The object list down the left side of the Sequencer window lists every object, camera and light in your scene, and it is therefore a convenient mechanism for visually organizing your objects and hierarchies.

This section covers the following topics:

- Reorganizing the Object List
- Linking Objects
- Expanding and Collapsing Object Hierarchies

Reorganizing the Object List

This section explains how to reorganize the object list in the Sequencer. This provides a quick way to logically group objects for easy reference. Moving an object in the object list has no effect on how the object appears or behaves in the scene (except for linking and unlinking, explained below).

To reorganize the Object list do the following:

- Click on the name of the object you wish to move and drag it to a new location in the Object list.
- If you move an object to a position between two objects that are part of the same hierarchy, it becomes part of that hierarchy. If the object you are moving is already part of another hierarchy, moving it breaks the link to the old parent.
- If you make change, you can reset the Object list to its original order by pressing the OPTION key (Mac) or the ALT key (Win) and clicking once on the title **Object Name** above the Object list.

Linking Objects

This section explains how to link objects using the Sequencer. As you may know, you can link objects together in Infini-D by creating object hierarchies. This process is covered in *Chapter 8: Object Hierarchies*. In addition to the tools described in Chapter 8, you can also link objects using the Sequencer.

Follow these steps to link two objects:

Step 1: Click on the name of the object to be linked and drag it to another location in the object list. As you drag the object name over the names of other objects, Infini-D highlights them.

Step 2: Drop the object onto a highlighted object name and it becomes indented underneath it indicating it is now the child of that object.

You can change the type of link by pressing the appropriate keyboard commands as you drag as follows:

- **Free Lock**—Do not use any keyboard command.
- **Pivot Lock**—Press the OPTION key (Mac) or the ALT key (Win).
- **Position Lock**—Press the CONTROL key (Mac) or the F2 key (Win).
- **Full Lock**—Press the OPTION and CONTROL keys simultaneously (Mac) or press the ALT and F2 keys simultaneously (Win).

Expanding and Collapsing Object Hierarchies

This section explains how to use the Sequencer to show or hide child objects in an object hierarchy. The Sequencer indicates that an object hierarchy is available by displaying a triangle next to the parent in the Sequencer Object list. This triangle works in the same fashion as showing or hiding panels in the Command Floater: if the triangle is Pink and pointing down, the hierarchy is expanded; if the triangle is blue and pointing toward the parent object, the hierarchy is collapsed, and the child objects are not listed.

Note that the ability to show or hide the children is just a convenience in the Sequencer when working with a complex hierarchy. Hiding the children may make it easier to see the big picture in the Sequencer, but has no effect in the scene. It is merely an organizational tool within the Sequencer window itself.

You can use the following keyboard commands in conjunction with showing/hiding objects:

- Press the OPTION key (Mac) or the ALT key (Win) while clicking on a top-level blue triangle to expand the first level of every hierarchy in the Sequencer.
- Press the OPTION key (Mac) or the ALT key (Win) while clicking on a top-level pink triangle to collapse the first level of every hierarchy in the Sequencer.
- Press the COMMAND + OPTION keys (Mac) or the CONTROL + ALT keys (Win) while clicking any blue triangle to fully expand all hierarchies.
- Press the COMMAND + OPTION key (Mac) or the CONTROL + ALT key (Win) while clicking any pink triangle to fully collapse all hierarchies .

Chapter 21

Advanced Animation

This chapter explains a few advanced animation techniques. Chapter 19 provided a basic overview of animation and Chapter 20 explained how to use the Sequencer—the main animation control center in Infini-D. This chapter builds on what you learned in the two previous chapters and provides some techniques you can use to create more sophisticated animations.

You can use Infini-D's powerful animation engine to animate lights, interpolate surfaces, morph SplineForm objects and more. This chapter discusses these capabilities as well as animation and object hierarchies and describes some advanced tools such as on-screen motion paths and velocity control.

Note that you *cannot* animate changes to an object performed in the Mesh Editor. If you edit an object in the Mesh Editor, you change it for all time across the Sequencer regardless of the position of the Scene Time Marker at the time you alter the object. If you want to alter an object over time, use a Deformation instead. See *Chapter 11: The Mesh Editor* or *Chapter 12: Deformations* for more information.

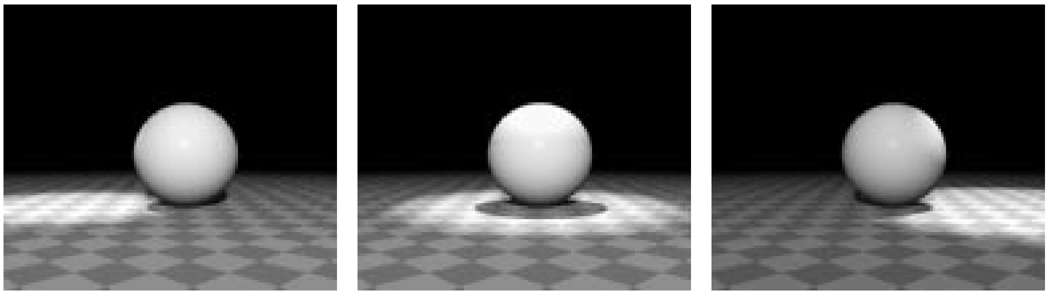
This chapter covers the following topics:

- Animating Lights
- Animating Booleans
- Animating Special Effects
- Morphing
- Using Invisible Parent Objects to Control Animation
- Using Links and Constraints with Animation

- Working with On-screen Motion Paths
- Working with Velocity Control

Chapter 22 covers Animation Assistants, which provide animation shortcuts for some other advanced animation techniques.

ANIMATING LIGHTS



This section explains how to animate lights. It is possible to create animated lighting effects with any light source light source—distant, point, tube or spot, target spot, or ambient. Lights can move and rotate in the same manner that other objects move and rotate, and any of the light's parameters can be animated (with the exceptions noted below).

As an example, follow these steps to animate the color of a light:

Step 1: Select a color for your light source in the **Light** panel of the Command Floater as explained in *Chapter 16: Working with Lights*.

Step 2: Click on the **Animation** menu and select **Snapshot**.

Step 3: Click in the **Light** panel again and change the light source to a new color.

Step 4: Click on the **Display** command tab in the Command Floater and set the rendering mode to a shading mode. See *Chapter 18: Adjusting View Settings* for details on changing the view rendering mode.

Step 5: Click on the **Animation** menu and select Animate to view the sequence.

Tip! For an interesting effect, move a light source over a landscape or rotate it around an object while it is interpolating between two colors.

All of the settings in the Light panel and Light Attributes panel in the Object tab of the Command floater can be animated over time. This allows you to change intensity, spotlight cone angles and more. The settings in the Light Effects panel can not be animated, with the exception of glow radius, intensity of visible rays, and the settings found in the lens flare dialog.

ANIMATING BOOLEANS

This section explains how to animate Booleans. (See *Chapter 13: Booleans* for more information.) Using fairly simple animated Booleans, complex effects can be achieved such as one object carving out of another over time. Animating a Boolean object works like all other animation in Infini-D. You can alter the object's position, rotation, size, shape, and surface throughout a sequence. By moving a Boolean object, you change the result of the Boolean operation, creating complex animation that would be impossible to create otherwise.

Keep in mind when animating Boolean objects that you cannot change an object's Boolean mode over time. Changing the Boolean mode at any point in time changes it for all points in time.

Follow these steps to create a sample animated Boolean effect:

Step 1: In a new Infini-D scene, place a sphere and a cube.

Step 2: Apply the Blue Plastic surface to the cube and the Red Plastic surface to the sphere.

Step 3: Set the sphere's Boolean mode to negative. Position it to one side of the cube.

Step 4: Move the Scene Time Marker ahead to approximately 3 seconds.

Step 5: Move the sphere to the other side of the cube.

Step 6: Render the animation in ray trace mode, and you will see the sphere carve through the cube as it moves.

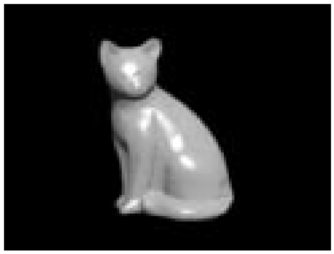
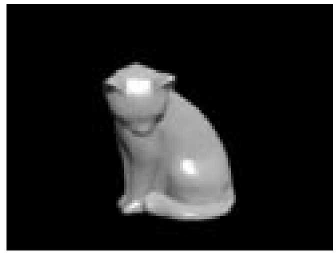
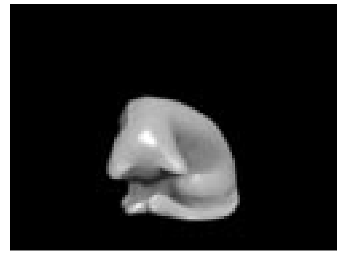
ANIMATING SPECIAL EFFECTS

This section explains how to animate special effects in Infini-D. These include:

- **Lens Flares**—Lens flares can be animated to create a wide range of lens flare and light glow effects.The light to which the lens flare is attached can be moved and you can animate any lens flare property for which you enter a value in the Lens Flare Editor dialog (e.g.: Glow Intensity, Halo Scale, etc.). Settings in pop-up menus (such as Streak type) can be animated, but they will not interpolate. For example, if you change streak type over time, it will pop from one type to the next at the appropriate time, with no transition between the two types. (See *Chapter 16: Working with Lights* for more on lights.)

- **Particles**—Particle systems are inherently animated (although you can create a static system if you want). The behavior of the particles is determined by the settings in the Particles dialog. You can animate the Particle emitter as you would any other object. (For example move the emitter over time so that the particles spray out over a line.) You cannot, however, animate any of the particle parameters over time. For instance, you cannot change from one color to another, or change the Frequency of the system. When you make a change to any particle parameter, it applies for all time. (See *Chapter 7—Other 3D Object Types* for more on particles.)

- **Deformations**—Animating a deformation is similar to animating any other parameter in Infini-D. You can apply a deformation to an object, move the Scene Time Marker to a new position, then change the deformation parameters. You can not animate from one deformation type to another, however you can achieve this effect by simply having one deformation's effect reduce to zero as the other increases. If you add or remove a deformation at any point in time, it is added or removed over all points in time. (See *Chapter 12—Object Deformations* for more on deformations.)

- **Plug-in Filters**—Filters are animated in a similar fashion to other object parameters in Infini-D. You can change the filter settings at a different point in time to increase or decrease the effect of the filter. You could, for example, use a blur filter that decreases in intensity over time to create the effect of an object coming into focus. Keep in mind that many filters have inherent animation capabilities, such as particle system filters which have motion and speed built in. These filters do not need to be changed over time in order for there to be animation. You can not animate from one filter to a different one over time. If you add or remove a filter at one point in time, it is added or removed across all time in the Sequencer. (See *Chapter 25—Advanced Rendering* for more on plug-in filters.)

MORPHING

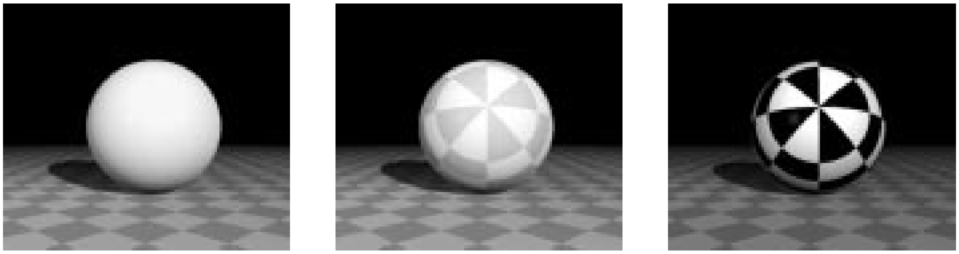
This section explains how to create morphing effects. Morphing is the process of changing the shape or surface of an object over time. For example, you could morph from white plastic to red plastic or change a wine bottle into a beer can.

This section covers the following topics:

- Surface Morphing
- Object Morphing with SplineForm Objects
- 3D Text Morphing

Surface Morphing

In Infini-D, you can morph between any two surface types. This allows you to create animated sequences showing one surface changing into another. You create surface morphs in the same way as all other animation sequences. An example is shown below:



The surface morphing differs depending on what surfaces you use in the morphing process. Therefore you should keep in mind the following:

- If you morph between a red and a blue surface, Infini-D gradually changes shades on the object from red to blue.
- If you morph between two procedural surfaces of the same type, for example two marbles, Infini-D will recognize that the two surfaces are of the same type and interpolate the individual settings between the two sets of values. In the case of the two marbles, creating a swirling effect.
- If you morph between two image surfaces (e.g., PICT maps), Infini-D blends one image into the other.
- If you morph between two dissimilar procedural surfaces—from a marble to a natural wood surface, for example—Infini-D blends from one surface to the other as if they were image maps.

Follow these steps to morph between surface types:

Step 1: Place an object in the scene as explained in *Chapter 6: Geometric 3D Objects* or *Chapter 7: Other 3D Object Types*.

Step 2: Apply a surface as explained in *Chapter 14: Surfaces and Texture Maps*.

Step 3: Click on the **Windows** menu and select the **Sequencer**.

Step 4: Move the Scene Time Marker ahead to the point in time when you wish to apply the new surface. See *Chapter 20: The Sequencer* if you need further information.

Step 5: Apple a different surface (to the same object) using the Surface tab from the Command floater.

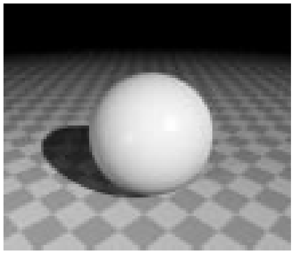
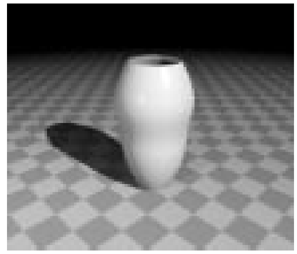
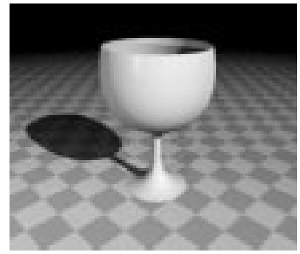
Step 6: Click on the **Animation** menu and select **Animate**. (Select Wireframe rendering mode to see this effect quickly.)

or

Click on the **Play** button in the **Animation** floater to see the object surface change over time.

Note: You must uncheck Motion Test in the Animation floater pop-up list to see the surface changing. If you have Motion Test checked, the surface will appear to stay the same over time. See Chapter 4: Infini-D Tools and Interface for more information on working in the Animation floater.

Object Morphing

This section explains how to use the Workshop to animate an object morphing from one shape to another.

Note: You can morph an object between any two shapes in this manner. A point-to-point correspondence between the two shapes is not necessary, although it can produce smoother results.

Follow these steps to morph an object in the Workshop:

Step 1: Place a new object in the scene as explained in *Chapter 6: Geometric 3D Objects* or *Chapter 7: Other3D Object Types*.

Step 2: Click on the **Animation** menu and select **Snapshot**.

Step 3: Double-click on the object to enter to the Workshop and edit the object's shape.

Step 4: Close the Workshop to return to your scene.

Step 5: Click on the **Animation** menu and select **Animate**

or

Click on the **Play** button in the **Animation** floater to see the object change over time.

Note: The method above applies only to objects created in the SplineForm Workshop. If you are using an imported DXF or 3DMF object, keep in mind that Infini-D cannot morph the actual shape of these objects, although you can apply animated deformations and animate any of the parameters in the Info floater (such as position, rotation, etc.). Also, keep in mind that you cannot morph from one terrain type to another.

3D Text Morphing

This section explains how to morph 3D text. This could be particularly useful for video and broadcast users. You could, for example, create a flying logo that transforms over time.

When you animate extruded fonts in Infini-D, it is similar to the animation of other objects in terms of position, orientation, scale and surface, but there are differences. When Infini-D extrudes a letter or group of letters, it represents the set of letters as a single object. This allows you to animate from one set of letters to another set easily without regard to the number of letters in the starting and ending words. For instance, you could go from the word *Apple* to the word *Macintosh* without worrying about constructing the four extra letters. (Note, however, that the metamorphosis looks best when going between words of equal length.)

Infini-D tries to morph intelligently from one set of letters to another, but your results may depend on the fonts you are using, and can sometimes produce strange results. If you require specific control over the metamorphosis of text or wish to make a letter morph into something unrelated to a letter, such as a square, treat the letters as individual objects using the **Break Into Characters** command, and edit them individually in the Workshop. See *Chapter 7: Other 3D Object Types* for more information.

Follow these steps to animate extruded text from one set of letters to another:

Step 1: Select the **Text** tool from the tool bar and enter your text as explained in *Chapter 7: Other 3D Object Types*.

Step 2: Click on the **Animation** menu and select **Snapshot**.

Step 3: Select the text in your scene, then click on the **Object** command tab and enter new text.

Step 4: Click on the **Animation** menu and select **Animate.**

or

Click on the **Play** button in the **Animation** floater to see the text change over time.

