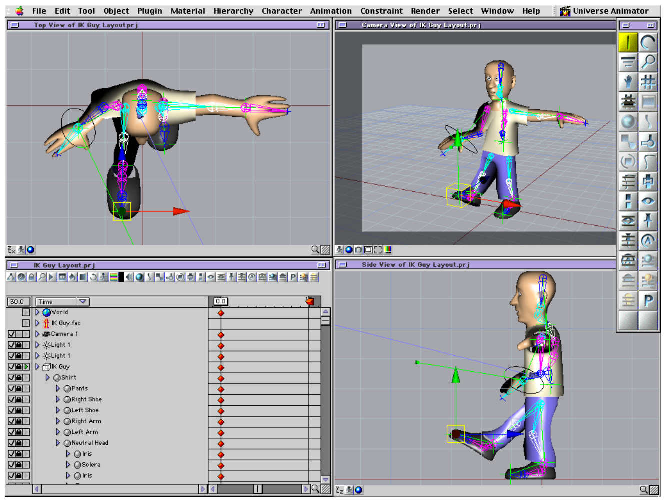
EIAS

Electric Image Animation System



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EIAS Concepts

The Electric Image Animation System (EIAS) is a powerful suite of programs that you can use to create fully rendered, motion picture quality computer generated 3D animated movies. It consists of three applications, Transporter for importing models, EIAS Animator for animation and surfacing, and Camera for rendering and raytracing. EIAS Animator also includes the Renderama™ network rendering utility.

EIAS is a multi-platform application suite. You can operate just as easily on Macintosh OS 9 and X, Windows NT, 2000 and XP computers. You can animate on one platform and render on another if you so choose.

1.0 EIAS Introduction

EIAS is a suite of applications which you use to create models, animate them, and finally render them into pictures or movies. The applications included within EIAS are:

EIAS Animator

You can use EIAS Animator to apply surface materials and textures, set up scene lights, and then animate your models. EIAS Animator has been used in most of the Hollywood summer blockbusters since 1991, when it was first introduced as ElectricImage Animation System.

Camera™

Rendering is the process of converting your animation, model and surface data into finished pictures and movies. The rendering process is effectively a standalone process: once you assign a rendering job, you take a break until its complete. Depending upon how many frames are in your animation, and what rendering levels you have chosen, your job could take a few minutes to many hours.

Camera is the rendering component of EIAS. Long known as the “world’s fastest renderer,” EIAS Camera is capable of rendering over 30,000,000 polygons, and an effectively unlimited amount of lights, texture maps, procedural shaders, and so on. The image quality and rendering speed of EIAS Camera are unsurpassed, as demonstrated by its continuos use in Hollywood’s biggest effects films.

Under all operating systems (except Mac OS 9), you must manually set the memory allocation for EIAS Camera within the application itself. This is done in Camera using the Set Memory Usage in the File menu (**File > Set Memory Usage**).

Make sure there is no Camera.ccn file in the same folder with Camera (or Camera will begin rendering), launch Camera, and choose **File > Set Memory Usage**. A dialog box will open, allowing you to set Camera’s memory partition. Set it to a number between 40 (40MB) and 2000 (2 GB). If, during rendering, Camera launches and immediately quits, you have assigned more memory than your operating system will provide. Throw away the Camera.ccn file, launch Camera and lower the memory allocation.

Renderama™

EIAS Camera can be controlled by Renderama, the network rendering server utility that ships with EIAS Animator. With Renderama, you can render to a local network, or across the internet! Renderama is a very simple utility, with very few bells and whistles.

1.1 Terms and Definitions

Before reading any further, it is necessary for you to understand the nomenclature of EIAS Animator. These terms will become important in the following sections:

Project. The project file is the main work file used by EIAS Animator. it stores all references to objects, materials, maps, procedural shaders, and any other files used in the scene.

Scene. A rendered sequence, like a scene in a movie.

Object. Any of several object types: camera, light, model, plugin, effector, and smoke object.

Camera (Scene Object). The camera is a scene object which is used to record the events of the scene over a period of time, just like a real camera.

Light (Scene Object). A scene object that can be any of several sub-types which is used to illuminate a scene.

Model File. A model is an object type that contains a geometric description of the shape of the object. A model is made up of collection of "groups."

Group. A member of a model file, a group is a single container of point, line and/or polygon data that is used to describe the shape of an object. A model file can have but a single group, but it must have at least one.

Groups can be linked to one another or other scene objects hierarchically, can be animated, and can contain shading information.

Polygon. A polygon is an enclosed, flat shape that, as part of a mesh of other polygons, defines a more complex shape.

Vertices. Points which define the corners of a polygon.

Attribute. An aspect of an object which can be set to a value or animated. Objects typically have many attributes.

Map. Refers to attribute maps, such as bump, clip, diffuse, transparency and so on, and projection maps.

1.2 Starting Up EIAS Animator

When you first start EIAS Animator, you will be asked to create a project. A project is the main file that EIAS Animator uses to store and organize animated scenes.

After you create your project, you will be asked to choose a model to import into the scene. If you cancel, an empty scene containing a single camera and light will be created. You can import objects and create 3D text at any time.

A new project will always start with four windows, a camera, a radial light, any models that you may have imported, and the main menu bar. Three of the windows represent your working space, or “world space.” They are titled “top view,” “front view,” and “side view.” The fourth window is your camera view. The camera’s start position is on the Z axis, looking towards the origin (0,0,0 in world space coordinates.) The origin is the center of the world, and of your project.

1.3 Moving in Space

We all exist in space. We organize our space with units of measurement, such as feet or meters. 3D programs need to work within a space just like we do. Fortunately, a 3D program is not limited to just one space, and it can easily work at the atomic or astronomic level.

3D space is represented as a cube, and divided into three “axes” called X, Y and Z. Remember in school when a geometry exercise required you to plot a curve on graph paper? Chances are, the graph paper grid was divided up into X and Y space. Now, imagine three pieces of graph paper, running through the centers of the other in a perpendicular direction. Each of the sheets of paper would be labeled XY, XZ and YZ. 3D space is described in the exact same fashion. Three coordinate pairs are used to describe the location of an object in 3D space, such as 20,10,0. In this example, the object is located 20 units on the X axis, up 10 units on the Y axis, with no change on the Z axis, putting the object on the XY plane of the 3D space. Values for 3D space can be both positive and negative. The direction that you travel will dictate whether or not your are in the positive or negative coordinates of a spatial region. The meeting point of all three planes is referred to as the “origin,” and located at coordinates 0,0,0.

Different 3D packages use different ways to look at the coordinates of the 3D cube space. Although it doesn’t really matter how a particular package may view 3D space, it can be a concern if you are interchanging data from one program to another program from a different manufacturer. The most important thing to note in your program of choice is “which end is up?”

In EIAS Animator, world space is “Y up,” that is, the positive Y axis is pointing up. The positive X axis points to the right, and the positive Z axis points to the rear. This is called the “left-handed coordinate system.” All objects in a EIAS Animator scene will move within this coordinate system. Another kind of space in EIAS Animator is “object space” or “local space.” Object space is localized to each object in the scene, and refers to the rotation or orientation components of an object, as well as material properties such as texture maps. This sounds more complicated than it is, really. As you work with EIAS Animator, you will be exposed to these concepts in more detail.

Depending upon how your model was made, you may see its rear end facing you in the front view, or you might see the front pointing at you in the top view. This is easy to correct with object axis editor **(Hierarchy>Axis Editor)**.

1.4 Looking at Your World

EIAS Animator offers you a set of tools for you to communicate what you want the program to do. The most basic tool is the window. Windows in EIAS Animator present you with information and allow you to edit and manipulate that information so that you can animate. There are several types of windows in EIAS Animator:

- 3D Windows
- Information Windows
- Editing Windows

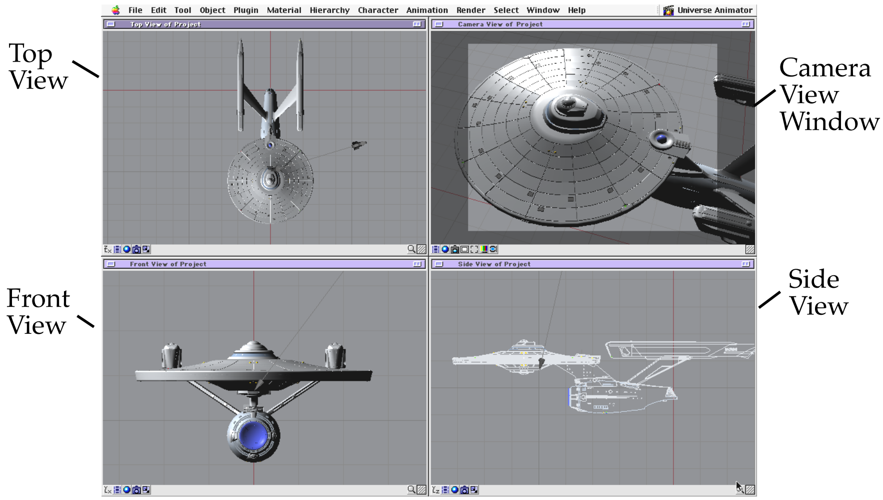


Figure 1.1 — **Default EIAS Animator interface (four view windows.)**

Each of these types of windows offers different methods for animating your objects. In the 3D windows, you interact with objects directly: you select them, move them, rotate them, and so on. You can also control the level of drawing and shading, choosing the method which offers you the best compromise of performance and presentation.

In any active orthographic window (that is, not the Camera View), you can switch from that specific view to any other orthographic projection.

Alt (Option on Macintosh) 1 for Top

Alt (Option on Macintosh) 2 for Side (right)

Alt (Option on Macintosh) 3 for Front

Alt (Option on Macintosh) 4 for Bottom

Alt (Option on Macintosh) 5 for Back

Alt (Option on Macintosh) 6 for Left

] for Zooming in

[for Zooming out

= for Fit to view

This is useful if you operate with only one orthographic window to improve drawing speed.

The information windows provide you with data that is current to the time in which your scene is currently residing. You can control all of the attributes available to an object with its information window, and you can even animate these attributes by changing the values at the current time.

The editing windows offer a more detailed view of your scene and the objects inside of it. The project window presents this data numerically, and is also used to control hierarchy and other functions. The function curve editor presents its data in curve form, allowing you change the shape of data as it progresses through time. This in turn translates to actual motion or attribute behavior. Once you get the hang of the function curve editor, it is likely that you will favor this editor as you animate. The morph editor offers a slider-based method of animating morph targets. Morph targets are most commonly used for facial animation, but can be used for a variety of other animated tricks as well. The joint editor is used to set up the orientation of joints in your hierarchies and skeletons. The axis editor lets you easily change the orientation of your model, without having to resort to rotating the model into place. The deformation editor is used to bend, twist and otherwise distort your objects into the performance that you require.

3D Environment Windows

3D environment windows are used to draw your scene in 3D. You interact within 3D space in these windows only. Other windows allow you to interact with your project in data or curve form. The 3D environment in EIAS consist of the following windows:

- World Windows
- Camera Window
- Light Windows
- Texture Map Alignment Windows
- Morph Editor
- Joint Editor
- Model Information Window

Projects in EIAS Animator can often get very complex, and it is not unusual to have model counts of a million or more polygons in a scene. You can imagine that constantly drawing and redrawing this much information can be difficult for your computer, and it is. EIAS Animator uses Open GL for drawing by default (you can also switch to a software drawing engine). Open GL is an open drawing architecture used by 3D cards to speed up the drawing of 3D scenes and objects.

In addition to Open GL, EIAS Animator also uses a variety of drawing modes that you choose, so that you can tailor the amount of drawing with the performance that you want to work with when you animate.

Drawing Modes

Drawing modes allow you to control detail vs. performance. You choose which one works the best for you and your setup. Drawing modes are set with the Window Display menu. This menu is located in the little blue ball at the bottom of each 3D window. The available drawing modes are:

- None
- Point
- Outline
- Wireframe
- Point Shaded
- Outline Shaded
- Wireframe Shaded
- Flat Shaded
- Gouraud Shaded
- Phong Shaded

Display None. This mode will draw nothing in the view. Hey, you never know.

Point. This mode draws points for each corner of every polygon in the scene. It can give you a fast volumetric feedback.

Outline. This mode draws a "cartoon-style" outline for each group in the scene, including silhouettes and contours. It offers more clarity than wireframe drawing, and is much faster, as it has to draw much less. Outline mode provides very good feedback and response time.

Wireframe. This traditional mode draws all of the polygons in the scene as wires that you can see through. This is the most clichéd drawing mode ever used in computer graphics. It is also slow when large numbers of polygons are present in the scene.

Point Shaded. This mode is the same as the point mode, except that the points are shaded by the lights within the scene. This mode can actually provide a combination of good speed and good feedback, as the shading of the points can remove the abstract curse of Point only drawing.

Outline Shaded. This mode is the same as Outline mode, except that the outlines are shaded by the lights within the scene. It is tempting to use this mode, but if you have objects with complex geometries, it can start to bog down when shading. You might find that you prefer Outline mode overall.

Wireframe Shaded. This mode is the same as Wireframe mode, except that the wireframes are shaded by the lights within the scene. It is very sexy to look at, but there is a time penalty to shade all of those wires.

Flat Shaded. This mode will shade each polygon in the scene giving a faceted or jeweled appearance. It is a very fast shading mode, but does not adequately show spotlights, highlights, or texture maps.

Gouraud Shaded. This mode will smooth shade across each polygon in the scene, although spotlights and highlights will not look as good as they do when the Phong Shaded mode is active. Texture Maps will be visible when this mode is on, and the Display Textures option is set in the group info window, on an object-by-object basis.

Phong Shaded. This mode is the superior shading method, and the results will match the results when you are rendering with the ElectricImage rendering engine, Camera. Spotlights, highlights and texture maps will all display correctly.

To view textures require that the Display Textures option is set in the group info window.

Engine. Underneath the drawing mode list in the menu is the Engine popup menu. This menu allows you to select Open GL (hardware) or the EIAS drawing engine (software.) It is rare that you would want to choose the software engine over Open GL, and it is offered as a choice primarily out of convenience. If you notice that the performance that you are getting from Open GL is less than what you would expect, try switching to the software engine and see if you notice any improvement. If you do, please call tech support.

Note *If you are using Open GL, you should* **not** *be using the ruler bars feature. Ruler bar drawing significantly negates Open GL performance and should be avoided unless absolutely necessary. If you need the ruler bars, use them just to determine the measurements you need, and then deactivate them.*

Following the Engine menu item are two other menu items:

- Show Extents
- Cull Back Faces

Show Extents. Selecting this mode draws the historically familiar cubic extent for each group. This is the fastest setting, but offers the least in feedback.

Cull Back Faces. This mode will speed up drawing by as much as two times, as the polygons which do not face the viewer are removed ("culled".)

Display Elements. Brings up a small dialog that lets you stop classes of objects from being displayed in the window. Each window stores its own Display Elements settings.

Interaction Sub Menu (Texture Window)

The following menu items appear only when in the texture window. The Interaction sub menu allows you to fine tune the performance of the interface drawing engine for maximum results and throughput.

There are four items in the Interaction Sub Menu:

- Update Time…
- Full Monty
- Drop Data
- Drop Quality

Update Time… This option brings forth a dialog which will allow you to set the amount of time that the Drop Data and Drop Quality modes use as their threshold values.

Full Monty. This mode will draw everything, regardless of the setting found in the Update Time value. Hey, what you see is what you get.

Drop Data. This mode will skip parts of the object in order to keep up with your interaction with the program. Depending on the speed of your computer, you may not notice this too much.

Drop Quality. This mode will continue to drop the drawing quality of the model, until it can keep up with you. This mode can be somewhat disconcerting to start with, but you get used to it.

Options Sub Menu (Texture Window)

The options sub menu allows you to select aides which can help in the application of your texture maps.

There are four items listed in the Options sub menu:

- Cull Back Faces
- Use Lights
- Show Normals

- Texture Shading

Cull Back Faces. This mode will speed up drawing by as much as two times, as the polygons which do not face the viewer are removed ("culled".)

Use Lights. This mode is active only when the Shaded options are selected. This mode allows you to view the texture with normal scene lighting.

Show Normals. This mode will draw lines along the direction that each polygon is pointing. If there is a problem with the normals of a particular polygon, it will be evident when examined with this feature, and appear as a normal pointing in a direction opposite that of the neighboring polygons.

Texture Shading. The default presentation of the texture map on the surface of the model is "fully lit," as if you were viewing the texture in a paint program. The default method can hide detail at times, so we created this option for you to use when you need to see some surface definition when you are applying your texture map.

In addition to the items covered in the Texture Window version of these menus, there are three other options that are found in the World and Camera View versions of these menus. These options are:

- Display None
- Display Lights
- Display Paths

Display None. This mode will draw nothing in the view. Hey, you never know.

Display Lights. This mode will draw the lights in the view. You can turn off the lights to hide the clutter, or speed up the shading performance of the view.

Display Paths. This option will toggle the display of motion paths in the view.

1.5 The Camera Scene Object

The camera is what records the scene. It is actually three connected pieces, as shown in Figure 1.2: the body, which is the focal plane; the view vector, which is a line indicating the view direction; and the reference point, which determines the actual point at which the camera is looking.

- Dragging on the body changes the position of the camera, but not where it is looking.
- Dragging the reference point changes where the camera is looking but not its position.
- Dragging the view vector keeps the orientation of the camera the same, but changes the camera's position and where it is looking.
- Dragging on the body while holding down the Control key moves the camera long its reference vector.
- Dragging on the constraint widget moves the body along the constraint axis.
- Dragging on the constraint widget while holding down the control key moves the body and reference along the constraint axis.

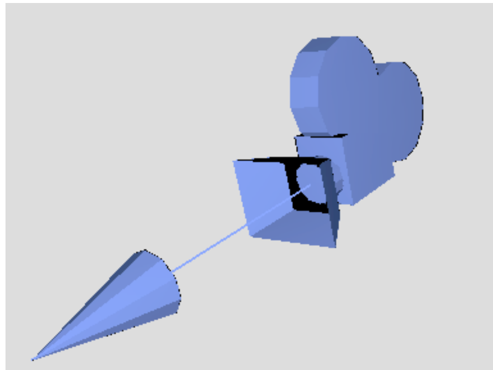


Figure 1.2 — **The camera icon**

One of the most common mistakes of new EIAS Animator users is employing too much camera motion. This is due to the fact that the camera is so easy to animate. Camera moves should be slow and deliberate. Otherwise, a "digital whiplash" effect occurs, the main result being that all your friends and associates will know that you are not a professional camera operator.

Aspect Ratio

The aspect ratio is the shape of the rendered image, expressed as width over height. The clear rectangle represents the area of the image which will be rendered; the grayed out portion of the view is just outside the camera's rendering area (which is how motion picture and television cameras actually operate).

In the movie industry, there are many different aspect ratios in use. EIAS Animator has menu items for the most popular aspect ratios used for production. You can also enter your own.

Focal Length and Field of View

Directly influenced by the aspect ratio is the focal length, also known as the field of view. The focal length works the same in EIAS Animator as it does for an actual camera. It can represent any lens type. There are two differences between EIAS Animator and a real camera: You do not have keystone problems (which are vertical line distortions due to the spherical nature of the real lens), and you do not have fisheye distortion problems at extremely wide focal lengths.

You may also use the field of view feature if that suits your needs. The field of view is expressed as an angle. For instance, a 35˚ field of view with the aspect ratio set to 35mm slide would equate to a 60mm lens on your slide camera.

Yaw, Pitch and Roll

As mentioned previously, all objects in EIAS Animator have an orientation. When referring to the camera, this orientation is called yaw, pitch and roll, which work the same for the camera as they do for the rest of the object classes in EIAS Animator. Yaw equates to the Y axis, pitch equates to the X axis, and roll equates to the Z axis.

1.6 Light Objects

Lights are the class of objects which illuminate a scene. EIAS Animator always adds a 100% white light with an intensity of 1.00 to your project as a default every time you create a new project, and any new light that you add has these same values. Lights have no physical properties as a model would have.

It is important to remember that the use of too many bright lights can overexpose the scene, in the same manner as when photographing a scene for film or video. If you experience this, you can drop the intensity of some of the lights. It is a common practice for only one or two lights (called the "keylights" in the production industry) to be near full brightness. The other lights are usually adjusted to set a mood in the scene.

Lights in EIAS Animator can be set to any one of 16.8 million colors. You can also animate the color of a light, and, depending on the particular type of light, you can even adjust the effective range of the light, called the "dropoff," and the inner and outer cone angles of the light. Wherever lights overlap each other, their colors will add together, producing a different color, just as with their real world counterparts.

There are six light types in EIAS Animator:

- Radial
- Parallel
- Spot
- Tube
- Ambient
- Camera

These light types can be mixed and matched together in order to achieve dramatic lighting effects.

Radial Lights. Radial lights cast light rays out from their centers in all directions. These rays act like the spokes of a bicycle wheel, but in a spherical area. Radial lights most closely resemble artificial lights, like those found in your home.

Parallel Lights. Parallel lights cast parallel rays. Parallel lights are analogous to stars (such as the sun). There is no real beginning to a parallel light. Objects lit by parallel lights will be evenly lit, unlike the other light types.

Spot Lights. Spot lights work just like real spotlights. You can adjust the inner and outer cone of the spotlight, as well as the dropoff distance. You can also animate these attributes. Spot lights are great mood enhancers for a scene and offer the greatest amount of control.

Tube Lights. Tube lights are basically elongated radial lights. You can adjust the length of the tube and, by enabling fog or glow special effects (as explained on the next page), create such visual elements as fluorescent bulbs, laser beams, etc.

Ambient Lights. Ambient lights add an overall brightness to a scene regardless of the orientation of the surface relative to the other lights. Experimenting with ambient lights will give you the best indication of their usefulness to you.

Camera Lights. Camera lights are radial lights which are attached to the front of the camera, always illuminating the area in front of the camera.

Animating in EIAS

To successfully create 3D animation in EIAS Animator, you must learn a few basic concepts about how 3D animation works, about the animation tools included with EIAS Animator and the EIAS workflow between EIAS Animator and EIAS Camera.

EIAS allows you to animate objects over time: model object files (and their groups or layers), cameras and lights. The following discussion applies to all of these object types.

1.7 What is an Object?

An object is any item which is an independent entity in the scene. An object can be a model file that you import, a scene camera and a scene light. Model files consist of a collection of sub-objects called groups in EIAS Animator (some programs refer to them as layers).

Scene cameras and scene lights are system objects. They exist in 3D space, but contain no real volume, with some lighting effects as exceptions to this.

Model files and groups are a collection of points, lines and polygons, and are combined with shading and material information at render time. These points, lines and polygons make up the overall shape that you perceive the model to have.

1.8 What Can You Do with Objects?

Objects are what you animate in EIAS. The type of animation allowed depends upon the particular object, but here is a general list of ways to interact with (and animate) objects:

- Import Model Files into the project
- Select (implicitly)
- Move (translate)
- Rotate
- Scale (models only)
- Animate
- Create Hierarchies
- Deform (models only)
- Morph (models only)

1.9 Importing Models into EIAS Animator

A “model” is an object file on disk which uses polygons to describe its shape. Models can be created in 3D programs (EIAS Animator does not create models directly, with the exception of 3D text). EIAS Animator requires that all of its models be imported into the FACT format, which is the Electric Image model format. EIAS Animator can import the following model types:

- Lightwave (.lwo I & II)
- 3-D Studio (.3ds)
- Autocad (.dxf)
- Maya (.obj)
- ElectricImage (fact)

To import a model into EIAS Animator:

1. Choose **Object>Import Object** from the main menu bar
2. Pick the file you wish to import from the file list

   The file will be imported into the scene. Once that is complete, the import dialog will appear again, prompting you for any additional model files to import.

3. Choose any additional models, or press the Done button to close the dialog

3D Text Models

Although you cannot create models in EIAS Animator, you can create 3D text from PostScript type one and True Type fonts, which is the type of font that you use with a laser printer or typesetter. You can create text with depth, bevels and separate face groups for material mapping.

1.10 Selecting Objects Implicitly

In EIAS Animator, objects are selected by the particular tool that you have chosen. In other words, you pick the tool, and then you pick the object.

1.11 Moving (Translating) Objects

The translate tool is the default animation tool in EIAS Animator. When you select an object to translate with the translation tool, the translate manipulator will be activated. The **T key** can be used as a quick shortcut to switch into translate mode.

Translate Manipulator. The translate manipulator is used move objects in the world. The manipulator can limit motion to just one axis, or all axes at a time. The manipulator is constructed of a yellow wireframe box at the origin of the manipulator (which is placed at the pivot point of the object) and three axis lines, radiating from the center outwards, each capped by a cone. The X axis is drawn as a red line. The Y axis is drawn as a green line. The Z axis is drawn as a blue line. Selecting any of these axes will cause motion to be limited to that axis. The selected axis will be drawn in yellow to indicate that it has been selected.

1.12 Rotating Objects

To rotate objects in EIAS Animator, select the rotate tool. Then, select the object to rotate. If you select the parent object of a hierarchy, then all of the objects will rotate along with the parent (assuming the objects have their inherit rotate attributes active, which is the default). If you select multiple, separate objects (that do not share a hierarchical relationship), each object will rotate about its own center. The **R key** can be used as a quick shortcut to switch into rotate mode.

Rotate Manipulator. The rotate manipulator is used to rotate objects. Rotations for objects always occur in the local space of the object. The rotate manipulator is an “arc ball” and drawn as a series of offset spheres or arcs, each axis a different color. Unlike the translate and scale manipulators which have only three axes, the rotate manipulator has four. The X axis is drawn as a red arc. The Y axis is drawn as a green arc. The Z axis is drawn as a blue arc. The view planar axis is drawn as a cyan circle. Selecting any of these axes will cause rotations to be limited to that axis. The view planar axis will always rotate the selected objects along the depth axis of the window plane. The selected axis will be drawn in yellow to indicate that it has been selected.

1.13 Scaling Objects

To scale objects in EIAS Animator, select the scale tool. Then, select the object to scale. If you select the parent object of a hierarchy, then all of the objects will be scaled along with the parent (assuming the objects have their inherit scale attributes active), maintaining the scaled distance between children. If you select multiple, separate objects (that do not share a hierarchical relationship), each object will scale to its own center point. The **S key** can be used as a quick shortcut to switch into scale mode.

Scale Manipulators. The scale manipulator is used scale objects in the world. The manipulator can limit scale to just one axis (non-uniform scaling), or all axes at a time (uniform scale). The manipulator is constructed of a yellow wireframe box at the origin of the manipulator (which is placed at the pivot point of the object) and three axis lines, radiating from the center outwards, each capped with shaded balls. The X axis is drawn as a red line. The Y axis is drawn as a green line. The Z axis is drawn as a blue line. Selecting any of these axes will cause motion to be limited to that axis. The selected axis will be drawn in yellow to indicate that it has been selected.

1.14 Configuring Manipulators

The size of the manipulator is not related to the size of the object which is using it. This allows you to scale the manipulator to the working size that you prefer. All manipulators use the same size value, so when you change the size of the translate manipulator, you are also changing the size of the rotate and scale manipulators.

The manipulator's display can be controlled from the **Edit>Display>Controller** menu item in the main menu bar. You can control the size of the elements that control the origin (yellow wireframe box) and the end caps (shaded cones for translate, and shaded balls for scale). You can also control the line thickness of all line elements (vectors for translate and scale, and arcs for rotate).

1.15 Animating Objects

Animation is what EIAS Animator is all about. You can choose to do simple little animations, or complex creations that rival blockbuster movie effects. What you get out of it is based on what you decide to put into it. EIAS operates under some important core concepts. These core concepts, when understood, will help you to apply the best approach to the animation that you are creating.

Remember, you are always animating objects. Animation is a record of the changes to an object that occurs over a period of time. These objects have attributes that can be animated. Objects can be joined together to form more complex assemblies. Objects can be modified by deformations and morphs. Once you understand these basic concepts, animating in EIAS will become easier:

- Time is used to control when something happens
- Keyframe events are used to control where something happens
- Animation channels are used to control the rate at which something happens
- Object hierarchies are used to control how many objects will be animated, and what attributes may be animated
- Deformations are used to control other aspects of how something happens

- Morphing is used to blend different model files of the same basic data

Time Line

To create an animation, you use the tools EIAS Animator supplies tools to move, rotate, scale, deform, or otherwise move or change an object over time. EIAS Animator uses a combination of time and events to animate your objects. EIAS Animator uses the time line to sample “snapshots” in time called “frames” and then uses these frames to render final images and movies.

The time line is a scale of time that you set for the duration of your project. The time line is available in either the project window, or the time palette. Within the time line is the time slider. To change the scene time, you just drag the thumb (slider) to the desired time. You can go forward or backward at any time.

You are in control of the amount of frames that are sampled over a period of time. This control is called “frames per second.” You can think of this as sort of a “level of detail,” as you can resample the time line into a different amount of frames per second as needed. As you create events, you advance the time slider to the next moment in time that you want something to happen. You then create the next event.

Key Frames

These events are called “key frames.” EIAS Animator then “interpolates” these key frames, adding extra information between each key frame that you set. When you playback your animation, you see a combination of your key frames and interpolated frames. Key frame events are the rough points of a motion or attribute change. You do not need to set a key frame for every frame in your scene, nor should you. Instead, you want to "rough in" your performance, refining keyframes and adding new ones as necessary to get what you want.

Creating Keyframes

Key frames can be created automatically whenever you change something that hasn't been changed before, or you can create them yourself by hand.

To create automatic key frames in EIAS Animator:

1. Select the object you wish to animate
2. Choose **Animation>Enable Animation** from the menu bar

   This will activate the animation channel for the object (see the following section for an explanation of animation channels.)

3. Drag the time slider to a different time
4. Move the object (or rotate, scale or otherwise change an attribute of the object)

   A key frame will be created.

5. Advance the time again
6. Move the object again

   Additional key frames will be added to the project.

To check your work, press the preview button, or open the project window and note that a new keyframe has been placed in the data panel of the window.

Animation Channels

If you don't set a key frame, you will not see any change in motion. If you change an object's attributes without activating the animation channel for the object, you will not see any change in motion. Instead, the last change you made on the object will be all that you see.

Animation channels are used to hold the information that you create when you animate. They are effectively “motion containers.” To save space and speed the performance of a project, animation channels are typically turned off. You can easily turn them on, just by selecting the object you wish to animate, and then choosing **Animation>Enable Animation** in the main menu bar.

1.16 Motion Path Curves

When you animate the position of objects in EIAS Animator, you will see a motion path curve appear. This is the path of motion that the object will follow. There are two classes of motion paths, implicit and explicit.

Implicit Keyframe Paths

If your object is set to animate its position with an implicit curve, the curve will run through each position key frame that you have set for the object. If you click on any keyframe point along the motion path, the scene time will be set to the time of the keyframe that you selected, and you will be editing that keyframe.

There are four different spline types available for implicit motion paths: linear, natural cubic, Hermite and Bezier.

Linear Splines. These are not actually splines, but rather a simple line. All motion using linear interpolation results in a very mechanical (sometimes awkward) motion.

Natural Cubic. These splines give a very fluid motion, and are the best to use if you do not care about the precision of object placement, since editing one keyframe along the spline will change the whole curvature of the spline.

Hermite Splines. These splines are more versatile to use but require greater effort to control. Unlike the natural cubic spline, editing one keyframe along the spline will not change the whole curvature of the spline, and thus the curve can be manipulated with greater precision.

Bezier Splines. These splines are the same splines used by popular Macintosh drawing programs such as Adobe Illustrator®, however EIAS Animator Bezier splines are 3-dimensional.

Spline paths can be edited at any time. You can also edit the tension, bias, and continuity attributes of Hermite splines.

Explicit Motion Curves

Explicit motion curves are different than implicit curves. These curves are combined plots of separate X, Y and Z position data curves. There is no provision to edit the shape of the curve in the 3D views. Instead, you must edit explicit curves in the function curve editor.

To set an object to use explicit translation curves:

1. Select the object
2. Choose Object>Group Info (command or control “i”) from the main menu bar

   The object information window will appear

3. Choose the X-form tab in the window if it is not already visible

4. Under the position heading, choose “Explicit” from the key popup menu

The curve is now changed to an explicit motion curve. The path curve will be drawn without any form of keyframe markers.

Note *Explicit path curve shapes are harder to control than implicit path curves, as you can edit those directly. If the shape of the path is important, try using implicit curves set to bezier, and make adjustments as needed. Then, you can convert to an explicit curve and finish the editing in the function curve editor.*

1.17 Object Hierarchies

Object hierarchies are used to control what objects are connected together, and what objects are animated within that relationship. The hierarchical relationship between objects is often expressed as parent/child. To understand what a hierarchy is, just examine you own hand. Each finger joint is attached to the next one, as the chain that is a single finger heads toward the wrist. Each finger travels through the palm area and forms a nexus with the other fingers at the wrist. The root of the hierarchy, forming the base, is the wrist/palm. The root, or parent, has the fingers attached to it, joint by joint. The fingers are said to be the children, grandchildren, and so on for each joint, down to the finger tips. This is a basic hierarchy.

Object hierarchies can be animated directly, using what is called “forward kinematics” or they can be attached to skeletons and animated in a fashion more like human motion, using what is called “inverse kinematics,” which is covered in the following section.

Forward Kinematics

Using the typical swing arm lamp as an example of a hierarchy containing five joints (base, arm 1, arm 2, lamp shade), animating this hierarchy one joint at a time to make the arm swing around is how forward kinematics is applied. You are responsible for animating each joint to get the performance you require. Forward kinematics are great for straightforward animation of fairly simple hierarchies.

1.18 Inverse Kinematics

Using the swing arm lamp example again, you can imagine the same hierarchy as a simple “IK chain,” which is just a fancy way of controlling the hierarchy as a single unit. With an IK chain, you merely adjust the end of the chain, in this case, the lamp shade, and the rest of the joints will move accordingly. Of course, IK chains can be applied to more complex hierarchies, such as organic characters like animals, humans and even aliens!

IK chains are actually a series of bones, with an IK handle applied to control them. An IK handle is a special controller that manages the motion of the chain to which it is attached. You move and animate the IK handle, not the bones or skeleton joints directly.

IK handles are scene objects, as such they do not render. IK handles have their own information window, which is activated in the following ways:

- Selecting the IK handle and then choosing **Object>IK Handle info**
- Double-clicking on the IK handle

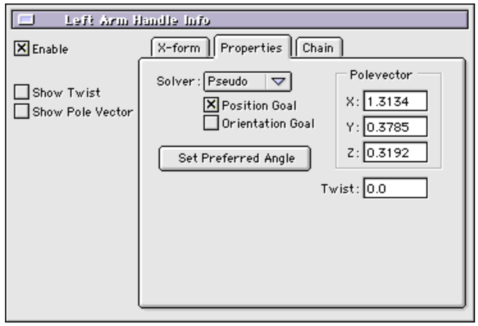


Figure 1.3 — **IK Handle Information window, Properties tab**

The IK Handle information window has three tabs:

- X-form
- Properties
- Chain

X-form tab. The x-form tab contains all of the transform information for the IK handle. You can use this tab to reset the position of the IK handle during an animation, especially if you "parked" the IK handle prior to animating.

Note You can only apply object parking (**Hierarchy>Park**) to objects that are contained within a hierarchy. If you attempt to apply the Park command to objects outside of a hierarchy, strange things can happen...

The x-form tab contains numeric entry edit boxes for translation, rotation, and scale. The translation and rotation edit boxes are applied in a manner similar to all other objects.

Tip The scale attribute is applied to the size of the selection handle for the IK handle. If you are having trouble selecting the IK handle, change the scale value to suit your needs.

Properties Tab. The properties tab controls the attributes of the IK handle. You can choose what type of IK solver is applied to the handle; set the preferred angle, pole vector location and twist of the handle; and choose which type of goal will be used by the IK solver.

There are three types of IK solvers in EIAS Animator:

- Pseudo
- Minimizer
- 2 Bone

In a character set up, your skeleton rig will have many separate chains. In a human, for example, you will have chains for each arm and leg, each finger and the spine. You can also add chains for the head and mouth, and the feet. These chains are typically (although not always) controlled by an IK handle, and that IK handle will use a solver to produce a result.

An IK solver is a method to determine how the IK solution will be calculated for the specific chain that you are working with. Which solver works the best is a matter of choice on your part. A solver works by finding the best IK solution to apply to a chain within the parameters that you specify. Typically, most of the chains used for a human character would be planar; that is, the motion of the bones in the chain would tend to lie on a plane.

For example, the human arm consists of several bones: the humerus, which extends from the shoulder to the elbow and comprises the “upper arm”; and the ulna and radius bones, which extend from the elbow to the wrist, comprising the “fore arm.” The direction of travel for the arm is led by the wrist/palm. If you were to “connect the dots” from the tip of the humerus through the elbow, on to the end of the ulna/radius, and back to the tip of the humerus at any point of motion for the arm, you would have a planar triangle. The IK solvers know that, and can limit the amount of work that they have to do to allow only planar solutions for the motion generated by the IK handle.

Each solver attempts to find a solution in a slightly different way. The pseudo solver uses linear approximation to quickly find an IK solution. The minimizer solver will minimize the amount of unacceptable solutions possible, and then pick a result. The 2 bone solver with apply geometric analysis to find a solution. It only works with chains of two bones in length, and will lock any additional joints.

You will find that you have the best results with either the pseudo or 2 bone solvers (any chains consisting of only 2 bones will automatically use the 2 bone solver). The minimizer solver can sometimes cause the end effector to be in a position other than the explicit endpoint defined by the IK handle.

Preferred Angle

The preferred angle indicates the desired direction preference of the IK chain. This value will help the solver to find an accurate solution quickly. To improve the results, the preferred angle should be clear and non-ambiguous. This is accomplished by creating or manipulating the shape of the chain to clearly show an angle, such as an elbow or knee bend. To set the preferred angle for the IK handle, click the Preferred Angle button.

Chain. The chain tab contains a list of all of the joints and bones under the control of the IK handle. You can access the bone or joint directly by double clicking on the name of the joint in the chain list.

To apply an IK handle to a bone or joint chain:

1. Select the end of the chain (if you want to apply an IK handle to the entire chain) or choose the beginning and end joint to be controlled by the IK handle (if you want to apply the handle to a subset of the chain)
2. Choose **Character>Add IK Handle** from the main menu bar

   The IK handle will be added from the end of the chain to the beginning of the chain (called the "root.") The handle will be listed as an object at the end of the object/channel list in the project window.

Once you have create an IK handle, you can use that handle to manipulate the chain underneath. If you happen to make any change to the chain that would affect the rotation axes (used by the IK handle) directly to the bone or joint, those changes will be lost the next time you use the IK handle.

In order to animate the IK handle, you must select the handle and choose **Animation>Enable Animation** from the main menu bar. Once you enable the animation record for an IK handle, the handle will maintain its position in space, as opposed to moving with the rest of the hierarchy. That is because the handles are located in global space by default. If you require a handle to move with the rest of the skeleton, you can imbed the handle into the hierarchy at the appropriate location.

Pole Vector and Twist Disc

The pole vector controls the direction in which the IK reference plane is oriented, and is used to keep the IK chain from flipping 180˚ on its axis. This happens when the pole vector has crossed the IK handle vector, or is pointing in the opposite direction (which can happen frequently). To control axis flip, you must activate the pole vector (enable the Show Pole Vector check box), and make sure that it doesn't cross the IK handle vector, or point in the opposite direction of the IK handle vector. To change the position of the pole vector, click and drag on the box at then end of the vector.

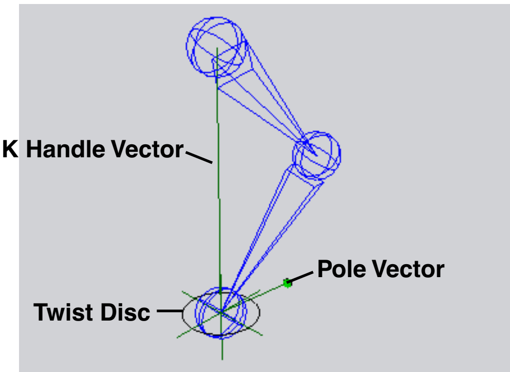


Figure 1.4 — **Bone chain, with IK handle parts illustrated**

The twist disc control is used to control the orientation of the IK joint plane, which is separate from the reference plane controlled by the pole vector, even though the end result appears to be the same. While the pole vector is used to keep the IK solution under control, the twist control is used for the purposes of performance. To keep things simple, use the pole vector to control axis flip, use the twist disc for everything else that requires orientation of the IK joint plane.

Hierarchies or No Hierarchies?

Do you need to create hierarchies to animate? Of course not. Whether or not you need a hierarchy depends entirely on what you are trying to animate. However, as you gain more experience in animation, you will likely apply a hierarchy to almost anything you animate with more than one component.

1.19 Deformations

Hierarchical animation will allow you to create complex assemblies and animate them easily, but you are limited to "rigid bodies" with hierarchical animation alone. You could not have a single arm model bend at the elbow without some additional help. That's where deformations come in.

Deformations are volumetric regions attached to objects which allow you to distort the shape of an object in a variety of ways. They can be applied, singly or in combination, to specific regions within a group, individual groups within a model, and can optionally affect other groups within the model. Deformations can also be animated. For example, you could take a model rectangle and ripple it like a flag in the wind. Or you could make a figure's body parts bend and twist to simulate natural arm, leg and head movement.

Deformations can be used with inverse kinematics to automatically create deformable skins. Using what is called a "bone deformation," the skins that are parented to the same root as the bone skeleton can bend the skin along with the bone skeleton as the skeleton is animated (this works with inverse or forward kinematics.)

In EIAS Animator, deformations can be applied in layers, in a hierarchical, cascading fashion. The order in which a deformation is applied to an animation is important, and EIAS Animator will let you adjust the order of deformations to get the proper effect.

Deformations are a group-based tool. They are applied as a group attribute, although they can affect children groups if the children of the parent to which the deformation is applied are set to inherit deformations.

Deformation Regions

Deformations are applied to groups and are bound by regions. Regions are boxes which surround the group. The group portions within the region will be affected by the deformation. Those portions outside of the region will not be. This behavior will allow you to put a small-radius bend into a cylinder, or bend the entire cylinder.

Regions can be animated, and then can be attached to null effectors as well as geometry. This allows for some very powerful effects. For example, if you create a null effector (a placeholder object that does not show up in rendered imagery) and attach a deformation region to it, parent a cylinder object to the null and set inherit deformation for the cylinder, then drag the cylinder through the null effector, you will see the cylinder deform as it passes through the null. As the cylinder passes outside of the null's influence, its normal shape will return.

Types of Deformations

There are twelve different deformation types available. Each of these deformations is suited to a particular task. In order, they are:

- Scale
- Shear
- Twist
- Taper
- Bend
- Bulge
- Linear wave
- Circular Wave
- Stretch
- Bezier

- Bezier II
- Bones

To apply a deformation to a group:

1. Select the group, by either clicking on it in the world views or selecting its name in the Project window.
2. Choose **Animation>Deformation Editor** from the main menu bar

   The Deformation Editor opens.

3. In the Region section, click on the Add button

   A new deformation region will be added to the group.

4. In the Deformation section, click on the Add button
5. Choose the type of deformation from the Type menu.

   The deformation will be added to the group.

Different deformations have different controls. Some deformations have special options, which are available in via the Options... button. All deformations require that you set the direction axis (or axes) and the deformation axis (or axes). You can interactively set the strength of the deformation in the 3D views, or you can enter a value for the deformation strength in the amount edit box.

You can limit the effective area of deformations by enabling the check boxes in the minimum and maximum sections. This controls the deformation region to which the deformation is applied. You can choose to limit just a few axes, or all axes, based upon which check boxes you enable. If no check boxes are enabled, the deformation will not be constrained.

Note While the deformation editor is active, no other functions will be available. In order to set a new rotation or translation on the group, you will need to close the editor before you proceed (placing the editor in the background will have no effect). Deformation editing can be accomplished only when the editor is open.

1.19 Morphing Model Poses

Deformations change the actual geometry of the model, but morphing uses model poses to create new, in-between poses. What technique to use is based largely upon the task at hand. For facial animation, it is hard to beat morphing. In fact, it has been the favored method of facial animation for some time now. The upside to morphing is that it is very easy to understand and learn to use. The downside is that you must create different variations of the model, typically called poses, in order to use morphing. Depending upon your modeling skills and your patience, you will have more or less success with morphing.

Morphing models is very similar to “replacement animation,” a technique often used by claymation animators (and a technique offered by EIAS Animator). These models must have the same amount of polygons in order for the process to work properly. Morph models are actually separate disk-based model files. These model files are loaded into the morph editor. From there, you use slider bars that has the morph editor blends the different model poses together, creating a new pose altogether.

Facial animation is the most common use for morphing, but you can use it for any model that you wish to morph. For example, you could animate a bird flapping its wings, or perhaps a pair or “rabbit ears” (an old fashion set top TV antenna) reacting with anthropomorphic character. Whatever you choose to morph, make sure that you have enough in between poses created. Unlike deformations, a morph target will tend to progress in a linear fashion. You can control the timing of the morph with a spline curve, but the morph itself will be direct (that is, linear.) So, it you are morphing things other than facial features, be sure to include an additional pose or two for extreme motion, to help make the motion appear more realistic.

1.20 Modifying Values in Edit Boxes and Cells

When animating in EIAS, you can interact with the program numerically or directly in 3D. Working numerically, which you will do from time to time, EIAS Animator allows you to enter relative values and percentage changes based upon the existing value in an edit box or cell.

Edit boxes support two types of value changes: relative offset and percentage.

Relative Offset Value Changes

Relative offset value changes alter each selected item by adding, subtracting, multiplying, dividing or taking to a power. A change of +25 would add 25 to the current value in the edit box or cell.

Percentage Value Changes

Percentage value changes alter the selected item by computing a specified percentage to each value individually. A percentage change of 150% would make the value 1.5 times its current value.

Applying Value Modification

Relative offset and percentage changes are applied by entering simple formulas in data cells or edit boxes. The syntax of the formula is:

@ symbol amount

where @ means the current value of the cell, and *symbol* indicates an operation to be performed, and *amount* is the numeric offset or percentage. For example, @*7.6 results in the cell's current value being multiplied by seven point six.

The formulas you enter are not retained by EIAS Animator. They are immediately processed, and the result is placed in the edit box or data cell.

The following symbols are supported:+,-, *, /,^and%. In addition, two other symbols,! (for negating the value of the edit box) and # (to set the absolute value).

1.21 Surface Attributes

Surface attributes (which apply only to models) define the color, diffuse, specular, reflectivity, transparency, luminosity, and edge density of the model's groups. Surface attributes, taken together with texture, reflection, bump, and transparency maps, make up the overall appearance of the rendered model. The Material Editor is used to set the surface attributes of your models.

1.22 Sound Synchronization

EIAS Animator allows you to import an unlimited number of sound tracks from the many different popular sound editing programs, or record directly from the microphone. Sound frequency import range is from 5KHz to 64KHz, and sound track wave forms are displayed directly in the Project window. The sound tracks are automatically parsed and sounds are assigned to every frame. Synced animations can be previewed in real time and saved in Quicktime format. EIAS will add sound only to the Quicktime format.

1.23 Tool Palette

The tool palette contains a collection of tools that give you access to most of the object manipulation functions in EIAS Animator, as well as motion path and grid control. All of the selections in the tool palette are available in the main menu bar, as well as several other locations.

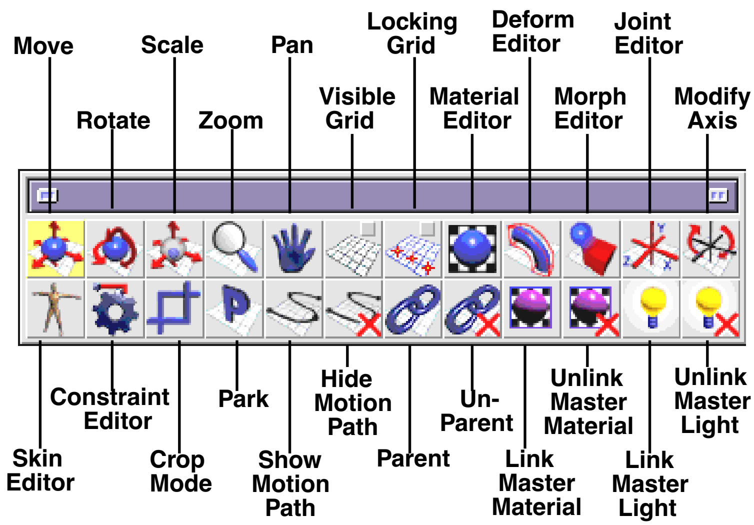


Figure 1.5 — **The Tool Palette**

1.24 The Project Window

Recognizing that different animators work in different ways, EIAS Animator allows you to animate in an event-based time system and/or by an explicit frame-based system. Both approaches use the keyframe paradigm, which harkens back to the days of traditional cel-based 2D animation. You can animate in either system or both, and each has its strengths and weaknesses. Taken as a combined whole, however, this approach provides you with the most powerful and flexible tools available in any animation system.

The Project window is where you set the animation modes (e.g., Time, Keyframe, etc.), and where you can observe and animate all of the attributes within the project file. In Time mode it provides a graphic time scale on which to set events.

Events can also be synchronized to sound tracks, which are represented in graphic form.

In the other modes, such as Keyframe mode, it provides a complete overview of the project in a format resembling a spreadsheet, and you could specify and animate virtually all attributes of the scene from this one window if you wished to.

Because there can be a very large amount of information in a project file, the Project window is programmable. It is broken down into several sections and each section can be collapsed to shrink the size of the window for convenience.

Groups and lights can be renamed in the Project window and frame data can be edited by directly keying in values.

The Project window also contains a palette with tools and pop-up menus for performing various operations on frame data such as cycling a range of frames and creating a blend between two frames (many options are available).

The Joint Editor

This window is where you can assign joint types for a model's groups' hierarchy (controlling how the model's groups move in relation to each other).

There are many options for setting how a group can move (i.e., rotate, swivel, etc.), by itself and in relation to other groups in the same model. The data contained in the edit boxes are in local coordinate space.

The Render Information Window

This window is where you specify how your animation or image is to be rendered, such as how many and which frames to render, how large your rendering should be, and the level of quality you wish your rendering to have.

The window's check boxes are used to selectively enable or disable rendering effects for controlling the efficiency of the rendering process (i.e., it may not be necessary to perform a full rendering if you are testing a single element of a scene).

1.25 File Management

EIAS Animator and you are responsible for managing the many different kinds of files that you will use to create your work. The types of files that EIAS uses are:

- Project Files
- Model Files
- Material Files
- Texture Files
- Sound Files
- Channel Envelope Files
- Plug-in Files

EIAS Animator maintains a directory structure for the most common files that it uses. After you install EIAS Animator, several directories are placed within the directory that EIAS Animator has been installed into. These directories are:

- EI Material
- EI Resources
- EI Shaders
- EI Snapshots
- EI Sockets
- Renderama Jobs

EI Material. This folder contains material descriptions that you create, save and load.

EI Resources. This folder contains resources that EIAS Animator needs in order to operate. Do not remove this folder, or change its location.

EI Shaders. This folder contains all of the shaders that you have installed. Place any third party shaders into this directory.

EI Snapshots. This folder is used to hold any snapshot renderings that you create during a session with the program. Once you exit the program, the snapshots in this folder will be deleted, freeing up disk space. If you wish to keep your snapshot renderings, you will need to set the preference. Choose **Edit>Preferences>Preview & Render tab**, snapshot section, and enable the Make Image Permanent check box. If this check box is enabled, snapshot images are then placed within the home directory of EIAS Animator, and not within the EI Snapshots directory.

EI Sockets. This folder contains all of the plug-ins that you have installed. Any plug-in not installed into this folder will not be available to the program.

Renderama Jobs. This folder contains the job information for any network rendering that you have initiated.

Any other files not covered by these categories can be placed anywhere, although it is recommended that you follow a logical structure. You may wish to keep all of your bitmaps in the same directory, or you may wish to place them within directories that are specific to the project you are working on. The same holds true for model files.

Note Should you need to gather files used by a project together, you can use File>Collect Files... from the main menu bar. This command will collect all files that your project is referencing, and place them where you direct.

Rendering and Raytracing

1.26 Introduction

Rendering and raytracing creates two dimensional pictures from the 3D information contained in the project file. When you set up your models, lights, and the camera, you are supplying the rendering engine with a three dimensional data set. That data set is fed to the rendering engine to be rendered and raytraced as you have determined. The output of the rendering engine is either a single picture or a movie file.

Rendering and raytracing perform imaging tasks in different ways. Rendering is like an artist or illustrator, capturing an impression of a composition. Rendering can easily produce photorealistic results, but you may be able to see that reflections and transparencies are not the same as those you would see in the real world. The benefit that rendering gives you is speed and image quality (in terms of anti-aliasing—see below.) The detriment to rendering is the setup time for simple things such as shadows, and the requirement that you plan ahead in order to optimize your speed benefits even further.

Raytracing is more like photography, in the sense that the raytracing engine will take a more accurate approach to imaging the scene, actually following beams of light as they exit the camera and voyage into the world (which is the exact opposite of what happens in the real world.) The images produced by raytracing can be nearly perfect, in terms of reflections, transparencies and refraction, and more accurate (and easier to use) shadows. Unfortunately, as you can imagine, raytracing is a slow process, and can get much, much slower when dealing with very large scenes (in terms of polygon counts.) Also, anti-aliasing can suffer, as a lower quality of filtering must be used in order to keep imaging times within the realm of practicality.

Hybrid Imaging

EIAS Camera is a hybrid renderer/raytracer. Depending upon the material and shadow settings that you specify, either the renderer or the raytracer will be used. This test is applied on a channel-by-channel basis, so that raytracing is used ***only*** where it is needed. As raytracing is very time consuming, this discretion is mandatory to make it practical for legitimate production.

The raytracer inside of EIAS Camera benefits from the legendary speed, efficiency and image quality of the renderer that preceded it. In the same amount of time as other raytracers, it can produce a higher quality image. It can also produce higher quality images is less time as other raytracers, and you may find this result is typical for your use.

1.27 Shading

Renderers and raytracers produce images by a process called shading. Shading determines what color a particular pixel in an image will be.

Before a pixel can be shaded, it must first be mapped to a polygon. And before the pixel is mapped to the polygon, the polygons must be tested to determine which part of the polygon is visible (if at all). Shading only the visible portions of polygons reduces actual rendering times quite a bit, since the renderer is not shading what is not visible and is not wasting any time.

Each polygon contains at least one shading normal (a normal is a line or vector which indicates the direction that a polygon or vertex is oriented towards). Vertexes which border polygons can also contain normals. These normals are used by the rendering and raytracing engines to properly shade the object. Without these normals, the objects would not be recognizable.

Polygons can be shaded in several different manners, called algorithms. EIAS Animator offers a choice of flat (also called “constant”), Gouraud, Phong and raytracing.

Flat Shading

Flat shading creates evenly filled polygons. It uses the single normal in the center of the polygon to determine a shade for the whole polygon. There would be no change of colors across the surface of a flat shaded polygon.

Gouraud Shading

Gouraud shading creates a graduated shade across the surface of the polygon. It uses the normals located at the corners, or vertices of the polygon with which to shade.

This results in a very fast, smooth shade, but the highlights (reflections of the lights illuminating the polygon) look awful, so Gouraud is usually not used when rendering shiny objects.

Phong Shading

Phong shading also graduates the shading across the surface of the polygon, but in a superior manner to Gouraud. It uses the normals at the vertices of the polygon, but creates new normals in between the existing normals, creating a much more precise shade across the surface of the polygon.

Raytracing

Raytracing is a very precise shading algorithm. It uses polygon normals as do the other methods, but it precisely tracks rays from the viewer to the object (and any reflections), and ultimately to the light source. As a result, raytracing takes much longer to image a scene than Phong or any of the other methods. It will give you accurate reflections, refractions and shadows, and should be used when you need those things. If not, use Phong.

1.28 Resolution

EIAS Animator will let you render your images in resolutions up to 32,000 pixels by 32,000 lines. You can even adjust the aspect ratio of the pixels in the image so that they better conform to video systems, or older graphics systems. The default resolution is set to the resolution of the monitor on which you start up EIAS Animator.

1.29 Color Depth

EIAS Animator renders in 48-bit color space and then reduces it down to 32 bit color space. That means that every image you render can have any one of 16.8 million colors per pixel, plus any one of 256 values of transparency per pixel. This is often referred to as true color. There are also some black and white rendering modes available, which resemble the old black and white paint programs from the early days of computer graphics.

1.30 Anti-Aliasing

Anti-aliasing creates an image which appears to be a much higher resolution image than was actually rendered. It does this by creating “in-between” colors for every pixel, by rendering the image at a higher resolution and then shrinking it. Instead of throwing away pixels which don't fit in the smaller space, these pixels are sampled together, and a new single pixel is derived. It may sound complicated, but all you need to know is that it significantly improves image quality, especially in animations. EIAS has superior anti-aliasing, and produces higher quality results without the time penalty of other programs.

EIAS Animator offers scene and object anti-aliasing, and can be adjust to whatever sampling levels are required. EIAS can anti-alias with an over-sample method, which produces images that are better suited to motion and film, and an adaptive method, which offers more clarity and detail at lower resolutions than oversample.

1.31 Motion Blur

Motion blur occurs whenever the subject or the camera moves faster than film can record an image. Since motion blur does not occur in computer graphics, computer animation often lacks an element of reality (we expect to see motion blur). EIAS Animator allows you to add motion blur so that the final image looks more like the real world.

EIAS Animator offers two different types of motion blur which can be intermixed for maximum benefit: 2D motion blur (motion vector) and 3D motion blur (multi-frame.) Electric Image developed 2D motion vector blur in the early '90's as an answer to the less that appropriate look of 3D blur. As both methods have their uses, EIAS Animator offers both. In fact, you can have 3D blur set, and use 2D blur to smooth the results a bit (with just a little extra rendering time!)

1.32 View Image

Once you have rendered your still image or animation, you will want to review it. The View Image interface allows you to do this. Rendered snapshots come up automatically, but for reviewing texture maps or older, rendered files, use the **File Menu>View Image** command.

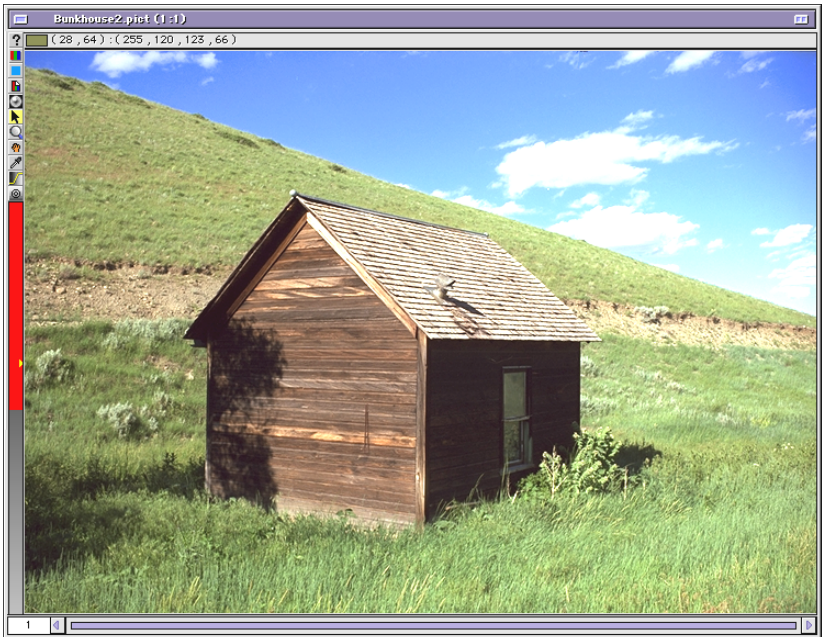


Figure 1.6 — **View Image**

The left side of the window has a toolbar for manipulating the image. There is a scroll bar at the bottom that tells you the current frame and allows you to view any frame in the animation.

There toolbar shown above is for a standard Image or QuickTime file. The toolbar has a few extra controls when viewing a lightprobe file.

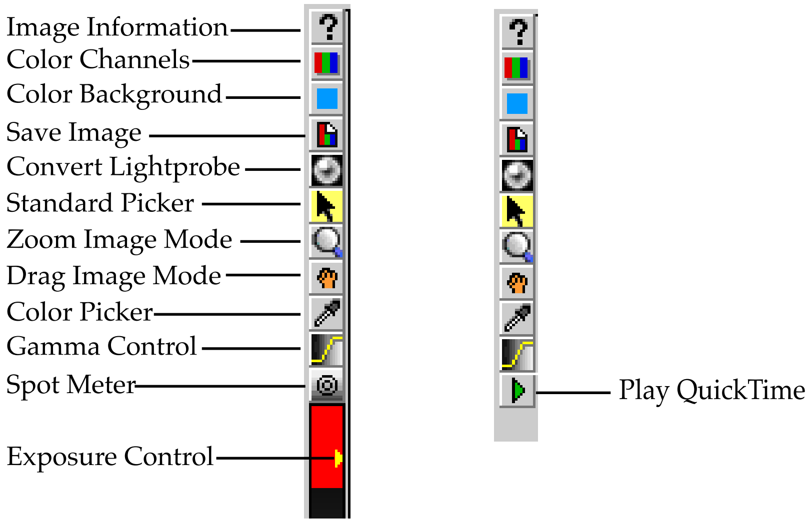


Figure 1.7 — **View Image Tool Bar – Lightprobe (left) Standard (right)**

Image Information. This button pops up a small window that displays basic data about the file being displayed including frame size, number of frames, frame rate and color depth.

Color Channels. This pop-up menu allows you to display individual color channels or just the alpha channel.

Color Background. This allows the background color of the Image file to be changed.

Save Image. This allows you to save the still image or animation to the Image file format or to QuickTIme. This can be used to convert files between Image and QuickTime and visa versa.

Convert Lightprobe. Animator's display engine can view files in the RADIANCE .hdr file format. Camera can not render these files directly, but the Convert Lightprobe pop-up menu can be used to save the files in a format that can be used by Animator (for Illuminator Gels) and for Camera.

Lightprobes generally come in two styles. Angular and Spherical. The vast majority of lightprobe .hdr files are Angular. This style creates less distortion at the edges. Convert Lightprobe allows you to select Angular or Spherical before exporting.

Three export formats are included under the Convert Lightprobe pop-up.

<u>Convert to Longitude/Latitude</u> This is the format to use when saving out images for use in Illuminator Gels (See "Gel Tab" on page 227.) The format spreads the image out, flattening it.

<u>Convert to Cubic Environment</u> This writes out a 6 frame Image file that can be used as a cubic reflection map.

<u>Convert to Cubic QuickTime VR</u> Writes out a cubic QTVR movies. This feature does not currently have a use in Animator or Camera but may provide an interesting view of the lightprobe. Note that after rendering our the QTVR, Animator will open it in a Display window that cannot properly handle panning. Please close that window and open the QTVR directly using Apple's MoviePlayer.

Standard Mode. This is the default mode. As you move the mouse over the image, you will see the pixel location and RGBA color and values displayed at the top of the window. Clicking the mouse in the image will have no effect when you are in this mode.

Zoom Image Mode. This button selects the zoom mode. Clicking in the window when in this mode zooms in. Right-button mouse click (Control-Key mouse click on Macintosh) zooms out.

Drag Image Mode. This button selects drag mode. This is used to pan an image that is larger than the display. The spacebar is a shortcut key for this mode.

Color Pick Mode. This button copies the color where the mouse is clicked to the scrap book. More importantly, it enables color dragging to any of he color chips in EIAS Animator.

Click and hold the mouse down on the pixel that you want to copy. Then drag this color onto one of the color chips. When the mouse moves over the color chip, it will highlight. At this point, release the mouse button. The color chip will now be the color of the pixel.

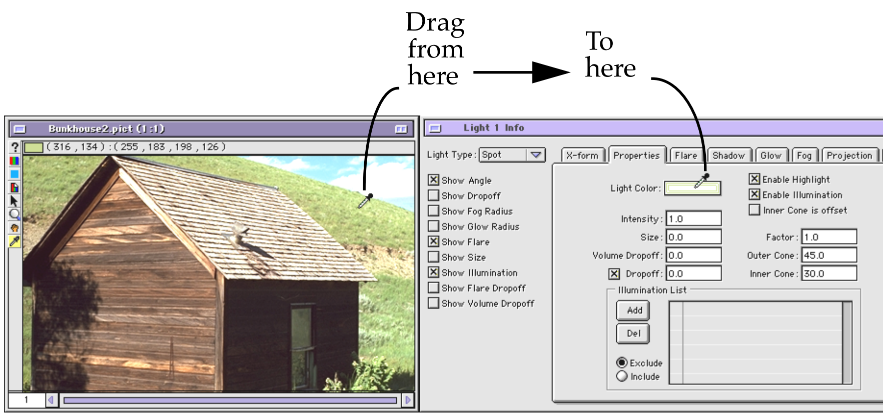


Figure 1.8 — **Color Pick Dragging**

Gamma Control. This Pop-up menu allows you to view the image in a variety of standard gamma settings, no gamma at all, or a custom value for gamma that you select.

Spot Meter. This control is available only when viewing lightprobes. Lightprobes are made my taking multiple photographs at different exposures. Animator (and Camera) can only deal with a single exposure setting. The spot meter and the Exposure control (discussed below) are used for this purpose.

Choosing the Spot Meter will change the cursor and the behavior of the display window when you click or drag in the image. Clicking on a dark region will brighten the exposure. Clicking on a light region will darken it.

Full Range, Mid Range and Center Weight are quick ways to select some generally useful exposure values.

Exposure Control. This control is available only when viewing lightprobes. Drag the small yellow triangle up and down to adjust the contrast of the image. Hold the shift key and drag to adjust the exposure.

Play QuickTime Movie. This button opens the movie in a QuickTime player window. This allows you to play the movie instead of just scrubbing it with the scroll bar.

1.33 OS X

EIAS runs natively under Mac OS X —it also runs under Mac OS 9. Running in the Classic environment is not supported.

Warning *Do not run EIAS with the Classic environment running in the background. Classic, even when idle, takes a lot of CPU cycles. It also has its own driver for the dongle. This can cause corruption of your projects. A warning dialog box appears if you attempt to launch Animator when Classic is running. Shut down Classic using the Classic Control panel in the Mac OS X System Preferences.*

After installing the applications under OS X, launch the Camera and set its memory allocation as described on page 2.

Under OS X, the Quit and Preferences menu items have been moved to the "EIAS Animator" menu.

Warning *Do not run EIAS if Norton Anti-Virus is installed on the computer. Norton prevents Camera from operating properly.*

World View Windows

2.0 Introduction

The World View windows are the drawing windows of the ElectricImage workspace. It is in these windows that objects (models, lights and the camera) are represented by icons which can be selected and dragged with the mouse. Also, the paths that objects travel (if animated) are visible as lines which can be edited in much the same way as lines are edited in most popular Macintosh drawing programs.

There are four World View windows, showing three views of EIAS:

- Top (from the top looking down)
- Side (from the right side looking across to the left side)
- Front (from the front looking to the back)
- Camera (perspective view)

In addition the three non perspective windows can also look from the Bottom, Left Side, or Back.

Each view can be changed to any of the other views. The figure below shows a Front World View window.

2.1 View Window Controls

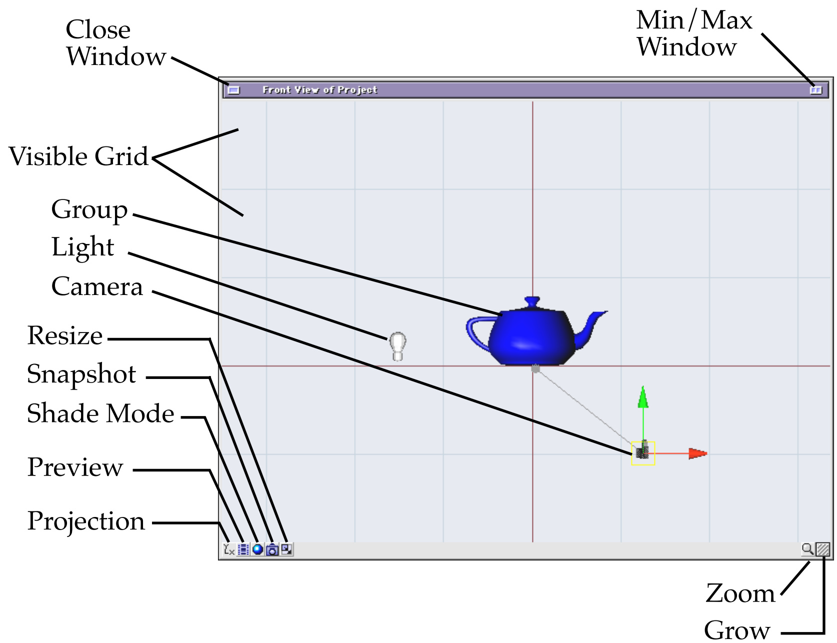


Figure 2.0 — **World View Window**

Close Window

Clicking this box closes the View Window. Windows may be reopened using the commands located under the **Window** menu.

Min/Max Window

Clicking this box causes the window to fill the screen. Clicking a second time returns the window to its former size.

Zoom

Click and hold the mouse button then drag from side to side. The window will interactively zoom in and out. You can fit the scene to the window by holding down the F-key and clicking in one of the three Orthogonal View windows. Shift-F-key and clicking will fit the selected objects to the window.

Pan

Hold down the spacebar and drag with the mouse button down to pan the Orthogonal View windows up/down, left/right. Hold down Spacebar and the X key to constrain the pan to left/right. Hold down the Spacebar and the Y key to constrain the pan to up/down.

Grow

Click and drag on the grow button to increase or decrease the size of the window interactively.

Shade Mode

Clicking on this button brings up a menu that allows you to set the drawing level of the window. Drawing modes are discussed in "Drawing Modes" on page 9.

Projection

This displays the two orthogonal axis of the window. Clicking on the projection button brings up a menu that lets you switch the view to Top, Front, or Side.

Snapshot

Causes Camera to be launched and a rendering made of the non-perspective view. Renderings can be made at the Window size or Render control size.

Note *Certain rendering features require perspective including Sky/Ground, volumetric lighting and lens flares. These feature will not be rendered from non-perspective views.*

Resize Window

This brings up a dialog that lets you set the view to the exact X and Y dimensions of your choice.

Preview

Clicking on the Preview button starts the preview process. The animation is previewed to the screen or to a file. When previewing to the screen, the preview continues looping until it is stopped by pressing the mouse button.

Right Mouse Button clicking (Ctrl-Key clicking on Macintosh) on the Preview button brings up the Preview Options dialog. There is one set of Preview Options for all windows.

Output. A pop-up menu that directs the preview to the screen, to an Image file, or to a QuickTime file.

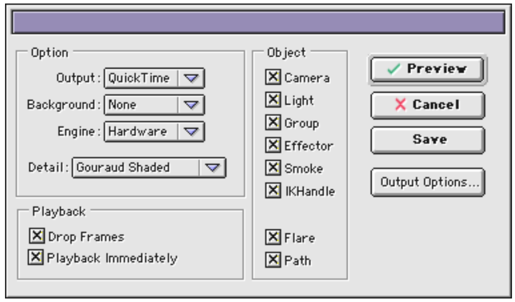


Figure 2.1 — **Preview Options Dialog**

Background. A pop-up menu that controls how the rotoscope background images are used during previews. **None** prevents the backgrounds from being used, **Still** causes the first frame of an animated background to be used in every frame of the preview. **Animated** increments the animated background as the preview plays. Preview performance will be highest when the None or Still options are used.

Engine. When rendering to Image or QuickTime you can select which drawing engine is used. Choices are **Native** (the software engine) or **Hardware** (OpenGL).

Detail. Selects the shading mode for the preview. Options are the same as those discussed in “Drawing Modes” on page 9.

Drop Frames. Used during preview to screen mode only. Causes the drawing engine to skip frames in order to maintain the project frame rate.

Playback Immediately. Used when rendering to Image or QuickTime. Causes the preview file to open and begin playing as soon as all of the preview frames are written out.

Object. Allows you to prevent classes of objects from being drawn during the preview.

Preview. Begins the preview process.

Cancel. Closes the dialog box without making any changes.

Save. Closes the dialog box and remembers the changes you have made.

Output Options. Brings up the QuickTime options dialog box where you can set the CODEC and quality for previews to QuickTime.

2.2 Grid, Rulers and Paths

The World View windows contain grids and rulers to help you align and manage the positions of the objects in your project.

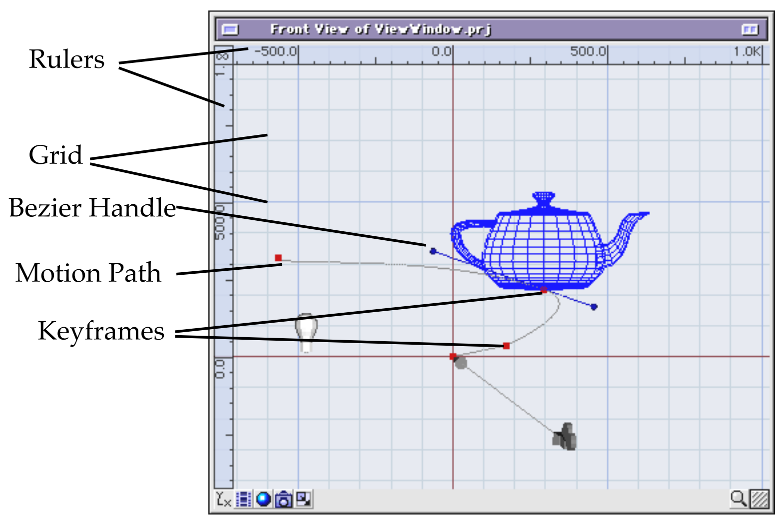


Figure 2.2 — **Rulers, Grids and Paths**

Visible Grid

The Visible Grid can be used to align objects to one another. The **Hide Grid/Show Grid** command under the Windows menu is used to control the display of the grid.

The Grid & Scale tab of the Preferences dialog box has controls that you can use to alter the scale of the Visible Grid.

Snapping Grid

In addition to the visual grid, there is also an invisible snapping grid to which object will “snap” when placed. Grid snap can be toggled on and off using either the **Snapping Grid** tool on the Tool Palette or by turning on the Caps Lock Key.

The Grid & Scale tab of the Preferences dialog box has controls that you can use to alter the scale of the Snapping Grid.

Rulers

Rulers are not displayed by default by can be toggled on and off using the shortcut key Ctrl-M (Cmd-M on the Macintosh). Alternately, you can use the **Hide Rulers/Show Rulers** command under the Windows menu.

The Grid & Scale tab of the Preferences dialog box has controls that you can use to alter the scale and display of the rulers.

Paths

Motion paths are drawn in the View windows to indicate the path of animated objects. Keyframe markers are drawn along the paths that correspond to the keyframes shown in the Project window. If the path type is

Bezier, control handles are shown on the path if the keyframe sits at the current time set by the time thumb in the Project window.

You can hide paths by using the **Hide Path/Show Path** command under the Windows menu.

2.3 Camera View Window

The Camera View window has several controls that are unique. These include Rotoscope display, Field Chart, Snapshot rendering, and view movement controls.

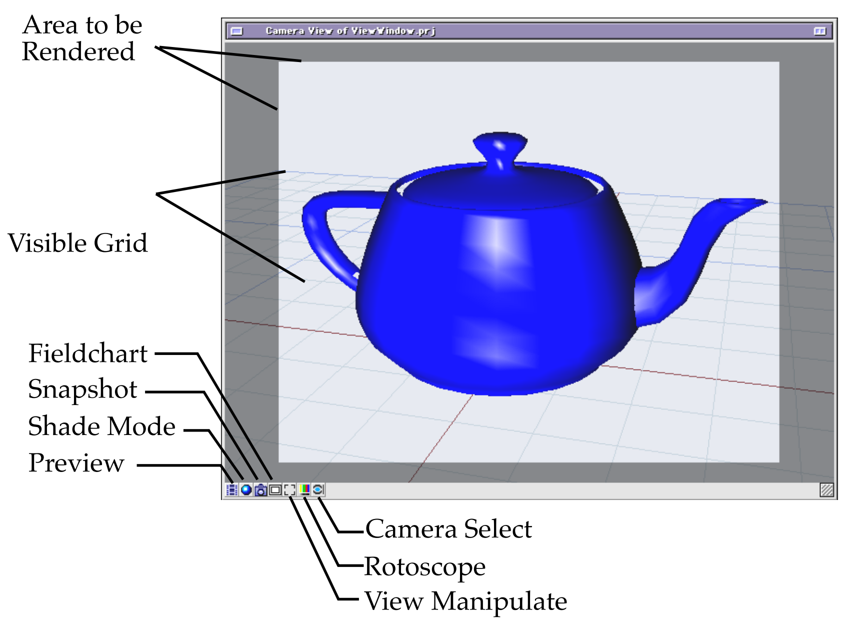


Figure 2.2 — **Camera View Window**

Snapshot

Click and hold on this button to bring up a menu with options for quick, snapshot, renderings. A snapshot is a single frame rendering to Camera. Upon completion of the rendering, the rendered image will be displayed.

The menu options are:

Window Size. Renders the Camera View window at the size of the window in Animator.

Full Size. Renders the Camera View window at the resolution set in the Render Control window.

Cropped Size. Renders the Camera View window at the resolution set by the cropping options in the Render Control window.

Selected Window Size. Prompts you to drag a marquee in the Camera View window. Camera renders the region you select at the size of the window.

Selected Full Size. Prompts you to drag a marquee in the Camera View window. Camera renders the region you select at the resolution set in the Render Control window.

Selected Cropped Size. Prompts you to drag a marquee in the Camera View window. Camera renders the region you select at the resolution set by the cropping options in the Render Control window.

Field chart

Clicking this button turns off and on the field chart display. Right-clicking the button (Ctrl-Key clicking on Macintosh) displays the field chart options pulldown menu.

Grid. This check box turns on the field grid which appears in the Camera View window.

Title Safe. This check box turns on a frame within which is considered to be the safe area to display titles (with no risk of cropping).

Action Safe. This check box turns on a frame within which is considered to be the safe are to display action (with no risk of cropping).

Cross Line. This check box turns on a pair of crossed lines in the center of the Camera View window.

Hatch Line. This check box turns on a pair of diagonal crossed lines in the center of the Camera View window.

Rotoscope

Brings up a pulldown menu that lets you select which foreground or background images are displayed in the Camera View window. Rotoscope images are added to the Camera itself using the Camera Info window. Once you choose to display an rotoscope in the Camera View window, a scroll bar appears which allows you to choose any frame for displays.

View Manipulate

Unlike the three orthogonal view windows which have only pan and zoom as controls, the Camera View window has a variety of view manipulation tools. Click on the View Manipulate button to bring up a menu of manipulation modes.

None. This is the default mode. You can pick and drag objects in this mode.

Orbit. In this mode, dragging the mouse in the Camera View window will orbit the camera around its reference vector.

Pan. In this mode, dragging the mouse in the Camera View window will move the Camera's reference vector leaving the camera body in place.

Dolly. In this mode, dragging the mouse in the Camera View window will move the camera body in and out along its reference vector.

Track. In this mode, dragging the mouse in the Camera View window pans the view plane, moving the Camera and its reference vector up/down, left/right.

Zoom. Dragging the mouse in the Camera View window will interactively alter the Field-Of-View setting in the Camera Info window.

Note *Don't confuse Zoom with Dolly. Zoom changes the camera's FOV. This is rarely done in computer graphics unless you are implementing a depth of field blur or other specialized effect.*

2.4 Selecting the Camera View Object

The Camera View window can be set to "look through" any camera or light in the scene. The selected camera will be the one that is rendered. If the Camera View is set to look through a light, you will not be able to render. A dialog box will pop-up telling you that rendering cannot take place.

To change the Camera View object, Click on the Camera Select icon at the bottom of the Camera View window. A pop-up menu will appear listing all valid objects you can look through.

Selecting a spotlight cone is a great way to aim the spotlight exactly where you want it. You can see exactly where the inner and outer cones of the light will strike the groups in your scene.

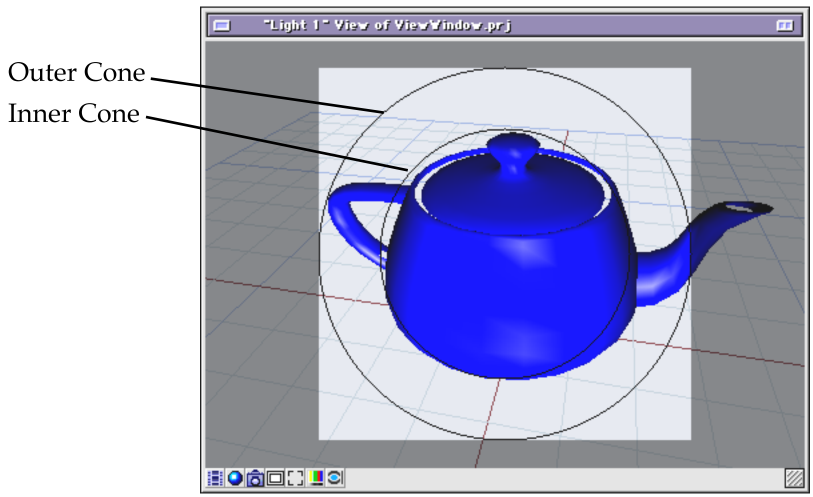


Figure 2.2 — **Looking Through a Spotlight**

Main Menu Bar

This section will give a brief overview of each of the menus in the main menu bar, and their options.

3.0 File Menu

The file menu is used to open, save and create new projects, merge project files together, view images and animation files, collect files together that are used by the current project (so that they can be transferred to another machine or animator), view project statisticsand quit the EIAS Animator application. The menu items are:

- New
- Open
- Merge
- Close Project
- View Image
- Save
- Save Project As
- Save Copy of Project As
- Collect Files
- Project Statistics
- Quit

New. Creates a new project.

(Cmd + N Mac, Ctrl + N PC)

Open. Opens an existing project.

(Cmd + O Mac, Ctrl + O PC)

Merge. Project... Merges another project into the current project.

Close Project. Closes the current project.

View Image. Displays image or animation in a separate window.

(Cmd + B Mac, Ctrl + B PC)

Save. Saves the current project under the same name.

(Cmd + S Mac, Ctrl + S PC)

Save Project As... Saves the current project under a different name and switches the working project to the one that was just saved.

(Cmd + Shift + S Mac, Ctrl + Shift +S PC)

Save Copy of Project As... Saves a copy of the current project under a different name. The current project is retained.

Collect Files... Collects all of the referenced files together in one location, and saves the project file to that location as well. Options include the ability to create separate folders for project elements. The project file is remapped so that it can be easily opened once a directory location is established.

Project Statistics. Brings forward a dialog box which provides all of the statistics for the project file.

Quit. Quits the EIAS Animator.

(Cmd + Q Mac, Ctrl + Q PC)

3.1 Edit Menu

The edit menu is used for undos, cutting, copying and pasting, clearing selections from the project, duplicating items, accessing EIAS Animator preferences and setting the display attributes of controllers, manipulators and so forth. The menu items are:

- Undo
- Cut
- Copy
- Paste
- Clear
- Duplicate
- Preferences
- Display
- Default Preferences

Undo. Undoes the previous action. Only one level of undo is supported. If Undo is not supported for that action, Undo will be greyed out.

(Cmd + Z Mac, Ctrl + Z PC)

Cut. Removes the selection and places it in the clipboard. It can then be pasted if desired into a target location.

(Cmd + X Mac, Ctrl + X PC)

Copy. Copies the selected item for pasting purposes.

(Cmd + C Mac, Ctrl + C PC)

Paste. Pastes the item in the clipboard to the selected destination.

(Cmd + V Mac, Ctrl + V PC)

Clear. Clears the selection from the project.

Duplicate. Duplicates the selected items. To have copies of objects or groups in the project window, this command is used.

(Cmd + D Mac, Ctrl + D PC)

Preferences... Brings forward the preferences dialog.

(Cmd + Y Mac, Ctrl + Y PC)

Display. Brings forward separate dialog boxes for each menu item. Controls the various display preferences for these items (Controllers, Lights, Cameras, Effectors, and IK Handles).

Default Preferences. Resets all preferences to their factory settings

3.2 Tool Menu

The tool menu contains control for the translate, rotate, and scale tool used to manipulate objects in the View windows.

- Translate
- Translate Local X Only
- Translate Local Y Only
- Translate Local Z Only
- Rotate
- Rotate Local X Only
- Rotate Local Y Only
- Rotate Local Z Only
- Scale
- Match Move

- Grid Snap

Translate. Puts tool in translate mode. Objects can be freely moved in the View windows.

Translate X/Y/Z Only. Puts tool in translate mode. Objects can be moved in the View windows only along the specified direction.

Translate. Puts tool in rotate mode. Objects can be freely rotated in the View windows using the arcball controller.

Translate X/Y/Z Only. Puts tool in rotate mode. Objects can be rotated in the View windows only along the specified axis.

Scale. Puts tool in scale mode. Objects can be freely scaled in the View windows.

Match Move. Causes a single frame to be matched. The Camera must be selected before this command is issued.

Grid Snap. Causes objects to be constrained to the grid when translated.

Note *The Caps Lock key is an overriding shortcut for this feature. Regardless of other settings in Animator, you will be in Grid Snap mode if your Caps Lock key is down.*

3.3 Object Menu

The object menu is used for any function that deals with objects as disk files (such as importing and exporting objects to and from the project), adding system objects (such as cameras, lights and nulls), adding 3D text, importing and recording sound files, locking and unlocking objects, hiding and showing objects, and accessing the object info window for the selected object or group. The menu items are:

- Import Object
- Export Object
- Export Parked FACT Object
- Add Camera
- Add Light
- Add Illuminator
- Add Null
- Add Smoke
- Add 3D Text
- Import Sound
- Record Sound
- Lock Selected
- Unlock Selected
- Hide Selected
- Show Selected
- Group Info

Import Object... Imports a model file into the scene. FACT format is default, but EIAS does import a variety of other formats.

(Cmd + Shift + I Mac, Ctrl + Shift + I PC)

Export Object. Exports an object to a desired format. FACT format is default, but EIAS does export a multitude of other formats.

Export Parked FACT Object. This export option will zero out rotation, position and scale data for a FACT file, and then saves it to disk.

Add Camera. Adds a camera into the scene.

(Cmd + Shift + C Mac, Ctrl + Shift + C PC)

Add Light. Adds a light to the scene.

(Cmd + Shift + L Mac, Ctrl + Shift + L PC)

Add Illuminator. Adds an illuminator to the scene.

Add Null. Adds a null object to the scene. Nulls are drawn as three stroked objects like the IK handle goals.

(Cmd + Shift + N Mac, Ctrl + Shift + N PC)

Add Smoke. Places a smoke object in the scene

Add 3D Text. Creates a 3D font from a PostScript or TrueType font file.

Import Sound... Imports a sound file into the project.

Record Sound... Records a sound into the project.

Lock Selected. Locks object from the selection. It also sets the object lock flag to on in the project window.

(Cmd + Shift + F Mac, Ctrl + Shift + F PC)

Unlock Selected. Makes object selectable, sets object lock flag to off in the project window.

Hide Selected. Makes object invisible. This also makes it unselectable in the world views.

(Cmd + Shift + G Mac, Ctrl + Shift + G PC)

Show Selected. Makes object visible in the world views, selection depends upon the lock flag.

Group Info. Brings the info window up for the group selected

(Cmd + I Mac, Ctrl + I PC)

3.4 Plugin Menu

This menu lists all the plugins that are installed for EIAS. Many 3rd Party developers have created Plugins and shaders to extend the capabilities of EIAS. Some plugins such as "Light Flare" are special interface plugins, which are accessible in other areas of the program. As a result, they are not listed in the plug-ins menu.

Note *All EIAS Animator plugins listed are cross-platform, and will operate consistently. You can use these plugins, and the aforementioned lens flare plugins (Lens Flare and Light Flare) when rendering across the network on various machine types (Macs and PCs). Be sure not to rename these plugins.*

The following menu items are contained in the plugin menu, though the contents of the menu will change depending upon the 3rd party plugins you may have installed:

- Dicer.plm
- Flag.plm
- Mesh.plm
- Mr. Blobby.plm
- Mr. Nitro.plm
- Power Particles Basic.plm

- Pixel Grains.plm
- UberShape.plm

Dicer. Adds the Dicer polygon decimator plugin to the project.

Flag. Adds the flag generator plugin to the project.

Mesh. Adds the mesh generator plugin to the project.

Mr. Blobby. Adds the Mr. Blobby metaballs plugin to the project.

Mr. Nitro. Adds the Mr. Nitro polygon-based explosion plugin to the project.

Power Particles Basic. Adds the Power Particles particle generator plugin to the project.

Pixel Grains. Adds the Pixel Grains plugin to the project.

UberShape. Adds the UberShape shape generator plugin to the project.

3.5 Material Menu

The material menu is used to add master materials and master lights to a project, to assign and remove master materials and master lights, and to access the material editor. The menu items are:

- Add Master Material
- Add Master Light
- Assign Master Material
- Remove from Master Material
- Assign Master Light
- Remove from Master Light
- Reload Material from File
- Material Editor

- Material Palette
- Shader Palette
- Shader Variance Editor

Add Master Material. Adds a Master Material to the project window list. Note this only adds the material to the project, it does not assign the material to any objects; use **Material>Assign Master Material** to do that.

Add Master Light. Adds a light to the scene. The light can be used as a standard light, or as a master light. This option will not assign subscriber lights; use **Material>Assign Master Light** to do that.

Assign Master Material. Assigns a master material to a selected object, group or series of objects or groups.

Remove from Master Material. Removes the selected object or group from the master material subscription list.

Assign Master Light. Assigns a master light to a selected light or series of lights.

Remove from Master Light. Removes the selected light or series of lights from the master light subscription list.

Reload Material from File. Reloads the original material settings from the object file on disk. If you want to restore the original settings after you have experimented and start over, use this menu option.

Material Editor. Activates the material editor for the selected group or master material.

(Cmd + E Mac, Ctrl + E PC)

Material Palette. Opens the Material palette. This palette displays all the materials stored in the EI Material folder.

(Cmd + Shift + E Mac, Ctrl + Shift + E PC)

Shader Palette. Opens the Shader palette. This palette displays all the shaders stored in the EI Shader folder.

(Cmd + [Mac, Ctrl + [PC)

Shader Variance Editor. Opens the Shader Variance editor. This editor allows you to create custom settings for your shaders.

(Cmd +] Mac, Ctrl +] PC)

3.6 Hierarchy Menu

The hierarchy menu is used to add and remove objects and groups from a hierarchy, freeze transformations to an object, and call up the joint and axis editor. The menu items are:

- Parent
- Remove Parent
- Park
- Show/Hide Children
- Joint Editor
- Axis Editor

Parent. This option prompts you to choose a parent for the object or group that you have selected.

(Cmd + P Mac, Ctrl + P PC)

Remove Parent. This option removes the selected object from the hierarchy, and place it at the root level. Note that if you select children as well as parents, all objects will be placed at the root level, regardless of their previous standing in the hierarchy. If you wish to keep a portion of the hierarchy intact, then select only the parent object at the level you wish to maintain, and then choose Remove Parent.

(Cmd + Shift + P Mac, Ctrl + Shift + P PC)

Park. This option will freeze all transformations applied to an object at the current values, and then reset those values to zero (the position, rotation and scale operations you applied previously will be maintained, but their values will bet set to zero). This is referred to as “baking” in other programs.

Show/Hide Children. This option hides or reveals the children of the selected parents as shown in the Project window. Handy way to reduce clutter in Project window. Parents with hidden children are shown with a small red arrow next to their names.

(Cmd + Shift + H Mac, Ctrl + Shift + H PC)

Joint Editor. Brings up the Joint Editor window for the selected object.

(Cmd + Shift + J Mac, Ctrl + Shift + J PC)

Axis Editor. Brings up the Modify Axis window for the selected object.

(Cmd + Shift + A Mac, Ctrl + Shift + A PC)

3.7 Character Menu

The Character menu is used to create skeleton hierarchies, bones deformations and to add IK handles to either bone or skeleton hierarchies. The menu items are:

- Create Bones
- Split Bone
- Add IK Handle
- Go To Rest Position
- Bind Skin to Skeleton
- Bind Skin to Selected Bones
- Detach Skin
- Skin Editor

Create Bones. This option will enable the creation of hierarchical bones in any 3D view window.

(Cmd + Shift + B Mac, Ctrl + Shift + B PC)

To terminate the operation, press the Cancel button in the floating alert dialog, or the keyboard shortcut.

Cmd "." (Mac), Esc (PC)

Split Bone. Divides the selected bone into two separate bones, maintaining the hierarchy.

Add IK Handle. This option will add an IK handle to a skeleton or bones chain. If you select the end effector of the chain only, an IK handle will be automatically applied from the root on down. If you select to joints, and then choose Add IK Handle, the IK handle will be applied only to those joints; the rest of the chain will be unaffected.

(Cmd + Shift + O Mac, Ctrl + Shift + O PC)

Go To Rest Position. Select an IK Handle in your project, then choose this menu item. The rotation of the bones being controlled by the IK Handle will be reset to their rest orientations.

Bind Skin to Skeleton. Binds the entire bone hierarchy of the selected bone to the skin. The operation will ask you to select the skins (geometry groups) to be bound. To terminate the operation, press the Cancel button in the floating alert dialog, or the keyboard shortcut.

Cmd "." (Mac) | Esc (PC)

Bind Skin to Selected Bones. binds the selected bones to the skin. The operation will ask you to select the skins (geometry groups) to be bound. To terminate the operation, press the Cancel button in the floating alert dialog, or the keyboard shortcut.

Detach Skin. Removes the relationship between the selected skin and the bones that control it.

Skin Editor. Opens the Skin Editor window.

(Cmd + Shift + V Mac, Ctrl + Shift + V PC)

3.8 Animation Menu

The Animation menu is used to control all of the animation options that any object can have. You use the menu to: enable animation channels; import and export animation channel envelopes; import and export motion capture files; add, delete and clear key frames; manage motion paths of objects; recalculate custom frames; fit frames and objects to curves; and access the offset editor, function curve editor, morph editor and deformation editor. The menu items are:

- Enable Animation
- Import Envelope
- Import Motion
- Export Envelope
- Export Motion
- Add Keyframe
- Delete Keyframe
- Clear All Key frames
- Make Path Explicit
- Make Path Implicit
- Set Path to (Linear, Natural Cubic, Hermite and F-Curve)
- Show Path
- Hide Path
- Recalculate Selected Frames
- Recalculate All Object Frames
- Fit Selected Frames to Curve
- Fit Selected Objects to Curve
- Offset Editor
- Time Marker Editor
- Function Curve Editor
- Morph Editor

- Deformation Editor

Enable Animation. Enables the animation channel for the selected object, group or series of objects or groups. The animation channel must be enabled in order to animate the group.

Import Envelope. Imports a motion envelope into the motion channel that is selected in the function curve editor.

Import Motion. Imports a motion capture file into the project. A skeleton will be automatically created, with the motion mapped to it from the motion capture file.

Export Envelope. Exports a disk file that contains the animation data for a specific channel selected in the function curve editor.

Export Motion. Exports a Biovision-format motion file, in either flat or hierarchical form. Also exports an ElectricImage format motion file, which can be imported into another EIAS Animator project.

You can also select a Camera and export its motion in the Maya ".ma" file format. This file can then be imported into Maya or Adobe After Effects.

Add Keyframe. Adds a keyframe to all channels of the selected object at the current scene time. This command will create key frames for all channels, which is not efficient or necessarily desirable. Automatic keyframe generation will likely be preferable to you.

(Cmd + K Mac, Ctrl + K PC)

Delete Keyframe. Deletes the current keyframe from the selected object. If more than one keyframe is present for the object at the current time, all will be deleted.

(Cmd + Shift + K Mac, Ctrl + Shift + K PC)

Clear All Key frames. Clears all key frames for the selected object. The current position and orientation will be set as the beginning state of the object.

Make Path Explicit. Sets the motion path of the selected object to explicit (applies only to translation channels). The motion path curve will not be editable in the interface beyond setting a new position for the keyframe. Three curves, for X, Y and Z, will be placed in the function curve editor on demand, for editing purposes. While this choice limits the path shape editing in the 3D views, it adds much more control within the function curve editor. Most professional animators prefer to animate in the function curve editor because of this.

Make Path Implicit. Sets the motion path of the selected object to implicit (applies only to translation channels.) The motion path will be fully editable in the 3D views, in any of four formats (linear, natural cubic, hermite and bezier). The motion channel data will not be editable as three separate curves in the function curve editor. Instead, only the velocity channel can be edited in the editor when the motion path is set to implicit.

Set Path to (Linear, Natural Cubic, Hermite and F-Curve). Sets the motion path type to any of the four choices listed. This applies only to motion paths that are implicit.

Show Path. Causes the animation paths of the selected objects to be shown in the View windows.

Hide Path. Causes the animation paths of the selected objects to be hidden in the View windows.

Recalculate Selected Frames. Recalculates frames that are selected in any of the spreadsheet-based project window views (keyframe, frame, index).

This feature is available only when the data in the frames deviates from the selected motion path curve type (custom frame data, indicated in underlined text.)

Recalculate All Object Frames. Recalculates frames for any selected object in the project. This feature is available only when the data in the frames deviates from the selected motion path curve type (custom frame data, indicated in underlined text.)

Fit Selected Frames to Curve. This feature will fit imported motion capture data frames that are selected in the project window to a curve (motion capture data is frame based, and custom frames are created when motion capture data is imported.) This feature effectively lets you convert the motion capture frame data to curve data.

Fit Selected Objects to Curve. This feature will fit imported motion capture data frames for a selected object to a curve (motion capture data is frame based, and custom frames are created when motion capture data is imported.) This feature effectively lets you convert the motion capture frame data to curve data

Offset Editor. The Offset Key frames editor is activated by this menu item. The Offset Key frames editor enables you to offset or scale the time values of selected key frames, or the values of selected key frames.

Time Marker Editor. The Time Marker editor lets you copy ranges of keyframes that lie between selected Time Markers.

(Cmd + Shift + T Mac, Ctrl + Shift + T PC)

Function Curve Editor. The Function Curve Editor is activated by this menu item. The function curve editor allows you to edit animation channel data in curve form, relative to other curves displayed in the graph. Professional animators prefer to animate with this tool over others, as this tool offers the most control of the animation data overall.

(Cmd + ‘ Mac, Ctrl + ‘ PC

Morph Editor. The morph editor is activated by this menu item. The morph editor allows you to create animation by blending together different model files of similar complexity. This technique is used most often for facial animation, although it can be used for any animation where the shapes of one object can be effectively blended with another (they have the same polygon and vertex count.)

(Cmd + Shift + W Mac, Ctrl + Shift + W PC

Deformation Editor. The deformation editor is activated for the selected object by this menu item. Deformations are used to physically warp and distort object geometry, and operate on the group level.

(Cmd + Shift + X Mac, Ctrl + Shift + X PC

3.9 Constraint Menu

The constraint menu is used to set up dependency relationships between objects. In all cases, first an object to be constrained (“constraint object) is selected, then the menu item is chosen, then the target(s) are chosen. The operation is terminated by pressing the Cancel button in the floating alert dialog, or the keyboard shortcut.

Cmd “.” (Mac) | Esc (PC)

The menu items are:

- Auto Look
- Auto Bank
- Aim
- Position
- Rotate
- Scale
- Normal
- Geometry
- Pole Vector
- Constraint Editor

Auto Look. causes the constraint object to point toward the target(s) and can blend in rotation/reference data from the constraint object itself.

Auto Bank. Allows an object's orientation to be animated while the object is moving along a curved path.

Aim. Aim is a multi-purpose aiming constraint that allows you to specify which direction to aim at and to set an up-direction to keep the object upright.

Position. Moves the constraint object to the target point.

Rotate. Rotates the constraint object in global space as the result of the weighted average of the global rotations of its target(s).

Scale. Scales the constraint object based on the weighted average of the scales of the targets.

Normal. Keeps the constraint object oriented normal (perpendicular) to the target.

Geometry. Keeps the constraint object at the position of the target point and normal (perpendicular) to the target point.

Pole Vector. Rotates the Pole Vector toward the target point.

Constraint Editor. Brings up the Constraint Editor window for the selected Constraint Object.

3.10 Render Menu

The render menu is used to control render settings, edit any cropping that has been applied, and to send off rendering jobs. The menu items are:

- Render Settings
- Radiosity Settings
- ShockWave Settings
- Render Flags Off
- Render Flags On
- Edit Cropping
- Render Project
- Render Window
- Render Frame
- Render Window Selection
- Render Frame Selection
- Preview Settings
- Preview Window...
- Preview Blur Settings
- Preview Blur Window...

Render Settings. This option activates the render information window.

(Cmd + R Mac, Ctrl + R PC

Radiosity Settings. This option opens the Radiosity Settings dialog.

(Cmd + Shift + R Mac, Ctrl + Shift + R PC

ShockWave Settings. This option opens the ShockWave Settings dialog.

Render Flags Off. This option sets all of the render flags in the Render tab of the render information window to off. Use this item if you intend to activate just a few flags, instead of turning off the undesired flags manually.

Render Flags On. This option sets all of the render flags in the Render tab of the render information window to on. Use this item to quickly activate all of the render flags.

Edit Cropping. This option will allow you to interactively edit the cropping rectangle in the camera view window. You must first activate cropped rendering by enabling the Enable Cropped check box in the Resolution tab of the render information window.

Render Project. This option will render the project, using the current settings in the render information window. An image or animation save dialog will appear, prompting you to name the file. A save project dialog will follow. EIAS Animator will then launch the rendering job, and shut down to allow more system resources to be allocated to the rendering.

Render Window. This option will render a “snapshot” image the size of the camera view window. Only the current frame will be rendered, regardless of the settings in the render control window. After rendering, the image will be automatically displayed in an image view window.

Render Frame. This option will render a full sized image of the scene. Only the current frame will be rendered, regardless of the settings in the render control window. After rendering, the image will be automatically displayed in an image view window.

Render Window Selection. This option will render the contents of a marquee selection that you are prompted to make, in "snapshot" resolution. Only the current frame will be rendered, regardless of the settings in the render control window. After rendering, the image will be automatically displayed in an image view window.

Render Frame Selection. This option will render the contents of a marquee selection that you are prompted to make, in full frame resolution. Only the current frame will be rendered, regardless of the settings in the render control window. After rendering, the image will be automatically displayed in an image view window.

Preview Settings... This opens a dialog box that controls the behavior of the View window animation preview options.

Preview Window. Causes animation previewing to begin in the front most View window.

Preview Blur Settings... This opens the dialog box that controls the blur preview options.

Preview Blur Window. Causes a blur preview to be calculated in the front most View window.

3.11 Select Menu

The select menu is used to make selections in a scene, set filters which allow you to select certain types of objects only, and select objects by attribute, type, model file, hierarchy, label or selection set. The menu items are:

- Groups Only
- Cameras Only

- Lights Only
- IK Handles Only
- All
- None
- Inverse
- Find
- Find Again
- Find All
- By Attribute
- By Type
- By Model
- By Hierarchy
- By Label
- By Set

Groups Only. This option sets the selection filter to allow the selection of groups only. No other items can be selected. If you have difficulty selection other objects, make sure you check the selection filter settings.

Cameras Only. This option sets the selection filter to allow the selection of camera scene objects only. No other items can be selected. If you have difficulty selection other objects, make sure you check the selection filter settings.

Lights Only. This option sets the selection filter to allow the selection of light scene objects only. No other items can be selected. If you have difficulty selection other objects, make sure you check the selection filter settings.

IK Handles Only. This option sets the selection filter to allow the selection of IK Handles only. No other items can be selected. If you have difficulty selection other objects, make sure you check the selection filter settings.

All. This option will select all objects in the scene that are not filtered from selection.

None. This option will deselect any selected objects.

Inverse. This option will invert the selection, releasing the selected objects and selecting those that were previously unselected.

Find. This option will search the project for any object by name, and fitting the criteria that you specify.

Find Again. This option will continue to find the next object that meets the criteria specified by the find command.

Find All. This option will find all objects in the project that meet the criteria that you specify.

By Attribute. This option will select all objects that are not filtered, and that fulfill the selected attribute: Visible, locked or hidden.

By Type. This option will select all objects that are not filtered, and that are of the type you specify: Camera, light, group, effector, sound, world, material model file, IK handle, smoke object.

By Model. This option will select all groups contained within the specified model file, regardless of the filter settings.

By Hierarchy. This option is used to select a hierarchy, or portions of a hierarchy, based upon the following criteria that you specify: root of selected, parent of selected, children of selected.

By Label. This option is used to select any object with a specific label attached to it. Labels are assigned to objects in the project window. You can also use **Select>By Label>Edit...** to change the label names.

By Set. This option is used to select any previously created selection set. Whatever is contained within the selection set will be selectable by this item. You can also use **Select>By Set> Edit...** to create new selection sets, and manage existing selection sets.

3.12 Window Menu

The window menu is used to open the tool palette, time palette and location palette; manage the 3D view windows; access the project window; close and reset windows; show and hide rulers, scene grid and motion paths. The menu items are:

- Tool Palette
- Location Palette
- Time Palette
- Top View
- Side View
- Front View
- Camera View
- Project Window
- Close Window
- Reset Windows
- Show/Hide Rulers
- Show/Hide Grid
- Show/Hide Path

Tool Palette. This option activates the tool palette. The tool palette contains tools for: translating, rotating and scaling objects; panning the 3D views; showing and hiding the grid; activating and deactivating the snapping grid; editing the cropping rectangle; activating deformations, morph editor, joint editor or axis editor for the selected object; showing or hiding the motion path for the selected object; parenting and unparenting the selected object; assigning constraints, master materials and master lights; and parking the selected object (freezing its transforms.) The tool palette is a floating palette, and can be oriented horizontally or vertically.

(Cmd + T Mac, Ctrl + T PC)

Location Palette. This option activates the location palette. The location palette displays the location of the mouse position in world space, specific to each of the Orthogonal View windows.

(Cmd + Shift + Y Mac, Ctrl + Shift + Y PC)

Time Palette. This option activates the time palette. The time palette is a simple timeline, which you can use to set the new scene time. Key frames are not displayed in the time palette.

(Cmd + - Mac, Ctrl + - PC)

Top View. This option toggles the display of the top view window.

(Cmd + 1 Mac, Ctrl + 1 PC)

Side View. This option toggles the display of the side view window.

(Cmd + 2 Mac, Ctrl + 2 PC)

Front View. This option toggles the display of the front view window.

(Cmd + 3 Mac, Ctrl + 3 PC)

Camera View. This option toggles the display of the camera view window.

(Cmd + 4 Mac, Ctrl + 4 PC)

Project Window. This option toggles the display of the project window.

(Cmd + L Mac, Ctrl + L PC)

Close Window. This option will close the currently selected window.

(Cmd + W Mac, Ctrl + WPC)

Reset Windows. This option will reset all windows, placing them in their factory determined locations and sizes.

Show/Hide Rulers. This option will toggle the display of the ruler bars.

(Cmd + M Mac, Ctrl + M PC)

Show/Hide Grid. This option will toggle the display of the scene grid.

(Cmd + Shift + M Mac, Ctrl + Shift + M PC)

Show/Hide Path. This option will toggle the display of all object motion paths.

Assigning and Using Cameras

4.0 Introduction

There are two basic points of view in EIAS Animator, world views and camera views. The world views present the project environment from a "creator's" perspective. You see everything in the project through these views. They assist you in the creative process, allowing you a variety of perspectives in which to view and work within your project. Camera views are used to actually record the results of your animation. It is the camera through which your audience sees your work.

4.1 Camera Anatomy

Cameras in EIAS Animator follow the "source/target" metaphor. Cameras do not have a "yaw, pitch and roll" but instead use the target control as a pointing mechanism.

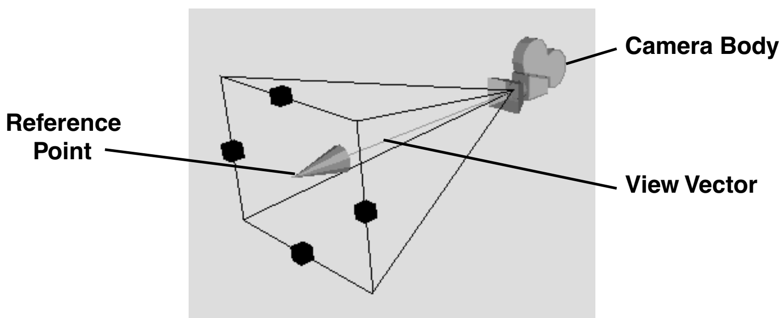


Figure 4.1 — **Camera control with field of view (FOV) active**

Figure 4.1 shows an illustration of the camera control. It has three separate components that you can manipulate:

- Camera Body (source)
- View Vector
- Reference Point (target)

Camera Body. Camera controls are actually drawn as a real motion picture camera. Looking at the control as illustrated below, note the film magazine on top of the camera, and the matte box to the front where the lens is. The actual focal (nodal) point of the camera exists where the view vector intersects with the camera body. All of the position data for the camera body references this location.

View Vector. The view vector is the line drawn between the camera and the reference point. You can drag the entire camera control by this vector, leaving the orientation of the camera intact (a great time saver!) The distance between the camera body and the reference point, as represented by the view vector, is pertinent only when depth of field rendering settings are used.

Reference Point. Also called the target in other programs, the reference point is the actual point of interest for the camera body. You can easily see and control the direction in which the camera is pointing by dragging the reference point to the desired position.

Adding Cameras to Scenes

You can have as many cameras as you want in EIAS Animator. Each of the cameras can have independent settings, although the resolution and image filtering settings are global for all cameras, as covered in the Render Information Window chapter.

There are two ways to add cameras into your projects:

- Choose **Object>Add Camera**
- Duplicate an existing camera by selecting it and choosing **Edit>Duplicate** from the menu bar

Translating Cameras

Moving cameras in EIAS Animator is very easy. Cameras can be moved either by the camera body, view vector or by the reference point. There are actually two ways to move the camera body:

- Move
- Rotate

Both of these methods use manipulators.

To move the camera body:

1. Choose **Tool>Translate** from the menu bar
2. Select the desired camera

The translate manipulator will appear.

3. Drag the camera to the desired location

The camera reference point will stay fixed on its target as you drag the camera. If you wish to move the camera along a particular axis, click on the desired axis of the translate manipulator and drag. The target will move with the camera when the camera is moved along a specific axis.

To move the reference point of the camera:

1. Select the camera
2. Click on the reference point and drag

You can move the reference point at any time, regardless of manipulator selected for the camera. The reference point cannot be rotated, it can only be translated, therefore, only that motion is passed along to the reference point.

Both the camera body and the reference point have their own motion paths, and can be animated independently. This might cause you to “over-animate” the camera, resulting in “digital whiplash.” The best way to animate the camera is either to animate only one of the controls, camera body or reference point (not always practical) or insure that the motion paths for each point roughly match, both in keyframe times, velocity, and path shape. You can use the function curve editor to further adjust these factors *(see the Project Window/Function Curve chapter for more information.)* Of course, there are far more controls for cameras than just the control icon. Like all objects in EIAS Animator, cameras have their own “info windows.”

Summary of Camera dragging options:

- Dragging on the body changes the position of the camera, but not where it is looking.
- Dragging the reference point changes where the camera is looking but not its position.
- Dragging the view vector keeps the orientation of the camera the same, but changes the camera’s position and where it is looking.
- Dragging on the body while holding down the Control key moves the camera long its reference vector.

- Dragging on the constraint widget moves the body along the constraint axis.
- Dragging on the constraint widget while holding down the control key moves the body and reference along the constraint axis.

Looking through the Camera

The camera view window shows the view from a camera that you select. You can also look through shadow casting lights in this view.

To look through a camera:

1. Depress the control key
2. Click in the title bar of the camera view window

A pop-up menu will appear, listing any available cameras and lights that can be used to view the scene.

3. Choose the desired camera to view through

The camera view will now be switched to the camera that you selected. If that camera has any images attached to it, such as rotoscope or camera map images, they can now appear in the window.

4.2 Camera Information Window Overview

The camera info window contains all of the settings required to manipulate a camera in EIAS Animator, as well as view its current attributes. Each camera in a project maintains a separate set of parameters, found in its camera info window. There are two ways to access the Camera Info Window:

- Select the Camera and choose **Object>Camera Info** (command or control “i”)

- Double Click on the Camera Icon in either the world views or project window

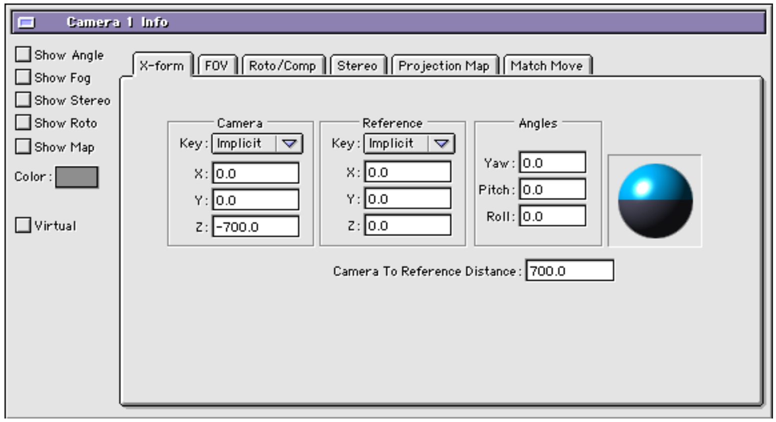


Figure 4.2 — **Camera Info Window**

General Camera Settings

In EIAS Animator the camera window is divided into 5 folder tabs. On the left side are check boxes used for enabling additional camera options in the view windows. The X-form tab displays the position of the camera and it's reference point, as well as its current angle. The FOV tab is used for setting the focal length and field of view of the camera, as well as its shutter, and depth of field settings. The Roto/Comp tab is used for adding rotoscoping and compositing layers. The stereo tab allows for the rendering of stereo-scopic images. Finally, the Projection Map tab is where camera maps are applied, allowing for the projection of custom images onto geometry from a camera's perspective.

Camera Display Options

On the left side of the camera window info are additional display options for the camera will be seen in the world view windows. These options are:

- Show Angle
- Show Fog
- Show Stereo
- Show Roto
- Show Map
- Color

Show Angle. This check box toggles the display of the camera's field of view (FOV) angle in the world views. When enabled, it will project a pyramid outward from the center of the camera to the reference point, as illustrated in Figure 4.1. The area inside these lines represents the field of view of the camera. This is what will be "seen" by the camera and rendered. The size of this area is changed by altering either the Focal Length in the FOV window, or by changing the aspect ratio in the Render window. Refer to the Focal Length section that follows for more information on changing the camera's field of view.

This display mode is very helpful for determining exactly which objects are within the field of view as you move the camera through the world view windows.

Show Fog. This check box displays a projection of the fog radius used by the camera. The fog region is an attribute the World object, which is listed in the project window. If the fog region has not been activated, this check box will have no effect. The fog region is a spherical volume which emanates from the center of any camera in the scene.

Show Stereo. When the Stereo rendering option is enabled, this check box provides a graphic display of the stereo separation parameters. Stereoscopic rendering creates two images for each frame in an animation, one for the left eye, and one for the right.

Show Roto. This check box will cause any loaded background or foreground images to be drawn in the camera view window. These images are added to a camera via the Roto/Comp tab.

Show Map. This check-box will cause any foreground image to be displayed in the camera view window.

Color. This sets the color of the camera icon as shown in the View windows.

Virtual

Turning this check box on disables the undo buffer for the camera. This feature can come in handy when you are trying to adjust the position of objects or bones in the scene while preserving the ability to undo the last operation. For example, if you are trying to get the exact position of a characters arm, you can set the camera to Virtual and then orbit in the Camera View window after making the change to the arm. After moving the camera all around, you can still undo the last change you made to the arm.

4.3 Camera X-Form Tab

This tab is broken down into four sections:

- Camera Section
- Reference Section
- Roll, Pitch and Yaw Angles Section
- Roll Control

Camera Section. The camera section contains the Key popup menu (for controlling motion interpolation) and three position edit boxes. These edit boxes list the current position of the camera, in X, Y, and Z coordinates, which can be changed by you at any time.

Reference Section. The reference section contains the Key popup menu (for controlling reference point interpolation) and three position edit boxes. These edit boxes list the current position of the reference point, in X, Y, and Z coordinates. You can also expressly set the camera to reference distance in the edit box.

Roll, Pitch, and Yaw Angles Section. The camera can also be controlled through more traditional roll, pitch and yaw edit boxes, and are expressed in degrees. The order of the boxes is actually presented as Yaw (X), Pitch (Y) and Roll (Z), and equates directly to X, Y, and Z.

Roll Control. The roll control is interactive, and can be dragged to create roll angles. Its presentation is reminiscent of the roll indicator found in aircraft avionics.

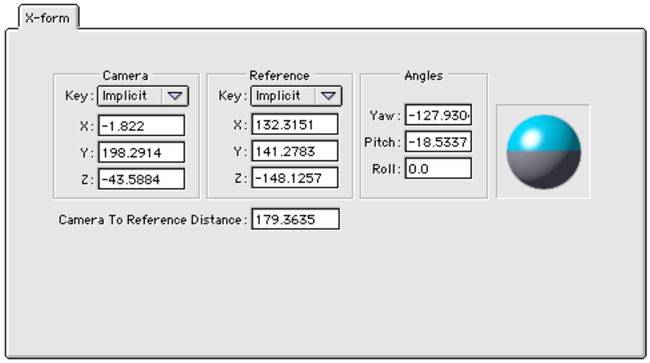


Figure 4.3 — **Camera X-Form Tab**

All of the numeric values presented in the edit boxes are dependent upon the editing mode set in the project window, and if the animate flag has been set for the camera object or a particular channel for the camera object.

In **Index** mode, changing the values updates the value for the current keyframe you are editing. Index mode only allows for the editing of previously generated key frames, rather than for creating new ones, so it is only possible to alter an existing keyframe while in index mode.

In **Frame** mode, changing the values in the x-form window creates a custom frame with those new values. Custom frames have an underline mark below their values in the project window. Custom frames are not affected by the interpolation and velocity of the frames around them. They are fixed values which will be implemented without regard to any other key frames. If you can picture a smooth curve, custom frames are like spikes jutting out from the curve. They have no regard for the curve itself, or its shape (velocity). They simply pop to their value, and then return back to the curve when done.

In **Keyframe** and **Time** modes, changing the values in the x-form window either creates a new keyframe (if none exists at the current frame), or updates the values of an existing keyframe.

EIAS Animator can display keyframe values in either **Implicit**, or **Explicit** values. Implicit is the way that EIAS Animator has always displayed vectorized quantities. When the camera is set to implicit, dragging the camera in a window controls two of its positional measurements. The velocity is computed as a composite of these two vectors. For instance, by dragging a camera in the top view window, the X & Z coordinates will change, in the Front View the Y&X, and the Side View the Y&Z coordinates. Implicit controls always function on all axes simultaneously.

When a camera or object is set to explicit positioning, it is possible to control the values and velocity for all 3 components of motion (X,Y,Z) independently in the function curve editor.

4.4 FOV Tab

This tab controls the camera focal length, shutter angle, and depth of field options. It is divided into three sections:

- Focal Length Section
- Shutter Section
- Depth of Field
- View
- Resolution

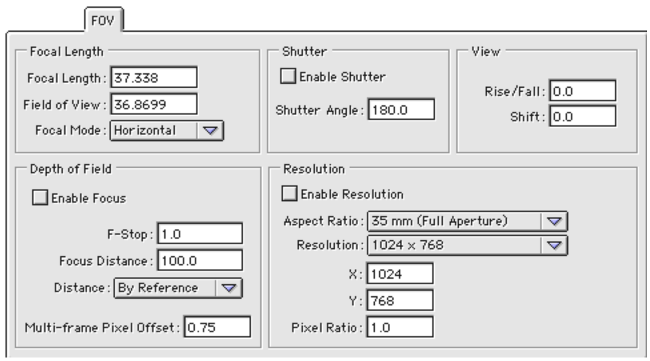


Figure 4.4 — **Camera FOV Tab**

Focal Length Section

In photography, an image is exposed onto film or captured on video. Light is collected through the camera's lens, and projected onto the focal plane. In film cameras, the focal plane is actually inscribed on the camera body, typically denoted by a circle with a slash running down the middle. The distance between the first lens element in the lens body to the focal plane is referred to as *focal length.*

EIAS Animator provides many controls to manage the lens characteristics of a camera. These controls are affected by the aspect ratio settings in the Render Information Window. The focal length section consists of the following three items:

- Focal Length Edit Box
- Field of View Edit Box
- Focal Mode Popup Menu

Focal Length Edit box. This edit box allows you to explicitly define the camera lens focal length. The number will change depending upon the aspect ratio setting in the Render Info Window. The default for that setting is "computer," so the number that you are most likely to see is a floating point number, such as "1.0." Changing the aspect ratio setting will result in a conversion of the number in the edit box to a new number. With the exception of the custom and computer aspect ratio settings, the number in this box will be expressed in millimeters. This allows you to match real world lens types to real world photography formats.

Note that if you do change the aspect ratio, the focal length will be adjusted to the new number, but the image in the viewing rectangle will appear relatively unchanged. Only the cropping areas will be affected, the image distortion will not.

The smaller the focal length, the wider the field of view. The larger the focal length, the narrower the field of view. Lenses with small focal lengths (6mm to 12mm) are called wide angle lenses, lenses with large focal lengths (75mm to 135mm) are called narrow or telephoto lenses, and those in between (16mm to 50mm) are considered normal lenses. Focal length is directly proportional to the size any object will appear in the frame. If the distance to the object remains constant, and the focal length is doubled, the object will appear twice as large in the frame.

Field of View Edit Box. Field of View (FOV) determines how much of the scene when viewed through the camera lens is visible to the lens. This value is expressed in degrees. The FOV is directly related to the focal length of the lens, the focal mode popup menu (discussed following) and the selected aspect ratio.

Many single lens reflex cameras (SLRs) include a 50mm lens. This lens most closely mimics the human eye for this 8 perf 35mm format (8 perf is also called "Vista - Vision" format when applied to motion picture cameras.) The field of view for this lens is approximately 40° in the real world (depending upon differing specifications by camera and lens manufacturers.) It should be noted that EIAS Animator presents these values in true mathematical space, while real world cameras and lenses are incapable of meeting these tolerances, and will often vary by one or two degrees.

Perspective distortion is also driven by both the focal length and Field of View. The smaller the FOV, the more distortion will appear, creating a wide angle effect. The larger the FOV, the less distortion will appear creating a telephoto effect. You can use extremely large focal lengths if you wish to negate the effects of perspective altogether. For example, you may wish to render a view with no perspective in order to create the basis for a texture map the closely conforms to the shape of the group.

Focal Mode Popup Menu

This menu determines how the focal length and field of view calculations are performed. There are three choices:

- Horizontal
- Vertical
- Diagonal

Horizontal Focal Mode. This mode uses the sides of the frame to calculate the focal length and field of view. This is the default mode, and is the typical method for making such calculations in most motion picture camera systems.

Vertical Focal Mode. This mode uses the top and bottom of the frame as a basis to calculate focal length and field of view. Some computer imaging systems use this mode, but it is unlikely that you would need to.

Diagonal Focal Mode. This mode uses the frame diagonal as a basis to calculate the focal length and field of view. Many SLR cameras use this method.

Shutter Angle Section. All real world cameras have a shutter system. Film cameras have a physical shutter, and video cameras have electronic shutters. A shutter is used to create discreet frames, otherwise all we would see would be smearings of color. Discreet frames are necessary for our perception of imagery in motion, made possible by a phenomenon called "persistence of vision." It is this phenomenon that enables us to see the discreet frames on film (or video fields) as a continuous motion.

Shutters actually keep parts of the film from exposing, rendering them black. A shutter is typically very fast, covering the focal plane for about half of the total exposure time. For example, in a 24 frames per second shot, the shutter will be closed for about 1/48 of a second, and open for the same amount. During the time that the shutter is closed, the world is still moving. When the next frame is exposed, the subject matter will not necessarily be in the same place, and thus, its motion is imparted to the film.

This section contains two controls:

- Enable Shutter Check Box
- Shutter Angle Edit Box

Enable Shutter Check Box. Use this check box to override the global shutter settings in the Render Info Window. If this box is enabled, the value in the Shutter Angle Edit Box for this camera will be used instead of the global value.

Shutter Angle Edit Box. Use this edit box to set the angle of the open shutter in degrees. In the real world, the shutter angle would max out at far less than 360˚, otherwise the images recorded would not make any sense to us. However, EIAS Animator provides a "virtual shutter" that can be far greater than 360˚. You can still view an image, because EIAS Animator does not actually use a shutter to render the discreet frames, it does so automatically (one of the benefits of a synthetic camera!) As such, the shutter angle can be used for some really cool effects, such as ultra high speed motion (like a space warp drive.)

Instead, shutter angle is a major component of the motion blur effect. The size of the shutter angle will dictate the amount of perceived motion blur along the following rules:

- Larger shutter angles produce longer blur streaks
- Shorter shutter angles produce shorter blur streaks

Note that shutter angle has no apparent effect on the Depth of Field function. It is included in this section as an animateable control for motion blur only.

Depth of Field Section

3D programs like EIAS Animator are all designed to mimic real world cameras, up to a certain point. The focal length section is used to approximate what a real world camera would see if the scene existed in our world. The basic physics are the same, with some added bonuses (such as, everything is always in focus.) Sometimes, however, that's not what you want. EIAS Animator is capable of performing depth of field rendering. Depth of field mimics a real camera, whereby images are blurred according to the focal settings of the camera. Depth of field is defined as the distance from the nearest object in sharp focus to the farthest object in sharp focus.

Depth of field rendering is a multi-frame technique that requires the multi-frame button to be set in the Motion Blur tab of the Render window. For best results the number of Blur Frames should be set to 5 or higher. ***Do not use raytracing with depth of field, the render times will be prohibitive****.*

The Depth of Field section contains five items used to control the options for this feature:

- Enable Focus Check Box
- F-Stop Edit box
- Focus Distance Edit box
- Distance Popup Menu
- Multi-frame Pixel Offset

Enable Focus Check Box. This check box enables the depth of field feature. It must be selected in order for the effect to be created.

F-Stop Edit Box. Use this edit box to set the f-stop for the camera lens. In real world terms, the light gathering power of a lens is called the speed of the lens. The more light that is available to a lens, the larger the area it is able to keep in focus (the depth of field). This is expressed as an f-number, or f-stop. This number is the ratio between the focal length of the lens and its diameter (the aperture):

$$\textit{f-stop} = \frac{\textit{focal length}}{\textit{lens diameter}}$$

As the lens diameter increases, so does the amount of light that passes through. As the focal length increases, the light is dispersed over a greater area and the amount of light available decreases. This is often expressed as a faster lens allowing more light through, and a slower lens allowing less light. Lenses of about f/2 and lower are considered fast.

Additionally, inside the lens is an iris diaphragm which can open or close to change the amount of available light. Thus, the actual term, f-stop, is determined by a series of “stops” along the lens aperture:

$$\textit{f-stop} = \frac{\textit{focal length}}{\textit{diameter of lens aperture}}$$

The standard series of stops is: 1, 1.4, 2, 2.8, 4, 5.6, 8, 11, 16, 22, 32. Each stop represents the halving (or doubling) of the amount of light that the lens passes. At low f-numbers, the diaphragm is open wider and more light enters the lens.

As in actual photography, smaller f-stops result in a shorter depth of field. Objects outside of the focus distance will appear soft and out of focus. Larger f-stops will result in a longer depth of field. Objects outside of the focus distance will be in sharper focus. Unlike real world cameras, the actual amount of light required to illuminate the scene will not change. Only the depth of field will be affected, not exposure.

Focus Distance Edit Box. This edit box determines the distance from the camera in which the object will be in sharp focus. Objects not in the area of the focus distance will appear out of focus, depending upon the f-stop setting. The focus distance can also be set to use the reference point of the camera. This is controlled by the distance popup menu, covered below. If the reference point method is used, the value in the Focus Distance Edit Box is ignored.

Distance Popup Menu. The two options in this popup menu selects the method for calculating the depth of field:

- By Channel
- By Reference

By Channel. When setting the focus distance by channel, the focal target is determined by the value entered in the Focus Distance edit box. This value emanates from the center of the camera, and is expressed in world units. For instance, a number of 50 would focus the lens on an object 50 units from the focal plane of the camera.

By Reference. When setting the focus distance by reference, the focal target is the end point of the reference vector. This provides an easy way to determine exactly what the focal object is. Just drag the reference vector out or in until it is sitting over your target object. This is the default method.

Multi-frame Pixel Offset. This value represents what is known as the circle of confusion. The point at which the focus distance is set, is said to be the area of critical focus. Everything on this plane is in focus. Objects that are nearer and farther from this point are said to be in the circle of confusion. Depending on the f-stop and focal length, many of these objects will also be in variable states of focus even though they aren't located at the exact focus distance.

For example, when the focus distance is set at 15 units, we might find that the depth of field where objects remain in focus ranges from 12 units to 20 units. Thus, the total depth of field here would be 8 units. Since "being in focus" is a subjective judgment, in order to determine what is defined as in focus, a permissible circle of confusion must be set; the circle of least confusion. In EIAS Animator, this value is the multi-frame pixel offset, and it uses this number to determine the acceptable range of sharpness when performing depth of field calculations.

The following rules apply:

- Smaller offset values produce sharper images
- Larger offset values produce blurrier images

Effectively, the offset is an additional control to determine how blurry the objects in the scene will appear.

View Section

In order to facilitate architectural rendering and add the ability to correct perspective distortions, view camera controls have been included.

These controls work by moving the lens of the camera parallel to the film plane. The result is that you can view objects which fall outside of the normal lens coverage. Think of this as scrolling the view.

The most common reason for using the View Camera controls is to correct perspective. With a standard camera, in order to capture a tall building in one image, you have to use a wide angle lens and tilt the camera upward. this results in “keystoning”. The bottom of the building will appear to be a lot wider that the top of the building due to perspective distortion.

There are two way to prevent this type of distortion:

Move. Move the camera away from the building until you do not need to tilt the camera upwards. This will produce the desired result but only the upper half of the frame will contain the building. The horizon line (base of the building) will cut right through the center of the frame.

Shift. Leave the camera level but shift the lens upwards. This will produce the desired result and use the entire frame. You are effectively scrolling the horizon line downward to the bottom of the frame.

There are two controls in the FOV tab of the Camera Info window, “Rise/Fall” and “Shift”. Rise/Fall moves scrolls the lens up and down. Shift scrolls it left and right.

A value of 0 means no Rise/Fall or Shift. A value of 0.5 in the Rise/Fall control scrolls the horizon to the bottom of the frame. A value of -0.5 scrolls the horizon to the top of the frame. Shift works similarly in that it scrolls the center of the frame to the right if the value is set to 0.5 and scrolls it to the left if the value is set to -0.5.

These controls are not bound by the range -0.5 to 0.5. They may also be animated.

Perspective

The normal camera parameters in EIAS yield a 3-point perspective. There is foreshortening on all 3 axis.

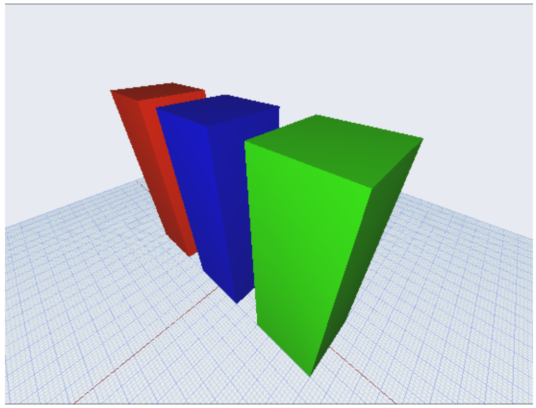


Figure 4.5 — **3-Point Perspective**

2-point perspective has foreshortening on only two axis.

For 2-point perspective, make sure that the camera is parallel to one side of the object(s) by moving and rotating the camera. Using the Rise/Fall OR Shift you can then fix the view to show you foreshortening on two axis only.

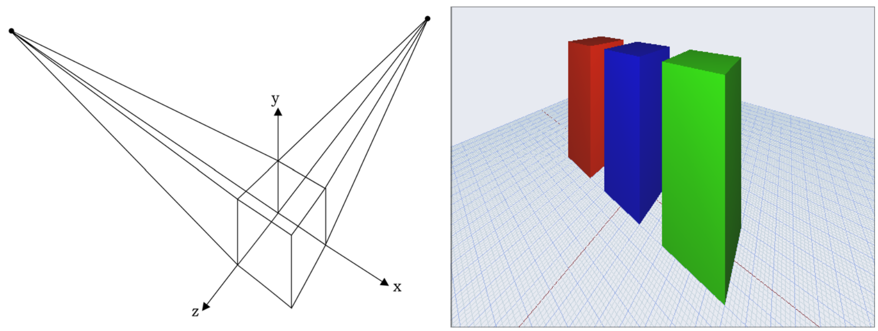


Figure 4.6 — **2-Point Perspective**

For a 1-point perspective, make sure that the camera is perpendicular to one side of the object(s). Using the Rise/Fall AND Shift you can then fix the view to show you foreshortening on one axis only.

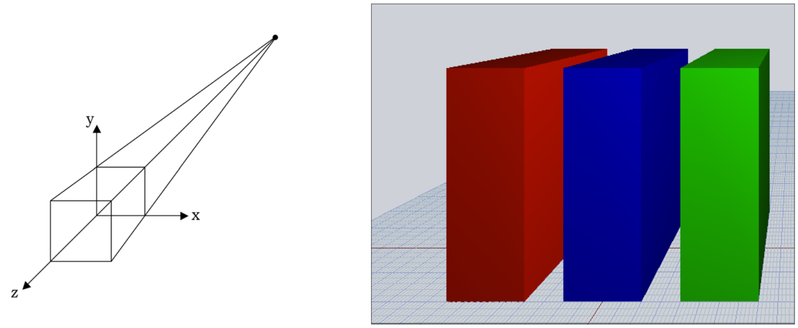


Figure 4.7 — **1-Point Perspective**

Note *Holding down the v-key on your keyboard and dragging in the Camera View window will interactively scroll the view by altering the Rise/Fall and Shift values.*

Resolution Section

The FOV tab of the Camera Info window has its own copy of the resolution information found in the Resolution tab of the Render Control window. When the **Enable Resolution** check box is turned on, the resolution settings in the Camera Info window override the settings in the Render Control window.

The purpose in having the information in both places is to allow a camera that projects a map to have a different aspect ratio from the camera that is rendering the scene. This is valuable when using multiple camera maps of different aspect ratios to build up a complex 2-1/2 D environment.

Typically, the camera rendering the scene will use the settings in the Render Control window (the Enable Resolution check box will be off for this camera). The cameras projecting textures will have the check box turned on with their aspect ratios being set in their respective Camera Info windows.

4.5 Roto/Comp Tab

Rotoscoping ("roto") is a term used to describe the process of incorporating information from previously exposed (or rendered) footage into a shot. One might wish to match the camera movements or other objects from live action footage, or have a rendered model follow the movements of an actor. Compositing ("comp") is a process of including foreground or background images or movies into your rendered scene. Composite layers are added above the 3D action you create in EIAS Animator, and background layers appear behind your renderings in the final image or movie. In order for compositing to work properly, the images or movies that you use will need to contain an alpha channel mask.

Your roto and comp footage can be any resolution, but it is best to match the final resolution to which you are rendering. If your background or foreground maps are smaller than your target render resolution, then they will be enlarged. This will reduce the quality of the images used for compositing. If the footage is a greater resolution, then the footage will be down sampled to fit in the image rectangle. This will not decrease the quality of the imagery used for compositing, but will add somewhat to the render time.

The Roto/Comp tab contains controls which allow for background and foreground image compositing within a rendering, and display of these images in the camera view window. There are several items in this tab:

- Render Rotoscope/Composite Check Box
- Background Map List
- Foreground Map List
- X-Form Tab
- Properties Tab
- Info Tab
- Crop Tab

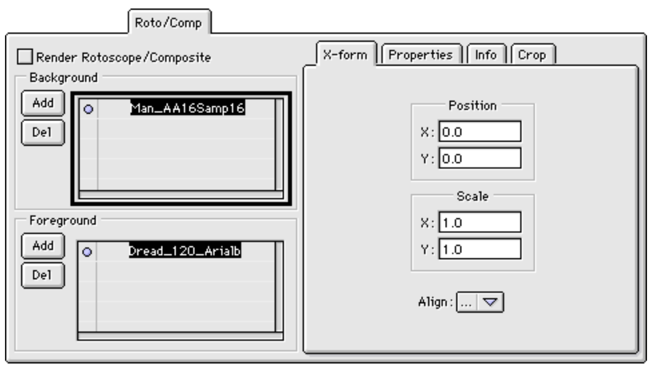


Figure 4.8 — **Camera Roto/Comp Tab**

Render Rotoscope/Composite Check Box. This check box enables the images in the background and foreground map lists to be rendered and/or composited into the final image. (Maps can also be individually enabled or disabled within the map lists.)

Background Map List. This list contains all of the images used as backgrounds for the active camera. Each camera renders its own map lists separately — what appears in the background list for one camera will not be present for another, unless you insure that the lists are the same for each camera. Each image can be enabled or disabled by clicking the active icon next to the name of the map. The background maps will appear in the final rendered image only if the active icon next to the image name in the list is present, and the Render Rotoscope/Composite check box is enabled. Background images can be animated and scaled in XY screen space with the X-form tab next to the map list.

To add a background image to the list:

1. Click the Add button
2. Choose an image or movie from the file list
3. Click the Open button

The background image you selected will now appear in the list.

To delete a background image from the list:

1. Select the image
2. Click the Delete button

The image will be removed from the list.

You can reorder the maps in the list by dragging the map to its desired location. You can **Edit>Copy** (command or control "c") and paste maps between lists by selecting the map and choosing copy, then selecting the destination map list, and choosing **Edit>Paste** (command or control "v").

Maps will be layered by the order in which they appear in the list. If the maps do not have alpha channel masks, then the top-most map will be the only map that will appear as a background image for this camera.

Foreground Map List. This list contains all of the images used as foregrounds for the active camera. Each camera renders its own map lists separately — what appears in the foreground list for one camera will not be present for another, unless you insure that the lists are the same for each camera. Each image can be enabled or disabled by clicking the active icon next to the name of the map. The foreground maps will appear in the final rendered image only if the active icon next to the image name in the list is present, and the Render Rotoscope/Composite check box is enabled. Foreground images can be animated and scaled in XY screen space with the X-form tab next to the map list.

To add a foreground image to the list:

1. Click the Add button
2. Choose an image or movie from the file list
3. Click the Open button

The foreground image you selected will now appear in the list.

To delete a foreground image from the list:

1. Select the image
2. Click the Delete button

The image will be removed from the list.

You can reorder the maps in the list by dragging the map to its desired location. You can **Edit>Copy** (command or control "c") and paste maps between lists by selecting the map and choosing copy, then selecting the destination map list, and choosing **Edit>Paste** (command or control “v”).

Maps will be layered by the order in which they appear in the list. If the maps do not have alpha channel masks, then the top-most map will be the only map that will appear as a rendered image for this camera, hiding any 3D objects that you intended to render.

Note *To view any image in the background of the Camera window, the option to show the image must be on (found in the Roto/Comp Properties Tab, Show in Camera View check box) and the Paint Image button must be set to the image name desired.*

The following illustration indicates the roto/comp controls that are displayed in the camera view window. These controls are visible only when the option to display an image in the camera view is active.

Paint Image Icon. This icon will draw the foreground/background image in the camera view. To use click on the button. A popup menu will appear, with the names of the loaded images listed. Choose the image that you wish to view. You cannot preview composites in this window. You must perform a window size rendering or full size rendering to do so.

Paint Image Icon *Frame Number* *Scroll Bar*

Figure 4.9 — **Camera View Roto/Comp View Tools indicated**

Frame Number. This box displays the current frame number. If the Sync with Time option is selected in the Roto/Comp Properties Tab, then this number will match the current frame number of the project.

Scroll Bar. The scroll bar allows you to scroll through the movie file to find the appropriate frame for use. This bar will have no effect on a single frame image.

Roto/Comp X-form Tab

This tab provides position, scale and alignment information used by the currently selected map in either list. Each map in each list can be positioned, scaled and aligned independently from the others. These functions are presented in 3 areas in the X-form tab:

- Position Edit Boxes
- Scale Edit Boxes
- Alignment Popup Menu

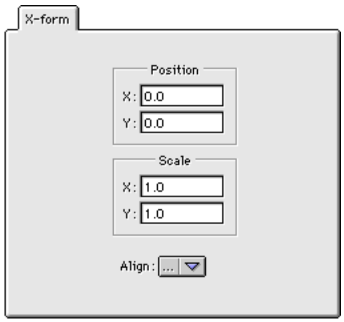


Figure 4.10 — **Roto/Comp Tab Foreground/Background Image X-form Tab**

Position Edit Boxes. These boxes control the position of the selected image in either of the foreground or background map lists. Maps can be positioned in X and Y space only (acting as flat layers.) The default value of 0.0 will place the map in the center of the frame. X and Y values of 1.0 or greater for each position attribute will place the map offscreen (Values may may vary depending upon the aspect ratio of the map as it relates to the rendered image.)

Scale Edit Boxes. These boxes control the scale of the selected image in either the foreground or background map lists. The default scale of 1.0 fits the map to the extents of the rendered image rectangle. The alignment popup, covered below, governs which axis is used as the “fit” axis, that is, which axis is used to fit correctly into the frame at a scale of 1.0. Values of less than 1.0 in will reduce the size and values greater than 1.0 will increase the size of the image.

Align Popup Menu. This menu is used to determine how the map will fit into the rectangle of the rendered image. There are three choices:

- Both
- Horizontal only
- Vertical only

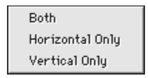


Figure 4.11 — **Align Pop Up Menu**

Both. This option will fit both axes of the image into the aspect ratio of the rendered image rectangle. If the aspect ratio of the image does not match the aspect ratio of the rendered image rectangle, the image will appear stretched or squeezed.

Horizontal Only. This option will fit just the horizontal axis of the background or foreground image into the rendered image rectangle. The vertical axis may extend past the rendered image extents or end within view of the frame if the aspect ratios of the foreground/background image doesn't match the rendered image rectangle.

Vertical Only. This option will fit just the vertical axis of the background or foreground image into the rendered image rectangle. The horizontal axis may extend past the rendered image extents or end within view of the frame if the aspect ratios of the foreground/background image doesn't match the rendered image rectangle.

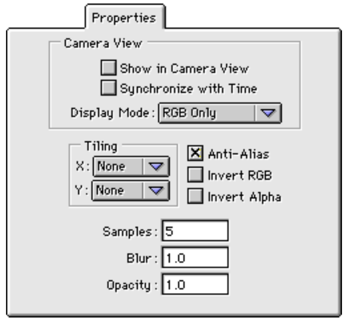


Figure 4.12 — **Roto/Comp Properties Tab**

Roto/Comp Properties Tab

This tab is used to control the foreground / background image rendering and display properties. This tab is comprised of several items:

- Camera View Section
- Image Tiling Section
- Anti-Alias Check Box
- Invert RGB Check box
- Invert Alpha Check Box
- Samples Edit box
- Blur Edit Box
- Opacity Edit Box

Camera View Section

This section contains controls which govern the display of the foreground / background image in the camera view window. There are three sub items listed in this section:

- Show In Camera View Check Box
- Synchronize with Time Check Box
- Display Mode Popup Menu

Show in Camera View Check Box. This control enables the display of the image in the camera view window.

Synchronize with Time Check Box. This control insures that the foreground/background images will match the time reference of the project scene time.

Display Mode Popup Menu. This popup menu determines which channels of the image will be displayed in the camera view window. This feature does not affect the rendering quality of the foreground/background images. There are four choices:

- RGB Only
- Alpha Only
- RGB + Alpha
- RGB + Color

RGB Only. Displays only the RGB channel of the foreground/background image in the camera view window. If the image has an alpha channel, then the display of the image in this mode will appear to have ragged edges (the anti-aliasing information is in the alpha channel).

Alpha Only. Displays only the Alpha (mask) channel of the foreground/background image in the camera view window.

RGB + Alpha. Displays a properly anti-aliased foreground/background image in the camera view window. (Uses the alpha channel information to mask in the RGB channel.)

RGB + Color. Displays the RGB channel of the image with the selected background color (set in the World Info Window).

Image Tiling Section

This section contains two popup menus which control the way the foreground/background images are tiled when viewed or rendered (one for the X axis and one for the Y axis). There are four choices:

- None
- Hold
- Repeat
- Mirror

None. Disables mirroring of the image on the specified map axis. Choosing None for both axes will cause the image to be displayed only where you positioned it, nowhere else.

Hold. Applies the colors found at the image edges outside of the actual image rectangle. (The image will appear once as positioned, with the border colors of the image extending beyond the image rectangle, covering the frame.)

Repeat. Repeats the image along the specified axis. Choosing Repeat for both axes will cause the image to repeat continuously.

Mirror. Mirrors the image along the specified axis. Choosing Mirror for both axes will cause the image to flip flop about both axes.

Anti-Alias Check Box. This check box enables foreground/background filtering. If you are not scaling your foreground/background images, and if they match the aspect ratio of the rendered image rectangle, then this setting can be disabled.

Invert RGB Check Box. This option will negate the RGB color space of the image.

Invert Alpha Check Box. This option will negate the alpha channel of the image. This is useful if you decide that you need to mask the area opposite of that represented by the alpha channel.

Samples Edit Box. This edit box lets you determine the sampling quality of the image. The default is 5.0. Numbers greater than 5 will cause the image to be sampled more often, slowing down render time, but increasing the quality of the image. Numbers less than 5 will cause the image to be sampled less often, speeding up render time, but decreasing the quality of the image. Numbers greater than 10 might be prohibitively slow. 5 is a good default, and you will likely not need to deviate from that amount.

Blur Edit Box. This edit box lets you blur the image. The default is 1.0. This value will present the image as is. Values of greater than 1.0 will blur the image. For example, a value of 2.0 will produce a blur of two pixels for every one encountered in the image. Values less than 1.0 will sharpen the image, although it will also introduce aliasing (jagginess) into the image.

Opacity Edit Box. This edit box controls the opacity of the foreground/ background image. The default is 1.0, where the image is completely opaque. Values of less than 1.0 will make the image more transparent, ending at 0.0 where the image will be invisible. Values of greater than 1.0 are ignored.

4.6 Stereo Tab

The stereo tab is used to set up stereo image rendering in EIAS Animator. This technique lets you create true "3D" images, when properly assembled and viewed through polarized glasses. (EIAS Animator does not support the anaglyph (red/blue) stereo effect, just "right eye/left eye" stereo.) To accomplish this, EIAS Animator creates separate image files for each eye. You will need a third party program to assemble the images into viewable 3D imagery or movies.

The stereo tab consists of a few simple controls to accomplish the stereo effect:

- Enable Check Box
- Stereo Separation Edit Box
- Stereo Convergence Edit Box
- Convergence Popup Menu
- Render Popup Menu

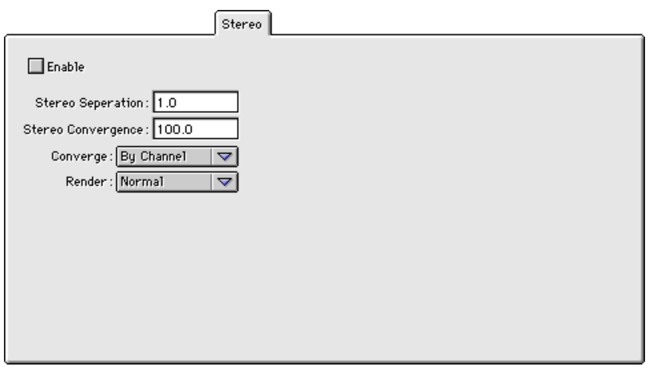


Figure 4.13 — **Stereo Tab**

Enable Check Box. This box enables the stereo effect. You can play with settings without actually rendering them by disabling this check box.

Stereo Separation Edit Box. This edit box controls the distance between the two cameras. (If you would like to see the distance indicated on the camera, enable the “Show Stereo” check box in the Camera Info Window’s Camera display control area to the left of the window.) The default value is 1.0. This may or may not be appropriate for your needs. Essentially this control is attempting to duplicate the distance between the human eyes. How much scale you want something to have will depend upon the size of this value. Unfortunately, the relevance of this number is directly related to the scale of the objects in your scene, so we can offer little guidance here.

Stereo Convergence Edit Box. This edit box controls to focus point of the stereo effect. Beyond this point, no depth will be perceived. This value is used only if the Convergence Popup Menu is set to “By Channel.”

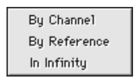


Figure 4.14 — **Convergence Popup Menu**

Convergence Popup Menu. This menu controls the type of convergence that will be used when the scene is rendered. There are three choices:

- By Channel
- By Reference
- In Infinity

By Channel. Causes the stereo effect to use the value found in the Stereo Convergence Edit Box.

By Reference. Causes the stereo effect to use the reference point as the point of convergence.

In Infinity. The perception of depth will extend into infinity.

Render Popup Menu

This menu controls what image files are created at render time (if any) for the stereo effect. There are four choices:

- Normal
- Left Only
- Right Only
- Left & Right
- Interlace Odd
- Interlace Even

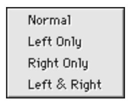


Figure 4.15 — **Stereo Render Popup Menu**

Normal. This option will render the scene normally, producing only one, “flat” image file.

Left Only. This option will render an image file for the left eye position only.

Right Only. This option will render an image file for the right eye position only.

Left & Right. This option will render two image files, one for each eye. In this instance, render times will be twice as long, as complete scenes for each eye must be rendered.

Interlace Odd. Causes a single, interlaced file to be rendered. The left eye in the odd field and the right eye in the even field.

Interlace Even. Causes a single, interlaced file to be rendered. The left eye in the even field and the right eye in the odd field.

There are video systems that can decode an interlaced video stream and send the streams to two separate video projectors. In this way, a 3D video presentation can be encoded on an ordinary video tape or DVD. One such system can be seen at www.3dimagetek.com another at www.razor3d.com.

4.7 Projection Tab

This tab is used to control map projections from the camera position. A projection map is a texture than can be projected onto many groups at once from the same location in space. Both lights and cameras can project maps. Lights project maps exactly like a slide or movie projector. Camera projection maps work a little differently. These maps are typically projected onto objects which are fully self-illuminated (meaning that the objects are always at full brightness, as are any maps applied to them.

Here's a real world analogy to this process — imagine that you have a photograph of a building. The camera is inside of an alcove, with walls on the sides, and an arch to the rear. Now, imagine that you have a model that is roughly scaled to the objects in the photograph. In essence, you have walls and then an arch at the end of the walls. The model is painted white to accept the slide of the photo. Now, setup a slide projector that can project the photo onto the model. Position the projector so that it approximates the position of the camera that took the original photograph. As you bend down and look at the model from the same point as the slide projector (or as close as you can get to the lens) what you would see would appear to be very close to the original photo. However, the farther away from the projector that you move — either side to side, up or down, or in and out — you would notice that what you are seeing is almost a true 3D representation of the original photo! This is a special effects technique that has been used for many years.

The first known use of this technique on a computer was performed by Mr. Yusei Uesugi, an extremely talented matte painter, on the film “Hook.” He painted an overhead view of the Neverland Island, and had the computer department create a rough model of the island and ocean. As the map was project from his point of view created in the painting, as soon as the recording camera moved off axis, the painting suddenly appeared to have a three dimensional feel. Since then Mr. Uesugi and a variety of very talented artisans have used this technique to great effect in such films as “Spawn,” “Star Wars Trilogy Special Edition,” “101 Dalamations,” and so on.

The true benefit of camera projection maps is that in many cases what would have required complex models before can now use rather simple models. The complexity instead is found within the details of the painting — a process many find easier than modeling.

Projection Map Process

Camera projection maps are applied to either all groups in a scene or groups within selection sets. *(See the Selection Sets chapter for more information on selection sets.)* Each map in the list can be set to project in different manners (“applied as”), and each map can be set to project to a different selection set (“applied to”). Typically, camera projection maps are applied as “luminance” maps (the default), so that the map appears at full brightness. This method allows the scene that is rendered and the original map image to have the same brightness levels. In other words, the rendered scene would look like the photograph of the map. It is not uncommon to also use clip and transparency map methods to isolate elements in the map image, such as people, trees, or other details.

After applying a camera map and aligning the projecting camera, you should lock the projecting camera, so that registration is maintained.

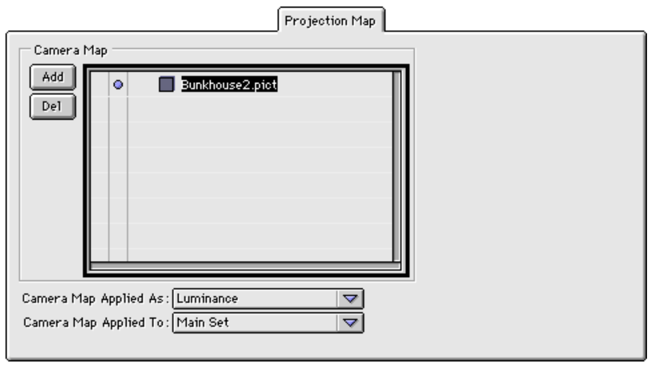


Figure 4.16 — **Camera Info Window Projection Map Tab**

The Projection Map tab consists of three items:

- Camera Map List and Controls
- Camera Map Applied As pop up menu
- Camera Map Applied To pop up menu

Camera Map List and Controls. The camera maps list is where you add camera projection maps. You can put as many maps as you like in this list. Maps can be single frames or movie files, and can be any bit depth desired.

To add a camera projection map to the list:

1. Click the Add button next to the Camera Map list
2. Select a map from the file list
3. Double click the map, or press the Open button

The camera map will be added to the list. To configure the map, double click on the map name in the list. To reorder the map in the list, just drag it to its new location.

To delete a camera projection map from the list:

1. Select the map from the file list
2. Click the Delete button next to the Camera Map list

The map will be removed from the list.

Camera Map Apply As Pop Up Menu

This menu allows you to set the method in which the map will be applied to items in the selection set. All map channel methods described in the Materials and Textures chapter are found here. You can use any of the methods that you wish, although in practice you may find just the few described above to be of any real use in the map projection process.

Figure 4.17 — **Camera Map Apply As Pop Up Menu**

There are eleven methods in the list in which the map can be applied. Applying camera maps to any of these channels acts as if the map has been applied to that group's corresponding material channel:

- Bump/Displace
- Clip
- Diffuse
- Specular
- Ambient
- Reflection
- Reflectivity
- Transparency
- Luminance
- Glow
- Transmission

Bump/Displace. The projected map will act as a bump/displacement map for the items listed in the Applied To pop up menu. This option is not typically used as a camera projection map.

Clip. The projected map will act as a clip map for the items listed in the Applied To pop up menu. This is option is great for isolating elements easily by masks.

Diffuse. The projected map will act as a diffuse map for the items listed in the Applied To pop up menu. This option is not typically used as a camera projection map, as the groups receiving a camera map from this method would shade normally, without self-illumination. (in other words, requiring standard scene lighting)

Specular. The projected map will act as a specular map for the items listed in the Applied To pop up menu. This option is not typically used as a camera projection map.

Ambient. The projected map will act as a ambient map for the items listed in the Applied To pop up menu. This option is not typically used as a camera projection map.

Reflection. The projected map will act as a reflection map for the items listed in the Applied To pop up menu. This option is not typically used as a camera projection map.

Reflectivity. The projected map will act as a reflectivity map for the items listed in the Applied To pop up menu. This option is not typically used as a camera projection map.

Transparency. The projected map will act as a transparency map for the items listed in the Applied To pop up menu. This option might be useful for some effects, or to isolate some elements of target groups.

Luminance. The projected map will act as a luminance map for the items listed in the Applied To pop up menu. This is the default setting, as it allows for the projection map and the original image to have the same brightness (in other words, the rendered image will appear virtually identical to the original map image in terms of brightness).

Note *The groups receiving maps from this method do not accept shadows when this setting is used. Self-illumination means that the groups are effectively not shaded, rather presented at full brightness levels. If you wish to cast shadows from other scene groups upon a projection mapped group with this method, you will be required to render an additional image, with the same groups, but with the map projections disabled, and the group shadow settings for the projection mapped groups (found in the group info window, shadow tab) set to "generate shadow mask." You would then need to composite the two images together, using the projection mapped image as the background, and the shadow mask image as the foreground.*

Glow. The projected map will act as a glow map for the items listed in the Applied To pop up menu. This option is not typically used as a camera projection map.

Transmission. The projected map will act as a transmission map for the items listed in the Applied To pop up menu. This option is not typically used as a camera projection map.

Camera Map Applied To Pop Up Menu

This menu determines which groups in the scene will receive the selected camera projection map. There are three choices for this menu:

- None
- All

- “Set List”

None. No groups in the scene will receive the selected camera projection map.

All. All groups in the scene will receive the camera projection map. This option should be used if you will not be introducing items that are not intended to be components of the map, as every group in the scene will receive the map projection.

“Set List” . Actually, after the All menu item, you will see the entire list of selection sets that exist within the project. If no selection sets exist, then there will be no items presented after the All menu item. Selection sets are the most controllable way of using camera projection maps. By use of a set or series of sets, you can determine exactly which groups will receive the selected camera projection map. Using sets, you can mix and match groups which do and do not receive projection map effects.

Camera Map Info Window

Double-clicking on the map in the map list brings up its Camera Map Info window. This window has the same controls found in the Texture Info window. For example, the Special tab contains the Displacement and Bump edit boxes when you are applying the map to these channels. The Clip Factor edit box is shown in the Special tab when the camera map is applied to the clip channel.

The special tab contains an one extra check box, “Map Visible Surfaces Only”.

Map Visible Surface Only

When this check box is on, the map is only applied to the visible surfaces of the groups in the selection set. Visibility is determined by rendering a shadow pass and then applying the resulting file as a mask.

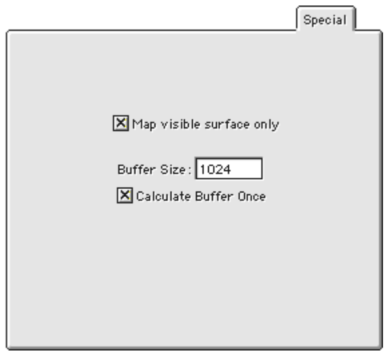


Figure 4.18 — **Camera Map Info — Special Tab**

Buffer Size. This is the maximum dimension of the shadow buffer in pixels. Unlike the shadow buffers for light sources, this shadow buffer does not have separate controls for the X and Y dimension. You enter in one dimension and the other is calculated for you based on the aspect ratio of the camera.