USING INVISIBLE PARENT OBJECTS TO CONTROL COMPLEX ANIMATION

This section explains how to use an invisible parent object in an object hierarchy to help you control animation. Even though the Sequencer gives you control over individual object attributes such as position, rotation, scale, etc. it does not provide specific control of each axis of movement. By using an invisible object as a parent, you can have more precise control. You could use the parent to control motion along the X-axis only, and then the Y-axis could be controlled by the object itself. You can use a deeper hierarchy for each degree of freedom you wish to control.

Consider these examples using a bouncing ball:

- If you wish to have a basketball bouncing up and down, you may need four Eventmarks to create this sequence of events.
- If you want the basketball to move across the screen, you may need only two Eventmarks: one at the starting point and one at the ending point.
- If you want the basketball to bounce up and down and move across the screen at the same time, you may run into a problem since you are limited to a single position per object. You could try to get around this by creating four Eventmarks:
  - The first Eventmark denotes the starting position of the basketball on the ground on the left side of the screen.
  - The second Eventmark denotes the next position of the basketball above the ground.
  - The third Eventmark denotes the next position of the basketball back down on the ground.
  - The final Eventmark denotes the final position of the basketball up and on the right side of the screen.

The problem with this approach is that there may be no change in the basketball's movement across the screen from the first Eventmark to the second Eventmark, or from the third Eventmark to the final Eventmark. What is likely to happen is that the object will move across the screen in an uneven manner—as opposed to bouncing—since there is no horizontal object position information in the second and third Eventmarks.

To get around this, you may want to use invisible parent objects—that is, arbitrary primitives you use to control animation of specific characteristics of another object over time. This allows you to add more than one position (or other object attribute) to an object for a single Eventmark. Of course, you'll want this parent object to be invisible, since it really doesn't belong in your scene and is there only to help guide the other object.

Follow these step to create a sample animation using an invisible parent object to control motion:

Step 1: In a new scene, create a sphere in the lower left corner of the Front view window. Name the sphere “Basketball”.

Step 2: Move the Scene Time Marker ahead .5 seconds. Move the sphere to the upper left corner of the Front view window.

Step 3: Holding the OPTION key (Mac) or ALT key (Win), drag the first eventmark to duplicate it and position it at the 1 second mark.

Step 4: Holding the OPTION key (Mac) or ALT key (Win), drag the (now) second and third eventmarks to duplicate them and position them at the 1.5 and 2 second marks, respectively. Preview the animation to see the sphere moving up and down twice.

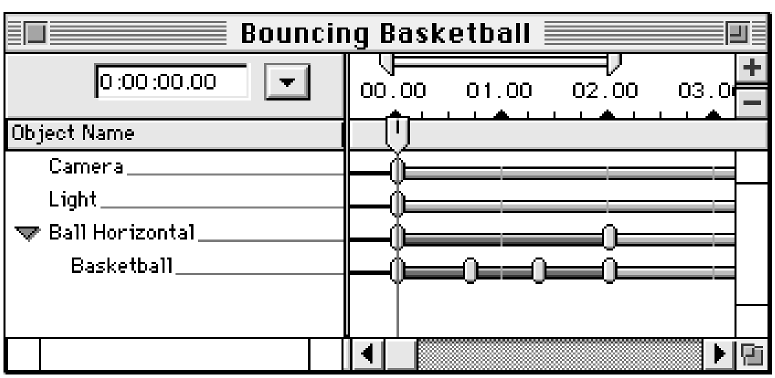
Step 5: With the Scene Time Marker at time zero, create a cube in the lower left corner of the Front view window. and name it *Ball Horizontal*. (This name is just a guide to help you understand how this object controls the horizontal movement.)

Step 6: Move the Scene Time Marker to 2 seconds and move Ball Horizontal to the lower right corner of the Front view window.

Step 7: Link Basketball as a child object to Ball Horizontal, creating a simple hierarchy. See *Chapter 8: Object Hierarchies* if you need instructions.

Step 8: Hide Ball Horizontal by unchecking Show Object in the Object tab of the Command Floater.

Step 9: Open **Sequencer** window if it is not already open. In the Sequencer you'll see that there are two objects, each with its own timeline. The Sequencer should look as below:



Step 10: Preview the animation to see the ball “bouncing” across the View window. The Basketball itself is just moving up and down, but when linked to the parent object, it moves horizontally simultaneously, creating a complex motion out of two simple motions.

Since you no longer have to move the basketball itself across the screen, you can limit it to one action. The basketball's Eventmarks in the Sequencer now designate only the motion of bouncing, while the parent sphere Eventmarks designate movement across the screen.

This system also makes it easier to fine-tune your animations. For example, if you decide that the movement of the basketball is too fast, you can simply adjust the Eventmarks of the controlling sphere that designates the starting and ending points. Doing this also affects the position of the basketball since the basketball is linked to the parent sphere. When you change the characteristics of the parent sphere, you do not affect the bouncing motion of the basketball itself, as those characteristics are designated in the basketball's Eventmarks.

The ability to create invisible parent objects can be a powerful tool as your animation becomes increasingly complex. You may realize that you need more parent objects for certain objects to control specific characteristics in your animation. You can get as complex as you like with this system creating grandparent objects that control the parents or great-grandparents that control the grandparents and so forth.

Note

Note: Since invisible parent objects are objects like any other, you can specify values that you don't wish to change, then lock them via the Constraints tab in the Modifiers command tab of the Command Floater. For example, if the parent object is only going to affect the change in an object's X position in 3D space, then you may want to lock the Y and Z position values so that when you drag the parent object, it will only move along the X axis.

USING LINKS AND CONSTRAINTS WITH ANIMATION

This section explains how to use links and constraints to create special effects during the animation process. There are many ways to use links and constraints with your animations for special effects and to create realistic models. For example, you could link several lights to a camera object so that wherever you move that camera, the lights will follow to maintain a constant lighting effect, or you could take that same camera and link it to a model of a car driving; the camera and lights will now move with the model as it drives along.

Keep in mind that if you create an animation that has object hierarchies defined in it, and you then break or change the links between parent and child objects, you may get undesirable results. Since object hierarchies base the child attributes on the parent’s, breaking or changing the links between child and parent causes the child object to follow the same values, but relative to View settings, rather than relative to the parent. This can create unexpected results. To avoid this, make sure you have all of your object hierarchies defined correctly before animating your models.

WORKING WITH ON-SCREEN MOTION PATHS

This section explains how to use motion paths during the animation process. Infini-D can display the motion path of an animated object in any View window. In addition, you can edit the motion path directly in the View windows, which can be extremely useful for fine-tuning an animation. Motion paths show only change in position for an object. They do not reflect any change to rotation or scale values.

This section covers the following topics:

- Showing and Hiding the Motion Path for a Single Object
- Showing and Hiding the Motion Paths for all Objects
- Motion Paths and Object Hierarchies

Showing a Motion Path for a Single Object

This section explains how to show a motion path for a single object. Note that you must have **Show Enabled Paths** checked as explained below in order to see any paths.

Follow these steps to turn on the motion path for a single object:

Step 1: Select the object with which you wish to work.

Step 2: Click on the **Model** menu and select **Enable Motion Path**. Notice that a red dot appears in the middle of the chosen object.

Step 3: If the object has motion events, there will be a red path indicating the motion path of the object, and red squares indicating the Eventmarks. These red squares can be dragged in the view windows to edit the motion path.

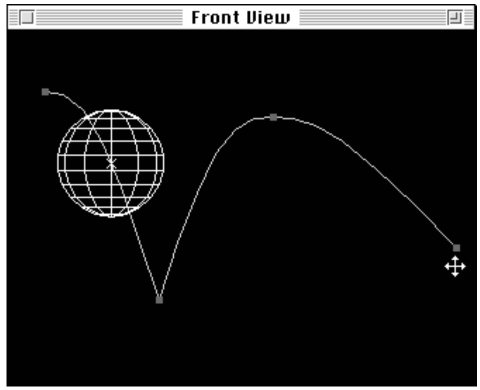
Showing a Motion Path for All Objects

This section explains how to see motion paths after you enable them for a specific object. When you show the motion path for all objects, you will see the motion paths for any objects in your scene that are moving and for which you have enabled the path. Motion paths are visible in all view windows. Once you can see the actual motion path, you can then manipulate the motion directly on screen by dragging around the red squares on the path.

Follow these steps to show a motion path for all objects:

Step 1: Click on **Animation** in the menu bar and select **Show Enabled Paths** (if it is not already selected).

Step 2: Animate the object as you wish and Infini-D displays the motion paths as lines. Each time you move the Scene Time Marker and manipulate the object in some way (move, rotate, etc.), Infini-D places a red square on the path. The graphic below illustrates this:



Step 3: You can manipulate these squares directly to change the motion of the object by clicking and dragging the squares to new positions.

Hiding a Motion Path for a Single Object

This section explains how to hide the motion path for a single object. As your scene becomes increasingly crowded, you may find it useful to hide the motion path for one or more objects.

Follow these steps to hide the motion path for an individual object:

Step 1: Select the **V-plane** tool in the tool bar.

Step 2: Click on the object whose motion path you wish to hide.

Step 3: Click on **Model** in the menu bar and select **Disable Motion Path**. Infini-D hides the motion path and you can no longer see it. You can make it visible again by clicking on **Model** again and selecting **Enable Motion Path**.

Step 4: Repeat Steps 2 and 3 as needed to hide the motion path for other objects.

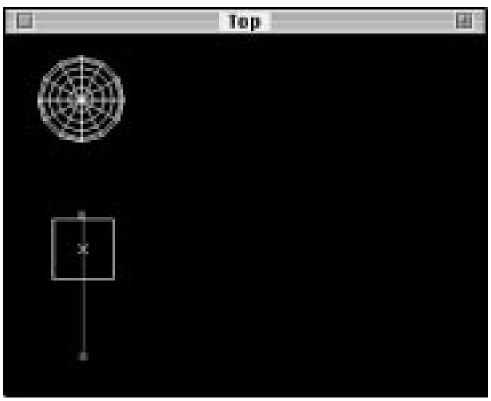
Hiding the Motion Path for all Objects

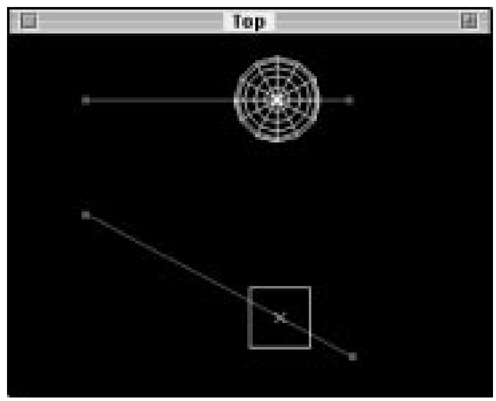
This section explains how to hide the motion paths for all objects in your scene. You may find that you want to see the motion paths to edit your animation, and when you're finished, hide all the paths to see your scene without the motion paths visible.

Click on **Animation** in the menu bar and select **Hide Enabled Paths**. Infini-D hides all paths in the scene.

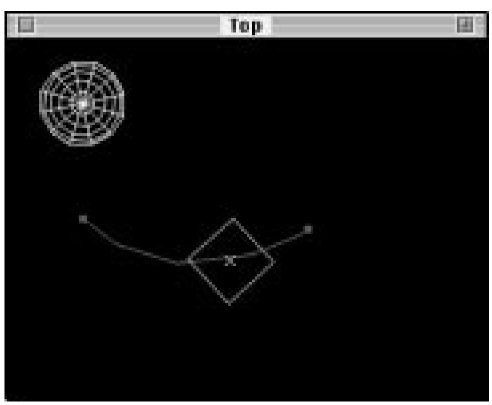
Motion Paths with Object Hierarchies

This section explains how to use motion paths when you have object hierarchies in your scene. Objects that are child objects in a hierarchy have motion paths that are defined not only by their motion, but by that of their parent. For example, suppose you have an object moving vertically that is linked to a stationary object. Moving the parent object horizontally causes the child's path to become a diagonal line. The graphic shown below illustrates this.

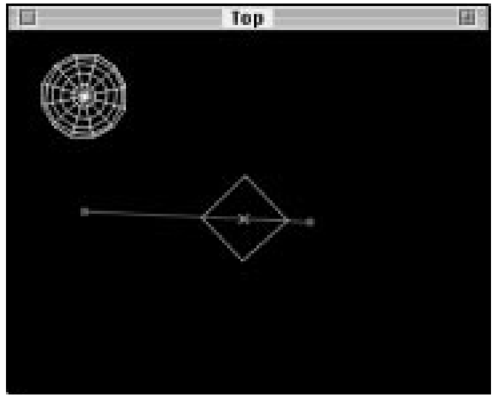




This becomes even more confusing if the parent object is rotating. In this case, the parent may have no visible motion path at all, while the child displays as an arc. The graphic below illustrates this.



If the child becomes unlinked from its parent during a sequence it maintains as much of the path as it can, but any curves based on the parent's rotation turn into straight lines. The graphic below illustrates this.



Note: Although a child object may have a very complex motion path that precisely mimics that of its parent, you can manipulate only the child object's own Eventmarks.

WORKING WITH VELOCITY CONTROL

This section explains how to use the Velocity Control dialog box to adjust the speed and acceleration of objects in your animation. The velocity graph provides a great deal of control over your animation, especially when used in conjunction with the motion paths discussed in the previous section and the Object Attribute Timelines in the Sequencer.

This section covers the following topics:

- Accessing Velocity Control
- Velocity Dialog Box Overview
- Using Velocity Control
- Velocity Control Limitations

Accessing Velocity Control

This section explains how to access the Velocity Control dialog box. Follow these steps:

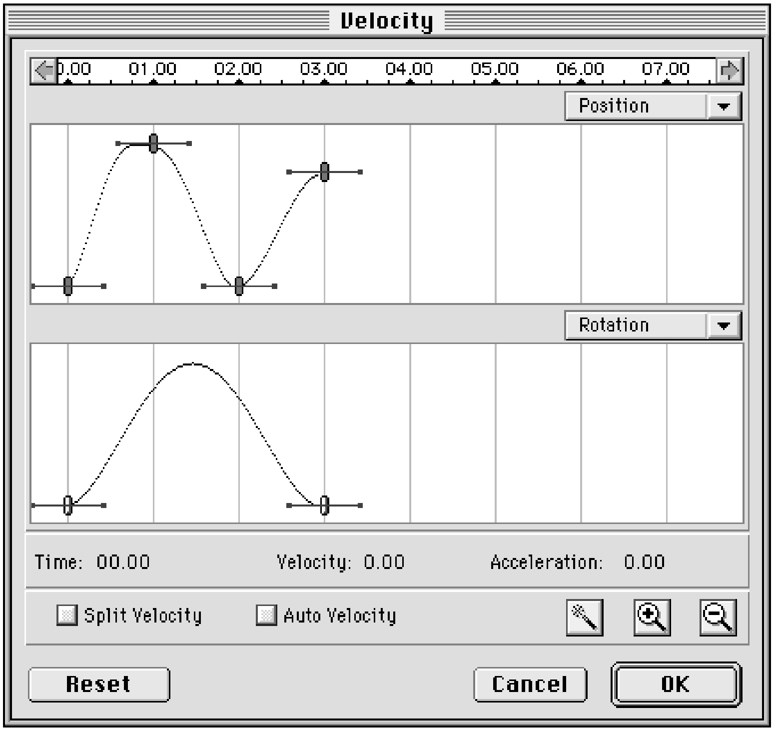
Step 1: Click on the **V-plane** tool in the tool bar.

Step 2: Click on an object that has more than one eventmark.

Step 3: Click on **Model** in the menu bar and select **Velocity**. The Velocity dialog box opens. The section that follows covers this dialog box in detail.

Velocity Dialog Box Overview

This section provides an overview of the Velocity dialog box. Refer to the graphic below:



Each part of the dialog box is described below:

- **Timeline**—This is located across the top of the Velocity dialog box. It shows a timeline corresponding to the timeline in the Sequencer. You can click and drag on the timeline to move forward or backward in order to look at a different part of the animation.

- **Object Attribute Pop-up Menu**—Directly below the timeline there are two graphs, each with a pop-up menu above it. Use these object Attribute pop-ups to choose which attribute you wish to view in the graph (Position, Rotation, etc.).

- **Graphs**—These two graphs show the velocity for the chosen object attribute. By default, the top graph shows position and the bottom shows rotation. If you did not rotate your object the bottom graph is blank. Note that you can show each object attribute only once in the graph, so for instance, both graphs cannot display rotation at the same time. The velocity graph shows velocity for a single object only.

  Each graph contains control points that represent Sequencer Eventmarks for the given object. These controls take the form of Spline controls. See *Using Velocity Control* in the section that follows for instruction on controlling velocity with these control points.

- **Information Bar**—The set of three numbers directly below the lower graph show the current values for the selected control points. These numbers update as you drag a control point, showing the current Time, Velocity and Acceleration.

- **Split Velocity Check Box**—Select an Eventmark and leave this option *unchecked* if you want the object to move smoothly through the point corresponding to the given Eventmark. Unchecked is the default setting.

  Check this check box if you want to split the Eventmark into two parts in the graph, allowing the object to enter the event at one speed and exit at a different speed. One particularly useful application for using this is to create the effect of an object being thrown at a wall. The object may come into the event at a great speed (high on the graph) but stops almost instantly (low on the graph) and then slowly speeds up again as it falls to the ground.

  Note that checking this check box could also produce the *undesirable* effect of jerking motion as the object moves through that event in space.

- **Auto Velocity Check Box**—This check box is checked by default for all Eventmarks. When it is checked, it maintains a smooth velocity graph automatically anytime you manipulate the graph.

  Note that events in the velocity graph that are surrounded on both sides by Auto Velocity events may have a limited range of motion in order to maintain a reasonable graph. If you uncheck this check box, Eventmark(s) turn red to indicate that they no longer maintain smooth velocity automatically, giving you greater freedom to manipulate each point..

- **Magic Wand Pop-up List**—Click on this button to access a pop-up list of smoothing functions that you can apply to a range of Eventmarks on the graph. Your choices are described below.

  - Smooth Velocity: This option creates a smooth curve that eases into and out of the range of events. If the first and last events in the select range are both slow (low on the graph) then the motion accelerates continuously until half-way through the sequence when it begins to decelerate until it stops at the end of the motion. If the first event in the range is faster than the last, then Smooth Velocity will create a smooth decelerating curve. A smooth accelerating curve is created if the first event is slower than the last.
  - Constant Velocity: This option causes constant speed throughout the sequence. Constant velocity appears as a straight horizontal line on the velocity graph.
  - Constant Acceleration: This option causes the speed to constantly increase or decrease throughout the event. Constant acceleration appears as a straight diagonal on the velocity graph. The direction of the line—increasing or decreasing—depends on the arrangement of the given events. If the first event in the range is lower than the last, then the resulting line will be increasing. If you want it to decrease instead, move the first event higher than the last. Unlike the smooth function, constant acceleration does not ease in or out, but instead starts and stops abruptly.

   – Average Velocity: This option causes constant speed between any two Eventmarks, but splits the Eventmarks to make this happen. Some uneven jumps in velocity could occur with this option.

- **Zoom In/Out**—Use this button to zoom in or out of the graphs to see more or less detail.
- **Reset**—Click on this button to return the graph to its original state when you first invoked the dialog box. Note that once you click on **OK** to return to the scene, you can no longer use this button.

Using Velocity Control

This section explains how to manipulate the graphs in the Velocity dialog box to control the acceleration of objects in your animation. Each graph contains control points that correspond directly to Eventmarks in the Sequencer. You can control the overall velocity of an object by dragging these control points. Remember, however, that when you change the horizontal position of an Eventmark in time on the graph, you change the position of that Eventmark in the Sequencer as well. In other words, changing an event in the velocity graph changes the point in time when that event occurs.

Keep in mind the following as you drag an Eventmark on the graph:

- Drag an Eventmark vertically to increase or decrease the velocity of the object at that point in time.
- Drag it horizontally to change the point in time at which the event occurs.
- Press the SHIFT key while dragging to constrain movement to either the horizontal or vertical axis.
- Drag the handles around the Eventmark to change the acceleration entering and exiting the event. Note that while you drag an Eventmark, Infini-D displays the time, velocity and acceleration at that point just below the bottom graph.
- Select a range of events by clicking in the graph (not on a control point) and dragging across any number of events. Note that you can not select a discontinuous range of events.

Velocity Control Limitations

This section explains some possible limitations working with the velocity graph. Though you can drag an Eventmark to virtually any position on the Velocity graph, you may get undesirable results in some instances because the distance between any two Eventmarks is fixed. In the velocity graph, you have control over the speed and the time, but the distance is set by the object's position in the scene.

For example, assume you've made an animation where an object is moving a very short distance in the scene, but covers a long time span. It's possible to adjust the ending Eventmark in the velocity graph so that it has a very high velocity. In order for the object to have such a great speed at the end, while moving a short distance over a long period of time, it may have to stop or even move backward to compensate. When situations such as this occur in the velocity graph, the line between the events drops to the bottom of the graph and turns red, indicating possible problems.

Chapter

22

Animation Assistants

This chapter explains how to use Animation Assistants to apply special animation effects quickly and easily. Animation Assistants are tools you can use as shortcuts to create complex animation effects that could otherwise take hours to create by hand.

This chapter covers the following topics:

- Accessing Animation Assistants
- Using Animation Assistants
- Adding Animation Assistants

ACCESSING ANIMATION ASSISTANTS

This section explains how to select a sequence of Eventmarks in the Sequencer, then apply an Animation Assistant to them. Follow these steps:

Step 1: Click on **Windows** in the menu bar and select **Sequencer** if it is not already open

Step 2: Select the range of Eventmarks where you wish to apply the Animation Assistant. See *Chapter 20: The Sequencer* if you need information on selecting one or more Eventmarks. Keep in mind the following when selecting Eventmarks:

- You will most likely want to apply an Assistant's action to all of an object's Eventmarks, but an Animation Assistant also works on a portion of an object's Eventmarks.
- You can use an Assistant on more than one object at the same time.
- If you select non-continuous Eventmarks for a single object, the Assistant performs its operation on each set of adjacent Eventmarks.
- If you select any sub-Eventmark for an object, the Assistant modifies the entire set of relevant sub-events for that object at that point in time.

Step 3: Once you've selected the Eventmarks, click on **Animation** in the menu bar and select an Assistant from the **Animation Assistant** sub-menu. Some Assistants present a dialog box asking you to specify options associated with the action of the particular Assistant. You can always undo the action of an Animation Assistant by immediately selecting **Undo** from the **Edit** menu. See the section that follows for details on each Assistant.

USING ANIMATION ASSISTANTS

This section explains each of the Animation Assistants on the Animation Assistants sub-menu. It covers the following topics:

- Apply Surface at Eventmarks
- Smooth Velocity
- Align Direction to Motion
- Auto-Banking
- Change Position
- Circularity
- Explode
- Mirror Events
- QuickTime VR Object

- Reverse
- Spin

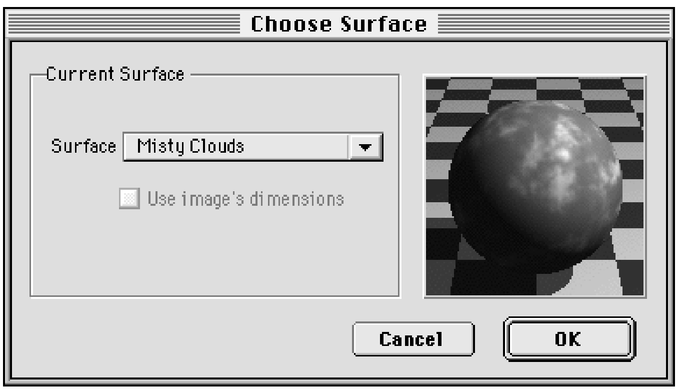
Apply Surface at Eventmarks

This section explains how to use the Apply Surface at Eventmarks Animation Assistant. Use this Assistant to change the surface of an object at multiple points in time, rather than manually setting the surface at each Eventmark. This Animation Assistant can also be used to apply the same surface to multiple objects at once.

Follow these steps to apply this Animation Assistant:

Step 1: Select the Eventmarks where you wish to apply this effect in the Sequencer.

Step 2: Click on **Animation** in the menu bar and select **Apply Surface at Eventmarks** from the **Animation Assistants** sub-menu. The Choose Surface dialog box opens.



Step 3: Select a surface from the **Surface** pop-up list, then click on **OK**. Infini-D applies the chosen surface to each object and at each point in time you selected in Step 1.

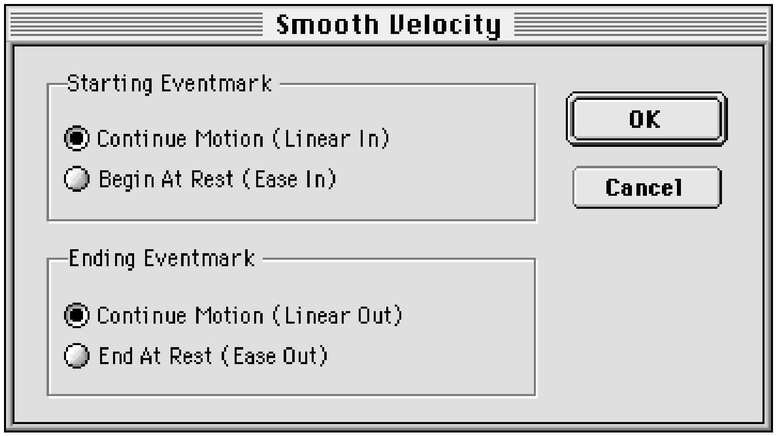
Smooth Velocity

This section explains how to use the Smooth Velocity Animation Assistant. Use this Assistant to smooth out the velocity or speed of an object. It analyzes the timing of the motion, then adjusts the timing of each Eventmark to make sure that the object moves as smoothly as possible. If the motion associated with the Eventmarks has not been previously set to Spline-Based in the Eventmark Info dialog box, the Smooth Velocity Assistant does this automatically. You can always see and fine-tune the results of the Smooth Velocity Assistant in the Velocity dialog box described in *Chapter 21: Advanced Animation.*

Follow these steps to use this Animation Assistant:

Step 1: Select a range of Eventmarks in the Sequencer you wish to smooth.

Step 2: Click on **Animation** in the menu bar and select **Smooth Velocity** from the **Animation Assistants** sub-menu and the Smooth Velocity dialog box opens.



Step 3: Alter the settings as needed. The options in the Smooth Velocity dialog box allow you to control the way an object enters and exits an event. Your options are described below.

- **Continue Motion (Linear In)—**Click on the radio button next to this choice if you want Infini-D to assume the object is in motion at the beginning of the selected range of Eventmarks. Selecting this option produces the smoothest effect because objects don't have to accelerate from a stopped position as they begin their motion.

  Keep in mind the following with this selection:

  – If you apply this Animation Assistant in the middle of an animation, Infini-D determines the starting velocity from the previous Eventmarks.

  – If you apply this Assistant at the beginning of the animation, Infini-D determines the starting velocity by extrapolating the velocity based on the first few Eventmarks.

- **Begin At Rest (Ease In)**—Click on the radio button next to this option if you want the object to begin at a stopped position, then accelerate gradually into motion. This, of course, assumes the object is at rest at the beginning of the sequence.

- **Continue Motion (Linear Out)**—Click on this radio button and the object does not slow down when the sequence reaches the final Eventmark. This selection assumes that the object is in motion at the last selected Eventmark. Infini-D determines the ending velocity by analyzing the Eventmarks following the last selected Eventmark. If there is no such Eventmark, Infini-D extrapolates this information based on the last selected Eventmark.
- **End At Rest (Ease Out)**—Click on the radio button next to this option to show a steady deceleration ending at the last Eventmark. This option assumes the object to be at rest at the end of its motion.

Step 4: Click on **OK** to save these settings and Infini-D applies them to the chosen set of Eventmarks.

Using Smooth Velocity Most Effectively

This section provides some tips on how to use the Smooth Velocity Assistant most effectively. Keep these points in mind when making your selections in the Smooth Velocity dialog box:

- Selecting **Begin In Motion** and **End In Motion** produces the smoothest overall effect.
- Selecting **Begin At Rest** and **End At Rest** produces the best results if you want an object to start from a stationary position, move smoothly through space and stop again.
- In order to produce the smooth motion effect, the Smooth Velocity Assistant changes the timing of the selected Eventmarks so that the object covers equal distance over equal time. If you wish, you can manipulate the Eventmarks after using the Assistant, but the object then may not appear to move smoothly through the scene.

Align Direction to Motion

This section explains how to use the Align Direction to Motion Animation Assistant to align the direction of an object to the direction of motion. This is most useful for lining up a camera with its flight path, but you could use it for any object type.

Follow these steps:

Step 1: Select a range of eventmarks where you wish to apply this Animation Assistant.

Step 2: Select **Align Direction to Motion** from the **Animation Assistants** sub-menu and Infini-D applies it immediately. There is no dialog box with this Assistant. Notice that this Assistant aligns the direction of the object at the Eventmarks, but does not add new Eventmarks.

If You Get Unexpected Results with Align Direction to Motion

If there aren't enough Eventmarks to determine the path of motion, the Assistant may produce unexpected results.

Follow these steps to correct this:

Step 1: Insert Eventmarks between the original Eventmarks, indicating the position you'd like the object to occupy at that time.

Step 2: Apply the Align Direction To Motion Assistant again and the object should move as expected.

Auto-Banking

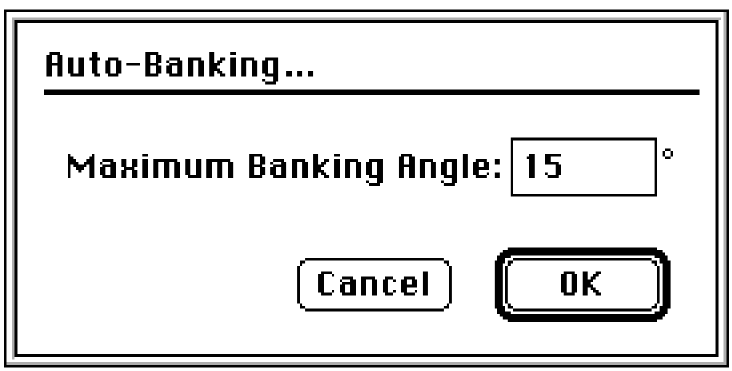
This section explains how to use the Auto-Banking Animation Assistant. When a real-world object takes a turn around a corner, it rotates to compensate for the centripetal force. Auto-Banking adds this effect to the animation by analyzing the turn angle and the turning velocity. The larger the turning angle and velocity, the higher the banking angle.

Since Auto-Banking only makes sense if the object's direction is aligned to its path of travel, it uses the Align Direction to Motion Assistant automatically to correct the direction.

Follow these steps to apply this Assistant:

Step 1: Select the range of Eventmarks in the Sequencer where you wish to apply this Assistant.

Step 2: Click on **Animation** in the menu bar and select **Auto-Banking** from the **Animation Assistants** sub-menu. The Auto-Banking dialog box opens.



Step 3: Enter the maximum banking angle. The number you enter here indicates the maximum amount of banking the Assistant will add to an object.

Step 4: Click on **OK** to apply this Assistant to the range of Eventmarks you selected in Step 1.

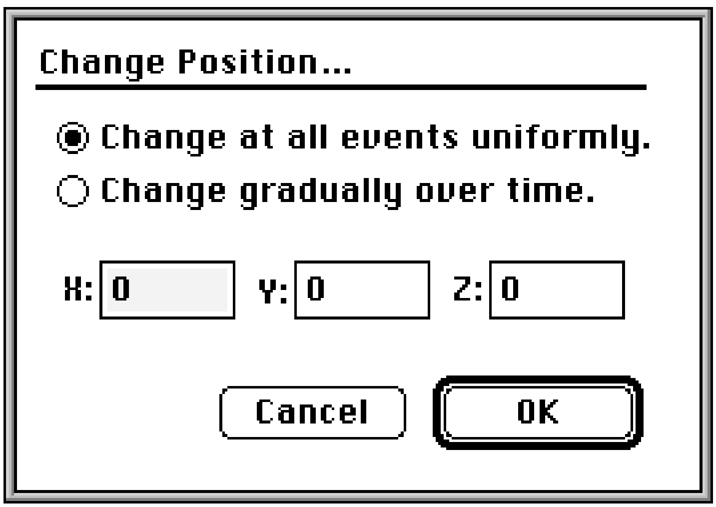
Change Position

This section explains how to use the Change Position Animation Assistant to change the position of the given sequence across the X, Y or Z axis. You can indicate whether you want to apply this Assistant uniformly or gradually. This could be useful when you need to change the position of a range of Eventmarks. Rather than changing each individual Eventmark, use this Assistant to apply the change to all of them at one time.

Follow these steps to use this Assistant:

Step 1: Select the range of Eventmarks in the Sequencer where you wish to apply this Assistant.

Step 2: Click on **Animation** in the menu bar and select **Change Position** from the **Animation Assistants** sub-menu. The Change Position dialog box opens.



Step 3: Click on the radio button to indicate whether you want to change the chosen event uniformly or gradually over time

Step 4: Enter the new position you want for the X, Y or Z axis.

Step 5: Click on **OK** to apply this Assistant to the range of Eventmarks you selected in Step 1.

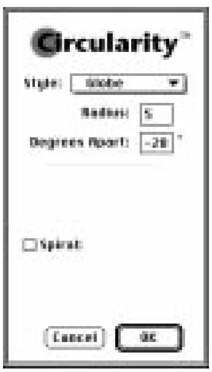
Circularity

This section explains how to use the Circularity Animation Assistant. Use this Assistant with an object hierarchy to position the objects along a variety of circular or curved paths. It is especially useful for text, but works with any object type. For this Assistant to work properly, you must have a group of objects, where the first object is a parent and the others are children of that parent. The effects can be animated by simply applying the effect at a later point on the time line. For example, start with a block of text at time zero, copy its eventmarks out to time two seconds and apply the Assistant at this later time—the text will animate from being in a straight line to a curved line.