Calculate Buffer Once. Turning the check box on causes the renderer to calculate the buffer once and then use it for every frame of the animation. This is useful if the projecting camera and the objects receiving the projections aren’t animated.

The Map Visible Surface Only feature is extremely powerful. You can add many projecting cameras to your scene. Each of which projects onto a controlled portion of the geometry. Feathering the maps at their edges using a circular gradient in Photoshop will allow you to blend the maps together. The overall effect is to create an integrated 3D environment from a series of pictures (or paintings) and some simple geometry.

Projection Order

Camera maps are applied from each of the projecting cameras in the order the cameras appear in the Project window (hierarchy view). You can reorder the cameras in the Project window to alter the order the maps are applied.

Match Move Tab

The Match Move features are covered fully in the next chapter.

Match Move

5.0 Introduction

To insert computer generated imagery into an existing film or video sequence, the original camera parameters must be known for each frame.

The Match Move system makes it possible to extract the original parameters from a “locked-down” camera (pan, tilt, and roll only) given a digitized video or film sequence and apply them to the internal camera mathematics in EIAS. This allows you to match your animations with a previously shot scene.

Match Move is a two-step process. You begin with 2D tracking. That is, you select a series of points in the sequence (or “Master”) and use the 2D auto tracking interface to locate these points in every frame.

The second step is the Match Look. In this step, the camera parameters are derived and automatically copied to the animation channels of your scene camera in EIAS.

5.1 Loading the Master

To match a video or film sequence (“Master”) you must first specify it in the scene camera. The animation data that is generated by the Match Mover will be added to the scene camera that has the Master.

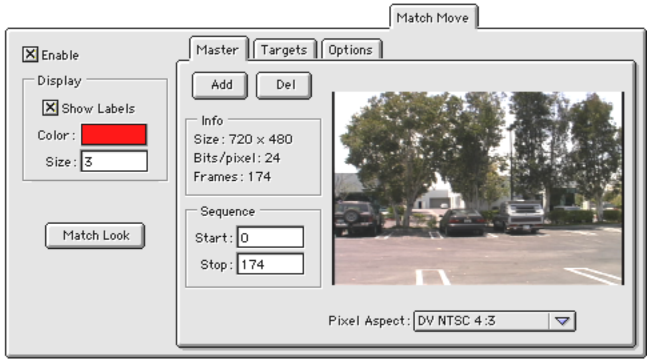


Figure 5.0 — **Match Move Tab**

The Match Mover supports the Image file format and any QuickTime file formats as well.

The Master is loaded into the scene camera using the Camera Info window. Specifically, the Match Move tab > Master sub-tab as shown in Figure 5.0.

Add/Del. Click on the Add button to add a Master to the scene camera. Click on Del to remove a Master.

After loading the Master, go to the Camera View window and make sure that it is set to the scene camera you have loaded the Master into. The Rotoscope pull-down icon at the bottom of the Camera View window will now contain a new entry, Match Move "Master", where "Master" is the name of the file you have loaded.

Pixel Aspect. It is important to select the proper pixel aspect ratio (pixel height divided by width) for the Master. The Pixel Aspect pull-down gives you a list of common aspect ratios to choose from. There is a custom setting available as well. The match will not be accurate if an incorrect pixel aspect ratio is chosen.

Start/Stop. Sets the starting and ending frames in the Master sequence to be used for Tracking and Matching.

Enable. The Enable button turns off and on the display of the 2D targets in the Camera View window.

Display. These options control the display of the targets in the Camera View window. You can change the color of the targets, “Color”, turn off the target names, “Show Labels”, and change the size of the square around the tracking point, “Size”.

Match Look. The Match button executes the match. See “Making The Match” on page 161 for a full description of the process.

5.2 Video Quality

It may be necessary to preprocess the video sequence using a third-party application to remove the interlace artifacts. Interlace artifacts are common in video footage because each frame of video contains two half-sized images called fields. These fields are shown in alternating scanlines. When you capture a frame of video, you are actually capturing both fields at the same time. Closer examination of the video will reveal slight offsets between scanlines depending on motion. These offsets are called interlace artifacts and will cause the automatic 2D tracker to produce unacceptable results. By processing the video frames to remove the interlace artifacts, the 2D tracker will produce better results. Most common image processing applications have features that allow you to remove interlace artifacts.

5.3 Managing Targets

Targets are managed using the Target sub-tab of the Match Move tab in the Camera Info window.

When you choose Targets, you need to think about their quality. “Good” Targets are features which have a high contrast such as window corners, table corners, knobs, intersecting painted lines on street, etc. “Bad” Targets are feature such as walls, grass, trees, road surfaces, and other large expanses with few repeating patterns.

Add/Del. Click on the Add button to add new targets to the Target list. The Targets are numbered sequentially, but you can change the name of the Target by double-clicking on it in the Target List.

Once a Target has been added, it appears in both the Camera View window (if the Enable button is on) and in the Target Editor. The initial position of the Target is X=100, Y=100, where 0,0 is the upper left-hand corner of the Master.

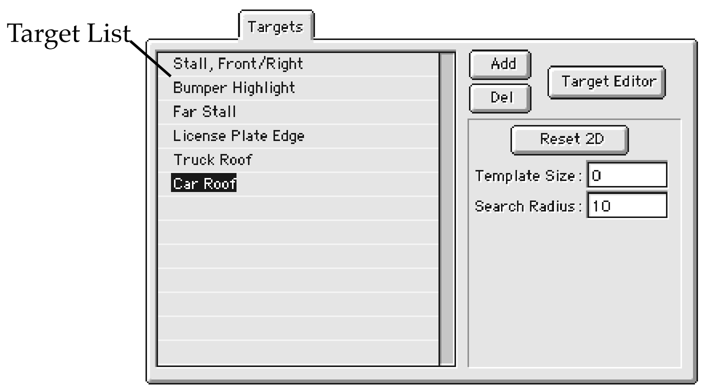


Figure 5.1 — **Targets Sub-Tab**

Reset 2D. This button deletes the 2D tracking information for the selected Target and repositions the Target back to (100,100).

Template Size. Specifies the size of the square (in pixels) that selects the image feature point to be searched. A value of 0 will select the auto-tracking template size.

Search Radius. Specifies how far to look around the estimated 2D position of the tracking point to find the match with its template.

Target Editor. This button opens the 2D tracking editor.

5.4 Target Editor

2D tracking is accomplished using the Target Editor. This window has much in common with the window used to display images. The differences are in the Toolbar and the Track List.

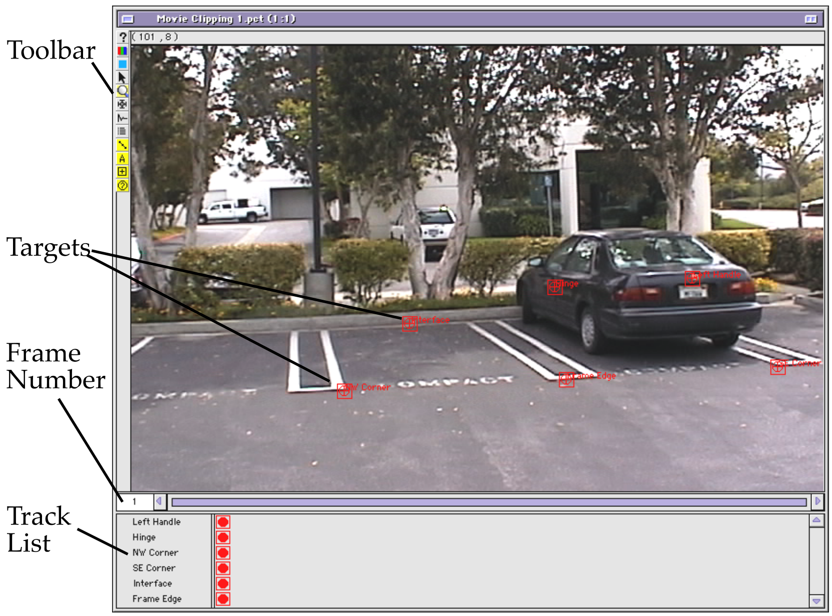


Figure 5.2 — **Target Editor**

Target Editor Toolbar

Image Information
Color Channels
Color Background
Standard Mode (pick targets)
Zoom
Track Targets
Smooth Target Tracks
Track Options
Toggle Track Path
Toggle Track Label
Toggle Track Template
Toggle Track Search Region

Figure 5.3 — **Target Editor Toolbar**

Image Information

This button brings up a window that displays basic information about the Master: width, height, number of frames, frame rate, color bit-depth, alpha bit-depth, and file size.

Color Channels

Allows you to change the image display. You can display just a single color channel, just the Alpha, or view the image as grey scale. The tracker actually uses the color channel selected. It is quite possible that one of the channels will yield a higher image contrast, and hence, produce better results.

Color Background

Allows you to override the background color with a color of your choosing.

Standard Mode

When highlighted, you can drag the targets around the Master. Hold down the Alt Key (Option Key on Macintosh) and drag to view a magnified area as you drag.

Zoom

When highlighted, clicking in the window zooms in. Clicking with the right mouse button (hold Control-key and clicking on the Macintosh) zooms out.

Track Targets

Clicking this button begins the 2D tracking process. All frames of the master will be tracked from the current frame to the end of the sequence using the active Targets in the Target Editor.

Smooth Target Tracks

Applies a cubic filtering algorithm (selected in Track Options) to the 2D tracks that have already been computed. Each click reapplies the filter. The target's path curve will be smoother if you use more data points but will less likely stay on the feature it is supposed to track.

Note *Excessive use of the filter will make the 2D tracking drift from its intended match in the 2D image, so use sparingly.*

Track Options

This button opens a dialog box that allows you to modify parameters for the Template, the 2D Smoothing filter, and the Magnifier.

Default Template Size. Sets the default Template size. A square region around the Target used for matching from frame to frame.

Method. Controls the number of data points used in the filter algorithm. You can choose to filter using either 5 or 7 points.

X/Y Axis. Determines if the filter is applied to the X-Axis, Y-Axis or both.

Size. X and Y dimension of the magnifying region in pixels. The magnifier is activated by holding down the Alt-key (Option-Key on Macintosh) while dragging the targets.

Pixels. X and Y dimension of the region of the Master that is magnified. If Size is 63 and Region is 15, a square 15 by 15 pixels will be blown up into a magnified region of 63 by 63 pixels.

Toggle Track Path

Makes the 2D tracks of the Targets visible. The tracks are drawn in the same color as the targets and are visible after you have executed your first 2D tracking.

Toggle Track Label

Makes the Track label visible in the Target Editor.

Toggle Track Template

Makes the Target Template squares visible in the Target Editor.

Toggle Track Search Region

Makes the Target Search Region circles visible in the Target Editor.

Target Editor Track List

The Track List shows all of the Targets and provides status for each Target in every frame that has been tracked. The status is shown using the square Frame Boxes in the Track List. Figure 5.2 shows a track list before any Targets have been tracked. The circles inside the Frame Boxes indicate that the targets have been manually positioned for that frame (the frame is "locked"). Since you must always manually position the targets for the first frame, the Frame Boxes for that frame always contain a circle.

The Frame boxes for the current frame (the frame set by the Shuttle Bar and shown to the left of the bar) are highlighted in Red.

In Figure 5.4 below, you can see that a whole series of frames have been tracked for the two Targets.

When a Target goes out of view of the Master, you must tell the tracker to disregard it. This is done by holding down the Control-key (Command-Key on Macintosh) and clicking on the Frame Box where the Target first disappears. The Frame Box and all Frame Boxes to the right will become invisible, telling the tracker to ignore the Target during the ghosted period. Control-key (Command-key on Macintosh) click again further down the sequence to reactivate the Target if it becomes visible.

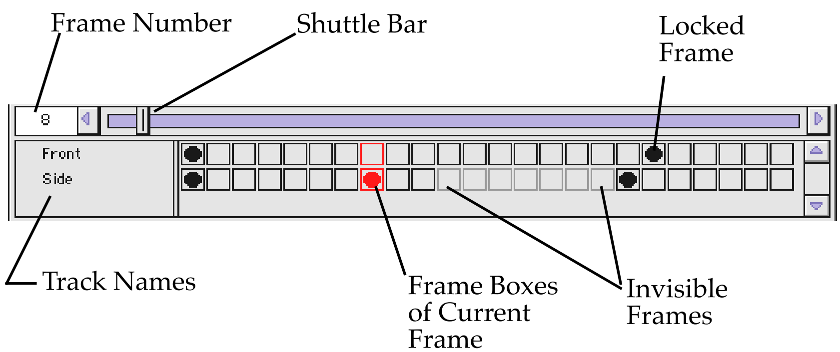


Figure 5.4 — **Target Editor Track List**

You can deactivate the Track by clicking on its name in the Track List. This allows you to track just one (or a few) tracks at a time. If you wish to disable all the tracks except for one, hold down the Control-key (Command-key on the Macintosh) and click on the track name.

5.5 Match Options

These controls enable filtering of the data that is generated during the Match Look. The filter will be applied to the data after the match is computed but before that data is copied to the animation channels of the scene camera.

The smoothing process works by looking at 5 or 7 data points around the current point and deriving a curve to best fit the data. The target's curve will be smoother if you use more data points but will less likely stay on the feature it is supposed to track. In situations were the camera movement is slow and steady and only the video noise contributed to the error in auto-tracking, you may use the linear smoothing method to remove any noise or jitter. In hand-held video sequences, you are best served by the cubic smoothing method since the movement is less likely to be linear.

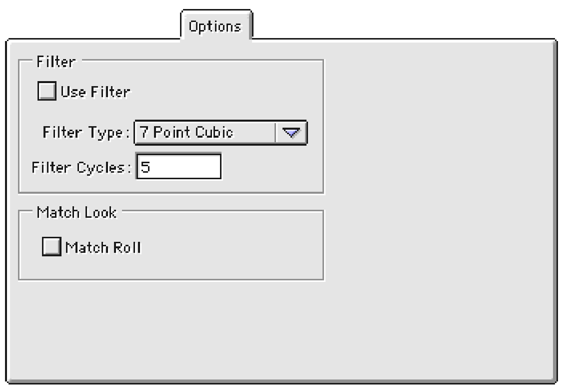


Figure 5.5 — **Options Sub-Tab**

Use Filter. Enables the filter. If this button is off, no 3D filtering will be done.

Filter Type. Choose either a Cubic or Linear filter.

Filter Cycles. This determines the number of times the filtering algorithm is applied to the data.

Match Roll. This enables computation of camera roll when the Match Look button is pressed.

5.6 Making The Match

Match Look computes only pan, tilt, and roll. It requires you to supply the original FOV of the camera that created the master.

Add the Master

Open the Group Info window for the scene camera that you wish to add the match move data to. Bring the Match Move tab forward and click on the “Add” button to choose the Master sequence.

Note Select the proper aspect ratio using the Pixel Aspect pull-down menu. Failure to choose the proper aspect ratio will cause severe errors in the Match Mover.

You will likely want to view the Master in the Camera View window. Use the Rotoscope button on the bottom of the window to select the Master.

Choose Your Targets

To get a good Match Move you are going to need to pick at least two features (Targets) in the Master to track. Actually, if you only intend to derive pan and tilt, only one Target need be tracked. Select features that have high-contrast characteristics and are visible for most or all of the sequence. Good candidates include building corners, table corners, knobs, lines painted on the street, etc.

Go to the Targets sub-tab and click on the Add button to create the Targets. The Targets will be numbered sequentially from 0. You can change the names of the Targets by double-clicking on them in the list and entering a new name. The Targets are initially placed at position (100,100) on the Master where (0,0) is the upper right-hand corner of the image.

You will see the Targets sitting one on top of the other in the Camera View window (this assumes the Enable button is on in the Match Move tab). Make sure the Time Thumb or Shuttle Bar is set to 0.0 then you can drag the Targets to their initial positions in this window or go ahead and open the Target Editor and position them there.

Track the Targets

2D tracking is done in the Target Editor. The Editor lists all of the Target tracks and provides control for each track in every frame of the Master sequence.

After you have moved the Targets to their initial positions and made sure that the Shuttle Bar is at 0, hit the “Track Targets” button in the toolbar. A status bar will pop-up telling that the tracks are being generated. You will see the Master play, frame-by-frame and the Targets move along with the imagery. When the tracking is complete, you will see that Frame Boxes have been created for each Track in every frame. As you scroll the Shuttle Bar, you will see the Master sequence play, the Targets move along their

Tracks, and the Frame Boxes light up in red as they become the current frame.

Note A magnifier tool is available to aid you in placing your Targets at the most optimal position on the Master. Hold down the Alt-key (Option-key on the Macintosh) and drag the Target. The pixels under the Target will be magnified making it easier to position the Target at an exact location. Options that control the magnifier are available using the “Track Options” button in the toolbar.

If a Target moves off of the selected feature in the Master at a particular frame, you can position the Shuttle Bar at that frame and then manually move the Target back into position. This will create a “Stop Frame” for that track at that particular frame. This is denoted by a solid circle inside the Frame Box. A Stop Frame tells the tracker that Target must reach that exact point on the Master at that frame. Once you have repositioned it, go ahead and hit the “Track Targets” button again. Tracking will proceed from the current frame (the frame set by the Shuttle Bar) to the end of the sequence.

If a Target moves completely out of the frame (the original film or video camera panned off of it), you need to make the Target invisible. Hold down the Control-key (Command-key on the Macintosh) and click on the Frame Box at the point in time where the Target disappears. The Frame Boxes from this point on are shown in a ghosted form and the tracker will ignore them. If the feature moves back in frame at a later time, you can enable it again by using the Control-key (Command-key on the Macintosh) at the frame where it reappears.

It may be easier for you to work on one Track at a time. You can click on the Target name in the Track List to enable or disable the target. Holding down the Control-key (Command-key on the Macintosh) and clicking on the Target name will disable all the targets except the one you clicked on.

The goal is to track every Target during each frame of the Master sequence. You may have to repeat the cycle of manually positioning an errant Target and Tracking several times for each of the separate Tracks.

After you have tracked your Targets, you can smooth out the paths using "Smooth Target Tracks" button in the toolbar. This button will apply a filtering algorithm to the Tracks every time it is pressed. Options that control the filter behavior are available using the "Track Options" button in the toolbar.

How the Tracker Works

Tracking is accomplished by using "Templates" and comparing them to the "Master" image. Templates are square images taken around the 2D feature being tracked and then used in the subsequent frames for matches to compute the next 2D location. You may specify how large these "Templates" can be by setting the Template Size (in pixels) in the Camera Info window > Match Move tab > Targets sub-tab. Highlight the Target name in the Target List and its Template Size is shown on the right. See Figure 5.1

The auto tracker has a default template size which it will use if the tracking point template has not been specified (set to 0). You may access that default by using the "Track Options" button in the Target Editor toolbar.

The larger the Template the slower the algorithm will be. Good sizes are 9 to 25 pixels which are fast and accurate. Also, the auto tracker will estimate by the previous 2D position where the 2D position in the next frame will be. However, it will still use the Template to search around that point to find the correct position.

To aid the search, a Search Radius has been provided to restrict the search within that area. The larger the search area, the slower the algorithm will be. Good radii are 10 to 20 pixels. Of course, these numbers depend on how "wild" the camera movements are. A locked-off camera requires almost no user intervention and a hand-held camera will require some experimentation and a lot of user intervention.

The Match Look

The Match Look requires you to set the proper FOV in the Camera Info window, FOV tab. The results will be incorrect if you have not set the FOV ahead of time. You will also need to place the scene camera in the approximate position represented in the Master.

Make sure that the scene camera is animatable. Hit the "Match Look" button in the Camera Info window > Match Move tab. You will see a dialog asking you which frames to track. Set the frames and click "OK". After the Match Look has been computed, the scene camera will update with the new information.

Note Remember to turn on the Match Roll button in the Options sub tab if you want the camera roll computed.

5.7 Match Move File Import

Electric Image EIAS can now read the match move data from Realviz's MatchMover (regular and Professional) and 2D3's Boujou directly. Previously, match move data could only be imported via the LightWave scene import option.

From Realviz's MatchMover, export the camera matched data as a .rz3 text file. From 2D3's Boujou, export the camera matched data as a Boujou animation file (.ban)

In EIAS, go to the Animation Menu->Import Motion..., and select the matched moved file (.rz3 or .ban). After the file is read, you will see a new scene camera and nulls (effectors) representing the 3D reference points (original targets). Camera position, direction, roll and focal length animation channels are imported. This data is saved as custom frames in the newly created scene camera.

Lights in EIAS Animator

6.0 Introduction

As with real world photography, 3D computer graphics programs need light to properly render an image. It is in lighting that one truly sets the mood of the composition. EIAS Animator offers a variety of different light types and lighting effects to help you set the mood you envision. You can animate all of a light's characteristics — there are over 450 channels to work with for a single light (including all of the special effects). The interface is very straightforward, to the point that you don't realize just how much control you have over the light.

Like groups, lights can exist individually or as part of a hierarchy, although they are best placed at the end of a chain or strange results will occur. Sometimes you will want to add lights into a hierarchy for scene illumination, other times you may wish to add them for visual effects. Some of the many visual lighting effects available are lens flares, visible lights and light rays, and light projections (where you load an image or movie and it is then "projected" into a scene.) You can also tell lights to include or ignore groups in a scene with selection sets. And you can even tell a light to *remove* light from a scene, by setting its intensity to a negative value.

6.1 Light Types

By default, all projects in EIAS Animator start out with one radial light so that you won't be left in the dark. There are six types of lights available in EIAS Animator:

- Camera
- Parallel
- Radial
- Ambient
- Spot
- Tube

Camera. This type of light simulates a point light that is attached to the camera itself. It is radial in nature (in that all beams of light from this source emanate from it's center).

Parallel. This type of light simulates a light placed an infinite distance away. The light rays are parallel, providing an even illumination. Use this type for sunlight, stars, etc. This is the best light source for illuminating flat shaded scenes.

Radial. This type of light (the default) simulates artificial lights, by nature of the way the rays emanate radially, like the spokes of a wheel, from the center of the light. The light has no sense of direction, just location and dropoff.

Radial lights can also be set to be dark lights. When a dropoff other than zero is specified in the Dropoff edit box (see below), a negative intensity can be used in the intensity box to create a subtractive lighting effect. Whatever color is specified in the Color Button (see below) will be subtracted from the scene.

Ambient. This type of light simulates a non-directional, overall illumination, much like you would see on a cloudy day. It is normally used so that objects don't shade to absolute black.

An ambient light, as with all lights (except for dark lights), adds more light to the scene. This can result in images appearing to be overexposed. To compensate for a strong ambient light, drop the intensity value of your other lights accordingly. It takes some practice, but the ambient light can add tremendous realism to a scene when used properly.

Spot. This type of light simulates a directional, limited area light, placing a pool of light over a specified area. The pool is circular in nature, and the lights contain several different variables, such as an inner and outer cone size (note that the inner cone is always smaller than the outer cone), which controls the umbra and penumbra of the light. The dropoff distance of the spotlight can also be set, as well as whether or not the effective drop-offs are calculated linearly or logarithmically.

Spotlights can also be set to be dark lights. When a dropoff other than zero is specified in the Dropoff edit box (see below), a negative intensity can be used in the intensity box to create a subtractive lighting effect. Whatever color is specified in the Color Button (see below) will be subtracted from the scene.

Tube. This type of light simulates artificial lights from a tube-like source. A tube light is basically an elongated radial light (its length can be adjusted) which, when used as a fog or glow light, can create visual effects such as fluorescent bulbs or laser beams.

Adding Lights

Typically you will use many lights in a scene to achieve a desired effect. There are two ways to create new lights in a project:

- Lights can be added by choosing **Object>Add Light**
- Existing lights in a scene can be duplicated

To add a light to a project from the Object menu:

1. Choose **Object>Add Light**
2. Click and place the light into the scene
3. Drag the light into the desired position

To duplicate an existing light:

1. Select the light to be duplicated in either the project window or world windows
2. Choose Edit>Duplicate (command-D)
3. Drag the duplicate to the desired position

6.2 Light Information Window Anatomy

Like all Info windows in EIAS Animator, the Light Info Window can be accessed using any of the following methods:

- Double click on the light in the World View or Camera Windows
- Double click on the light name in the Project Window
- Choose “Light Info” from the Object menu, with the light previously selected

Figure 6.1 shows an illustration of the Light Info Window. To the left of the Light Info Window is the Light Type pulldown menu and a series of check boxes. To the right are a series of named configuration tabs, each containing the controls and functions indicated by the name of the tab. To select a tab, just click on it to bring it forward.

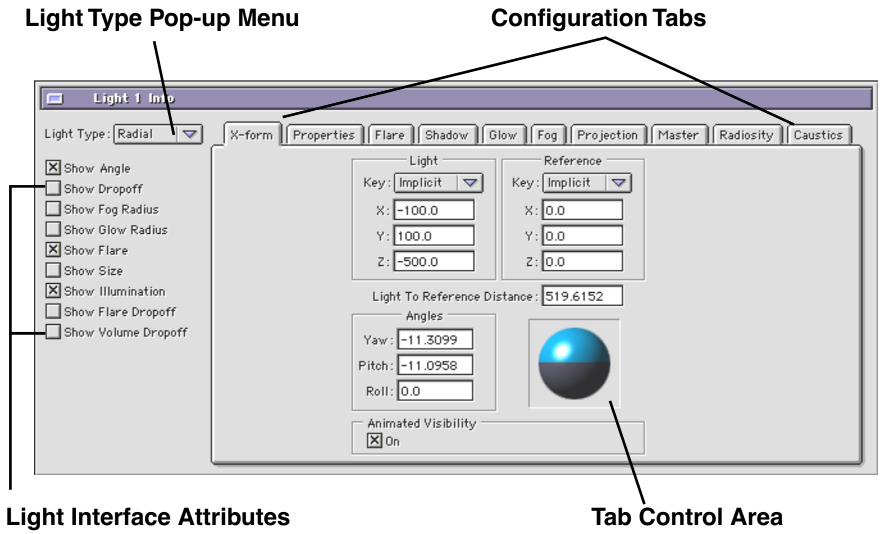


Figure 6.1 — **Light Info Window**

The Light Type popup menu allows you to select the type of light you want this light to be, and the eight check boxes activate interface representations of specific attributes within the world view and camera view windows. The checkboxes allow the user to have quick visual feedback regarding the parameters of the lights sources without having to render out scenes. You can use the checkboxes while setting up a scene but only activate those attributes needed, as turning on too many at the same time can clutter up your view windows.

Light Display Options

The following light interface attributes are available:

- SHOW ANGLE
- SHOW DROPOFF
- SHOW FOG RADIUS
- SHOW GLOW RADIUS
- SHOW FLARE
- SHOW SIZE
- SHOW ILLUMINATION
- SHOW FLARE DROPOFF
- SHOW VOLUME DROPOFF

Show Angle. This check box option enables the display of the light's spotlight and/or shadow cone angle in the World View windows. The cone angle projection emanates from the center of the light toward the direction indicated by the reference point of the light. It will project four lines which define the maximum area of the cone as indicated in the Inner Cone and Outer Cone edit boxes, discussed below.

Show Dropoff. This check box option enables the display of the light's dropoff value when the light is selected. A simple wireframe sphere primitive will be used to represent the area of the dropoff of radial lights. Spotlights will show a clipped disc primitive inside the area of the spotlight cone, regardless if the SHOW ANGLE checkbox is active. Tube lights will show a tube-shaped primitive surrounding the light controls. Parallel lights do not support dropoff. Dropoff will not be shown for camera lights.

Show Fog Radius and Show Glow Radius. These check boxes enable the display of the light's fog and glow radii when the light is selected. The display primitive is the same as for SHOW DROPOFF.

Show Flare. This check box option enables the display of the light's flare in the Camera View window if the lens flare is active for the light. Display of the flare in the interface is not affected by the FLARE DROPOFF value.

Show Size. This check box option enables the display of the light's size when the light is selected. The same primitives will be used as SHOW DROPOFF.

Show Illumination. Show Illumination (defaults on) can be used to control which lights in your scene are used during OpenGL drawing. When this check-box is turned off, the light will no longer be used to shade in the View window. However, Camera will still use the light when it renders.

You can create light sets and turn their Show Illumination check-boxes on and off in groups to manage your drawing speed. OpenGL can only use eight lights at a time. It renders the scene with the first eight lights, if there are more than eight, the scene must be re-rendered and added to the first rendering. Each of these rendering passes eats up a lot of time. The Show Illumination check-box can be used to determine which lights and how many lights get used by OpenGL. Please keep in mind that one light is always reserved by the drawing engine for lighting the light and camera widgets. Therefore, the first OpenGL pass really consists of the first seven lights in your scene.

Show Flare Dropoff. This checkbox draws the Flare dropoff primitive in the world view and camera view windows when the light is selected, and represents the furthest distance from the light that the lens flare effect will be visible. You can access installed lens flares through the Flare tab in the Light Info Window.

Show Volume Dropoff. This checkbox draws the volume dropoff primitive in the world view and camera view windows when selected. The volume dropoff compensation will occur inside of the dropoff extent. The volume drop off setting is an edit box located in the properties tab of the Light Info Window.

Light X-Form Tab

The light x-form tab contains transform information for the light. This tab is broken down into four sections:

- Light Section
- Reference Section
- Roll, Pitch and Yaw Angles Section
- Roll Control
- Animated Visibility

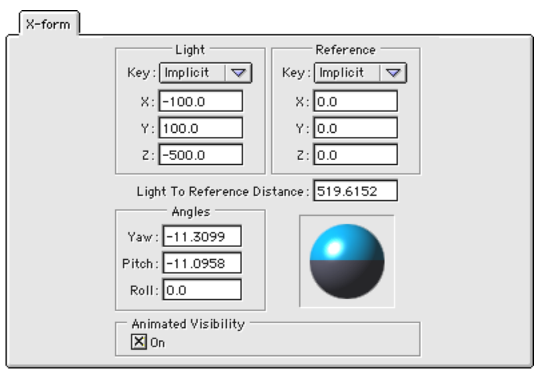


Figure 6.2 — **X-Form Tab**

Light Section. The light section contains the Key popup menu (for controlling motion interpolation) and three position edit boxes. These edit boxes list the current position of the light, in X, Y, and Z coordinates, which can be changed by you at any time.

Reference Section. The reference section contains the Key popup menu (for controlling reference point interpolation) and three position edit boxes. These edit boxes list the current position of the reference point, in X, Y, and Z coordinates. You can also expressly set the camera to reference distance in the edit box.

Roll, Pitch, and Yaw Angles Section. The light can also be controlled through more traditional roll, pitch and yaw edit boxes, and are expressed in degrees. The order of the boxes is actually presented as Yaw (X), Pitch (Y) and Roll (Z), and equates directly to X, Y, and Z.

Roll Control. The roll control is interactive, and can be dragged to create roll angles. Its presentation is reminiscent of the roll indicator found in aircraft avionics.

All of the numeric values presented in the edit boxes are dependent upon the editing mode set in the project window, and if the animate flag has been set for the camera object or a particular channel for the camera object.

In **Index** mode, changing the values updates the value for the current keyframe you are editing. Index mode only allows for the editing of previously generated key frames, rather than for creating new ones, so it is only possible to alter an existing keyframe while in index mode.

In **Frame** mode, changing the values in the x-form window creates a custom frame with those new values. Custom frames have an underline mark below their values in the project window. Custom frames are not affected by the interpolation and velocity of the frames around them. They are fixed values which will be implemented without regard to any other key frames. If you can picture a smooth curve, custom frames are like spikes jutting out from the curve. They have no regard for the curve itself, or its shape (velocity). They simply pop to their value, and then return back to the curve when done.

In **Keyframe** and **Time** modes, changing the values in the x-form window either creates a new keyframe (if none exists at the current frame), or updates the values of an existing keyframe.

EIAS Animator can display keyframe values in either **Implicit**, or **Explicit** values. Implicit is the way that EIAS Animator has always displayed vectorized quantities. When the camera is set to implicit, dragging the light in a window controls two of its positional measurements. The velocity is computed as a composite of these two vectors. For instance, by dragging a camera in the top view window, the X & Z coordinates will change, in the Front View the Y&X, and the Side View the Y&Z coordinates. Implicit controls always function on all axes simultaneously.

When a light is set to explicit positioning, it is possible to control the values and velocity for all 3 components of motion (X,Y,Z) independently in the function curve editor.

Animated Visibility. This checkbox controls the existence of the light for every frame of the animation. For more information see “Animated Visibility” on page 331.

Properties Tab

The Properties tab contains the basic illumination features of the light. This tab is broken down into a variety of sections, depending upon which light type is selected.

Common Attributes to All Lights:

- Light Color Swatch
- Intensity Edit Box
- Size Edit Box
- Volume Dropoff Edit Box
- Enable Highlight Check Box
- Enable Illumination Check Box
- Illumination List

Light Color Swatch. This swatch selects the color of the light at the current keyframe, frame or point in time (depending on the editing mode in effect). When the color button is clicked, the Color Picker comes forward for color selection. The color button will then change to the color of the light, and the light icon will change to the new color in the world view windows.

Intensity Edit Box. This edit box contains a value for the brightness of the light at the current keyframe, frame or point in time (depending on the editing mode in effect). The default intensity is 1. If it is necessary to increase the brightness of the light, then the Intensity value should be greater than 1. If a “dark light” effect is required (where light is subtractive rather than additive), then a negative value should be entered into the box.

Size Edit Box. This edit box contains the value for the size of the light (in world units) at the current keyframe, frame or point in time (depending on the editing mode in effect). The default is 0.0, which means that the light is infinitely small (effectively, a point.) The size value can be used by lens flares for scale control, and for soft ray-traced area shadows, where the size of the light is used for the area shadow calculation.

Volume Dropoff Edit Box. The Volume Dropoff setting is used to improve the look of both glow and fog lights. The purpose of this feature is to prevent spotlight beams from washing out surfaces which they intersect. The illustration below clearly shows the benefits of using volume dropoff. Most would argue that the image on the right appears more natural than the one on the left. With the exception of enabling the volume dropoff feature for the image on the right, both images use identical values. There is no significant render time penalty to use the volume dropoff feature.

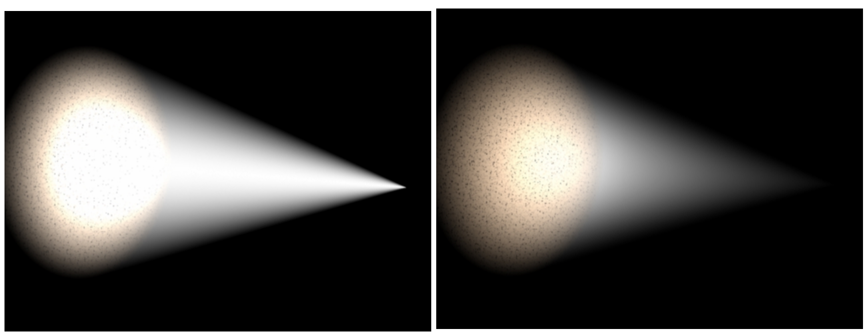


Figure 6.3 — **To the left, Volume Dropoff is disabled, to the right image Volume Dropoff is enabled. All other values are the same.**

Smaller values set the dropoff towards the light source, larger values set the dropoff closer to the illuminated object. The Volume Dropoff value represent distance in scene units. Using the ruler bars (command-m) will help to choose the best distances.

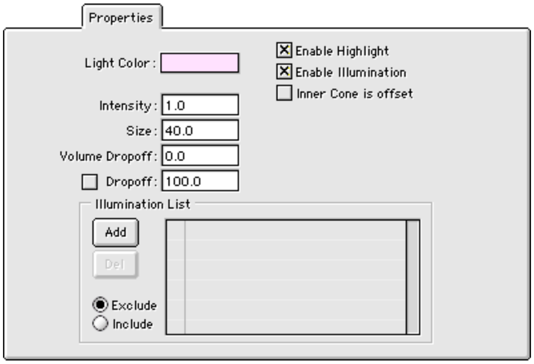


Figure 6.4 — **Properties Tab**

Dropoff values visible inside of the glow or fog regions will appear as a parabolic mach band within the region. This effect is similar to seeing a spotlight beam focused in smoke. If this effect is undesirable, increase the dropoff value beyond the range of the glow or fog region. The effect will no longer be visible.

Enable Highlight Check Box. This check box will enable the light to cast a highlight reflection, or specular on any object in the scene, unless the object is on the exclude illumination list, or not present on the include illumination list.

Enable Illumination Check Box. This check box will enable the light to illuminate any object in the scene, unless the object is on the exclude illumination list, or not present on the include illumination list.

Additional attributes of Camera, Radial, Spot and Tube Lights:

- Dropoff Edit Box
- Dropoff Enable Check Box

Dropoff Edit Box. This edit box contains a value for the dropoff distance of a light at the current keyframe, frame or point in time (depending on the editing mode in effect). Dropoff is not available for parallel lights or ambient lights. You can use the rulers (command or control “m”) to see the actual scale of your scene, and to determine the dropoff distance you would like to use. To view the dropoff in the world view windows, click the **Show Dropoff** check box in the Light Interface Attributes section.

Dropoff Enable Check Box. This check box will enable the dropoff shading feature for the light. If this checkbox is off, but the show dropoff check box in the interface attributes section is on, no dropoff will be shown in the interface.

Additional attributes of Spotlights:

- Inner Cone is Offset Check Box
- Factor Edit Box
- Outer Cone Edit Box
- Inner Cone Edit Box

Inner Cone is Offset Check Box. This check box lets you create a great looking spot light cone by typing in just one value instead of two. When you enable this option, an edit box will appear to set the offset distance. 5 ˚ is a good value for starters, but feel free to experiment. Once enabled, whenever you set the outer cone of the spotlight, the inner cone will adjust to its new value based upon the offset that you provide.

Factor Edit Box. This edit box contains a value for the rate at which the spot light falls off between the inner and outer cones. The default is 1.0, which provides an even transition. A higher number creates a sharper transition.

Outer Cone Edit Box. This edit box contains a value for the outermost diameter of the area illuminated by the spot light. The area outside the outer cone will not be illuminated by the light. The area between the outer and inner cones is a transition area between full illumination and none.

Inner Cone Edit Box. This edit box contains a value for the diameter of the area receiving the full illumination of the spot light. The light falls off between the inner and outer cones.

6.3 Illumination Lists

Illumination lists provide a way to control which objects receive light from a particular light source. They are common to all light types. Which objects receive or are excluded from the illumination of a particular light source are determined by selection sets.

Adding Illumination Lists

To add an illumination list to the light, use the following method:

1. Click the Add button
2. Select the set from the list window that appears
3. Click the Add button in the list window

You will now see the name of this selection set listed in the Illumination List window.

Enabling/Disabling Illumination Lists

Sets in the Illumination lists are enabled or disabled by clicking on the solid circles to the left of their names (defaults to enabled.) Once clicked, the circle becomes hollow, indicating that the set member will be ignored. This feature works in the same manner as the checkboxes to the left of each group name in the project window.

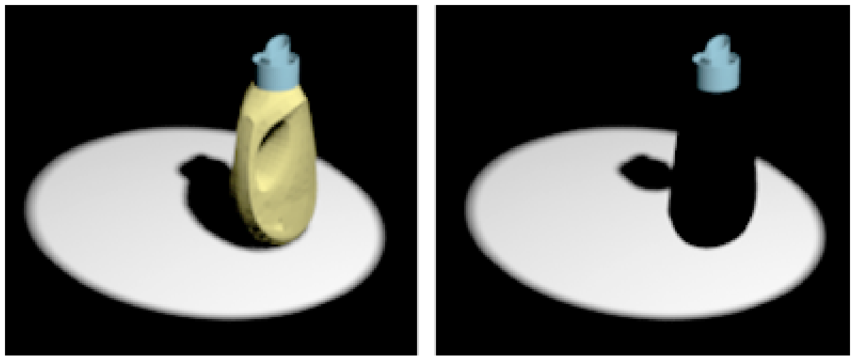


Figure 6.5 — **Light exclusion example**

Illumination Lists and Light Behavior

Once you assign an illumination list to a light, the light "sees" only those items contained within the selection sets listed for the specified behavior. If the Illumination List is set to be excluding, then those selection sets in the illumination list are not lit by the lightsource. All other objects in the scene will be lit normally. If the Illumination List is set to be including, then only those items contained within the selection sets will receive illumination from the lightsource. All other objects in the scene will be ignored by the light.

Lights can only offer include or exclude behavior, regardless of the number of selection sets within the illumination list. Behaviors cannot be mixed and matched. If such is desired, you would need to create a new light with the corresponding selection sets and settings.

Flare Tab

The flare tab contains all of the parameters to control lens flares for the lightsource. Installed lens flares are available from the popup Flare menu (flares are plug ins and need to be installed into the EI Sockets folder to be available to a project.)

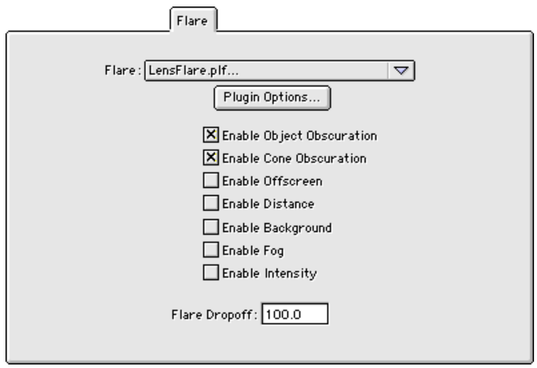


Figure 6.6 — **Flare Tab**

There are several options which relate to all lens flare plug-ins, regardless of the manufacturer:

- Flare Selection Pop-up Menu
- Plug-in Options Button
- Enable Object Obscuration
- Enable Cone Obscuration
- Enable Offscreen
- Enable Distance

- Enable Background
- Enable Fog
- Enable Intensity
- Flare Dropoff Edit Box

Flare Selection Pop-up Menu. This menu allows you to choose the desired lens flare plug-in for the light. Only one lens flare per light is allowed.

Lens flare plug-ins will be available only when properly installed in the EI Sockets directory.

Plug-in Options Button. This button will activate the configuration dialog for the selected lens flare.

Enable Object Obscuration. Causes flare to dim as the light is covered by a group. Light size is determined by the **Size:** edit box in the Light Info window.

Enable Cone Obscuration. Causes the flare brightness to change as the spotlight cone moves through the camera's view. Takes into account the brightness of the inner and outer cone of the spotlight.

Enable Offscreen. This checkbox enables the flare to gradually diminish as the origin of the flare moves off screen. With this option on the flare behaves as the real photographic artifact behaves. The lightsize setting in the Properties tab is used to control the effect.

Enable Distance. This checkbox enables the flare to diminish over distance. The lightsize setting in the Properties tab is used to control the effect.

Enable Background. Allows the lens flare to "glow behind" all objects in the shot. As such, this feature ignores the Enable Obscuration setting. You can add some dramatic backlighting effects to your scene with this feature.

Enable Fog. Causes the flare intensity to diminish as the flare moves into the fog (the fog feature is available in the World Info Window.)

Enable Intensity. Uses the Light intensity setting to calculate the flare intensity. The Light intensity setting is available in the Properties tab. The Dropoff setting for the light will effect the lensflare if this setting is active.

6.4 Shadows

The shadow tab is used to control the shadow properties for the light. All lights can cast shadows. There are two different types of shadows offered in EIAS Animator:

- Depth Buffer Shadows
- Raytraced Shadows

Depth Buffer Shadows

Depth buffer shadows are very fast to calculate and render. They are soft and less defined along the edges than raytraced shadows. Depth buffer shadows required much more setup effort than raytraced shadows, and are also less accurate. As such, numerous controls are implemented to allow you to “fine tune” the depth buffer shadows for better results.

Raytraced Shadows

Raytraced shadows are very slow to calculate and render. They are very sharp along the edges, unless the soft shadow option is enabled (which adds even more render time.) Raytraced shadows are very accurate, and are very easy to setup and use. Essentially, there is no setup involved, with the exception of activating them. For soft raytraced shadows, just a little more effort involved, as will be discussed in a following section.

Note *Neither shadow type will motion blur with the motion vector blur setting enabled. If you need your shadows to be properly blurred, you will need to use the multi-frame blur setting, or a combination of multi-frame and motion vector.*

Depth Buffer Shadow Tab

The shadow tab contents will change depending upon the setting of the shadow type pop-up menu. This section will cover depth buffer shadow settings. The following attributes are available to depth buffer shadows:

- Enable Shadow
- Outside Buffer Area in Shadow
- Calculate Shadow Only Once
- Buffer X Resolution
- Buffer Y Resolution
- Shadow Color
- Gap
- Softness
- Samples
- Transition
- Smoothing
- Darkness

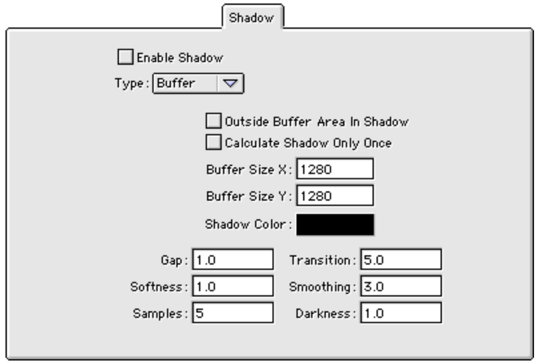


Figure 6.7 — **Shadow Tab showing depth buffer shadow attributes**

Enable Shadow. This check box option enables the light to cast shadows.

Outside Buffer Area in Shadow. This check box option, when enabled, causes the entire area of the image outside the outer cone angle (specified in the Outer Cone edit box) to be rendered in shadow (simulating the effect of a real spotlight).

Calculate Shadow Only Once. This check box option, when enabled, causes the shadow image to be calculated only once, as it appears in the initial frame of an animation. This feature saves rendering time when the shadow image does not change during an animation (such as when only the camera is moved).

Buffer X Resolution. This edit box contains a value for the shadow buffer X resolution. The larger the buffer size, the greater the rendering detail for the shadow, however greater memory is required to render the shadow. The default is set to 1280 pixels square, which creates good looking shadows. This setting uses 6.5 mb of RAM.

Buffer Y Resolution. This edit box contains the Y buffer resolution for the depth buffer shadow. You can create non-square shadow buffers to suit your needs. Often, too much space is wasted in a shadow buffer. By allowing a non-square shadow buffer, you can orient the light position to maximize the buffer usage.

Shadow Color. This swatch allows you to use the color picker to set the color of the shadow. Shadows on earth are rarely black, unless induced by artificial lighting.

Gap. This edit box contains a value for the minimum distance between a surface casting a shadow and the point at which a shadow first appears.

Softness. This edit box contains a value affecting how the shadow's edge appears. The larger the value, the softer or fuzzier the shadow's edge will appear. A value of 1 creates fairly crisp shadows.

Samples. This edit box contains a value for the number of shadow samples per pixel. A larger value reduces the noise around the edge of a shadow but takes longer to render.

Transition. This edit box contains a value for the fade-in distance between a surface casting a shadow and the surface upon which the shadow appears.

Smoothing. This edit box contains a value for the softness of shadow edges when viewed up close. Longer values can reduce the stair step of shadow edges, but can also cause shadows to appear further away from the surfaces which cast them.

Raytraced Shadow Tab

The shadow tab contents will change depending upon the setting of the shadow type pop-up menu. This section will cover Raytraced shadow settings. The following attributes are available to raytraced shadows:

- Enable Shadow
- Dropoff Section
- Soft Shadow Section
- Optimize Shadow Generation

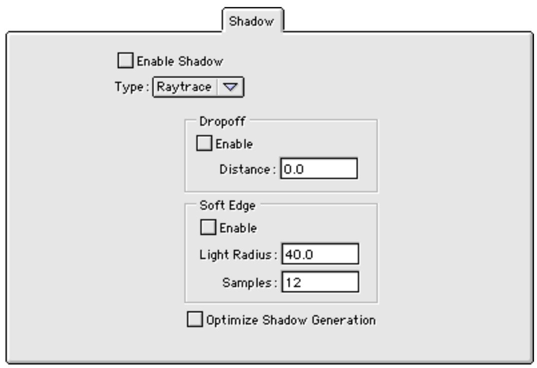


Figure 6.8 — **Shadow Tab showing raytraced shadow attributes**

Enable Shadow. This check box option enables the light to cast shadows.

Dropoff Section. This section contains controls to enable the dropoff value of the raytraced shadow. There are two controls, the Enable check box, and the distance edit box. To activate dropoff, click in the enable check box. Add a dropoff distance in scene units.

Soft Edge Shadow Section. This section contains controls to enable the soft area shadow effect. To enable soft shadows, click in the enable box. The samples edit box allows you to set the number of samples that will be applied to the shadow. Higher numbers in this edit box will result in significantly longer raytrace times, as the number of samples is then squared and scattered over the area of the light (as determined by the light size attribute in the Properties tab.)

There is a direct relationship between the Lightsize attribute and the samples edit box in this section. Larger lights may require higher samples for accurate shadows. Smaller sample values may produce artifacts such as noise, and can be especially noticeable around the edges of the shadow boundary.

To improve the performance of the soft shadows, we suggest that you always use a spot light just large enough to capture the shadow casting objects. If you need the look of a radial light, use a duplicated spot light with a negative light intensity (and no shadows enabled) to cancel out the illumination of the shadow casting spot light. Then use the radial light with shadows disabled.

Turn down the samples value from their defaults. Try 6 or 7 on smooth surfaces. If your surfaces have some bump then the samples can be turned down even further as the bump will cover up any sample grain.

Turn off Cast Shadow for any ground plane. Turn off Receive Shadow for any glass objects.

If you are using mirrors or chrome (100% reflective) surfaces, disable Receive Shadows. Anything 100% reflective will not show any shadows. While this may not be “photorealistic” it can improve performance without changing the look of the scene very much.

Note *Parallel lights cannot be used to create soft-edged raytraced shadows. They simulate a light that is infinitely small and infinitely far away. Therefore, there is no area from which to calculate the ray distribution.*

Optimize Shadow Generation. This check box enables soft, raytraced shadows to calculate sixteen times faster while producing indentical visual results. However, using this feature may produce artifacts such as small squares which are different than the surrounding pixels in the image. If you encounter artifacts, then disable this feature.

Soft shadows are very effective, but they extract a tremendous time penalty, especially when you consider just how fast the rendering engine really is. Should you need soft shadows, depth buffer shadows may be a better choice, especially if you are creating a long animation sequence.

6.5 Special Lighting Effects

EIAS Animator offers an impressive array of special lighting effects. These lighting effects can be used to convey a variety of different moods in your scenes. They can also be used for specific effects such as laser beams or streak effects. Available special lighting effects are:

- Glows
- Fog
- Volume Shadows
- Light Rays
- Smoke Effects
- Projector Light Effects

Glows. Effectively, the glow properties enable your light to be *visible* in the scene. With this feature, you are not required to create a model of your light, as you are creating an actual glowing light, When combined with lens flares, this effect is especially powerful.

Important Rendering Note The glow property of a light is not compatible with transparent objects, or material attributes which use the transparency pipeline, such as clip maps. Do not use effects which rely on the glow light, such as those effects in this section (except for projector lights without light rays) when the scene also includes transparent object or material effects.

Fog. Fog is essentially the glow feature, but instead of the light being added to the scene, it is averaged into the scene instead. Light-based fog is different from the environmental fog found in the World object. Environmental fog is global, and does not produce volume shadow effects.

Important Rendering Note The fog property of a light is not compatible with transparent objects, or material attributes which use the transparency pipeline, such as clip maps. Do not use effects which rely on the fog light, such as those effects in this section (except for projector lights without light rays) when the scene also includes transparent object or material effects.

Volume Shadows. Volume shadows are shadows that are cast through a glow or fog light region, or through a smoke object. Volume shadows resemble beams of sunlight shining through the clouds.

Volume shadows rely on the glow and fog properties of lights to produce results. Transparent objects, and material attributes which use the transparency pipeline (such as clip maps) may not be compatible with volume shadows.

Light Rays. Light rays are like volume shadows, except that instead of casting shadows, light is cast instead. This makes the object appear to be generating shafts of light.

Light rays, like volume shadows, rely on the glow and fog properties of lights to produce results. Transparent objects, and material attributes which use the transparency pipeline (such as clip maps) may not be compatible with light rays.

Smoke Effects. Smoke effects take advantage of a smoke object volume. Smoke effects are best used if you need to see smoke billows and tendrils. If you prefer more of a blanket of smoke, to where the amount of smoke is even and you do not see definition to the smoke, then stick with glow or fog lights alone, as they will render significantly faster.

Smoke effects are visible only inside the cone of a spotlight with the glow or fog properties enabled.

Projector Light Effects. Projector lights are similar to volume shadows, except that instead of a streaked volume shadow, the image loaded into the projector light is substituted. This is great for simulating a movie projector in a theatre, or stain glass windows in a cathedral. Simpler effects can also be accomplished, such as the pattern of a flashlight beam.

Projector lights which are set up to use volume shadows or light rays rely on the glow and fog properties of lights to produce results. Transparent objects, and material attributes which use the transparency pipeline (such as clip maps) may not be compatible with projector lights using volume shadows.

Important Glow and Fog Rendering Note

All of the visible lighting effects, that is, effects which rely on glow or fog properties of lights to produce their results, should not be used with transparent or clip mapped objects. Volumetric glow effects and transparency materials and effects (clip maps use the transparency pipeline in the rendering engine) are not compatible for a variety of technical reasons, and can cause strange artifacts to occur.

Some alternatives to these limitations are:

- Render your scene in layers, inserting the glow effects on a layer other than transparent objects and objects with transparency or clip maps
- Use material glow effects (which is an image processing effect) instead of glow lights, which are volumetric. Material glow effects are applied after the image is rendered, and thus bypass the incompatibility (although these glows will not be visible in raytraced reflections or mirror maps)
- Use lens flare effects (which is an image processing effect) instead. These effects are also applied after the image is rendered, and like material glow effects are not visible in ray traced reflections or mirror maps
- Use geometry and transparency edge settings, along with luminance channel settings, to simulate glows with actual models in the shape of the desired glow. This method is a bit “old fashioned” but works well.

Glow Tab

This tab contains all the information to control the glow properties of your light source.

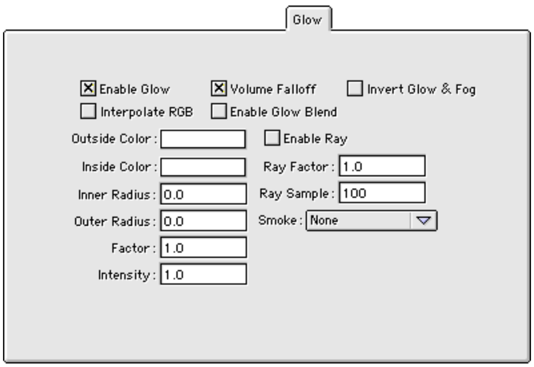


Figure 6.9 — **Glow Tab**

The following attributes are available on the light glow tab:

- Enable Glow
- Volume Falloff
- Invert Glow & Fog
- Interpolate RGB
- Enable Glow Blend
- Enable Ray
- Outside Glow Color
- Inside Glow Color
- Inner Radius
- Outer Radius
- Factor
- Intensity

- Ray Factor
- Ray Sample
- Smoke Volume Selector

Enable Glow. This check box option enables the glow effects for the light.

Volume Falloff. The Volume Falloff checkbox enables the volume dropoff value in the Properties tab to be used when shading the glow region. *For more information, see “Additional attributes of Camera, Radial, Spot and Tube Lights:” on page 179.*

Invert Glow & Fog. This feature will invert your light rays and other glow and fog light effects. For example, instead of your logo casting shadows within your light beam, you can have the logo actually ***cast*** the light beam for streak effects.

Interpolate RGB. The default color interpolation method for the glow attribute is HSV color space (hue, saturation and value.) This option will allow you to change the interpolation method to RGB color space (red, green and blue). HSV is a more natural form of interpolation, and will maintain the brightness of the colors in the glow region as the glow is rendered. RGB is a more linear form of interpolation. When a glow region is calculated with RGB interpolation, the color values will dim and get muddy, and the brightness factor will decrease in this space. HSV brightness values will remain constant throughout the region.

Enable Glow Blend. As glows are an additive process, when one glow region intrudes into another, the area of intersection will be brighter than the areas of glow outside of the intersection. While physically accurate, this look may not be what you are after. The Enable Glow Blend feature will not brighten the area of intersection, but rather just blend them together (as would occur in an averaged process.)

Enable Ray. This check box activates the light ray feature.

Outside Glow Color. This swatch opens the color editor to select the color at the edge of the glow. If the outside color is different than the inside color, a blend will occur between the two.

Inside Glow Color. This swatch opens the color editor to select the color at the center of the glow. If the inside color is different than the outside color, a blend will occur between the two.

Inner and Outer Radius. These edit boxes contain values for the size of the effect. Within the inner radius it is opaque; the outer radius is where it becomes clear. To see these radii in the World View windows, enable the Show Glow Radius check box in the interface attributes section of the light info window.

Factor. This edit box indicates the rate (default is 1) at which the glow will drop off between opacity at the inner radius and transparency at the outer radius. It is an exponential function, and the higher the value, the greater the rate of drop off to the outer glow radius.

Intensity. Intensity controls the density of the inner glow radius. A value of 0.5 in this edit box will result in a glow of 50%.

Ray Factor. To decrease the darkness of the rays, enter a value between 0 and 1 in the Ray Factor edit box—the smaller the number, the lighter (or with less contrast) the rays. The Ray Factor value defaults to 1.0, which produces very dark (high contrast) rays.

Ray Sample. This attribute controls the grain present in the rays, enter a value in The Ray Sample edit box. The value in this edit box determines how many samples are taken to calculate the streak intensity through the cross-section of the spotlight cone. Increasing the value reduces grain in the rays (at the expense of processing speed, however).

Smoke Volume Selector Pop-up Menu. The Smoke pop-up menu is used to assign a smoke object to the light for creating smoke within the cone of the spotlight. It will list all smoke objects in the scene, from which you can choose one.

Creating Glow Effects

Glow lights must be configured before they can be used. The following steps represent the typical steps involved in configuring glow attributes for a light.

To configure a glow attribute for a light:

1. Select the desired light to add the glow effect
2. Open the Light Info Window for the selected light (command or control "i")

The light info window will now open.

3. Click on the Show Glow Radius check box. This will allow you to see the area occupied by the glow region once you have entered the sizes for the inner and outer glow areas
4. Choose the Glow tab
5. Click on Enable Glow to activate the glow feature
6. Set the size of the outer glow region by typing in the desired size in scene units
7. Set the inner glow region by entering the desired size in scene units

8. Click on the outer glow color swatch

The color picker will appear.

9. Select the desired color for the outer glow. Click the OK button to accept the color
10. Do the same for the inner glow
11. Set the glow intensity. For subtle glow effects, try numbers that are less than 0.25 intensity. Numbers greater than 0.50 will appear more stylized or cartoon-like
12. Set the ray factor to determine the look of the glow transition from inner to outer radius (optional).

Once the glow attribute for a light is configured, it is ready to be used in the scene and rendered.

Creating a Volume Shadow with a Glow Light

Once you have created and configured a glow light, you can add a volume shadow or light ray to the light effect. Glow or fog attributes for a light must be enabled in order for the ray effect to be visible.

Volume shadows can be used to create natural shafts of light when applied to a glow or fog effect on a spotlight. When light rays are applied, the shaft of light will be partially blocked when it is interrupted by groups in your project. Since the shaft can be partially blocked, you can place cut-outs in front of the shaft to create shaped shadows and spots. In theatrical lighting terms, you can create gobos, cucoloris, and dingles.

Light rays do not pass through transparent groups or groups with transparency maps. This can be used to some advantage, however. A transparent (invisible) plane may be animated to cause the end point of the rays to move through space, creating exciting effects for logo work.

To create volume shadows:

1. Select the light and open the Light Info window.
2. Choose Spotlight from the Light Type pop-up menu.

This sets the light type to spotlight.

Because the light streak effect uses the shadow buffer of spotlights to function, the light mode must be set to Spot and shadows must be enabled.

3. Follow the previous steps to configure the light for a glow effect
4. Click the Enable Ray check box to enable the volume shadow effect
5. Choose a smoke object from the Smoke pop-up menu (optional)

Volume shadows will now be rendered for any object which passes through the shadow cone of the light. If you choose a smoke object, you will notice significantly longer render times.

Creating Light Rays

Light rays are volume shadows with the invert Glow & Fog checkbox enabled. When enabled, this checkbox will convert the shadow into a luminous volume, as if streaks were emanating from the object (instead of a shadow.)

Fog Tab

This tab contains all the information to set the fog properties of your light source.

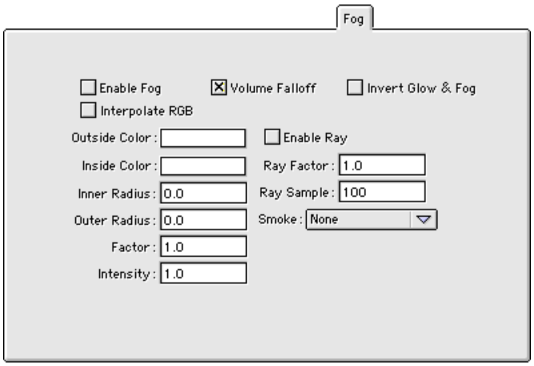


Figure 6.10 — **Fog Tab**

The following attributes are available on the light fog tab:

- Enable Fog
- Volume Falloff
- Invert Glow & Fog
- Interpolate RGB
- Enable Ray
- Outside Glow Color
- Inside Fog Color
- Inner Radius
- Outer Radius
- Factor
- Intensity
- Ray Factor
- Ray Sample
- Smoke Volume Selector

Enable Fog. This check box option enables the fog effects for the light.

Volume Falloff. The Volume Falloff checkbox enables the volume dropoff value in the Properties tab to be used when shading the fog region. *For more information, see "Additional attributes of Camera, Radial, Spot and Tube Lights:" on page 179.*

Invert Glow & Fog. This feature will invert your light rays and other glow and fog light effects. For example, instead of your logo casting shadows within your light beam, you can have the logo actually ***cast*** the light beam for streak effects.

Interpolate RGB. The default color interpolation method for the glow attribute is HSV color space (hue, saturation and value.) This option will allow you to change the interpolation method to RGB color space (red, green and blue). HSV is a more natural form of interpolation, and will maintain the brightness of the colors in the glow region as the glow is rendered. RGB is a more linear form of interpolation. When a glow region is calculated with RGB interpolation, the color values will dim and get muddy, and the brightness factor will decrease in this space. HSV brightness values will remain constant throughout the region.

Enable Ray. This check box activates the light ray feature.

Outside Fog Color. This swatch opens the color editor to select the color at the edge of the fog. If the outside color is different than the inside color, a blend will occur between the two.

Inside Fog Color. This swatch opens the color editor to select the color at the center of the fog. If the inside color is different than the outside color, a blend will occur between the two.

Inner and Outer Radius. These edit boxes contain values for the size of the effect. Within the inner radius it is opaque; the outer radius is where it becomes clear. To see these radii in the World View windows, enable the Show Fog Radius check box in the interface attributes section of the light info window.

Factor. This edit box indicates the rate (default is 1) at which the fog will drop off between opacity at the inner radius and transparency at the outer radius. The higher the value, the greater the rate of drop off.

Intensity. Intensity controls the density of the inner glow radius. A value of 0.5 in this edit box will result in a glow of 50%.

Ray Factor. To decrease the darkness of the rays, enter a value between 0 and 1 in the ray Factor edit box—the smaller the number, the lighter (or with less contrast) the rays. The Ray Factor value defaults to 1.0, which produces very dark (high contrast) rays.

Ray Sample. This attribute controls the grain present in the rays, enter a value in the Ray Sample edit box. The value in this edit box determines how many samples are taken to calculate the streak intensity through the cross-section of the spotlight cone. Increasing the value reduces grain in the rays (at the expense of processing speed, however).

Smoke Volume Selector Pop-up Menu. The Smoke pop-up menu is used to assign a smoke object to the light for creating smoke within the cone of the spotlight.

Creating a Volume Shadow with a Fog Light

The procedure to creating volume shadow effects with fog lights is exactly the same with glow lights, with the exception that you are working in the fog tab. Please see the discussion topic in the Glow section.

Projection (Map) Tab

Projection maps are controlled from this tab. Projection maps are single or multiple frame image files, which are projected along the a light's direction vector. Any light that can cast a shadow can cast a projection map. Each shadow casting light is allowed one projection map only.

Light projection maps are simpler than camera projection maps. Light projection maps can be used to simulate movie or slide projectors, bulb patterns that are common with flashlights, and so on. In fact, you can think of them as texture maps for lights. Some of the texture map controls are also used in the projection map sub-tabs, covered below.

This tab contains buttons to add and delete projection maps, and small thumbnail representation of the RGB and Alpha channels of the loaded map. This tab also contains several sub tabs:

- X-form
- Properties
- Info
- Crop

Projection Map: X-Form Tab

The Projection Map X-Form (Transformation) tab is used to control the position of the map in the light's local space. The position edit boxes control the X and Y position of the map. The scale edit boxes control the X and Y scale of the map. The Align popup menu (shown extended in the figure below) eases map alignment and fitting. They are discussed below.

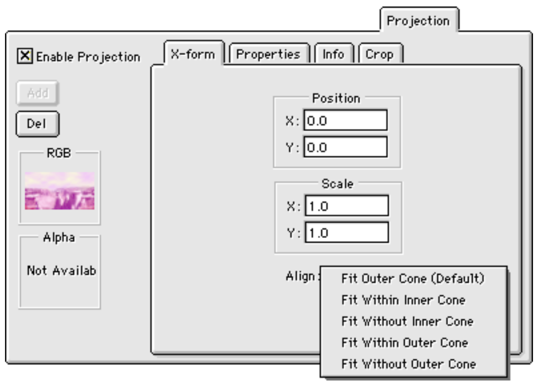


Figure 6.11 — **Projection (Map) Tab: X-Form Tab**

- Fit Outer Cone (Default)
- Fit Within Inner Cone
- Fit Without Inner Cone
- Fit Within Outer Cone
- Fit Within Outer Cone

Fit Outer Cone (Default). This option distorts the projection map to fit inside of the outer cone of the spotlight. Do not use this option if you wish to maintain the map's aspect ratio.

Fit Within Inner Cone. This option fits the rectangular extent of the projection map to the inside of the inner cone of the spotlight. The map's aspect ratio is presented without distortion.

Fit Without Inner Cone. This option fits the rectangular extent of the projection map to the outside of the inner cone of the spotlight. The map's aspect ratio is presented without distortion.

Fit Within Outer Cone

This option fits the rectangular extent of the projection map to the inside of the outer cone of the spotlight. The map's aspect ratio is presented without distortion.

Fit Without Outer Cone. This option fits the rectangular extent of the projection map to the outside of the outer cone of the spotlight. The map's aspect ratio is presented without distortion.

Projection Map: Properties Tab

The Projection Map: Properties tab is used to control the properties of the projection map. Illustrated below, the tab is divided up into several components: Tiling popup menus; Samples edit box; Blur edit box; and a series of checkboxes.

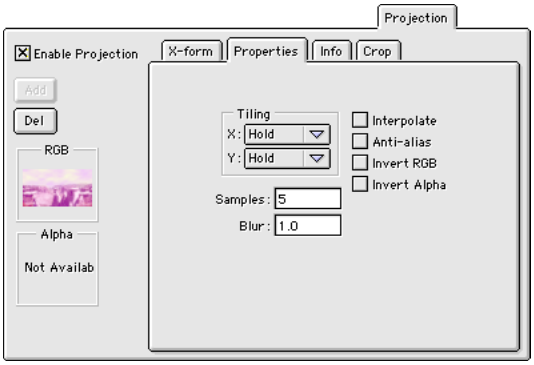


Figure 6.12 — **Projection (Map) Tab: Properties Tab**

Tiling Popup Menus. The tiling section controls the repeat functions of the map if it is scaled at less than 1.0 (scale functions are found in the Projection Map: X-Form tab.) There are four options for each popup menu:

- None
- Hold
- Repeat
- Mirror

None. Disables mirroring of the map on the specified map axis. Choosing None for both axes will cause the map to be displayed only where you positioned it, nowhere else.

Hold. Applies the colors found at the map edges outside of the actual image rectangle. (The map will appear once as positioned, with the border colors of the image extending beyond the image rectangle, covering the frame.)

Repeat. Repeats the map along the specified axis. Choosing Repeat for both axes will cause the map to repeat continuously within the cone of the light, depending upon the scale of the map.

Mirror. Mirrors the map along the specified axis. Choosing Mirror for both axes will cause the map to flip flop about both axes.

Samples Edit box. This edit box lets you determine the sampling quality of the map. The default is 5.0. Numbers greater than 5 will cause the map to be sampled more often, slowing down render time, but increasing the quality of the map. Numbers less than 5 will cause the map to be sampled less often, speeding up render time, but decreasing the quality of the map. Numbers greater than 10 might be prohibitively slow. 5 is a good default, and you will likely not need to deviate from that amount.

Blur Edit Box. This edit box lets you blur the map. The default is 1.0. This value will present the map as is. Values of greater than 1.0 will blur the map. For example, a value of 2.0 will produce a blur of two pixels for every one encountered in the map. Values less than 1.0 will sharpen the map, although it will also introduce aliasing (jagginess) into the map.

Quality Control Check Boxes

There are four check boxes which let you control the quality of the map:

- Interpolate
- Anti-Alias
- Invert RGB
- Invert Alpha

Interpolate. Enables map filtering. Necessary to avoid moire patterns in the map as it rotates off axis.

Anti-Alias. An additional level of filtering for image quality. Not always necessary, and can soften the look of the map.

Invert RGB. Negates the RGB channels of the map for special effects.

Invert Alpha. Negates the Alpha channel of the map. This feature comes in handy when you aren't sure how to design the alpha channel of the map.

Projection (Map): Info Tab

The info tab contains information about the projection map, as well as any cropping that you may have performed on the map.

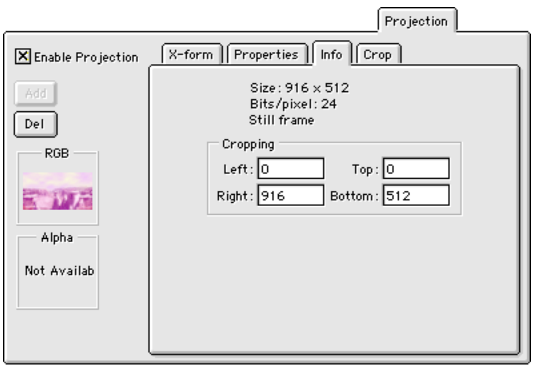


Figure 6.13 — **Projector (Map): Info Tab**

Projection (Map): Crop Tab

The crop tab displays a reduced version of the map and allows you to crop within it, so you can use just a section of the map. To crop, click anywhere on the "crawling ants" border around the edge of the map in the rectangle. Clicking on the edges of the map will drag the entire side of the map. Clicking on the corners of the map drags the corner inward. To reset the map, drag the borders to the extents of the image.

Adding Projection Maps

The process of adding projection maps to a light is straightforward. There are two different looks that you may wish to achieve, as illustrated:

- Projection maps with no additional effects
- Projection maps with volume shadows or light rays

To add a projector map with no additional effects:

1. Click on the Add button
2. Select an image file
3. Double click the file or click on the Open button

The map is now ready for use. The light will now project the loaded image, as you have configured in the previous sections.

To add a projection map with volume shadows or light rays:

1. Follow the previous steps to add an image to a light for projection
2. Configure the glow or fog sections as described in previous steps, making sure that shadows are enabled
3. Determine the effect type to use (volume shadow or streaks) and set the Invert Glow & Fog check box accordingly

These settings will allow the projected map to generate colored streaks across the scene.

6.6 Smoke

Smoke is a mathematical function generator that adds noise patterns to light rays. The noise patterns will appear to create smoke within the cone of a spotlight. To use this feature, light rays must be configured for the spotlight, as described in the previous section.

To create smoke:

1. Add a smoke object to the project.

From the Object menu choose **Add Smoke**.

2. Click and drag in one of the World View windows to place the smoke object.

The smoke object appears as a box in the View windows. The size of the box is determined by the size of the rectangle you drag when you place it. The first smoke object added to a project has a default name of “Smoker 1”. Subsequent smoke objects are numbered 2, 3, etc.

You do not need to place the smoke object in front of a light in order for the smoke effect to be seen in that light. you can therefore use the same smoke object for multiple lights. When you animate the smoke object’s position and rotation, the smoke within the cones of all spotlights to which the smoke object is assigned will appear to shift.

3. Select the light to be configured for the smoke effect and open it's Light Info window.

4. Configure the light for light rays.

- Choose **Spot** from the **Light Type** pull-down menu.
- Enable **Buffer** shadows from the Shadow tab.
- Choose **Enable Glow** or **Enable Fog** from the Glow/Fog tabs and configure the glow/fog fro color, radii, factor and intensity.
- Choose **Enable Ray** from the Glow/Fog tab.

5. Select the smoke object from the Smoke pull-down menu in the Glow/Fog tab.

The Smoke Info window, as shown below, opens.

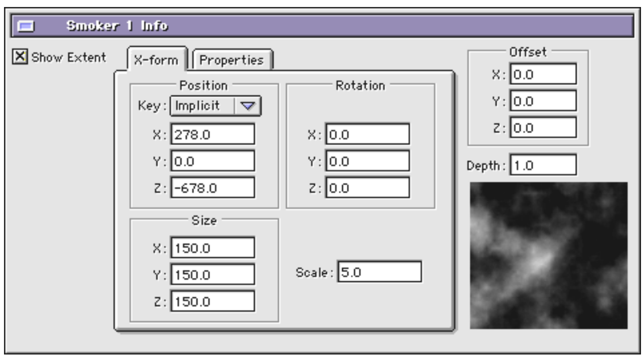


Figure 6.13 — **Smoke info Window X-Form Tab**

6. Use the controls of the window to configure the smoke to your liking.

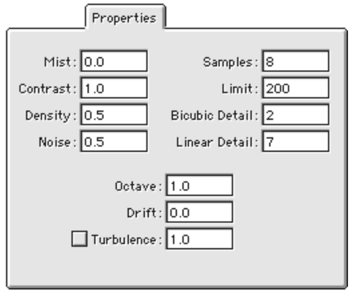


Figure 6.13 — **Smoke info Window Properties Tab**

Show Extent. This check-box option, enabled by default, toggles the display of the smoke object in the World View windows

Scale. This edit box contains a value that determines the scale at which the visible portion of the smoke effect is rendered. The greater the value, the smaller the "blobs" of smoke.

Position, Rotation and Size. These edit boxes contain values that define the smoke object's position rotation (orientation) and size in world space.

Mist. This edit box contains a value in the range of 0 to 1 that sets the ambient smoke level. A value of 0 is no ambient (rays will not show at all). A value of 1 creates a solid white smoke volume.

Contrast. This edit box contains a value that controls the contrast between the light and dark regions of the smoke.

Density. This edit box contains a value that controls how much smoke is in the unit volume. A value of 0 is a completely smokeless volume. A value of 1 causes the smoke function to be enabled throughout the volume.

Noise. This edit box contains a value of 0 to 1 that controls the detail in the smoke. Values below 0.5 give a smoother effect. Values above 0.5 add more detail to the smoke. If you increase the noise value past 0.5, try increasing the **Linear Detail** value (discussed below) as well.

Samples. This edit box contains a value that determines whether the smoke is 2-dimensional (value 1) or 3-dimensional (value>1). 2D smoke will render much faster than 3d, but if you need to move the camera through the scene, 2D smoke will appear flat.

Limit. This edit box contains a value that applies only if the Samples value is greater than 1. It limits the maximum number of depth samples to be evaluated for the smoke. Setting the value above 200 will increase the rendering time.

Bicubic Detail. This edit box contains a value that controls how many fractal levels are created using bicubic computation. Bicubic computation produces smoother areas of smoke, but at the expense of slower rendering times. The higher the value, the greater the detail in the smoke. Both bicubic and linear computation (below) can be used together.

Linear Detail. This edit box contains a value that controls how many fractal levels are created using linear computation. Linear computation produces ridge-like, horizontal and vertical areas of smoke, less "realistic" than bicubic detail but faster to render. The higher the value, the greater the detail in the smoke. Both linear and bicubic computation (above) can be used together.

Octave. This edit box contains a value that controls how many layers of turbulence appear within the unit cube of smoke. The layers default parallel the XZ axis. Changing the **Rotation** value will change this orientation.

Drift. This edit box contains a value that moves the layers through the turbulence. The range of possible values is dependent on the number of layers you create using the **Octave** setting. Plus 1.5 will move one and a half layers through the turbulence.

Turbulence. This check-box option and edit box enables a turbulence function that mixes the layers of smoke into each other. The edit box contains a value from 0 to 1 that controls how much the layers are folded into each other. A value of 0 keeps the layers separated. A value of 1 completely mixes the layers together.

Preview Window. This window is used to obtain a preview of the smoke effect that will appear in the smoke object. If the smoke is 3D, as set in the **Samples** edit box, the view will represent a slice of the smoke.

Offset. These edit boxes contain values that offset the image in the preview window. Values of 0 for the X, Y, and Z edit boxes center the image in the preview window. Scrolling the preview window will change the values in the edit boxes. Offsetting the Z value changes the depth at which the viewing slice is take.

Depth. This edit box contains a value that corresponds to the depth of the slice shown in the preview window for a 3D smoke effect.

6.7 Master Lights

Master lights are lights which control the illumination properties of other lights. Think of a master light as a light switch. Turn on the master lights, and the other lights in the "circuit" are also turned on. Dim the master light, and the other lights in the circuit dim by the same amount.

You decide which properties you want a light to inherit from a master light. The properties available for inheritance are:

- Inherit Visibility
- Inherit Intensity
- Inherit Dropoff
- Inherit Color
- Inherit Attributes
- Inherit Shadow
- Inherit Glow
- Inherit Fog
- Inherit Flare
- Inherit Projection
- Inherit Caustics

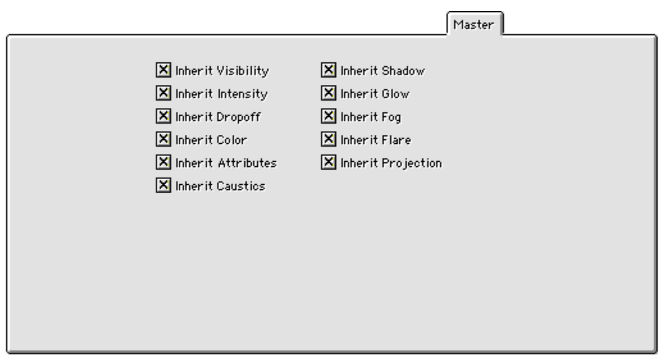


Figure 6.14 — **Master Light Tab**

Inherit Visibility. This setting allows the master light to control the visibility of the subscriber lights. If the master light is made invisible, then the subscriber light will also be invisible.

Inherit Intensity. This setting allows the master light to control the intensity of the subscriber lights. If the master light's intensity attribute is modified, then the subscriber light will also be modified.

Inherit Dropoff. This setting allows the master light to control the dropoff of the subscriber lights. If the dropoff of the master light is made changed, then the subscriber light will also be changed.

Inherit Color. This setting allows the master light to control the color of the subscriber lights. If the master light is made red, then the subscriber light will also be red.

Inherit Attributes. This setting allows the master light to control the light size and dropoff factor of the subscriber lights. If the dropoff factor or the size of the light is changed on the master light is made invisible, then the subscriber light attributes will also be changed.