There are three types of paths you can apply with this Assistant:

- Globe
- Lifesaver™
- Corkscrew

Each of these is described below.



Globe Circularity Effect

This section explains how to use the globe circularity effect. Use this effect, for example, to show text circling a globe as with the Universal Pictures™ logo.

Follow these steps to add this effect:

Step 1: With the text tool, click to place text in the scene. See *Chapter 7: Other 3D Object Types* if you need instructions on working with text.

Step 2: Click the **Break into Characters** button in the Object tab of the Command Floater. See *Chapter 7: Other 3D Object* Types if you need further instructions.

Step 3: Select the eventmarks for all the characters in the Sequencer.

Step 4: Click on **Animation** in the menu bar, then select **Circularity...** from the **Animation Assistants** sub-menu. The Circularity dialog box opens with **Globe** as the default style.

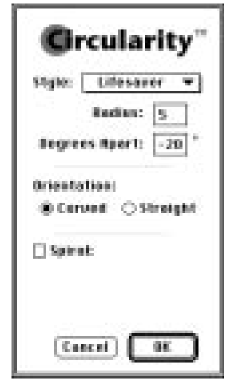
Step 5: Enter the settings for the Globe style as follows:

- **Radius—**Enter a number that represents the radius of the globe.
- **Degrees Apart**—Enter a number that represents how many degrees apart you want the letters to be.
- **Spiral**—Check this check box if you want the circular path to spiral, rather than having a flat circular path. When you check this two more options appear:
  – Spiral Amount: Enter a number that represents how far along the Z axis the spiral goes (the height of the spiral).

– Radial Change: Enter a number that determines whether the radius of the spiral increases or decreases along the length of the spiral.

Step 6: Click on **OK** to save the settings and Infini-D applies the globe Circularity effect to the selected text.

Lifesaver Circularity Effect



This section explains how to use the Lifesaver circularity effect which spreads the letters of a text object out in a circle with the letters laying in the same plane, like the letters on a Lifesaver™ candy.

Follow these steps to add this effect:

Step 1: Click on the **Text** tool in the tool bar to place text in the scene. See *Chapter 7: Other 3D Object Types* if you need instructions on working with text.

Step 2: Select the text object's Eventmark in the Sequencer

Step 3: Click on the text in your scene, then click on the Object control tab in the Command Floater and click on the **Break into Characters** button. See Chapter 7 if you need further instructions.

Step 4: Click on **Animation** in the menu bar, then select **Circularity b2** from the **Animation Assistants** sub-menu. The Circularity dialog box opens with **Globe** as the default style.

Step 5: Click on the **Style** pop-up list and select Lifesaver. The settings change to reflect this choice.

Step 6: Enter the settings for the Lifesaver effect as follows:

- **Radius—**Enter a number that represents the radius of the lifesaver.
- **Degrees Apart**—Enter a number that represents how many degrees apart you want the letters to be.
- **Orientation**—Click on the radio button next to curved to make the letters conform to the circular path or straight to keep them oriented in the same direction.
- **Spiral**— Check this check box if you want the circular path to spiral, rather than remain in a single plane. When you check this two more options appear:

  – Spiral Amount: Enter a number that represents how far along the Z axis the spiral goes (the height of the spiral).

  – Radial Change: Enter a number that determines whether the spiral's radius increases or deceases as it moves along the Z axis.

Step 7: Click on **OK** to save the settings and Infini-D applies the Lifesaver circularity effect to the selected text.

Corkscrew Circularity Effect

This section explains how to apply the Corkscrew circularity effect. Use this effect to rotate the text along a path like a corkscrew. Select **Corkscrew** from the **Style** pop-up list. The controls work in exactly the same way as those for the Globe effect described above.

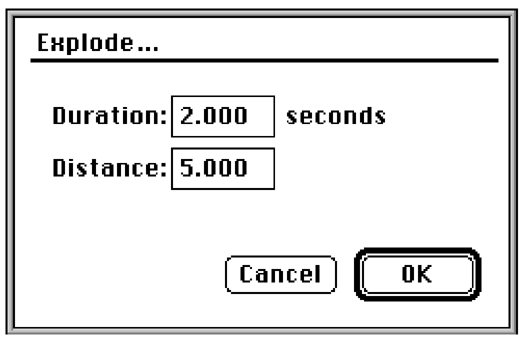
Explode

This section explains how to use the Explode Animation Assistant, which is designed to be used on a compound model made up of many child objects. It creates an explosion effect by causing each of the child objects to fly off suddenly in a random direction from the center of the model.

Follow these steps to apply this Assistant:

Step 1: Select the range of Eventmarks in the Sequencer where you wish to apply this Assistant.

Step 2: Click on **Animation** in the menu bar and select **Explode** from the **Animation Assistants** sub-menu. The Change Position dialog box opens.



Step 3: Enter a number that represents the duration of the of the explosion in seconds.

Step 4: Enter a number that represents the distance the exploded pieces will travel from the parent object.

Step 5: Click on **OK** to apply the Assistant with these settings.

To create a shatter explosion effect that actually breaks apart a model, export the model as a 3DMF file in the patches format, re-import it, and then apply the explosion Animation Assistant. This works particularly well with text objects. (See *Chapter7—Other 3D Object Types* for details on 3DMF export and import.)

Mirror Events

This section explains how to use the Mirror Events Animation Assistant. This Assistant takes the Eventmarks you select, duplicates them, then plays them back in reverse order. Infini-D adds these new Eventmarks at the end of the sequence, creating a back-and-forth effect.

This Assistant applies immediately without any dialog box appearing.

QuickTime VR Object (Mac Only)

This section explains how to use the QuickTime VR Object Animation Assistant to create a QUickTime VR object movie of an object or scene. This Animation Assistant makes your camera circle around an object within a predetermined sphere, while taking shots of the object at many different angles. When you view the resulting file with a standard movie player, the object seems to be spinning around on a changing axis. With Apple's Make QTVR Object utility, you can convert this file to a QTVR object movie that can then be viewed interactively using Apple's MoviePlayer or QTVR Player, or used within a larger multi-node QTVR scene.

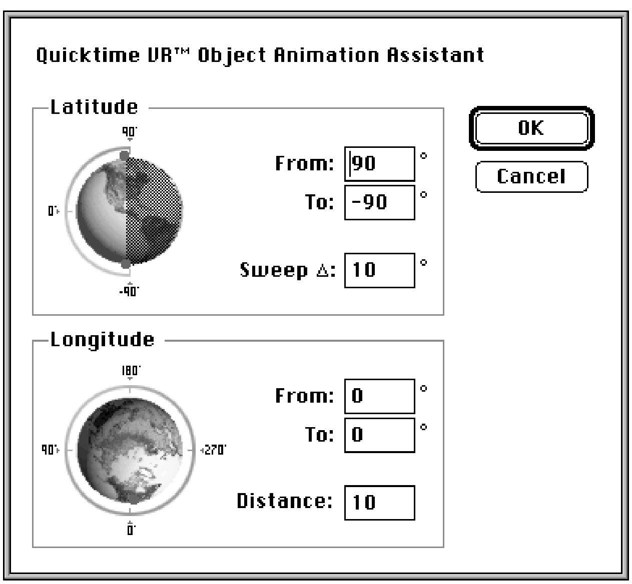
Before applying this Animation Assistant, be sure that your model is complete and that the Sequencer does not contain any animation (i.e., the object and the camera should each have only one Eventmark). Also, it is important to note that you must use a regular (non-targeted) camera for this Animation Assistant to work properly.

Follow these steps to create a QuickTime VR Object movie:

Step 1: Create your scene. Place a regular camera in the scene.

Step 2: Select the camera's Eventmark and the central object's Eventmark in the Sequencer. Note that if your model contains hierarchies, make sure you select the parent object's Eventmark.

Step 3: Select **QuickTime VR Object** Animation Assistant, from the **Animation** menu and the QuickTime VR Object dialog box opens.



Step 4: Use this dialog box to specify the latitude and longitude of the camera's path as it revolves around the model. This determines how far the object will rotate interactively in the final QTVR object movie.

You can enter settings directly in the fields adjacent to the graphic and the graphic changes accordingly, or click and drag on the control points in the graphic and the numbers change accordingly.

Keep in mind the following as you adjust these settings:

- The default settings provide full 360° rotation in all directions.
- If it is not necessary to see certain sides of an object in your QTVR object movie, you can reduce the final file size, as well as the rendering time, by reducing the size of the Latitude and Longitude arcs.
- The more you decrease the size of the Latitude arc, the less of an object's top or bottom you can access through QTVR interactive rotation.
- The more you decrease the size of the Longitude arc, the less of an object's back or front you can access through QTVR interactive rotation.

Step 5: Enter the distance in the Distance field in the Longitude section to determine the distance of the camera from the center of the object. The smaller the distance, the closer the object will appear in your final movie.

Step 6: Click on **OK** to save the settings and apply the Assistant. You will only see the results of this Assistant when you render the final animation. See *Rendering QTVR* in *Chapter 25: Advanced Rendering* for details on rendering this type of animation.

Reverse

This section explains how to use the Reverse Animation Assistant to reverse the order of the selected Eventmarks. Infini-D then plays the given animation sequence in reverse. This is useful when combined with the Explode Assistant if you want parts of a model to begin off screen and fly into the form of the original shape. First use the Explode Assistant on your hierarchical model, then select all the Eventmarks and apply Reverse.

This Assistant applies immediately without any dialog box.

Spin

This section explains how to use the Spin Animation Assistant to spin a selected object around the chosen axis for a given number of times. Infini-D applies the Assistant after the last Eventmark in your range, using the final eventmark as the starting point, then creating new eventmarks to produce the spin effect.

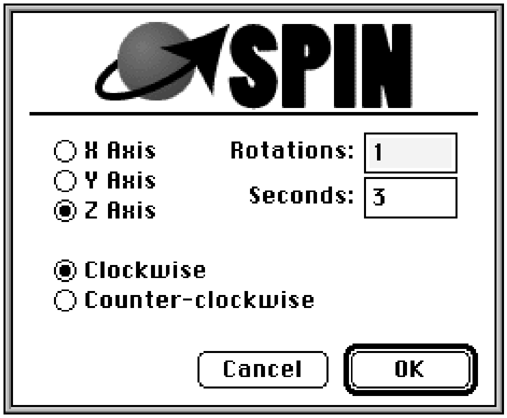
Note

If you fail to select all of the Eventmarks in your range, this Assistant may not work as you expect.

Follow these steps to apply this Assistant:

Step 1: Select the Eventmarks you wish to spin in the Sequencer.

Step 2: Click on **Animation** in the menu bar and select **Spin** from the **Animation Assistants** sub-menu. The Spin dialog box opens.



Step 3: Enter your settings for the spin effect as follows:

- **Axis**—Click on the radio button next to the axis around which you wish to spin the object.
- **Direction**—Click on the radio button next clockwise or counter-clockwise to indicate the direction you wish to spin.
- **Rotations**—Enter a number that represents how many times you want to spin the object.
- **Seconds**—Enter a number that represents how long you want to spin the object.

Step 4: Click on **OK** and Infini-D applies the spin effect to the range of Eventmarks you chose in Step 1.

ADDING NEW ANIMATION ASSISTANTS

This section explains how to add new Animation Assistants to Infini-D. Animation Assistants are based on a plug-in architecture. This means that you can add Assistants without upgrading or modifying Infini-D. This also means that third-party developers can create their own Assistants.

Contact MetaCreations for more information about receiving a development kit for Animation Assistants.

Note

Follow these steps to add a new Animation Assistant to Infini-D:

Step 1: Locate the Animation Assistants folder in the same folder as the Infini-D application.

Step 2: Copy the new Assistant to the Animation Assistants folder. Do not change the name of this folder or Infini-D will be unable to recognize it.

Step 3: Exit Infini-D, then restart and the new Animation Assistant should appear in the Animation Assistants sub-menu.

Section 7

Rendering

This section explains the Infini-D rendering process. Rendering brings your models to life by giving them color and texture and by introducing dynamic lighting and shadow effects. Three factors determine how the object renders:

- **Rendering Mode**—The mode you select indicates how accurately to draw an object and how much surface detail to display.
- **Surface**—This gives the object color and texture such as plastic or wood, and surface attributes such as reflection or transparency.
- **Lighting**—This provides highlights and shadows to your image or scene.

It is useful to keep in mind one rule about rendering: the higher the quality of the final image (i.e., the more realistic it looks), the longer it takes to render. This is the reality of computer graphics. The rendering speed depends on several factors including the rendering mode, if you have Deformations, if you have a mesh object with a high-level of triangulation, the kinds and number of lights you have, the size of the rendered image and many other factors. Each decision you make during the scene creation process can affect the speed at which Infini-D renders the scene. As you have learned throughout this manual, you must make trade-offs continually between speed and quality.

Section 8 covers the following topics:

- Introduction to Rendering
- Final Rendering
- Advanced Rendering

Chapter

23

Introduction to Rendering

This chapter explains the rendering process by discussing the various options for rendering your scene in a View window.. As you may recall from *Chapter18: Adjusting View Settings*, you can select a rendering mode for each View window individually. You can select among several rendering modes including draft, shading and ray tracing. In addition you have a choice of renderers including MetaCreations' and QuickDraw 3D hardware of software.

You can Phong shade or ray trace part of your scene or object with the **Marquee Render Tool** in the tool bar. This provides a quick way to see what a rendered object or portion of a scene looks like without accessing performing a final render. (See *Chapter 24: Final Rendering for details on the final render mode.*)

If you render your scene in one of the view windows, you may you want to save the image you have created. You can do this with the **Save Image As** command in the **File** menu.

This chapter covers the following topics:

- Rendering Modes
- Rendering a View Window
- Rendering with the Marquee Render Tool
- Save Image As

RENDERING MODES

This section discusses the different rendering modes. When rendering either in a View window or in the final render mode you can select from a range of rendering modes that provide a range of image quality, detail and effects. Which mode you choose depends your purpose for rendering. You could, for instance, conduct a test render, in which case a draft rendering mode or low-shading mode may suffice. After you have tested your scene and are completely satisfied, you will want to select a high-quality rendering mode such as Phong shading for the final rendering of your scene.

Keep in mind, the higher the rendering quality you select, the longer the rendering time. Also, remember that as you create and arrange your scene you will likely need to perform numerous test renderings to see how the scene will look when rendered. You may change rendering modes several times to suit your testing requirements throughout the scene-creation process.

There are a few important distinctions to be made about the two final quality rendering modes, Phong shading and ray tracing. These two modes use different methods for computing the shading of the objects in your scene, and each has support for a few unique features. Phong shading is generally the final render mode of choice for animation, and renders much faster than ray tracing overall. Phong shading in Infini-D is adaptive and is capable of rendering true reflections, transparency with refraction, and sharp or soft shadows. Ray tracing should really only be needed for high-resolution rendering for print or in cases where spline objects will be viewed extremely close to the camera, and Phong shading at high patch detail does not produce a smooth enough result. In this case ray tracing spline objects as spline patches will produce the smoothest objects. Ray tracing does not support MIP Mapping or Summed Area Tables for texture maps, nor does it render polygon particles (they will revert to lines).

For optimal rendering performance use Phong shading, soft shadows, and transparency without refraction. Sharp shadows and transparency with refraction take considerably longer to render. In addition, consider carefully when increasing the patch detail settings either for the scene globally or for individual objects. It is usually not necessary to set the global patch detail to Medium or High, as this produces vastly more polygons, requiring a large amount of RAM, and is usually overkill for the majority of the objects in the scene. To conserve memory and speed rendering, it is generally advisable to leave the scene patch detail setting on low and only increase the settings for specific objects that genuinely require it (important central objects, objects that move close to the camera, etc.).

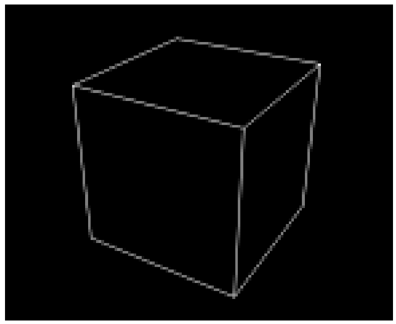
This section covers the following topics:

- Draft Rendering Modes
- Shaded Rendering Modes
- Ray Tracing

Draft Rendering Modes

There are two draft rendering modes: Bounding Box and Wireframe. When you want to render quickly, this is your best choice. In both modes, Infini-D draws an object as a collection of lines representing the outer skeleton of the given shape without any detail on the faces of the object. You can see surfaces as a general color outline around the object, but you cannot see any lighting in either draft mode.

Bounding Box



This is the fastest, most basic rendering mode. Infini-D represents the object as a box roughly the same size as the object. Since Infini-D doesn't display any object detail, this is by far the fastest rendering mode. Bounding box mode is most useful for very large scenes with lots of objects, particularly if you are just setting up the general positioning of objects. Infini-D uses bounding box mode automatically when you play an animation preview or when you drag the Scene Time Marker in the Sequencer.

Wireframe

This is the default drawing mode and provides more detail of the object's shape. During scene composition, you typically work in this mode, since it allows for quick yet careful alignment of objects in your scene. See *Section 5: Composing a Scene* for more information.

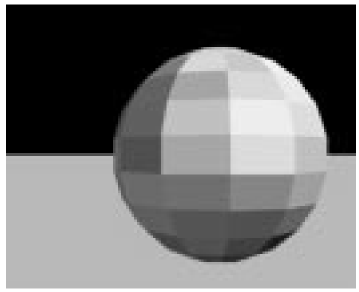
Shaded Rendering Modes

The shaded rendering modes provide a greater level of detail. As you increase the shading quality, you can see an escalating level of surface detail. Shading is a technique that allows you to visualize solid models and lighting effects. It works by filling in the faces or polygons that make up the shape of an object with colors corresponding to the object's surface.

There are three degrees of shading that offer increasing degrees of realism including:

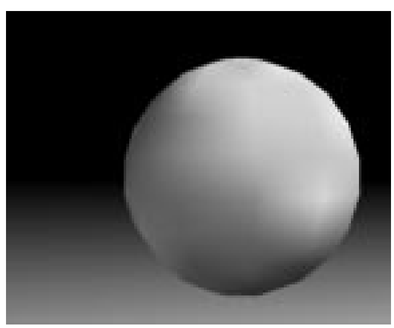
- Flat
- Gouraud
- Phong

Flat Shading



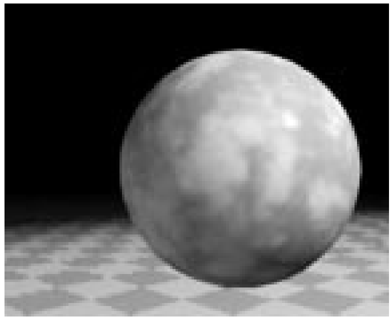
Flat Shading is the fastest of the three shading methods, since Infini-D draws the object with flat faces. With this technique, Infini-D finds the center pixel of each polygon, and then colors the entire polygon based on the color of the center pixel and the effect of all light sources. The result is a shape that appears quite faceted or rough as illustrated in the above example. Although this is highly unrealistic, it enables you to see rough lighting and shading effects quickly, and is therefore useful during the scene creation process.

Gouraud Shading



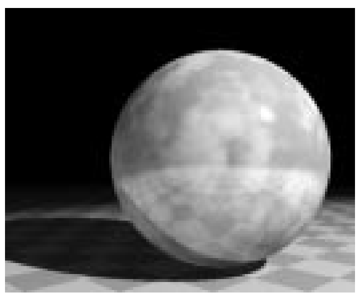
This method provides a higher level of detail than Flat Shading by making objects appear smoother. With this technique, Infini-D takes the colors of the corners of a polygon, determines the effect of lighting on these corners, then smears the color across the polygon from the corners to shade the polygon. This mode displays a slightly faceted effect with imprecise surface detail, but it is more accurate than Flat Shading because it smooths out the edges between polygons without accurately depicting every pixel on the face of each polygon (as with Phong Shading described below).

Phong Shading



Phong shading produces the most realistic result of the three shading modes, providing a far superior level of surface detail. This method takes the longest, since Infini-D checks every pixel within a polygon, uses its surface information, and based on the lighting, gives it a color. It displays all surface detail including shadows, reflections and transparency.

Ray Tracing



Ray Tracing is another high-quality rendering mode. It works by shooting imaginary rays at the models through every single pixel in the View window of the scene you are Ray Tracing. Infini-D uses any surface colors, maps, properties and effects you have applied to the chosen View window to determine the final appearance of each individual pixel. If an object is at all reflective or transparent, it sends secondary rays from each pixel to all other objects in the scene to determine what should be reflected onto or visible through that object. Infini-D also uses secondary rays to make lighting and shadow effects.

Ray Tracing provides more accurate rendering than shading modes. As such, Ray Tracing may take significantly longer than any other rendering mode.

Changing a Ray Traced Scene

You should note that Ray Tracing is not a shading mode, but rather a one-time calculation step. Therefore, if you manipulate a Ray-Traced object, it reverts to the shading mode that was previously set for the given View window. You can, however, Ray Trace any object at any time, regardless of the current shading mode with the **Marquee Render Tool** in the tool bar. This tool is covered later in this chapter.

Pros and Cons of Ray Tracing

There are advantages and disadvantages to using Ray Tracing versus using Phong Shading. These are described below:

Pros

- Booleans are visible only in Ray Tracing.
- Ray Tracing produces more accurate overlapping objects.
- Ray Tracing produces extremely smooth curved SplineForm objects (If you Ray Trace as spline patches).

Cons

- Polygon particles are not visible in ray tracing, they will render as lines.
- MIP Mapping and Summed Area Tables do not work with Ray Tracing.
- It is the slowest of all the rendering modes.
- Plug-in filters may not produce expected results when used in conjunction with ray tracing.

Ray Tracing & Shading Tips

- Since shading and ray tracing use different methods to render a scene, keep in mind the following to produce the best results.
- In shading modes, the fewer polygons in your model, the less smooth they appear when rendered. You determine the default number of polygons in SplineForm objects with the Patch Detail setting in the Scene tab of the Preferences dialog box. (*See Chapter 3: Getting Started* for more information.) You can also modify the Patch Detail of objects individually in the Object tab, or globally in the Preferences dialog or the Render tab of the Render Setup dialog box. Note that Object-level settings override all others.
- The number of light sources directly affect the rendering time. For instance, if you have one light source and you ray trace, Infini-D has to cast an appropriate number of rays to handle that light source. If you add a second light source, Infini-D must cast twice as many rays to handle the second light source, which can double the rendering time.

One way to cut rendering time is by selecting Phong Shading, rather than Ray Tracing. Starting with Infini-D 4.0, both provide true reflections, transparency and shadows. Therefore, unless you have a still image that requires the highest level of accuracy, choose Phong Shading.

RENDERING A VIEW WINDOW

This section covers rendering in a View window. As you work, you may want to see what different View windows look like at various rendering qualities. If you are satisfied with the contents of View window, you can use the Save Image As command as explained later in this chapter.

Follow these steps to render a View window:

Step 1: Select the View window you wish to render.

Step 2: Click on the **Display** command tab in the Command Floater.

Step 3: Select a rendering mode from the **Rendering** pop-up list. See *Chapter 18: Adjusting View Settings* for more information.

RENDERING WITH THE MARQUEE RENDER TOOL

This section explains how to render with the **Marquee Render Tool** in the tool bar. You can use this tool to Phong Shade or Ray Trace as much of a scene as you want. This could be useful to preview textures and lighting effects before performing a final-quality rendering, although you can use this tool to create final images.

Follow these steps to use the Marquee Render Tool:

Step 1: Select the **Marquee Render Tool** in the tool bar.

- Select the top tool with “S” for Phong Shading.
- Select the bottom tool with “T” for Ray Tracing.

Step 2: Click and drag a marquee around the area you wish to render in any View window. Infini-D Phong Shades or Ray Traces the area within the marquee. Keep in mind the following as you use this tool:

- If you double-click the Marquee Render Tool, Infini-D ray traces the entire View window. This can be useful for doing a test render of an entire image.
- If you want to save the rendered image to disk, click on **File** in the menu bar and choose **Save Image As**, explained below.

SAVE IMAGE AS

This section explains how to use the Save Image As command in the File menu to save an image to disk. If you render a View window and are happy with the results, you can save it to directly to disk without using the Render... command.

Following these steps to use the Save Image As command:

Step 1: Click in the View window you wish to save.

Step 2: Click on **File** in the menu bar and select **Save Image As**.

Step 3: Name the file, then select an output format from the **Format** pop-up list. See Chapter 24 for more information on output formats.

Note

When you save an image using the Save Image As command, the view will be saved exactly as is, including the ground plane,orientation axes, etc. Turn these elements off (in the Display tab of the Command Floater) to save the image by itself.

Chapter

24

Final Rendering

This chapter explains how to conduct a final rendering. When you do this, you access the Render Setup dialog box where you can select the settings for rendering your image or animation to disk.

This dialog box is divided into three tabs: Render, Image and Animation. After you select your render settings, you must provide a name for your file and choose an output format, then Infini-D opens the Render window where you can watch your scene rendering, and also check system and rendering information in the Rendering panel.

This chapter covers the following topics:

- Selecting Settings in the Render Setup Dialog Box
- Selecting an Output Format
- Watching the Rendering Process
- Exporting a Rendered File

Note: If you wish to render in the QTVR Panoramic format, see Chapter 25: Advanced Rendering.

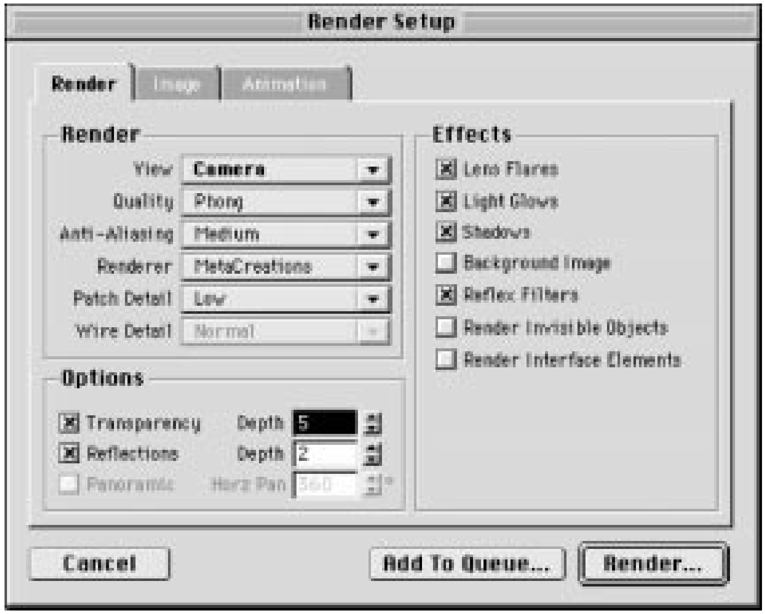
Note

Selecting Settings in the Render Setup Dialog Box

This section explains how to use the Render Setup dialog box. This is where you select your settings for the final rendering of your work.

Follow these steps:

Step 1: Click on **File** in the menu bar and select **Render**. The Render Setup dialog box opens.

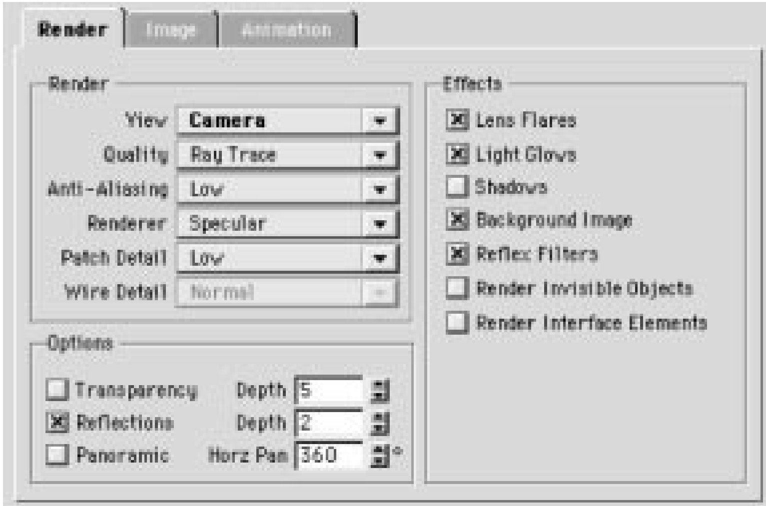


Step 2: Click on each tab to select your settings. See the sections that follow for instructions.

- Render
- Image
- Animation

Step 3: When you are done, click on the **Render** button at the bottom of the dialog box to continue.

Render Tab in Render Setup Dialog Box



This section explains how to select settings in the Render Setup dialog box. This tab is divided into three sections:

- Render
- Options
- Effects

Render Settings

Use the settings in this section to define how you wish to render your image. You can render it at any quality as described in *Chapter 23: Introduction to Rendering.*

Each of these options is described below:

- **View**—Select the View window you wish to render from the pop-up list.
- **Quality**—Select the rendering quality from the pop-up list. If you are not familiar with these choices, see the *Rendering Modes* section in *Chapter 23: Introduction to Rendering.*
- **Anti-Aliasing**—Select the anti-aliasing quality you wish to use for your scene. Note that this option may be grayed out, depending on your rendering-quality choice. Anti-aliasing smooths the edges of rendered objects and removes the jagged appearance of diagonal lines. See *Chapter 18: Adjusting View Settings* for more information.

- **Renderer**—Select a renderer from the pop-up list. You can select either the standard Specular renderer or choose one of the QuickDraw 3D renderers.

  The latter employs Apple's QD3D technology, which provides interactive rendering, hardware acceleration and a standard file format for transporting 3D information between applications. Note that QD3D does not support anti-aliasing or Ray Tracing. See *Chapter 25: Advanced Rendering* for more information. There are three QD3D rendering choices:

  – QD3D Software: Select this option and Infini-D renders the image using QD3D software only.

  – QD3D Hardware: Select this option and Infini-D will take advantage of any installed QD3D compatible accelerator boards.

- **Patch Detail**—Select a patch detail level from this pop-up list as applicable to your scene. If your scene does not include a SplineForm object this selection is grayed out. This provides one last opportunity for you to adjust the Patch Detail level globally for the scene, although the object-level patch detail always overrides any other level.

  You determine the default Patch Detail level in the Preferences dialog box, but you can override this default here. Remember, the higher the patch detail level, the longer it takes to render the scene. See the *Spline Detail Level* section in *Chapter 9: Object Settings* for more information.

- **Wire Detail—**Select a wire setting in the event you are rendering in Wireframe mode only. Otherwise, this is grayed out. In Normal mode, the scene renders the object in a typical Wireframe. See *Rendering Modes* in *Chapter 23: Introduction to Rendering* for more information.

  Select Draft if you are using SplineForm objects to view only the end caps and rails of the objects. This can be useful in a busy scene to reduce the level of detail.

Options

Use the settings in this section to turn on some effects that give your scene a greater sense of realism. These options are all grayed out if you select a Draft rendering mode—that is, Bounding Box or Wireframe. The Panoramic option activates only in the event you select Camera View and Ray Tracing.

Each option in this section is described below:

- **Transparency**— Check this check box to show transparencies in your scene (if there are any objects using transparent surfaces), then enter a number that represents the number of levels of transparency you wish to render. Transparency enables you to see through a objects, so the higher the number, the more consecutive objects you will be able to see through. Use care in setting this number higher as it can increase rendering times. You can see transparency in all shaded rendering modes and Ray Tracing.

- **Reflections**—Check this check box to show true reflections in the scene (if there are any objects using reflective surfaces), then enter a number that indicates the number of consecutive reflections to render. Note that you get true reflection only in Phong

Shading or Ray Tracing modes. In other shaded rendering modes, you can use an environment map to simulate highlights on shiny objects. As with transparency depth, use care in setting the number of reflections higher, as it can add to rendering time. See *Chapter 25: Advanced Rendering* for more information.

- **Panoramic**—Check this check box to render a panoramic view of your scene for use with QuickTime VR. You must use ray tracing as the rendering mode for this option to be available. See *Chapter 25: Advanced Rendering* for more information.

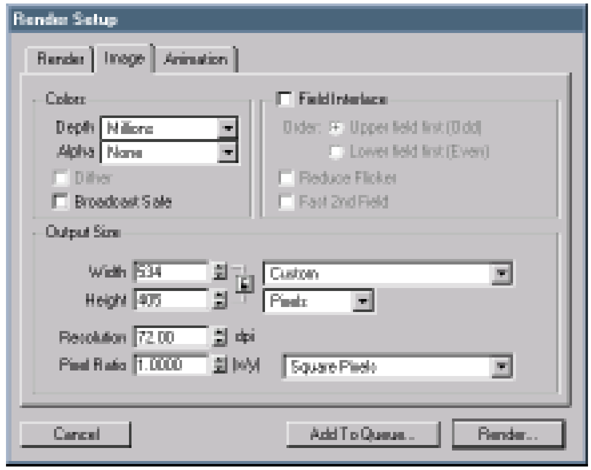
Effects Check Boxes

These check boxes are similar to the Show check boxes in the Display command tab. Check any effect you want to render in your scene. If you are doing a test render, the scene renders faster with these Effects unchecked. The more effects you check, the longer the scene takes to render.