If you need only the dropoff factor attribute, make sure that the light size of the master light is 0.0. If you need only the lightsize attribute, make sure that the dropoff factor is 0.0 for the master light.

Inherit Shadow. This setting allows the master light to control the shadow attributes of the subscriber lights.

Inherit Glow. This setting allows the master light to control the glow attributes of the subscriber lights.

Inherit Fog. This setting allows the master light to control the fog attributes of the subscriber lights.

Inherit Flare. This setting allows the master light to control the lens flare attributes of the subscriber lights.

Inherit Projection. This setting allows the master light to control the light projection map attributes of the subscriber lights.

Inherit Caustics. This setting allows the master light to control the caustics attributes of the subscriber lights.

Creating a Master Light

Creating a master light is different than adding or creating a master material in a project. While master materials can be loaded from external files, master lights cannot. Instead, they must be created from an existing light. That light is still used to add illumination to a scene, but it can also pass along its functions to subscriber lights. Subscriber lights can determine which attributes they wish to inherit from master lights.

Master light attributes that are passed to subscriber lights are light attribute data only. No transformations or rotations are passed within this relationship (the same as master materials). If you wish to pass along transformation information to subscriber lights, you must use the hierarchy tools to assign that relationship.

To create a master light in a scene:

1. Open the project window (command or control “l”)
2. Pick a light to designate as a master light
3. Set the light’s attributes as desired (optional, this can be done at any time)
4. Name the light appropriately (such as “dining room master”)
5. Using the label function in the project window, assign a color to the light’s name. This and the above step will help to identify the master light in the various view methods of the project window

Follow the next few steps to complete the process.

Assigning a Subscriber Light to a Master Light

Once a master light is created from an existing light in the scene, you are able to add subscriber lights to the master light. Subscriber lights can determine which attributes they wish to inherit from master lights.

To add a subscriber light to a master light:

1. Open the project window (command or control "l")
2. Choose the subscriber light
3. Pick the "Assign Master" icon in the project window menu bar
4. Select the desired master light from the object list in the project window
5. Open the light info window for the subscriber light, and choose the master tab
6. Choose which attributes you wish to inherit from the master light

The master/subscriber relationship is established between the lights. Subscriber lights can be assigned to only one master light. Master lights cannot be assigned to other master lights.

Viewing the Master Light Hierarchy

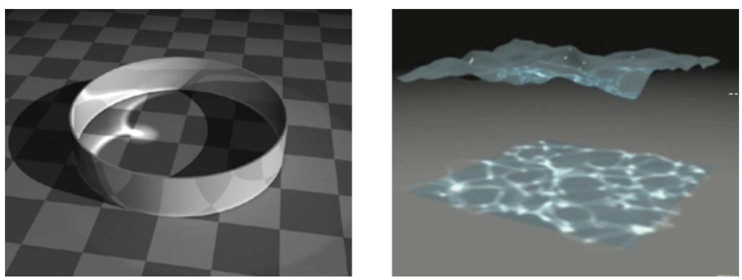
When you assign a master light, you will not see the relationship indicated in the project window, unless you have previously set the window to "View Master lights." If you need to see a visual confirmation of the relationship, then use this option. Remember, the master/subscriber relationship exists outside of the normal scene hierarchy, which allows you to parent the light to a completely different object, and still maintain the master/subscriber relationship.

6.8 Radiosity Tab

This tab contains the settings for the Radiosity intensity of the light. For radiosity information please see “Light Info Window, Radiosity Tab” on page 305.

6.9 Caustics Tab

Caustics are created when light is focused on a surface. Light can be focused by refractive (transparent) objects - wind blown water on the surface of a pool causing light ripples on the pool’s bottom. Caustics can also be caused by purely reflective objects - a metal ring casts a unique caustic on the surface upon which it sits.



a b

Figure 6.15 — **(a)Refraction Caustics and (b)Reflection Caustics**

Light sources cast caustics on to objects in the scene. Objects have separate material settings for casting and receiving both refraction and reflection caustics. For more information on the material property settings see“Materials and Texture Maps” on page 431.

Parallel, Radial and Spot lights can cast caustics. The Caustics tab contains the interface elements that enable and control the creation of caustics maps (also called photon maps).

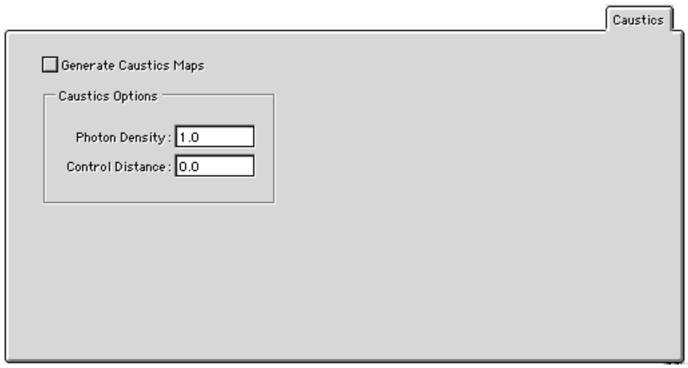


Figure 6.16 — **Caustics Tab**

Generate Caustics Map. Turn this checkbox when you want the light to create caustics. Parallel, Radial and Spot lights can generate caustics.

Photon Density. This is the number of photons that will emitted by the light per square scene unit.

Control Distance. By default (value = 0) the caustics engine automatically disperses the photons to match the size of the overall scene. One way it does this is to keep the density of photons constant throughout. In the real world, the photon density would fall off with the square of the distance from the light source. Thus, in reality caustics fade with distance from the light source. To get this ‘real world’ effect you must set a scene distance from the light source to the point where you want the caustics effect (the photon density) to be greatest. ***Note:*** This control is available for Radial and Spot lights only.

Caustics Tips

Refraction caustics are very sensitive to the index of refraction of the generating group.For example, the index of refraction of water varies with temperature and salinity. Water may have an index of 1.3 or 1.35, and the rendered results will show significant differences. You might wish to render a a test animation where you vary the index of refraction over time. This will give you a better idea of how the index is going to affect your scene.

The caustics use the light’s color multiplied by the diffuse color (for reflective caustics) or by the transparency color (for refractive caustics).

Because caustics are a ‘magnified lens’ effect, small defects in your models can translate into dramatic caustic effects. Sometimes you may want to use this to generate more interesting caustics. A little bump map may also make the caustics more impressive.

Objects that have materials set to generate raytraced transparency will always receive caustics.

To create caustics in your scene make sure at least one of the lights has caustics enabled and enable at least one of your objects to cast reflection or refraction caustics in its Material Info window.

Default material settings are set to receive refraction and reflection caustics.

6.10 Illuminators

An Illuminator is an array of lights in a Dome-like or Box-like pattern. It can be used to create natural, day-lit lighting effects.

Illuminators are added by selecting Add Illuminator from the Object menu (**Object > Add Illuminator**). Click in one of the World View windows to define the center and then drag out the desired stage radius. Release the mouse button to complete the operation. A Dome Illuminator is added to the Project window and the World View windows.

Figure 6.17 — **Illuminator in Project Window**

Note *Illuminators are drawn using the light color parameter. The default light color is white. If the background color of the World View windows is also white, you won't see the Illuminators in the windows. We suggest setting the background color of your World View windows to a light gray.*

Illuminator Light Info Window

Double clicking on an Illuminator to open up its Info window. Comparing the Light Info window for an Illuminator to one for a regular light source you'll notice that the Flare, Glow, Fog, and Projection tabs are missing. Illuminators are do not support these options.

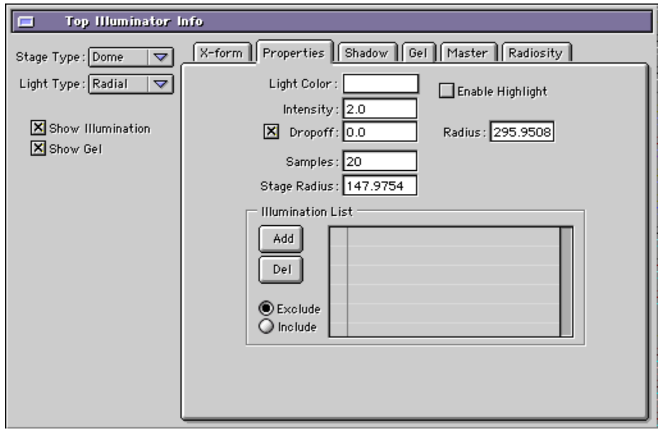


Figure 6.18 — **Illuminator Light Info Window**

Samples Illuminators are arrays of radial or parallel lights. The lights are distributed on the dome or the rectangle (depending on the Stage Type) in a random pattern. The number of individual lights that are distributed is controlled using the Samples parameter in the Properties tab of the Info window.

Stage Radius The Stage Radius controls the overall size of the Z-buffer shadow that is optionally cast by the Illuminator. You can go into the Shadow tab and set the usual shadow parameters. We suggest softening the overall effect of the shadows. This makes for a more pleasing effect.

You can also set the Illuminator to cast raytraced shadows. Please keep in mind that, for 20 samples, you would be adding 20 raytraced shadows to your scene. This will have an adverse effect on render times.

Each shadow cast by a sampled light falls on the center of the Illuminator stage because each of the sampled lights is pointed from their positions on the dome or box toward the center of the stage.

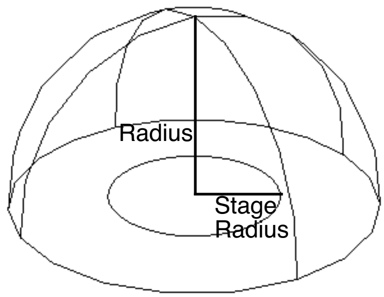


Figure 6.19 — **Dome Illuminator—As Shown in World View Windows**

Light Type You can choose to have either Radial lights or Parallel lights distributed across the surface of the Illuminator

Stage Type The Stage Type: pull-down menu to changes the Illuminator type from Dome to Box. Box lights have Height, Width, and Length dimensions that define the outer shell that the lights are distributed on. They behave in all other respects just like the Dome Illuminators.

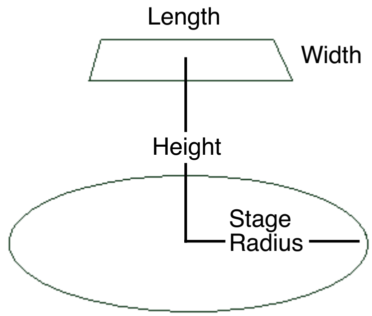


Figure 6.20 — **Box Illuminator—As Shown in World View Windows**

Gel Tab

As discussed above, Illuminators are arrays of lights. The Gel tab allows you to automatically assign colors to the lights based on the colors in a texture map. The map itself is never passed to the renderer. Instead,. the various lights in the array are given colors based on the texture.

The Gels are shown in the view windows projected onto the stage of the illuminator. This can aid in remembering which illuminator is casting which gel.

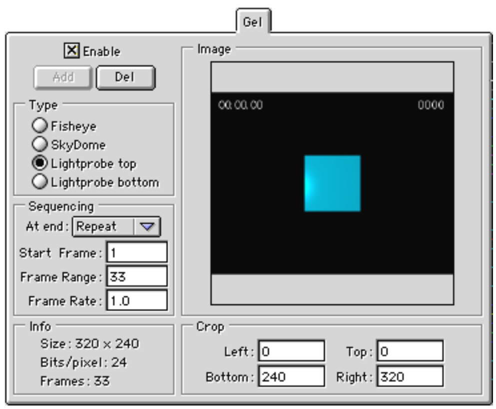


Figure 6.21 — **Illuminator Light Info Window - Gel Tab**

Enable This checkbox can be used to disable the Gel.

Add/Del Click the Add button to open a file dialog box and select the texture map, animated texture map or numbered texture sequence to use for the Gel.

You can also pick a lightprobe (.hdr) file directly. When you do this, the Center Weight exposure will be used (See “Spot Meter” on page 57.).

Fisheye This causes the Gel system to choose colors from a photograph taken with a fisheye lens.

Skydome Use this option if you have a flat map that you want to apply as a Gel.

Lightprobe Top and Bottom You can hit the Add button and select a lightprobe (.hdr) file directly. If you do this the Center Weight exposure setting will be used (See “Spot Meter” on page 57.) However, if you want to choose your own exposure setting, open the .hdr file using the View Image command (CMD-B on Macintosh CTRL-B on Windows), pick an exposure, and save the image as Longitude/Latitude (See “Convert Lightprobe” on page 55.) Then apply that map to the Gel.

Since the Illuminator is a hemisphere and the lightprobe is a full sphere, you must choose to apply the top or the bottom half of the image as a Gel.

Sequencing You can use an animated texture map or a numbered sequence of texture files as a Gel. Animator will recolor the lights in the array each frame of the animation to match the changing colors in the textures. For information on using the Start Frame, Frame Range, and Frame rate edit boxes, please See “Start Frame” on page 496.

Cropping You can select to use a portion of the map as a Gel. You can type numbers in the edit boxes or interactively drag the cropping rectangle from the edges of the image.

Using Illuminators

Because Illuminators focus their attention on a single point in your scene, the center of the stage, they are best suited for lighting a discrete object or region. One rewarding technique has been to use two Illuminators, one pointing down from above and one underneath pointing upwards. The Illuminator underneath acts to 'reflect' light back up from the stage. This Illuminator is given a lower light intensity value and a color in keeping with the object on the stage.

Backdrops, Fog and the World Info Window

7.0 Introduction

Backdrops and fog help to create a variety of locations, times of day and weather conditions. Used in conjunction with other rendering features, backdrops and fog can produce striking results. EIAS Animator puts these controls in the World object, along with background image color, scene ambient values, and global reflection maps. Unlike other objects in EIAS Animator, the world object is more like a "meta object." Rather than occupying a particular location, the world objects exists everywhere in the scene. Like other object classes in EIAS Animator, the attributes in the world object can be animated. There are more than 100 potential animation channels for the world object, and even more when you add global reflections.

The world object does not officially occupy a space. It cannot be included in a hierarchy. It has no groups included within it. The world object is listed only in the Project Window.

7.1 World Info Window Overview

The World object is included in every project, and is presented at the top of the Project Window List. Like other objects and groups in EIAS Animator, the world object has its own information window.

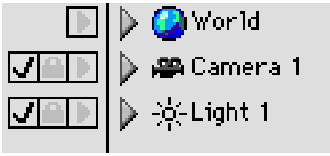


Figure 7.0 — **The World icon in the Project window**

There are two ways to access the World Info Window:

- Double click the World icon in the Project Window
- Select the World Icon in the Project Window and choose **Object>World Info** (Mac, command-I) (PC, Control-I)

7.2 Fog/Ambient/BG Tab

The Fog/Ambient/BG window contains three sections:

- Fog controls
- Ambient Color control
- Background Color control

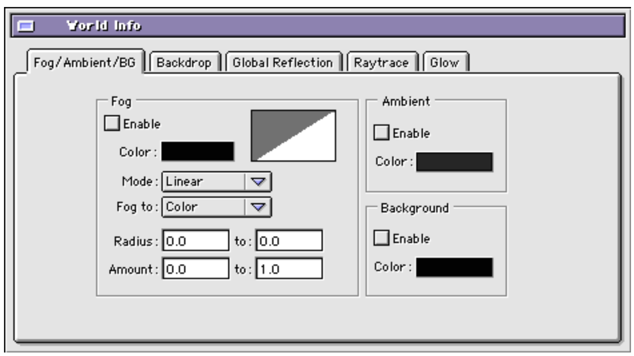


Figure 7.1 — **World info window**

The Fog Controls

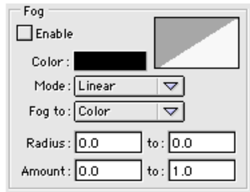


Figure 7.2 — **Fog control window**

Fog, or Fog Projection, simulates atmospheric depth cuing. Atmosphere has depth because of particles contained within it, which gives Fog the appearance of being more dense the further away it is from the Camera. While it can simulate distant haze or fog in a landscape, it does not induce atmospheric effects such as visible light shafts or shadows.

There are a number of items in the Fog Controls section:

The Enable checkbox

This checkbox enables the Fog effect. It defaults to off.

Color

Clicking this box will bring up the EIAS Color Picker. There, you can select a color for your fog.

Mode

This menu determines the type of transition that will occur between the region in which the fog effect starts, and the region in which the fog reaches its maximum density. (The fog region starts at the center of the active camera body and extends outward in all directions by the specified distance.) There are four choices under this menu:

- Linear
- Exponential
- Non Linear 1
- Non Linear 2

Linear. Linear gives an even increase in the density of the fog region. The rate in which density increase will be constant throughout the length of the fog region, as defined by the Radius boxes (below.)

Exponential. Exponential will calculate the density of the fog in a more realistic, non-linear fashion. This option renders results similar to Pixar's RenderMan® fog shader.

Non Linear 1. Non Linear 1 will calculate a gradual slope in fog density, topping out to a sharp curve. This choice amounts to a significant accumulation of fog towards the end of the fog region.

Non Linear 2. Non Linear 2 will calculate a sharper curve flowing towards the top, and then flattening out (in an arc-like fashion). The change in fog density will be greater at the beginning of the region, and change less towards the end of the region to the maximum value.

Fog To

This menu determines the type of fogging technique to be used. There are three choices under this menu:

- Color
- Alpha
- Background

Color. Color will calculate fog to the color specified in the Fog Color box. As the fog gets further and further away from the Camera, it will become closer and closer to the specified color. This is exactly the same as doing a gradient fill in a paint program, where the gradient tool is set to fade from transparent to a color. No matter what color you may have selected for a Background Color, the fog will calculate to the designated fog color.

Alpha. Alpha will calculate the fog to an alpha value of 0, which is totally transparent. When this is digitally composited over a background image, the objects enveloped by the fog will eventually fade out to the composited background.

Background. Background calculates the fog to the background color, as set in the Background Color box.

This is essentially the same as the first option, Color. The difference, however, is that while Color calculates the fog to the color designated in the fog color box, Background calculates the fog to the designated Background Color.

Radius

These edit boxes contain values that define the inner and outer fog radii of the camera. The first box represents the point where the fog will begin, and the second box designates where the fog will end. These two values are known respectively as the Inner Radius and Outer Radius.

The inner and outer fog radii are drawn in the world view windows as two discs which appear in the camera view frustrum (visible when “show angle” is selected for the camera). These discs are only visible if the camera is selected, and if Show Fog is checked in the Camera Info window.

Amount

These boxes function in essentially the same way as the fog radius boxes. However, instead of determining the start and stop points of the fog radius, they determine the opacity value of the fog at the start and stop points. These values in these boxes range from 0 to 1, with 0 being 100% transparent and 1 being 100% translucent.

While it is possible for you to enter a higher value than 1, you will not ever get a value higher than 100%, so make sure you don't enter a value of anything other than numbers between 0 and 1 in these boxes.

The first box shows the fog opacity value between the camera and the inner radius. The second number designates the opacity value at the outer radius and beyond.

The Ambient Color Controls

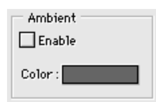


Figure 7.3 — **The Ambient Light Control**

The Ambient Color Controls set the color of global ambient light in a scene. There are two items in this section:

Enable

This checkbox enables the ambient light effect. The default is off.

Color

Clicking this box will bring up the EIAS color picker. There, you can select a color for your ambient light.

The Background Color Controls

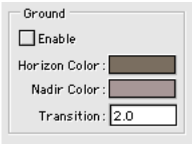


Figure 7.4 — **Ground Color Controls**

The Background Color Controls set the color of the background in a scene. When unchecked, the default black background will be rendered in your scene.

Note *The background color is actually colorizing the alpha channel of the image. If you import a 32 bit EIAS Animator file into an application such as Adobe ®Photoshop®, the background will appear black, regardless of the color you have set. This occurs because Photoshop does not support colorized alpha channels.*

There are two items in this section:

Enable

This checkbox enables the background color. The default is off, which produces a background color of black.

Color

Clicking this box will bring up the EIAS color picker. There, you can select a color for your background.

7.3 Backdrop Tab

The World Info Window contains features under the backdrop tab that procedurally generate ramped color sky and ground planes. This feature can be used while initially setting up your project to give your test renderings a better sense of scale.

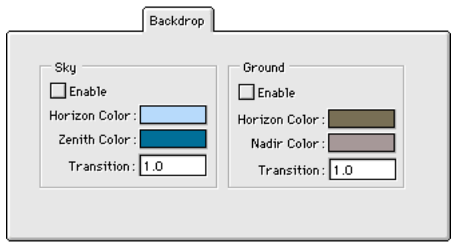


Figure 7.5 — **The Backdrop Tab**

There are two main sections in this window:

- The Sky Controls
- The Ground Controls

Sky

The Sky Controls give you the ability to designate custom background colors sky. There are four items in this window:

- The Enable Check Box
- The Horizon Color Box
- The Zenith Color Box
- The Transition Box

The Enable Check Box. This check box enables the sky color effect. The default is off.

The Horizon Color Box. Clicking this box will being up the EIAS color picker. There, you can select a color for the sky at the horizon line.

The Zenith Color Box. Click this box to enter a color value for the sky at the Zenith line.

Note *The Horizon is the point at which the sky meets the ground. The Zenith is the upper region of the sky that is positioned directly above the camera.*

The Transition Box. This value sets the midpoint of the transition between the Horizon Color and the Zenith Color. Higher values move the midpoint closer to the horizon, thus showing more of the zenith color. Lower values, such as the default 1, will show more of the horizon color.

The default sky colors **The sky colors with a transition of 3**

Figure 7.6 — **Setting sky color transitions**

Ground

The Ground Controls function in exactly the same manner as the Sky controls do. There are four items in this window:

- The Enable Check Box
- The Horizon Color Box
- The Nadir Color Box
- The Transition Box

The Enable Check Box. This check box enables the ground color effect. The default is off.

The Horizon Color Box. Clicking this box will being up the EIAS color picker. There, you can select a color for the ground at the horizon line.

The Nadir Color Box. Click this box to enter a color value for the ground at the Zenith line.

Note *The Horizon is the point at which the ground meets the sky. The Nadir is the lower region of the ground that is positioned directly below the camera. The Nadir is diametrically opposed to the Zenith.*

The Transition Box. This functions in exactly the same manner as the sky transition box. Higher values move the midpoint closer to the horizon, thus showing more of the nadir color. Lower values, such as the default 1, will show more of the horizon color.

The default ground colors   The ground colors with a transition of 6

Figure 7.7 — **Setting Ground Color transitions**

Note *When both items are enabled at the same time, the following image appears when rendered:*

Figure 7.8 — **A rendering with the default settings**

7.4 The Global Reflection Tab

The third tab contains a list of Global Reflection maps that are accessible in each group's material interface.

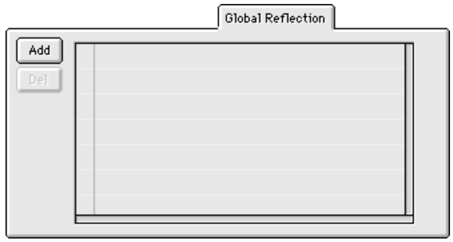


Figure 7.9 — **The Global Reflection Tab**

To add a reflection map to this window, click the Add button. A standard Open dialog will appear. Simply navigate through your computer, find the map you wish to add, and select Open.

When setting an object's reflectivity value in the material editor, you will notice a check box called Use Global Reflections. Any object that has this item checked will reflect the reflection maps added to this window.

7.5 The Raytrace Tab

The raytrace tab is used to set the global refraction index for the scene. The global refraction index covers all space that is not assigned with a refraction index. The default is 1.0, which is the index of refraction for air on the earth's surface.

The global index of refraction value is necessary when you are dealing with non-earth atmospheres. For example, if you are raytracing an underwater scene, you would want to set the global index of refraction to roughly 1.33, which is the index of refraction for water (not allowing for different levels of seawater salinity around the world.)

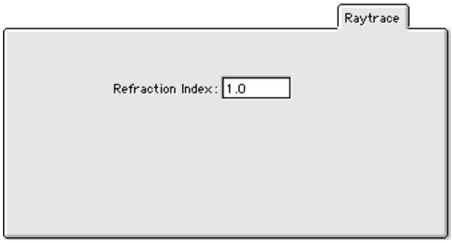


Figure 7.10 — **The Raytrace Tab**

The global index of refraction is used only when raytracing, and again, only in those volumes that do not have an index of refraction that is specified in the object's material definition (transparency tab of the material editor.)

7.6 The Glow Layer Tab

Any group can be given a gaussian glow that emanates outward from that object. Additionally, groups of layers can be defined, each with its own glow radius and intensity.

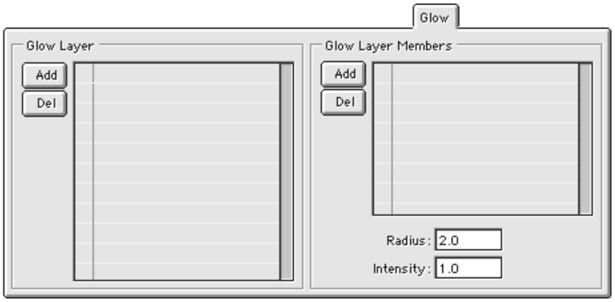


Figure 7.11 — **The Glow Layer Window**

There are three sections in the glow tab:

- Glow Layer List
- Glow Layer Members List
- Configuration Section
-

Glow Layer List. A glow layer contains glow attributes which apply only to members of that layer. To add a glow layer:

1. Click the Add Button Next to the Glow Layer list
2. Name the layer
3. Click OK

A new glow layer is added to the list.

Glow Layer Members List. Glow layer members are selection sets. In order for groups to use their glow effects (applied as a material), the groups need to be in a selection set contained within a glow layer. To add a selection set to a glow layer:

1. Select a glow layer
2. Click the Add button next to the glow layer member list
3. Pick a selection set form the list
4. Click the Add button

The selection set is now added to the glow layer.

Glow Configuration Section. The appearance of the glow layer is a combination of the material attributes of the glow, as well as the settings in the Glow Radius and Glow Intensity edit boxes, shown below.

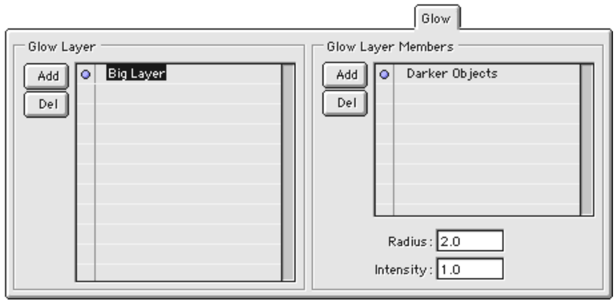


Figure 7.12 — **The Glow Layer Window with Glow Layers and Layer Members**

Glow Radius. The pixel area of the glow. This is the area of the image that will have a glow effect applied to it. Smaller values are good for objects that you wish to appear brighter in a scene, while larger values are better for simulating effects such as glare.

Glow Intensity. This value controls the brightness of the glow. Glows are added on top of the rendered scene, therefore a value of 1.0 would produce a glow that is twice as bright as the original image without glow.

Although glow layers and sets may seem a bit complex at first, once you get the hang of it you will begin to understand the potential. Rather than having to manually tweak settings for each separate glow effect you can simply define a series of standard effects and apply those to the appropriate sets at render time. For instance, you could come up with a set of glow layers to simulate fire, candles, tv monitors, spaceship exhausts, light bulbs, etc. Once you have a series of defined glow layers they can easily be assigned to any set of objects you've created. Additionally, since Glow radius and intensity can vary by layer, a series of complex effects and layered glows can be created.

Rendering

8.0 Introduction

Rendering is the process in which all of the elements in a scene (models, lights, cameras, textures, etc.) are combined, and used to generate a final picture or movie. It is analogous to the photographic exposure of a scene recorded by the film in a camera. EIAS is known to have the world's fastest 3D rendering engine. That is not an idle boast. From time to time we often compare the variety of 3D software programs with our own, comparing features and timings. In most cases with the most popular of our competitors, ElectricImage EIAS is typically 6 to 15 times faster to create the same image. Often our image quality is superior, as faster render times let us perform better anti-aliasing.

The EIAS rendering engine, EIAS Camera, was designed from the ground up as a motion picture production rendering system. It can handle an incredible amount of data (currently topping out at 30,000,000 polygons, although this is an artificial limit) in a very short amount of time.

EIAS Camera is a hybrid render/raytracer. Wherever possible, the standard rendering engine will be used. However, if you specify a material attribute that requires raytracing, and the Camera format is set to Raytrace (Render information window, Render tab), then raytracing will be used.

Rendering is very different from ray tracing. Rendering requires more hands on attention than ray tracing, especially when dealing with shadows, and to a lesser degree, reflections. The approximate results that you achieve through these methods are good, and have been production-proven. That said, the raytracing engine in EIAS Camera is fast, and generates beautiful imagery. You may find that you begin to favor raytraced options over time, as they are far easier to deal with. This will be especially true as computers improve in their processing power, and thus produce images more quickly.

Note *Motion vector blur, also known as "2D blur" will provide inconsistent results when raytracing. Reflected objects in motion will not be properly motion blurred, for example. The best solution to this is to use the Multi-frame blur (also known as "3D blur"), or a combination of the two methods. Be warned, however, render times will be longer...*

When rendering and raytracing imagery, EIAS Camera transforms the models into optimal segments for rendering speed, caches the texture maps to RAM (or the hard drive), generates shadow maps and color buffers, and then applies the desired shading algorithm and render settings to the geometry in the scene. It is also during this stage that effects like anti-aliasing, motion blur, and glow are applied. All of these complex processes take place transparently to you after clicking on Go to launch the render. It is in the Render Information Window that the settings which control all these various rendering parameters are applied.

8.1 Render Information Window

In order to give the user maximum control over all aspects of the rendering process, the Render Information window in EIAS Animator is divided into folder tabs. This chapter will explore each of these sections and explain what their functions are, as well as how these settings affect other group and object settings.

There are two ways to access the Render Info Window:

- Choose **Render> Render Settings** from the main menu bar
- Type **command-r (PC control-r)**

The Render Info Window will then appear.

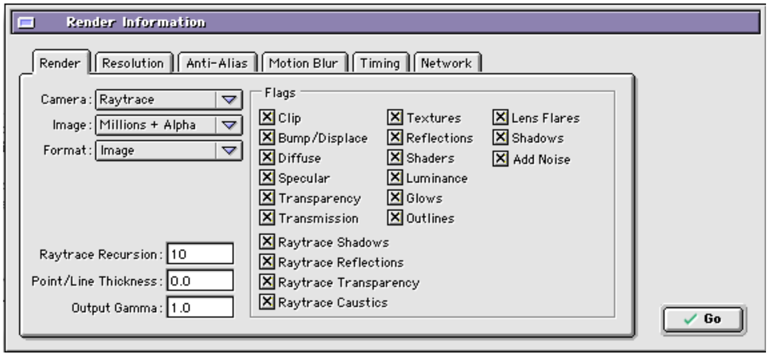


Figure 8.0 — **The Render Info Window**

This is the window where general rendering parameters are set, such as the global shading level, color depth, and the image format. This is also where global rendering flags are set, allowing the user to enable and disable specific parameters on a per-render basis. Each of these areas is explained in depth in this section.

8.1 The Render Tab

The render tab in the Render Information Window contains global shading level attributes for shading method, image quality, format, activation flags and gamma control.

The Camera Menu

This menu sets the maximum shading level for the rendering. The default is Raytrace, and this will provide the highest quality rendering. If this global shading level is set to a lower quality than an individual group or object's shading level, the global setting will override the objects' setting. For instance, if an object is set for Phong shading and the global is set for Flat shading, the object will be rendered using flat shading. This allows the user to render an entire scene quickly using a lower quality shading level for motion tests and other previews. However, if the global is set to a higher quality shading level, individual objects in the scene can still be set to render at any of the other lower shading levels on a per object basis. This allows for a mixture of shading methods (i.e., wireframe objects with Phong rendered objects) in the same scene.

There are five basic shading algorithms currently available in EIAS Animator. Listed by increasing quality and render time they are:

- Wireframe
- Flat
- Gouraud
- Phong
- Raytrace

Wireframe. Wireframe rendering is the fastest of the five rendering methods, and renders out a simple wireframe mesh image. This option will override any of the other shading methods set at the group/object level.

To control line thickness enter a value in the Point/Line thickness box. Higher numbers result in thicker mesh lines. Here are examples of Wireframe shading using various Point/Line Thickness settings:

P/L Thickness1.0 P/L Thickness 3.0 P/L Thickness 5.0

Figure 8.1 — **P/L Thickness**

Flat. Flat shading is fast, but lowest quality, solid rendering algorithm. Solid rendering allows for full hidden surface elimination, which is helpful for quick test renders in order to make sure objects aren't intersecting with each other improperly. Flat shading, also known as constant shading, applies a light source to only one point on each face of a model. This can give a rendered image a faceted, blocky appearance. Using this global setting, individual objects can use both flat, and wireframe shading, at the group/object level. It will however, override the shading level for any group/object that is set for Gouraud, Phong, or Raytracing.

Gouraud. Gouraud shading results in a higher quality solid rendering than Flat Shading, but is slightly slower. Rather than applying a light source to only one point on each face of a model, Gouraud shading calculates the light source based on the vertexes of the polygons that make up a face. These values are then interpolated to give a slightly smoother appearance than flat shading. The net result is that for a slight increase in render time, objects appear smoother and more naturally shaded than they do with Flat Shading. With this global setting, individual objects can use wireframe, flat, and Gouraud shading at the group/object level. This global setting will however, override the shading level for any group/object that is set for Phong shading and Raytracing.

Phong. Phong shading uses an algorithm that creates natural, smooth shaded images. Phong shading calculates the light sources from multiple points across the surface of a model, instead of just at the vertexes of the component polygons. The result is more realistic specular highlights on surfaces as well as the most natural shadowing and light sourcing of any of the shading methods. This global shading level allows for all shading types to be active at the group/object level for the maximum amount of control.

Raytrace. Raytracing is the highest quality imaging level available in EIAS. It produces accurate reflections, refractions and shadows, The raytracing technology is channel-based, that is, only channels which are specifically assigned to raytrace will be imaged with the raytracer. In all other cases, the remaining channels will be imaged by the traditional rendering engine. This implementation promotes the fastest speed possible for a final image.The ray trace engine inside of EIAS Camera understands whether or not you are inside or outside of an object, so objects such as goblets etc. will render with the proper refraction effects out-of-the-box, with no need for special tricks (such as "air volumes" in other packages).

Selecting this option will raytrace every object that is set to raytrace in its group properties. If no objects use raytrace properties, then the scene will not be raytraced.

The Image Menu

The Image popup menu determines the final bit depth of the rendered image. Bit depth represents the number of colors used in the palette of an image. Black and white images are 1-bit (black or white), 256 Color and grayscale images are 8-bit, thousands of colors are 16-bit, millions are 24-bit, and millions + alpha are 32-bit. These color depths are all processed as a post-rendering effect, as all EIAS rendering algorithms are initially computed in 64-bit color and then down-converted to the selected image format, which is typically 32-bit (Millions+Alpha). It is important to note that there will be NO savings in render time or speed by rendering in less than 24-bit color. It may actually take longer to render in one of the other modes, as there is an extra step which takes place after the render is complete.

The options for this pop-up are:

- BW Lines
- BW Filled
- BW Dithered
- BW Summation
- 256 Shades
- 256 Colors
- Thousands
- Millions
- Millions + Alpha

BW Lines. Renders an image with lines only, in black and white only.

BW Filled. Renders an image with filled polygons, in black and white mode, similar to flat shading.

BW Dithered. Simulates a smooth shaded image using a fixed dither pattern, in black and white.

BW Summation. Renders a black and white image using summation dithering, a higher quality dithering. This dither uses randomly placed dots to make the image appear to be more smoothly shaded. From a distance, the image appears as a continuous tone.

256 Shades. This option converts the image to 256 shades of gray (8-bit). No histogramming is required for 256 Shades as it is converted directly to gray scale from the original 32-bit palette. Therefore, there is no rendering time penalty for this option.

256 Colors. This option coverts the image to an optimized 8-bit color palette. 256 Color animation's are histogrammed from the original 64-bit image file, resulting in a consistent frame-to-frame color palette. This means that a 256 color animation will maintain the same color palette throughout the entire animation. There will be a time penalty for the histogram process to occur, and the amount of time required is directly related to the amount of frames in the movie file.

Thousands. This option converts the image to a 16-bit color palette (32,768 colors) after rendering. As noted above, this does not speed up render time as the image is initially created in 64-bit.

Millions. This option renders the image in 64-bit color, adds noise and discards the alpha channel, resulting in a final 24-bit image.

Millions +Alpha. This option renders the image in 64-bit color, and adds noise, creating a 24-bit RGB image with an embedded 8-bit alpha channel.

The Format Menu

The Format pop-up menu determines the file format for the final, rendered image. The five menu items are:

- Image
- Quicktime
- PICT
- GlobeCaster
- GrangerFX
- Planar Z-Depth
- Spherical Z-Depth

- Environment

Image. The original file format, used since the origin of Electric Image. The Image format is a robust, 32-bit color format. It is natively supported by many other, high-end graphics packages such as Adobe Photoshop® and After Effects®. Files stored in the Image format can be displayed within EIAS Animator choosing **File>View Image**.

Note *Camera can Render out Image files larger than 2GB. However, After Effects cannot handle any non-QuickTime files larger than 2GB. If your Image file is larger than 2GB and you need to import it into After Effects, open it in the QuickTime movie player and export it as Animation Codec, Millions+Alpha, Highest Quality. Then import the QuickTime movie into After Effects.*

QuickTime. QuickTime™ is a digital movie format that has become a standard across multiple platforms. Choosing the QuickTime format brings up a dialogue that offers the choice of any installed hardware or software compression CODEC's.

Note *Settings made in the CODEC window will override both the frames per second, and the Image Depth, settings in the Render window. For instance, even if you set the Image Depth to Millions+Alpha in the Render window, if you choose millions only in a QuickTime CODEC the image will be stored in millions of colors, WITHOUT the alpha channel. Also note that any slave machines used for rendering must have the same QuickTime CODEC installed as selected on the host machine.*

Note *There is a 2GB file size limit on QuickTime movies rendered by Camera. If you exceed this size, you will get an error message.*

PICT. PICT format is used for single frame images, rather than animations. If PICT is chosen for a multi-frame render, a series of sequentially numbered PICT files will be saved. PICT files have the same CODEC options as a QuickTime movie.

Note *Camera can not render out PICT files larger than 2GB.*

Planar Z-Depth. Causes Camera to render out a ".eiz" file. This variation of the Image file format contains 32-bits of depth information at every pixel. The depth is from the object to the camera plane.

Spherical Z-Depth. Causes Camera to render out a ".eiz" file. This variation of the Image file format contains 32-bits of depth information at every pixel. The depth is the length of the vector connecting the camera to the object.

Note *This file format is not viewable by any standard means. It is meant to be imported as a layer in a compositing application. The.eiz file can contain stills or animation.*

Environment. Causes a 6-frame animation file to be rendered out, analogous to an environment reflection map. The purpose of this feature is to create files that can be used as Cubic Reflection Maps.

The scene camera is automatically oriented and the frames are written out in the following order:

1. Front
2. Back
3. Left
4. Right
5. Top
6. Bottom

Note *Regardless of the number of frames selected for rendering, only six frames will be written if "Environment" is selected in the Format pull down menu.*

Render Flags

Render flags are check boxes that are used to turn on and off various effects for rendering. Any box that is checked enables that function. This has no effect on the settings of a given group or object, but simply turns off that function temporarily during the render. Any objects that use these effects (i.e., reflections or shadows) will still maintain their settings, and will render properly when the appropriate flag is re-enabled. This allows the user to enable and disable specific effects and functions on a global, per render basis. For instance, while doing a test render it might not be necessary to calculate shadows, so the Shadows box can be unchecked to save time until a final render is needed.

At many professional effects houses a trick that is often employed is to render out the same image using multiple passes, and then compositing the different passes together to form the final image. One render will be made just for the reflections, while another will be done for the diffuse light, another for glows, and so on. Then, in a post-processing program these layers can be combined with the utmost accuracy and flexibility, even changing over time.

The Flags control the following functions:

Clip. This check box controls whether or not clip maps are rendered. This option defaults to on.

Bump Displace. This check box controls whether or not bump and displacement maps will be rendered. This option defaults to on.

Diffuse. This checkbox controls whether or not the Diffuse channel will be used during rendering. This option defaults to on.

Specular. This check box controls whether or not specular maps will be used in the rendering process. This option defaults to on.

Transparency. This check box controls whether or not transparencies or transparency effects will be rendered. This option defaults to on.

Transmission. This check box controls whether or not transmission effects and maps will be rendered. This option defaults to on.

Textures. This check box controls whether or not any texture maps will be rendered. This option defaults to on.

Reflections. This check box controls whether or not any reflection maps will be rendered. This option defaults to on.

Shaders. This check box controls whether or not procedural shaders will be rendered. This option defaults to on.

Luminance. This checkbox controls whether or not Luminance effects will be rendered. This option defaults to on.

Glows. This check box controls whether or not glow effects are applied to the render. This option defaults to on.

Outlines. This check box controls whether or not the Cel/Outline shader functions are enabled. It defaults to on. By enabling this check box, and by also activating the Cel/Outline shader options in a groups' material window, a variety of effects can be achieved. The Cel/Outline shader allows for separate color and thickness to be assigned to polygons, edges, and silhouettes of models.

Lens Flares. This check box controls whether or not lens flare effects will be rendered. This option defaults to on.

Shadows. This check box controls whether or not shadows will be calculated and rendered for an image. This option defaults to on.

Add Noise. This check box adds random noise to rendered images to reduce mach banding (very discernible differences in what should be smooth color transitions), especially prevalent in darker colors of the 32-bit color space. This option defaults to on.

Raytrace Shadows. With this checkbox marked, Raytraced Shadows will be rendered, if there are any in the scene. If unchecked, the Raytraced Shadows will not be rendered.

Raytrace Reflections. This option will render Raytraced Reflections, when there are any in the scene.

Raytrace Transparency. This options will render any Raytrace Transparencies in the scene.

Raytrace Caustics. This options will render any Caustics in the scene.

Raytrace Recursion

This edit box controls how many bounces a raytrace solution will make. The more bounces the more accurate the render, but it will also take much longer.

Point/Line Thickness

When a scene is rendered in wireframe, the Point/Line Thickness edit box allows the user to specify the thickness of points and lines in pixels. The default is 1 pixel. Higher numbers will give the wireframe mesh thicker lines.

Output Gamma

Gamma is a technical term used to describe the intensity of different levels of gray as they appear on an output device; usually either a computer monitor or video screen. Standard gamma settings range from 1.0, up to 2.2 depending on the output device.

8.2 The Resolution Tab

The Resolution Settings tab is where all of the parameters for the resolution of the final rendered image are set. In this window there are options for setting the aspect ratio, resolution, cropping, and VR rendering functions.

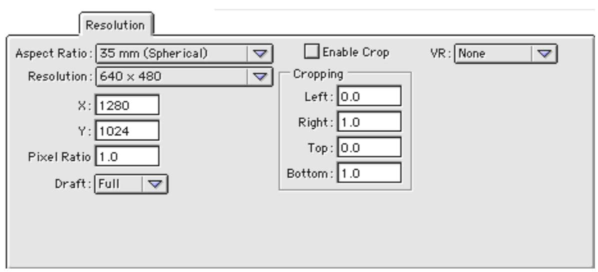


Figure 8.2 — **The Resolution Tab**

The Aspect Ratio Menu

The Aspect Ratio popup menu defines the relationship between the x and y pixels of the image. This relationship is known in technical terms as the aspect ratio. This ratio is commonly stated as "x resolution in pixels: y resolution in pixels", simplified to the lowest common denominator. Therefore, a standard Macintosh screen with a resolution of 640 pixels horizontally (x) and 480 pixels vertically (y) has an aspect ratio of 4:3. Usually, when discussing film resolutions, the aspect ratio is specified as a ratio with y always equal to 1. For instance, IMAX film requires a very square 1.22:1 ratio, while 70mm uses an ultra wide 2.20:1 ratio. There are a number of preset aspect ratios defined in EIAS Animator, or the user may choose to enter their own Custom aspect ratio. What aspect ratio you choose depends solely on the final format required for output. By choosing one of the predefined aspect ratios, the rendered image will be constrained to the proper pixel ratio for that format.

An important consideration when using one of the preset aspect ratio’s is how it affects the field of view of the camera. Not only does film stock vary in aspect ratio, it also correspondingly varies in the amount of information it can record, or the Field of View. One way to consider how the field of view relates to the aspect ratio is to visualize a physical piece of film stock. When you look at it, it has a tangible measurement of x inches horizontally, and y inches vertically. One factor is the relationship of these two measurements to each other. Those measurements will give you the aspect ratio, and determine how wide or square an image will appear when projected. The other factor is the physical size of the film stock itself. Although both Super 8mm film, and 35mm Full format film have the same aspect ratio (1.33:1), you can see a lot more on 35mm film, shooting the same subject at the same distance, and using the same lenses. In other words, if you put the exact same lenses on both cameras, say 25mm, and shoot from the exact same distance, the 35mm film will have a significantly wider field of view and you will see more information recorded on the film. Why? Because 35mm film is physically larger and has about 4 times the surface area of Super 8mm film on which to record an image. So it is very important to remember that you are determining not only the width, or aspect ratio, of an image, but also it's relative field of view. Of course, in 3D you can use any lens, regardless of the aspect ratio, in order to create a specific field of view, but the film stock is an important factor in this equation.

Note *The aspect ratio is locked to the X resolution. Any number entered in the X box will automatically calculate the proper Y resolution based on the currently selected aspect ratio. However, numbers can be entered manually in the y resolution and do not automatically convert the x value to the correct aspect ratio. Therefore, if you want the aspect ratio to be automatically calculated, always enter your resolution in the X edit box, and let ElectricImage EIAS calculate the proper Y resolution.*

The aspect ratio choices are as follows:

- Custom
- Computer
- Super 8mm
- 16mm
- Super 16mm
- 35mm Spherical
- 35mm Full
- Vista Vision
- 65mm
- IMAX
- 70mm
- Techniscope
- 6x45 (medium format)
- 6x6 (medium format)
- 6x7 (medium format)
- 6x8 (medium format)
- 6x9 (medium format)

- 6x12 (medium format)
- 4x5 (large format)
- 5x7 (large format)
- 4x10 (large format)
- 8x10 (large format)
- 1/3 In. Video Pickup
- 1/2 in. Video Pickup
- 2/3 in. Video Pickup
- HD 16:9 Non-Switchable
- HD 4:3 Switchable
- HD 4:3

Custom. This option brings up a dialogue box for entering a custom aspect ratio. The pop-up menu on the right allows the user to specify the measurement system in millimeters, centimeters, or inches. Then, simply enter the specific film gauge measurements in both x and y dimensions, or enter an aspect ratio in the Frame Aspect edit box.

This dialogue box is very useful for entering custom measurements when you are trying to match a film stock that is not one of the presets, or you need to match a particular aspect ratio from another 3D package, or to suit a specific programming need.

Computer. This option (the default) specifies the 4:3 aspect ratio of a standard 640x480 computer screen. The horizontal field of view using a 25 mm lens is 3.0 degrees.

If you are doing multimedia work for a standard computer screen, this is the setting that you would use most often.

Super 8mm. This option specifies the 1.33:1 aspect ratio of Super 8mm film. The horizontal field of view using a 25 mm lens is 12.1 degrees.

16mm. This option specifies the 1:38:1 aspect ratio of standard 16mm film. The horizontal field of view using a 25mm lens is 23.2 degrees.

Super 16mm. This option specifies the 1.7:1 aspect ratio of Super 16mm film. The horizontal field of view using a 25mm lens is 28.1 degrees.

35mm Spherical. This option specifies the 1.37:1 aspect ratio of standard 35mm film. The horizontal field of view using a 25mm lens is 47.4 degrees.

35mm Full. This option specifies the 1.33:1 aspect ratio of 35mm Full format film, also known as Academy Aperture or "four perf," for the amount of sprocket perforations used per frame as the film runs vertically through the camera. The horizontal field of view using a 25mm lens is 52.9 degrees.

VistaVision. This option specifies the 1.5:1 aspect ratio of VistaVision format, with 8 horizontal perforations per frame. The horizontal field of view using a 25mm lens is 74.1 degrees.

65mm. This option specifies the 2.28:1 aspect ratio of 65mm vertical 5 perf film. The horizontal field of view using a 25mm lens is 92.8 degrees.

IMAX. This option specifies the 1.22:1 aspect ratio of 65mm horizontal 15 perf IMAX film. The horizontal field of view using a 25mm lens is 109.25 degrees.

70mm. This option specifies the 2.20:1 aspect ratio of 70mm film running vertically through a motion picture camera. The horizontal field of view using a 25mm lens is 88.3 degrees.

TechniScope. This option specifies the 2.35:1 aspect ratio of TechniScope film. (TechniScope is also referred to as "two perf," as it divides the vertically oriented 4 perf standard 35 mm frame into two frames, each using two sprocket perforations.) The horizontal field of view using a 25mm lens is 88.3 degrees.

Image Resolution Menu

The Resolution popup menu determines the final number of pixels to render for an image. This resolution will be constrained by the chosen Aspect Ratio.

The resolution of an image has little effect on the amount of memory required to render, but does increase the number of passes needed, due to the additional pixels, and increases render time.

You should note that the resolution has no effect on the field of view. You won't be able to see twice as much of a scene by doubling the resolution. In order for the camera to "see" more of a scene, it is necessary to either change the aspect ratio and/or the focal length of the camera. The resolution setting merely renders more or less pixels in a given image. The amount of information seen by the camera is the same, regardless of the resolution.

The choices for image resolution, based on a Computer aspect ratio of 4:3, are:

- 260x200
- 320x240
- 640x480
- 1024x768
- 1280x960
- 2048x2048
- 4096x4096

- Main Screen (the default): This setting uses the resolution of the primary monitor.
- NTSC: (720x486) The standard television resolution used in North America and Japan. Pixel ratio =.9 (See below for explanation of Pixel ratio)
- PAL: (768x576) The standard television resolution used in many European countries, including England, and Germany.
- HDTV: (1920x1280) The mythical, high definition television format that may appear in the United States one day, but most likely not at this resolution and no longer called HDTV.
- Abekas NTSC: (720x486) Resolution used by Abekas direct disk recorders at NTSC resolution. Pixel ratio=0.9.
- Abekas PAL: (720x576) Resolution used by Abekas direct disk recorders at PAL resolution. Pixel ratio= 1.0667.
- Trinity

X and Y Edit Boxes

These edit boxes allow the user to directly enter values for resolution rather than choosing from the resolution pop-up menu. The X value will automatically constrain the Y value to the chosen aspect ratio, but not vice-versa. The maximum theoretical resolution is 32,760 pixels by 32,760 pixels.

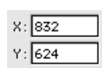


Figure 8.3 — **The X and Y Edit Boxes**

Pixel Aspect Ratio

This edit box allows the user to control the aspect ratio of each rendered pixel. Most computer screens display square pixels, at a pixel ratio of 1.0. However, broadcast television signals, including NTSC, PAL, and HDTV do not use square pixels. Therefore, by altering the pixel aspect ratio, non-square pixels can be rendered. The value in this box will automatically change when specifying a resolution in the resolution popup.

Figure 8.4 — **The Pixel Ratio box**

Rendering with rectangular pixels will tend to make images look stretched out when viewed on a computer screen, but after being properly processed and sent to video tape they should appear normal.

Draft Mode

Draft provides an easy way to render out to fractional resolutions. The default is “Full” which provides the resolution displayed in the X and Y edit boxes. Changing Draft to a fractional setting won’t alter the resolutions displayed in the edit box, but Camera will render to the fractional size.

The setting is ignored by window-sized and cropped snapshot renderings.

Note *It’s easy to forget the setting of Draft. Make sure you set it back to Full before you begin your final rendering.*

Image Cropping

The image cropping function allows for only a portion of an image to be rendered. There are two ways to use the new cropping feature. First, the enable cropping check box must be checked in the Render window. Next, values from 0 to 1 can be entered directly in the text boxes in the cropping area, where 0 represents left/top, and 1 represents right/bottom. When the image is sent to render, only the area within the cropping guidelines will be rendered.

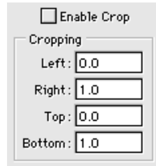


Figure 8.5 — **The Image Cropping options**

More usefully, the crop region can be seen and interactively set. By first selecting **Render >Render Settings, Resolution** tab, Enable Crop and second choosing **Render>Edit Cropping** from the menu. A visual guide will appear in the camera window. This region can now be interactively resized by dragging the safe title edges. When the render is sent, only the area within the visual cropping guides will be rendered.

Rather than just a temporary selection, like the method of rendering Selected Size, the Crop region can be saved and easily moved and resized.

This kind of selective rendering option can be extremely useful when you have a scene set up, and you need to preview specific areas of the scene, but don't want to wait while the computer renders everything in the scene. Rather than turning a bunch of objects off and on, or setting up multiple cameras, you can selectively set a cropping region around the object you wish to and render. There is also a shortcut under the preview render icon, Cropped Size, that allows you to instantly render the cropped selection, or to render a selection within the cropped area, Selected Cropped Size.

QTVR

Quicktime VR (QTVR) is a "virtual reality" format, presented via Quicktime. It offers two different VR modes, panoramic and object. Panoramas are created by warping the rendered image, which places the viewer in the middle of the image. The image is processed by Quicktime to give the viewer the apparent ability to pan around an environment, looking up and down, and zooming in and out.

An object is a Quicktime VR movie that tracks a single object around a 360 degree axis. Rather than the viewer panning and tilting across a panorama, an object movie allows the viewer to spin and rotate a single object around it's own axis. Other tricks include the ability to have portions of the object animate instead of a complete 360˚ spherical orbit (or as part of a complete 360˚ orbit.)

None. This option disables the QTVR features. This is the default option.

Panoramic. This option will create a self-contained panorama, as long as Quicktime is installed on your computer. (This option is not available on Sun machines.) You can save the output of the file as a warped image for use with VR methods other than Quicktime, by choosing the desired format from the Format menu in the Render tab. If you choose the Quicktime option from that menu, you will be prompted to select a CODEC for compressing the QTVR movie.

QTVR has several rules regarding output resolutions. The X dimension must be evenly be divisible by 96 and the Y dimension evenly divisible by 4. Common output resolutions include 2496 by 768 and 1248 by 384.

Camera renders QTVR panoramas in four panes, each with a 90 degree horizontal field-of-view (FOV). Make sure that the horizontal FOV is set to 90 degrees in the Camera Info window. One of these panes will be displayed in the Camera View window when QTVR is enabled.

During rendering, all four views will be automatically rendered, rotated and properly warped.

It should be noted that EIAS Animator can only generate single node movies. You will need to obtain additional tools, either from Apple or a third party, in order to create multi-node, or other special QTVR movies.

Object. Place the object you want to rotate at 0,0,0 on the global axis. Then, select Object from the VR popup menu in the Resolution tab of the Render Information Window. This will bring up an additional dialog box allowing you to set the number and angle of Horizontal (Latitude) and Vertical (Longitude) samples needed. By default an object movie will utilize a 360 degree axial rotation, starting at 90 degrees Latitude, 0 degrees Longitude and rotating to -90 degrees Latitude, and 360 degrees Longitude. To create a smoother object movie, more samples can be created per rotation, by entering a value in the Sample edit box.

Unlike QTVR Panoramas, QTVR Object movies do not have set requirements for FOV or Resolution. These are left up to the user.

For more information, please visit Apple Computer's Quicktime VR web page at: www.apple.com/quicktime/qtvr/

8.3 The Anti-Alias Tab

Anti-aliasing is the filtering process used to remove "jaggies" and moire patterns from rendered images. The anti-alias tab contains all of the settings through which you control anti-aliasing quality.

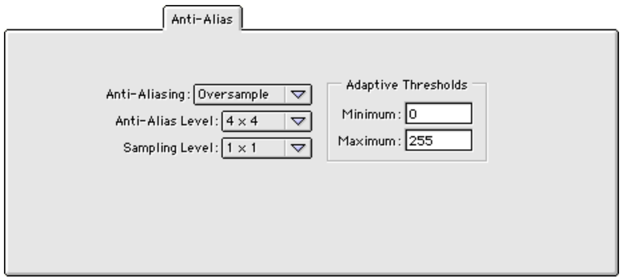


Figure 8.6 — **The Anti-Alias tab**

The Anti-Aliasing Menu

The Anti-Aliasing popup menu determines the type of anti-aliasing used when rendering.

The choices are:

- None
- Adaptive
- Oversample

None. This option specifies that no anti-aliasing will be used on the image. Edges and outlines may have a jagged, rough appearance.

Adaptive. This option specifies that adaptive anti-aliasing be performed on the render. This produces a softer image than None, and a sharper image than the Oversample. Thin, sharp lines may cause artifacting when rendering for video output, and using Oversampling may be more effective in these cases.

Oversample. This option (the default) specifies that Oversampling be performed on the render. This produces the softest images with the smoothest edges, and significantly reduces video artifacting caused by jagged edges.

The Anti-Aliasing Levels Menu

This menu controls the amount of sampling that will be performed on the image. The menu items are:

- 4x4
- 8x8
- 16x16
- 32x32
- 64x64

4x4. (The default) This setting is generally sufficient for most images. Lines and edges maintain a sharp, detailed appearance. High contrast vertical and horizontal edges can cause artifacts, and moire patterns, for which the 8x8 setting may work better.

8x8. This setting is useful when a slightly smoother, softer look is required. Lines and edges will appear less crisp than when using the default, and may reduce moire patterns and artifacts. Be aware, however, that this setting may slow down rendering time significantly over the default 4x4.

16x16 (and higher). These settings should only be used in specific instances where a very high level of anti-aliasing is needed. For the vast majority of renders, these sampling levels will produce an image that is indistinguishable from one rendered at a 4x4 or 8x8 level. However, rendering time goes up dramatically when using these levels.

The Sampling Levels Menu

Object sampling levels are set in the group info window for each object. The values in the sampling level menu are used to determine the maximum amount of sampling allowed at render time. If some of your groups are set to 4x4 sampling, and the sampling menu is set to 2x2, sampling will be limited to up to 2x2 maximum as the image is rendered. The menu items are:

- 1x1
- 2x2
- 4x4
- 8x8
- 16x16
- 32x32
- 64x64

1x1. (The default) This setting is sufficient for lower detail objects, or models that appear at a moderate distance from the camera. However, when viewing images rendered at this setting up close, jagged edges may be apparent. This is also not a good setting for high resolution images.

2x2. This is a good, general setting for most objects and groups. Render time compared to 1x1 sampling may be only slightly higher, and the extra detail is generally worth the time, especially with high detail texture maps. This setting may also help animations that exhibit flashing, or stair step patterns on playback.

4x4. This setting, although slower than 2x2, is useful for objects which require a high amount of sampling detail. This includes objects with intricate texture maps that are in close proximity to the camera, or that involve complex effects passes (smoke, fog, glow). Very high resolution images may also benefit from this sampling level.

16x16 (and higher). Like anti-aliasing levels, these setting should only be used in specific instances where a very high sampling level is required. Render time at these levels increases by a huge amount, and for the majority of renders will show no noticeable improvement.

When rendering at any typical resolutions (720x486 and less), leave your anti-aliasing level at 4x4. Unless you see a problem in the render this setting will be more than adequate and allow you to render as quickly as possible. For sampling levels, consider using a global maximum sampling level of 4x4, and individually setting the sampling levels on a per object basis. Therefore, if you have an object with a complex texture map very close to the camera you can set it's sampling level to 4x4, while objects that only appear in the distance can be set for 1x1. This approach gives you the maximum control over the 2 major issues in a production setting; quality and render time.

Adaptive Sampling Threshold

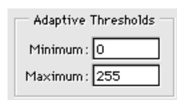


Figure 8.7 — **The Sampling Threshold boxes**

The Min and Max edit boxes contain values that control the type of adaptive comparison filtering to be performed between adjacent pixels of different color values. If the difference in the pixels is less than the minimum value, the image is sharper (less filtering, more jaggy). If the difference in the levels is greater than the maximum value, the image is softer (more filtering, less jaggy). If the difference falls between the minimum and maximum values, adaptive anti-aliasing is performed. The higher the difference, the softer the image; the lower the difference, the sharper the image.

High contrast vertical edges next to horizontal edges can cause aliasing artifacts. On occasion, high-frequency details, such as an edge with a highlight, will have a stair-step pattern or will flash off and on. Higher sampling levels will reduce this noise and improve the sharpness of texture maps. But using a higher sampling level will have a dramatic impact on rendering time. Rendering your whole project at 2x2 sampling instead of 1x1 can quadruple rendering time. That is why we have provided the ability to set the sampling level on a group-by-group basis.

As a general rule, make the Anti-Alias level two four times the highest Sampling Level used on any of your groups. If you need to increase the Sampling Level of a particular group to 2x2, increase the Anti-Alias level to 8x8.

Setting the Sampling Level higher than the Anti-Alias Level will not improve the quality and slows down rendering.

8.4 The Motion Blur Tab

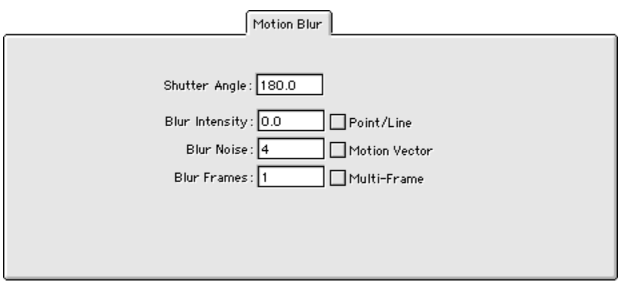


Figure 8.8 — **The Motion Blur Tab**

This section of the Render window is used to control the motion blur features of EIAS Animator. Motion blur is the simulation of the kind of effect that occurs when recording a moving object on film. As an object moves across a frame of film it naturally blurs, depending on the speed of the film, and the object's velocity. These controls allow you to mimic that behavior in EIAS Animator. Note that in order for blur effects to be rendered, it is also necessary to set the blur mode for each object/group that you wish to blur under that object's group info window.

Note *This setting defaults to no motion blur. You will need to change the blur mode to the desired setting per object blur or motion blur will not be rendered.*

Shutter Angle

Figure 8.9 — **The Shutter Angle Box**

This edit box contains a value in degrees that represents the circular angle at which a camera shutter is open. A value of 360 degrees simulates a shutter that is always open, whereby all moving objects leave a continuous streak across the frame. A value of 180 degrees (the default) simulates a shutter that is open for half a frame, mimicking a motion picture camera. The higher the angle, the longer the shutter will stay open, creating longer streaks and more blur. Note that only moving objects create blur, or streaks, as the streak length is computed by the distance an object moves within the field of view from frame to frame. Hence, objects that are far away from the camera will streak very little regardless of their velocity, while very close objects will streak dramatically with very slight movement. Values higher than 360 ° will create dramatic streaking, even on slow moving objects. Great for that "warp speed" effect.

Blur Intensity

Figure 8.10 — **The Blur Intensity checkbox**

This edit box is used in conjunction with the Point/Line blurring technique (see below). This value controls the brightness of the streaks left behind by points and lines. A value of 0.0 (the default) imparts a constant value regardless of the length of the streaks. Larger values produce brighter streaks, while smaller values produce dimmer streaks. A separate blur intensity can be set for each individual object/group in that group's info window. This edit box automatically appears after selecting the Point/Line blur mode.

Blur Noise

Figure 8.11 — **The Blur Noise checkbox**

This edit box is used in conjunction with the Motion Vector blurring technique (see below). This value controls the number of blur samples per pixel. The higher the number, the less visible noise in the streak. By using a value of 0, EIAS will automatically compute the optimal number of samples for a streak based on its length. A value of 4 (the default) renders quickly and produces high quality results. Values over 10 are unproductive, and will drastically slow the rendering process.

Blur Frames

This edit box is used in conjunction with Multi-frame motion blur (3D blur). This value represents the number of individual frames that are rendered prior to averaging the frames together to generate a single frame. For instance, if this value is set to 3, for each frame of an animation, EIAS generates 3 images, the frame ahead of the current frame, the current frame, and the frame behind. It then averages these images together to make a single frame, with blurring based on the distance moved between all 3 frames. If this value is set to 2, EIAS calculates two frames for averaging; the current frame, and one after the current frame.

Point/Line Blurring

Figure 8.12 — **The Point/Line Blurring checkbox**

This check box, when enabled, activates the point/line motion blur technique at the global level. Individual objects still need to be set for this type of blurring at the group/object level. In this mode, only points and lines leave streaks behind. This is most useful for the motion blur of star streaks and particle systems. Normal polygonal models will not streak using this method.

Motion Vector

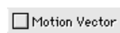


Figure 8.13 — **The Motion Vector checkbox**

This check box, when enabled, turns on Motion Vector motion blur (2D blur) at the global level. Unlike the point/line method which only blurs points and lines, this method induces blur on all objects which have been set for motion vector blurring. This includes points, lines, and polygons. It should be noted that blurred lines are always linear, and are never curved when seen in a single frame. This is a fast and versatile technique which works for most objects.

Multi-Frame

Figure 8.14 — **The Motion Vector checkbox**

This check box, when enabled, allows for multi-frame sampling for motion blur. It can be used in conjunction with the other blur techniques (point/ line or motion vector). The number of frames to be sampled is set in the Blur Frame check box. Strobe like effects are produced if too few sample frames are used with this option alone. It is best applied to a section of an animation where there is complex or rapid motion (like spinning fan blades, or the tires of a quickly moving car). Combining this technique (set to 2 sample frames) with Motion Vector blur produces great results for those times when Motion Vector isn't quite enough.

8.5 The Timing Tab

The timing tab contains start and stop information, and playback information.

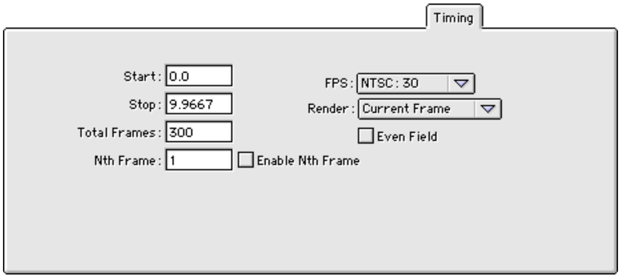


Figure 8.15 — **The Timing Window**

Start and Stop Times

This edit box defines the start and end times for a project, in seconds. These settings are also represented visually in the project window by the green (start) and red (end) arrows, and can be changed by dragging them interactively. Any changes made in the project window will be reflected here, and vice versa. These boxes define the total range of frames for a given project. Animation keyframes can still exist outside of the range of frames for a project, but will not be rendered.

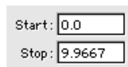


Figure 8.16 — **The Start and Stop Boxes**

Note: *It is possible to set the start time to a negative number. This can be very helpful if you've already created a complex animation starting at 0.0 seconds, and you later realize you need to add a sequence prior to the start of the animation. Rather than attempting to drag all of your keyframes to the right, simply use a negative number as your start time. Be aware, however that while this works in most cases, negative frame numbers may not work with simulation plug ins such as particle systems.*

Total Frames

Figure 8.17 — **The Total Frames box**

This edit box displays the total number of frames in an animation. This number is generated automatically based on multiplying the delta (difference) of the start and stop times by the number of frames per second and adding 1. For instance, if a project is set for 10 seconds, and the frame rate is 30 frames per second, the total number of frames rendered will be 301. This extra frame is due to the fact that EIAS Animator counts frame zero as the first frame in an animation. This number is displayed primarily for reference, although by setting the Total number of frames directly in the edit box, the Stop Time will be updated accordingly in both the Stop edit box and the project window.

Nth Frame

Figure 8.18 — **The Nth Frame box and checkbox**

This edit box is used to specify that an animation is only rendered out with every nth frame. In other words, if this box is set to 2, then every 2nd frame will be rendered. If the start frame is 0, the following frames will be rendered: 0, 2, 4, 6, 8...etc. In order for this to work, the Enable Nth frame checkbox must be checked. This setting works independently of the Render frames pop-up. The Nth frame is always used if selected, whether an animation is rendering all frames, or a selected range of frames. For instance, if a render is set for a range of frames from 100 to 150, and Nth frame is set to 3, then the following frames will be rendered: 100, 103, 106, 109...etc.

The Nth frame box is extremely useful for doing test renders. Instead of having to render out every single frame of an animation, it is often sufficient for a rough motion test to only render out every 2nd or 3rd frame.

FPS Menu

This edit box is used to specify the number of frames per second (fps) to be rendered for an animation. This figure determines the total number of images that are drawn per second. Note that it is important to set this number prior to doing any animation in a project, as all animation keyframes that are created will be based on this number of frames per second. By changing this value later, velocities and keyframe attributes may be thrown off.

The pop-up menu contains the following choices:

- Custom
- NSTC 30
- NTSC 30i
- Pal 25
- Pal 25i
- Film 24

Custom. The Custom setting allows the user to enter any number of frames per second, as well as choose whether or not the image will be interlaced. Interlaced rendering splits each frame into two fields, with the odd field dominant unless the Even Field check box is enabled. Interlaced fields are necessary for some broadcast video output cards. You should consult with your video output devices manuals to determine if interlaced fields are necessary.

NTSC: 30, 30i. This setting specifies the NTSC video standard of 30fps. This is what all broadcast television in the US is shown using, and consists of a 60Hz signal, being shown in 2 fields. Combining both fields into 1 frame results in a frame rate of 30fps. NTSC: 30i is output as interlaced frames, with the odd field dominant.

PAL: 25, 25i. This setting specifies the PAL video standard of 25fps. This is most common for European broadcast television, and differs from the US in that it operates at 50Hz, shown in 2 fields. Combining both fields into 1 frame results in a frame rate of 25fps. Pal:25i is output as interlaced frames, with the odd field dominant.

Film: 24. This setting specifies the motion picture standard of 24fps.

8.6 The Render Menu

This pop-up menu is used to select the range of frames that are to be rendered. The choices are:

Current Frame. This option (the default for single frame projects) causes only the current frame in the animation to be rendered. The current frame is defined as whatever frame is currently displayed in the camera window. This is selected by moving the time slider in the project window.

All Frames. This option (the default for multi-frame projects) causes all frames in an animation to be rendered. The total number of frames is defined by the Start and Stop times, mentioned above.

Range of Frames. This option opens a dialogue box which allows for setting specific frame numbers to be rendered. Using this tab, any portion of an animation within the Start and Stop times can be rendered. This is very helpful when working in a large project, with multiple animation sequences. Using this setting, only a specific range of frames needs to be rendered. You can also use Range of Frames to render your animation in reverse order, by typing reverse values in the edit boxes.

Even Field. This checkbox specifies that when rendering interlaced animation files, the Even field will be rendered out as the dominant field. This defaults to off, because the RS-170A specification for NTSC calls for odd field dominance. Some video cards break this rule (programmers always start on even numbers, such as zero, instead of odd numbers like one) and this option is present for those conditions.

Note *Be warned, even if your setup is even field dominant, most production houses are odd field dominant — you might need to re-render!*

8.7 Network Rendering Tab

You can render to as many computers as you wish *(assuming they meet minimum performance requirements.)* Renderama, the EIAS network rendering application, must be available in the same folder as EIAS, and properly configured. See “Network Rendering with Renderama” on page 287.

8.8 How To Render a Project

To initiate a render, make sure that all of your parameters are set the way you want them. You can then launch the rendering process in one of several ways:

- **Render>Window** from the main menu bar
- **Render>Frame** from the main menu bar
- **Render>Window Selection** from the main menu bar
- **Render>Frame Selection** from the main menu bar
- **Render>Render Project...** from the main menu bar
- The “Go” button from the Render Information Window

The **Render>Window** (and selection) and **Render>Frame** (and selection) will render the current frame only. You cannot initiate a complete project render from these menu items. Only **Render>Project** and the “Go” button from the main menu bar can initiate a complete project render. For more information on rendering single frames, please See “Render Menu” on page 91.

Launching a Render from the Menu Bar

The Render Project... menu option will render all frames of an entire project, unless you have selected otherwise, with the Render popup menu in the Timing tab of the Render Information window. Once you select **Ren-**

der>Render Project..., a save dialog will appear, prompting you for the name of the image or movie that you wish to render, and for the location where the file is to be placed upon completion. Afterwards, a Save Project dialog will appear. If you choose ***not*** to save the project, all of the work that you had completed after your previous project save will be lost.

Launching a Render with the Go Button

To simply begin rendering a project, click the Go button. If you haven't saved, you will be prompted to do so. Following that, EIAS Animator will quit, launch the camera application, and begin rendering.

Network Rendering with Renderama

9.0 Introduction

Rendering is typically the longest process in computer animation production. Even with the "world's fastest renderer," rendering still takes too long. In recent years, a method has appeared to allow the work of the rendering engine to be split up into smaller tasks, and distributed over a computer network of suitable machines and rendered remotely. This is called "network rendering."

Network rendering requires a robust computer network, computers with large hard drive capacities, generous amounts of RAM, and modern CPUs, such as Intel PIII or P4s, Athlons, or Power PC G4s or. You can use older machines, but of course, your render times will be longer.

The network rendering process involves a great deal of file transferring of data back and forth, and any noise on the network will affect data transfer throughput. Mixed protocol networks can sometimes create grief, and older routers can often be the culprit of slow network performance. Which, of course, leads to poor network rendering performance. Therefore, in a perfect world, these are things that you should avoid.

As you can imagine, with this much data traveling back and forth across the network, tracking model files, texture maps, plug-ins and so on can get rather complicated. A management system needs to be in control of the situation in order to produce satisfactory results. Network rendering in EIAS is managed by the included Renderama utility.

Renderama

Renderama can be used to schedule batch rendering on a single computer, as well as to distribute renderings among many networked computers. Each time that you send a file to be rendered via Renderama, you are creating a rendering job. Renderama will manage each job separately for you.

Note *Renderama jobs can only be distributed across TCP/IP local and wide area networks. No other network protocol is supported.*

Renderama can distribute rendering jobs transparently among multiple computer platforms including Macintosh, NT, and UNIX-based computers. However, if you do choose to render in a multi-platform environment, it is a good idea to confine specific shots to a specific class of computers. This is due to the fact that different computer classes use different math processors. As each rendered frame is very math intensive, small differences maybe noticeable frame-to-frame across different CPU types. Most of the time, these differences are not noticeable. Sometimes, however, they are glaring.

Renderama acts as a middle-man in-between EIAS Animator and one or more EIAS Camera rendering engines. It coordinates all rendering activity, automatically distributing jobs across the network, or queuing several jobs for subsequent batch rendering, in the case of a single machine configuration.

Renderama is actually a very simple-minded program. It does not offer many bells and whistles. Instead, it doles out single frame renders to each active machine on the network, and waits to see if the machine successfully completed the frame. If the rendering was successful, it is sent back to the master machine to be stored until all of the frames in the animation have been completed. Once all the frames are completed, the Renderama master application will stitch the frames together in the proper order.

If for some reason a machine fails to successfully complete a rendered frame, Renderama will remove the machine from the active list, and take it offline. In the status section, an error message will be displayed, and the word "error" will appear next to the slave's IP address in the slave list. That machine will remain offline for any further rendering jobs unless you reset it directly at the machine itself. Resets cannot be performed remotely.

Note *If a machine actually crashes, or the power goes out while a machine is rendering, Renderama can recover once the machine is rebooted.*

9.1 Configuring Renderama

Renderama consists of two applications, Renderama and Renderama Slave. The Renderama application acts as a master, and directs all the Renderama Slaves. The Slaves then transfer the output back to Renderama, where it stitches them all together.

Important EIAS Animator and the Renderama master application must be run from the same machine. The machine that is running the Renderama master application cannot be shut down until the current rendering job is completed, or the job will be suspended. If you desire unattended network rendering, you will need to manually copy your EIAS Animator project file and associated model and texture files to the master machine, launch EIAS Animator on that machine, and follow the steps outlined in "Network Rendering Job Management" on page 293.

By default Renderama will recognize the machine where it is installed as a possible rendering candidate, called "local". If you have a multiple machine network, and want to render on other machines, they must be added to the list.

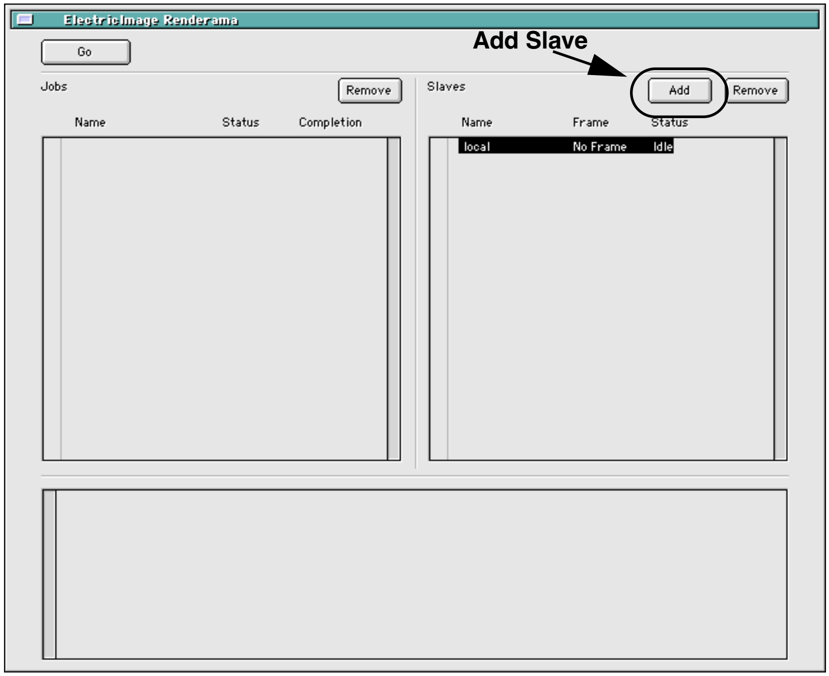


Figure 9.1 — **Initial Renderama Interface with Add Slave Highlighted**

Adding a slave rendering machine to Renderama:

1. Launch the Renderama application. It is located in the EIAS Animator directory
2. Once Renderama starts up, the control window as shown in Figure 9.1 will appear
3. Click the Add Slave button

After clicking the Add Slave button, a dialog appears to enter the Slave's IP address. Enter the address and click OK

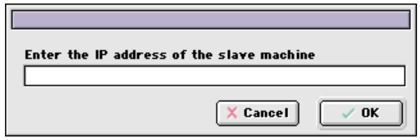


Figure 9.2 — **Add Slave IP Address Dialog**

After the new IP address is added, the new slave will appear in the Renderama window. The small circle icon next to the name indicates that you will allow this machine to be available to render.

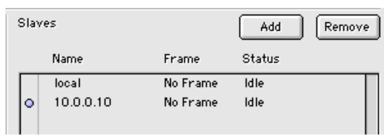


Figure 9.3 — **Renderama with a Slave Added**

Note *A machine called "local" will always appear in the slave list. This is the machine that the Renderama application was launched on. You may wish not to use the local machine as part of network rendering.*

Important The Slave machines must have a directory with Camera, Renderama Slave, and the EI Sockets, EI Resources and EI Shader directories installed. Renderama will not transfer sockets or shaders, instead, it looks locally.

The Renderama Slave application must be running in order for a rendering machine to be accessed by the Renderama Master. EIAS will not launch the Renderama Slave or Renderama Master applications. You must do this yourself. On network rendering machines, it is a good practice to place an alias or shortcut of the Renderama Slave to launch when the computer boots. This will allow for seamless operation, as well as better error recovery.