Each option is described below:

- **Lens Flares**—If you are using lens flares in your scene, check this item to show them or uncheck it to hide them. See *Chapter 16: Working with Lights* for more information.
- **Light Glows**—If you have light glows turned on in your scene (visible beams or rays), check this check box to make them visible. Leave it unchecked if you have no light glows or you are test rendering and you want to increase rendering speed. See *Chapter 18: Adjusting View Settings* for information on how to turn light glows on.
- **Shadows**—Check this box to render shadows in your scene if you have lights that are casting shadows. Uncheck it to hide them. Shadows are cast in your scene by each object that is set to cast shadows. See *Chapter 9: Object Settings* and *Chapter 16—Working with Lights* for more information
- **Background Image**— If you are using a background image, use this option to show or hide it. You may find it faster to hide the background image during a test rendering. Check this option to show the background image. Uncheck it to hide it.
- **Plug-In Filters—**If you have applied filters in this scene, check this check box to show the filter effects. Uncheck it to hide the effect. During test rendering, you may find it useful to turn filters on and off to see the scene with and without the effect and to speed up rendering. See *Chapter 25: Advanced Rendering* for more information on applying filters in a scene.
- **Invisible Objects**—If you have invisible objects in your scene, check this check box to see the invisible objects in your rendered scene. See *Chapter 9: Object Settings* for more information on making objects visible and invisible.
- **Render Interface Elements**—Check this check box if you want to include Infini-D's interface elements such as cameras, lights, targets, and grid plane in your rendered image or animation. Otherwise, leave it unchecked. This could be helpful during a test rendering to line up items precisely using the Infini-D grid.

Image Tab in Render Setup Dialog Box



This section explains how to select Image settings in the Render Setup dialog box. This tab is divided into three sections:

- Colors
- Field Interlace
- Output Size

Colors

Use this section to define the color bit depth for your rendered image. The fastest mode is millions of colors—Infini-D works completely with 32-bit images internally. If you use fewer than Millions of Colors, you will probably want to check the **Dither** check box to achieve smoother color blending.

The color options are described below:

- **Depth—**Select a color depth from the pop-up list.
- **Alpha**—Select whether or not you want to generate an the alpha channel with this image. You can access this selection only if you select Millions Of Colors as the color depth. Alpha channels are used fro compositing your rendered 3D object over a background image or background video. If you render with an alpha channel, Infini-D will create an anti-aliased mask around the objects in your scene, masking out any area that have no objects. If you have imported a background image, it will not appear in the final image when rendering with an alpha channel. There are two types of alpha channels—Straight and Multiplied. Most applications support Straight alpha channels, although you should check the documentation of the application in which you will be doing your compositing for specifics.

Note: An alpha channel is sometimes known as a "mask" in the print industry or a "moving matte" in the video industry.

- **Straight**: This method produces a separate alpha channel, which works well when you need to make a composite of multiple images using a program such as MetaCreations Painter or Adobe Photoshop, or if you want to key 3D graphics over video with crisp, anti-aliased edges using digital video editing software and hardware. Note however, that when you use a straight alpha channel, the edges of objects may look jagged in programs that *don't* support alpha channels because the anti-aliasing information is stored only in the alpha channel and these programs don't have access to it.
- **Multiplied**: This method produces the alpha channel in the same way as a Straight alpha, except that it also integrates the alpha information onto the red, green and blue color channels. This makes the program anti-alias correctly even if it does not support alpha channels, but also adds information to the red, green and blue channels. Note that this could result in incorrect compositing, since this method essentially doubles the anti-aliasing information for the image.

• **Dither**—Check this check box when you select fewer than Millions of Colors. Dithering tricks the eye into seeing a greater range of colors than are actually present. For images with fewer than Millions of Colors, dithering can improve image quality dramatically. Note that this option is grayed out if you select Millions of Colors from the **Depth** pop-up list.

• **Broadcast Safe Colors**—Check this check box if you are producing a scene for a broadcast medium and you want Infini-D to correct any colors that are out of the color range of the destination medium. Uncheck it to remove safe color correction. You can specify safe color parameters in the Preferences dialog box. See *Chapter 3: Getting Started* for more information.

Field Interlace

Use the options in this section to turn on Field Interlacing and set field rendering parameters. Field interlacing is required when rendering for video, and should not be used otherwise. Computer monitors and video monitors display images differently. On a computer, if you play a movie file that is 30 frames per second, it will display 30 whole frames per second, one after another. Video, on the other hand, only displays half of a frame at a time (every other scanline), but displays them twice as fast, so that the result is a smoothly moving image. With field interlace turned on, Infini-D will render twice as many frames as specified in the Frame Rate field, however each frame will have only half the total number of scanlines. The graphics below compare a moving text object with and without Field Interlacing.

Field Interlace options are described below:

- **Field Interlace Check Box**—Check this check box to turn on field interlacing and activate the other options. Leave it unchecked to keep field interlacing off. Interlacing divides the video into two fields with each field containing every other line in the frame.
- **Order Radio Buttons**—Click on one of these radio buttons to select the order you wish to use for the interlacing. You can choose to show Upper (Odd) field first or Lower (Even) field first. Different video systems have different requirements, check with the documentation that came with your digital video system or with the production facility you will be using to see what setting to use.
- **Reduce Flicker**—Turn on this option to reduce flicker in a field-rendered image. Note that images with thin, horizontal lines are particularly susceptible to flicker. If find you have no flicker problem, leave this unchecked.
- **Fast Second Field**—Check this check box and Infini-D ignores surface interpolation, deformations, shape morphing, particle emission and other effects when rendering the second field. Use this setting if you don’t have these effects in your scene, or to speed rendering when performing a test render.

Output Size

These settings allow you to enter width and height values and determine the resolution and pixel ratio of the final image.

The Output Size options are described below:

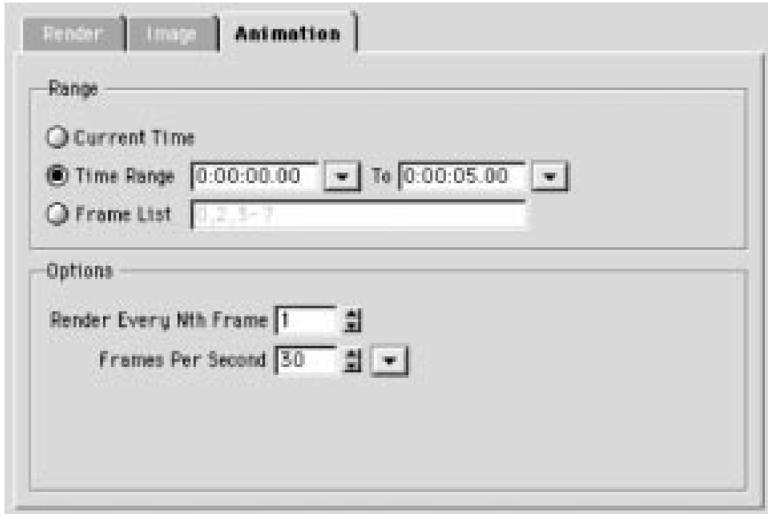
- **Width/Height**—Enter the size you want for your rendered image. You can lock the aspect ratio by clicking on the **Lock** icon adjacent to this field. If you do this, Infini-D calculates the proper height based on the width you enter (or vice-versa). Choose a unit (Inches or Pixels) from the units pop-up to the right of the Width and Height fields.

  You can also select a standard width/height from the Width/Height pop-up list adjacent to the Width/Height fields. This may be desirable for many users, since you can select form a range of standard sizes. If you are rendering for video, you can use this list to pick the proper size for desired video format. Note that if you select a video output format, Infini-D calculates the correct Pixel Ratio (defined below) automatically. See *Chapter 25: Advanced Rendering* for more information on rendering QTVR.

- **Resolution**: Leave the default resolution or enter a new number. Resolution is measured in dots per inch. If you are rendering for a video medium, leave the resolution at 72 dpi (the resolution setting will be ignored in a movie file anyway). If you are rendering for print or any other medium that requires a specific resolution setting, enter a value, e.g.: 266 dpi is a common resolution for printing.

- **Pixel Ratio—**Pixels are square on personal computers, but not in a non-linear, digital video editing systems. This setting determines the pixel's aspect ratio when played back on a non-linear system. This has no effect on the image when it is shown on a computer monitor. Select the proper ratio from the pop-up list or enter a number for a non-standard system.

Animation Tab in Render Setup Dialog Box



This section explains how to select Animation settings in the Render Setup dialog box. If you have no animation in your scene, you can skip this tab. It is divided into two sections:

- Range
- Options

Range

Use this section to select the range of animation you wish to render. Your choices are described below:

- **Current Time—**Click on this radio button to render the image at the current position of the Scene Time Marker in the Sequencer.
- **Time Range**—Click on this radio button to select the start and end times when rendering an animation. By default, the animation starts rendering at time zero and ends at the last eventmark. If you wish to render a different time range, you can either enter time values in the two fields, or you can select from several choices in the pop-ups adjacent to the time fields: Current Time, First/Last Event, or Punch In/Punch Out markers.
- **Frame List**—Click on this radio button to render any selection of individual frames and/ or frame ranges. Numbers must be separated by commas and ranges should be separated with a dash (-). For example: 2,4,6,8,10-20, 25.

Options

Use these options to determine the timing of the animation. Note that these options are grayed out unless you select Time Range as explained above. Your choices are described below:

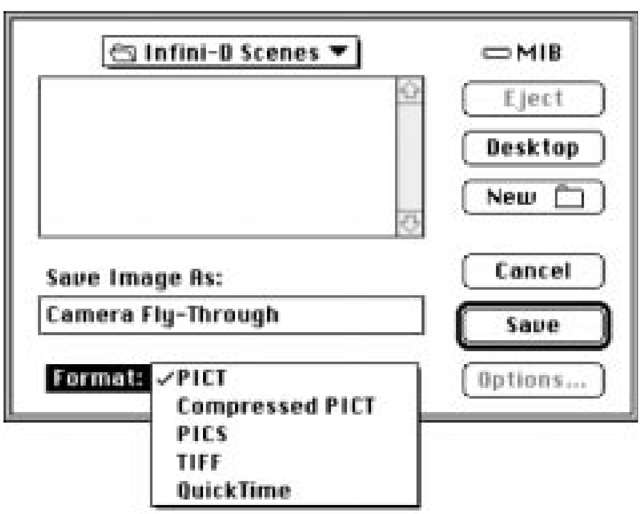
- **Every Nth Frame—**Enter a number that indicates which frames you want to render for the purpose of testing the animation. For example, you could enter 5 and Infini-D renders every fifth frame. This an easy way to perform a motion test without rendering the entire animation. This is similar to Frame List in the Range section above, but instead of entering the individual frame numbers, you enter a single number and Infini-D renders the frames that match your number.

- **Frames per Second**—This number indicates the number of frames to be rendered for each second of animation The default is 30 frames per second. You can enter a new rate or make a selection from the pop-up list adjacent to this field. If you are planning to output to video or film, you can select the proper frame speed from this list.

Tip! Choosing a low frame rate such as 5 or 10 frames per second is an excellent way to get a quick preview of your animation for proofing purposes without taking the time to render for final output.

SELECTING AN OUTPUT FORMAT

This section explains how to select an output format for your image. After you select render options, click on the **Render** or **Add to Queue** buttons in the Render Setup dialog box and a standard Windows or Macintosh Save dialog box appears.



You must name your file and select an output format. There are a variety of formats available. Some formats are available on both platforms, while some are specific to Macintosh or Windows.

Follow these steps to select an output format:

Step 1: Click on **Render** or **Add To Queue** in the Render Options dialog box after you finish selecting your rendering options.

Step 2: The standard Windows or Macintosh Save dialog box opens.

Step 3: Name your file.

Step 4: Select an output format from the **Format** pop-up list. The available formats are covered in the next section.

Note: If you select QuickTime as your output format, you can choose QuickTime compression options from a standard QuickTime Options dialog box by clicking on the Options button in the Save dialog.

Step 5: Click on **Save** to begin rendering or to add the job to the queue.

Windows-Specific Output Formats

This section provides a description of the Windows image and animation formats available. Macintosh formats and formats that work on both systems are described in the sections that follow this one. These appear only in the Windows version of Infini-D. Your choices are described below:

- **AVI**—This is an animation format designed to play back using the Windows™ Media Player. When rendering with this format, various compression settings are available. Click on the **Options** button next to the Format pop-up list to change the compression parameters.
- **BMP, DIB**—This format contains 32-bit color information.
- **PCX**—Zsoft software created this format for its PC Paintbrush software.
- **PSD**—This is the Adobe Photoshop 3.0 file format. This format supports all Photoshop image modes, including Bitmap, Grayscale, Duotone, Indexed Color, RGB, CMYK, Lab and Multichannel.
- **RAS**—This file format is used for native Sun Unix files.
- **TGA**—This format was designed for use on systems using the Truevision® video board. TGA (Truevision Targa) supports 24- and 32-bit color information.
- **WMF—**This is also known as the Windows Metafile format. Instead of a bitmap image, these images use a collection of device-independent functions to represent the image.
- **WPG**—This format is used by the WordPerfect word processing program.

Macintosh-Specific Output Formats

This section provides a description of the Macintosh image and animation formats available for Infini-D Macintosh users. There are several formats shared by both Macintosh and Windows as explained in the next section. Your choices are described below:

- **PICT, PIC, PCT**—PICT is the most widely recognized image format on the Macintosh. This format saves alpha channel information and can use 16 or 32 bits of color information per pixel. You can also save this for Windows by selecting the PIC or PCT extension from the Format pop-up list.
- **Compressed PICT**—This format uses QuickTime to achieve the compression. Therefore, you must have the QuickTime extension installed to save or open Compressed PICT files.

  If you choose this file format, you can change the compression options for your file by clicking on the **Options** button next to the Format pop-up menu. Refer to the QuickTime Manual that comes with the QuickTime System Extension to learn more about these compression options. Due to the nature of these compression techniques, you cannot save compressed PICT files with alpha channel information.
- **PICS**—A PICS file is multiple PICT files stored in a single document. Many desktop video and multimedia programs can import this file format. If you choose this file format, you can change some options by clicking on the **Options** button next to the Format pop-up list.
  - **Maximum File Size**: You can change the maximum file size for a PICS. If Infini-D reaches the maximum size during rendering it will save that PICS and create a new PICS numbered by frames.
  - **Crop to Differences**: You can also crop to the difference between frames within a PICS file. When you check this option, Infini-D saves only the area that changed from the previous frame, rather than the entire window. This is useful when you use a program such as Macromedia Director as it saves memory when importing the PICS file into these programs.

Output Formats Supported by Both Platforms

This section provides a description of the image and animation formats that are supported by both Windows and Macintosh. You will therefore see them in both versions of Infini-D. Your choices are described below:

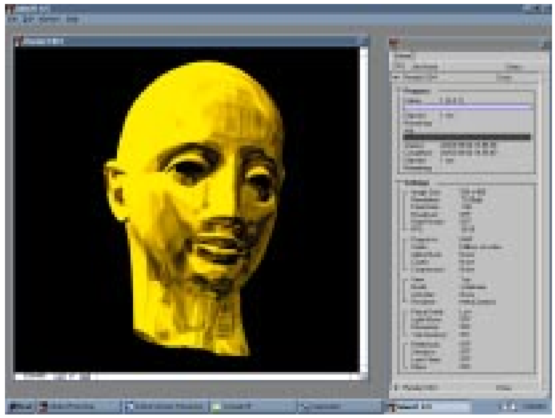
- **TIFF—**The TIFF format is favored by many desktop publishing programs. You can save TIFF files with alpha channel information, but they are typically larger than PICT or Compressed PICT.

It is important to note that Infini-D cannot render to a TIFF file in blocks. This means that you will need sufficient RAM to hold the entire image in memory at once while rendering in order to render to a TIFF file. If you are rendering at a large image size, it is advisable to render out a PICT file and then convert to a TIFF afterwards in an image-editing application.

Note

• **QuickTime**™— QuickTime allows you to compress animations to save disk space, but the compression produces varying degrees of image quality. If you choose this file format, you can change the compression options by clicking on the **Options** button next to the Format pop-up list.

THE FINAL RENDER MODE



This section explains Infini-D's final render mode and render queue. After you have selected render settings in the Render Setup dialog, clicked the Render button, and entered a name and file format, Infini-D enters the final render mode. The job is added to the render queue and begins rendering immediately. Jobs are rendered in the final render mode in the order in which they are added to the queue. In this mode, you can watch the progress of the currently rendering job and manipulate jobs in the render queue. Be aware that rendering is an extremely compute-intensive process, and Infini-D is putting almost all of the machine's resources towards rendering in order to render as fast as possible. Therefore response time to commands or mouse clicks during final rendering may be slower than normal.

Note

To maximize available memory for final rendering, close all open scenes before entering the final render mode. To do this, use the Add to Queue button in the Render Setup dialog to add your job to the render queue without entering the render mode. Then save your scene and close it. Then use the Enter Render Mode command in the file menu. Once in the render mode, use the Render Now command to start your job rendering.

As has been stressed throughout this manual, the decisions you make as you create your scene have a direct effect on the final rendering time. For example, volumetric lighting effects increase rendering time, as do mesh objects with a high triangulation level, a high level of anti-aliasing, and so on.. And, of course, the rendering mode you select has an affect on rendering time as well.

The render mode is divided into three sections:

- Render Menu Bar
- Render Window
- Render Queue Floater

The Render Menu Bar

The Render menu bar contains three menus: File, Edit, and Window. The choices in these menus is different on Macintosh and Windows, so they will be described separately where appropriate. a standard menu bar.