Using Specific Port Numbers

You may set a port number in addition to the IP address when configuring your slaves. To configure the port number of a slave, launch Renderama Slave and choose File Menu > Set Port Number. A dialog box will appear. Enter in a 16-bit port number (0-65535). If another application currently running is using that port, you will be asked to choose a different port number. After changing the port number you must quit and restart the slave.

The default port number is 1616. If you do not choose a port number, Renderama Slave will run on this port.

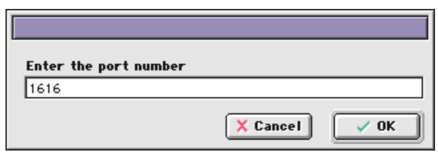


Figure 9.4 — **Renderama Slave Port**

Since the slaves can now have any port number you choose, Renderama itself now has the ability to specify a port number in addition to the IP address for the slaves.

To include a port number when specifying the IP address of a slave in Renderama, append “:port number” to the end of the address. For example, 192.168.1.106:5432 This would be IP address 192.168.1.106 and port number 5432. Renderama will now show both the IP addresses and the port numbers in its list of slaves.

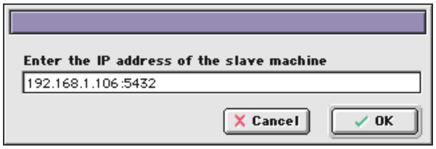


Figure 9.5 — **Renderama — Entering IP and Port**

If you do not add a port number to the IP address, Renderama will use the default, 1616.

9.2 Network Rendering Job Management

Once the Renderama master application is configured, and the slave machines are properly installed, up and running, you can begin to use Renderama for network rendering. The first thing that you must do is to set up your EIAS Animator project for network rendering.

Creating a Renderama network rendering job:

1. Launch the EIAS Animator application
2. Load the desired project into EIAS Animator
3. Choose **Render>Render Settings** from the main menu bar
4. Select the **Network** tab in the Render Information Window

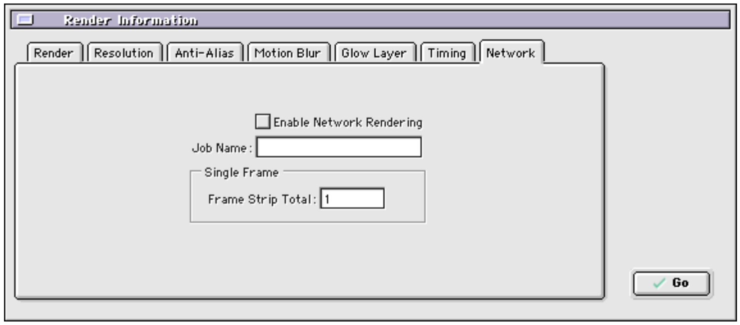


Figure 9.6 — **Render Window with Network Tab Selected**

The network rendering tab will appear.

5. Click on the Enable Network Rendering check box
6. Enter the name of the rendering job
7. Click on the Go button

   A save file dialog will appear, prompting you to choose the final animation file and the directory in which the file will be placed. Rendering control files will then be written from EIAS Animator, and supplied to the Renderama application. Normal operation will then be returned to EIAS Animator.

Once you have created a network rendering job for Renderama, you must then activate the job.

Note *EIAS Animator will not automatically switch to Renderama for network rendering. You must do that manually.*

To activate a rendering job in Renderama:

1. Launch the Renderama application
2. From the job list, choose the desired job name. There may be more than

one job name

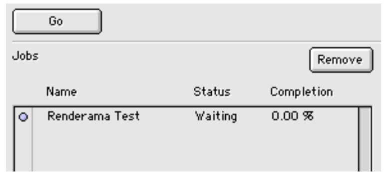


Figure 9.7 — **Job List in the Renderama Window**

3. Make sure that the job is active, as indicated by the shaded circle icon to the left of the job name. If the circle is not present, the job will not be processed.
4. Select the Go button at the top of the window.

   Once you select the Go button, Renderama will begin to transfer files to the slave rendering nodes on the network.

The status section at the bottom of the window will provide current Renderama system information. Slave machine status will be presented to the right of the slave machine in the slave list. As the rendering job progresses, Renderama will report any necessary information in the status section.

The jobs can also be removed by highlighting them and clicking remove.

Error Recovery

In the event that one or all of the Renderama applications fail, or the rendering computers fail, Renderama will pick up where it left off after everything is reset.

How to Get the Best Results from Renderama

As mentioned previously, Renderama is a simple-minded application, intentionally so. It is designed to make good use of a multi-machine render farm. Under certain conditions, using Renderama can be a matter of diminishing returns. Due to some overhead operations, Renderama is less efficient when you have less than three slave machines in your render farm. That does not mean that you shouldn't use Renderama in render farms with less than three machines, but that larger jobs (longer movies) will show more of a benefit in using Renderama than smaller jobs will.

As Renderama requires an individual control file for every frame, the control file write process can take noticably longer in EIAS Animator than writing out a single control file for direct rendering. To insure that a job is successfully completed, Renderama performs certain housekeeping routines which can also impact your overall render times.

9.3 Renderama Tips

- You must make sure that Renderama slaves are active in order to successfully launch a rendering job.
- If you have installed any new shaders or plug-ins on your Renderama master machine, make sure that you place copies of them in the EI Shaders and EI Sockets folders on the Slave machines.
- Some plug-ins use supporting files, such as textures. Make sure that these are located inside the EI Sockets folder on the slave machines as well.
- If networks use substandard network cables, switches, hubs, or has a lot of traffic, this will impede network rendering performance, or even make it impossible to complete a job.
- If you are doing a local (batch) rendering, make sure the enable button next the word "local" is activated.

- On the Macintosh, make sure that Ethernet is the chosen **Connect Via:** option in the TCP/IP control panel. Neither Appletalk, PPP or any other connection method will work.

9.4 Multiprocessor Slave Rendering

By specifying unique port numbers Renderama can communicate with more than one copy of Renderama Slave. This means it is possible to run multiple copies of Camera simultaneously on a slave, each rendering a single frame on its own processor. Is your slave a dual-processor Mac or PC? You can render two frames at once.

First a bit about the terms we use to describe network rendering. There are two network rendering applications, Renderama (the master), and Renderama Slave. Renderama distributes jobs to copies of Renderama Slave on the network. In addition, Renderama can act in “Local Mode”. This means Renderama can also distribute frames to a copy of Camera located in the same directory as itself. A Slave installation consists of a folder containing a copy of Camera, the EI Sockets folder, EI Shaders folder, EI Resources folder, Renderama Slave application and the .rsrc files (PC) and EI Shared Memory Lib.bundle file (Mac).

To set up your slaves, make a copy of the slave folder for each processor. If you are going to be running a batch job, you will need only one copy of the slave (see “Multiprocessor Batch Rendering” below).

We recommend that the slave folders be a the same level of the file system hierarchy. Please do not put one slave folder inside another or in the same folder as the Renderama Master.

Launch the copies of Renderama Slave in the folders and give them each a unique port number. Quit and restart the Renderama Slaves. On the master, launch Renderama and add an entry for each slave's IP:port. When you render, the master will treat each slave as an independent computer and will send control files and support files to each. A separate copy of Camera will be launched to render each frame.

9.5 Multiprocessor Batch Rendering

It is now possible to render in local mode and simultaneously use a slave on a dual-processor computer. This requires that you have two processors and enough memory for two copies of Camera, one copy of Renderama Slave, and one copy of Renderama.

You will have two folders on your computer, one containing the original Animator installation (for local mode rendering) and the other will be a slave installation. Do not install the Slave folder inside the Animator folder.

Launch Renderama Slave in the Slave folder and give it a different port number than the Slave in the EIAS Animator folder has.

Note *It is important that the port number of the Renderama Slave be different because, even though you aren't using the Renderama Slave in the Animator folder, Renderama will look at the preferences for Renderama Slave and communicate in Local mode using the set port number.*

Launch Renderama in the Animator folder, add a new slave with the IP of the computer you are using and the port number of the Slave you just created.

With Local mode and the Slave enabled in Renderama, two copies of Camera will now be launched when a job begins.

9.6 Subframe Still Rendering

You can now split up stills into pieces, send them to different slaves and have them stitched back into a single image. Renderama does this all for you.

The Render Control window, Info tab now has a new item, Frame Strip Total. This edit box tells Renderama how many pieces (strips) to divide up the single frame render job into. The default is 1, which means the image won't be divided at all. That is, a single frame will be sent Renderama. A value of 2 will divide up the frame into 2 pieces. A value of 5 will divide up the frame into 5 pieces. And so on.

The frames are divided up horizontally, sent to each slave and then reassembled into a single, finished image.

This feature was designed to aid those doing very high resolution print work and extremely complex raytraced stills.

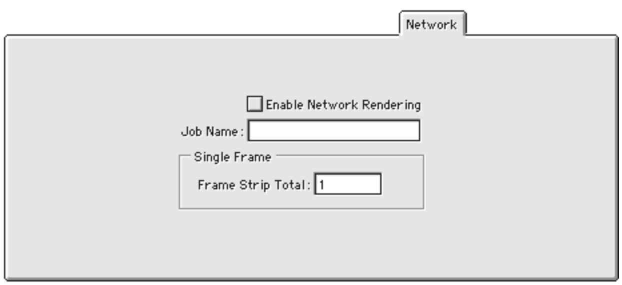


Figure 9.7 — **Render Control Window — Network Tab**

9.7 Plugin and Shader Subfolders

Please make sure that, in every folder that you use Renderama Slave, the EI Sockets folder and the EI Shaders folder do not contain any subfolders. Camera does not automatically search subfolders when running in Slave mode. This restriction does not apply to the folder that you run the Renderama master from.

9.8 Manual Stitching

The File Menu of Renderama contains a command, **Stitch...** This command can be used to stitch together an incomplete rendering. Issue the stitch command and then choose the folder with the unstitched Image files. You will be asked for a filename to save the final Image file to and the frame rate of the animation. The frame rate is stored with the Renderama Job. Since you are stitching outside of the normal job process, you must supply the proper frame rate.

Radiosity

10.0 Introduction

The Radiosity Engine calculates the distribution of light energy within a scene. First the amount of light directly striking each surface is determined. Then, in subsequent steps, or iterations, the diffusely reflected light hitting each surface from all other surfaces in the scene is calculated. This process is repeated until one of two conditions are met — all of the light except a very small amount (the “error”) has been accounted for in the entire scene or a prescribed number of iterations have been completed.

The accumulated light value is stored at each vertex in the scene. If these values differ by more than a certain amount between two adjacent vertices on a face, that face is subdivided.

As you can imagine, scenes with large numbers of light sources and millions of polygons will cause the Engine to generate exponentially large numbers of new polygons. Achieving a solution in a practical amount of time is best accomplished through approximation.

The Radiosity Engine provides two different methods to compute the light distribution. The Hierarchical method uses various approximations to dramatically reduce the time required to reach a solution, but in doing so, may introduce visible artifacts. It also has severe memory restrictions that keep it from handling all but the smallest scenes. The Progressive method is very robust, and handles nearly any scene without artifacts, but it relies on many more calculations, and therefore, takes more time to reach a solution.

10.1 Overview

The Radiosity Engine is a separate application (named Radiosity) that runs when you want to calculate or recalculate a radiosity lighting solution. It is used before rendering with Camera takes place. Therefore, it has no animateable parameters.

Figure 10.0 — **Radiosity Application Icon**

The basic approach is to choose which lights and groups in your scene to calculate, pick a solution method, adjust the settings, and then tell the Engine to begin. The Engine calculates the light distribution, subdivides the groups into larger numbers of polygons, and then writes out a FACT file (the radiosity solution FACT file). Animator will tell Camera to use the groups in the new FACT file instead of the original ones when rendering. Stored in this FACT file along with the polygons are radiosity color vertices. These are displayed as luminance in both Animator and Camera.

Since the radiosity color appears as luminance, you can add regular Phong lighting on top of it. This means you can choose to use the Engine to calculate the overall, “ambient”, lighting in your scene and still add detail lights (spotlights, tube lights, etc.) as well. This allows a hybrid approach for getting the warm feel of the Engine without forcing you to calculate every bit of light in the scene using it.

The Engine considers three types of light sources: Phong lights (radial, spotlight and parallel light), any FACT group in the scene that you want to emit light, and a Phong light that uses an external FACT model to define its shape.

Note *Do not assign a plugin object (e.g. Ubershape sphere) as a light source The Radiosity engine will not receive the proper geometry and error will result.*

The last two choices are virtually the same. Assigning a FACT model to a Phong light lets you use the lights convenient reference control when aiming and positioning the emitter.

You can disable the display of the Radiosity colors on a group-by-group basis using the “Display Radiosity” check-box in the Display tab of the Group Info window. This defaults on (displays the colors).

Note *As with most check boxes, right mouse clicking (Ctrl-clicking on Macintosh) will bring up a menu that allows you to change the settings for all or a selection of project groups.*

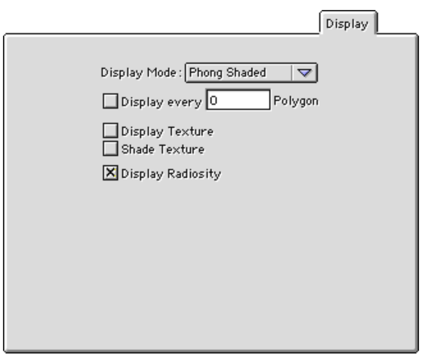


Figure 10.1 — **Group Info Window, Display Tab**

10.2 Setting Up Geometry and Lights

Geometry can receive light, emit light, or be completely invisible to the Radiosity Engine. Two parameters have been added to the Material Info window, Diffuse tab for controlling the amount of light emitted and reflected by geometry during radiosity calculations.

Energy Reflection. For those groups that receive light this parameter controls how much energy reflects to other objects in the scene.   The Engine works by first distributing light to polygons directly visible to it. Then those polygons distribute a portion of that light to polygons visible to them. The process is repeated until most of the light has been distributed. Energy Reflection controls how much light is passed on from the group to other groups in the scene. Range of values [0 - 1]. Most objects in real life fall into the range of .35 to .85. Few are less than .15.

Radiosity Intensity. For those groups designated as light sources this parameter controls how much light is emitted. Range of values [0 - 40000].

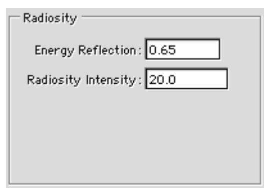


Figure 10.2 — **Material Info Widow, Diffuse Settings**

Light sources (Radial, Spot, and Parallel) can be designated as light emitters for the Engine. The Radiosity tab has been added to the Light Info window to control the behavior of these lights.

Radiosity Intensity. This controls how much light is emitted. Essentially the light intensity of the light source.   Range of values [0 - 40000].

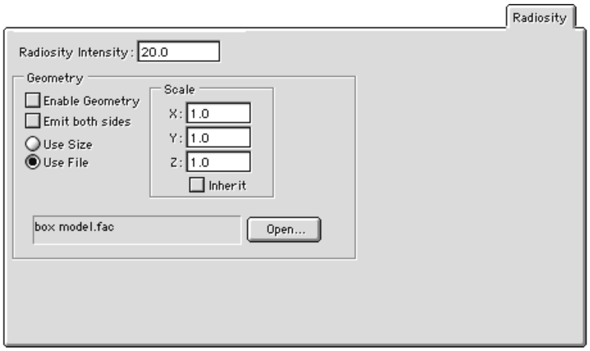


Figure 10.3 — **Light Info Window, Radiosity Tab**

The Engine emits light from a surface. Phong light sources don't have a surface, therefore the Engine provides two ways of creating a surface for the light.

Use Size. This radio button tells the Engine to use the light size parameter in the Properties tab of the Light Info window to create a virtual object for the emission of light.

Note *Do not forget to set the size when using Phong lights for Radiosity. If you do, the Engine will arbitrarily set the size to 1.0. This will be unlikely to yield the results you desire.*

Use File. This radio button tells the Engine to use an external FACT file as a light emitter. Selection of this option brings up an open-file dialog box for the selection of a FACT file from your file system.

Once the FACT file has loaded, you will see a wireframe representation of it in the View windows. The light controls (rotation, translation, reference) will position the light and its FACT emitter in the scene.

If the FACT file contains multiple groups, all groups will be merged into a single emitter object.

The color of the Phong light itself, as set in the Properties Tab of the Light Info window, will be the emitted color.

Enable Geometry. This is a quick way to turn off and on the use of an external light emitter. If instead you change the state of the radio buttons from Use File to Use Size, the scale information and the reference to the external FACT file will be lost.

Emit Both Sides. Tells the Engine to emit light from both sides of the FACT object.

Scale. Allows you to scale the size of the FACT emitter.

Inherit. Causes the FACT emitter to be scaled by the parents of the Phong light. This allows the Phong light to inherit scale from the project hierarchy.

Open... Allows you to select a different FACT file as an emitter.

10.3 Radiosity Controls

The Radiosity setting dialog box is brought using the Render menu at the top of the screen. It contains all of the controls to vary the behavior of the engine, the list of lights and objects the engine will consider and the buttons used to initiate the solution and to update the scene with the solution once the engine has completed its task.

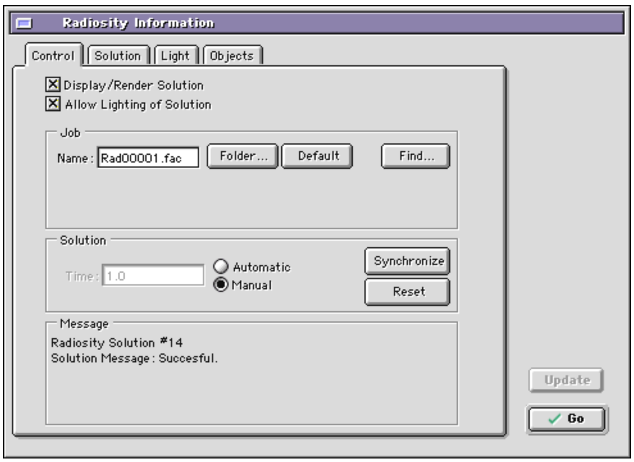


Figure 10.4 — **Radiosity Settings Dialog**

Go. Pressing this button launches the Radiosity Engine beginning the solution process.

Update. When the Engine completes its calculations, the Update button highlights. Pressing the button updates the radiosity solution. You will then see the results in the View windows (the windows must be in Hardware mode). If the Automatic/Manual radio button is in Automatic mode, you won't have to press this button. Animator will update the solution for you.

Control Tab

Display/Render Solution. This tells Animator to use the computed solution when drawing groups in the four View windows (the windows must be in Hardware mode) and when rendering to Camera.

Allow Lighting of Solution. When this button is on, all lights in the scene are treated as Phong lights. Their lighting is added to any existing radiosity solution. This applies to what is displayed in the four View windows and what is sent to Camera for rendering.

Turning this button off disables every Phong light in the scene. The only lighting displayed and rendered is that computed by the Radiosity Engine.

Job Name. This is the name of the FACT file (radiosity solution file) that the Radiosity Engine will use to store the modified groups and their radiosity color vertices. There is only one of these files per project. By default, this file is stored in the same folder as the project file.

Folder... Lets you choose which folder in which to store the radiosity solution FACT file.

Default. Causes the radiosity solution FACT file to be stored in the same folder as the project file.

Find... Lets you search for the radiosity solution FACT file. Useful if you have move the project to another computer and Animator can't locate the file.

Time. Controls how often Animator checks to see if the Engine has completed its solution. Only applies when the Automatic/Manual radio button is in Automatic mode.

Automatic/Manual. Controls how the solution is updated after the Engine begins running. In Manual mode, you must hit the Update button to see the solution. In Automatic mode, Animator checks periodically to see if a solution has been completed and then updates the solution when it detects that the Engine is done.

Synchronize. This insures that the solution being used is the current solution.

Reset. Deletes all the radiosity information from the project. Deletes the radiosity solution FACT file.

Message Box. This section of the dialog box contains status messages about the last solution calculated.

Solution Tab

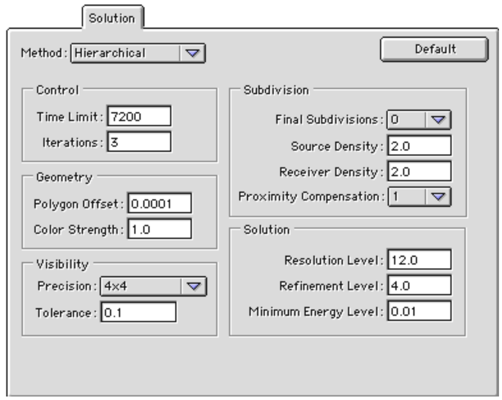


Figure 10.5 — **Radiosity Settings, Solution Tab**

Default. Resets the contents of the Solution tab back to their factory defaults.

Method. This pull-down menu lets you select either the Hierarchical or Progressive solution methods.

Time Limit. Complex scenes may take a long time to solve, especially when using the Progressive method. In a production setting, there may be a limited amount of time to run the solution, and it is desirable to take the best solution achievable during that time. The maximum time a calculation is allowed to run is controlled by entering the desired number of seconds. When the solution is not complete, but this time is met, a final pass will be run and the solution will be output. Range of values [0 - 84000].

Iterations. Applies only to the Hierarchical method. This value determines the number of times to cycle through the solution process— each time successively lowering error values until the Minimum Energy Level is met. Higher values provide better results but take more time. If the scene appears too dark, or there is not enough inter-patch reflection present, the number of Iterations should be increased. If the scene isn't intended to have much indirect illumination, a lower value will be sufficient. Range of values [1-100]

Polygon Offset. The Radiosity Engine functions more efficiently if there is a small gap introduced between the sides of each two-sided polygon. The size of this gap is controlled by the Polygon Offset. This value should be as high as possible without causing visual artifacts in the solution. Range of values [0 - 1].

Color Strength. If a white polygon is placed near a red one, the white polygon will appear slightly red due to the diffuse light reflected from the red polygon. This called color bleed. The Color Strength setting acts as a multiplier in the color bleed calculation. A value of 1 allows full color bleed between polygons. A value of 0 allows no bleed at all. Range of values [0 - 1].

Visibility Precision A polygon will only directly receive energy from polygons visible to it. There are two ways that visibility can be determined. 1x1 casts a single ray between the center of each polygon. 4x4 casts sixteen rays between the polygons. This is more accurate but takes longer to calculate.

Visibility Tolerance. Often, one polygon is only partially visible to another. When this happens, the Engine determines the degree of partial visibility and, depending on how the Visibility Error value is set, may subdivide the polygons. The effects of this setting are most apparent along shadow boundaries. If shadow edges appear ragged or are ignored altogether, this setting should be decreased. Note that decreasing this value will cause more polygons to be subdivided increasing the amount of time required to reach a solution. Range of values [0 - 1].

Final Subdivisions. When the solution is complete and the radiosity values are distributed to all of the polygons, the Final Density controls how much additional subdivision will take place. Additional subdivision can improve the quality of shadows in the solution. If blocky shadows are the only complaint, increasing the Final Subdivision Density is a good approach. Otherwise, adjusting the Refinement Level would be a better first choice.

Source Density. Often scenes contain large polygons that will likely be subdivided several times as the solution is calculated. If these large polygons are divided into smaller polygons before the Engine begins calculating, the solution is often reached more efficiently. The Subdivision Density value is the degree to which this initial subdivision will occur for emitters. Increasing the value will increase the number of polygons subdivided. Range of values [0 - 100].

Receiver Density. Often scenes contain large polygons that will likely be subdivided several times as the solution is calculated. If these large polygons are divided into smaller polygons before the Engine begins calculating, the solution is often reached more efficiently. The Subdivision Density value is the degree to which this initial subdivision will occur for receivers. Increasing the value will increase the number of polygons subdivided. Range of values [0 - 100].

Proximity Compensation. When two polygons intersect or are in close proximity to each other, the solution becomes more computationally intensive. There is a trade-off between the quality of the solution and the time consumed estimating the light transport between the polygons. Increasing the Proximity Compensation value improves the quality of the solution but increases the calculation time.

Resolution Level. The higher this value is set to, the larger the size of the polygons considered by the Engine. When the Resolution Level is set too high, blockiness will result because small details are being ignored by the Engine. Range of values [0 - 40].

Refinement Level. This is the most significant variable for controlling the quality of the solution. The Engine works to meet this value when characterizing the transport of light energy throughout the scene. It affects the quality of shadows and how well the overall transport is approximated. If the solution is blotchy or artifacts are visible, raising the Refinement Level may resolve the issue, although performance will suffer.   Range of values [0 - 40]

Minimum Energy Level. Regardless of how long the Engine calculates, there will always be some amount of light energy left to distribute. The Engine stops calculating when the amount of energy left to distribute reaches this value. Lowering this value will increase the quality of the resulting scene, particularly when a scene is dim to begin with. Performance will improve with higher Minimum Energy Levels. Range of values [0 - 1]

Light and Objects Tabs

You tell the Engine which objects and lights to use by adding them to the lists contained in these tabs.

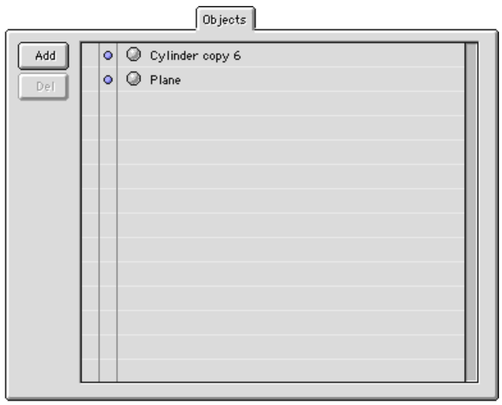


Figure 10.6 — **Radiosity Settings, Objects Tab**

To make a group part of the radiosity scene, select it in the Project window or one of the View windows. Then click on the Add button in the Objects Tab.

You add lights to the radiosity scene in a similar way. Since geometry can act as a light, you can click on a group or a light in the Project window or one of the View windows and then click on the Add button in the Light Tab.

10.4 Polygon Quality

The direction a polygon faces is critically important in determining the overall radiosity solution. If a light is facing away from a surface, it will not directly illuminate that surface. Similarly, the direction a polygon faces is significant when determining whether any of the energy reflected from it reaches other surfaces.

Depending on whether the “Cull Backfaces” check-box is turned on in the Group Info window, the Engine will treat polygons as one-sided or two-sided. Two-sided polygons emit and received light from both sides. In the Engine the polygon will be turned into two polygons facing back to back.

Therefore, turning off “Cull Backfaces” can double the number of polygons that the Engine must solve for.

Objects with complex polygons are currently not handled. Please break up complex polygons into quads and tris. Objects that are poorly tessellated, i.e. objects that have long thin triangles and strange, inset regions, may not be solved for properly by the Engine. While perfect, regular tessellation is not required, please try to provide well-tessellated geometry.

Polygons with holes aren’t handled and may lead to visual artifacts, usually triangular-shaped areas that have a different radiosity intensity. These polygons must be broken up in your architectural modeler before exporting to FACT.

10.5 Radiosity Engine Interface

The engine has a simple status display that gives information about the solution being computed. It has two status bars at the bottom that track the progress of the engine. The lower bar indicates the particular part of the solution the engine is working on (visibility testing, ray casting, etc.) The upper bar indicates the progress of that part. In Figure 10.7 below, the Visibility Calculations are half-way complete.

When the engine completes its solution, it quits automatically. You can quit it ahead of time by using the Abort or Quit commands under the File menu. There are also options to Pause the solution (or continue again) and to hide or show the status display.

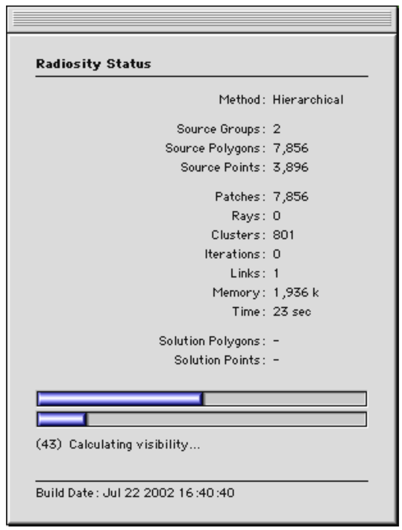


Figure 10.7 — **Radiosity Engine Status Display**

10.6 Putting It All Together

Here are the basic steps required to create an animation using the Radiosity Engine and Camera:

- Open your project file and choose the groups that will receive light directly (from light sources) and indirectly (reflected from objects in the scene).
- Add those groups to the Objects tab in the Radiosity Settings dialog.
- Choose the groups and the Phong lights that will be acting as light emitters and add them to the Light tab in the Radiosity Settings dialog.
- Set the Size parameter of the Phong lights (that don't have attached FACT files) in the Light Info window.
- Set the Radiosity Intensity of the Phong lights in the Radiosity tab of the Light Info window
- For the Groups that act as emitters, set the Radiosity Intensity value in the Diffuse tab of the Material Info window.
- Go to the Radiosity Setting dialog, Control tab and choose either Hierarchical or Progressive.
- Hit the Go button in the Radiosity Settings dialog. The Engine will launch and begin computing a radiosity solution.
- When the Engine is done, hit the Update button in the Radiosity Settings dialog. You will now see the solution in the Four View windows (the windows must be in Hardware mode).
- Render a snapshot to Camera.
- At this point you can adjust the Radiosity settings, add Phong lights and rerender to Camera or recompute the radiosity solution and hit the Update button again.

10.7 A Few Extra Notes

Animator stores the radiosity data as color vertices in the FACT file. A bit flag tells Animator and Camera if the color vertices are to be used as regular color (the kind Amorphium Pro paints on) or as radiosity info. When used as radiosity info, the color is applied to the ambient channel of the group. There are three conclusions you can draw from this:

1. A group can't have both color vertices and radiosity vertices at the same time.

2. The Ambient controls in the Material Info window can be used to reduce (but not increase) the radiosity intensity or tint its color. These controls can be animated for flickering light effects.

3. Plugins scan access the radiosity vertices the same way they access the color vertices of the model...since its stored in the same place.

Selection Sets

11.1 Introduction

Although this chapter is deceptively short, it discusses a seemingly simple part of EIAS that grows in importance with the complexity of the project: Selection. Just as image-editing and illustration applications have multiple methods of selecting elements based on their attributes, then acting on them in ways unique to the selection process, we have widened the scope of how selections are made in EIAS Animator — of how they are used to organize a project, and how they can be used to create special effects.

To move an object or access the material attributes of a group, you must first select the object or group. This is done by clicking once on the object, either in the world views or Project Window, or by dragging a rectangle around one or more groups. To facilitate selections which are larger in scope, the Select menu allows you to select models and groups by a variety of methods.

The Select Menu has a selection type, By Set. A set is simply a defined collection of groups from within a project. The By Set menu option allows you to edit selection sets, or select items in the project that already belong to an existing set. The hierarchical menu below By Set initially contains a single entry, Edit Sets. As sets are created their names will appear in this space.

Selection sets are used for light inclusion/exclusion lists, glow layers, Camera maps, and, of course, typical selections. Selection sets will come in very handy as you work with EIAS Animator.

11.2 Select by Set

Figure 11.0 — **Select Menu**

Sets have four uses in EIAS.

- To select groups of items within the project
- To include or exclude groups from a light's illumination
- To control the glow radius and glow intensity for a set of models
- To control which objects receive projections from Camera Maps.

To create a selection set:

1. Choose **Select>By Set>Edit**.
2. The Sets window, show below in the illustration "Selection Sets Window" on page 321, opens.
3. In the Selection Sets column, click Add. When prompted, create a name for your set.

The name of the selection set will be appended to the **Select>By Set** menu.

The Selection Sets Window

Selection Sets The left column, Selection Sets, contains the names of all existing sets. Once you create your set its name will appear in this column. New sets can be created and old sets can be deleted using the Add and Remove buttons. The Sort pull down gives you the option of viewing the list of sets alphabetically or in their creation order.

Members The right column, Members, shows the members of the set that is highlighted in the left column. To add members to an existing set, go to the Project window and highlight the names of the groups to be added. Then return to the Selection Sets window.

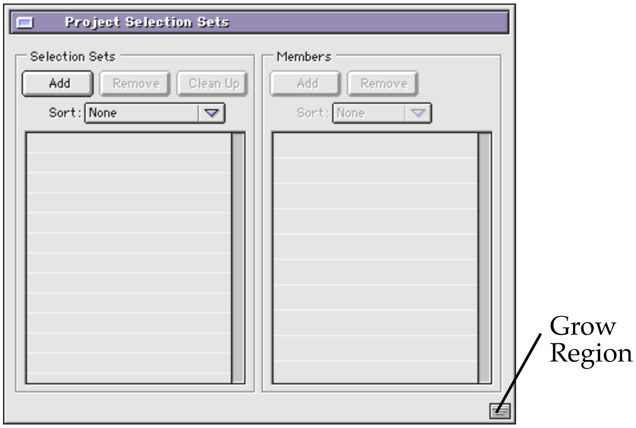


Figure 11.1 — **Selection Sets Window**

In the left column, highlight the set name to which you wish to add the objects and click on the add button on the right side of the dialog box. Members of sets or whole sets can be removed by highlighting the item and clicking on the remove button.

Find Tools

Find, Find Again... and Find All... can be used to search the names of objects in the Project window for a particular alphanumeric sequence. It's a handy way to locate a particular object when your project grows to a very large size.

Using and Animating Groups

12.1 Introduction

In EIAS Animator, geometry that is animated and rendered are referred to as groups. Typically, a single group corresponds to a single layer or object within a model file. Groups can exist as independent entities, or within a hierarchy. Groups can be translated (moved, rotated and scaled), deformed, have its materials animated, and so on. Groups can be imported from other programs (into the native ElectricImage FACT format) or be created by a variety of plug-in programs. A group can have as many as 250 or more animation channels, many of which can be individually enabled or disabled (others by the class of animation channel). Each channel can be controlled independently by you. All of the channels can be placed into the function curve editor for animating, or you can pick individual channels.

Each group can contain an unlimited amount of points, lines and polygons and texture maps. There are no limits to the amount of groups that you can have within a project, memory permitting.

To import a FACT model into a project:

1. Choose **Object>Import Object...**
2. Select the Model name from the file list
3. Double click or press the Add button
4. Click the Done button when finished

The model will now appear in the world view windows, and the file name of the model will appear in the Model File section of the Project Window. The model’s groups will appear in the group section of the Project Window.

Model formats from other programs can be imported into EIAS Animator. Several popular formats are supported.

To import a foreign model format into a project:

1. Choose **Object>Import Object...**
2. Select the Model name from the file list
3. Double click or press the Add button
4. Click the Done button when finished

The model will now appear in the world view windows, and the file name of the model will appear in the Model File section of the Project Window. The model's groups will appear in the group section of the Project Window.

As mentioned previously, groups can exist individually, or as part of a hierarchy. Hierarchies enable complex motions to be created, using groups linked in "chains" or "trees." Hierarchies are also required if you wish to animate your groups with inverse kinematics.

12.2 Importing 3D Text

In addition to adding and importing models into EIAS Animator, you can also create font models from Adobe® PostScript® Type 1 fonts or Apple® TrueType™ fonts. The font outlines are converted into polygons, and depending upon your choices, extruded into 3D and even bevelled.

To add 3D text into a project:

1. Choose **Object>Add 3D Text...**
2. Select a Font from the file list (a font does not need to be installed in the system in order for it to be converted into 3D — the fonts can reside on

any disk)

3. Type in the font letters that you desire in the text box
4. Click OK (The 3D Font Options dialog box opens)
5. Set the extrusion height and bevels and element colors (if desired)
6. Click the OK
7. Save the font model

The font model will now appear in the world view windows, and the file name of the model will appear in the Model File section of the Project Window. The model's groups will appear in the group section of the Project Window.

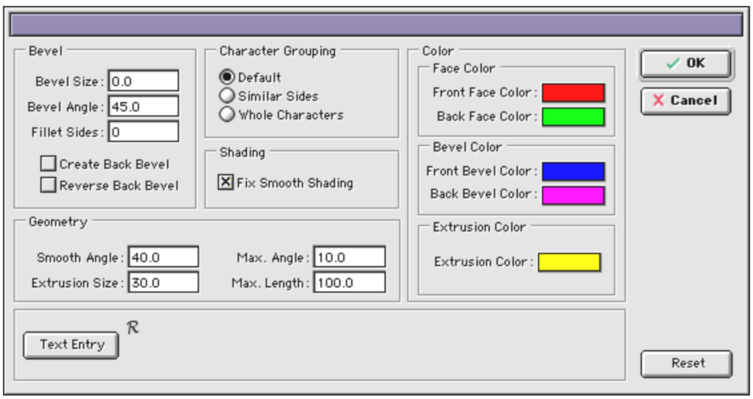


Figure 12.0 — **3D Font Options**

Bevel Size

This edit box contains a value that sets the size of the bevel (the default is 0 for no bevel). The value of the bevel size is in units relative to the other values in the dialog box. A negative value will bevel inside the original fount outline, and a positive value will bevel outside the original outline.

Bevel Angle

This edit box contains a value that works in conjunction with the **Bevel Size** edit box to set the degree to which the bevel will occur on the font, as viewed from the side.

The default is 45°; an angle smaller than 45° will cause the bevel to recede towards the center of the model (as viewed from the side); an angle larger than 45° will cause the bevel to advance away from the center (as viewed from the side).

Fillet Sides

This edit box contains a value that creates a rounded bevel. You can add a rounded edge to the font instead of an angled bevel by increasing the value in the Fillet Sides edit box to a value larger than zero. The value determines how many segments are to be used in the fillet. For a good, rounded appearance, a value of 6 to 8 is sufficient.

Note *Filleting adds many polygons to the model and increasing the amount of time it takes to create the 3D object.*

Create Back Bevel

This check-box option, when enabled, creates a font model with back facing bevels as well as front facing bevels.

Reverse Back Bevel

This check-box option, when enabled, reverses the angle of the back bevel so that it is opposite the front bevel. This can result in a “stepped”, pyramid-like bevel or fillet.

Default (Character Grouping)

Causes the 3D test to be created in a hierarchy with the extruded sides as the parent group to the front face, back face, front bevel and back bevel.

Similar Sides

Causes similar faces of all characters in the font model to be grouped together, such as both bevels in one group and both faces in another group.

Whole Characters

Causes all faces of individual characters in the font model to be grouped together as single groups.

Smooth Angle

This edit box contains a value that determines the angle at which a hard edge appears between polygons when using the **Fix Smooth Shading** option.

This feature works by comparing the angle of the polygon to the angle of the polygon next to it. If the angle is greater than the value in the Smooth Angle edit box, the polygon will shade as a hard edge. If the angle is less than the value in the Max Angle edit box, the edge will smooth shade.

Fix Smooth Shading

This check-box option, when enabled, creates hard edges when smooth shading a model.

Max Angle

This edit box contains a value that determines whether the font outlines are sampled in a course or smooth fashion. The default angle is 4°, meaning that the outline will be sampled so that there is no angle greater than 4° along the edge of the resulting model, providing a fairly smooth text. The larger the angle, the courser the text. If the font you are working with has very shallow curves, a smaller Max Angle is advised, but be aware that this will create a far greater number of polygons.

Extrusion Size

This edit box contains a value that gives a font depth. The default distance for the extrusion is 30 units. To make the resulting text flat (2D), set the value in the Extrude edit box to 0.

12.3 Group Info Window

Like all other object classes in EIAS Animator, groups have an information window associated with them that allow you to control a variety of options. The group info window contains basic non-material attributes for the group (such as position, rotation, scale, and so on), as well as an access point to the group's material record. The Group Info Window is divided into conveniently organized folder tabs, each containing the controls and functions indicated by the name of the tab. To access the contents of a tab, just click on it.

The group info window is divided into the tab section, Material ball icon, and configuration check boxes. The four folder tabs are:

- X-Form (Transformation)
- Shading
- Shadow
- Info
- Display

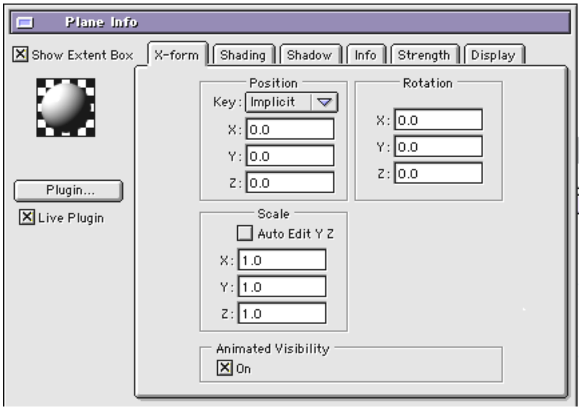


Figure 12.1 — **Group Info Window**

Figure 12.2 — **Material Ball**

Base Options

On the left side of the window you will see either two or four options, depending on what type of object it is. They are not linked under a folder tab, and remain visible at all times.

Show Extent Box

This check box toggles on and off the display of group bounding boxes in the 3D views.

The Material Ball

The material ball shows shading properties that are set for the current group (it is does not show texture maps or procedural shaders.)

The following two options will only appear if the group's geometry is generated by an active plug-in.

The Plug in Button

When a group is comprised of data generated by a plug-in, clicking this button will open the plugin's configuration window.

Live Plug in

This checkbox toggles on and off the active recalculation of a plugin's parameters when the time thumb is moved (a great time saver.)

For example, if you have a Mr. Nitro group in your project, every time you move the time thumb Mr. Nitro will recalculate the position of the group's fragments. A particle system will do exactly the same thing. Unchecking Live Plug-in will disable this calculation, removing the need for you to type Alt-Period (Command-Period) to prevent recalculation.

The X-Form Tab

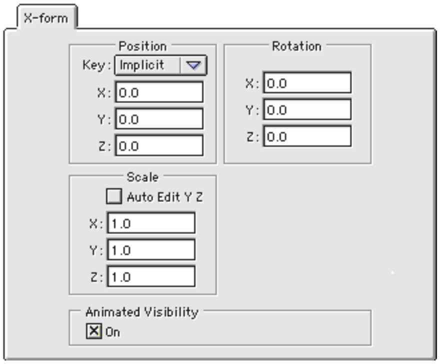


Figure 12.3 — **X-Form Tab**

The X-Form (Transformation) Tab contains spaces which contain X, Y, and Z values for the three geometric transform values of a group:

- Position
- Rotation
- Scale
- Auto Edit Y Z
- Animated Visibility

Position. Displays the position data at the current scene time.

Rotation. Displays the rotation data at the current scene time.

Scale. Displays the scale data at the current scene time.

Auto Edit Y Z. When on, the scale value entered in X will automatically be copied to Y and Z. This is a simple way to enforce non-uniform Scaling.

Animated Visibility. Animator has always supported two methods of controlling object visibility. The Visibility check box and the Visibility Channel.

The check box can be used to turn off the object (and the object's children if they are set to inherit visibility) over the entire duration of the project. When this check box is turned off, the object disappears from the view windows.

Visibility Channel can be animated. You can put the Project window into Frame Mode and change the entries to/from On/Off. During rendering, the object (and the object's children if they are set to inherit visibility) will only be seen if the channel is set to On for the frame being rendered.

Note *Unlike the check box, using the Visibility Channel to prevent an object from rendering does not remove it from the View Windows.*

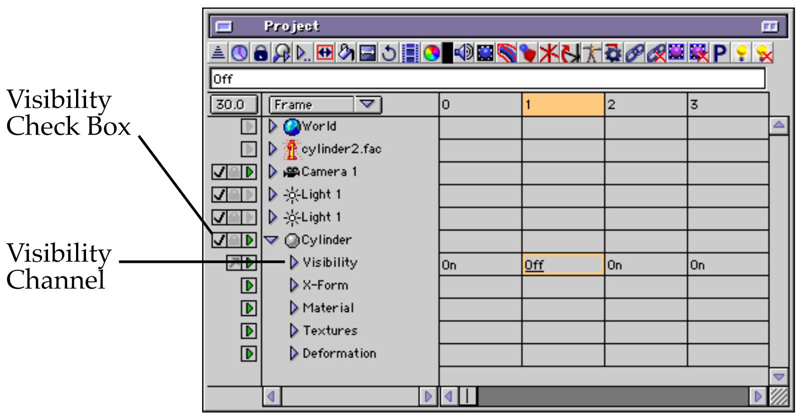


Figure 12.4 — **Project Window — Frame Mode**

Animator allows you access to the Visibility Channel directly through the Group Info window, X-form tab and the Light Info window, X-form tab. A new section, "Animated Visibility" has been added. This is the only check box in Animator that animates. You can use it as a convenient way to access the Project window's Visibility Channel.

In the position section, you will see a popup menu where you can select Implicit or Explicit keyframe interpolation. The following section will explain the differences in these two types of interpolation. Following this section we will continue with the explanation of the Group Info Window.

Implicit and Explicit Interpolation

All vectorized quantities in EIAS Animator (position, reference, center, etc.) have an extra pulldown menu in their info windows. This pulldown controls whether the quantity is Implicitly or Explicitly translated. Explicit translation allows separate control in our curve editor for each of the three components (X,Y,Z).

To make an object's Translation explicit:

1. Open the Group Info window for a given object. Make sure that the X-Form window is in the foreground.
2. Change the translation of the particular Transformation characteristic from Implicit to Explicit.

The illustration below shows the Position translation being changed to Explicit.

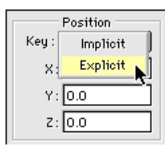


Figure 12.5 — **Changing Implicit to Explicit**

The translation value for the object's position is now explicit. Repeat these steps for any other value to change its transformation.

The Shading Tab

The shading tab contains attributes which let you specify the shading behavior of the group.

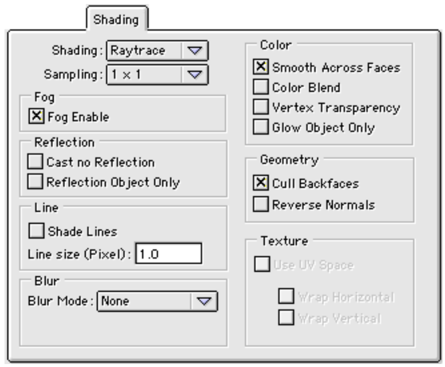


Figure 12.6 — **Shading Tab**

The Shading tab is divided into seven sections:

- Shading Pop up Menu
- Sampling Pop up Menu
- Fog Section
- Reflection Section
- Line Section
- Blur Section
- Color Section
- Geometry Section
- Texture Section

Shading Pop Up Menu

The Shading pop up menu allows you to set the rendering level for the group. The items offered in the menu are the same as the choices offered in the Camera pop up menu found in the Render tab of the Render Information Window. The items offered and their definitions are covered on page 250.

Sampling Pop Up Menu

The Sampling pop up menu allows you to set the level of sampling, or anti-aliasing, that the group will receive. If you choose the option labeled “default,” then the group will be sampled at the level set in the Anti-Alias tab in the Render Information Window. If you choose a sampling level other than “default,” the object will be sampled up to the level of sampling that you have selected. The actual level of sampling the object receives is again dependent upon the sampling level settings in the Anti-Alias tab of the Render Information Window. If you choose a level in the Anti-Alias tab that is lower than the level that you have chosen for the object, the level of sampling will be limited to the setting in the Render Information Window. If you choose a sampling level that is lower than the setting in the Render Information Window, then the level of sampling will not extend further than the sampling level set in the Shading tab of the group. For more information and definitions of the other choices in the menu, please refer to page 273.

Fog Section

Fog Enable

This check box enables the group to be affected by any of the global fog settings in the **World Info Window's Fog Tab**. When this box is unchecked, the object will not be affected.

Reflection Section

The items in this section are pertinent only when automatic reflections such as mirror or environment maps are used somewhere in the scene. They are otherwise ignored.

Cast No Reflection

Enable this check box if you don't want the group to cast a reflection onto another group.

Reflection Object Only

Checking this box will force the group to not render in the scene, but other objects will be able to see it in their reflections.

Line Section

The attributes in this section affect wireframe shading options only. They do not affect the cell/outline shader settings found in the geometry tab of the Material Editor.

Shade Lines

When a group's shading popup is set to wireframe, this check box enables the material attributes assigned to the group to actually shade the wireframes of the group. Very cool.

Line Size (pixel)

Use this value to set the line thickness in pixels for wireframe shading. A value of 0.0 will use the global line thickness settings in the **Render Information Window** instead.

Motion Blur Section

Blur Mode Popup

There are three options for motion blur for every group:

- None
- Point /Line
- Motion Vector

None. No blur is used for the group (default)

Point/Line. This blur option should be used if you wish to blur groups containing points and lines. The line size value is also used by this option when active.

Motion Vector . A very high quality fast motion blur that most closely approximates real photographic motion blur. This setting is the best to use in about 90% of the cases you will come across. At times, the effect does break (such as a fan inside a cage). At those times, you can set the Motion

Vector setting at the group level, and choose both the Frame Multisample (set the sample value to 2 and increase as necessary) and Motion Vector settings (use the default) in the Render Information Window. The combination of these two blurs can usually satisfy all but the most ardent critics!

Color Section

Smooth Across Faces

Enables the shading of the group to smoothly blend across the faces that make up the group's shape. If you want to see the individual faces defined, disable this check box.

Color Blend

Blends the color of the vertexes of the group together. Typically, the vertexes of a group are a single color, rendering this option useless. However, you can create some nifty special effects if you have the ability to color individual polygons (most modelers do) and use this feature. For example, you can create a tail cone of a jet with black colored polygons around the edge of the cone closest to the outlet, and the color the polygons around the section closest to the body gray. Enable this checkbox and shade. See how the colors blend together? For added realism in this example, don't color all of the polygons black around the outlet, leave some gray. It looks even better now. This is basically a throwback to the old CGI days, before texture mapping was common.

Vertex Transparency

Certain plug-ins are able to set transparency values for geometry on a polygon by polygon basis. This will be very useful for plug-ins that simulate fire and other such effects. This type of transparency will be used by the render if this is checked.

Glow Object Only

This option will not shade the group, but will allow its glow settings to be used by the renderer. When combined with particle systems, for example, what you essentially end up with are “fuzzy particles.”

Geometry Section

This section contains controls which directly affect the group’s geometry during the rendering process.

Cull Backfaces

Removes back facing polygons (those not seen by the camera) so that they are not shaded at render time. This speeds up rendering (didn’t think we could get any faster?) and is great for eliminating the double specular effect present with transparent objects.

Reverse Normals

You can reverse the normals of a group with this option enabled. Unlike most rendering engines, EIAS Animator understands that polygons have two sides regardless of the normals for the polygons and will shade the model accordingly. You can turn the group inside out with this feature, or better yet, combine it with the Cull Back faces option. Try this: add a model (don’t use the standard shapes plug in with this feature) of a sphere and enable both of these features. When you render, you will see the inside of the back of the sphere. Combine this with edges set to transparent and you will have yourself the beginnings of a planet atmosphere!

Texture

When groups contain UV information, you have the option of using that information to apply texture maps.

Use UV space. This check box will enable the UV space feature.

Wrap Horizontal. This option will allow the UV space to wrap in the horizontal axis. This will prevent a visible seam from appearing.

Wrap Vertical. This option will allow the UV space to wrap in the vertical axis. This will prevent a visible seam from appearing.

Shadow Tab

The shadow tab controls the shadow casting properties of the group. There are five check boxes in the tab:

- Cast Shadow
- Receive Shadow
- High Precision Shadow
- Generate Shadow Mask
- Shadow Object Only

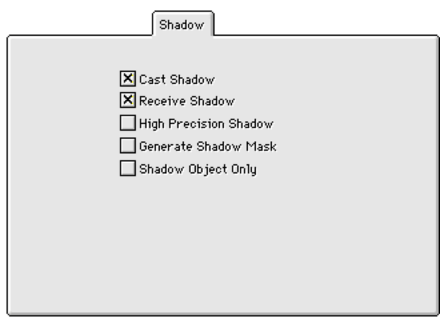


Figure 12.7 — **Shadow Tab**

Cast Shadow. Enables the group to cast a shadow onto other groups. Defaults On.

Receive Shadow. Enables the group to receive shadows from other groups. Defaults On.

High Precision Shadow. Improves the quality of the shadows that fall upon this group. Defaults Off, because it is usually not needed. If you do not like the way a shadow appears as it falls upon this group, high precision shadow's alternative filtering method might improve the look of it.

Generate Shadow Mask. Creates a "shadow cutter" using this group. The group effectively becomes a mask wherever a shadow from another group would fall upon it. The sections of the group outside of the shadow would be rendered with a value of zero (black) in the alpha channel of the image. You can use this to assist in realistic compositing of rendered objects into real world scenes, and so forth. Use the diffuse color channel to determine the color of the "shadow" that this group becomes. Defaults to Off.

Shadow Object Only. Forces the group to be rendered only during the shadow pass, not during the final render. With this feature you can create low resolution shadow casting groups to make things render even faster! Defaults to Off.

The Info Tab

This tab stores information about the group's creation date, the amount of points, lines and polygons in the group, and the extent of the group's volume.

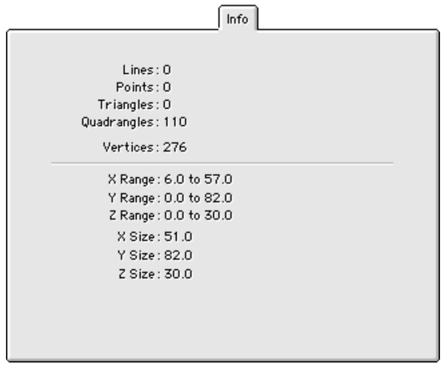


Figure 12.8 — **Info Tab**

The Strength Tab

This is where the strength maps that control the behavior of the skinning engine are applied and managed. In addition the strength painting interface is accessed in this tab. For detailed information on the Strength Tab See “Strength Maps” on page 569.

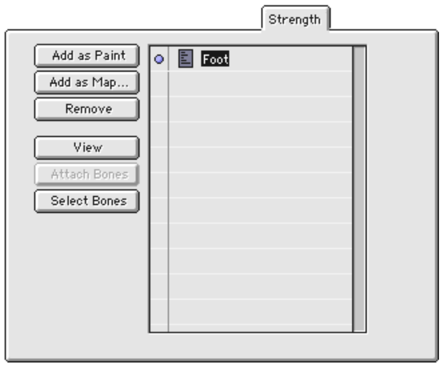


Figure 12.9 — **Strength Tab**

The Display Tab

This tab controls the display of the group in the 3D view windows. It is composed of three controls:

- Display Mode Popup Menu
- Display (limited) Polygons
- Display Texture
- Shade Texture
- Display Radiosity

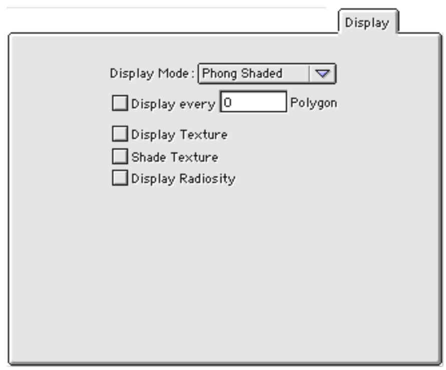


Figure 12.10 — **Display Tab**

Display Mode Popup Menu. The Display Mode popup menu allows you to choose the level of shading that will be used.

Display (limited) Polygons. The display every Nth edit box allows you to set an amount of polygons to display that is less than the total number of polygons in the group.

Display Texture. The display texture check box will shade the group with the top-most diffuse map visible.

Shade Texture. Causes the lighting to be taken into account when displaying textured objects in the World View windows. works with both the Software and Hardware engines.

Note *OpenGL blends the surface color (diffuse color) with the shaded color. To avoid unwanted coloration in the view windows, make sure your textured objects have a white diffuse color.*

Display Radiosity. Causes the radiosity vertices to be displayed on the group. For information about radiosity, see “Radiosity” on page 301.

12.4 Motion Data Import/Export

EIAS imports motion capture data from three different file formats and exports it to four. The three import formats support group names for the models that will receive the motion data. If groups with matching names are found in the project, the data be added to those groups. If not, Animator will offer you the opportunity to create a model using effectors instead.

All data is imported as custom frame data. Make sure that groups receiving imported data have animation enabled.

.bvh. The BioVision Hierarchical format, .bvh, is the preferred format for importing motion data. It includes a header that accurately describes the model hierarchy. by using this format you insure that the lengths of the links between groups will be taken into account when the data is imported.

.bva. The BioVision Flat format, .bva, should only be used for groups that are not in a hierarchy.

.obm. The Electric Image Motion format, .obm, is designed to exchange camera motion data between different animation programs or between EIAS Animator and a motion control rig. This format can accept group names with spaces in them. The .bvh and .bva formats do not.

.ma. This Maya format is used by Animator to send camera motion data to Adobe After Effects. You can only export camera motion to this format. Import is not supported.

Using the Motion Data Import Feature

The Motion Data Import feature is available through the **Animation > Import Motion...** submenu. There is no need to select (highlight) groups before issues the command. Animator compares the group names in the header of the motion data file to those in the project and adds the data to the matching groups.

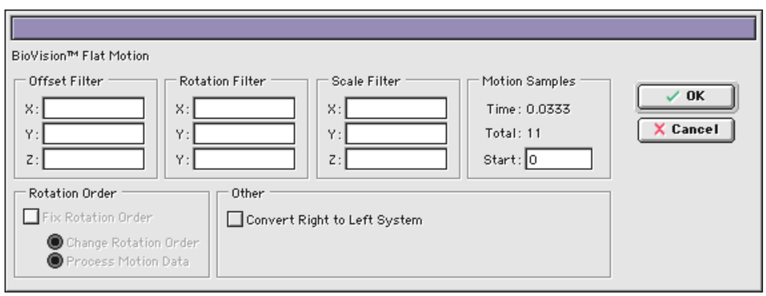


Figure 12.11 — **Motion Import Dialog**

Offset Filter. Adds an offset to the position data during import.

Rotation Filter. Adds an offset to the rotation data during import.

Motion Samples:Time. Displays the duration of each sample (one over the number of samples per second).

Motion Samples:Total. Displays the number of samples present in the motion capture file.

Start. Controls which sample to begin with when the data is imported.

Rotation Order. Enables a change in the rotation order, either the groups rotation order or the order in the capture file.

Change Rotation Order. Changes the rotation order of the groups to force them to conform to the rotation order in the capture file.

Process Motion Data. Changes the rotation order in the capture file to conform to the current groups' rotation order.

Convert Right To Left System. Modifies the coordinate system of the imported data so it corresponds to the 'handedness' used by EIAS Animator.

Using the Motion Data Export Feature

The Motion Data Export feature is available through the **Animation > Export Motion...** submenu. Select (highlight) the groups you wish to export motion from before issuing the command.

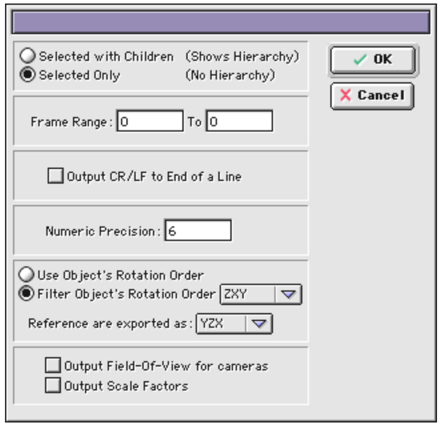


Figure 12.12 — **Motion Export Dialog**

Selected with Children. Motion data is written out for the selected groups and all groups linked to them. This option is only available for the .bva and .bvh formats

Selected Only. Motion data is written out for the selected groups only.

Frame Range. Selects the range of frames for which motion is exported.

Output CR/LF to End of Line. Alternate line termination for systems requiring CR/LF at the end of each line.

Numeric Precision. Selects how many digits to the right of the decimal to export.

Use Object's Rotation Order. Uses the rotation order of each object when writing out the file. The default is to use YXZ as the rotation order for all groups. Option not available when exporting .ma files.

Filter Object's Rotation Order. Alters the rotation order on export to the pull-down menu setting next to this option. Option not available when exporting .ma files.

Reference are exported as. Objects with reference vectors (cameras, spotlights, etc.) are exported using the rotation order specified. Option not available when exporting .ma files.

Output Field-Of View for cameras. Causes the FOV to be written out when cameras are exported to the .obm format.

Output Scale Factors. Causes scale information to be written out for effectors, groups, smoke objects and IK handles.s

ASCII Motion Version. This edit box contains the version number that will be written into the header of the .ma file. This option only available when exporting to .ma.

Function Curve Editor

13.0 Introduction

The Function Curve Editor is a powerful feature which lets you graphically create, edit and apply animation information to virtually any parameter in a scene. Function curve editors have formed the basis of some of the most powerful character animation software anywhere.

What is a Function Curve Editor?

The Function Curve Editor is a window which allows animators to graphically control animation data in the form of a curve which represents changes in time and data values. All animation channels can be edited with a function curve, with the exception of color.

The Benefits of Using the Curve Editor

The art of animation involves many subtleties. Good animators know that to add those subtleties can be an exercise in tedium. The function curve editor is intended to make that task easier. By being able to edit the curve as it enters and exits a keyframe, the animator has more control over each keyframe, leading to more control to the overall animation and the realism of the shot. At the very least, using the Function Curve Editor will assist the animator in creating complex motion using fewer keyframes, saving time in the process.

Accessing the Curve Editor

There are two ways to open the Function Curve Editor:

- Choose **Animation>Function Curve Editor**
- Type command or control ‘.

The Function Curve Editor opens.

13.1 The Function Curve Editor Anatomy

The Function Curve Editor is divided into three sections:

- Graph Window
- Channel List
- Tool Bar

Graph Window. The graph window contains the function curves that graph the actual channel data, the time line, and the data scale. The time line is displayed at the top of the window area. It is the same time line in the project window, and functions indentically. The data scale displays data values which change depending upon the window magnification. The combination of the time scale and data scale is used to plot the channel curves.

Channel List. To the left of the graph window is the channel list. The channel list is where all of the loaded channels are displayed. Each channel is represented by individual curves. The channel list is covered in detail on page 356.

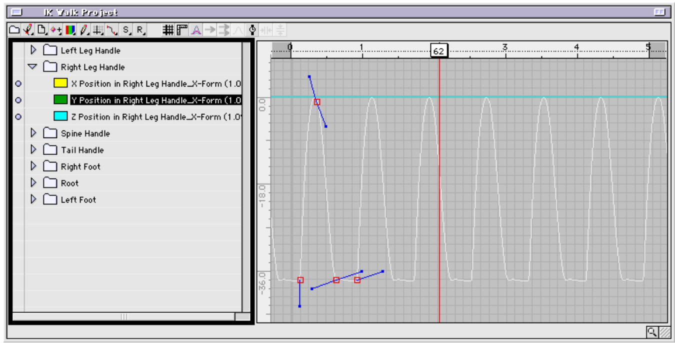


Figure 13.1 — **Function Curve Editor (with channel data)**

Tool Bar. Above the channel list and the graph window is the tool bar. The tool bar contains icons which are used to control the display of the function curve editor, the display of elements within the editor, and the loading and saving of channel envelopes. The Tool bar is covered in detail on page 358.

Initially, there won't be any channels loaded into the Editor. Channels are loaded by two methods:

- From the project window, by double-clicking on the animation channel names in the particular object that you want to work with.
- Using the Key Channel Loader described in the Tool bar section of this document.

You can load in as many channels as you like from as many different groups as you like. Virtually any animation channel, except RGB color, can be loaded into the editor.

13.2 The Graph Window

The graph window is used as an interactive display to modify the effects between two or more keyframes. Through the use of the graph window, keyframes may be added and deleted, as well as modified. Acceleration/ Decceleration and Velocity are optionally plotted as well, depending upon toggles set in the tool bar. *See "The Tool bar" on page 358 for more information.*

The active channel curve is drawn in white. All other curves are drawn in the color next to the channel name. *(See "To set the curve color:" on page 357.)*

Time and data ranges can be selected by dragging in the areas to the right and bottom of the graph window. These ranges are indicated by darker gray regions in the graph window background. The display of these regions can be toggled by clicking on the time and data range icons in the tool bar. *See "Time Range" on page 363 and "Data Range" on page 363.*

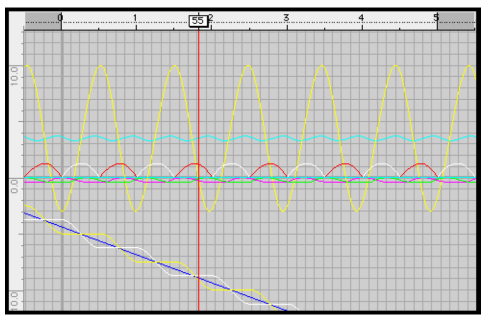


Figure 13.2 — **Graph Window**

There are a variety of commands and shortcuts available in the Graph Window.

The Tab Key. Can be used to restrict the axial movement of the keyframes. Tab once to restrict in X, tab again to restrict to Y, tab again to restrict diagonally, tab again to restore free movement.

Command Clicking. Command clicking on a key will break or mend the control handles.

Option Clicking. Option-clicking (or option-clicking and dragging) will add a new key to the point on the curve on which you clicked.

Shift Clicking. Shift clicking or marquee selecting a group of keys will allow the keys to be dragged together.

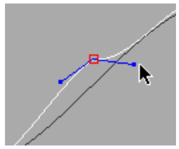
Control-Drag. Holding down the control key as you drag a key will interactively scale the curve (requires that a time range be selected first).

Keypath Drag. Drag the curve between two keys to drag both keys. This allows you to drag a section of the curve.

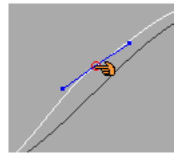
Dragging the Window. Hold the space bar down to drag the entire Graph Window.

Toggle Linear. Command-Control clicking on a key will toggle the linear buttons in the Key Channel Dialog box for that key.

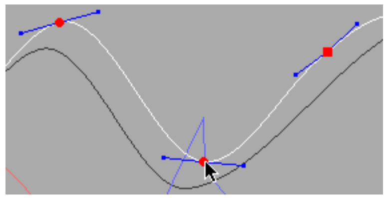
Cut and Paste. Cutting and pasting sections of the curve requires that a time range be selected first.



Command Click adjusts slope of handles



Option Click adds new keyframe



Shift Click selects multiple keys

Figure 13.3 — **Keyboard Shortcuts**

13.3 Channel List

The channel list contains all of the loaded channels in the function curve editor. Each curve in the graph window corresponds to one item in the channel list. All channels added to the list are added to the bottom. The list cannot be reordered. The black circle to the left of each channel name controls the display of the curve for that channel. Clicking on the curve will change the visibility of the curve (the circle will turn transparent when the curve is not drawn.)

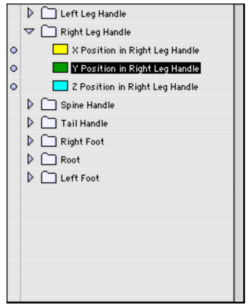


Figure 13.4 — **Channel List**

The channel list display area can be resized by dragging the right edge next to the scroll bar left or right (the cursor will change as indicated below.)

Each channel in the list has a separate color to plot its curve in the graph window. The color swatch next to the name of the channel is used to set the curve color.

To set the curve color:

1. Click on the color swatch for the desired channel.
2. Choose a new color from the color picker.
3. Click the OK button to accept the new color.

The new curve color will now be set.

The selected channel will always draw its curve, regardless of the channel's visibility setting in the channel list.Double clicking the channel name in the list will bring the Key Channel Window for that item forward.

The loading and saving of channel envelope information is controlled by icons in the tool bar.

13.4 The Tool bar

To effectively edit motion and time data, some special tools are required. The Function Curve Editor comes with its own set of tools which are used to edit data splines, load motion data, and various other tools to manipulate the motion data. The following sections will detail the function of each Tool icon and it’s menu items.

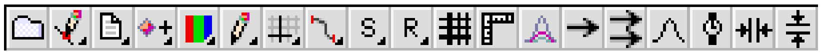


Figure 13.5 — **Function Curve Editor Tool bar**

Add Folder

Add Folder will create a folder in which to place your channel data. You can organize your data easily by using folders.

To add a folder to the channel list:

1. Click on the Add Folder icon in the tool bar

The folder will appear at the bottom of the list.

It is typically best to name the folder the by group name, and place channels that are specific to that group in the folder, thereby drawing a logical connection between the two.

To rename a folder:

1. Select the folder name
2. Press the enter key

The text will change to indicate that you can now edit the text

3. Type the new name for the folder.

4. Press enter to accept the change.

You can nest folders within folders, and drag and drop the order of folders in the list. You can also hide or reveal folder contents with the display icon next to the folder.

To remove a folder from the channel list:

1. Select the folder
2. Press the delete key

Note *The contents within the folder will be deleted along with the folder.*

Edit Mode

Edit mode has three options:

- Edit Curve Data
- Edit Time Range
- Edit Data Range

Edit Curve Data. This is the default edit mode for the function curve editor. This mode allows the normal editing of curve data.

Edit Time Range. This mode will allow you to set the range of time in which you will be editing. Setting a time range makes data management easier. The cursor will change to indicate that you are in time edit range.

Edit Data Range. This mode will allow you to set the range of values that you will be editing. This helps you to control the way that data is displayed in the editor. The cursor will change to indicate that you are in data range edit mode.

Envelope

Envelope allows you to load values into and save data out from curves described in the Graph Editor (See the Graph Editor section below.) These curve files are called “envelopes.” Envelopes may be loaded or saved across the entire time range or across a selected range of time.

One of the benefits of using a computer is that it can do the repetitive work for you. You can easily load motion data from motion capture device data files, other groups or function curves from another EIAS Animator project. By saving and loading envelopes from other channels, you can reuse existing motion data and customize it for your current animation project. This works very well when doing repetitive motion, such as animating a set of humming bird wings, a trail of ants taking over a picnic, or matching blinking light patterns.

Clicking on the Load icon brings up a drop down menu with four choices:

- Load to Replace All...
- Load to Insert Into Time Selection
- Save All...
- Save Within Time Selection

Load To Replace All. This menu choice will replace all of the keys with a previously saved channel envelope. Selecting this menu choice will present the standard Macintosh file open dialog from which you can select an envelope file. Envelope files can be saved from other channels or motion capture data files.

Load to Insert Into Time Selection. Using this option will replace the selected time frame with the saved data envelope. If the inserted envelope is larger than the selection area, keys outside the selection area are scaled to allow for the inserted envelope. Inserting an envelope works as if a slice of time is being inserted at the selection area. If the selection area is the same size in time as the envelope, keys outside the selection are unaffected. If the envelope is smaller than the selection area, keys following the selection area are shifted to an earlier time in the time line.

Save All. Use the Save All function to save all keys in the selected function curve. This effectively saves an entire channel as an envelope which can be loaded at a later time

Save Within Time Selection. Using this option, you can save all keys located within a selected range to an envelope file.

Key Channel Loader

As its name suggests, the Key Channel Loader is used to add key channels into the Curve Editor. Select the object(s) in the Project Window, then use this tool load in all of or a selected group of animation channels. Once loaded, the channels are displayed in the channel list. The circles to the left of the channel names may be used to turn off the display of the channel in the graph window. Channel may be removed from the editor by selecting them in the channel list and hitting the delete key or by using the clear under the edit menu.

All. All channels for the selected object(s) are added to the key path editor. Depending on the selected object, there may be as few as 7 or as many as 30 or more channels added to the editor via this option.

Custom. Loads the channel selected using the Custom... view option in the project window.

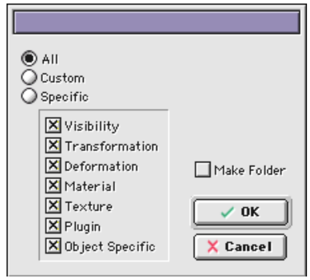


Figure 13.6 — **F-Curve Editor — Add Channels dialog**

Specific. Using the Specific option, you can import channels of selected types only. This option works well when you only need to edit a single attribute on many objects, such as the visibility property. Since some attributes have interrelated channels, those too will be loaded. For example, loading the Material type will load as many as 22 channels, while the Transform type will load 9 and the visibility type only one.

Make folder. When this check box is on, a folder will be created in the channel list and all channels placed into it. The object name in the project window will be used to name the folder.

Color Preferences

Use to set the default color for curves displayed in the graph window of the Curve Editor. Clicking on this option invokes a dialog box with editor attributes accompanied by a color bar for customizing the color used for each attribute. You may use any color combination which is comfortable for you, although selecting non-contrasting colors may make it difficult to distinguish between editor attributes.

Graph Display Element Control

This pulldown changes the on/off settings of the last nine controls represented in the tool bar. Since, these nine controls can be turned off or on by clicking on them, this particular tool is redundant and will likely be removed.

Grid. Displays a horizontal and vertical grid.

Ruler. Toggles the visibility of the time and range scales.

All Curves. Toggles whether the selected channel or all channels are displayed.

Velocity. Displays the velocity graph.

Acceleration. Displays the acceleration path.

Snap Undo. Displays the Snap Undo path.

Current Time . Displays the current time marker.

Time Range. Displays the time ruler.

Data Range. Displays the data ruler.

Grid Options

This menu controls the grid. Both the spacing of the visual grid and the snapping grid are controlled here. To activate snapping, make sure that the caps lock key is set.

Key Channel Window

The Key Channel window is used to set the curve type for each channel, and the beginning. You can also manage individual keyframes through the key list. Get to know this window well, as it will offer you the ability to fine tune your function curves, and get the most out of your animation efforts.

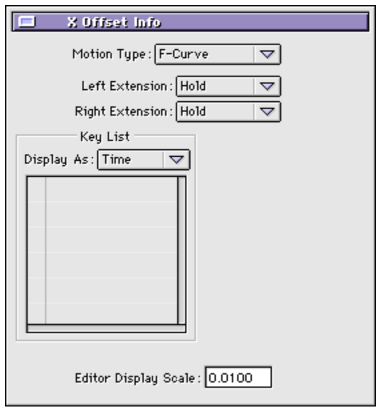


Figure 13.7 — **Key Channel Window**

The Motion Type Menu

The motion type menu determines the type of spline curve used to calculate the interpolation of the data in the channel. There are four different curve types:

- Linear
- Natural Cubic
- Hermite
- F-Curve

Linear. Straight line between the keys, no interpolation.

Natural Cubic. B-Spline interpolation, no controls. Use where you want automatic smoothing.

Hermite. More versatile than Natural Cubic. The whole curve won't change when one key is adjusted.

F-Curve. Contains control handles for fine adjustment. This will give the best control and is similar to Bezier curves.

The Left & Right Extension Menus

The beginning and ends of function curves can have a variety of behaviors. This allows you to create repetitive motions quickly and easily, and has the added value of transmitting any changes to the carried over curve sections, if desired.

Hold. The hold option maintains the value of the starting or ending point of the curve.

Repeat. This option will cause the entire curve to repeat itself in a cycle.

Oscillate. The Oscillate option will make the curve repeat itself in a mirror-image fashion.

Accumulate. The Accumulate option will make the curve repeat in a cycle but in each cycle, the data from the previous cycle is added on.

The Key List Subsection

Individual channel keys are displayed in the keylist to the lower left of the Key Channel window. Keyframe attributes are displayed when a particular keyframe is selected in the list. There are several attributes that are controllable on a keyframe by keyframe basis:

- Time
- Value
- Spline-specific controls

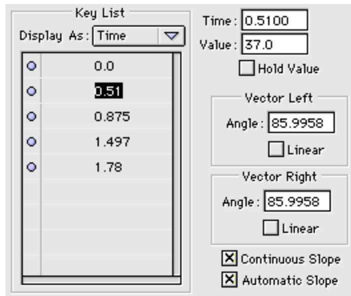


Figure 13.8 — **Keyframe List**

Time and Value Edit Boxes. You can change the time or value of the selected keyframe. Enabling the Hold Value check box will force the value of the slope between the selected keyframe and the next keyframe be maintained until the next keyframe: no interpolation will occur. This will appear as a flat line until just before the next keyframe in the Function Curve Editor.

Spline Specific Fields. This section displays different controls depending upon the spline selected in the Motion Type popup menu:

- Linear
- Natural Cubic
- Hermite
- F-Curve

Linear. There are no additional controls for the Linear Motion Type.

Natural Cubic. There are no additional controls for the Natural Cubic Motion Type.

Hermite. There are controls for the Tension, Bias, Continuity attributes of the acceleration and velocity of the curve. You can type the values in directly, or hold down the T, B, or C keys (lower case is fine) and dragging. You will see the acceleration and velocity curves change as you adjust the value. You will also clearly see changes in the actual motion path drawn in the world view windows. You can linearize the values by checking the Linear button.

F Curve. Controls for the keyframe vectors will appear if the Motion Type is set to F-Curve. The keyframe vectors are the little “teeter bars” that appear at each keyframe. There are separate vectors for the left and right side of the keyframe. You can set the vector angles by clicking and dragging on the vectors, or by typing values directly into the edit boxes. In addition, you can linearize the spline segment by enabling the Linear button. When the beginning or ending keyframes are selected, on the left or right vector will be displayed.

There are also two check boxes for slope control, which affect the shape of the curve, and how the curve is interpolated through its control points:

Continuous Slope. Causes the curve to be smoothed along both sides of the control point equally.

Automatic Slope. Causes the curve's adjoining slopes to be adjusted for smoothness.

Editor Display Scale. The Editor Display Scale box allows you to scale individual curves so that they can be displayed together in the Editor. For example, lets say you have a X motion curve that runs from 0.0 to 4444 over 4 seconds and you also have a roll channel that goes from 0.0 to 5 degrees over the same 4 seconds. Using the Editor Display Scale you can set the scale of the X motion to 1.0 and the roll to 889. In this way, both curves will be visible in the Curve Editor and the same time. The Editor Display value for each channel is listed as a percentage after the channel name in the channel list.

Snap

When a data or time range is edited within the Function Curve Editor, the original path becomes the Snap value. The Snap command stores the present position of a curve in memory. This allows you to display the original path while you make changes to it. You can make adjustments to a function curve and revert back by clicking the Unsnap option or saving the new curve as the snap value (or new original) by clicking the Snap option.

Range

Ranges are highlighted sections of the Graph Window. The tools in this menu allow you to select a time or data range and to operate on sections of a curve within the range.

The range itself is created by dragging in the white band just below (time range) or just to the right (data range) of the curve editor. The Time Range and Enable Range buttons must be on for the range to be displayed (see below).

Set Ranges… Brings up a dialog box that allows you to type in values to create the range instead of dragging the range at the right or bottom of the Graph Window.

Fit to Range. Scales the curve to fit within the selected time range.

Fit to Data Range. Scales the curve to fit within the selected data range.

Move to Beginning. Move an entire channel's keyframes to start at the beginning of the project time.

Reverse Time. Reverses the order of keyframes reversing the animation.

Reverse Data. Reverse keyframes to reverse data values

Key Time Range. Converts the extension portion of the curve in the selected time range to keyframes.

Fit Curve To Data in Time Range. This option fits a curve to custom keyframe data with a tolerance setting. The original custom data is deleted. You can use this setting to turn motion capture data into motion curves.

Grid Enable

This button toggles the display of the grid in the graph window.

Time Scale Enable

This button toggles the display of the time scale, the value scale, and the time thumb control. The time thumb display mode (seconds, timecode, frames) can be changed by option-clicking on the control.

All Paths

When this button is off, only the channel highlighted in the channel list is displayed in the graph window.

Velocity Display

Toggles the display of the velocity curve. The velocity curve is updated as you make changes to the channel curve.

Acceleration Enable

Toggles the display of the acceleration curve. The acceleration curve is updated as you change the channel curve.

Current Time

Toggles the vertical time line that crosses through the editing field.