The File Menu

- **Render Now**—This command forces Infini-D to start rendering the selected job in the render queue immediately. If there is another job currently rendering, it will be suspended, and the new job begun in its place.
- **Suspend Job**—This command stops the currently rendering job and puts it into suspended mode in the queue. The job can be resumed at any later time using either the Resume Current Job command or the Render Now command.
- **Abort Job**—This command aborts the job selected in the render queue. You will be prompted to confirm the command. Aborted jobs cannot be resumed. Use this command only if you are certain that you do not want to render the job either now or at a later time. (Although the job cannot be resumed, it can be duplicated and the duplicate rendered from the beginning.)
- **Save Job List as Text**—This command saves a list of each job currently in the render queue, including all of the individual settings for each job. This is useful for keeping a record of your renders, for keeping log of different render settings for a scene, or for billing a client.
- **Exit**—This command exits the render mode and returns you to the currently open scene. If there is a job rendering, you will be prompted to confirm the command and the job will be suspended.

The Edit Menu

- **Preferences**—This command opens the standard Infini-D preferences dialog. It is useful to be able to access the Preferences dialog from the render mode in order to set rendering block size and frame dimming preferences.

The Window Menu

This menu is different on Macintosh and Windows, and so will be described separately.

On Windows

- **Arrange Windows**—This command re-positions the render queue floater in its default position on the right-hand side of the screen.
- **Render Queue**—This command shows or hides the render queue floater.

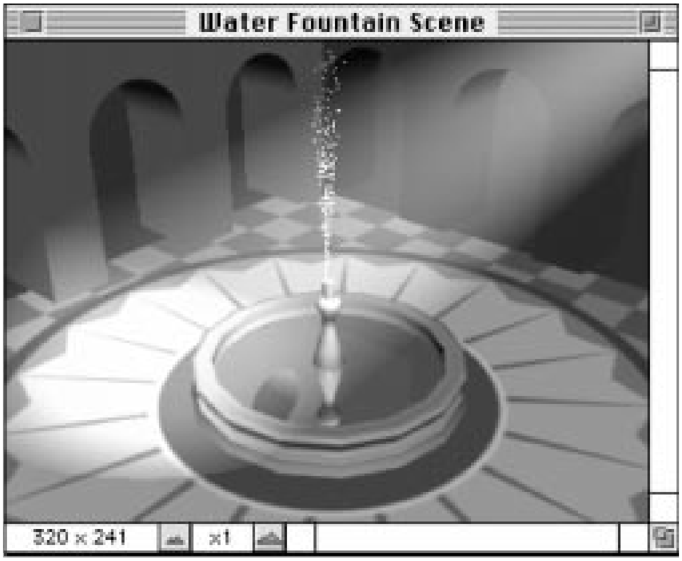
- **Render Window**—This command shows or hides the render window.

On Macintosh

- **Arrange Windows (Tall)**—This command re-positions the render queue floater in its default position on the right-hand side of the screen, and consolidates any tabs that have been torn off back into the main floater.
- **Arrange Windows (Stacked)**—This command re-positions the render queue floater in its default position on the right-hand side of the screen, but splits it into two floaters—the upper one containing the Queue tab and the lower one containing the Engines, Serial #s and IP #s tabs.
- **Render Queue**—This command brings the Queue tab to the front of the Render Queue floater, or, if it is already the foremost tab, closes the entire Render Queue floater. If the Queue tab is torn off, it will show or hide it individually.
- **Engines**—This command brings the Engines tab to the front of the Render Queue floater, or, if it is already the foremost tab, closes the entire Render Queue floater. If the Engines tab is torn off, it will show or hide it individually.
- **Serial #s**—This command brings the Serial #s tab to the front of the Render Queue floater, or, if it is already the foremost tab, closes the entire Render Queue floater. If the Serial #s tab is torn off, it will show or hide it individually.
- **IP #s**—This command brings the IP #s tab to the front of the Render Queue floater, or, if it is already the foremost tab, closes the entire Render Queue floater. If the IP #s tab is torn off, it will show or hide it individually.
- **Render Window**—This command show or hides the render window.

The Render Window

The render window displays the currently rendering frame as it progresses. As blocks of the frame are rendered, they are filled in with the rendered image. Colored rectangles indicate blocks that are currently being rendered. The previous frame may still be visible, depending on the *When Animating* setting in the Preferences dialog. (See *Chapter 3—Getting Started* for more on setting Preferences.)



This window follows standard window behavior, meaning you can open, close or resize this window just as you can with any window. In addition, you can zoom in or out by clicking on the Zoom in or out icons at the bottom of this window. This is useful when rendering large image sizes to make the entire image fit onscreen. Zooming is also useful for seeing detail during rendering to be sure the scene is rendering the way you want. In the lower left corner of the window, the frame size of the current job is indicated, in pixels.

The Render Queue Floater

This floater contains the render Queue tab, which lists all jobs currently in the queue along with information about each job. (On Macintosh, this floater also contains additional panels, please see the *Infini-D 4.5 User's Manual Addendum* on the Infini-D CD for details.) A panel is created in the Queue tab for each job in the queue. The name of the scene file is displayed in the title bar of each job, along with its status in the Queue: Rendering, Suspended, Aborted, Done, Preparing, or Pending. Within each panel are two sub-panels, Progress and Settings:

- **Progress—**This displays the progress of both the current frame and the entire job. Infini-D also calculates the time it takes to complete the rendering along with the time remaining and displays it here, so you can monitor how much time is left in the rendering process.
- **Settings**—This panel shows all the settings for the job including image size, render mode, render options, compression method, etc.

The Render Queue Tab Pop-Up Menu

In the upper right corner of the Queue tab is a pop-up menu that contains commands for working with jobs in the queue. These are described below:

- **Edit Current Job's Settings**—This command will open the Render Setup dialog for the selected job, where you can make changes to the settings. If the selected job is Done or Aborted, you will be informed that you cannot edit settings for completed jobs and given the option of duplicating the job. If the selected job is Rendering, you will be warned that editing the settings will cause the job to re-start from the beginning, losing all work completed to that point.
- **Duplicate Job**—This command creates an exact duplicate of the job and adds it to the queue. This is useful for rendering the same scene more than once with different settings, or for re-rendering a completed job.
- **Remove Job**—This command permanently deletes the selected job from the queue. If the job is not completed, all work completed to that point will be permanently lost.
- **Remove Completed Jobs**—This command permanently removes all Done or Aborted jobs from the queue at once.

Re-Ordering Jobs in the Queue

Jobs are listed in the queue in the order in which they will be rendered, starting at the top and ending at the bottom. A job can be re-positioned in the list at any time by clicking on the job's panel title bar and dragging it to a new position on the list. Dragging a pending job above the currently rendering job will force the current job to suspend and the new job to start immediately. Jobs that are Done or Aborted will remain listed in the Queue until they are removed. To permanently remove a job from the queue, select it and press the DELETE key (you will be asked to confirm the delete), or choose Remove Job from the Queue tab pop-up menu (see above).

Chapter

25

Advanced Rendering

This chapter provides instruction on some advanced rendering techniques. Aside from the rendering techniques explained in the previous rendering chapters, there are some special rendering issues.

- Selecting Settings in the Environment Dialog Box
- Rendering with QTVR
- Rendering with a QD3D Renderer
- Rendering Shadow Catcher Objects
- Using Plug-In Filters

SELECTING SETTINGS IN THE ENVIRONMENT DIALOG BOX

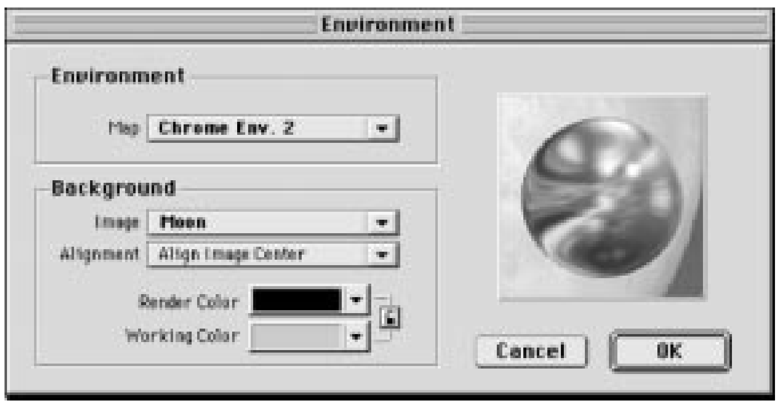
This section explains how to select settings in the Environment dialog box, where you can adjust the following:

- Environment Map
- Background Image
- Color for Ambient Light, the Working Background Color and the Rendered Background Color

Note that any changes you make here affect the entire scene for all time, so for example, you cannot change the background color over time.

Follow these steps to adjust Environment dialog box settings:

Step 1: Click on **Edit** in the menu bar and select **Environment**. The Environment dialog box opens.



Step 2: Make your selections as explained in the sections that follow.

Step 3: Click on **OK** to save your changes. Click on **Cancel** to exit without saving your changes.

Environment Map

Environment mapping simulates reflections by taking an image and mapping it onto a virtual sphere surrounding the entire scene. This image is not directly visible, but reflective objects in the scene will reflect it. Thus, the map is not associated with a particular object, but with the entire scene. Any object with reflective surface properties reflects the environment map automatically. See *Mapping Tips* below for more information.

Click on the pop-up list and make a selection. You should recognize this as the standard list of surfaces in Infini-D. These surfaces do work as maps, but images generally work better. Import a new image by clicking on the **Load Image** selection.

Environment Mapping Tips

Keep in mind the following about environment maps:

- Any surface can be used as an environment map in Infini-D, but image files are generally most effective.
- Since Infini-D wraps a 2D image around the 3D scene, some pinching of the environment map will occur at the poles of your world. This pinching can look unattractive with reflections. You can avoid this effect by making the top and bottom edges of your image black (or at least a consistent color).
- If you Ray Trace the scene, Infini-D combines the elements of the environment map and the reflections of actual objects. The true reflections will be in the foreground relative to the environment map. In some cases, environment maps that work well in Phong Shading are too extreme for Ray Tracing.
- An environment map is an integral part of creating high quality reflective surfaces in Phong shading.

Tip! For dynamic animation effects in Phong shading, try using a QuickTime movie as an animated environment map.

Background Image

You can use any image or QuickTime movie as a background in any View window. This can be useful for aligning the position and timing of 3D objects in your scene relative to the background image. You can also use it to display your scene against an imported backdrop.

Click on the **Image** pop-up list and select one if any are available. If not, click on **Load Image** to import the file you want.

Note: See Chapter 14: Surfaces and Texture Maps for more information on importing an image.

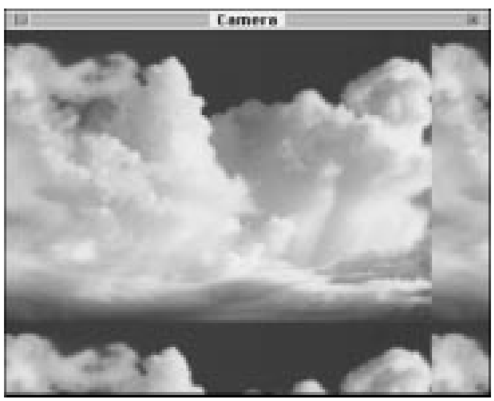
You can also select the alignment of the background image by making a selection from the **Alignment** pop-up list. Your choices are defined below:

- **Align Image Center**—Select this choice to align the image in the center of the View window. If the image is too large, Infini-D crops it. If it is too small, Infini-D fills in the open space with background color (described below). The graphic below illustrates this:

- **Align Image Upper Left**—Select this choice to align the image in the upper left corner of the View window. If the image is too large, Infini-D crops it. If it is too small, Infini-D fills in the open space with background color (described below). The graphic below illustrates this:

- **Scale Image to Fit**—Select this choice to resize the image to fit in the View window. Note that this can cause the image to distort if there is a significant difference between the image size or dimensions and that of the View window. The graphic below illustrates this:

- **Tile Image**—Select this choice to have the image appear in “tiles” in the View window. Tiling means the image repeats in the style of bathroom or floor tiles. The graphic below illustrates this:



Colors

You can select the colors you want for the ambient light in your scene, the working scene and the rendered scene. Click on the Color swatch and select a color from the standard Windows or Macintosh color picker. These are described below.

- **Ambient Color—**Ambient light is light that exists throughout your scene. It does not emanate from a source and can have no special effects other than a color. Ambient light can be thought of as a global “fill” light.

Note

Note: Low ambient light values cause high contrast in shadows generated from other light sources.

- **Background Render Color**—This is the color you want for your background when you perform a final rendering. The default is black.
- **Background Working Color**—If you want your working background to be different from the final rendering color, select another color here. Click on the **Lock** icon to make the working color the same as the render color. While locked, if you change one background color, the other changes automatically.

Note

Note: You can set each View window to use either the render or working background color in the Edit View dialog box. See Chapter 18: Adjusting View Settings for more information.

RENDERING QTVR

This section explains the special instructions you need to follow when rendering a QuickTime Virtual Reality movie. As you may recall, you learned how to create a QTVR object movie in *Chapter 22: Animation Assistants.*

This section covers the following topics:

- Rendering a QTVR Object Movie
- Working with a QTVR Player
- Rendering a QTVR Panorama

Rendering a QTVR Object Movie

This section explains how to render a QTVR object movie. If you want to render a QTVR Panorama, see *Rendering QTVR Panorama* below. Rendering a QTVR object movie works the same as rendering any other object in Infini-D, but there are some specific settings you must adjust.

Follow these steps to render a QTVR movie:

Step 1: Click on the **File** menu and select **Render**. The Render Setup dialog box opens. This was covered in detail in *Chapter 24: Final Rendering.*

Step 2: Click on the Animation tab and enter at least 36 in the **Frames per Second** field for a reasonably smooth movie.

Step 3: Click on the **Render** button, then select PICS or QuickTime as the Output format. If you render to a PICS file, you can use any QuickTime playing utility such as Peter's Player (included on the Infini-D CD) or Apple's MovieConverter to open the file and re-save it as a QuickTime movie with keyframes at every frame.

If you choose QuickTime, click on **Options** next to the Format pop-up list and enter **1** for the keyframes.

Step 4: Click on **Save** and Infini-D renders the scene in the usual fashion. See the next section for instructions on converting the resulting QuickTime movie into navigable QTVR movie.

Working with a QTVR Player

This section explains how to convert the rendered file to a QTVR movie. After you render your QTVR movie, you must then convert it to QTVR with Apple's Navigable MoviePlayer, which is part of the QuickTime VR Authoring Tools Suite.

Note: There are also two free tools (at the time of this writing) available from Apple's web site for converting PICTs to QTVR Panorama (PanoTool) and QuickTime movies to QTVR object movies (ObjTool). These tools are not part of Infini-D. Contact Apple for more information.

Note

Follow these steps to convert the rendered movie to QTVR:

Step 1: Launch Apple's Navigable MoviePlayer. See Apple's documentation for more information.

Step 2: Click on **Edit** in the menu bar and select **Add Navigable Data**. The Import dialog box opens.

Step 3: Check the numbers you chose for the longitude and latitude in the QVTR animation assistant dialog box, then use the formulas below to enter the remaining values:

- Subtract the To Value from the From Value that you entered in the Latitude section of the QVTR dialog box.
- Take the difference from the equation above and divide it by the **Sweep Value**.
- Enter this quotient in the **Rows** field in the Navigable Player's Import dialog box.
- In general, you should leave the default **Start HPan** and **End HPan** values of 0 to 360 degrees to render all the way around the object.

Step 4: Enter the **Start VPan** and **End VPan** values in their respective fields. These are the same values you entered in the Latitude From and To fields in the QTVR dialog box.

Step 5: Leave all other defaults and click on **OK** to save the object as QTVR movie.

Rendering a QTVR Panorama

This section explains how to render a QTVR panorama, which is different from a QTVR object movie. Rather than viewing a single object, your movie will be an interactive view of an entire scene. This means that your scene should have as much detail as possible to create an interesting QTVR panorama. You should also have some knowledge of MPW scripts to achieve reasonable results.

Note

Note: QuickTime panoramas require Apple's QuickTime VR Authoring Tools Suite. These tools do not come with Infini-D. Contact Apple for more information. There are two free tools (at the time of this writing) available from Apple's web site for converting PICTs to QTVR Panorama (PanoTool) and QuickTime movies to QTVR object movies (ObjTool). These tools are not part of Infini-D. Contact Apple for more information.

Follow these steps to render a QTVR panorama:

Step 1: Create your 3D scene. Place the camera in a centrally located position, making it perfectly level—the X rotation value should be 90 and the Y rotation value should be 0. Place it at a height that allows you to see an adequate amount of your scene.

Step 2: Select the camera object, then click on the **Object** command tab in the Command Floater. There are two preset lens type settings for QTVR in the **Focal Lens** pop-up list—QTVR 85¡ vert. pan and QTVR 90¡ vert. pan. These choices set the focal length of the lens to create vertical pan angles of 85¡ and 90¡, respectively for output to a panoramic PICT for use with QuickTime VR.