Time Range

Toggles the display of the selected time range. The Time Range is chosen by dragging in the white region just below the Graph Window. Copying and pasting takes place inside the chosen Time Range.

Data Range

Toggles the display of the selected data range. The Data Range is chosen by dragging in the white region just to the right of the Graph Window.

Automatic Channel Scaling

In previous versions of ElectricImage, when you added channels to the Function Curve Editor, you had to manually adjust the panning controls to see the selected curve. (Because of the differences in values, curves for different channels can be in drastically different positions on the graph.) Now, selecting a channel in the editor causes the curve to be placed within the center of the graph window (note that view scale is unchanged.) To change the behavior of this feature, you can use the “Automatically Scale Graph” preference in the Preference Widow: **Keypath Editor > Automatically Scale Graph.**

Interactive View Scaling

You can interactively scale the graph window of the function curve editor by clicking on any zoom icon, and then dragging. The direction that you drag will affect the zoom. Remember that there are two zoom factors for the graph editor (time and value) which can be independently controlled. Work with this for a couple of minutes to get the hang of it.

Project Window

14.0 Introduction

The Project window is the heart of animating in EIAS Animator. This single window offers the control of virtually every parameter in your project, in time line form or spreadsheet form. It is in this window that you set the animation mode in which to view and edit a project, and where you can observe and animate all of the attributes within the project file.

Some animators love the project window, while others loathe it. While there are certain operations that can only be performed in the project window, whether or not you need to use them is up to your method of working. There are definitely easier tools to use if you so prefer, such as: the function curve editor for animating everything in motion curve form; the morph editor for morphing and facial animation (the function curve editor works great for this as well); the time palette for setting the scene time; and the various menus for controlling the various attributes of an object or series of objects.

The project window includes many useful tools which can make the task of using it much easier. There are tools to limit the amount of data presented, so that you are not overwhelmed by larger projects. There are tools to control the way that data is listed in the window, so that you can find what you want to edit quickly. There are also tools which allow you to animate almost exclusively from the project window itself. Take some to read through this chapter, and learn about the tools that the project window offers you. Afterwards, use this chapter as a reference to keep you up to speed on the project window. You will find that once you get to know it, the project window will be a very valuable tool indeed.

The project window is very complex, due to the fact that it is the single repository of all information in your project. Every project attribute is listed in the project window, typically in hierarchical fashion (although you can control this). As your animation projects get more complicated, the data presented in the project window will grow. Be sure to read about the useful tools that the project window offers to assist in handling copious amounts of data.

Project Concepts

The project window is an environment of its own which exists in the overall EIAS Animator environment. As such, there are several discussions that this chapter will focus on:

- tools which you can animate
- tools which can help you animate
- tools to help you organize your scene
- tools which help you control your work environment

Tools Which You Can Animate

EIAS Animator allows you to animate almost any attribute of any object in your scene. These attributes are called “animation channels.” Animation channels contain the animation data that is used to drive your animated content. Animation channels contain either keyframe and/or frame data, and can be viewed in time line or spreadsheet form. Individual cells of a spreadsheet equate to either a single frame or single field of data for an attribute. Sections “Animation Channels” on page 385 and “Editing Cell Contents” on page 399 covers what you can animate, and the methods in which you can edit your data.

Tools Which Help You Animate

EIAS Animator can be used to literally create a “universe” As such, things can get a little busy. To help you manage this, there are several tools offered in the project window which allow you to hide the parts of the project that you aren’t’ dealing with at any given time. The sections “Project Window Anatomy” on page 377 and “Project Editing Modes” on page 390 describe the architecture of the project window, and its contents, as well as how to work within the various editing modes offered.

Tools to Help You Organize Your Scene

Organizing large amounts of data can always be a pain. The project window can be configured to let you navigate through your projects more easily, and to help organize and structure the files and objects that you deal with. Sections “Project Window Anatomy” on page 377 and “The Tool Bar” on page 408 offers insight into organizing your projects and managing scene data.

Tools Which Help You Control Your Environment

Lastly, the overall environment in which you work can be set up to allow you a more efficient work experience. Tool offerings let you control the frames per second of your project, the amount of time which your project represents, and the methods in which the project window displays the contents of your project. The section “Project Window Anatomy” on page 377 will help you to better work within the project window environment.

The topical sections mentioned above will cover the many functions that you can control with the project window. Here is a list of the topics that are covered in the sections:

- Showing and hiding groups, (page 410)
- Showing and hiding animation channels, (page 385)
- Activating and deactivating animation channels, (page 386)
- Controlling the visibility of objects in the scene, (page 379)
- Locking and unlocking objects in the scene, (page 379)
- Setting the project window edit mode, (page 390)
- Editing animation and timing data, (page 388)
- Naming and renaming objects, (page 381)
- Creating and editing hierarchies, (page 381)
- Editing scene timing, (page 415)
- Setting the current scene time, (page 390)
- Setting the scene frames per second value, (page 378)
- Assigning channels to the function curve editor, (page 419)

14.1 Project Window Anatomy

At any time, the project window can be opened by the either of the following methods:

- From the main menu bar, choose **Windows>Project Window**
- command (Mac) or control (PC) “l”

Once opened, the project window will appear as illustrated in Figure 14.1.

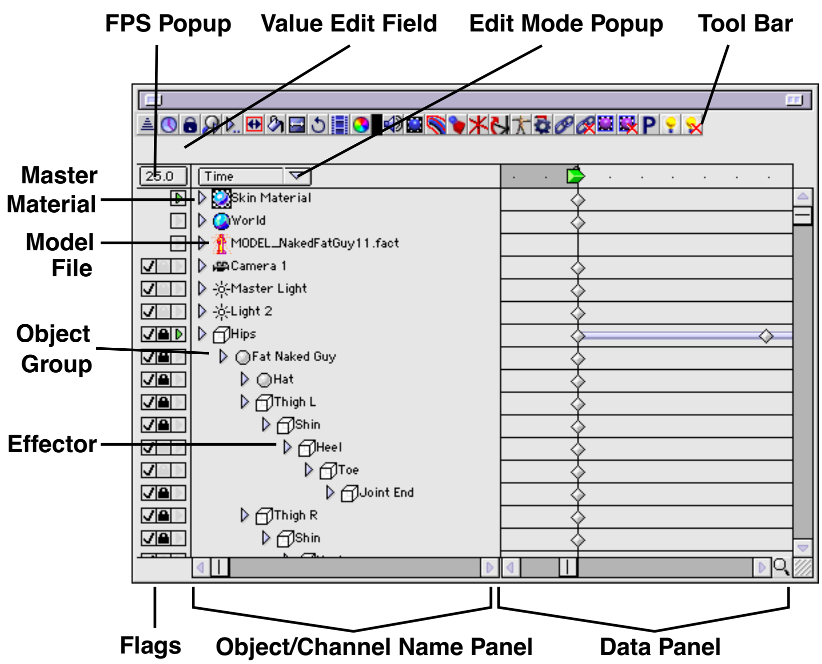


Figure 14.1 — **Project Window Anatomy (time mode displayed)**

The project window structure is divided into several areas which are used for controlling animation channels, setting window and time view attributes, and other scene properties. Those areas are:

- Frames per second (FPS) popup menu
- Value/name edit field
- Edit mode popup menu
- Tool bar
- Object/channel enable/disable flags panel
- Object/channel name panel
- Channel data panel

Frames Per Second Popup Menu

The FPS pop-up menu is used to select the number of frames per second to be calculated and rendered.

Along with duration, FPS determines the total number of frames for the animation (i.e., if the duration is 10 seconds, selecting 30 FPS calculates and renders 301 frames—frame 0 plus 300 frames).

The menu choices are:

Custom… This option opens a dialog box that enables you to specify a number other than the NTSC (30 FPS), PAL (25 FPS) or motion picture (24 FPS) standards.

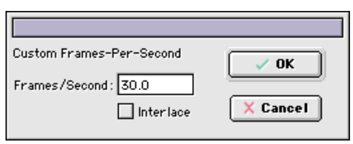


Figure 14.2 — **Custom frames per second dialog box**

The frames/second edit field is where you can enter a real number (numbers with decimals) to specify the recording/projection speed you need to work in. The interlace check box will properly set up your project file for video interlace, allowing you to animated per field.

NTSC: 30. This option uses the NTSC video standard of 30 FPS.

NTSC: 30i. This option uses the NTSC video standard of 30 FPS, but with interlacing. Each frame is split into two fields, so that in Keyframe and Frame modes the data panel will show frames as 0a, 0b, 1a, 1b, 2a, 2b, etc.

PAL: 25. This option uses the PAL video standard of 25 FPS.

PAL: 25i. This option uses the PAL video standard of 25 FPS, but with interlacing. Each frame is split into two fields, so that in Keyframe and Frame modes the data panel will show frames as 0a, 0b, 1a, 1b, 2a, 2b, etc.

Film: 24. This option uses the motion picture standard of 24 FPS.

The Flag Panel

Located down the left side of the Project window, this panel, as shown in Figure 14.1, shows flags indicating the status of an object's visibility and selection locking.

The status can be changed by clicking on the appropriate icon:

- Clicking the visibility control toggles the visibility of the object. Invisible objects are not rendered, but animation information will be passed to their children (if so hierarchically structured).
- Clicking the selection lock prevents the object from being selected in the World View windows. It may still be selected in the Project window, however.

Pressing the Option key while clicking either of these controls will toggle the status of both the group you are clicking and any groups hierarchically linked below it.

The Object/Channel Name Panel

Located to the right of the flag panel, the Object/Channel Name panel, as shown in Figure 14.1, displays a list of all of the objects and channels in the project. The object/channel name panel can be used to perform the following operations:

- Selecting objects in the scene
- Accessing the object's information window
- Rename objects in the list
- Creating a hierarchy
- Breaking a hierarchy
- Show or hide children of objects
- Show or hide object data channels

The appearance of an object's children (groups hierarchically linked below the parent group) in the Object Name panel can be toggled on and off by pressing command (Mac) or control (PC) "h".

To select objects in the project window list. Objects can be selected by clicking on their icons or on their names.

Object Info Window

The object info window displays pertinent information about an object at the current scene time. It is commonly used to set, shading attributes, material attributes, motion data, and scene display settings for the object.

To access the object's info window. There are two ways to access an object's info window from the object name panel:

- Double-click on the object

- Select the object, and choose **Object>Group Info** (command or control "i")

Naming objects is important to help organize your projects. Naming objects clearly (and concisely!) will make finding objects in the project window easier, and help other animators working with you to understand your scene layout more quickly.

To rename an object in the project window:

1. Click on the object's name in the object panel.

   The object is selected and the object's name is put into the edit box, highlighted for editing.

2. Type a new name for the object.
3. Press **Return**.

The new name replaces the previous name in the object panel.

Hierarchy

A hierarchy is a collection of related objects, arranged in a tree-like fashion. Parent objects contain children objects. Children objects can contain grandchildren objects, and so on. Hierarchy allows for very complex motion to be animated with relative ease, or to effectively mimic real life motions of real things.

To assign a hierarchy of objects:

1. Select the objects that are to be made children
2. Choose **Hierarchy>Parent** from the menu bar, or choose the Parent icon from the project window tool bar
3. Select the parent object

The resulting hierarchy will be displayed as a tree in the project window.

To remove an object from a hierarchy:

1. Select the objects that you wish to remove from the hierarchy
2. Choose **Hierarchy>Unparent** from the menu bar, or choose the Unparent icon from the project window tool bar

The objects chosen to be unparented will be displayed as such in the object list, with no attachments.

The object/channel name panel contains a list of all of the objects in the project. You can control the visibility of the object's hierarchy and animation channels in this panel. You can show or hide the hierarchy from the location of a specific object to the end of the tree by a single key command.

It is necessary to understand the display of hierarchy in the project window, as animation channels are attached to objects. If an object is hidden relative to its place in the hierarchy, its animation channels will be hidden as well.

To hide the hierarchy of objects attached to the current object:

1. Make sure the project window is open and active
2. Select the desired object
3. Depress command (Mac) or control (PC) "h" (for "hide")

All of the objects attached to the hierarchy from the location of the object downward along the tree will be hidden. A small, downward-pointing red arrow will be added to the object icon, indicating that there are hidden items attached to it.

To show a hidden hierarchy:

1. Make sure the project window is open and active
2. Locate the desired hierarchy to unhide
3. Select the object
4. Depress command (Mac) or control (PC) "h" (for "hide")

The attached hierarchy will be revealed, up to the point that the next hierarchy was hidden. If nested hierarchies have been hidden, you will need to reveal them one at a time.

The Data Panel

Located to the right of the object panel, the channel data panel contains the data (attributes) for objects in the project. In all editing modes other than Time, the data cells in this panel can be edited.

Displaying Data Channels. When the Project window is first opened, the data channels are not displayed. Each object in the object panel can be opened up to list its data channels in much the same manner as folders in the Finder can be opened up to list their files.

You can also use the Open/Close *pop-up menu in the Project window's pop-up menu palette to open and close the display of selected attributes.*

When the list becomes longer than the height of the window, you can then scroll the window's contents with the window's scroll bar.

Resizing and Scrolling the Display

All panels are resizable by moving the cursor to a vertical edge of a panel, clicking on it, and dragging that edge to its new location.

- If the size of the panel becomes too small, the edge will snap to the nearest edge of the next panel or window.
- If the size of the panel is too large, the edge stays at the outermost position indicating the panel's maximum size.

The following controls are also available for scrolling the display:

- The horizontal scroll bar in the Object Name panel can be used if the names extend beyond the panel's edges.
- In Frame and Keyframe modes, the horizontal scroll bar in the Object Data panel can be used if there are more cells to be displayed beyond the right edge of the window.
- In Time mode, the horizontal scroll bar is used to show more key frames in the time line, if any.
- All panels can be scrolled vertically with the vertical scroll bar.
- In Time mode, the zoom controls in the lower right corner of the window can be used to zoom the window. Holding down the Option key while clicking either zoom control centers the time display between the start and stop times of the project.

14.2 Animation Channels

Animation channels are containers which hold all of the animation data in a project. Each object in a scene has its own unique set of animation channels. If the data in an animation channel changes over the time span of the project, the object is said to be *animated*.

Animation channels can be:

- Displayed or hidden
- Activated or deactivated
- Selected or deselected entirely or in part
- Edited numerically

Displaying Animation Channels

Each object entry in the panel list is preceded by a "display channel" icon. This icon is similar to icons used by file browsers in popular operating systems. The icon appears as an arrowhead. When the arrowhead is pointing to the right, more data is available by turning it down.

Channels are available regardless of whether or not they are set to be animated. Therefore, the display channel icon will always appear next to an object, regardless of the object's animation channel settings.

To display an animation channel of an object:

1. Make sure the project window is open and active
2. Locate the desired object
3. Click on the display channel icon to show the animation channels for the object.
4. For hierarchically-organized channels, follow the above steps until you arrive at the desired channel

Activating and Deactivating Animation Channels

Each object can have potentially hundreds of animation channels, which can get somewhat difficult to manage, especially if a scene has hundreds of objects. A solution to this problem is to limit the amount of animation channels that are active in a project.

EIAS Animator defaults all animation channels to ***OFF****. This is important, as you will need to activate animation channels for objects that you intend to animate. You can change this behavior to default all animation channels to* ***ON*** *in the* **Edit>Preferences>Keyframe tab.**

Channels can be activated from the group or channel level, however, if you activate a particular channel without also activating the group, the animation data will be ignored. This behavior allows you to easily disable a channel while retaining the animation record for the channel.

To activate an animation channel for an object or model group:

1. Open the project window
2. Locate the object in the name/channel panel
3. Click on the animation flag in the flag panel to the left of the name

The animation record for the object will be activated, as indicated by the green arrow. To disable the animation record for the object, just click on the animation flag again. The channel will be disabled, as indicated by the gray arrow.

To activate the animation record for a specific channel attribute:

1. Follow the previous instructions
2. Open the object channel by clicking on the turndown icon next to the object name.

A list of channels for the object will be displayed. Some channels will contain additional turndown icons. Navigate through the list until you arrive at the channel that you wish to animate.

3. Once the channel is located, click on the animation flag to the left of the channel name

The channel animation record will be activated, as indicated by the green arrow. To disable the animation record for the channel, just click on the animation flag again. It will turn gray to indicated that the record has been discarded.

Selecting Animation Channels

Animation channels can be selected and deselected in their entirety in any one of the three spreadsheet-based edit modes. You would typically select an entire channel for the purposes of:

- Recalculating the channel data (if a numerical process was applied that needed replacement)
- Adding a special function to the channel data, such as a repeat or cycle behavior

To select an entire animation channel:

1. Make sure that the project window is open and active
2. Set the project window edit mode to keyframe
3. Select the desired object
4. Click on the display channel icon to show the animation channels
5. Located the desired channel in the list
6. Command (Mac) or control (PC) click in a cell of the animation channel

The entire channel will be selected. You can then apply any of several functions or values to the data within the channel. To deselect the channel, just click in another cell in the project window.

Editing Animation Channel Data

In any of the three "spreadsheet views" of the project window (keyframe, frame and index), you can directly edit the contents of an animation channel. This feature is included more as a "power user" feature than as a feature that you would typically need to use.

In the spreadsheet views, data is presented numerically in each cell of the spreadsheet. The frame number for each cell is at the top of row of the spreadsheet, and the current frame will be highlighted to indicate its selection.Bold text cells represent key frames, normal text cells represent frames, and underline text cells represent custom frames.

Direct values can be typed into the cells, and depending upon the edit mode that you have chosen, key frames, frames or custom frames will result.

To edit animation data in a spreadsheet cell:

1. Click in the data cell to be edited.

   The cell is selected and the cell's data is put into the value edit field.

2. Type a new value for the cell.
3. Press **Return**.

The value you typed in the value edit field replaces the previous value in the data cell.

To advance to another cell in the spreadsheet:

1. Click in the data cell to be edited.

   The cell is selected and the cell's data is put into the value edit field.

2. Press the arrow key to advance one cell in that direction

   The selection focus will advance to a new cell in the direction of the depressed arrow key. The previous cell will be deselected.

You can select a range of cells, and move the entire range focus to another area of the spreadsheet in a similar fashion.

To move the focus of a series of selected cells:

1. Select a series of data cells to be edited.

   All of the cells are selected, and the first cell is activated for numeric entry. This is indicated by outlining the cell border and placing its value in the name/value edit field.

2. Press the arrow key to advance one cell in that direction

   The selection focus will advance to a new series of cells in the direction of the depressed arrow key. The previous cells will be deselected. To continue advancing, press the arrow key again.

14.3 Project Editing Modes

Editing modes determine how your data is presented in the project window. Three edit modes are spreadsheet-based, with a column of editable data for each frame in the project (Keyframe and Frame modes show all frames; Index mode shows only the key frames, listed in order of creation). The default mode is a time line style representation, which presents key frames as diamonds in the window data panel. Which edit mode you work with depends upon you, but certain functions such as numeric editing require a spreadsheet-based edit mode. The editing mode is selected with the editing mode pop-up menu, as shown in Figure 14.1.

There are four editing mode choices are:

- Time Mode
- Keyframe Mode
- Frame Mode
- Index Mode

Time Mode

The default view is Time mode. In Time mode, the Project window is used to set the duration of the animation and the timing of individual events. In Time mode, the Project window appears as in Figure 14.3. In this mode, the data panel represents key frames as diamonds and interpolated time (time between key frames) as bars. A time scale is drawn above the data panel, and a time thumb represents the current time (or frame, depending upon which display option is set.)

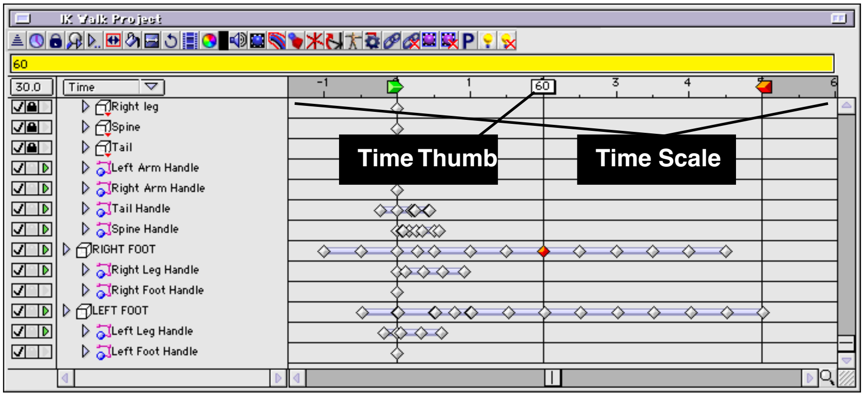


Figure 14.3 — **Project window in Time Mode view**

The display of the project window in time mode is unique to any other project window edit mode. It consists of:

- The time thumb
- The time scale
- Active time range

Time Thumb. The time thumb is used to set the current time of the scene. To set the time at which events occur in the animation, drag the time thumb across the time scale. The current time value in the readout box changes as the time thumb is dragged.

You can change the time display of the time thumb from seconds (the default) to SMPTE time code, or frames. You can also snap to frames or key frames.

The time thumb has a contextual menu that can be brought up by Right-Clicking on it (Ctrl-Click on Macintosh). This menu can be used to modify the time display or alter Time Markers.

Time Scale. The time scale is drawn above the data panel. It represents time in seconds, regardless of the display that the time thumb is set to.

Active Time Range. The active time range is displayed in the time scale. The active range is bracketed by two markers, one representing the start time of the project, and one the end time of the project. The range between these markers is the range that is rendered by default when the render command is given.

The start time marker (drawn in green), which appears in the time scale, indicates the start time of the project (it defaults to time 0). The project's start time can be changed by clicking and dragging this icon to the left or right. The time thumb will snap to the marker.

The end time marker (drawn in red), which also appears in the time scale, indicates the stop time, or duration, of the animation (it defaults to 10 seconds). The animation's stop time can be changed by clicking and dragging this icon to the left or right.

Time mode operation allows you to:

- Change the scene time
- Create key frames
- Select Key frames
- Change keyframe timing
- Change sequence timing
- Scale sequence timing

Changing the Scene Time. To change the scene time of the project in time mode, drag the time thumb to the left (smaller time values) or to the right (larger time values). Use the time display icon in the project window tool bar to change the display of the time scale (seconds, time code, frames). The time thumb control will display the current scene time.

Creating Key frames. Key frames are automatically created any time you change the current time in the Project window (by dragging the time selector) and then set an event, such as changing the position of a model, or adjusting the color of a light.

Selecting Key frames. Key frames can be selected by clicking on them. You can press the shift key to select more than one keyframe. To select a region of key frames, drag a rectangle around the region. Selected key frames are drawn in red. Selected keyframe sequences are drawn in dark blue.

Changing Keyframe Timing. To change the time for a keyframe, click and drag the keyframe to the desired time. If you have a selection of key frames, you can change their location in the time line as well by dragging.

Changing Sequence Timing. A sequence is a series of key frames which are connected by a bar. To change the timing of a sequence of key frames, click in any portion of the bar that is connecting the key frames in the sequence, and drag to the desired time.

Scaling Sequence Timing. You can compress or expand the timing of a series of key frames or sequences by pressing the control key as you drag the mouse to the left or right.

Keyframe Mode

Keyframe mode displays all events occurring in the project by key frames and interpolated frames, as shown in Figure 14.4. Instead of a time scale, a frame scale is drawn above the data panel. To differentiate between the two types of frames, key frames are drawn in bold text, and interpolated frames are drawn in normal text. If animation channels are collapsed, the cell data is not displayed. Instead, a key symbol is drawn in the frame column to represent that key frames are present for the channel. To view the keyframe data, use the display channel icon.

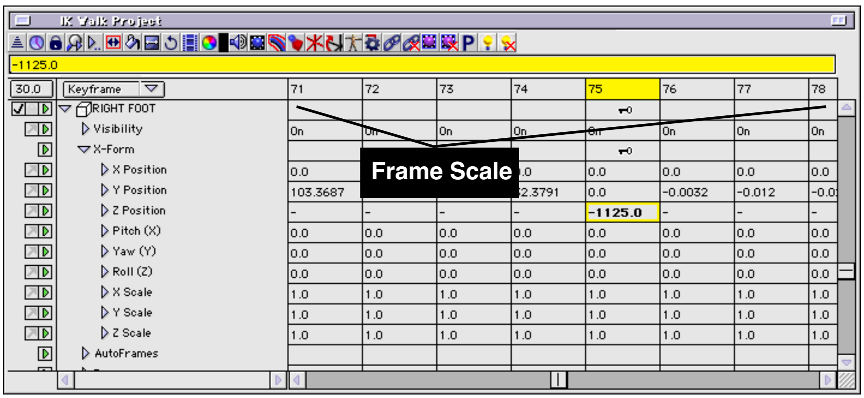


Figure 14.4 — **Project window in Keyframe mode**

In keyframe mode, you can:

- Set the current frame
- Add new key frames
- Remove key frames
- Edit the contents of keyframe cells

Setting the Current Frame. Instead of a time scale to set the current time (as is the case in Time mode), you are presented with a frame scale to select the current frame (in Figure 14.4, frame 75 is selected). To set the current frame, click on the frame number in the frame list row.

Adding a Keyframe. To add a keyframe in keyframe view, click on a cell and enter a new value. The keyframe will be set, as indicated by the value in the cell being drawn in bold, and a key symbol being drawn in the root channel row of the animation channel record.

Removing a Keyframe. To remove a keyframe in keyframe view, select the desired keyframe cell and choose **Animation>Delete Keyframe**. The keyframe will be removed, and replaced by an interpolated frame. The value of the interpolated frame will most likely be different that the keyframe value that you deleted.

Editing the Contents of Keyframe Cells. To edit keyframe values in keyframe view, click in a data cell, and then enter the new value in the edit box. If you make a change or addition to a channel that does not contain a keyframe, a new keyframe is automatically added at that position.

Frame Mode

In Frame mode, the Project window displays all events occurring in the project as actual frame values. Unlike Keyframe mode, editing a frame's data in Frame mode changes the value for that frame only—no key frames are created and no interpolation will occur; you would be creating data that deviates from the key frames you have created and the frames interpolated from those key frames. This feature can be thus be used to create intentional "glitches" in the animation. (If you need to, you can always reinterpolate the frame list by selecting the range of frames and choosing

Recalculate Frames from the Keyframe menu, or Recalculate All Frames for all frames.)

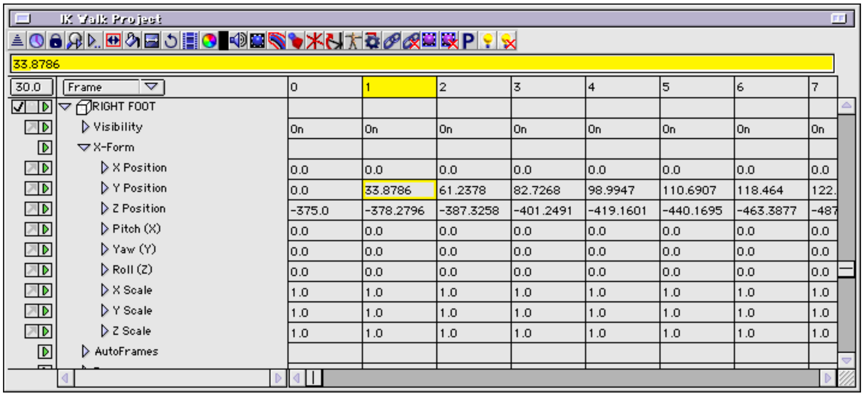


Figure 14.5 — **Project window in Frame mode view**

Changed frame values are underlined in the data cell, and the underline remains in the cell if you switch back to Keyframe mode.

In frame mode you can:

- Set the current frame
- Edit frame values (creating custom frames)
- Resetting a frame's value (removing a custom frame)

Setting the Current Frame. To set the current frame, click on the desired frame number in the frame scale. Use the scroll bars at the bottom of the window to scroll beyond the frames displayed.

Editing Frame Values. Editing frame values directly will create a custom frame. A custom frame is a frame which was not created by interpolation of two key frames. A custom frame is drawn as underlined text.

Resetting a Frame's Value. To reset a frame's value so that it conforms to the interpolation curve, select the frame and choose **Animation>Recalculate Frame**. The frame's value will be reset, and the frame will be drawn in plain text to indicate the change.

Key Index Mode

In Key Index mode, as illustrated in Figure 14.6, the Project window displays key frames only, by the order in which they were created for each object.

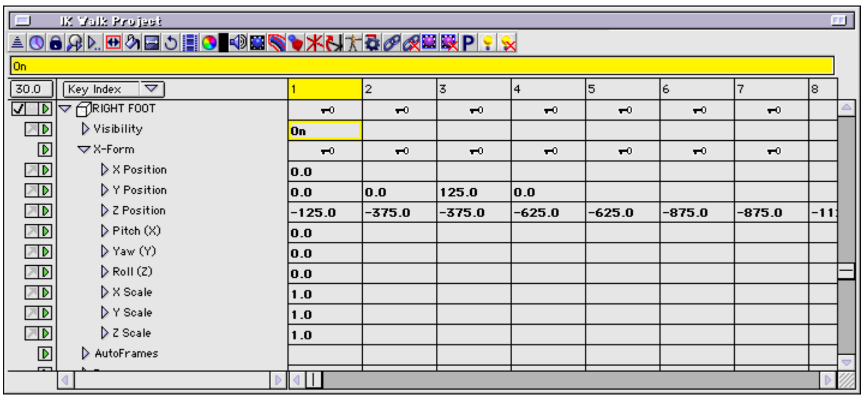


Figure 14.6 — **Project Window in Key Index Mode view**

Instead of a time scale or frame scale, a keyframe index scale is displayed above the data panel. This scale represents the order of creation of key frames for the channels only. There is no interrelationship of time between channels that is maintained in this view.

In key index mode, you can:

- Select the current key index

- Edit keyframe values
- Display a keyframe in the list

Selecting the Current Key Index. The current index is set by clicking the appropriate value in the index scale at the top of the data panel. The time values for the key frames are not displayed in this mode.

Editing Keyframe Values. To edit keyframe values in the index list, select the keyframe. Its value will be placed in the value edit field. Enter a new value to override the previous value.

Displaying an Keyframe in the Index List. To display a keyframe in the index list, click on the desired keyframe. Only that keyframe value will be displayed. ***Keyframe values for other channels will not be in sync. It is for this reason that Keyframe Index mode should not be used for animating, but rather, just quickly checking keyframe data.***

14.4 Editing Cell Contents

From time to time, you may wish to create a particular behavior for a motion channel, such as an up and down value for a rotation axis that could be used for a wing flap. Or, you may wish to fill the contents of a cell over a period of time with a particular value. In fact, there are several filters or actions that you can apply directly to the contents of a cell:

- Fill Cell with Value
- Blend Cell Contents
- Cycle Cell Contents

Filling Cells with Specific Values

The paint bucket icon in the project window tool bar offers a pop-up menu (used in Keyframe, Frame or Index modes) that fills the data cells in a range of selected frames with a specified constant value. It can also be used to invert, scale and offset the values in the selected range frames.

The following options are available under the paint bucket icon:

- Fill Selected
- Fill Constant
- Invert
- Scale
- Offset
- Randomize
- Jolt
- Spring

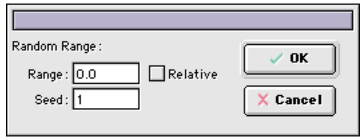


Figure 14.7 — **Randomize dialog box**

Fill Selected. This option fills the selected range of frames with the data from the first (left-most frame) in the selection of frames. For example, selecting frames 1 through 5 and choosing this option would fill frames 2 through 5 with the data from frame 1.

Fill Constant… This option opens a dialog box that enables you to specify a value that will fill the selected range of frames.

Invert. This option inverts the data in the selected range of frames (positive values become negative, and vice versa).

Scale… This option opens a dialog box that enables you to specify a factor by which the data in the selected range of frames will be scaled.

Offset… This option opens a dialog box that enables you to specify a value by which the data in the selected range of frames will be offset.

Randomize... The randomize function opens a dialog box that enables you to randomly change the data in an animation channel. The randomize dialog contains three edit items:

- Range Edit Box
- Seed Edit Box
- Relative Check Box

The range edit box contains a +/- value. Therefore, 5 would yield random numbers between -5 and +5. These numbers are added to the current value of each highlighted data cell.

The seed edit box contains an initialization value for the random number generator. If you find patterns in the random numbers applied, you can alter the seed to improve the randomization.

The relative check box, when enabled, causes the Random Range value to become a percentage value. The current value of each highlighted data cell will be increased or decreased by a random percentage.

Jolt... The jolt function creates an initial shock, followed by a decay. This can be used to simulate a camera hitting a small bump as it rolls along the road, for example, or perhaps being hit by flak or debris. The jolt dialog box contains five edit items and a graphic display of the effect to be applied to the data channel:

- Amplitude
- Frequency
- Decay
- Relative
- Reverse

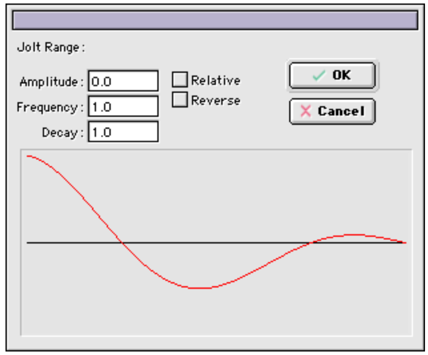


Figure 14.8 — **Jolt dialog box**

The amplitude box contains a value that controls the maximum and minimum points on the waveform.

The frequency edit box contains a value that controls the number of complete cycles in the entire waveform.

The decay edit box contains a value that controls the slope of the entire waveform.

The relative check box, when enabled, allows the amplitude to be treated as a percentage. At the maximum point on the waveform, the value of the data cell will be increased by the percent entered in the Amplitude edit box.

The reverse check box, when enabled, inverts the entire waveform.

Spring... The spring function opens a dialog box which lets you imprint a wave form which you specify on the data in a selected series of cells.

Because this command adds and subtracts from the current value of the data cell, multiple applications of Spring can be used with different frequencies and amplitudes to create "white noise." There are nine edit items in the dialog, as well as a graphic display of the result to be applied:

- Amplitude Edit Box
- Frequency Edit Box
- Phase Edit Box
- Relative Check Box
- Reverse Check Box
- Decay Edit Box
- Decay Interval Edit Box
- Attack Edit Box
- Attack Interval

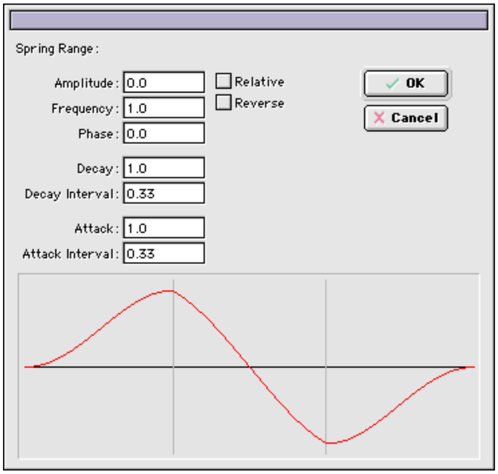


Figure 14.9 — **Spring dialog box**

The amplitude edit box contains a value that controls the maximum and minimum points on the waveform.

The frequency edit box contains a value that controls the number of complete cycles in the entire waveform.

The phase edit box contains a value that shifts the starting point of the waveform. Phase may also be changed interactively by dragging the waveform in the curve window.

The relative check box, when enabled, allows the amplitude to be treated as a percentage. At the maximum point on the waveform, the value of the data cell will be increased by the percent entered in the Amplitude edit box.

The reverse check box, when enabled, inverts the entire waveform.

The decay edit box contains a value that controls the slope of the waveform from the Decay Interval Bar to the end of the curve.

The decay interval edit box contains a value that controls the length of the decay. The decay interval may also be changed interactively by dragging the Decay Interval Bar in the curve window.

The attack edit box contains a value that controls the slope of the waveform from its beginning to the Attack Interval Bar.

The attack interval edit box contains a value that controls the length of the attack. The attack interval may also be changed interactively by dragging the Attack Interval Bar in the curve window.

Blending the Contents of Cells

The gray ramp (blend) icon in the project window tool bar offers a pop-up menu (used in Keyframe, Frame or Index modes) that controls the blending of data across a range of selected frames (page 388), in order to “smooth” the data values in those frames in either a linear or curved fashion. This operation is very useful if you wish to smooth out rough moves, or create some kind of transition to Project window data values.

Blended frames are custom frames, denoted in the Project window by underlined text. Custom frames need to be reevaluated when changed, and that recalculation will occur when the animation is previewed, rendered or saved (or when recalculated manually).

The two types of cell blending offered are:

- Blend Linear
- Blend Curve

Blend Linear. This option uses a linear method of interpolating the data.

Blend Curve. This option uses a curve method of interpolating the data.

Cycling the Contents of Cells

The bent arrow icon in the project window tool bar offers a pop-up menu (used in Keyframe, Frame or Index modes) which controls the cycling of data across a range of selected frames, causing a sequence to repeat cyclically until the end of the animation. This operation is very useful for repetitive motion, such as a 5° rotation on a wheel, or the flapping wings of a butterfly. It can be used to increment motion as well.

Cycled frames are custom frames, denoted in the Project window by underlined text. Custom frames need to be reevaluated when changed, and that recalculation will occur when the animation is previewed, rendered or saved (or when recalculated manually).

The following options are available:

- Repeat
- Oscillate
- Offset Repeat

Repeat. This option repeats the selected sequence of frames until the end of the animation. For example, repeating frames 1 through 5 would repeat the values from frames 1 through 5 starting with frame 6 and continuing until the end of the animation (i.e., the new sequence of frames would be 1, 2, 3, 4, 5, 1, 2, 3, 4, 5, 1, 2, 3, 4, 5, etc.).

When repeating within a range of key frames, select all frame cells with the range except the very last keyframe. This will ensure a smooth transition between repeat cycles.

Oscillate. This option oscillates the data from the selected sequence of frames until the end of the animation. For example, oscillating frames 1 through 5 would take the values from frames 1 through 5 and repeat them in an oscillating sequence starting with frame 6 and continuing until the end of the animation (i.e., the new sequence of frames would be 1, 2, 3, 4, 5, 4, 3, 2, 1, 2, 3, 4, 5, etc.).

When oscillate repeating within a range of key frames, select all frame cells with the range except the very last keyframe. This will ensure a smooth transition between repeat cycles.

Offset Repeat. This option repeats and incrementally adds the values from the selected sequence of frames until the end of the animation. For example, offset repeating frames 1 through 5 would both repeat and add the incremental change in values from frames 1 through 5 starting with frame 6 and continuing until the end of the animation (i.e., the new sequence of frames would be 1, 2, 3, 4, 5, 5+1, 5+2, 5+3, 5+4, 5+5, 5+5+1, 5+5+2, 5+5+3, 5+5+4, 5+5+5, etc.).

When offset repeating within a range of key frames, select all frame cells with the range including the very last keyframe. This is different than the previous choices due to the fact that offset is always adding the value and offset to the previous frame.

14.5 The Tool Bar

The project window tool bar is located at the top of the project window. It is actually two separate tool bars, one containing tools which control the basic environmental settings of the project window (plus a few cell editing tools) and one which contains additional tools for dealing with hierarchy and animation data.

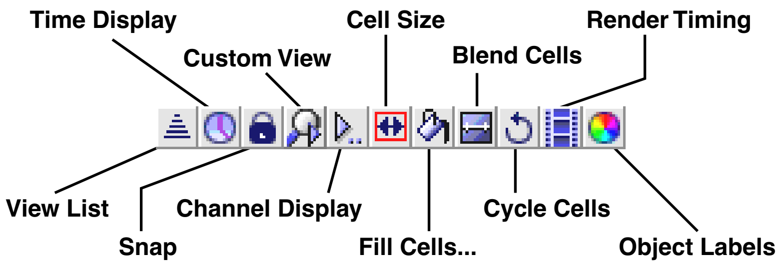


Figure 14.10 — **Primary tool bar**

Clicking on the icon in the palette opens a pop-up menu, and some icons change to indicate the particular menu choice. The pop-up menus, from left to right, are:

Project Window List View Control

This pop-up menu is used to control the display of objects in the project window. The window can be viewed in a number of ways as discussed below. The menu choices are:

- Flat
- Hierarchy
- By Name

- By Label
- By Material
- By Model File
- By Complexity
- By Master Light

Flat. This option shows a flat listing of objects in order of creation.

Hierarchy. This option (the default) shows objects in hierarchical order. Children are indented from the parent to show their relationship.

By Name. This option lists all objects in the project alphabetically.

By Label. This option lists all objects in the project by the color assigned to them with the label tool, which also resides in the project window tool bar. Objects without labels will be listed at the end, in alphabetical order.

By Material. This option lists all objects children of the master materials that they subscribe to. Objects that do not subscribe to master materials are put at the end of the list in alphabetical order.

By Model File. This option lists all objects as children of the model files to which they belong (model files defined as disk files in the operating system.) All other objects not associated with disk-based model files will be put at the end of the list in alphabetical order.

By Complexity. This option orders the list of objects by the amount of polygons stored in the file. Objects with more polygons are listed ahead of objects with less polygons. Objects without polygons are put at the end of the list, and sorted by alphabetical order.

By Master Light. This option lists all lights as children of the master lights that they subscribe to. Lights that do not subscribe to master materials, as well as objects which cannot, are put at the end of the list in alphabetical order.

Snap

This pop-up menu (valid in Time mode only) controls whether or not the time thumb will snap to a frame or keyframe when it is dragged to a new position. The menu choices are:

None. This option turns off the snap to frame function.

Snap to Frame. This option (the default) causes the Time Selector to snap to a frame when it is dragged to a new position.

Snap to Keyframe. This option causes the Time Selector to snap to a keyframe when it is dragged to a new position.

Custom View

This pop-up menu is used to control what data is displayed in the Project window. The menu choices are:

All. This option (the default) shows all data in the project file.

Custom… This option opens a dialog box, as shown in Figure 14.11, that enables you to specify which data for which object class to display.

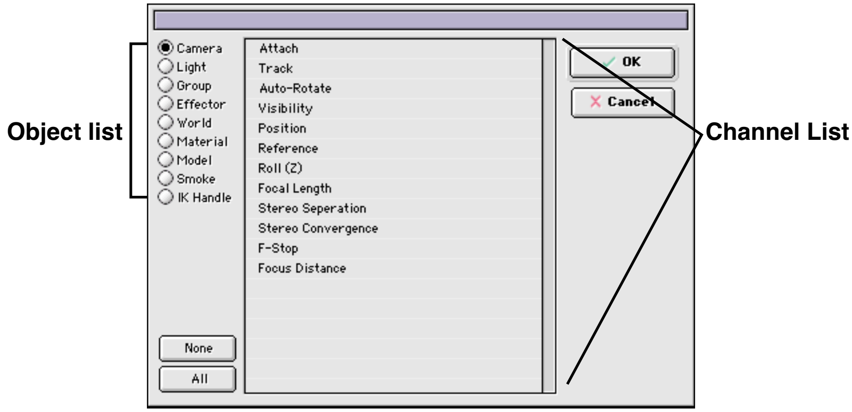


Figure 14.11 — **Custom view dialog**

To use the custom view dialog to control channels displayed in the project window:

1. Choose the object type to configure from the **object list**.
2. Select the channels to be displayed in the channel list (shift-click to select more than one), or click **All** to select all attributes from the list (clicking **None** de-selects any selected attributes).
3. Either click **OK** or press **Return**.

Position. This option shows only data for the position of objects.

Rotation. This option shows only data for the rotation of objects.

Scale. This option shows only data for the scale of objects.

Color. This option shows only data for the color of objects.

Visibility. This option will show only the visibility channel for objects in the scene.

Transform. This option will display transformation data only (position, rotation, scale) for each object in the scene.

Auto frames. This option will show only the auto frame channels (attach, track, auto-rotate) for each object in the scene.

Channel Display

This pop-up menu is used to open or close the different levels of animation channel data in the Project window's data panel. The menu choices are:

Open Root. This option opens data cells for all roots.

Open Selected Root. This option opens data cells for selected roots.

Open Animated. This option opens data cells for all animated values.

Open Selected Animated. This option opens data cells for selected animated values.

Open All. This option opens all data cells.

Open Selected All. This option opens all data cells for selected objects.

Close All. This option closes all data cells.

Close Selected All. This option closes all data cells for selected objects.

Show/Hide Children. This option toggles display of a parent object's children (command or control "h", for "hide").

Hide Selected. This option will hide the selected objects from the project window list. The objects will remain visible in the world views and camera views.

Hide Unselected. This option will hide unselected objects in the project window. The objects will remain visible in the world views and camera views.

Hide by Type. This option will hide objects by type. These types are:

- Cameras
- Lights
- Groups
- Effectors
- Sounds
- World object
- Material objects
- Model Files
- IK Handles
- Smoke objects

Show Selected. This option will unhide previously hidden, but still selected, objects.

Show Unselected. This option will unhide unselected objects previously hidden.

Show by Type. This option will unhide objects by type that have been previously hidden. These types are:

- Cameras
- Lights
- Groups
- Effectors
- Sounds
- World object
- Material objects

- Model Files
- IK Handles
- Smoke objects

Cell Size

This pop-up menu is used to change the size (width and height) of the key and frame cells. The column width edit field will set the width of all of the column in pixels. The row height edit field will set the height of all of the rows in pixels. The default button will reset the column width and row height to factory settings.

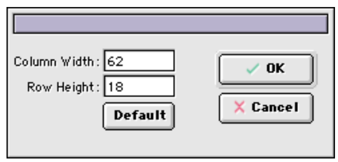


Figure 14.12 — **Cell size dialog**

Fill Cells

The descriptions for the fill cells popup menu can be found in the section “Editing Animation Channel Data” on page 388.

Cycle Cells

The descriptions for the cycle cells popup menu can be found in the section “Editing Animation Channel Data” on page 388.

Render

This pop-up menu is used to specify the frames that are to be rendered.

The menu choices are:

- All Frames
- Range of Frames
- Current Frame
- Every Nth Frame

All Frames. This option (the default) renders all frames in the animation.

Range of Frames. This option opens a dialog box for entering the specific start and stop frame numbers to be rendered.

Current Frame. This option will set the rendering engine to render only the current frame. Previews will also show only the current frame.

Every Nth Frame… This option opens a dialog box for entering the specific nth frames to be rendered (i.e., every 2nd frame, every 3rd frame, etc.)

Object Labels

This tool allows you to set named, colored labels for any object listed in the project window object/channel panel. The edit option in the menu will allow you to change the name of each label. Up to nineteen labels can be applied.

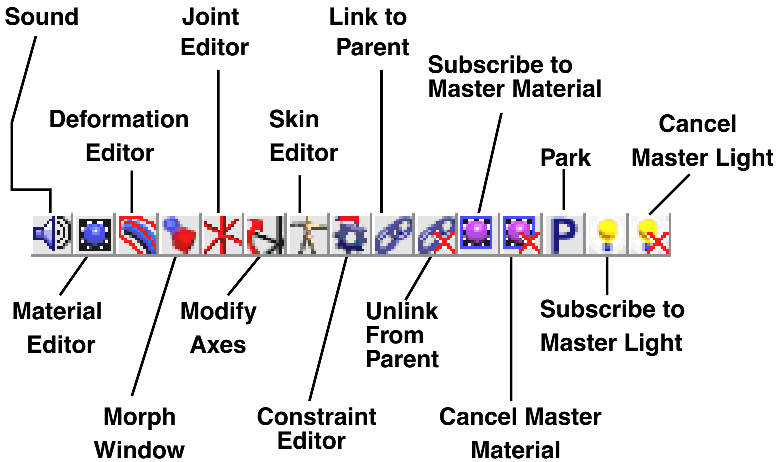


Figure 14.13 — **Secondary tool bar**

Sound

This tool plays the selected sound track object. If a portion of the sound track is selected, only that portion will play.

Deformation Editor

This tool opens the deformation editor window for the selected group.

Material Editor

This tool opens the material editor window for the selected group.

Joint Editor

This tool opens the joint editor window for the selected group.

Modify Axis

Brings up the Modify Axis window for the selected object.

Skin Editor

This tool opens the skin editor window for the selected group.

Constraint Editor

This tool opens the constraint editor window for the selected group.

Link to Parent

This tool allows you to choose a new parent for the currently selected object. If many objects are selected, the new parent will apply to all the selected objects. To cancel the operation, press the command-period keys.

Unlink from Parent

This tool removes parentage from all selected objects.

Subscribe to Master Material

This tool will subscribe a group to a master material that has been previously loaded into the project, or previously created from the material record of another group.

Cancel Master Material

This tool will remove a group from a particular master material.

Park Object Data

This tool will reset the object data channels to 0.0, without changing the actual object orientation, position, scale, and so forth. Use this tool when you need to have the object's coordinate space set to other than the one that it was created with.

Subscribe to Master Light

This tool is used to form a Master Light subscription. This tool does not create a hierarchical relationship. Use the parent tool for that operation if needed.

Cancel Master Light

This option will remove a subscriber light from a master light.

14.6 Scrubbing

Scrubbing the view windows with the time thumb is an effective way to preview the animation in your scene. Hold down the Alt key (Option key on Macintosh) while dragging the time thumb to see all View windows update as you drag. Hold down the Alt and Shift keys (Shift-Option on Macintosh) while dragging the time thumb to see just the Camera view window update as you drag.

This feature works with the time thumbs found in the Project window, Time palette, and F-Curve editor. It does not work in the Morph window.

14.7 Assigning Channels to the Function Curve Editor

The function curve editor is used to edit motion data in curve form. You will likely find that the editing methods employed by the function curve editor or more intuitive than the numeric data presented by the project window. In order to edit curves in the function curve editor, the data channels must be sent over to it. That is done in the project window.

To send motion curve data to the function curve editor from the project window:

1. Open the project window
2. Locate the object to be edited by the function curve editor
3. Open the display channel icons, so that the animation channels are displayed.
4. Double-click on the channel that you want to send to the editor.

   If you choose an implicit motion channel (that is, a motion channel which is a composite channel of x, y and z motion attributes presented as a single channel), you will see the following dialog:

Figure 14.14 — **Key channel velocity dialog**

This dialog is used to either include or exclude velocity channels when sending the animation data to the function curve editor.

Answering “yes” will remove velocity controls for the yaw, pitch, roll and scale channels. Answering “no” will leave the velocity controls intact for those channels. A velocity channel will always be added to the curve editor for position.

5. Choose the dialog option that best suits your needs

To see the results, you will need to open the function curve editor.

14.8 Reordering Items In the Project Window

You can drag objects up and down in the Project window to change the order they are listed or their parent/child relationships. Reordering is supported when the Project View is set to Hierarchy, Master Material, Master Light, Name, Label, FACT Model File, or Complexity.

Reordering

Drag the selected objects until your mouse is over the ICON of the target object. The objects you are dragging will be placed above the target object. To place the objects below, hold down the control key before you begin dragging. A black arrow pointing to the right and an underline indicates you are reordering.

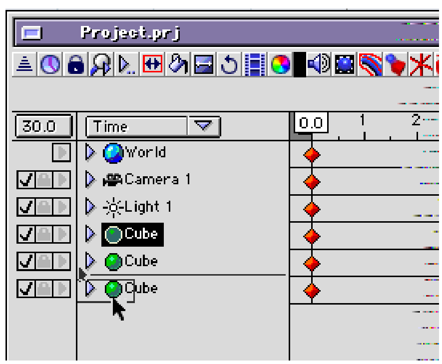


Figure 14.15 — **Placing Top Cube Between Second and Third Cube**

Linking

Drag the objects until your mouse is over the NAME of the new parent. A black arrow pointing down and an underline indicates you are linking.

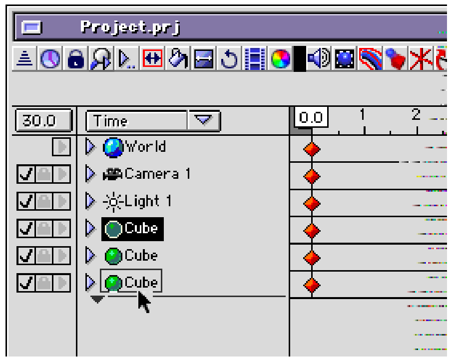


Figure 14.16 — **Linking Selected Cube to Last Cube**

Unlinking

Drag the objects into the area to the left of the object list (the area with the visibility check box, lock box and animation enable) and release the mouse button. The objects will be unlinked and move to the top of the hierarchy.

Please note that to if you wish to move a child to a particular place at the top level of the hierarchy, that this is two separate operations. You must unlink and then reorder.

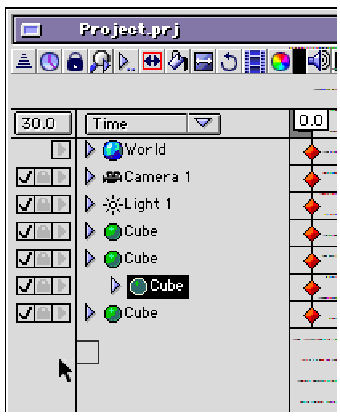


Figure 14.17 — **UnLinking Selected Cube**

Time Markers

15.0 Introduction

Time Markers are small, yellow tags that you place along the time line to help keep track of important events in your project. In addition, these Markers can aid in navigating to different points in the project as described in the sections below.

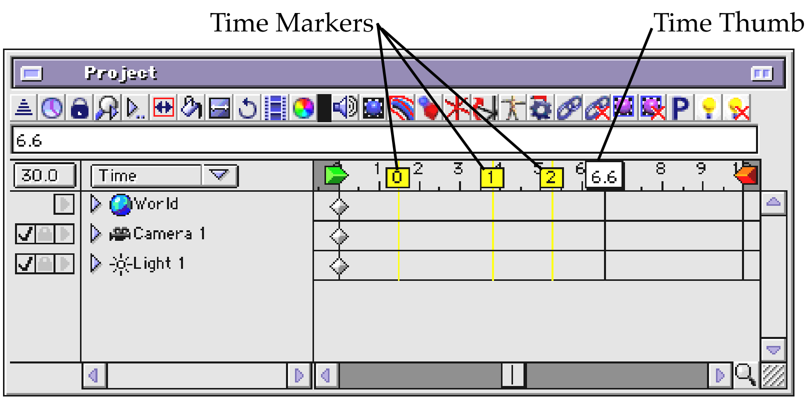


Figure 15.0 — **Time Markers**

A name can be added to each Marker to help you keep track of key events, changes you have made to the project, or any sudden bursts of inspiration you want to record. These names will pop-up, just as tool tips do, when you roll over the Time Marker.

15.1 Adding Time Markers

Markers are added using the Add Marker.... command under the Time View menu in the Project window. New Markers are added to the project at the current time, i.e. at the point in time where the time thumb currently resides.

You can also add a marker by, right mouse-clicking on the Time Thumb (Ctrl-click on the Macintosh). A menu will pop-up allowing you to add a new Time Marker. This works with the Time Thumbs in the Project window, Time palette and F-Curve editor.

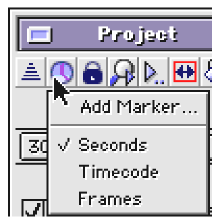


Figure 15.1 — **Add Marker**

After adding the Marker, you will be invited to provide a name for the Marker. Names show up as tool-tips when you place the mouse pointer over the Marker.

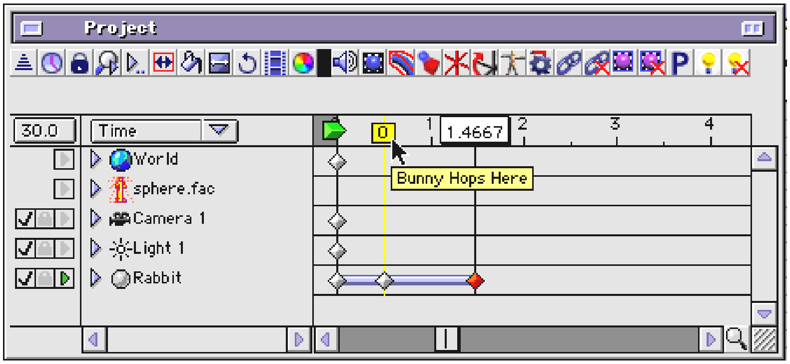


Figure 15.2 — **Marker Tool Tip**

Markers are numbered 0-9 sequentially as you add them to the project. You may add Markers beyond number 9, but they all show up in the time line as “+”. The “+” symbol is used instead of two or three digit numbers to minimize the amount of space taken up by the Markers in the time line.

You can drag Time Markers to any position along the time line just as you would drag the Time Thumb.

Markers are displayed where ever a time line is present. They are shown in the Project window, F-Curve editor, and the Time palette.

15.2 Deleting and Renaming Markers

Hold down the Control key (Right Mouse button click on the PC) and click on a Time Marker to bring up its contextual menu. The menu will allow you to delete the Marker, delete all the Markers in your project, change the Marker's name, or Lock/Unlock the Marker. Locking a marker keeps it from being dragged along the timeline.

15.3 Navigating Using Time Markers

Clicking on a Time Marker will cause the current time (Time Thumb) to jump to that Marker.

The first 10 Time Markers (0-9) each have their own shortcut key. Just hit the number on your keyboard or keypad and the Time Thumb will jump to the corresponding Marker. Use the "+" and "-" keys on your keyboard or keypad to jump forwards or backwards one Marker.

Note *These shortcuts will not work if the key-focus is set to a numeric or text edit box.*

15.4 Time Marker Editor

The Time Marker Editor (Animation menu > Time Marker Editor) contains tools to manage markers and for selecting and copying keyframes based on their location between Markers. This copying functionality can be useful in copying character ‘poses’.

The editor displays a list of all the markers in your project. More than one marker can be selected in the list, and this multiple-selection ability is important when using the features described below.

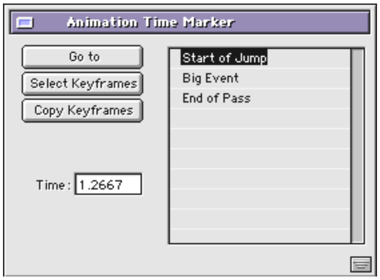


Figure 15.3 — **Time Marker Editor**

Goto. Causes the Time Thumb to jump to the selected marker.

Select Keyframes. Select two markers from the list and then click on this button. In the Project window, for every selected object, all keyframes that lie between the Markers will be highlighted in blue. If no objects are currently selected, the keyframes for every object in the scene that lie between the Markers will be selected.

Copy Keyframes. Select two markers from the list and then click on this button. For each object currently selected, all keyframes that lie between the markers will be copied to the current position of the Time Thumb. If no objects are currently selected, every keyframe in your scene will be copied.

Time. When a single Marker is selected, the time the marker is set to is displayed.

Start/Stop/Frames. When more than one Marker is selected, the start time, stop time and number of frames that lie between the Markers are displayed.

Materials and Texture Maps

16.1 Introduction

In this chapter we will discuss the Materials and Texture Map features in EIAS Animator. Materials are what the rendering engine uses to give shading and detail to a group. Textures are a component of Materials.

Note *Procedural Shaders are also a component of Materials, but are covered in the Procedural Shaders chapter.*

Great effort has been spent conforming to industry standard material terms and behavior wherever possible. This was done to allow you to take advantage of the myriads of books and publications which cover the topics of 3D which are now available, and to make EIAS even easier to use than ever before.

16.2 Overview of Features

The following highlights will give you an idea of the Materials and Texture Map capabilities of EIAS Animator.

- Master Materials (materials that groups can subscribe to)
- Materials Can Be Saved To Disk
- Industry Standard Material Controls
- Easy to Use Interface Design
- Displacement Maps
- Clipping Maps
- Procedural Shaders
- Unlimited Texture Maps
- Precise Texture Mapping Controls

16.3 Materials Defined

Materials are a collection of shading attributes, called channels, that you create and apply to a group (or groups.) Materials can also contain texture maps and procedural shaders. You can apply materials from saved material files on disk, from materials created in the Material Editor, or from Master Materials.

Master Materials

Master Materials are visible in the Project Window, and can have many groups linked to them. Master Materials will replace all of the attributes of the groups linked to them (an exception to this rule applies to locked maps.) You will still have to tweak the texture map alignment to fit each particular group for the best results, unless the groups are similar in shape. You can have as many Master Materials as you wish in a project. To add a Master Material to a project, choose **Material > Add Master Material.** You will now see the Material at the top of the item list in the Project Window.

Groups must be linked to Master Materials in order to use them. You can link as many groups as you like to an individual Master Material. A group may be linked to only one Master Material in a scene.

To link a group to a master material:

1. Select the group (or groups) that you wish to link to the Master Material.
2. Click on the Link Material icon in the Project Window tool bar.
3. Click on the desired Master Material in the Project Window List.

The selected groups are now linked to the Master Material. You can confirm this by setting the Project Window display icon to "By Material." The Project Window display will change to show the groups that are linked to the Master Materials displayed as children to the Master Material.

16.4 Accessing the Material Editor

In order to create or edit a material or Master Material, you need to get to the Material Editor. There are four ways to access the Material Editor:

- Select the Group, and click the Material Editor icon in the Project Window
- Command double click on a Group in any window
- With the Group Info Window open, click on the Material Ball icon
- Double click a Master Material in the Project Window

The Material Editor

There are two variants of the Material Editor, one for group materials, and one for Master Materials.

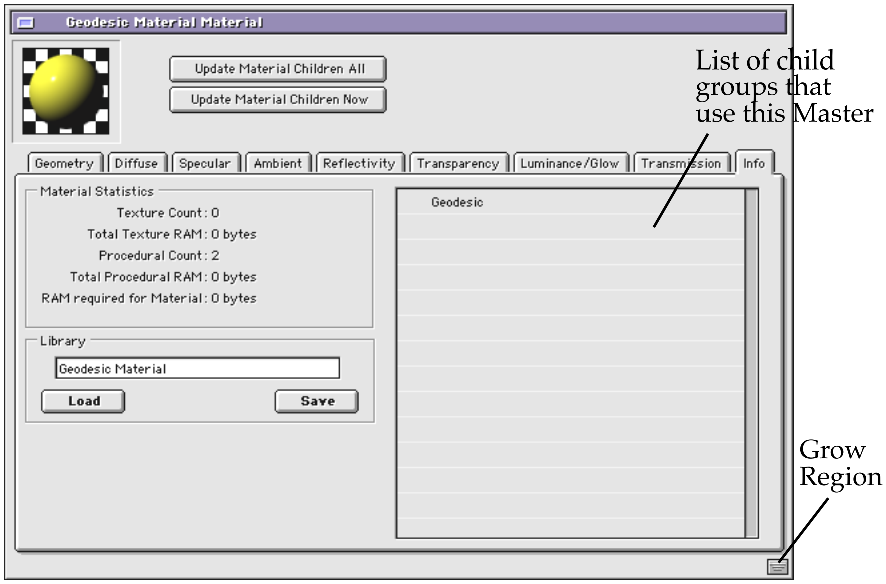


Figure 16.0 — **Master Material Editor — Info Tab**

The primary difference between the Group Material Editor and the Master Material Editor are the material management buttons, located above the tab area and displayed in the Info tab. The following discussion applies to both window variations.

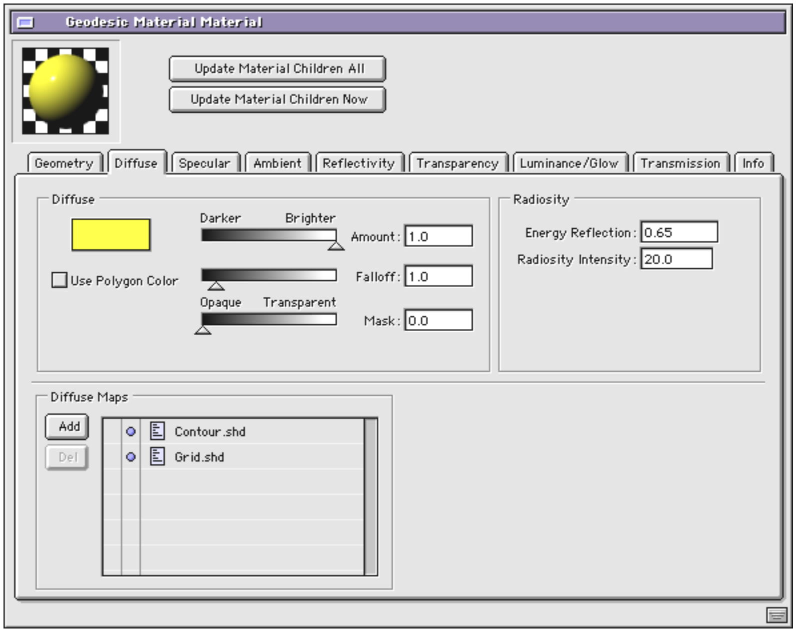


Figure 16.1 — **Group Material Editor**

All of the material channels have separate tabs, with each tab containing the controls and functions indicated by the name of the tab. To access the contents of the tab, just click on it, and the tab will move forward.

Above the tabs you see the material ball icon to the left. The material name edit field is just to the right of that. Below are the Load and Save Material buttons, and below them is the Create New Master button. To the right of the buttons is the Material Statistics section, which illustrates the makeup of the material.

The material ball icon shows a live preview of the settings of the various material channels. To copy a material, select the Material Ball Icon and choose Copy. To paste a new material into this material record, select the Material ball icon, and choose paste. (You can change the background color of the material ball icon by option clicking in the background of the icon, and choosing the preferred background display pattern or color.)

Loading and Saving Materials

One of the most powerful new features is the ability to create a material and save it to disk to be called up any time it is needed. The material is saved to a directory within your EIAS Animator directory called "EI Material." The saved material contains the settings of the various material channels (diffuse, specular, etc.), as well as, external references to texture maps and procedural shaders.

For saving and load materials using the Material palette please see "Material Palette" on page 510

To load a material:

1. In the Info tab, Click the Load button
2. Choose a material from the directory
3. Double click the material or click the open button

The material is now applied to the group. Groups can only have one material assigned to them, whether you assign a material to a specific group, or whether you assign a group to a master material.

To save a material:

1. In the Info tab, Make sure that the material is named
2. Click the Save button

The material is then added to the EI Material directory. EIAS Animator does not provide any indication that the material has been saved. To check this you can save it again, if you like. When you do, you will then be asked if you wish to replace the material (indicating that it was previously saved.)

16.5 Creating New Master Materials

You can create new Master Materials from the Material Editor of a particular group, or you can add them to a project as described previously. Groups can be linked to them with a special material link command described in the Master Materials section.

Groups can be passively linked to a Master Material, or they can be "live linked." Passively linked groups will require a manual update to receive any changes that are made to the Master Material they are assigned to. Live linked groups will be updated immediately upon any change to the Master Material they are assigned to.

To create a Master Material:

1. Set up your material
2. Click on the Create New Master button
3. A dialog will appear, prompting you to name the material.

A Master Material version of the material you were editing now appears in the Project Window item list. You will note that two new material management buttons have now been added to your material, just below the Create New Master button: Reload from Master and Update Master.

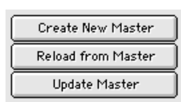


Figure 16.2 — **Material Management Buttons**

Reload From Master

This button appears in groups that are passively linked, not live linked, to a Master Material, and reloads the material properties from the Master Material. This is useful if you are exploring a change to a material but decide you prefer the original.

Update Master

This button appears in groups that are passively linked, not live linked, to a Master Material, and replaces the Master Material with the current material. Groups that are live linked to the master will be immediately updated.

16.6 Material Interface

The Material Editor presents all material channels in a tab context. This makes all of the shading attributes of EIAS Animator very accessible and easy to use. It should not take very long to get acclimated to the new interface. To edit a particular channel within a material, just click on its tab. A material channel is a shading component, referred to as material channel. There are eight material channel tabs:

- Geometry
- Diffuse
- Specular
- Ambient
- Reflectivity
- Transparency
- Luminance/Glow
- Transmission

Each channel tab contains the many attributes which are controlled by the channel, including texture maps and procedural shaders.

Geometry Tab

The geometry tab contains all of the material channels and attributes which affect the apparent geometry of a group and how it is shaded. You can add outlines to the group, add bump and displacement maps for more detail, or punch actual holes into the group with clipping maps (and shadows do see these holes.)

The geometry tab is organized into three basic sections:

- Cel/Outline Shader section
- Bump/Displacement Map list
- Clipping Map list

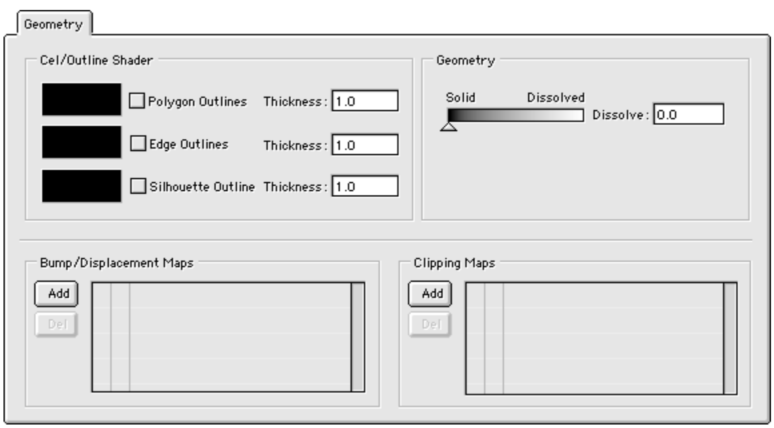


Figure 16.3 — **Geometry Tab**

Cel/Outline Shader Section

In this section you assign color and thickness to polygon outlines, edge outlines and silhouette outlines. Used in conjunction with the Cartoon procedural shader, the look of traditional 2D cel animation can be achieved. There are three types of line effects:

- Polygon Outlines
- Edge Outlines
- Silhouette Outlines

Polygon Outlines. Activating this setting causes all of the polygons in the group to receive an outline. This is similar to wireframe shading, except that the polygon will also be shaded.

Edge Outlines. Activating this setting will cause certain edges to be defined with lines. As the group or camera is in motion, the definition of the edges will change, similar to the effect you see in traditional 2D animation. The silhouette feature should be active with this feature.

Silhouette Outlines. This setting causes the silhouette of an object to be drawn in lines. On occasion, the silhouette is not clearly resolved, so it is best to use this feature with the Edge Outline feature enabled.

To activate the particular line effect you wish you must click in the check box. You can color the lines by clicking on the color swatch and choosing a new color from the color picker. To adjust line thickness, type in a new value in the edit box to the right of the line type (values are in pixels.)

Bump/Displacement Maps List

The Bump/Displacement Maps list is where you add maps of these type. You can add as many maps as you like to this list. Along with the standard bump map, displacement maps are supported. Displacement maps actually move the vertexes in the group using the map to determine how much displacement is applied.

With bump maps the illusion of depth or relief can be created such as the bark on a section of log. The limitation to bump mapping is that the silhouette or edge of the log is perfectly smooth and the closer to the edge the more obvious the cheat. With a displacement map the geometry is actually moved, so the edge of the log shows relief as well as the center. It is important that there be enough vertex points in the group to achieve a satisfactory effect. It might be necessary to apply the Dicer plug-in to the group to achieve best results.

Bump maps and displacement maps can be either a grayscale bitmap image or movie file or a procedural shader. Any bitmaps of greater than 256 colors will be converted to gray scale by the rendering engine to achieve the effect. If an alpha channel is present, it can be used to control the bump instead.

To add a bump or displacement map

1. Click on the add button next to the bump map list
2. Choose the Map
3. Double click on the map or click on the open button

The map will be added to the list. You can configure the map by double clicking on the name of the map in the map list.

Controls for the strength of the bump and displacement are found under the Special Tab in the Texture Info Window, and these controls can be animated. Setting Bump Factor to 0 will disable the bump calculation. Setting Displacement to 0 will disable the displacement calculations. The values can be negative.

Clipping Maps List

The clipping maps list is where you add clipping maps to your group. You can add any amount of clipping maps or procedures to this list. Similar to transparency maps, clipping maps are a quick and efficient way of cutting holes into a group. Unlike a transparency map, the clipped region is anti-aliased independent of resolution. Zooming in close, the clipped object will still exhibit very clean edges. Clipping maps actually remove geometry, so they will create appropriate shadows.

Clipping maps can be either a grayscale bitmap image or movie file or a procedural shader. Any bitmaps of greater than 256 colors will be converted to gray scale by the rendering engine to achieve the effect. If an alpha channel is present, it can be used to control the clipping instead.

To add a clipping map

1. Click the Add button next to the Clipping Map list
2. Select the map or procedural from the dialog
3. Double click the map, or click the open button

The Clip factor edit box is found in the Texture Info Window under the special tab, and controls the strength of the clipping map, where 0 is fully transparent and 1 is fully opaque.

Clip Factor of 0 is a special mode that produces soft clip edges as the camera gets close to the map. If you are not happy with the behavior of the clip map with 0 as the clipping factor, try setting it to 0.01 instead.

Solid/Dissolved Slider

This slider is another way to control transparency.

Diffuse Tab

The diffuse tab contains all of the material channels and attributes which affect the diffuse channel of a group. The diffuse channel is where color is applied, and you will note that there is no longer a surface color attribute.

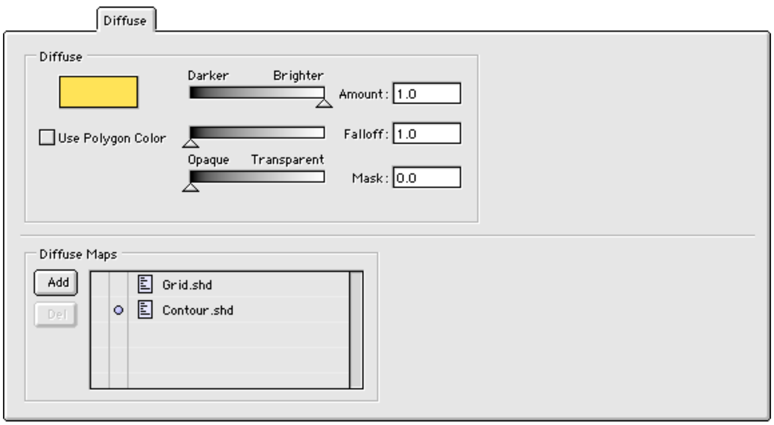


Figure 16.4 — **The Diffuse Tab**

The diffuse tab is organized into two basic sections:

- Diffuse parameters
- Diffuse Maps list

The diffuse parameters section contains a color swatch, slider bars for controlling the amount of energy transmitted by the group, the falloff of that energy, and the mask opacity for the group. There is also a checkbox that allows you to use the original polygon colors of the group *(some modeling programs let you assign unique colors to individual polygons, which you may want to keep.)*

Color Swatch

To choose a diffuse color, click on the swatch and pick a new color from the color picker.

Use Polygon Color

This check box forces the renderer to use the color assigned to the individual polygons of the group when it was created. Assigning a color to the group with the swatch will ignore all of the polygon colors in the group. You can revert back to the original color of the group with this checkbox.

Amount

Use this slider to darken the group's color. The slider bar will use the color in the swatch (or the polygon colors if Use Polygon Color is active) as top end of the range (brighter). You can also type in a value in the Amount edit box. The Amount slider is a nifty way of keeping your diffuse color intact while adjusting the brightness levels of the group.

Falloff

Falloff was formerly called Shading Dropoff, and sets transition value from fully shaded to not shaded. Larger objects to have sharper falloff values (such as planets, where.25 is a good falloff value.) Smaller objects should have falloff values closer to 1.0.

Some sliders will accept values of greater than 1.0, or less than zero. You can adjust the value by typing in the value that you wish in the edit box to the right of the slider. Falloff is one of the attributes that allow this.

Mask

This slider affects the alpha channel for the group (often called a Mask or Matte) in the final render. This feature can be used in conjunction with a compositing effects. If you want the group to appear normally in the scene, then leave the value at 0.0 (opaque on the slider.) If you want the group to act as a cutter, removing its shape from the scene, then set the value of the mask attribute to 1.0 (transparent on the slider). When this setting is anything more than 0.0, a true hole will be left behind if the group is obscuring another object.

Diffuse Maps list

The diffuse maps list is where you add color maps, procedural shaders, or diffuse value maps. You can put as many maps as you like in this list. Maps can be single frames or movie files, and can be any bit depth desired.

To add a diffuse map to the list:

1. Click the Add button next to the Diffuse Map list
2. Select a map or procedural shader from the file list
3. Double click the map, or press the Open button

The map will now be added to the list. To configure the map, double click on the map name in the list. To reorder the map in the list, just drag it to its new location.

The Specular Tab

The specular tab contains all of the material channels and attributes which affect how the various specular attributes of a group will shade. The specular tab is organized into two basic sections:

- Specular Attributes
- Specular Map List

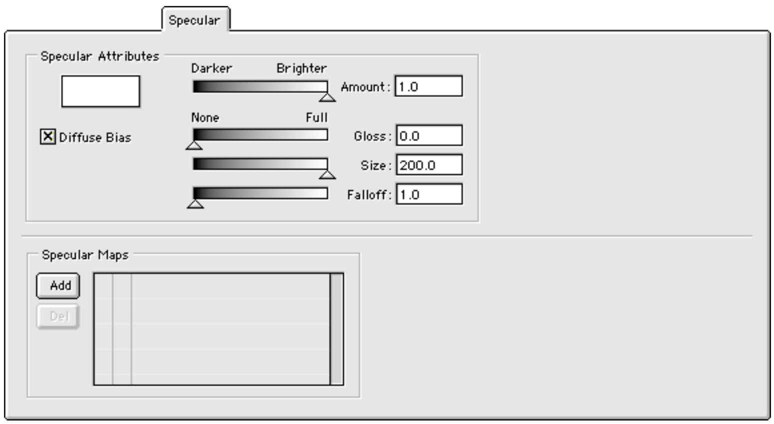


Figure 16.5 — **The Specular Tab**

The Specular Attributes section contains a color swatch, slider bars for controlling the amount of specularity, gloss, size and falloff, and a diffuse bias check box.

Color Swatch

The color swatch is used to set the color of the specular highlight. To choose a color, click on the swatch and pick a new color from the color picker. This setting is ignored if the Diffuse Bias setting is active.

Diffuse Bias

This check box forces the specular color to be equal to the diffuse color. The color of the highlight is added to the diffuse color, making the highlight brighter than the surrounding area. This is analogous to the way that highlights work in the real world, and defaults to on (which ignores the color in the color swatch.)

Amount

The Amount slider controls the brightness of the specular highlights that appear on the group. A value of 0 turns off the highlight.

Gloss

The gloss slider adds a gloss or sheen to your group. It imitates what the group would look like if it were a bit reflective, removing color from the surface around the highlight. It can create an odd look, so you might want to use this sparingly.

Size

Controls the size of the highlight on the group. The smaller the number, the larger the highlight. Values of greater than 1.0 can be typed into the Size edit box.

Some sliders will accept values of greater than 1.0, or less than zero. You can adjust the value by typing in the value that you wish in the edit box to the right of the slider. Specular size is one of the attributes that allow this.

Falloff

Controls the sharpness of the highlight. Larger numbers give a sharper, more abrupt transition, and smaller values produce a smoother and less defined highlight.

Specular Maps List

A specular map controls the area in which the specular highlight is visible on a group, as well as the value (brightness) of the highlight or the color of the highlight. Specular value maps can be either a grayscale image or movie file or procedural shader. Any bitmaps greater than 256 shades will be converted to gray scale by the renderer for specular value maps. If an alpha channel is present, it can be used to control the specular instead of the RGB channel.