Step 3: Click on **Edit** and select **Edit View**, then select a QTVR window size from the pop-up list adjacent to the **Window Size** field. When you do this, Infini-D enters the proper QTVR aspect ratio automatically.

Step 4: Make sure all of your camera and light objects are *invisible*. Otherwise, they may reflect in other objects in the scene when you Ray Trace the panorama.

Step 5: Click on **File** and select **Render** and the Render Setup dialog box opens. Select the following settings in the Render tab:

- For View, select **Camera** or the name of the Camera View window if different.
- For Quality, select **Ray Trace**.
- Check the **Panoramic** check box in the options section

Step 6: Click on the Image tab and select one of the QTVR settings from the Output Size pop-up list. Select QTVR Full Size for use in the QTVR Tools Suite.

Step 7: Click on the **Render** button and Infini-D renders the scene in the usual fashion.

Step 8: When the rendering is complete, open the rendered PICT file in the QTVR Tools Suite, where you can work with it.

Note: The QTVR kit requires that you first rotate the PICT 90¡ counterclockwise using an image processing tool such as Adobe Photoshop. If you use one the preset QTVR window sizes or make the Camera View window taller than it is wide, the resulting image is rotated automatically. It can then be used in the QTVR Dicer tool to create the QTVR movie. The Infini-D CD-ROM includes a sample MPW script to illustrate how to create the QuickTime VR movie from the PICT file.

Note

RENDERING WITH THE QD3D RENDERER

This section provides some detail on the QuickDraw 3D (QD3D) renderers. These employ Apple's QD3D technology, which provides interactive rendering, hardware acceleration and a standard file format for transporting 3D information between applications. QD3D rendering provides near instantaneous object rendering and manipulation.

For example, you can rotate a model, and see a shaded image of the model rotating in near real-time right before your eyes, rather than a simple wireframe or bounding box. You can also watch near real-time screen rendered previews of your animations with the **Animate** command, before committing yourself to rendering the final file to disk.

When you select a QuickDraw 3D renderer, moving, rotating and scaling of objects takes place in the specified shading mode for each window. Lights and cameras also operate in this interactive manner.

This section covers the following topics:

- QD3D and Rendering Modes
- QD3D RAM Requirements

QD3D and Rendering Modes

When you select one of the three QD3D renderers—Best Interactive, Software Interactive or Hardware Interactive—anti-aliasing and Ray Tracing are no longer available. This is because QD3D does not support these options. Although these renderers improve your testing ability, they may not be the best choice for final rendering. When you perform your final render, you may want to select the Specular renderer. Please note also that the shading modes included with the QD3D renderer are similar to the Specular renderer, but you may notice some differences.

Also note the following:

- There are hardware cards available that accelerate QD3D interactive rendering. In order to take advantage of the card, you must select **Best Interactive** as the rendering mode. Note that **HW Interactive** is only for Apple's accelerator card.
- Version 1.5 and later of QD3D allow other vendors to write renderers for use with QD3D. If you have any of these custom renderers properly installed, they will appear in the renderer list automatically.

Note

Note: If you use another vendor's renderer, you may not be able to render some Infini-D features such as procedural surfaces, composed surfaces, lens flares and visible light glow.

QD3D RAM Requirements

As you may expect, due to the interactive quality of the QD3D renderer, it requires more system resources in general and RAM in particular.

Windows users should have a minimum of 16 MB of RAM to function properly. Even with a lot of RAM, the QD3D system can grow so large, it uses all available memory. Infini-D has no control over this. If you have problems using QD3D, contact their technical support line at 1-800-767-2775.

RENDERING SHADOWCATCHER OBJECTS

This section explains how to render ShadowCatcher objects. These objects are particularly useful to video users because they allow you to save the true shadow of an object in the alpha channel and composite it later against other images, animations, or video clips. They provide a mechanism for generating the true shadows for 3D objects, so they appear on top of background imagery in a realistic way.

Keep in mind the following about ShadowCatchers:

- A ShadowCatcher object is rendered ONLY in the areas where it is in shadow. All other parts of the object display the background color or background image.
- Objects behind a ShadowCatcher object are not visible.
- Infini-D stores ShadowCatcher information in the alpha channel.
- The surface you apply to the ShadowCatcher object provides the color and transparency level of the shadow.
- ShadowCatcher objects work with Phong Shading or Ray Tracing only. In all other rendering modes, they appear as normal objects.

Follow these step to designate an object as a ShadowCatcher:

Note: You must render with shadows for the ShadowCatcher to work.

Note

Step 1: Select an object in any View window.

Step 2: Click on the **Object** command tab in the Command Floater.

Step 3: Check the **ShadowCatcher** check box to turn on this effect.

Step 4: Uncheck the **Cast Shadows** check box because ShadowCatcher objects which cast shadows upon other objects can create an undesirable effect.

Step 5: Click on the **Surfaces** command tab in the Command Floater.

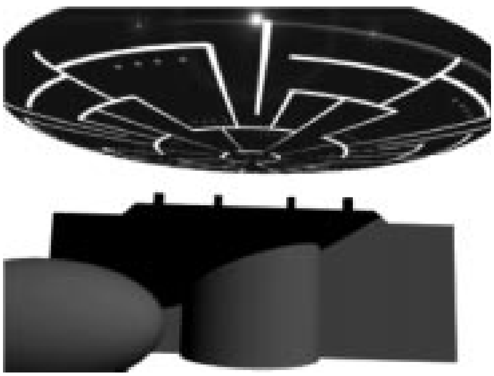
Step 6: Create and apply a surface with the desired color and level of transparency. See *Chapter 14: Surfaces and Texture Maps* for more information.

At 0% transparency you get a completely opaque shadow. At 100% transparency, only the background is visible, effectively eliminating the shadow altogether. See the next section for an example.

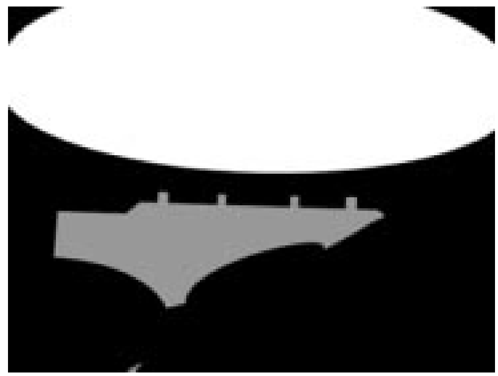
ShadowCatcher Example

This section provides an example of ShadowCatchers in action. This image of a spaceship over the White House was created using a ShadowCatcher. This is how it was done:

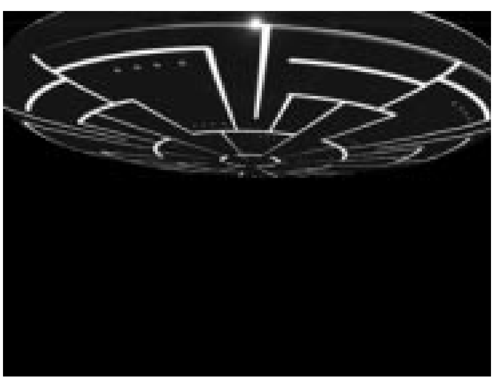
- The artist created a very simplistic model of the White House using a stretched cube for the main building, a cylinder for the balcony, several cubes for the chimneys and a sphere for the tree in the foreground. A background image of the White House was used to align the objects and the camera's point of view.
- Next, the objects were designated as ShadowCatchers as described above. During rendering, the building is invisible, but Infini-D stores the shadowed parts of the building in the alpha channel, so when it is composited over the original image of the White House, it appears as though the White House itself is in shadow. Refer to the graphics below.



Saucer & Stand-ins



Alpha Channel from Infini-D



Rendered Saucer

White House Image

Final Composited Image

USING PLUG-IN FILTERS

This section explains how to use plug-in filters within Infini-D. Using filters within Infini-D you can create a wide range of effects that would be difficult or impossible to create as a post-process in After Effects or similar video compositing programs. The support for filters within Infini-D is in no way meant to replace the need for After Effects, but rather to broaden the range of possibilities by allowing you to use the filters on the object level, within the scene.

Compatibility

Infini-D can use most filters that are compatible with Adobe After Effects (including MetaCreations' own Final Effects filters) as well as certain filters compatible with Adobe Photoshop (those written to the ANIM specification introduced with version 3.0.5). Although we have worked to make sure that Infini-D is compatible with as many filters as possible, there are certain filters that will not work within Infini-D. The filters that do not work within Infini-D generally fall into three categories:

1. They are designed to take advantage of certain features specific to After Effects.
2. They perform operations on channels, layers or other entities not present in a 3D application like Infini-D.
3. They need access to future frames in order to compute the effect for the current frame. In a video editing application, the images that the filter are being applied to are stored on disk in the form of movie files, so the application can access them at any time in any direction. A 3D application does not have future frames rendered, and so cannot perform some of these operations.

To disable all known incompatible filters, check the **Don't Load Incompatible Filters** check box in the General tab of the Preferences dialog box.

Using Filters In Your Scene

Before you can use Plug-in filters, you must tell Infini-D where they are stored by specifying a folder in the **Filters** section of the General tab in the Preferences dialog box. See *Chapter 3: Getting Started* for details on how to change preferences.

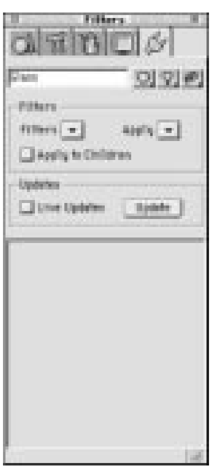
Keep in mind that when you are using filters, they will add to the rendering time since they require additional computation. Keep this in mind when applying filters and when previewing them in the View windows. The **Live Updates** check box, which tells Infini-D to render the view each time you change a filter parameter or delete the filter altogether, gives you quick feedback about how the filter effect will look, but if you have a complex scene, it could take some time to render the View.

You have several choices as to how you can apply the filter. For example, you could apply it to an individual object, to the entire view or to a light, which applies the filter to anywhere the light shines.

You can see the effect of filters in the active View window if the Filters check box in Display tab of the Command Floater is checked, and you are rendering in any mode *except* Bounding Box. You cannot see filter effects in Bounding Box mode. See *Chapter 18: Adjusting View Settings* for more information on the Display tab. Also, filters are designed to work with Phong as the final quality rendering mode. Results may be unexpected when using filters with ray tracing as the final render mode.

Note

Each filter has its own unique set of parameters and settings. Please refer to the documentation that came with the filters for specific information on adjusting these controls.



Follow these steps to apply a filter:

Step 1: Select an object, light or camera.

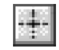
Step 2: Click on the **Filters** command tab in the Command Floater.

Step 3: Click on the **Filters** pop-up list and select a filter. For details on each filter type, refer to its documentation. When you select a filter, a panel opens with settings for the given filter. In addition, depending on the filter type, a dialog box for adjusting filter settings may also open. Each Filter detail panel has the following controls:

- **Edit Button**—Click here to access the dialog box with the filter controls. If no such controls exist, this button is grayed out.
- **About Button**—Click here to access the standard copyright statement for the given filter. Click anywhere in the box to close it. If there is no About box available, this button is grayed out.
- **Reset Button**—Click here to reset the filter to its default settings.
- **Trash—**Click here to remove the filter.

- **Filter Settings**—Each filter has its own unique settings, which you can alter to customize the filter's effect. See the documentation that comes with the filter for more information. Examples include color, a percentage of the filter to apply, or the speed at which the filter changes (for those filters that are designed for animation).

- **Center Icon**—Some filters display a Center icon as part of their parameters. Click on this icon, then click in a View window to indicate a centerpoint for the filter effect.



Step 4: Click on the **Apply** pop-up list and select how you wish to apply filters to this object. Each object, camera and light can have only one Apply mode—all filters applied to that object use the same mode. Your choices are as follows:

- **To Object Within Image**—Select this option to apply the filter to the image out to its boundaries. The effect cannot bleed outside the object boundaries.

- **Separately to Object**—Select this option to apply the filter to a object, but allow it to bleed outside the borders of the object as needed. For instance, if you are applying a splatter filter, you would want the object to spread beyond its original boundaries.

- **Everything in Front of Object**—Select this option to apply the filter to anything that appears in front of the object (closer to the camera), but not to the object itself.

- **Everything Behind the Object**—Select this option to apply the filter to anything that appears behind the object (farther from the camera), but not the object itself.

- **Entire View**—Select a camera object in any View window to activate this choice and the filter applies to everything that falls within the camera's viewing area. This option is available only for cameras.

- **Illuminated Area**—Select a light object in any View window to activate this choice and the filter applies to everything that the light shines upon. The strength of the filter effect will diminish with distance (as does the illumination cast by the light) as dictated by the light's Falloff settings. This option is only available for lights, and does not work with Distant lights.

Step 5: You have several other options as follows:

- Check the **Apply to Children** check box when you are working with an object hierarchy and you want to apply the filter effect to any child objects as well as the selected parent object.

- Check the **Live Updates** check box to render your scene each time you change a filter setting. Keep in mind that this can slow down system performance. In order for this to work, you must check the **Filters** check box in the Show area of the Display tab in the Command Floater.

- Check on the **Update** button to view changes you make to filter settings. You can use this button when you don't check the **Live Updates** check box. In order for this to work, you must check the **Filters** check box in the Show area of the Display tab in the Command Floater.

Applying Multiple Filters

This section explains how to apply multiple filters to the same object. Just as with Deformations described in Chapter 12, you can stack multiple filters to achieve complex effects. To apply multiple filters to an object or view, simply apply them one after the other. Each filter will be added to the list in the Filters tab in the order in which it was added. The order in which the filters are computed is significant, applying the same three filters in three different orders could have three very different results. A filter can be easily re-ordered by simply dragging its title bar to a different position in the list. Each filter in the list has its own panel that contains the settings for that filter. Each panel can be opened and closed as needed in the same manner as panels in other Command Floater tabs.

Animating Filters

Any filter can be animated by changing its parameters over time. To animate a filter, simply apply the filter, set the desired values for the beginning of the animation (Time Marker at time zero) and then set the desired values at the end of the animation or segment. The effect of the filter will be interpolated between the two sets of values over the course of the animation. A track is added to the Sequencer for each filter applied to an object so that each can be controlled independently. Eventmarks are added to the filter's track when any parameter is changed, and a filter can have an unlimited number of eventmarks.

Although you can animate filter parameters, you can not animate the presence of a filter—filters are either present or not for the entire course of your animation. You cannot, for instance, apply a filter at one point in time, then delete it later. To achieve the effect of the filter disappearing completely (or appearing), set the filters parameters to zero (or whatever setting is appropriate for the filter) so that it has no visible effect. See *Chapter 19: Introduction to Animation* for more information.

Filters and Other Effects

When using filters to create effects in your scene, keep in mind that they are applied as a post process in the rendering process. This means that they may not interact with other effects as expected. For example, the Adobe Pinch filter shrinks the apparent size of the object, however it will not affect the size of the object's shadow.

Appendix A

Common Surface Settings

The following table shows the Surface Information dialog box settings for several commonly used surface types. The color should be set as needed for the specific surface desired. An Effect map may also be added.

	Chrome*	Glass	Gloss Paint	Rubber
Diffuse Shade	20	10	50	70
Specular	100	80	30	5
Shininess	100	55	25	0
Metallicity	100	50	0	100
Glow	0	0	0	0
Reflectivity	100	20	15	0
Transparency	0	90	0	0
Index of Refraction	n/a	1.15	n/a	n/a

	Plastic	Plastic, Clear	Plastic, Shiny	Porcelain
Diffuse Shade	100	20	100	60%
Specular	30	100	90	95%
Shininess	30	95	50	75%
Metallicity	0	0	75	0%
Glow	0	25	0	0%
Reflectivity	0	15	10	25%
Transparency	0	100	0	0%
Index of Refraction	n/a	1.1	n/a	n/a

*Chrome and other metallic surfaces work best with an environment map, especially when Phong shading.

Appendix B

Index of Refraction Table

The following table lists the index of refraction of several common-place real-world materials. They are designed to help provide a more natural look when designing transparent textures. The amount of transparency and color of the object can vary depending upon the specific effect you are trying to achieve.

Material	Index of Refraction
Amethyst	1.54
Diamond	2.41
Emerald	1.57
Glass	1.10 - 1.90
Hematite	3.22
Ice	1.30
Opal	1.45
Quartz	1.54
Ruby	1.76
Sapphire	1.77
Turquoise	1.61
Water	1.33

Appendix C

Reference Materials

This is a list of reference materials pertaining to technical aspects of 3D modeling and rendering, as well as design-oriented techniques for animating in general.

Animation. © Foster Art Service, Tustin, California. Written by Preston Blair.

The Animator's Workbook. ©1986, Watson-Guptill Publications, a division of Billboard Publications, Inc. Written by Tony White.

Computer Graphics. ©1990, Macmillan Publishing Co., a division of Macmillan, Inc. Written by F.S. Hill, Jr.

Fundamentals of Interactive Computer Graphics. ©1982, Addison-Wesley Publishing Company. Written by James D. Foley and Andries Van Dam.

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