To add a specular map to the list:

1. Click the Add button next to the Specular Map list
2. Select a map or procedural shader from the file list
3. Double click the map, or press the Open button

The map will now be added to the list. To configure the map, double click on the map name in the list. To reorder the map in the list, just drag it to its new location.

The Ambient Tab

The ambient tab contains all of the material channels and attributes which affect the ambient shading characteristics of the group. Ambient is a simulation of ambient fill light, and you can make the ambient take a different color cast than the diffuse channel.

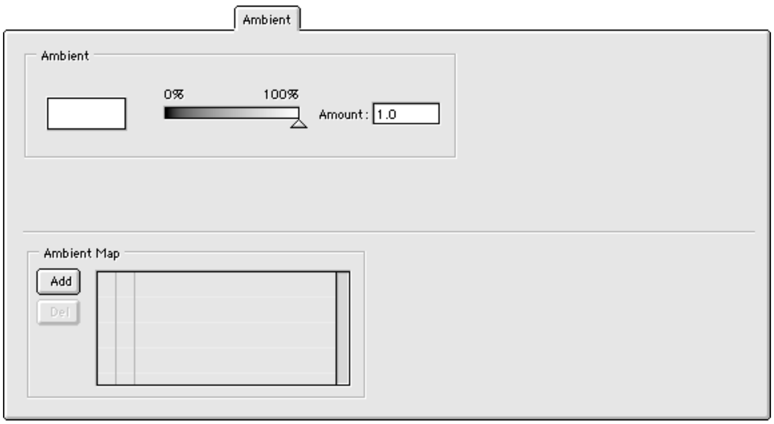


Figure 16.6 — **The Ambient Tab**

There are two basic sections to the ambient tab:

- Ambient Attributes
- Ambient Map List

The ambient attributes section contains a color swatch and a slider bar.

Color Swatch

Controls the color cast of the ambient fill light on the group. To change the color, click on the color swatch and pick a new color from the color picker.

Amount

Controls how the group responds to ambient light. Larger numbers will make the group appear to have more fill color, and be a little less defined. Higher fill values would be appropriate for objects in sunlight. Lower fill values would be more appropriate for night time or deep space shots.

Ambient Map List

Ambient maps can affect the color of the ambient effect, the value of the effect, and the areas of the group that receive the ambient effect. You can have as many ambient maps as you like in the material. An ambient map can be an image or movie file or a procedural shader.

To add an ambient map to the list

1. Click on the Add button next to the Ambient Map List
2. Select the map
3. Double click the map, or click the Open button

The map is now added to the list.To configure the map, double click on the map name in the list. To reorder the map in the list, just drag it to its new location.

The Reflectivity Tab

The reflectivity tab consists of two sub tabs. Main Options contains all of the Phong material channels and attributes which affect how and what the group will reflect. There are four main sections to the Main Options sub tab:

- Reflectivity Configuration (*How much* the Group Reflects)
- Reflection Configuration (*What* the Group Reflects)
- Reflectivity and Reflection Map Lists

- Raytrace Enabler

Both the Reflectivity Configuration section and the Reflection Configuration section are comprised of additional subsections.

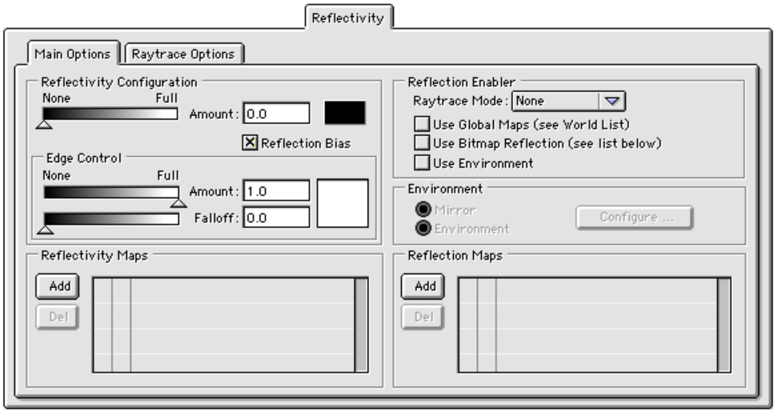


Figure 16.7 — **The Reflectivity Tab - Main Options**

The Reflectivity section resides within the left side of the tab, and the Reflection section resides on the right side of the tab.

Reflectivity Configuration Section

The reflectivity configuration section contains the basic reflectivity controls and specialized edge attenuation controls.

Amount

The Amount slider is used to control overall reflectivity amount of the material. The valid ranges are 0.0 to 1.0.

Color Swatch

The color swatch tints the group’s reflection. It is disabled if the Reflection Bias checkbox is enabled.

Reflection Bias

This check box forces the reflected color to be equal to the diffuse color. The reflection is then added to the group by whatever percentage is set in the Amount attribute. This is more realistic than setting the color of the reflection manually, and defaults to on.

Edge Control (Attenuation) Section

Edge control allows you to attenuate the reflection across the surface of the group (this is also called the Fresnel effect.) Objects in the real world tend to reflect more intensely towards the edge, and less so towards the center as seen from the viewer’s point of view.

To illustrate this effect, set the reflectivity amount to.5, edge amount to 1.0 and falloff amount to 1.0. Note that the center of the material ball shows no reflection, but the edges are quite reflective.

Amount

The amount value controls the amount of reflection along the edge of the group. It is factored into the overall reflection amount. This value is unused if the edge falloff amount is set to 0.0.

Falloff

The Falloff value controls how the reflection will fall off towards the center of the group. The higher the number, the less reflection you will see at the center of the group. This value is not considered if the Edge Amount value is 0.0.

To the right of the edit boxes is a graph area, which shows the relationship of the Edge Amount and Falloff values. With the Edge Amount set to 1.0, and the Edge Falloff set to 0.0, the graph will appear as a white square (the default.) This indicates that the reflection will appear evenly across the surface of the group. As you adjust the relationships between the two values, you will see the graph change to reflect the new values.

Reflectivity Maps List

A reflectivity map controls how the group will reflect any reflection maps assigned to it in the Reflection Map section. It can also control what areas of the group receive a reflection, and how much of it. Any bitmap image, movie or procedural shader can be used as a reflectivity map.

To add a reflectivity map to the list:

1. Click the Add button next to the Reflectivity Map list
2. Select the map or procedural shader from the file list
3. Double click the map, or press the Open button

The map will now be added to the list. To configure the map, double click on the map name in the list. To reorder the map in the list, just drag it to the new location.

Reflection Map Configuration Section

Reflection maps are what the group is actually reflecting. Reflection maps can be bitmaps, either still or movie files. **Procedural shaders cannot be used for reflection maps.** Reflection maps can also be automatically generated by EIAS Animator. These are called mirror maps, which are flat, and environmental maps, which are cubic. The controls for the automatic maps are in the Environment Reflection subsection.

In the main Reflection Map Configuration section, there are three check boxes:

- Use Global Maps
- Use Bitmap Reflection
- Use Environmental Reflection

Any or all of these settings can be selected at any time. Each map has an amount slider that allow maps to be less than full intensity. This allows reflections to be added together, say global maps with bitmap reflections. The effect is additive, which may not be desired.

Global Maps. This check box enables the reflection maps applied under the World Info Window located in the Project Window as a reflections for the group. This setting allows as many groups as you wish to use the same reflection. This map can also function as a "default" reflection map, removing the need to physically assign a reflection map to the group.

Bitmap Reflection. This check box enables the group to reflect maps from the reflection map list.

Environment Reflection. This check box enables any of the selected Environment Reflections specified in the Environment Reflection subsection.

Environment Reflection Subsection

There are three choices in the subsection:

- None
- Mirror
- Environment

None. No map is selected. This is the default condition.

Mirror. Mirror maps are flat, and automatically render an exact mirror reflection, relative to the established mirror plane. You control the mirror plane through the Configure… button in the subsection. It is necessary to establish a plane to guarantee expected results.

Environment. Environment maps are cubic reflection maps that are automatically created by the rendering engine. The rendering engine creates six images representing the faces of the cube. These images then form the basis of the reflections on the group. You can control the resolution of the environment map with the Configure… button. The resolution settings are in an edit box available under the Projection tab.

Note *Environmental reflections and mirror reflections can add up rendering time if you use alot of them. In that case, you are better off choosing raytraced reflections. It takes six complete renderings of your scene to create just one environment reflection map.*

To save render time, you can set an automatic environment map to calculate its reflection only once. This setting is available through the Configure… button, in the Filter tab.

Note *Do not turn on the Use Raytrace check-box if you are using Mirror or Environment maps. These maps are created using multiple Phong renderings of the scene and cannot be used with the raytracer.*

Reflection Map List

The reflection map list is where you add the bitmap images or movies that you wish the group to reflect.

To add a reflection map to the Reflection Map List

1. Click on the Add button next to the Reflection Map list
2. Select a map from the file list
3. Double click the map, or press the Open button.

The reflection map is added to the list. To configure the map, double click on the map name in the list. To reorder the map in the list, just drag it to its new location.

Cubic Reflection Maps

These are six-frame animations that get applied to your group as a single, six-sided reflection map. One frame is applied to each side of your group. The frames must be stored within the animation in the following order:

4. Front
5. Back
6. Left
7. Right
8. Top
9. Bottom

Cubic Reflections are a bitmap reflection mode and can be chosen in the Texture Info window, Projection tab, Map Type pull-down. They are available for both the Reflection and Reflectivity channels.

Reflection Mode

The settings of this pull down menu control the behavior of ray traced reflections.

None. This is the default. No ray trace reflections will be created.

Normal. Reflections will be ray traced.

Note *Do not set the mode to Normal if you are using bitmap or world list reflection maps. The renderer can either render or raytrace a reflection. It cannot do both on a single object. You can still use Reflectivity maps to control the amount of raytrace reflection on each part of the object.*

Note *Do not set the mode to Normal if you are using Mirror or Environment maps. These maps are created using multiple Phong renderings of the scene and cannot be used with the raytracer.*

Occlusion. Reflection maps have been around for a long time. Used in place of raytraced reflections, reflection maps are much faster, but not accurate, as they are merely a simulation of reflectivity. Raytraced reflections are very accurate, but require long render times, and filtering costs can be prohibitive. One method which provides the benefits of both is Reflection Map Occlusion. Essentially, reflection maps show a reflection everywhere on a reflected object, which is not accurate. Occluded reflection maps place the reflected map image only where it would be physically possible to see a reflection in the first place. Imagine looking at the reflection of a car door. In the real world, you would not see a reflection of the sky where a reflection of the rear view mirror would be. That is the operative principle here. In this example, a sky reflection map would not appear where the reflection of the mirror would be, instead, you would see no reflection of the map at all in the mirror area.

This method is not as accurate as a fully raytraced reflection, but then again, it is not nearly as time consuming either, and produces great results.

Occlusion works with Environment and Mirror reflections as well as reflection maps.

Raytrace Options

This sub tab contains the controls for raytracing and caustics. The raytracing options are available when the Raytrace Mode pull-down (see “Reflection Mode” on page 458). The Caustics options are always available.

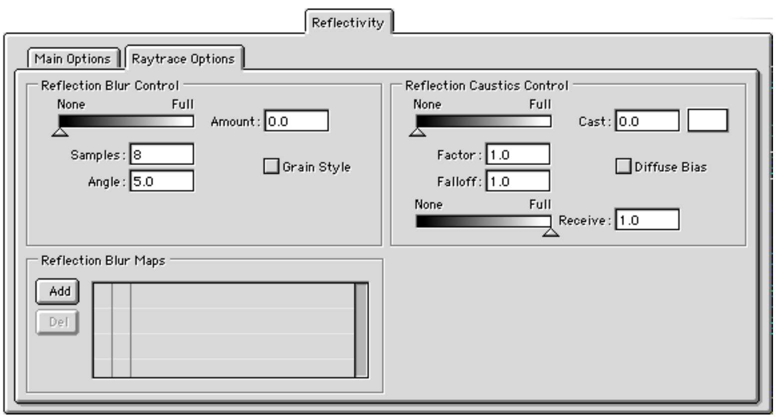


Figure 16.8 — **The Reflectivity Tab - Raytrace Options**

Reflection Blur

Surfaces are not always perfectly smooth, and rough surfaces create blurry reflections. To simulate this effect, EIAS supports the ability to blur raytraced reflections. You can add blur to the entire object using a slider or add a reflectivity texture map to control which parts of your group are blurred.

Please note that reflection blur can increase the amount of time it takes to raytrace the scene. The blur requires many more rays to be cast than would otherwise be necessary.

Amount. This controls the amount of overall blur. The value range from 0.0 to 1.0. This value is ignored if you add Reflection Blur Maps.

Samples. Number of extra rays that are cast. The most useful range of values is from 4 to 8. More samples mean a higher rendering time. If you lower the blur angle below 5 degrees, you can reduce the Samples to 4 without suffering any loss of image quality.

Blur Angle. Controls the intensity of the blur. In other words it controls how far the rays spread out as they blur.

Grain. Turning this checkbox on will cause noise to be added into the blur. This has the effect of 'roughening' the look of the blur.

Reflection Blur Maps. These can be added to control blur on specific parts of the group. The Amount slider is ignored if any Reflection Blur Maps are added. For the map, black is no blur and white is maximum blur.

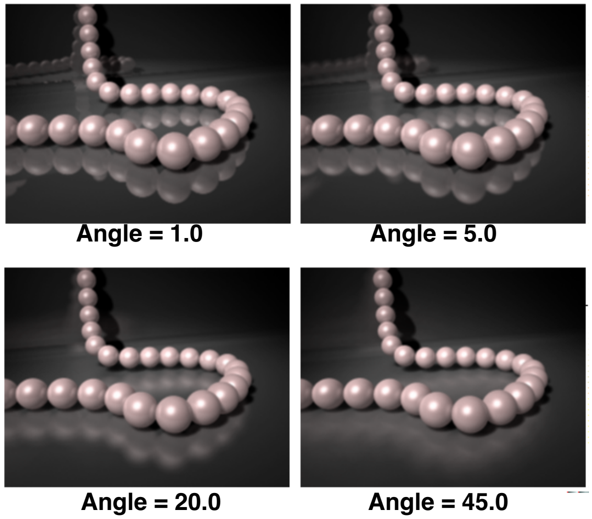


Figure 16.9 — **Reflection Blur Sample - Varying Blur Angle**

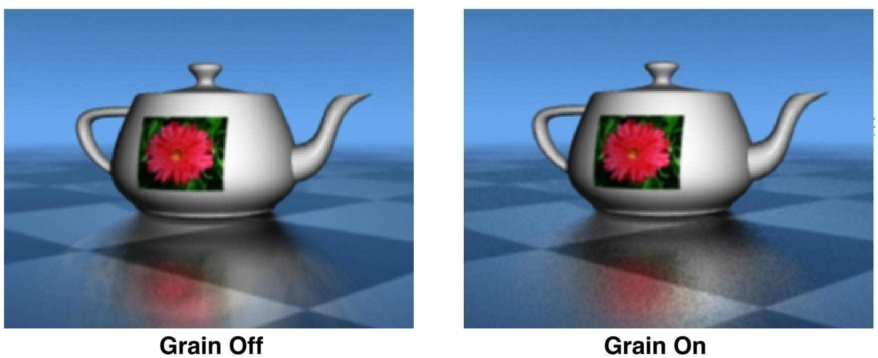


Figure 16.10 — **Reflection Blur Sample - Grain**

Reflection Caustics Control

This section controls how the group sends and receives reflection caustics. Using Caustics is discussed more fully in the chapter on lights. See **"Caustics Tab" on page 220.**

Cast. Sets the intensity of the Caustic cast by the object. Slider defaults to a range of 0 to 1.0 but values larger than 1.0 can be set.

Color Chip and Diffuse Bias. You can add a color to the reflected caustic by choosing one from the color picker (click on the color chip) or you can use the diffuse color by turning on the Diffuse Bias check box.

Factor. This can be used to increase the precision of the Caustics. But you will have to increase the Photon Density in the Light Info window as well. This will increase rendering time.

Falloff. A power multiplier factor for the Reflection Caustics. It is analogous to the Factor control found in the Diffuse tab.

Receive. Controls weather the group receives Caustic Reflections from itself or from other objects. By default all groups receive Caustics. You can prevent a group from receiving by setting this slider to 0.

The Transparency Tab

The transparency tab contains two sub tabs, Main Options and Raytrace Options. The Main Options sub tab contains all of the material settings and attributes which affect the phong transparency of the group. The Raytrace Options sub tab contains the controls for caustics.

Please note that the specular highlight and reflection calculations for the group are not affected by the transparency settings. If you wish to lessen their impact on a transparent group, you will need to adjust these values separately.

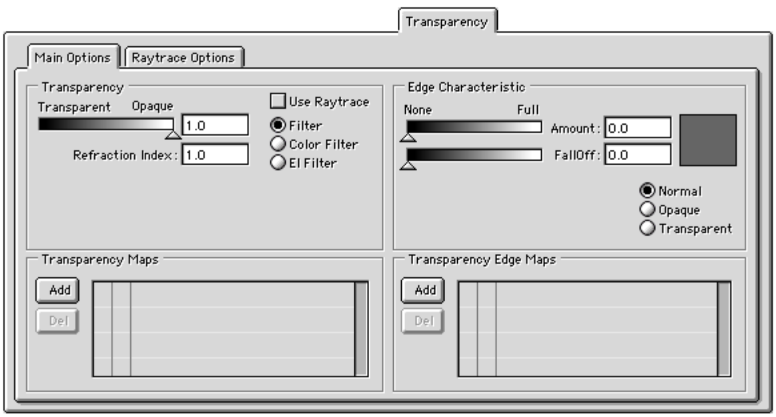


Figure 16.11 — **The Transparency Tab - Main Options**

The Main Options sub tab contains four sections:

- Transparency Attributes section
- Edge Characteristic section
- Transparency Map list
- Transparency Edge Map list

Transparency Attributes Section

Use Raytrace

Transparencies can be either Raytraced or Phong based. Raytraced transparencies are more accurate and show light bending through an object. For example a glass of water bends the light as you look through it, making objects look distorted when viewed through the water.

Index of Refraction

This is the amount of refraction (bending of the light) that occurs when the Use Raytrace check box is on. 0.0 is considered vacuum so no light would bend. Higher numbers would create more distortion. Water is about 1.3, Diamond is 2.2.

Attributes

The transparency attributes section contains controls for setting the actual transparency of the group. The slider bar controls the amount of transparency. The three buttons to the right of the slider control the type of transparency applied to the group:

- Filter
- Color Filter
- EI Filter

Filter. Filtered transparency groups are mathematically “averaged” into the scene, meaning that they do not change the appearance of any groups that fall behind them, with the exception of dimming the brightness values of those groups by the value set for the transparency. This effect does not reflect how transparent objects behave in the real world, and tends to be used primarily for special effects.

Color Filter. Color filter transparencies are either subtracted from the scene or added to the scene, depending upon which choices you make in the filter mode subsection. *(The filter mode subsection is visible only if this option is selected.)*

Figure 16.12 — **Filter Mode Subsection**

The filter mode subsection is divided into two areas:

- Filter Mode
- Filter Color

Filter Mode. Filter Mode determines the method by which the transparency will be applied to the scene.

Subtractive transparencies most accurately mimic the effect of transparent objects in the real world. Groups which pass behind a subtractively transparent group will be tinted to color of the transparent group, as the color of the transparent group is subtracted from whatever is behind it.

Additive transparencies are typically used for special effects purposes, such as glowing balls of energy and so forth. Groups which pass behind additive transparent groups will appear brighter, as the color of the transparent group is added to whatever is behind it.

Filter Color. Filter color is used to determine the color that will be used for the filter effect.

The Use Surface Color option will use the Diffuse channel and all attributes assigned to it for the filtering process set by the Filter Mode switch. This is the most realistic setting, and the default.

The Use Custom Color option will use the color in the swatch next to the item as the filtering color. It will ignore all of the attributes in the Diffuse channel. To change the color of the swatch, click on it and pick a new color from the color picker.

EI Filter. This setting is included for project file compatibility with previous versions of ElectricImage. The color filter transparency method offers far more control and ease of use than this method. Consider ignoring this method when you are creating new projects from scratch.

Figure 16.13 — **EI Filter Options**

When this option is selected, the EI Filter options subsection appears. It consists of two items:

- Use Surface Color
- Use Custom Color

Use Surface Color

This option will use the diffuse channel and all attributes associated with it as the filtering process for the transparency.

Use Custom Color

This option will use the color in the swatch as the filter color. This is analogous to the methods used by previous versions of ElectricImage. To change the color in the swatch, click on it and pick a new color from the color picker.

Transparency Map List

Transparency maps can be applied to modify the amount of transparency or to modify the color of the transparency. You can have both types of maps in the list. Maps can be bitmap images and movie files, or procedural shaders.

To add a transparency map to the list:

1. Click on the Add button next to the transparency map list
2. Choose a map from the file list
3. Double click on the map, or press the Open button

The map is added to the list. To configure the map, double click on the map name in the list. To reorder the map in the list, just drag the map to its new location.

Edge Characteristic Section

The items in this section control the effect of the edge of an group, regardless if the group is set to be transparent or opaque. For transparent groups, you can adjust the opacity of the edge, and the falloff when the edge gets more opaque. For opaque groups, you can adjust when the edge of the object becomes more transparent.

A notable difference between EIAS Animator and previous versions is that the Edge Color value has been removed. Instead, the edge color is derived from the color of the diffuse channel. If a colorless transparent glass look is desired, set the transparency method to color filter, select subtractive, and the custom color option. Click on the color swatch to set a new color, perhaps a lighter variant (close to white) of the diffuse color selected (remember, we are using that value to give the edge some color.) Because you have selected the subtractive transparency mode, the white will *be removed, leaving no color contamination behind, as more saturated colors will do. This will give a result equivalent to earlier versions of ElectricImage.*

There are two sliders which affect the look of the edge:

- Amount
- Falloff

The Edge Characteristic sliders work similarly to the Edge Reflection sliders.The type of effect achieved is determined by the three edge control buttons described following the Amount/Falloff discussion.

Amount. This slider determines the amount of edge transparency or opacity applied to the group. The falloff value (described below) must be set to a value other than 0.0 to see the effects of this slider. The range of this slider is 0.0 to 1.0.

Falloff. This slider determines how the edge will intrude into the body of the group. The Edge Amount slider must have a value other than 0.0 to see the effect. This slider has an infinite upper range, however, you may find numbers greater than 5 of no useful effect.

Edge Graph

To the right of the sliders and edit boxes is the edge graph, which shows the relationship of the Amount and Falloff parameters in graphic form. It updates in real-time as these values are edited. You will note that the more white area in the graph, the more powerful the defined edge will be, as represented in the material ball. The curvature plotted in the graph represents the actual mathematical function plotted by the values in Amount and Falloff

Edge Control Buttons

There are three radio buttons which control the treatment of the edge of the group:

- Normal
- Opaque
- Transparent

Normal. No edge characteristic is applied. The transparency effect is carried evenly through the group. This often yields a group with less definition, and is considered less realistic for transparencies.

Opaque. The edges of the group will be opaque, using the parameters set by the Amount and Falloff sliders. For transparent objects, this option yields the most realistic results, with the Amount and Falloff values set to your preference.

Transparent. The edges of the group will be transparent, using the parameters set by the Amount and Falloff sliders. Opaque objects can be made to have clear, fluffy edges, and can be used for such things as clouds, cotton balls, or planet atmospheres.

Transparency Edge Map List

Transparency edge maps work the same as the transparency maps and can affect the value or color of the transparency at the edge of the group.

To add a transparency edge map to the list:

1. Click on the Add button next to the transparency edge map list
2. Choose a map from the file list
3. Double click on the map, or press the Open button

The map is added to the list. To configure the map, double click on the map name in the list. To reorder the map in the list, just drag the map to its new location.

Raytrace Options

The controls in this tab are for refraction caustics. Using Caustics is discussed more fully in the chapter on lights. See **"Caustics Tab" on page 220.**

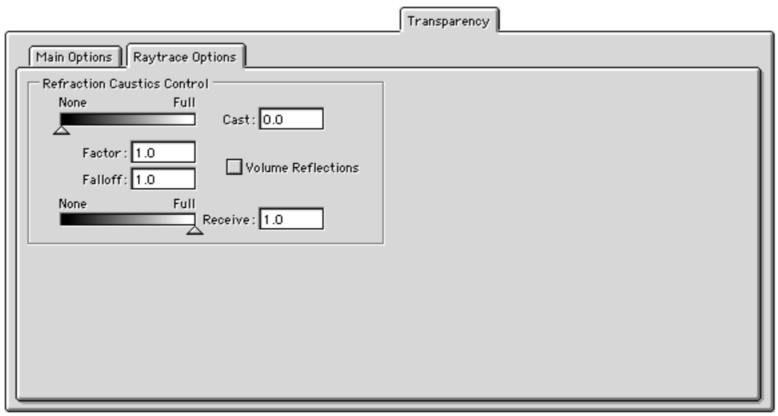


Figure 16.14 — **The Transparency Tab - Raytrace Options**

Cast. Sets the intensity of the Caustic cast by the object. Slider defaults to a range of 0 to 1.0 but values larger than 1.0 can be set.

Factor. This can be used to increase the precision of the Caustics. But you will have to increase the Photon Density in the Light Info window as well. This will increase rendering time.

Falloff. A power multiplier factor for the Reflection Caustics. It is analogous to the Factor control found in the Diffuse tab.

Volume Reflections. A When on the caustics engine will create additional photons to simulate internal reflections that take place inside transparent objects.

Receive. Controls weather the group receives Caustic Reflections from itself or from other objects. By default all groups receive Caustics. You can prevent a group from receiving by setting this slider to 0.

Note that a transparent object will receive caustics if its Use Raytrace check box is turned on. When the checkbox is on, the Receive slider is ignored.

The Luminance/Glow Tab

The luminance / glow tab contains all of the material channels and attributes which affect the luminosity and glow effects that a group can have applied to it.

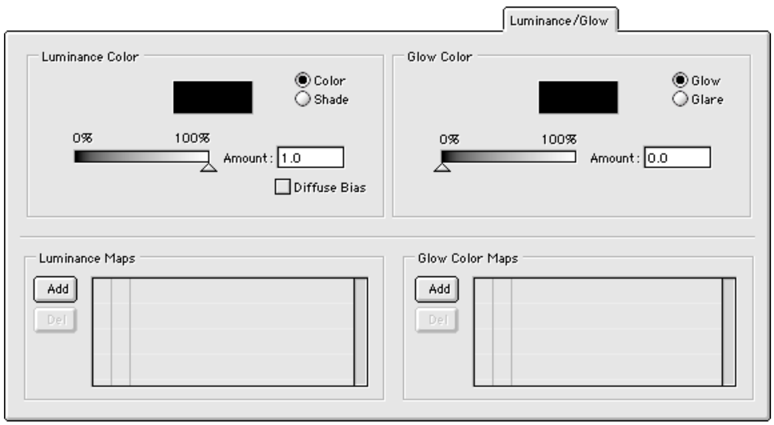


Figure 16.15 — **The Luminance/Glow Tab**

The luminance/glow tab is divided into four sections:

- Luminance Color
- Glow Color
- Luminance Map List
- Glow Map list

Luminance Color. The luminance value controls the group's self illumination. (This value does not actually cause the group to emit light, but rather glow like an LED would glow.) The slider controls the amount of self illumination of the group, using either the color in the color swatch, or the diffuse shading channel of the group. Texture maps can also be used to control the luminescence of the group.

- Use Color Button

The use color button will cause the group to luminesce with the color in the color swatch. The change the color in the swatch, click on it and pick the color from the color picker.

- Use Shading Button

The use shading button will cause the group to luminesce with the values found in the diffuse channel.

Luminance Map . Luminance maps can be either value maps or color maps. In the case of grayscale the white areas of the map will illuminate to white and black areas will not illuminate. In the case of a color map the illumination will possess the colors of the map.

To add a map to the luminance map list:

1. Click the Add button next to the map
2. Select a map from the file list
3. Double click the map, or press the Open button.

The map will now be added to the list. To configure the map, double click on the map name in the list. To reorder the map in the list, just drag the map to the new location.

Glow Color. The glow effect causes groups to apparently emit a glowing area around the group. The glow is a compositing effect added at the end of each rendered frame (and as such the effects of the glow settings are not represented in the material ball icon.) Glowing groups will not effect the appearance of other groups in the scene.

Setting up glows properly requires the following procedure:

1. Setting the glow attribute in the group's material
2. Assigning the group to a selection set
3. Adding a the selection set to the glow layer tab in the Render Information Window
4. Set up the glow layer

Setting the Glow Attribute in the Group's Material

In the Glow Color section, you can control the amount that an object will glow, the color or shading of the glow, and whether the group will actually glow, or have a glare on the brighter areas of the group (which you can control.)

Glow. The Glow radio button will use the color swatch as the glow color. The value of the glow is set by the Glow Amount slider. To change the color in the color swatch, click on the swatch and pick a color with the color picker. The actual area of glow is determined by the attributes of the Glow Layer, found in the Glow Layer tab of the Render Information Window. If the group is not part of a selection set contained within a Glow Layer, then the group will not appear to glow in the rendering.

Glare. The glare button will use the diffuse channel to create a glare around the group. The amount slider determines the brightness cutoff for the glare. Typically, a fairly subtle cutoff is desired, as glares tend to be less overpowering than glow effects. 50% is a good value for the brightness cutoff to begin with. You can have the entire group "radiate" by setting the slider to 0.0. This makes the group appear to be heavily over-exposed, depending upon the settings in the glow layer to which the group's selection set is assigned.

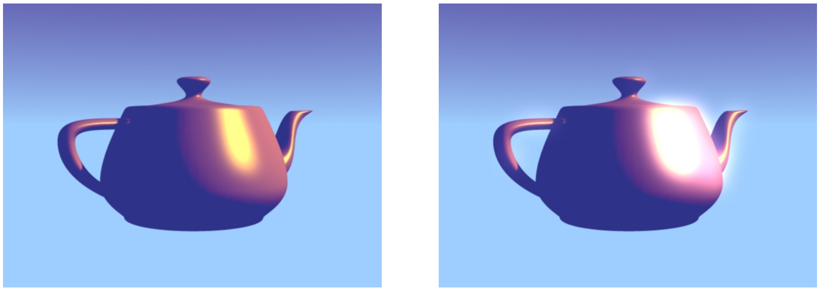


Figure 16.16 — **Teapot without glare on the left, Teapot with glare on the right**

Any pixels which fall within the specified tolerance set by the Glow Amount attribute will be blurred by the amount specified in the Glow Radius attribute of the Glow Layer, and then added back onto the scene by the amount specified in the Intensity attribute of the Glow Layer to which it is assigned. Glow Radius values of 50 pixels or greater, plus a Glow Intensity of 1.5 will give you a good starting point for a nice glare effect (as shown in the illustration.)

The actual area of the glare is determined by the attributes of the Glow Layer, found in the Glow Layer tab of the Render Information Window. If the group is not part of a selection set contained within a Glow Layer, then the group will not glare in the rendering.

To assign the Group to a Selection Set:

1. Select the group
2. Choose **Select>By Set>Edit Sets**
3. Click the Add button in the Selection Sets section of the window that appears
4. Type in the name of the set and hit return
5. Select the name of the set that now appears in the list
6. Click the Add button in the members section of the window

7. Close the window

All of the selected groups will now be part of that named selection set.

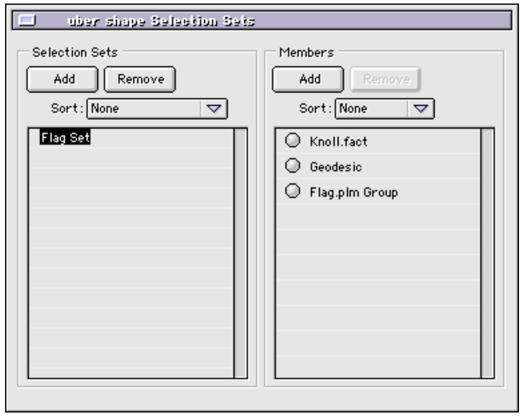


Figure 16.17 — **Edit Selection Sets Window**

Add the Selection Set to a Glow Layer:

1. Open the Render Information Window (**Render>Render Settings…**)
2. Select the Glow Layer tab
3. Click the Add button in the Glow Layer Section
4. Type in Glow Layer name in the edit field and hit return
5. Select the Glow Layer in the list
6. Click the Add button in the Glow Layer Member section
7. Select the desired selection set from the list that appears, and click the Add button

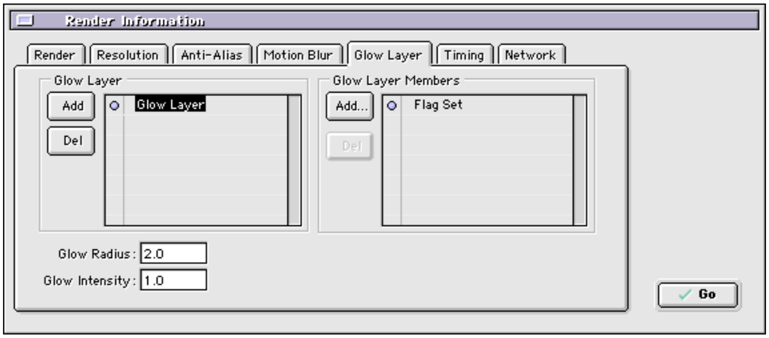


Figure 16.18 — **Glow Layer Tab of Render Information Window**

The selection set is now added to the glow layer.

Set Up the Glow Layer

1. Select a Glow Layer from the Glow Layer List
2. Type in a value for the Glow Radius in pixels
3. Type in a value for Glow Intensity

The smaller the pixel number in the Glow Radius edit box, the more defined and brighter the glow will appear. Larger values in the Glow Radius edit box might require an adjustment to the Glow Intensity value to achieve the desired effect (larger intensity values for a stronger glow, smaller intensity values for a weaker glow.) Glow effects will typically be 2 or greater in intensity, while Glare effects will probably not be brighter than 1.5, but feel free to experiment.

The previous steps cover typical glow and glare usage.

Glow Color Maps List

Glow maps can be applied to control the amount of glow, and to control the color of the glow. Glow maps can be a bitmap image or movie file, or a procedural shader. You can have as many glow maps as you like.

To add a map to the glow color maps list:

1. Click the Add button next to the glow color maps list
2. Select a map from the file list
3. Double click the map, or press the Open button

The map will now be added to the list. To configure the map, double click on the name of the map in the list. To reorder the map, just drag the name to the desired location in the list.

The Transmission Tab

The transmission tab contains all of the material channels and attributes which affect the transmission characteristics of the group. Some objects in the real world can allow light to go through them to a degree. This effect can be seen of you were to hold up a leaf to the sun. You would notice the spidery vein network as darker shapes, and the thinner parts of the leaf would appear brighter. The transmission channel lets you correctly reproduce this phenomena.

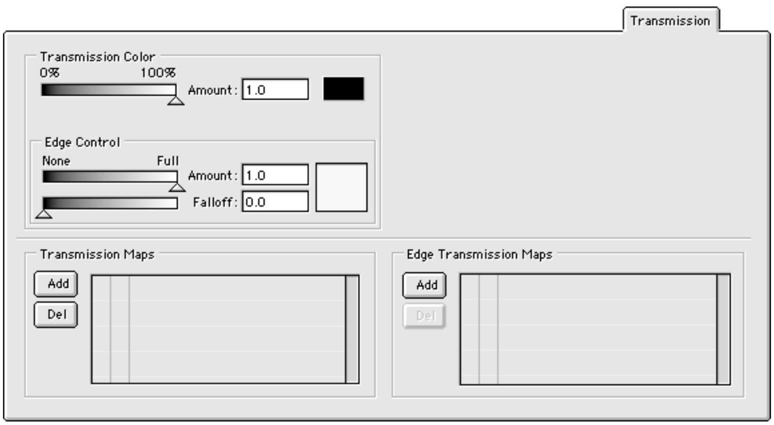


Figure 16.19 — **The Transmission Tab**

The transmission tab is divided into three sections:

- Transmission Color Section
- Transmission Edge Control Section
- Transmission Maps List
- Edge Transmission Maps List

Transmission Color

This attribute determines the transmission amount and color. The best transmission color is white, as it will conform to the color of the group and any maps, plus the lightsource.

Edge Control Subsection

Transmission edge control works the same as with edge transparency allowing you to build less translucent edges to curved groups the way they would appear in the real world.

Edge Amount

Controls the transmissiveness of the edge. The Edge Falloff slider must have a value other than 0.0 to see the effect.

Edge Falloff

This slider determines how the edge will intrude into the body of the group. The Edge Amount slider must have a value other than 0.0 to see the effect.

Edge Graph

To the right of the sliders and edit boxes is the edge graph, which shows the relationship of the Amount and Falloff parameters in graphic form. It updates in real-time as these values are edited.

Transmission Maps List

Transmission maps are used to control the value and color of the transmission. Transmission maps can be a bitmap image or movie file, or a procedural shader. After a map is assigned, the slider no longer has any effect as all the transmission information is derived from the value of the map.

The best way to achieve a natural look is to assign a standard color map under the Diffuse tab and then a grayscale transmission map under the Transmission Tab.

To add a map to the transmission map list:

1. Click the Add button next to the transmission maps list
2. Select a map from the file list
3. Double click the map, or press the Open button

The map is now added to the list. To configure the map, double click on the name of the map in the list. To reorder the map, select the name and drag it to the desired location.

Edge Transmission Map List

Edge transmission maps are used to control the value and color of the edge of the group. Edge transmission maps can be a bitmap image or movie file, or a procedural shader. After a map is assigned, the slider no longer has any effect, as all the transmission information is derived from the value of the map.

To add a map to the edge transmission map list:

1. Click the Add button next to the edge transmission maps list
2. Select a map from the file list
3. Double click the map, or press the Open button

The map is now added to the list. To configure the map, double click on the name of the map in the list. To reorder the map, select the name and drag it to the desired location.

16.7 Using Texture Maps

EIAS Animator supports an unlimited number of texture maps per group. Texture maps are an integral component of a material. Texture maps do different things, depending upon the tab and map list in which they reside. The same map can be used in many different channels, and each channel can have an unlimited amount of maps as well.

All of this power can come at a price if you are not frugal with your map management. Be careful not to waste maps and map memory. If you just need a grayscale value for a bump map, then you would be wasting over 1 MB of RAM (for a typical map) if that same map also had RGB channels associated with it (and was unused elsewhere).

Map placement controls are included that allow face to face precision of map placement. Multiframe maps can be easily controlled with start and stop times and stop ranges. Most of the map functions described in this section can also pertain to procedural shaders, in EIAS Animator.

Map Types

Texture maps can be in EIAS's native Image format (.img) or in any format supported by QuickTime, including BMP, TIFF, TGA, JPEG, MPEG, etc. Animated files can also be used as textures. Animated texture maps are supported automatically when a QuickTime or Image movie is selected.

Texture Sequences

You can use a folder containing a series of sequentially numbered files as an animated texture map. Once you click the Add button in the Material Info window to add a texture map, an Open File dialog box opens. Inside the box is a check box, "Use Multi-File frames". Turn on this check box and then select any one of the sequentially numbered texture frames. Animator will include the map in texture list and substitute the "#" symbol for the number to indicate an animated texture sequence has been applied. Sequence names in the form of "NAME ####.YYY" are supported where NAME is the texture name, #### is a number, and YYY is the file extension. Sequence names in the form of NAME.XXXX are not supported. On all operating systems the texture sequence names must end in a file extension.

Animator will use the first numbered file in the folder as the first frame of the animation regardless of which of the texture maps in the sequence you select,. To begin the sequence on a different frame, use the map playback controls (See "Map Playback Controls" on page 495.)

Map Lists

Maps are managed within map lists. Each material channel contains a map list where appropriate. Map lists are a jumping off point to map configuration and management.

Map Order

Map order is very important, as some effects may not be obvious if maps are out of order. Fortunately, reordering maps within a channel is easy — just drag the maps in whatever order you wish.

Map Alpha Channels

Alpha channels now take on a more specific meaning in EIAS Animator, both to make the process of using texture maps easier, and to conform to industry standards. There are essentially three ways to use an alpha channel within a texture map:

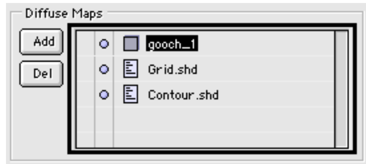


Figure 16.20 — **Diffuse map list box**

- Ignored
- As Value
- As Mask

The Way Texture Maps Work

Maps add into the list from the top. Think of the list being stacked on top of the group. The map at the top of the list is the uppermost one, while the map at the bottom is innermost, nearest the actual surface of the group. The maps can be reordered by dragging them up or down in the list.

The circle next to each map is a checkbox that can be used to enable or disable the map. This feature is very useful while developing new materials. The empty space next to the circle is the map lock toggle. This can be set to prevent this map from being over-written by a Master Material assigned to the group.

Texture maps can be copied and pasted from one map list to another. To copy the map, highlight the map, select Copy Texture from the Edit menu. To paste the map, select the list you want paste it into by clicking somewhere in the list box. The list box will show that it has been selected with a thick black outline. Use the Paste Texture command from the Edit menu to complete the operation.

To configure the texture map, double-click on the name of the map in the list box. The Texture Info Window will open. This window displays the group to be textured and the map projection (on the right) and has a series of tabs and buttons for controlling texture scaling, tiling, etc. (on the left).

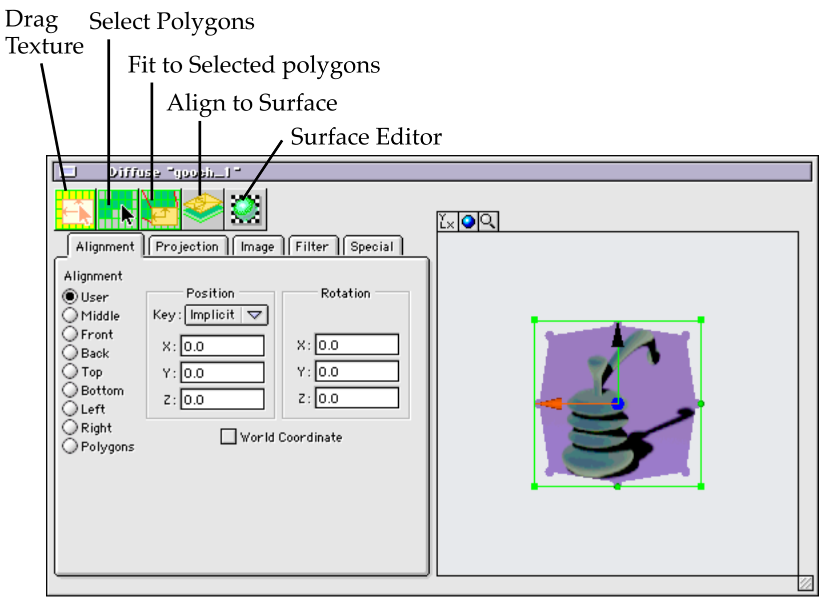


Figure 16.21 — **Texture Info Window**

Map Alignment Buttons

There are five map alignment buttons at the upper left of the window assist in map placement. These buttons are:

- Drag Texture
- Select Polygons
- Fit to Selected Polygons
- Align to Surface
- Surface Editor

Drag Texture. This (default) button allows you to move the map projection around in the window for proper placement on your model. Drag left or right at the edges of the projection to scale the map. Hold down the control key and drag to rotate the map.

Select Polygons. This button is used to select polygons by clicking on individuals or drag a rectangle for multiples. Shift click to add or remove polygons within the selection.

Ctrl-Clicking (Option-Clicking on Macintosh) on the Select Polygons button brings up a color picker that lets you change the color of selected polygons.

Fit to Selected Polygons. This button sets texture projection to the extent of the polygons selected with the Polygon Selection Button. There is a pull-down menu that is brought up by clicking on this button with the Ctrl-Key (Option-Key on Macintosh) held down. It brings up the following options:

> These options are designed to assist you when positioning cylindrical and spherical maps. *Note that the button must be active in order for these options to be effective.*

Align to South Pole. Choosing this option will align the south pole of the spherical or cylindrical mapping primitive with whatever point you select on the model.

Align to North Pole. Choosing this option will align the north pole of the spherical or cylindrical mapping primitive with whatever point you select on the model.

Align to Equator Front. Choosing this option will align the side of the spherical or cylindrical mapping primitive opposite the seam to whatever point you select on the model.

Align to Equator Seam. Choosing this option will align the seam of the spherical or cylindrical mapping primitive opposite the seam to whatever point you select on the model.

Align to Surface. This button sets map plane any polygon, regardless of the polygons you may have already selected with the Select Polygons tool. Unlike the Fit to Selected tool, the size and aspect ratio of the map is maintained with this tool. Align Map Plane is a very powerful feature for aligning the map projection icon to tricky curved surfaces. This feature is also available while in Move mode by Command-clicking on a polygon.

Surface Editor. This button brings up a list of texture maps applied to the current group and allows you navigate to any of them. Alt-Clicking (Option-Clicking on the Macintosh) opens up the Material Info window.

Map Alignment Tab

The alignment tab contains the position and rotation information for the texture map. The map alignment tab is divided into three sections:

- Alignment Radio Buttons
- Position Information
- Rotation Information

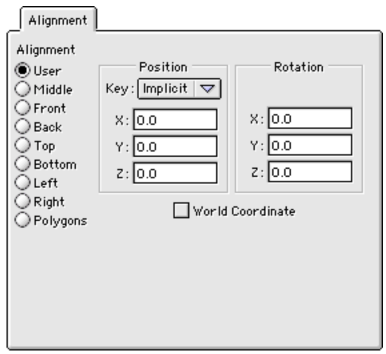


Figure 16.22 — **Map Alignment Tab**

The Alignment Radio Buttons

These buttons provide a straightforward way of aligning the texture map:

- User
- Middle
- Front
- Back
- Top
- Bottom
- Left
- Right
- Polygons

These projections will align and scale the map along the axis noted by the radio button. They are used to set the initial map alignment. You can use the map alignment buttons to more precisely locate the map to the group.

Position Information

The position information section contains X,Y, and Z readouts for map position, as well as a popup menu to control the motion path interpolation method for the map position channel. You can change the map position by dragging, or by typing values into the edit boxes.

Rotation Information

The rotation information section contains X,Y, and Z readouts for map rotation, as well as a popup menu to control the motion path interpolation method for the map rotation channel. You can change the map rotation by rotation tools and keyboard shortcuts, or by typing values into the edit boxes.

World Coordinates Checkbox

When this checkbox enabled, the map will reside in world space instead of local space. Effectively, the map becomes fixed in space at the coordinates specified (you can always animate its position, of course), and the group would then be perceived as moving *through* it's map if the group were moved.

Map Projection Tab

The projection tab is used to determine the type of mapping primitive that the map will project, as well as the tiling method and map scale. There are four types of map tiling:

- None
- Hold
- Repeat
- Mirror

None. Disables mirroring of the map on the specified map axis. Choosing None for both axes will cause the map to be displayed only where you positioned it, nowhere else. You can choose this option along with another to constrain a map to hold, mirror, or repeat along a single axis.

Hold. Applies the colors found at the map edges outside of the map area. The map will appear once as positioned, with the border colors of the map extending beyond the map rectangle, covering the object.

Repeat. Repeats the map along the specified axis. Choosing Repeat for both axes will cause the map to repeat continuously, depending upon the scale of the map relative to the group.

Mirror. Mirrors the map along the specified axis. Choosing Mirror for both axes will cause the map to flip flop about both axes.

Disable UV

This option is available when “Use UV Space” has been turned on in the Group Info window. Checking it prevents UV’s from being used for the map. This allows the UV space to be used for some maps but not others.

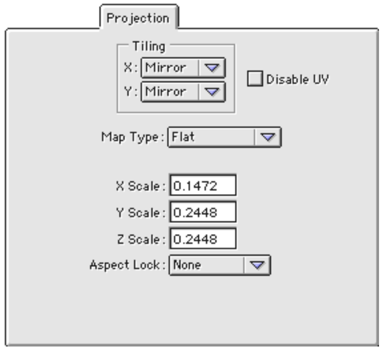


Figure 16.23 — **Map Projection Tab**

Map Type Popup Menu

Map projections use simple primitives to process and align the texture map for rendering. There are four types of map projections:

- Flat
- Cylindrical
- Spherical
- Cubic

Pick the projection which most closely matches the shape of the group.

Flat. This option (the default) is best used for flat or flattish objects. If applied to a non-flat-object, the texture will streak along the sides of the object as it is projected onto all surfaces of the group.

The rectangle in the display represents the map and consists three arrows, one pointing to the top of the map (Y axis), one pointing out to the side of the map (X axis) and the other pointing out from the center of the map (Z axis.)

The flat projection scale defaults to the group's extents. The scales of the projection are visible in the **X Scale**, **Y Scale**, and **Z Scale** edit boxes and can be changed by typing new values into the edit boxes.

Cylindrical. This option projects a cylindrical image around the group.

A cylinder is oriented around the center of the object, with an arrow pointing towards the top of the cylinder, and a line indicating where the seam will be. This is the best mapping type to use if the object is roughly cylindrical.

Cylindrical map types have three projection alignment controls, wrap angle, height and radius. The wrap angle controls the longitude projection, and the height factor controls the latitude projection of the cylinder. The wrap angle axis allows angles from 0˚ to 360˚. The default is 180˚. The height factor allows a real number factor, with 1 being the default size. The radius represents the radius of the cylinder, and defaults to fitting from the center of the group to the edge extent of the group.

Spherical. Spherical mapping warps the bitmap into a spherical shape, and then projects the map onto the group. A sphere primitive is centered around the group, with a line running along the sphere. This line is where the seam of the map will occur, and also points to the top of the map. An arrow runs from the center of the primitive to the top of the sphere. This is the best mapping type if the object is roughly spherical.

The spherical texture type has four separate projection alignment controls, wrap angle, band angle, band angle start, and radius. The wrap angle controls the longitude projection, and the band angle controls the latitude projection. The wrap angle axis is a circular axis allowing angles of 0˚ to 360˚.

The band angle axis is half circular, allowing for angles of 0˚ to 180˚. The band angle start determines where the band angle will begin. The band angle is centered on the sphere by default. The radius represents the radius of the sphere, and defaults to fitting from the center of the group to the edge extent of the group.

Cubic. The front face of the cube will have an “x” through the center, much like the flat type. There will also be three lines indicating the top (Y axis), front (Z axis) and side (X axis) of the map.

When this map is used with a cube-shaped group, all sides should project onto the group with minimal distortion. If this mapping type is applied to a curved group, the edges of the cubic map will be seen, appearing like a seam. Seaming also occurs when the projection is not properly aligned to a cube-shaped object.

The front face is the active face, which determines the overall mapping characteristics of the selected group. Use the active face to correctly scale the texture to the group, as well as to correctly orient the projection to the group’s coordinate space.

Map Scale Edit Boxes

The map scale edit boxes can be used to fine tune the scale and fit of the map on the group. There are separate values for X, Y, and Z axes.

Image Map Tab

The image map tab contains thumbnails of the RGB and Alpha channels of an image map, some statistics about the map, the map cropping rectangle, a Replace Map button, and movie playback information for multi-frame map files.

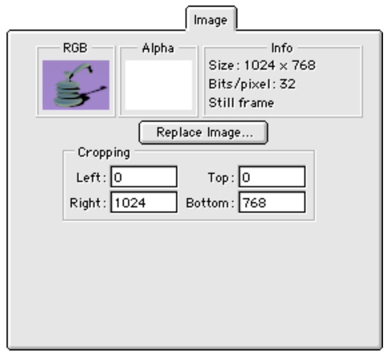


Figure 16.24 — **Image Map Tab**

RGB and Alpha Thumbnails

The RGB and Alpha thumbnails give you a quick visual reminder of the contents of the map channels. If you click on the thumbnail, a larger image will appear in the view window to the right of the tab. If you double click on the image in the view window, the actual image will be displayed in a separate image display window.

Replace Image Button

Allows you to replace the current texture file without losing the placement, scaling, and other settings.

Cropping Edit Boxes

These coordinate boxes allow you to crop the texture map to any size or portion of the map you wish to use. You can crop interactively by first clicking on the RGB or Alpha windows, to bring up the image in the texture window, and then drag the crawling ants border.

Map Playback Controls

These controls will appear whenever you have selected a mutli-frame map as a texture. You can adjust the end behavior, at what frame the movie will start, how many frames to play back, and the playback rate.

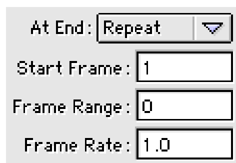


Figure 16.25 — **Map Playback Controls**

End Condition Popup Menu

This controls how the movie will behave when the end of the file is reached. There are three choices:

- Repeat
- Oscillate
- Hold

Repeat. Repeats the movie when the end of the file is reached.

Oscillate. Cycles back and forth through the movie when the end of the file is reached.

Hold. Holds the movie at the last frame when the end of the file is reached.

- Start Frame

The first frame of the animated texture to be used. The first frame of the animated texture is considered frame 1 not frame 0. Choosing a value other than one will cause the animated texture to begin at that frame. Combined with the Frame Range edit box, you can choose to render just a section of the animated texture map.

- Frame Range

This value sets the number of frames to use for the animated texture map. When combined with the Start Frame value, this feature can be used to render just a section of the animated texture map. The default value is 0, which causes all frames in the animated texture map to be used.

- Frame Rate

Controls the number of animated texture frames to increment for every frame of the output animation. The default is 1.0. Smaller numbers will speed up the apparent playback of the texture when viewed at speed. Larger numbers will make the texture appear to be slower. Extremely large numbers will make the texture appear to be "step framed." You can fine tune the playback by using real numbers (numbers with decimals.)

Map Filter Tab

The map filter tab contains the image filtering and map strength controls for the texture map. This tab also is used to select how the different RGB and Alpha channels will be processed. The filter tab is divided into several sections:

- Map Filter Check Boxes
- Map Quality Edit Boxes
- Map Strength Slider
- Use Channel Popup
- RGB Channel Configuration
- Alpha Channel Configuration
- Texture Falloff

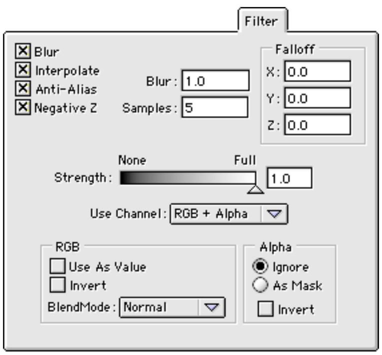


Figure 16.26 — **Map Filter Tab**

Map Filter Check Boxes

These check boxes enable map filtering, and the Negative Z function. There are a total of four check boxes:

- Interpolate

- Anti-Alias
- Negative Z
- Calculate Once (automatic reflections only)

Interpolate. Interpolation filters the map as it is applied to the model. It cuts down on aliasing, but can also soften the image (especially as the map grows larger than 1.0 in scale.) Disabling this feature will sharpen the map, but doing so is not recommended.

Anti-Alias. Texture anti-aliasing is another form of map filtering. With this option enabled, the map is effectively anti-aliased twice, first, during the stage in which the map is applied, then, as the entire image is anti-aliased. This can cause a loss of high frequency detail in the map, which some consider objectionable. Disabling this feature will cause some aliasing, but the overall image anti-aliasing might hide the artifacts. Use at your discretion.

Negative Z. Causes the texture map to be projected along both the positive and negative Z axis. The map will be projected along only the positive Z axis if this checkbox is off. As an example, imagine a flat map placed on a nearly flat disk. If the Negative Z checkbox is on, the map will appear on both sides of the disk. If the checkbox is off it will appear only on the front side.

Calculate Once. Causes a mirror or environmental reflection map to be rendered only once in the animation. This feature can save much rendering time, although it must be used wisely, as the reflection will not update after the first frame.

Map Quality Edit Boxes

These edit boxes offer even more control over the quality of the texture. There are two values to do so:

- Blur
- Samples

Blur. Allows you to degrade the map sharpness. This tool is useful for blurring a bump map that is too sharp and not giving you a clean bump, or taking the edge off of a reflection that might appear too busy otherwise.

Samples. Controls the quality of the map. For the most part, 5 samples will yield acceptable results. If you wish to improve the quality of your maps even more, just increase this value. Higher values will increase rendering time, however.

Map Strength Slider

This slider controls the amount of affect the current texture has on the group. Use this slider when you have multiple texture maps on one group to mix together several maps. This value can be animated to cause maps to fade in/out over time. The value can be greater than 1.0.

Use Channel Popup Menu

This popup is used to specify what image map channels you wish to use and for what purpose. You can choose RGB, Alpha or both and then specify if you want it used as color or as value and if you want to invert it. There are three choices:

- RGB Only
- Alpha Only
- RGB + Alpha

RGB Only. Uses the RGB channel only for the map. The options field changes when this item is selected, offering you the ability to use the map as a color map, or as a value map (in which case the map will be automatically converted to gray scale.) There is also a button to the invert the map.

Alpha Only. Uses the alpha (mask) channel only for the map. The options field changes to the invert map button, allowing you to reverse the alpha channel.

RGB + Alpha. Uses both the RGB and Alpha channels. When this option is selected, the options field displays configuration sections for both the RGB and alpha channels, which allow you to modify the behavior of these two channels. These configuration sections are described in detail below.

RGB Channel Configuration

There are four items in the RGB channel configuration section:

- As Color
- As Value
- Invert
- BlendMode:

As Color. This option sets the RGB channel to be used as color only. The color of the map will be passed through to whatever shading channel the map is applied to (note that some channels, such as Bump/Displace and Clipping, do not use RGB colors.)

As Value. This option uses the RGB colors as values (think of it as an automatic gray scale map conversion.) Effectively, the RGB channel can be used to drive value-based effects, such as bump and displacement maps, clip maps, transparency value maps, and so on.

Invert. This option negates the colors of the RGB channel. The map can still be used either As Color or As Value. This option often prevents a quick trip to Photoshop!

BlendMode. This menu allows you to better control how texture maps and shader affect what is beneath them as they are rendered. If a single map is applied, the mode selection will affect how the map is applied to the surface of the group itself. If the texture or shader is applied on top of another map or shader, the blend mode selection will affect just that item directly underneath it. The blend mode functions in the same manner as blend mode for layers in Adobe Photoshop.

Blend Modes can be used only on images which contain data in the RGB channel. They cannot be used for the alpha channel of the map.

Figure 16.27 — **Blend Modes**

Please see your Photoshop manual for a detailed description of each Blending Mode.

Alpha Channel Configuration

There are three items in the Alpha channel configuration section:

- Ignore
- As Mask
- Invert

Ignore. Ignores the alpha channel altogether.

As Mask. This option enables the alpha channel to be used as a mask.

Invert. This option negates the colors of the alpha channel.

Falloff

Texture Falloff allows a texture to “fade away” towards the edges of a group by a user-controlled amount. This allows you to cause the detail of a texture to blend away over a distance. It also allows pseudo color ramps to be easily created (ramping form the falloff texture to the surface attribute underneath).

The texture will always falloff from the center of the group outwards in all directions. The falloff values presented are in actual object units. As an example, if a plane object is 200 by 200 units, and you wish the texture to falloff at the edges, you could type in 100 for all three texture axes (remember to divide the size of the group in half, as falloff is calculated from the center of the object).

In a sense, texture falloff works like an alpha edge mask.

Special Tab

Depending upon the type of map, this tab may be empty or may contain controls for bump/displacement maps, as well as a button to bring up the procedural shaders dialog box.

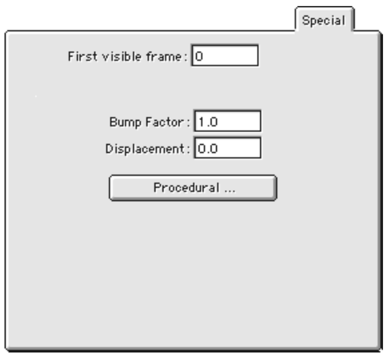


Figure 16.28 — **Special Tab**

Bump Factor. Sets the amount of Bump for the texture map. This edit box will only appear when the map has been applied to the Bump/Displacement channel.

Displacement. Sets the amount of Displacement for the texture map. This edit box will only appear when the map has been applied to the Bump/Displacement channel.

Clip Factor. Sets the amount of Clipping for the texture map. This edit box will only appear when the map has been applied to the Clip channel.

Procedural. Opens the Procedural Shader dialog box. This box has all of the options specific to the shader in use. This button only appears when the applied map is a procedural shader.

First Visible Frame. The value in this box (defaults to 0) determines when the texture (still or animated) or shader first appears in the scene. This feature is especially useful for animated textures. You can control when the sequence of animated frames first begins 'playing' in the scene.

16.8 Drag and Drop Textures and Shaders

You can drag and drop the texture or shaders to another channel, copying the item and its Texture Info window parameters as well.

Hold down the Alt-Key (Option-Key on Macintosh) and click/hold on the texture, drag the texture up to one of the tabs (this will cause the tab to come forward), then drop the texture into the Texture List Box of your choosing.

Shaders can also be dragged into the Variance List in the Shader Variance editor (discussed below) in the same way.

16.9 Shader Variance Editor

The Shader Variance editor, **Material Palette > Shader Variance Editor,** gives you the ability to save different shader settings under unique names. A shader's dialog box can be brought up, changes made to the settings, and then this configuration can be saved and used over and over again.

Variances are stored in the EI Shaders folder. There is one ".var" file for each shader. Don't forget to copy these files when you move your software to a different computer.

The editor contains a scrollable list of all the shaders in the EI Shaders folder on the left hand side. To scroll the list, drag in it while holding down the Spacebar. Hold down Shift-Spacebar to drag faster.

Letting the mouse linger over a shader will bring up a tool tip containing the shader's name.

Click on a shader to highlight it. This brings up a list of it's variances on the right-hand side. In the example shown in Figure 16.29, the Bricks shader has been selected and three variances are shown in the Variance List.

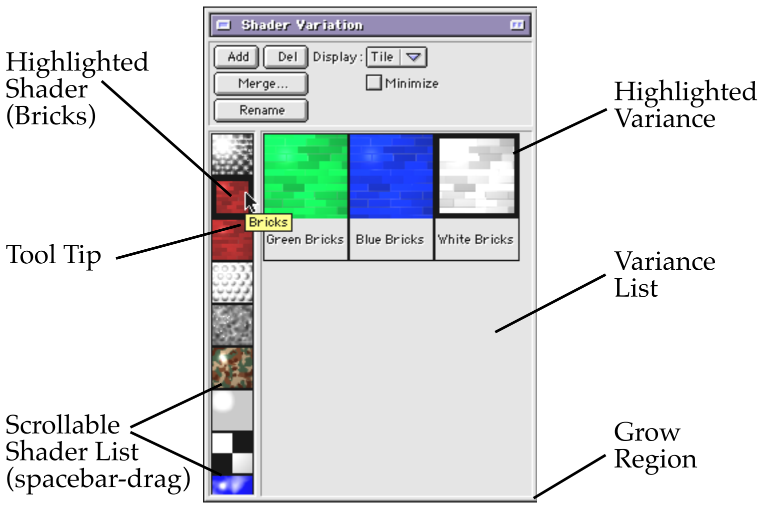


Figure 16.29 — **Shader Variance Editor**

Double-click on the variance to bring up its unique dialog box. Any changes you make in this dialog box are saved with the variance.

If you hold down the Control-key (Command-key on Macintosh) and drag your mouse on a shader, the light source will move across the surface of the shader.

Add. This button adds a new variance entry for the highlighted shader. Once you have added the entry, you can double-click on it to open the shader dialog box.

Del. This button deletes the entry highlighted in the Variance List.

Merge. Merges the selected .var file into the editor. This allows you to exchange shader variances with colleagues.

Rename. This button renames the entry highlighted in the Variance List.

Display. This pull-down menu controls how the variance entries are laid out in the list. **Tile** lays them out in a matrix pattern (in rows and columns). **List** lays them out in one vertical column.

Minimize. This check box shrinks the variance entries down to the same size as the shaders in the Shader List on the left-hand side of the editor.

Drag and Drop Shader Variances

Shaders (both those in the scrollable list and the variances) can be dragged from the Shader editor directly into a Material Info window, Texture List box. Several variances can be shift-selected and all dragged at once. In this way, the Shader editor can be used to manage all of your shaders and their variances. Alternately, you can use the new Shader Palette (discussed below) to move shaders into the Material Info window.

Shaders can be dragged from the Material Info window, Texture List box into the Shader Variance palette. To do this, hold down the Alt-Key (Option-Key on Macintosh) and click/hold on the shader drag the shader to the Variance list and let go of the mouse button. You will then be asked to name the variance.

16.10Shader Palette

The Shader palette, **Material Menu > Shader Palette**, is a handy way to view your entire catalog of shaders and to drag them into the Material Info window. To scroll the list, drag in it while holding down the Spacebar. Hold down Shift-Spacebar to drag faster.

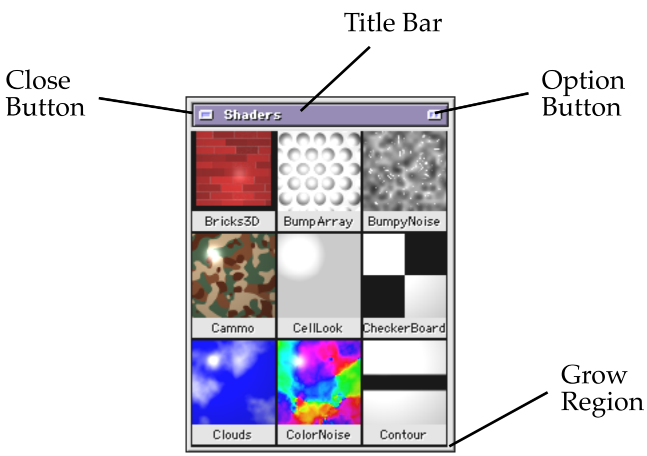


Figure 16.30 — **Shader Palette —Tile Layout**

The palette gives you access to all of the shaders in their default modes and to all of the variances you have created using the Shader Variance editor. To view the list of variances for a shader, Right-click (Ctrl-click on Macintosh) on the shader. A menu will pop up containing the list of variances and the original shader, “Default”. Choosing a variance will cause it to be displayed in the palette.

If you hold down the Control-key (Command-key on Macintosh) and drag your mouse on a shader, the light source will move across the surface of the shader.

Layout Menu

Right-clicking (Ctrl-clicking on Macintosh) in the title bar brings up the layout menu for the Shader palette. These controls vary the appearance of the palette.

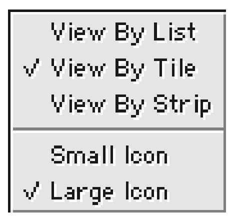


Figure 16.31 — **Layout Menu**

View By List. In this mode, the palette is laid out in one long vertical list with the names of the shaders shown to the right. Clicking on the option button (upper right hand corner of palette) acts as minimize/maximize window.

View By Tile. Shown in Figure 16.30, the palette is laid out in rows and columns of shaders. Clicking on the option button (upper right hand corner of palette) acts as minimize/maximize window.

View By Strip. In this mode, the palette is laid out in one long list with the names of the shaders shown underneath. Clicking on the option button (upper right hand corner of palette) switches the palette from a horizontal to vertical layout.

Small Icon/Large Icon. When switched to Small Icon mode, the names of the shaders are not displayed. Letting your mouse linger over a shader will bring up a tool tip with its name.

Drag and Drop Shaders

Shaders can be dragged from the Shader editor directly into a Material Info window, Texture List box. Several shaders can be shift-selected and all dragged at once.

Shader Subfolders

Subfolders are supported in the EI Shaders folder. Storing your shaders in subfolders (along with their .rsc and .var files) allows you to logically organize your shaders by functionality. Simply create a new subfolder in the EI Shaders folder and drag the .shd, .rsc and .var file into the subfolder. The Shader Variance editor and Shader Palette will display the subfolders just like in the Material palette. See “Material Palette — Strip Layout” on page 510.

16.11 Material Palette

The Material palette, **Material Menu > Material Palette,** provides control over the materials stored in the EI Material folder. You can drag materials from the palette onto the shader ball in the Group Info and Material Info windows. To scroll the list, drag in it while holding down the Spacebar. Hold down Shift-Spacebar to drag faster.

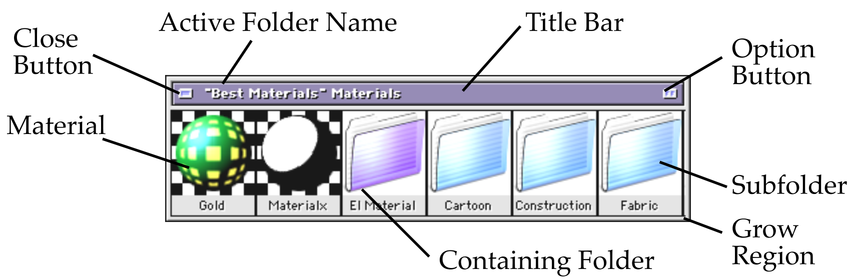


Figure 16.32 — **Material Palette — Strip Layout**

The palette contains materials, subfolders (blue), and the containing folder (purple). These correspond to the materials files (".mtr"), and folders in your EI Material folder. Double-clicking on a subfolder will cause the palette to display the contents of that folder. Double-clicking on the containing folder will take you up one level in the folder hierarchy.

In the example shown in Figure 16.32, the contents of a folder called, "Best Materials" are shown. This folder contains two materials, "Gold" and "Materialx" and three subfolders, "Cartoon", "Construction" and "Fabric". The folder, "Best Materials", is in the EI Material folder.

Note *The Material palette does not act as a Master Material. If you update the library entry, the objects that you have previously copied the material to will not update. Please use the Material palette in conjunction with the Master Materials to achieve this behavior.*

Layout Menu

Right-clicking (Ctrl-clicking on Macintosh) in the title bar brings up the layout menu for the Material palette. These controls vary the appearance of the palette.

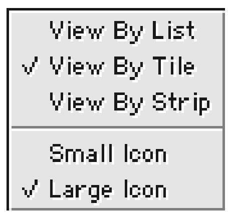


Figure 16.33 — **Layout Menu**

View By List. In this mode, the palette is laid out in one long vertical list with the names of the materials shown to the right. Clicking on the option button (upper right hand corner of palette) acts as minimize/maximize window.

View By Tile. Shown in Figure 16.30, the palette is laid out in rows and columns of shaders. Clicking on the option button (upper right hand corner of palette) acts as minimize/maximize window.

View By Strip. In this mode, the palette is laid out in one long list with the names of the materials shown underneath. Clicking on the option button (upper right hand corner of palette) switches the palette from a horizontal to vertical layout.

Small Icon/Large Icon. When switched to Small Icon mode, the names of the materials are not displayed. Letting your mouse linger over a material will bring up a tool tip with its name.

Drag and Drop Materials

Materials can be dragged from the palette and dropped onto the shader ball in the Group info or Material Info windows. This will replace all textures, shaders, and material settings that were originally present.

You can put a material into the Material palette by dragging from the shader ball in the Material Info window and dropping the material onto the palette or into one of the subfolders shown in the palette. You will be asked to name the material. If the material name already exists, you will be asked if you wish to replace the original.

Using Effectors

17.0 Introduction

Effectors are invisible null objects that models, cameras, and lights in a scene can be linked to. Any transformation, rotation, scale, or deformation applied to the effector will be passed on to the groups that are linked to it. Using effectors allows you to control complex animation's by layering motion characteristics into separate control objects. The following chapter will explain the use of effectors of all kinds, and describe the layout of the effector window.

Adding Effectors to a Scene

1. Choose **Object > Add Null.**
2. The cursor will change to an arrow with a cube next to it.
3. Click in any view window to set the effector in the scene.

If, after issuing **Object > Add Null**, you click on a group name in the Project window, the null that is created will have extents matching those of the group you clicked on.

17.1 The Effector Info Window

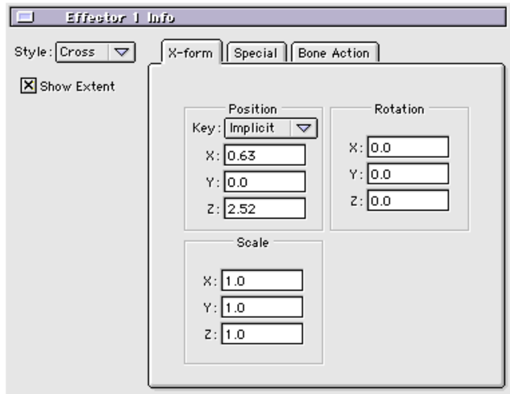


Figure 17.1 — **The Effector Info window with the X-form tab displayed**

An effector's characteristics are controlled by the settings in the Effector Info Window. This window is very similar to the Group Info window for model geometry. It is divided into three specific sections, each marked by a folder tab.

- X-Form
- Special
- Bone Action

X-Form (Transformation) Tab

The X-form tab in the effector info window is similar to the x-form tab for other objects in a scene. There are three rows of data cells that allow the input of values:

- Position
- Rotation
- Scale

Position. This row of data cells allows the input of X, Y, and Z position values for the effector. The “Key” pull-down menu offers a choice of “Implicit” or “Explicit” keyframe recording.

Implicit. Will create a velocity curve for the key frames.

Explicit. Will create f-curves for the key frames.

Rotation. This row of data cells allows the input of X, Y, and Z rotation values for the effector.

Scale. This row of data cells allows the input of X, Y, and Z scale values for the effector.

Auto Edit Y Z. When on, the scale value entered in X will automatically be copied to Y and Z. This is a simple way to enforce non-uniform Scaling.

Special Tab

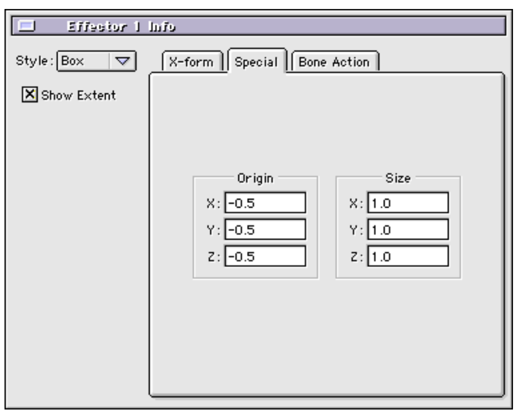


Figure 17.2 — **The Effector Info window with the Special tab displayed**

The Special tab contains editable fields that affect how different types of effectors display in a scene. This tab is used for Box Effectors, Joints, and Bones only.

The Style pull down menu in the effector info window offers a choice of how you want to display an effector. The standard effector display styles are Cross and Box. There are also a special class of effectors called Joints and Bones that create pre-built hierarchies. Whichever display method is chosen, keep in mind that an effector represents a single point in space, and is transformed in relation to that point.

The Effector Style Menu

Box. Choosing Box from the style drop down menu will display a cube in the scene. An extra check box called Show Extent will become available right below the Style drop down menu.

Extents are essentially the lines that join to create the cube. They display the outer limits of the space occupied by the effector. Unchecking this box will disable the display of the cube, leaving only its center of rotation visible in the scene.

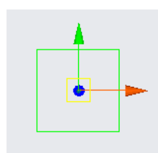


Figure 17.3 — **A box effector showing extents**

The defining characteristic of a box effector is that it can be resized. This makes the box effector display perfect for scaling and deformations, as well as surrounding groups of linked objects.

Special Tab Options

Selecting Box from the style pull down in the Effector Info window will cause the Special tab to display two options:

- Origin
- Size

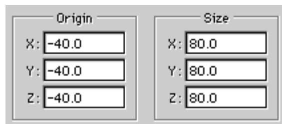


Figure 17.4 — **The Origin and Size value boxes**

These options only affect the way the effector displays.

Origin. The Origin defines the point in space that the boxes extents are drawn from. The origin displays as a small cross. In the picture below, the Origin is represented by the black circle and the black crossed lines at the center of the effector.

Size. The Size defines the size of the box effectors extents in world units. Don't confuse size with scale (found in the X-Form tab). If you scale a box effector, you will scale all objects attached to it. Changing extent size affects only the box display. You can, for instance, change these values to make a box effector larger in order to surround the groups that are linked to it.

The size and origin boxes work together to control the overall size and positioning of the effector in space. When a change is made to the size values, the boxes extents will change in relation to the origin point. To keep the origin exactly in the center of the box the values in the origin fields need to be a negative half of the value in the size fields.

For instance, if you change a boxes size from 1.0 on x, y, and z to 100 you would need to change the origin to -50 on x, y, and z to keep the point from which the box is drawn even with the boxes center point.

Cross. Choosing Cross from the style menu will display a small target shaped circle.

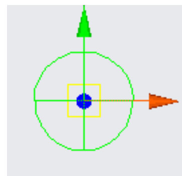


Figure 17.5 — **A cross effector**

The defining characteristic of the cross effector display type is that it can't be resized. This makes the cross effector ideal for large scenes that require constant zooming in and out. Regardless of how far in or out you zoom, the cross effector will remain the same size, and thus be easy to select and manipulate.

Special Tab Options

There are no editable attributes displayed in the special menu for a cross effector.

Joint. Choosing Joint from the style drop down menu will display a Skeleton Effector Joint Vector in the scene.

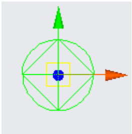


Figure 17.6 — **Joint effector**

A joint displays as a long, toothpick shaped object, that is pointy on one end and round on the other. The center of a joint effector is displayed where the horizontal and vertical vector lines cross. Joint effectors are used to create skeletal hierarchies. To create a linked chain of bone effectors use the **Character > Create Bones** command. The Objects created will be bones. Change the style to Joint to use the Joint Effectors.

Special Tab Options

Selecting the joint display method enables a row of size data cells in the special tab.

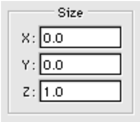


Figure 17.7 — **The Size boxes**

These values can be modified to change the length of the Joints vector. Because skeleton joints always orient with the Z-axis running the length of the vector, the only value that needs to be changed is the Z data field.

Bone. Choosing Bone from the style drop down menu will display a Bone Effector Joint Vector in the scene.

A bone displays as a long, toothpick shaped object, that is pointy on one end and pyramid shaped on the other. The center of a bone effector is displayed where the horizontal and vertical vector lines cross. Bone effectors are used to deform object meshes. To create a bone effector chain use the **Character > Create bones** command.

When a bone display style is chosen, several new items become available in the effector info window.

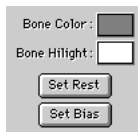


Figure 17.8 — **Options in the window when Bone is selected**

Bone Color

The bone color displays the color the bone will appear in when it is deselected. This color can be changed by clicking on the color tab and choosing a new color from the color picker.

Bone Highlight

The bone highlight color displays the color the bone will appear in when it is selected. This color can be changed by clicking on the color tab and choosing a new color from the color picker.

Set Rest

Rotating a bone into the desired position and pressing the “Set Rest” button will tell the bone what position to stay in when it is at rest.

Set Bias

Resets the current rotation values of the bone to 0,0,0. Bones have a default Z orientation, which can interfere with imported data, such as motion capture data. This feature lets you position the bone, and then "zero it out." This is similar to indexing a servo motor or motion control axis on a robotic camera system.

Special Tab Options

Selecting the bone display method enables several options in the special palette. These options are specific to how a bone deforms a mesh.

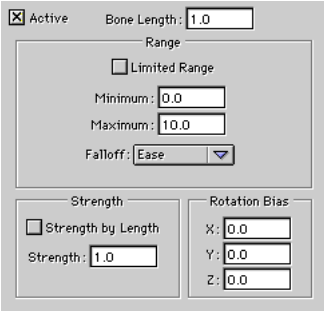


Figure 17.9 — **The Special Menu options for Bone**

Bones

Bones are a special class of effectors that can be used to create pre-linked hierarchies. Bones both display with a ball at the joint pivots and a pyramid "bone" in between.

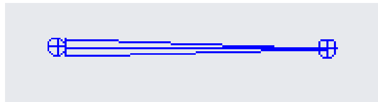


Figure 17.10 — **Bone Effector**

Bone chains can be used to create complex hierarchies that geometry can be linked to. By allowing an underlying hierarchy of effectors to control a complex model, you gain the freedom to manipulate, or replace geometry without the necessity of re-defining all of your joint parameters.

Bone Effectors are also used to create chains that can deform an object's mesh. They can be used to create smooth skeletal deformations in situations where you can't work with a jointed model.

Adding Bones:

1. Choose the **Character** menu and pick **Create Bones.**
2. Click in any window to set the root of the chain (double click to set the root for a bone),
3. Click a second time to set the length of the vector.
4. Continue clicking in this fashion to create a linked chain of any length.
5. To end the creation of a chain type command or control ".".

Bone Orientation

The Z-Axis of a bone is always oriented parallel to the length bone vector. This has the potential to cause confusion if you don't look for it.

For instance if you draw a bone in the front view window, starting at the top and moving to the bottom, you would expect the z-rotation tool to rotate the effector like the hand on a clock. However, you will find this isn’t the case because the Z-axis is aligned with the world's Y-axis.

17.2 Why use an Effector?

Often times an animation requires “layering” of motion. You may need to translate or rotate an object in several different ways to achieve the desired animated results. The only problem is that an object has only one set of data channels. Once the rotation channels are filled, for instance, they can't be changed without erasing the previous values. You can, however, link to a second object to create a second set of rotations that will happen on top of the rotations that have already occurred in the local data channels. EFFECTORS allow you to gain control of your animation by separating transformations into easily addressable layers.

One classic example of this is a moon orbiting a planet. You want the moon to rotate about its local center point, but you also want it to orbit around the planets center point. You create a rotation of the moon on the Y-axis so it spins. But now you have to give the moon a second Y-axis rotation characteristic that orbits it around the planet. The only way to do this is to link the moon to an effector that is positioned over the center of the planet. By rotating the effector on Y you can create two y-rotations for the moon!

Another example would be creating a swarm of bees. You would want to individually animate each bee so it flies in a slightly different manner, but you would also want all the bees in the swarm moving forward at a similar rate. You could animate each bee's forward motion individually. Each time you change one bee in the swarms forward accelerations, however, you would have to re-animate the rest of the swarm to follow. A better way to control the swarm would be to link each bee in the swarm to an effector that pulls them forward as a group. This would allow you individual control over each bee (as long as the link type is set to free), but move them all forward at the same rate.

If you're working on a complex animation task and having difficulty achieving the desired results, ask yourself "Could an effector help me here?"

The Joint Editor

18.0 Introduction

Through the Joint Editor, you determine transformation behavior, rotation order, link type, rotation orientation, movement constraints, inherited transform behavior, and joint attributes. It is wise to take the time to work with these attributes to get the most from bones deformations and inverse kinematics.

A pivot point is the location on the group in which rotations occur. It is also the point of origin for scaling operations, and translation (movement). A pivot point is visible for each group in all of the world windows.

The pivot point and the group center are almost always located in the same position. The group center can be offset from the pivot point by typing in a new value in the Group Info Window. Doing so is ill advised, and can cause some unwieldy animation behavior.

The pivot point defaults to the center of the group. You can use the Joint Editor to place the pivot point at some other location. You can even set the pivot point to be well outside of the group's extents, if need be.

There are four ways to access the Joint Editor:

- Select a group and choose the Joint Editor icon from the Tools palette
- Select a group and choose **Hierarchy>Joint Editor**
- Select a group and choose the Joint Editor Icon from the Project Window
- Hold down the Command & Option keys (PC -Control & Alt keys) and double click on a group.

18.1 Joint Editor Anatomy

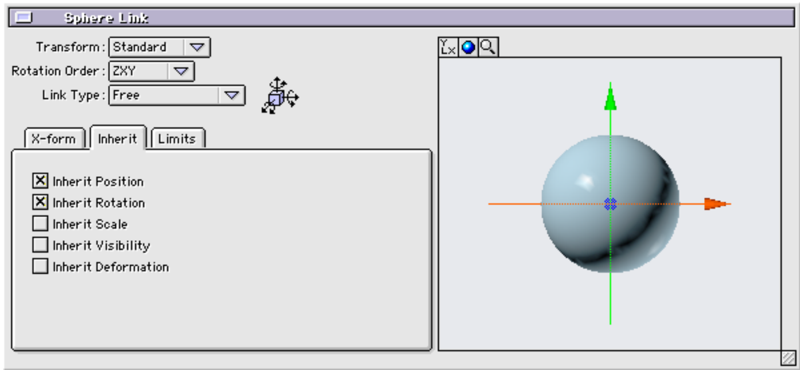


Figure 18.1 — **The Joint Editor**

The Joint Editor can be positioned to your preference. It can also be resized by clicking on the lower right hand corner and dragging. It is context sensitive — the contents of the window will change to reflect the currently selected group. It can display the linkage information for one group at a time. The window is divided into three sections:

- Group Preview Pane
- Pop Up Menu Section
- Tab Section

Group Preview Pane

The group preview pane allows the pivot point for an object to be interactively positioned by clicking and dragging. Unlike the world windows, the pivot point representation in the Joint Editor is that of a large red cross hair, called a gnome. The gnome displays the X, Y, and Z coordinate position and orientation for the joint. Where these vectors meet represents the center of the pivot point.

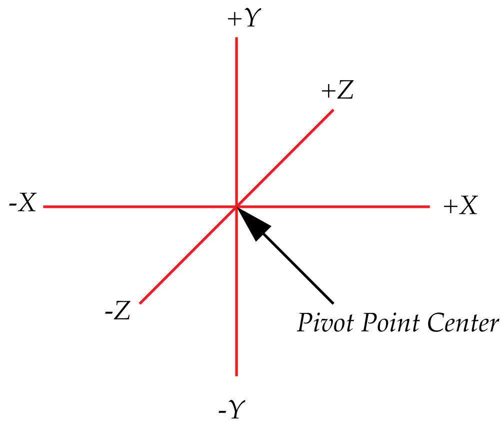


Figure 18.2 — **Pivot Point Gnome**

The detail to which an object is drawn in the group preview window is controlled by the settings in the Drawing Preferences Box, under **Edit>Preferences**, Drawing Tab. Also, the shader ball icon can be set to control drawing, by holding down the option (PC- MSWindow) key and clicking on the icon, then choosing the desired drawing level from the pop up menu list.

The group preview window view can be manipulated in the same way world view windows are. Clicking on the zoom button will bring an object closer or farther from the view window. Option-clicking (PC- Alt-clicking) on the zoom icons will fit the group into the view. Clicking on the view pop-up will change the angle from which the object is viewed.

The gnome can be positioned by clicking and dragging on it in any orthographic view. The gnome cannot be interactively dragged when the view is set to skew, but it can be interactively rotated.

18.2 Pop Up Menu Section

The pop up menu section at the top of the Joint Editor contain settings that will affect joints the same way regardless of what information is entered in the tabs. There are three menus:

- Transform Menu
- Rotation Order Menu
- Link Type Menu

Transform Menu. Rotations are susceptible to a distortion known as "shearing" when non-uniform scaling is applied to groups within a hierarchy. The transform menu lets you choose how the phenomenon will be addressed, on a group by group basis (each group can have a separate setting). The transform menu offers two options:

- Classic
- Standard

Standard. To avoid the shearing phenomenon, this option allows ElectricImage EIAS to compensate by processing scaling operations so that the shearing phenomenon does not occur. This is the default method.

Classic. This method bypasses any compensation for the shearing effect. You can use this option if you are not applying non-uniform scaling to any groups in the hierarchy without any ill effects. If you do notice shearing, switch to the Standard method. This option is called classic because other programs on the market use this method (even though it is less sophisticated.)

Rotation Order Menu. Object rotation order determines how rotations will be processed. Each rotation axis is processed one at a time. Ultimately, one of the three axes will nullify one of the other axes. For example, a rotation applied to Y and Z may produce the same result, even though they are clearly different axes. This is called “gimbal lock.” Choosing a different rotation order can alleviate the problem.

The default is ZXY. This means that Z rotations will be calculated first, followed by X, and finally by Y axis rotation calculations. For many animation situations the default settings will work just fine.

A good rule of thumb for assigning rotation order is to calculate the axes in a descending order of stability. Think about how you're object is moving, and decide which axis is most important to creating the desired motion. Which axis is second most important, and which is the least important.

The last six choices in the Rotation Order pull-down have a fourth coordinate inside parentheses. This coordinate controls the last rotation in the order. For instance, XYX(z) indicates an X rotation, then a Y rotation, and a second X rotation that is controlled by the Z coordinate channel.

Note *An alternative method for dealing with gimbal lock is to assign separate effectors for each axis of rotation, and parenting the group to these effectors. Set up each effector so that it can only rotate on a single axis, which prevents gimbal lock altogether.*

Link Type Menu. The Link Type pull-down menu contains pre-configured link types that can be applied to an objects pivot point. Use this pull-down menu to set a basic set of position and rotation limits for a joint. The link type chosen will create global rotation and position limits that will override specific values entered in the limits sub-palette, by locking specific X, Y, and Z channels.

There are eleven menu options in the Link Type Menu:

- Custom…
- Free
- Ball Planar
- Cylinder Planar
- Planar
- Socket
- Cylinder
- Universal
- Slide
- Pin
- Lock

Custom. The custom option opens a dialogue box that allows specific rotation and position parameters to be locked or unlocked for a group. Parameters with check marks next to them are completely disabled. For instance, a check mark next to Lock Y Position will disable an objects ability to move on the Y-axis.

The Custom link type can be used to see what kind of position and rotation limits are created by the other pre-defined link types. Just pick one of the link types, like socket, and then choose Custom. The Custom Joint dialogue will pop-up with the limits that a socket link uses already checked off.

Free. This link type allows an object total freedom to move and rotate on all axes. Free is the default link type for root objects in any chain. Because this joint type is free to move and rotate on all axis, the values in the limits sub-palette will override it.

Ball Planar. This link type locks the Y position channel only.

Cylinder Planar. This link type locks the Y position channel and the X rotation channel.

Planar. This link type locks the Y position channel and the X and Z rotation channels.

Socket. This link type locks the X, Y, and Z position channels.

Cylinder. This link type locks the X and Y position channels and the X and Y Rotation Channels.

Universal. This link type locks the X, Y, and Z position channels and the X rotation channel.

Slide. This link type locks the X and Y position channels and the X, Y, and Z rotation channels.

Pin. This link type locks the X, Y, and Z position channels, and the X and Y rotation channels.

Lock. This link type locks all position and rotation channels.

18.3 Folder Tab Section

All of the specific local controls for a group's pivot point can be set in the folder tabs of the Joint Editor. There are three folder tabs in this section:

- X-form (Transformation)
- Inherit
- Limits

The X-Form Tab

The X-form tab controls the position and orientation of the gnome, and thus the pivot point for an object. Values entered in these fields will cause the gnome to be re-positioned in the group preview pane.

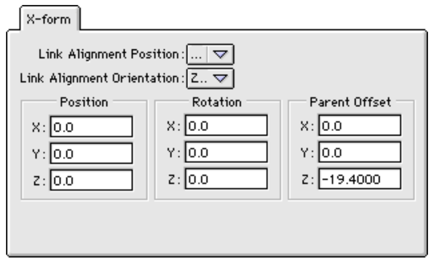


Figure 18.3 — **The Transformation window**

Link Alignment Position

This pull-down controls the position of the groups pivot point in relation to its geometric bounds. The different choices will place the gnome in that position relative to the group.

There are a total of seven items in this menu:

- Middle
- Front
- Back
- Top
- Bottom
- Left
- Right

Middle. The default for all objects, positions the pivot point exactly in the center of the object.

Front. This option positions the pivot point with the groups front.

Back. This option positions the pivot point with the groups back.

Top. This option positions the pivot point with the groups top.

Bottom. This option positions the pivot point with the groups bottom.

Left. This option positions the pivot point with the groups left side.

Right. This option positions the pivot point with the groups right side.

Link Alignment Orientation

This pull-down controls the orientation of the groups pivot point. Changing the link alignment orientation changes the orientation of the X, Y, and Z axes of the pivot point. Changing the Link Alignment Orientation will change the direction that the object rotates.

The results of changing the Link Alignment Orientation can be seen in the group preview pane by watching the changes in the gnome orientation as different options are chosen.

There are three choices in the Link Alignment Menu:

- Z is Z
- Z is X
- Z is Y

Z is Z. The default option maintains the objects initial link coordinates.

Z is X. This option will swap the group's Z and Z coordinates so that the Z coordinate becomes the X coordinate.

Z is Y. This option swaps the group's Z and Y coordinates so that the Z coordinate becomes the Y coordinate.

Position Section

This area contains data cells for the X, Y, and Z position of the pivot point. Entering values in this field will update the position of the gnome in the group preview window.

Rotation Section

This area contains the data cells for the X, Y, and Z rotation of the pivot point. Entering values in this field will update the orientation of the gnome in the group preview window.

Parental Offset Section

This area contains data cells for the X, Y, and Z parental offset values of the pivot point. The parental offset is the distance between the pivot point of the parent object, and the pivot point of the child object. Changing the values in the Parental Offset data cells changes the distance between the pivot point of the child and the pivot point of the parent, it does not change the position of the pivot point in relation to the object. Changing the parental offset value will cause an object to move closer too, or farther away from its parent.

The Inherit Tab

The inherit tab controls which transformations performed on the parent will be passed on to the child in a hierarchy. To enable an attribute check its box, to disable an attribute uncheck its box.

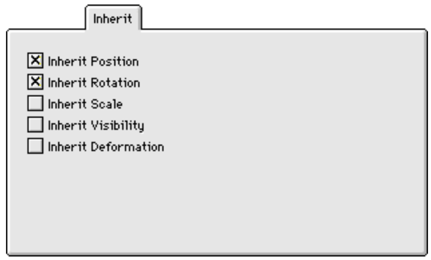


Figure 18.4 — **The Inherit Tab**

By default rotation and position information are passed from the parent to the child. When a parent object is transformed or rotated, its child will be transformed or rotated accordingly. If the position and rotation checkboxes were unchecked, the child would not react at all to the parents movements.

The default preferences for the inherit options can be changed by choosing **Edit>Preferences,** Import & Data tab. The Import & Data tab contains an identical set of attributes to the inherit palette. Checking attributes in the Import Preferences dialogue will make those settings the default for all newly created hierarchies.

Inherit Position

This check box option, when enabled, links the position of the child group to the position of its parent group. When the parent is moved in X, Y, or Z space, the child will be moved with it.

Inherit Rotation

This check box option, when enabled, links the rotation of the child group to the rotation of its parent group. When the parent is rotated in X, Y, or Z space, the child will be rotated with it.

Inherit Scale

This check box option, when enabled, links the scale of the child group to the scale of its parent group. When the parent is scaled in X, Y, or Z space, the child will be scaled with it.

Inherit Visibility

This check box option, when enabled, links the visibility of the child to the visibility of its parent. When the parent's visibility is off, the child's visibility will be off.

Inherit Deformation

This check-box option, when enabled, will include the child with a deformation applied to the parent. The deformation region for the parent must be adjusted to include the child object within the deformation region for this option to be effective. This is a very powerful feature that will allow you to deform an entire hierarchy as if it were one object.

Note *Linking a child to an animated parent can cause the child to animate in undesirable ways. This occurs because a rotation is pre-calculated for the child. The motion path of the child is modified which can cause it to 'fly off into outer space'.*

You can avoid this behavior by turning off Inherit Rotation in the Joint Editor for the child prior to linking it to its new parent. No pre-rotation calculation will be performed and the original motion path will be kept. After the linking has been done, the Rotation Inheritance can be turned back on

The (Joint) Limits Tab

Joint limits allow you to set up your hierarchy chains to behave in a realistic manner, using a variety of natural forces and limited ranges of freedom. You can also create joint libraries to make the creation of complex hierarchy chains easier.

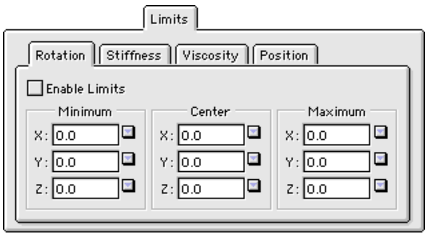


Figure 18.5 — **The Limits Tab**

The limits tab consists of the following items:

- Rotation Tab
- Stiffness Tab
- Viscosity Tab
- Position Tab

The Rotation Sub-Tab

The rotation sub tab allows joint rotation limits to be set for X, Y, and Z rotation. There are four items in the tab:

- Enable Limits Check box
- Minimum Section
- Center Section
- Maximum Section

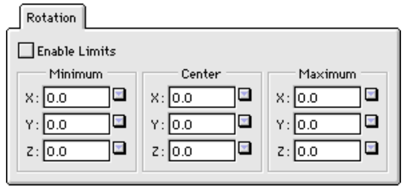


Figure 18.6 — **The Rotation sub-tab**

Minimum Section. This row of data cells contains values, in degrees, for the minimum angle a joint can rotate.

Center Section. This row of data cells contains the values, in degrees, for the angles at which the joint wants to be naturally positioned at rest. This value is used to help smooth the transition between the minimum and maximum rotation limits. Instead of rotating between the maximum and minimum, the joint motion curve will arc through the center limit first.

Maximum Section. This row of data cells contains values, in degrees, for the maximum amount a joint can rotate.

Use Current Value Arrows

Each data cell in the rotation limits sub-palette has a small arrow that, when clicked on, will bring up a Use current value box. Selecting this option will update the current rotation value of the joint into the data cell. This allows rotation limits to be set interactively by rotating a joint with the rotate tools, and transferring the value of the rotation into a limits data cell. The Joint Editor is non-modal, so you can easily jump back and forth between world view windows and the limits palette to make use of this feature.

EIAS Animator knows to put the highest value in the maximum box, and the smallest value in the minimum box. This means you can click on the

Maximum or Minimum use current value arrow and the proper values will be inserted where they belong. For instance, if you try to put a negative X value in the maximum box, and a positive X value in the minimum box, ElectricImage EIAS will automatically "flip-flop" the two values so the positive value is in the Maximum box and the negative value is in the Minimum box.

There is an additional current value choice in the drop-down menu for the center data cells called Use center of limits. Selecting this option will divide between the minimum and maximum limits and enter the result in the data cell. Note that in some cases the center of limits may not be where you want the joint to be when it is at rest. In those cases manually rotate the joint into the resting position and select the "use current values" option.

The Stiffness Sub-Tab

The stiffness sub-tab can be used to control the amount of pull required to move a joint through its X, Y, and Z rotation. The higher the values in these fields the harder the pull required to move the joint. The end result is that joints with a smaller stiffness setting will move farther, faster, than joints with a high stiffness setting.

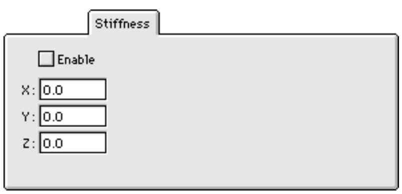


Figure 18.7 — **The Stiffness Sub-Tab**

An example would be a human leg. The thigh bone should move slower than the shin bone. Setting a higher stiffness for the thigh would mimic this motion. The Enable check box, when checked, makes the stiffness settings active.

The Viscosity Sub-Tab

The viscosity sub-tab can be used to control the viscosity, or apparent friction, of a joints X, Y, and Z rotation. The higher the values in these fields, the more friction the joint will appear to experience as it rotates. Very high values will make the joint appear to catch and release as it rotates. Click the Enable box to activate viscosity.

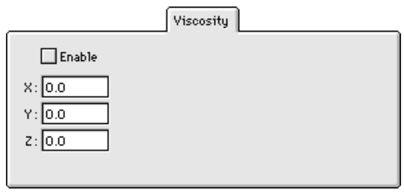


Figure 18.8 — **The Viscosity Sub-Tab**

An example would be a rusty door hinge. The rust would cause more friction, and thus cause the joint to move in an un-smooth fashion. To recreate this you would apply a high amount of viscosity to the hinge joint.

The Position Sub-Tab

The position sub-palette allows joint position limits to be set for the X, Y, and Z axes. These limits control how close, or far, a group can move from its parent. The enable limits check box, when checked, makes the position limits active.

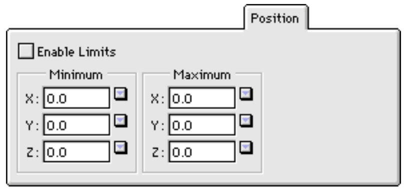


Figure 18.9 — **The Position Sub-Tab**

There are two sections in the Position Sub-Tab:

- Minimum
- Maximum

Minimum. This row of data cells contains the minimum X, Y, and Z position values for the groups joint.

Maximum. This row of data cells contains the maximum X, Y, and Z position values for the groups joint.

Each data cell has a drop-down menu arrow that, when selected, will input the current position of the joint into the field.

18.4 Working in the Joint Editor

Because the Joint Editor offers a wide variety of tabs and input fields, it's helpful to develop a standard procedure when creating joints. Like any complex task, it's best to start with the basics and work your way to the specifics. A basic procedure might go something like this:

1. Choose a pre-defined link type from the Link Type pull-down menu.
2. Select the X-Form Palette and choose a link alignment position for the pivot point. (If one applies)

3. Interactively drag the gnome into position in the group preview window. Tweak the values in the X-form palette if needed.
4. Set Joint rotation and position limits in the Rotation and Position sub-palettes.
5. Test your joint to make sure it's working properly.
6. Set Stiffness, Viscosity, and Gravity settings only if they're needed.

Constraints

19.0 Introduction

The constraint system in EIU allows you to animate position, rotation, scale, or the pole-vector (IK handles) using the position, rotation, or scale of other objects. The object that is constrained is called the “constraint object”. The objects doing the constraining are called, “targets”. One constraint object may be constrained by many targets. The influence of each target is controlled by a floating-point value called, “weight”. This value is used to compute a weighted average of the desired constraint. This final value is called the “target point”. If all targets have equal weight, the target point is a simple average between them. A higher weight value relative to the other weights increases the influence of a target, while a lower weight value relative to the other weights decreases the influence of a target. A value of zero effectively removes the target's influence from the constraint. All weight values can be animated, which allows you to change the constraint over time, effectively creating animations without changing the position, rotation, or scale channels of the constraint object.

The new constraint system replaces the Look-At and Auto-Bank features that were included in the older versions of the ElectricImage™ Animation System. Unlike the older method, which required pre-computation of Auto-Frames, the new system is real-time and interactive. For example, if your camera is constrained to look at an object, you will see the camera rotate in the View windows as you drag the object around the scene.

19.1 Applying Constraints

Constraints are added to an object via the Constraint menu. Select the Constraint Object and then choose one of the available constraint types from the Constraint menu. A dialog box will come up letting you know that you are about to replace any animation data with the constraint. Click away this reminder and you are then prompted to choose the target(s). Targets are selected by clicking on them in the Project or View windows. The selection process is terminated by hitting the Escape key or Command-. (Macintosh). If the constraint type is inappropriate for the object, that type will be grayed out in the menu. If the constraint conflicts with another constraint, for example, aim conflicts with either Auto Look or Rotate, you will be notified and no constraint will be added.

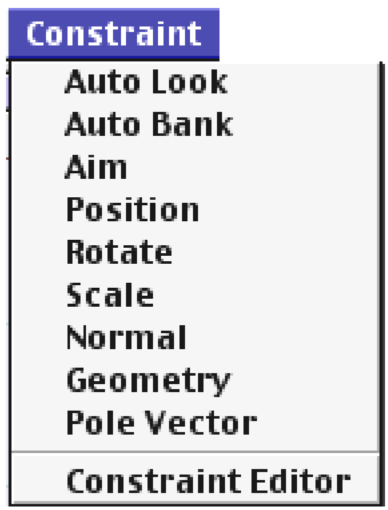


Figure 19.0 — **Constraint Menu**

Once constraints have been applied to an object, the Constraint Editor dialog box may be brought up by first selecting the constraint object and then choosing Constraint Editor from the Constraint menu. The dialog has a "Type" pull-down menu with a list of constraint types that have been applied to the object. Each type has an associated list of targets in the "Target" area of the dialog box. All the constraints allow you to change the Weight of each target (select the target from the list and then change the Weight value) and to delete the target. You may also disable the constraint engine for the constraint type by turning off the Enable Constraint Engine check-box.

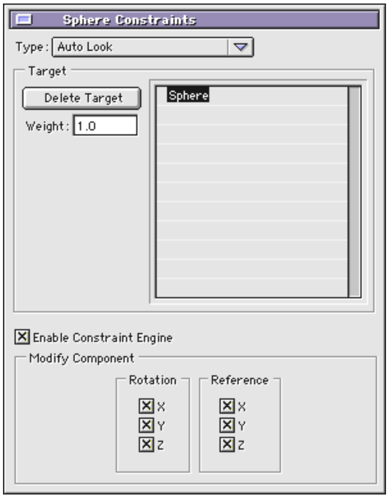


Figure 19.1 — **Constraint Editor**

The Constraint Editor also has a Modify region that lets you disable the constraint's effect on individual axes. Targets may be deleted using the Delete button. If all targets for a particular constraint are deleted then the constraint itself is deleted.

19.2 Constraint Types

Auto Look The Auto Look constraint causes the constraint object to point toward the targets and can blend in rotation/reference data from the constraint object itself. This constraint replaces the look-at feature in 3.0 EIAS and earlier versions of EIAS. To enable Auto Look, select a constraint object, and then select the targets to look at. One of the targets can include the constraint object itself, which indicates to the engine to use the constraint object's rotation/reference animation channels as part of the weighted solution.

While the constraint is in force, the rotation/reference channel values in the Group Info window of the constraint object cannot be altered. It is necessary to turn off the engine temporarily to allow the editing of the constrained channels. The "Enable Constraint Engine" button in the Constraint Editor dialog box can be used to do this. Turning it off will revert the object's rotation/reference back to its animation channel values.

As with all targets, the rotation/reference channel has a weight associated with it, allowing you to smoothly blend the various look-at points and animation values for the desired rotation/reference orientation.

Auto Bank Auto Bank allows an object's orientation to be animated while the object is moving along a curved path. This constraint replaces the auto bank feature in EIAS 3.0 and earlier versions of EIAS.

To enable Auto Bank, select the object, and then select a null object (any effector in the scene) as a target. It actually doesn't matter what object you choose since the target isn't used by the constraint system. The weight of the selected target is used to blend the Auto Bank rotation with the rotation in the animation channel of the constraint object.

The “Enable Auto Roll” button adds a “roll” into the banking based on the gravity vector length. The tighter the curve, the more pronounced the roll. The larger the gravity length, the less pronounced the roll. The gravity direction has no effect.

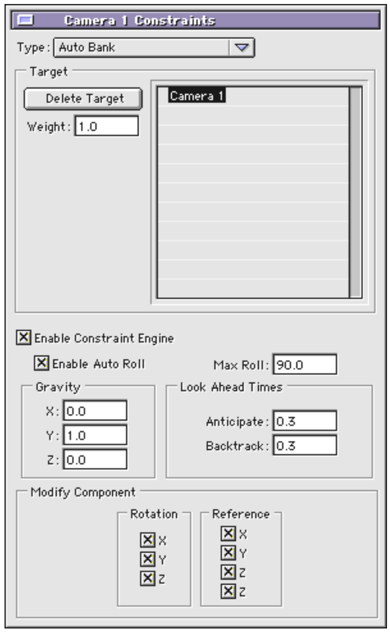


Figure 19.2 — **Constraint Editor-Auto Bank**

The orientation is computed by looking back and ahead a certain amount of time. Looking ahead in time allows you to “anticipate” an orientation change on the curvature of the path. Looking back in time allows you to “ride out” an orientation change. Looking ahead in time is called Anticipation and is entered in seconds. Looking back in time is called Backtrack and is also entered in seconds.

Aim Aim is a multi-purpose aiming constraint that allows you to specify which direction to aim at and to set an up-direction to keep the object upright. The aim vector is the main vector to aim the constraint object toward. It is possible to aim the object in directions other than the main three axis x, y, or z. The local up-vector keeps the object upright in its local space, while the global up-vector keeps the object upright in its global space.

The global up-vector is a reference vector for the local up-vector. When the aim vector aligns with the target, the local up vector tries to align itself as close to the global up-vector as possible.

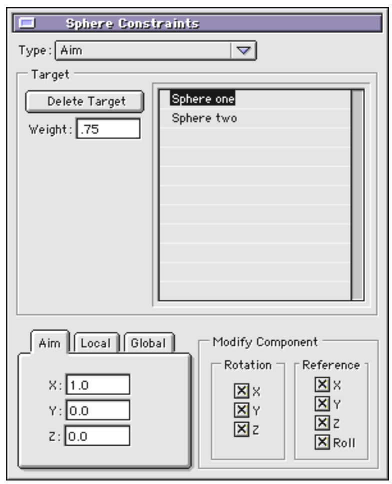


Figure 19.3 — **Constraint Editor-Aim Constraint**

Position The Position constraint moves the constraint object to the target point. The target point is the weighted average of the target centers. An optional X,Y,Z offset can be included. This offset is applied to the computed target point.

Rotate The Rotate constraint rotates the constraint object in global space as the result of the weighted average of the global rotations of its target(s).

Scale The Scale constraint scales the constraint object based on the weighted average of the scales of the targets. Either local or global scales are used based on the check-box in the Constraint Editor.

Normal The Normal constraint keeps the constraint object oriented normal (perpendicular) to the target. This constraint is different than the others in that the Constraint Object must be linked to another group and that group is animated, not the Constraint Object. The simplest way of achieving this is to link the Constraint Object to an effector. Create a Normal Constraint between the Constraint Object and the target. As you drag the effector over the target, the Constraint Object will move with the effector and rotate to remain normal to the target.

While computing the constraint, there is a choice of point search methods. The “Every Vertex” method is the slowest and will use all vertices in the target to find the closest point between the constraint object and the target. Use it if the target has non-shared vertices. The “Closest Vertex” method is the fastest and will use the closest vertex to find the closest point on the target. Use it if the target has all vertices shared.

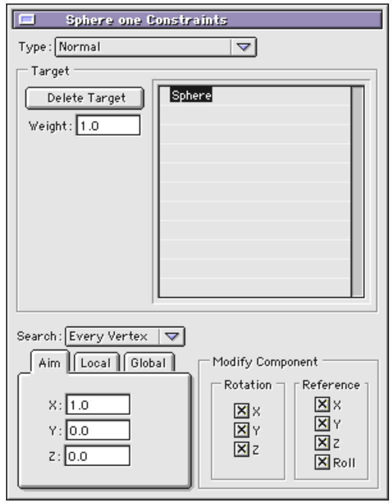


Figure 19.4 — **Constraint Editor-Normal Constraint**

Geometry The Geometry constraint keeps the constraint object at the position of the target point and normal (perpendicular) to the target point. The target point is the point on the target that is closest to the constraint object. The target must be a geometric mesh (a group). The constraint system will only use one target at a time. If you have added multiple targets, the one with the largest strength will be used.

This constraint is different than the others in that the Constraint Object must be linked to another group and that group is animated, not the Constraint Object. The simplest way of achieving this is to link the Constraint Object to an effector. Create a Geometry Constraint between the Constraint Object and the target. As you drag the effector over the target, the Constraint Object will move to stay fixed to the target.

While the Normal constraint will only use the target's computed surface normal to affect the orientation of the constraint object, the Geometry constraint will use the computed surface normal AND surface point to compute the orientation and position of the constraint object. Since both will clash with the rotation/reference channel, use the Geometry constraint if you desire both normal and position constraint.

The surface normal at the target point can be the target orientation so that the aim vector of the constraint object aligns with the normal vector.

Pole Vector The Pole Vector constraint rotates the Pole Vector toward the target point. The target point is the weighted average of the position of all of the targets.

19.3 Circular Dependencies

EIAS Animator will prevent you from creating conditions that allow circular dependencies. For instance, create a new project and then add a sphere and a cube. Now constrain the sphere to the cube's position (sphere is constraint object, cube is target). Animator will no longer allow you to link the cube to the sphere in a parent/child hierarchy. Why? Because the sphere is getting its position from the cube via the constraint. If the cube were a child of the sphere, then, through inheritance, the cube would be getting its position from the sphere. A cycle would then be created and Animator wouldn't know how to resolve the correct position of the objects.

Inverse Kinematics

20.0 Introduction

Inverse Kinematics (IK for short) is the process of computing the rotations and positions of the parents in a hierarchy given the position and rotation of the children. The term “Inverse” comes from this method of solving the hierarchy from the bottom-up. Traditional, forward kinematics, computes the position and rotation of the children by inheritance from the parents (top-down).

IK is a more direct method of animation for characters when you want to position the end of a hierarchical branch (called a “chain”) and have the other parts of the branch follow naturally. With IK, you can drag a character’s hand to the door knob and the forearm and upper arm will follow.

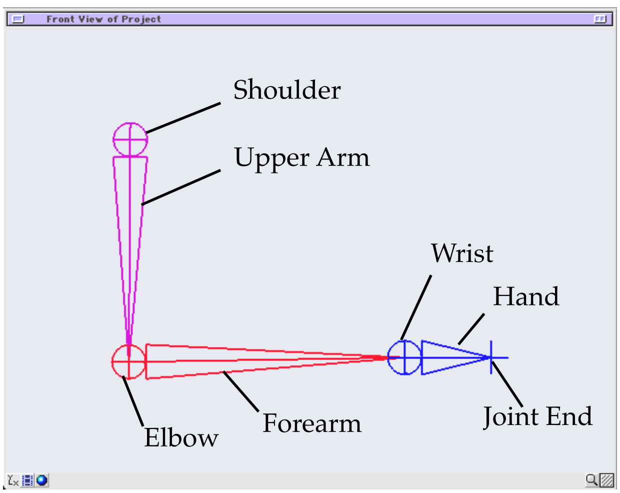


Figure 20.0 — **Arm Chain**

EIAS Animator allows you to apply a controller, called an “IK Handle”, to chains. Once applied, the handle is used to manipulate the chain. Moving the handle causes the IK engine to solve for the position and rotation of the members of the chain.

20.1 Creating an IK Handle

An IK Handle is created by selecting the bones to be controlled by the Handle in the Project window or one of the View windows and then choosing Add IK Handle from the Character menu. Instead of choosing all the bones in the chain, you may choose only the last one. In this case, the IK Handle created will control all the bones from the end of the chain up to the top of the branch (the chain must contain at least two elements or no IK Handle will be added).

Once added, the IK Handle will appear in the Project window and in the View windows.

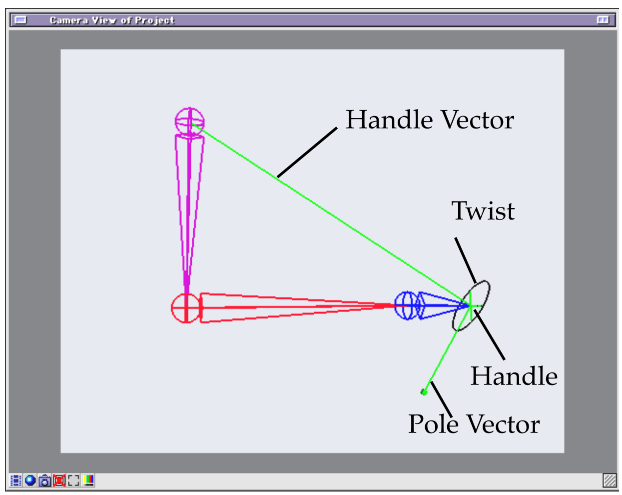


Figure 20.1 — **Arm Chain with IK Handle**

In the View windows, the IK Handle is represented by a green plus sign. The first and last bone being controlled by the Handle is indicated by a Handle Vector. Optionally, two other IK Handle sub-controllers can be shown, the Twist (oval shape) and the Pole Vector (line ending in small cube). These sub-controllers are discussed below.

Figure 20.2 — **IK Handle in Project Window**

The IK Handle is added to the bottom of the Project window and given a unique number to differentiate it from existing handles.

Multiple IK Handles can be added to a chain but the Handle Vectors may not overlap. In the arm example, Figure 20.1, you could add a Handle from the shoulder to the wrist and then a second handle from the wrist to the joint end. But you could not add a second handle from the elbow to the joint end. Overlapping control is not permitted. If you attempt to do so, Animator will not add the Handle.

20.2 IK Handle Info Window

Double-clicking on the IK Handle in either the Project window or View windows brings up the IK Handle Info window. Like all other object classes in EIAS Animator, the IK Handle has an info window that controls basic attributes such as position, rotation, etc. The IK Handle Info window is divided into three tabs:

- X-Form
- Properties
- Chain

On the left side of the window you will see three check-boxes.

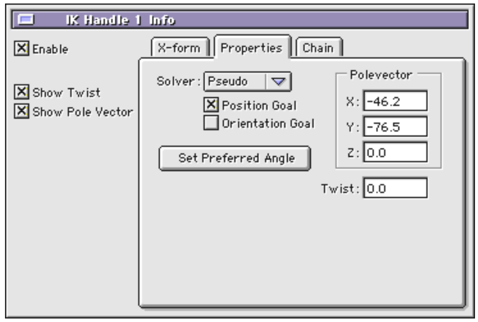


Figure 20.3 — **IK Handle Info Window**

Enable

This check box (defaults on) allows you to disable the IK Handle. The Handle won't disappear from the View windows, but the IK engine will no longer be called when the handle is moved.

Show Twist

This check box (defaults off) causes the circular -shaped twist controller to be displayed in the View windows.

Show Pole Vector

This check box (defaults off) causes the Pole Vector controller to be displayed in the View windows.

X-Form Tab

The X-Form tab contains the edit boxes that control position, rotation, and scale for the IK Handle.

Properties Tab

As depicted in Figure 20.3, this tab has all the controls for the IK engine. Including those for the type of IK engine (called a solver) and the current settings for the Pole Vector and twist.

Set Preferred Angle

There is an angle for each joint that the solver tends to move toward. This is called the Preferred Angle. Initially this angle is set equal to the rotation values in your chain at the time the IK Handle is applied. Pressing the Set Preferred Angle button resets the preferred angles to the current rotation values in your chain.

Why is a preferred angle needed? Imagine a chain made up of four bones in the shape of a “W” with the IK Handle at the top-right end of the chain. Pulling the handle to the far right would stretch the “W” shape out into a straight line. As you drag the Handle back to the left, it would be nice if the chain slowly took on its original “W” shape again. The IK engine is, in fact, able to do this by remembering the preferred angle for each of the joints in the chain.

The preferred angle determines the preferred configuration of the IK chain and makes the IK solution predictable. Choosing the right preferred angle can also avoid singularity conditions. These conditions occur when you pick the fully extended position as the preferred angle for a chain.

Note *When creating a chain (building the arms of a character for instance), it is best to add the bones such that there is a angle less than 180 degrees between the joints. Creating bones in a perfectly “straight line” can lead to singularity conditions because the preferred angle is initially set to the angle of bone creation.*

Solver

There are three different mathematical engines (solvers) you can choose from to determine the optimal behavior of each IK Handle in your project.

Pseudo The Pseudo solver solves an approximated linear system in a small interval and then integrates the results. This solver is more accurate than the Minimizer, but slower.

If you are using joints with rotation limits, the Pseudo solver may never reach the goal after it runs out of its time interval. This makes the Pseudo solver slow when using rotation limits. Therefore, we suggest using the Minimizer solver when rotation limits are involved.

Minimizer The Minimizer is implemented using a conjugate gradient method. It uses a recurrence formula to generate a series of mutually conjugate search directions and moves along the search directions to minimize the measure function of the chain configuration.

The Minimizer solver efficiently handles joints with rotation limits and is superior to the Pseudo solver when rotation limits are used.

2-Bone The 2-Bone solver is the fastest of the three solvers but only works on the first two bones in the chain. It is ideal for arms, legs, and other bone pairs. Do not use it with chains that contain more than 2 bones. It does not offer high-accuracy when rotation limits are used.

Position Goal

This check-box tells the solver that its goal is to move the chain end to the same position as the IK Handle. This is the default.

Orientation Goal

This check-box tells the solver to match the orientation of the chain end to the orientation of the IK Handle. Only the Minimizer solver uses this option. Orientation can be confusing since the solver may rightly decide that the solution has been reached before the chain has been dragged to the position of the handle. The Minimize solver creates a balance between the position goal and the orientation goal when both check-boxes are on.

The solver will not do anything if both Position Goal and Orientation Goal are turned off.

Chain Plane

There is an imaginary plane that runs through the joints in your chain. This plane is used by the engine to compute the orientation of the chain. Specifically, the Plane controls the twist of the chain. The IK engine has two controllers, the Pole Vector and Twist, that allow you to control the overall orientation of the Chain Plane, and thus, the orientation of the chain. In EIAS, the IK engine uses the first two bones in the chain to create the plane.

Pole Vector

The Pole Vector is shown in the View windows as a green line that begins at the location of the IK Handle and terminates in a tiny box. You can drag this vector in the View windows to alter the overall orientation of the IK Plane.

Note that if the Pole Vector crosses the Handle Vector or becomes opposite to it during posing or animation, the entire chain can suddenly flip 180 degrees around the Handle Vector. Take care to orient the Pole Vector to prevent this flipping behavior.

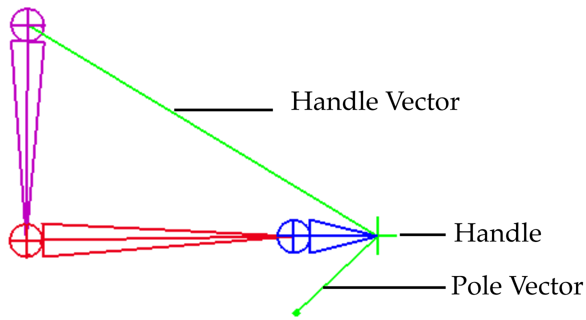


Figure 20.4 — **Pole Vector**

Twist

The Twist controller allows you to rotate the entire chain about the Handle vector. The controller defaults to 0.0 degrees and indicates that by its black color. As you drag your mouse around the controller, the twist value will increase and the controller will become green to indicate the twist value.

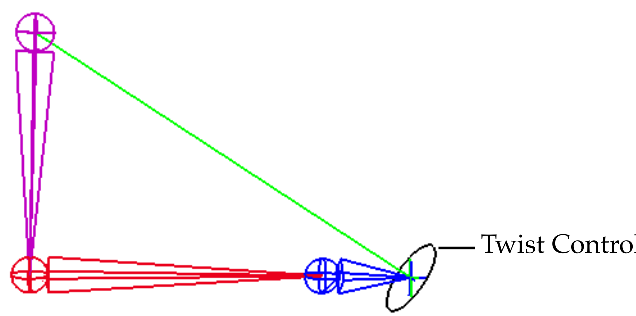


Figure 20.5 — **Twist**

Chain Tab

The Chain tab contains the list of bones that are under the control of the IK Handle. The list is not interactive, it is for reference only.

20.3 Using IK on Models

The sections above discuss the use of IK Handles with bone chains. EIAS allows you to use IK Handles on model groups directly. This is useful if your character is mechanically jointed. A good example of this is a robot. The geometry data for a robot is not a single skin but is instead a series of separate, jointed model groups.

Once your groups have been organized into a character hierarchy, you can select model chains and apply IK Handles to them just as you would with bone chains.

You will need to use the Joint Editor (**Hierarchy > Joint Editor**) to set the link points for each of the groups in the chain (found in the X-Form tab). When creating a bone chain, this is done automatically. For model chains, it must be done manually.

20.4 Go To Rest Position

The Character Menu contains the Go To Rest Position tool. Select an IK Handle in your project, then choose this menu item. The rotation of the bones being controlled by the IK Handle will be reset to their rest orientations.

Skin and Bones

21.0 Introduction

EIAS includes a skinning engine that automatically deforms the geometry of your character (the “skin”) as you move your character’s bones.

The new skinning engine improves on the old method in both speed and ease of use. Restrictions such as the bones being the children of the skin and adding bones-style deformations have been eliminated.

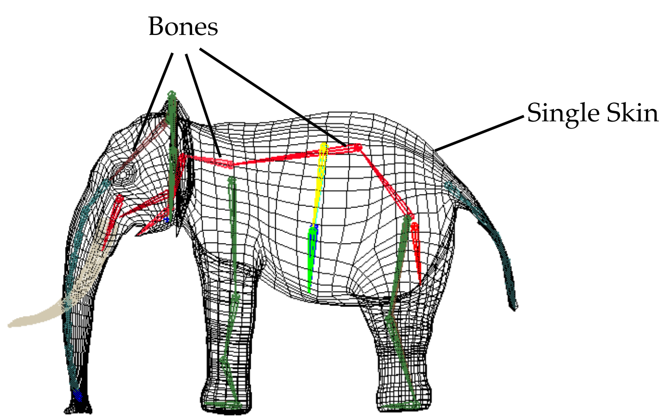


Figure 21.0 — **Skin With Bones**

Skinning is now a dependency. That is, a relationship outside the hierarchy is created between the bones and the skin (geometry). This means that the bone chains driving the skin cannot be dependent on the geometry in any other way. Therefore, BONES CANNOT BE CHILDREN of the skin.

There is one exception to this rule. Bones used with the old-style bones deformation system can and must still be children of the geometry.

21.1 Bones

Bones are a type of effector designed to give geometry motion and deformation. They are linked together in short hierarchies, called bone chains or skeleton chains.

For information on adding bones to your scene, see ***The Animator 3.0 Manual, Chapter 13, "Using Effectors"*** *and* ***"Bones" on page 674.***

When using bones with the skinning engine, the options in the Bone Info window are valid with a few exceptions. Bone length, influence region, and strength are not animated values. At the time of the skin binding, the current values will be used and further changes will be ignored. Also note that "Rest" Position has no meaning anymore. The minimum and maximum influence values for bones will still have effect and may be useful in influencing the "folding" of the skin.

Note Animator version 4.0 has removed the "skeleton effector". This was an alternate effector type that could be used to manipulate the position of geometry but not alter its shape. Bones fulfill both of these purposes, and in addition, IK Handles can now work directly on model chains. See ***"Using IK on Models" on page 561***

Split Bone

A new command has been added to the Character Menu, "Split Bone" (**Character > Split Bone**). This command divides the selected bone into two separate bones, maintaining the hierarchy. The new bone is inserted as a child of the original bone and children of the original bone become children of the new bone. Split Bone can be used after you have created your skeleton to give a particular chain more definition and control. For example, let us say your character's spine has 3 bones and you decide that the character needs to bend in a very flexible way. Splitting the bones would now give you 6 bones in the spine without having to go to the trouble of manually rebuilding the skeleton.

Bone Strength Tab

This tab lists the strength maps that the bone is associated with. See ***"Strength Maps" on page 569*** for more information. The list is in the form of map name, followed by the skin name in parenthesis. The button next to the list entry may be used to temporarily remove the bone from its association with a particular strength map. The "Del" button permanently deletes entries from the list.

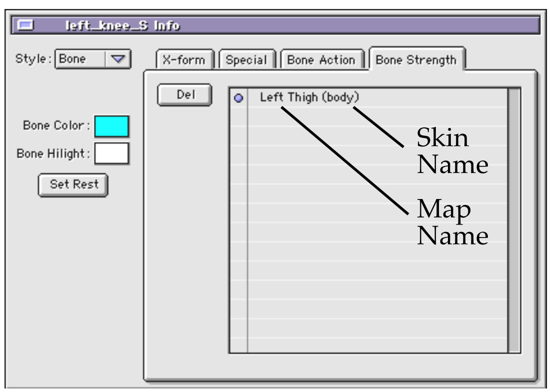


Figure 21.1 — **Bone Strength Tab**

21.2 Binding the Skin

Binding is the process of creating a dependency relationship between a group of bones, the “skeleton”, and the skin (geometry).

When building the skeleton, place it in the center of your skin. When you are ready bind the bones to the skin, these spatial relationships will be preserved throughout the animation. Changing the initial relationship will involve detaching the skin from the bones and then re-binding the skin geometry to the bones.

Skin binding is accomplished in one of two ways:

1. Select any bone in a skeleton chain and use the “Bind Skin To Skeleton” in the Character menu (**Character > Bind Skin to Skeleton**) to bind the ENTIRE bone chain to the geometry group.

2. Select one or more bones and use the “Bind Skin To Selected” in the Character menu (**Character > Bind Skin To Selected**) to bind only the SELECTED bones to the geometry group.

You can add more bones to the skin at any time by selecting the bone(s) and then using **Character > Bind Skin To Selected**. Also, a bone or a chain may be bound to more than one skin at a time. This is important when your character is made up of multiple geometry groups.

Once bones have been bound to a skin, the skin can no longer be translated, rotated, or scaled directly. These functions must be performed on the bones (or the controllers and IK handles you have added to assist in moving the bones). The bones give rise to both the movement and deformation of the skin. Morphing, deformations, materials, and any other surface-modifying features can still be applied directly to the skin.

Note *Skinning will work several times faster on FACT geometry than on geometry created by plug-ins. This is because the skinning engine caches data to prevent recomputation at every frame. This isn't possible with plug-ins because they can change the number and order of vertices every frame.*

21.3 The Skin Editor

The behavior of the skinning engine can be adjusted for each skin in your project using the Skin Editor. Select the skin with skinning options you wish to examine and choose "Skin Editor" from the Character menu (**Character > Skin Editor)**.

The bottom half of the Skin Editor contains the bone list. The "All" tab shows the list of the bones bound to the skin. The "Del" button can be used to unbind selected bones from the skin.

The "Active" tab shows the list of the bones that actually influence the skin. Even though a bone is bound to the skin, it can be deactivated by turning off the "Activate" button in the Bone Info window. Bones with this button turned off will not be shown in this list.

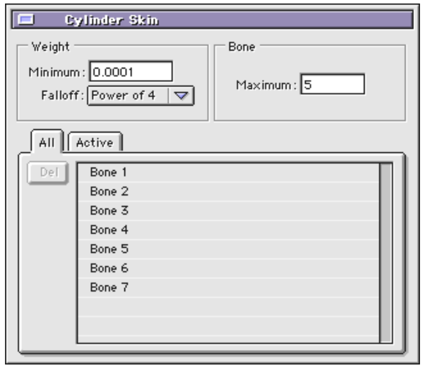


Figure 21.2 — **Skin Editor**

Weight Minimum

The Minimum weight allows you to specify the minimum influence a bone has on a vertex. If the computed weight falls below this threshold, the bone will not influence the vertex. This is a time versus accuracy control. Smaller numbers will improve the accuracy of the skin engine but at the cost of slower performance.

Falloff

The distance Falloff Power allows you to “tighten” or “loosen” the influence of the bones based on the distance between the skin’s vertices and the bones. The lower the falloff power, the “softer” the influence becomes. A “linear” falloff allows the vertex to pull away from the bone while a “Power of 32" falloff grips the vertex very tightly to the bone.

Bone Maximum

The Bone Maximum edit box contains the maximum number of bones that can influence each vertex in the skin. A value of 0 does not allow any influence, hence no skinning deformation at all. A value of 1 only allows the closest bone to influence the vertex, thus producing folds which are very angular and tend to penetrate the skin, while higher values produce more pleasing folds but at a somewhat slower performance.

Note *If you notice that vertices in your skin are being left behind (separating) as you move the bones, try reducing the Weight Minimum and increasing the Bone Maximum.*

21.4 Strength Maps

Strength maps allow you to fine tune the effect of a bone's influence on the skin. Strength is a relationship between a particular vertex in the skin and any number of bones. The skin may have many of these strength maps, each of which controls how much influence one bone has over another at a particular point on the skin. Each bone can be associated with a single map per skin (but a bone may be bound to more than one skin).

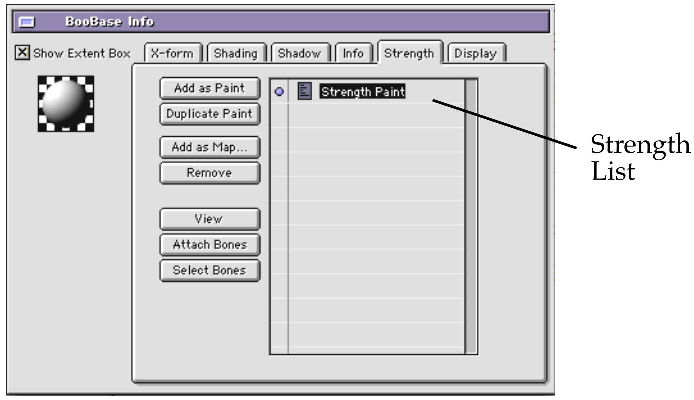


Figure 21.3 — **Group Info Window—Strength Tab**

Strength maps are a property of the skin and are added, removed, and controlled using the "Strength" tab in the Group Info window. There are two kinds of strength maps; Painted maps that you paint directly on the skin, and Texture maps that are applied using the normal material tools.

Add as Paint

Clicking on the "Add as Paint" button creates a new vertex Paint map. You are asked to give the paint map a name. The named map appears in the Strength List. Double-clicking on the paint map in the Strength List allows you to rename the map.

Duplicate Paint

Makes a copy of the highlighted Strength map in the Strength List. This is a great way to experiment with changes to your Strength maps without changing them permanently. Select the map, duplicate it, then turn off the original using the blue enable button to the left of the map in the Strength List. You can now experiment with the copy without losing the original.

Add as Map

This brings up a texture get-file dialog box. You choose the texture map and it appears in the Strength List. Double-Clicking on the texture map in the Strength List brings up the Texture Info window. This window is used to position the map on the skin. The Texture map will automatically set the strength at each vertex based on the luminance value of the texture pixels.

Note *Only the first frame of an animated texture map will be used.*

Remove

The Remove button deletes the highlighted map from the Strength List.

View

Places the View windows into the strength map display mode. For texture strength maps the color of maximum strength may be chosen. The View palette pops up that allows the display color of maximum influence (100%) to be changed. Minimum influence (0%) is always shown as black. The color is displayed on the skin in the view windows as long as the palette is open. For painted maps, the Paint palette pops up and interactive painting on the skin may take place.

Note *The View windows must be in OpenGL mode (the hardware engine must be in use) and set to Flat, Gouraud, or Phong to see the strength.*

Attach Bones

Associates the bones selected in the Project window or View windows with the map highlighted in the Strength List.

Select Bones

Selects the bones in the Project window and View windows that are associated with the map highlighted in the Strength List. This is a quick way to see which bones are associated with a particular strength map.

21.5 Painting

When using a Paint map, you can interactively paint the skin using the built-in paint tool. To bring up the tool, select the Paint map from the Strength List and click on the “View” button. The Paint palette pops up and the skin’s color is changed to show the strength at each vertex. The color will be shown on the skin in the View windows until the Paint palette is closed.

Shortcut The W key can be used to temporarily turn off the paint colors while you are in paint mode.

Note *The View windows must be in OpenGL mode and set to Flat, Gouraud, or Phong to see the strength.*

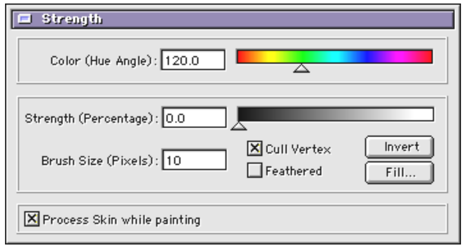


Figure 21.4 — **Paint Palette**

Color (Hue Angle)

Changes the color of maximum influence (100%). Minimum influence (0%) is always shown as black. This doesn't alter the behavior of the skin it is just a color preference.

Strength (Percentage)

Sets the value for the paint brush (0 to 100 percent). 0 percent means that the bones associated with the skin do not affect the skin at all. 100 percent means that the bones have full influence on the skin. Keep in mind that the final computed strength for any vertex on the skin is the weighted average of all the bones.

Shortcut Hold down the Control key and right mouse button (Control and Command keys on Mac), then drag the mouse right or left.

Brush Size (Pixels)

The Brush Size sets the radius of the brush in pixels. The brush cursor is shown as a circle in the View windows.

Shortcut Hold down the right mouse button (Control Key on Mac) and drag the mouse right or left.

Cull Vertex

The Cull Vertex check-box, when on, causes the brush to modify only the vertices visible in the View window in which you paint. When off, the brush paints straight though the skin to the polygons behind. If you are painting the left ear in the Side View window, the right ear will also be painted.

Feathered

Feathered modifies the vertex strength by the distance of the vertex to the brush center (cursor) and its value. This causes the strength to fall off as it moves from the center of the brush outward.

Invert

The “Invert” button inverts all of the strength values in the strength map. Setting 100% to 0% and vice-versa.

Fill

Brings up a dialog box that allows you to set every vertex in the map to a specified value.

Process Skin While Painting

When on, the skinning engine is called as you paint. This gives you constant feedback on the effect your painting is having on the skin deformation. The multitude of calculations required to provide this feedback is significant. You may wish to turn this option off to increase the speed of painting.

Note *If you see whole polygons turning a different color as you brush instead of nicely blended vertex colors, your OpenGL card or driver does not support the standard Vertex Blending feature. See your OpenGL card's specification for more information on this feature.*

Using Sound in Animator

22.0 Introduction

You can add sound to Animator for the purpose of synchronizing the sound to your animation. Animator supports sound file formats through QuickTime. Supported formats include WAV and AIFF.

Add a soundtrack using the **Object Menu > Import Sound...** command. Once added, the soundtrack with its waveform will be displayed in the project window.

When you write out a preview animation file to QuickTime, the soundtracks in your project are written as well. This feature is not available when writing out preview files to the Image file format. Image does not support sound.

22.1 Sound Info Window

The Sound Info window, as shown below, contains controls for playing the selected soundtrack, along with settings for the selected soundtrack's start time in the project. It also contains settings for selections of the soundtrack and the creation and maintenance of cues (small sections of the soundtrack).

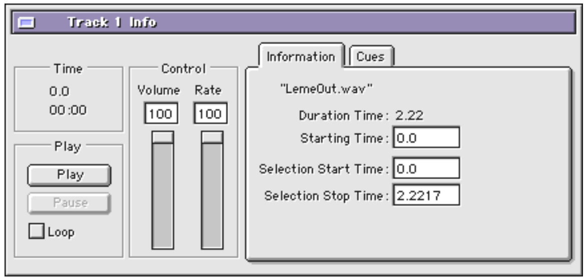


Figure 22.0 — **Sound Info Window**

To open the Sound Info window, select the soundtrack in the Project window, then choose **Sound Info** from the Object menu (or double-click on the soundtrack icon in the Project window).

Play

This button, when clicked, plays the soundtrack. While the soundtrack is playing, the button changes to read **Stop**.

Pause

This button, when clicked, pauses the soundtrack during play. while the soundtrack is paused, the button changes to read **Continue**.

Loop

This check-box, when enabled, causes the soundtrack to loop continuously during playback. It can be clicked on and off during playback.

Volume

This edit box and slider bar sets the volume of playback. It defaults to full volume (100). If you do not hear the sound during playback and there is a visible waveform shown in the Project window, check the settings of your computer's OS-level sound control panel.

Rate

This edit box and slider bar sets the playback rate of the soundtrack. It defaults to full speed (100) and can be slowed down.

Duration Time

Displays the overall length of the soundtrack in seconds.

Starting Time

This edit box contains a value for the time in the project at which the sound starts.

Selection Start Time

This edit box contains a value for the time in the project at which the selected portion of the soundtrack starts.

A portion (selection) of the soundtrack can be selected in the Project window by clicking and dragging inside the waveform of the track. By default, the selection will appear to be cyan in color.

Selection Stop Time

This edit box contains a value for the time in the project at which the selected portion of the soundtrack stops.

Sound Cues

The Cues tab contains controls for creating and managing sound cues. These are segments of the soundtrack that can be recalled and located at any time. When you create a cue, the cue's duration in the soundtrack's waveform will be shown in red.

Cue List

This box contains a list of cues created by selected a portion of the soundtrack and clicking the **Add** button. Double-clicking on the cue in the Cue List will put the cue in the selection region of the soundtrack. Clicking on the **Play** button will now just play the cue.

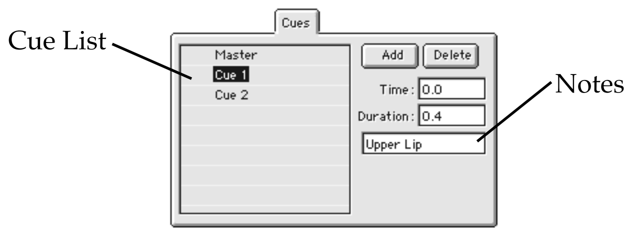


Figure 22.0 — **Sound Info Window Cues Tab**

Add

This button is used to add a selected portion of the soundtrack to the cue list.

Delete

This button is used to deleted the cue selected in the cue list.

Time

This edit box contains the value for the start time of the selected cue.

Duration

This edit box contains the value, in seconds, for the length of the selected cue.

Notes

This edit box can be used to annotate the selected cue.

Recording Sound

If you computer has a microphone or another sound input device, you can record your own soundtracks and add them to your Animator projects.

To record a soundtrack, choose **Record Sound...** under the Object menu. A dialog box will appear.

Figure 22.0 — **Sound Recording**

Record

Start recording sound.

Stop

Ends the sound recording. The **Play** and **Save** buttons will become active.

Pause

Pause the recording.

Play

Play back the recording. This button becomes available when sound has been recorded.

Save

Saves the recorded sound to disk and adds it as a track in your project.

Facial Animation

23.0 Introduction to the Morph Window

One of the most powerful features for character animation is morphing. There are effectively two types of morphing techniques — simple target morphing and weighted target morphing. EIAS Animator offers the weighted target method, as it is superior for facial animation. This chapter will concentrate on using the Morph Window for Facial Animation.

Morphing creates in-between models from a source model and one or more target models. The source model is typically a "neutral" version of the model, and the target models are versions of the model in various poses or expressions. In simple target morphing, the models may not even need to depict the same object. A plate could morph into an apple, for example.

Morphing requires that models contain the same number of points and polygons, and that they are stored in the same order. For example, the polygons which make up a nose for the source model must directly map to the polygons which make up the nose in the target model. If these polygons do not correspond, very strange results will occur.

The Morph Window is just one part of the character animation equation. In addition, bones, effectors, and inverse kinematics round out the tools that are typically used to create great character animation.

23.1 Creating Models for Morphing

It is best to start with the source model, and use it to create your target poses. There are a variety of ways to create both the source and target models, depending upon the modeling software that you choose to use. You can even use the BONES feature in EIAS Animator to create target models from your source model.

To create the new poses or expressions that you need, you drag the points of the polygons to create the new shape. This can be a tedious and laborious process, but when done well, the results are worth every second.

Note 3D animator and reviewer George Maestri has written a very thorough treatise on character animation, which includes a variety of illustrations that are typically used for facial morphing. Published by New Riders, it's called, "Digital Character Animation II: Essential Techniques" (New Riders Publishing— ISBN: 1562059300). It retails for approximately $40.00 at Amazon.com— not cheap, but it will save you an incredible amount of time and effort!

23.2 Using the Morph Window in EIAS Animator

Once you have created the necessary target models, its then time to load the models into EIAS Animator so that they can be morphed. Morph model targets are not added into an EIAS Animator project as other models are. Instead, they are added through the Morph tool. All models in the project, whether or not they are used for morphing, are listed in the project window, above the group list (in the default project window display). Let's load a model and have a look around the Morph Window.

To add a morph source model into EIAS Animator:

1. Add the source or anchor model to the project as a normal object file.
2. Be sure that the animation channel is enabled (**Animation>Enable Animation**).
3. Select the source model.

4. Click on the MORPH BUTTON in the Project Window.

The following window will appear.

Figure 23.0 — **Morph Window with targets**

The name of the source model will appear in the Morph Anchor section, to the top left. The model that will be morphed is drawn in the view area to the right of the window.

The Morph Window is divided into sections:

- Morph Anchor
- Target Match Popup Menu
- Reload Target Data Button
- Morph Group
- Morph Target
- Keyframe/Timeline Slider
- Viewing Area

Morph Anchor Section

The morph anchor is the base or source model. The morphing engine will actually use this model to create all of the poses and expressions specified by you in the Morph Window. The name of the anchor file is listed here.

Target Match Popup Menu

The target match popup menu tells the morph engine how to treat the morph target groups. There are five menu options to choose from, depending upon the desired treatment of the targets:

- First
- Full Match
- Index Only
- Name Only
- Geometry Only

First. This option will use the first group in the target model as the morphing target. If you only have single groups in your morph models, use this option.

Full Match. This is the default option. Group names, number of coordinates and group index order must all match in order for this option to have expected results. Properly constructed morph targets should conform to this recommendation.

Index Only. Group order must match in order for the morphing to work properly with this option selected. In other words, given a group named “foo” in both the source and target models, each occurrence of group “foo” in the target models must match the order in which group “foo” occurs in the source (anchor) model. No other restrictions are active with this option selected.

Name Only. This option morphs only across group names contained within the source (anchor) model. All other groups will be ignored.

Geometry Only. This option ignores group names, or group order, and addresses each polygon vertex in the order in which it is stored within the model file. In this case, each vertex in the source model must be in the same order in the target models. This should be the case in any event.

Reload Target Data Button

This button will allow you to replace morph targets while retaining the animation channel data for the target. This is useful for fine tuning poses, or substituting higher resolution morph targets.

Morph Group

Morph target models are placed within morph groups. You can have as many morph groups as necessary. Morph groups are used to organize your morph targets into logical collections. As you can imagine, some morphing projects can get pretty complex. The morph groups will help to better manage the complexity.

For example, if you have many different models which describe mouth movement, you may wish to place all of those targets into a morph group called “mouth.”

To add a Morph Group:

1. Click the Add Morph Group button.
2. A dialog will appear, asking you to name the group.
3. Click OK to clear the dialog.

The morph group is created, and added to the Current Morph Group popup menu. Any morph targets that you add will always be added to the morph group indicated by the Current Morph Group menu.

Morph Target Section

As mentioned previously, the morph target models are effectively the extremes of the variety of poses or expressions that you will be using in the morphing process. Morph targets are contained within morph groups for easier management of model and morph data. Morph targets are added to the current selection displayed in the Current Morph Group Menu.

To Add Morph Targets:

1. In the Morph Target section, click the Add button.
2. A file dialog will appear, listed model files.
3. Select and add the desired target files.
4. When complete, press the done button in the dialog.

The target files are now displayed in the morph target area. Along with the actual file names, slider bars, edit and check boxes are also displayed in the Morph Target Section. The default state of a target slider is the center of the slider. A morph can actually operate in the positive or negative. The check-box to the right of the target name enables or disables the target from being used in the morph process.

In addition to the actual Morph targets, there are three buttons and one menu in the Morph Target Section:

- Add
- Del(ete)
- Add Blend To Curve Editor
- Default Morph Blend Menu

Add . This button allows you to add morph targets to the selected Morph Group.

Delete. This button allows you to remove the selected morph target from the morph target list.

Add Blend to Curve Editor. This button will manual force an update to the animation of the selected morph target to the function curve editor for fine tuning. In addition to the manual button presented here, at the bottom of the Morph Target section is a checkbox that will automatically send data to the function curve editor, if activated.

Default Morph Blend Menu. This menu allows you to choose the interpolation method for the morph targets. The interpolation method will appear in the function curve editor as the appropriate spline type. There are four options:

- Linear (Default)
- Natural Cubic
- Hermite
- F-Curve

Linear (Default). This option directly blends one morph target to another. This option produces rather mechanical results.

Natural Cubic. This option uses a natural spline to interpolate one morph target to another. Splines tend to produce a more realistic result than linear interpolation. This curve type offers no modification options in the function curve editor.

Hermite. This option uses hermite splines to interpolate one morph target to another. Hermite splines offer additional Tension, Bias, and Continuity control over the spline curve interpolation. These attributes can be adjusted in the FUNCTION CURVE EDITOR by selecting either the T, B, or C keys and dragging the mouse with the KEYFRAME selected in the editor.

F-Curve. This option uses function curves to interpolate one morph target to another. Function curves offer a very realistic result, and additional control in the FUNCTION CURVE EDITOR.

Keyframe/Timeline Slider

This slider sets the project time, so that the morphing action desired occurs at the time you specify. You can either drag the slider to the desired frame number, or manually enter the frame number in the edit section.

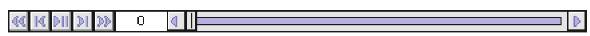


Figure 23.1 — **Keyframe/Time line Slider with Playback Controls**

To the left of the frame display field are the playback controls. These controls are illustrated in the following diagram:

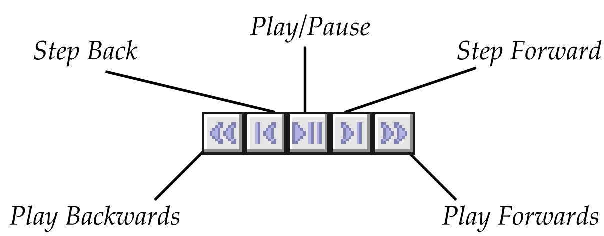


Figure 23.2 — **Playback Controls**

Play/Pause. Starts playback of the morph animation. All of the other playback controls require that Play be on in order to work.

Step Forward. Will cause the animation to step forward one frame.

Step Backward. Will cause the animation to step backward one frame.

Play Forward. Will cause the animation to play forward.

Play Backward. Will cause the animation to play backward.

View Area Section

This is where you can view the results of your morphing choreography. The default display is wireframe for speed, however, you can also display this window as phong shaded, by option clicking on the SHADER BALL icon in the upper section of the window.

23.3 Making Morphs

We have covered the Morph Window, and the process of adding a morph source model and its targets in the previous sections in this chapter. Now we are going to concentrate on creating actual morph animations.

The Morph Window is best used as a facial morphing system (although you can animate anything you care to morph with it). Each morph target has a slider that lets you blend the target with the source. The range of each slider is negative target to positive target, with the center, 0, being null (the source would be the result if all of the sliders set to zero. Typically, your morph target poses (the models that you create for the pose positions) will be the positive end of the scroll bar (value 1.0). The negative values (value -1.0) are the opposite of the positive poses, and are derived by determining the change of the target model from the source model, and then negating that value. This gives you the benefit of not having to create minimum and maximum ranges.

Note *All of the morph targets are weighted and averaged together to form the final object for that frame. You can change the interpolation method for the best results. See the section entitled "Default Morph Blend Menu" on page 589.*

The mechanics of the morphing process requires that you do two basic things:

- Set the current frame
- Move the sliders for the desired look for that frame

Tip Regular people tend to act pretty straight forward, and are usually not overly dramatic. Animators learned long ago that presenting such real world people makes a rather mundane performance. They learned that by exaggerating the performance somewhat, the performance becomes much more interesting. The typical purpose of character animation is to entertain, or sell by entertaining. A few extra movements, some obvious thought implied to the character perhaps, can go a long way. It can also go overboard as well, and earn the curse of being "over animated," especially if true to life subjects are being presented.

Two of the greatest tools that you can use to your success are timing and characterization. Timing let's you present the character effectively, making the most by doing the least. Simply stated, but not simply achieved. Some of the world's best comedians are also the best at timing (knowing when and when not to tell a joke, give a look, and so on.) Timing for an animation is a learned art, and it takes patience to develop the skill.

Characterization is effectively the soul of the character that you are endeavoring to create. Since the characters you are animating aren't real, it is your job to impose a sense of reality to them. In this way they can seem real, or at least real enough, so that the audience can accept them, and enjoy the performance.

Typically, this involves imparting a sense of thought to the character, giving its actions a sense of deliberateness. Making the character appear to think and ponder, as well as react and emote, are all ways of imparting a soul to it. Some performances might be pantomime, others might use heavy dialog. Some might be theatrical, others might be subtle.

Note In addition to the Maestri book, there is another must have reference has been written by two of the "nine old men" from Disney's golden age: "The Illusion of Life," By Frank Thomas and Ollie Johnston. It is available through Amazon.com, and retails for about $60.00. This book presents a remarkable history of Disney's best animation, and is an excellent treatise on animating characters.

23.4 Timing

Typically, animation is keyframed every 8th frame. Cycles tend to happen in eight frames, gross mouth positions for dialogs on eight frames, and so on. Essentially derived at for film speeds of 24 frames per second, eight frames evenly divides a second into three even chunks. Video animation is 29.997 frames per second, but you might find that ten frames can be just a tad too long (its up to you.)

You should put a keyframe where ever you think necessary (some animators have keyframes on almost every frame!) but the 8 frame technique is a good rule of thumb.

To set keyframes in the Morph Window:

1. Move the keyframe slider into position
2. Adjust the morph target slider bars for the proper expression

The view area will update to the new pose. Keep adding new key frames every 8 or so frames as needed.

To playback the animation:

1. Click the Play / Pause button
2. Click the button again to stop

23.5 Working with Sync Sound

One of the most powerful character animation tools is sound. The great thing about sync sound and dialog is that the timing is built in. All an animator has to do is match up lip positions (and add some emotion, of course — acting!)

To animate with sync sound in the Morph Window, you use the sync sound display in the Project Window. The Keyframe slider in the Morph Window will stay in sync with the overall project time slider. By positioning the Project and Morph Windows relative to each other so that you can see the full Morph Window, and the sync sound track in the Project Window, sync sound is very straight forward to accomplish. To check your animation, create a preview in EIAS Animator in Quicktime format. When the quicktime file plays back, you will be able to immediately see the in sync results of your work.

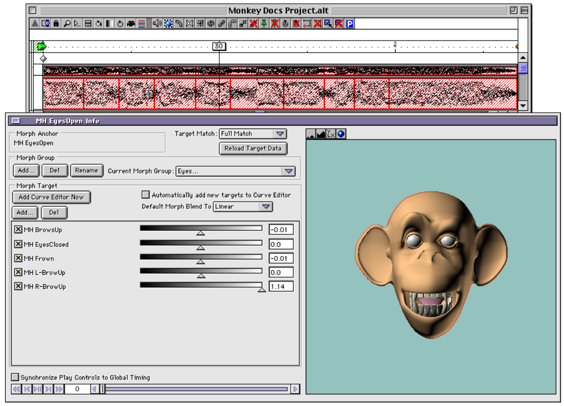


Figure 23.3 — **Typical Sync Sound Window Setup**

Sync dialog is actually fairly easy to animate to, and with a little practice the waveforms become very easy to read. As an assistant, you can use the Cue feature to break up the waveforms and annotate them from the Sound Info Window. A few minutes of work here will make sync dialog a snap. Typically, creating a separate cue for every spoken word should be enough. You can then use the cue playback feature to get a feel for the mouth positions required to sync. Then, all you do is match the mouth positions to the sound. The previous illustration shows how to organize your windows so that you can see the waveform and morph window at the same time.

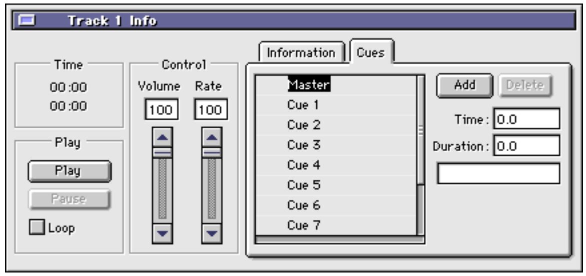


Figure 23.4 — **Sound Info Window Cue List**

It's a good idea to concentrate on matching the mouth movements in one pass through, and then layer in the emotional content in additional pass throughs. If you try to animate every aspect of the performance at once, things can get real confusing. Animating in passes is actually faster in the long run, and tends to yield better work.

23.6 Working with Morph Curves in the Function Curve Editor

The Morph Window is great for creating the expressions and emotions that you want to put into your character. The function curve editor is the better tool for tweaking timings of those expressions and emotions. Why? The Function Curve Editor presents morphing as curves, showing how the inter-relationships of the morph targets are working. Subtle changes can be made in the editor that would be rather tedious to try in the Morph Window. With a little practice you might even prefer to animate your morphs in the Function Curve Editor. It is also easy to match non-morph animation in your project with morph animation in the function curve editor.

note *You can also adjust timings in the project window, by dragging the keyframe diamonds to new desired locations.*

To copy a morph “blend” into the function curve editor, select the morph targets that you would like to edit, and click on the Add Blend to Function Curve Editor button. The blend will now be presented as a linear curve in the editor.

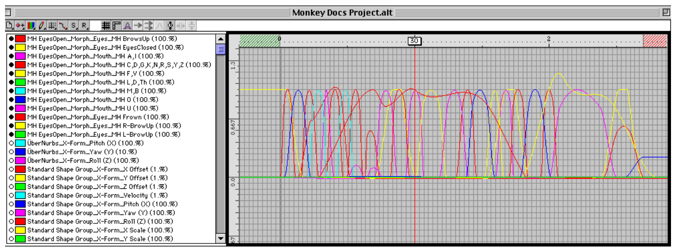


Figure 23.5 — **Function Curve Editor with Morph Blend Curves**

The morph target channel is presented to the left of the window. Select the channel, and the curve changes to white in the editor. Double click on the channel, and you can change the curve to any supported type. You can use all of the tools available in the function curve editor to tweak or enhance your animation.

23.7 Morphs and Materials

When rendering morph models, only the material settings in the anchor model will be used. Material morphing is not supported. Therefore, you need to assign all shading attributes to the anchor model. The groups listed in the project window when you select by model are the groups for the anchor model — the groups for the target models are not presented in the list.

You can still animate the materials used in the anchor model as expected. If you do not want to animate your materials, disable the animation flag on the material and texture channels in the project window, under the appropriate group name. This will prevent unwanted artifacts from occurring.

Deformations

24.0 Introduction to Deformations

Deformations allow you to bend, twist and otherwise distort groups in a variety of different ways. A basic tool for 3D character animation, deformations will enable you to impart “life” into a character, “bend steel with your bare hands” (apologies to the Superguy!), and so on. When used in conjunction with morphing, all of these deformation tools provide everything you need to create fantastic character animation.

In this chapter we'll discover just what a deformation is, how to use it, the differences between each deformation type offered in EIAS and some tips on their use.

What is a Deformation?

A deformation region allows you to squash, stretch, twist, bend, shear or wobble any group (including its children) in any manner you see fit. You can have one deformation action on a group, or you can have many. Any deformation is animateable, which means you can make that can of tomato soup do the Macarena if your heart desires. When you combine different animated deformations into one object, often times the flexibility offered is amazing.

Deformations in EIAS

In EIAS, deformations are applied to groups through the use of regions. A deformation region is similar to a group's cubic extent at first, but you can adjust the area of a region to suit your needs. You can assign as many deformation regions as you like to a group. The reasons for doing so are up to you, and are typically done for either more precise control or data management (too many deformations in a single region can sometimes get a little complex to follow.)

Actual deformations are assign to a specific region. You can have as many deformations as you like in a region, and they can be of any supported type. The effect that a deformation will have on a group is dependent upon both the order of the deformations in the region's deformation list, and the order of the actual regions in the region list. In both cases, the lists are processed top to bottom. You can think of this as a simple hierarchy.

24.1 Using Deformations

The discussion below is based on deforming a simple "hot dog" model as seen in Figure 24.1. This model consists of an UberShape capsule with a pair of funny glasses linked to it. The project is called "HotDogD4M" and can be found on the EIAS Content CD.

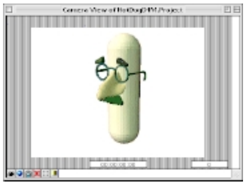


Figure 24.1 — **the Hot Dog object**

To Apply a Deformation

1. Select the group, by either clicking on it in the world views or selecting its name in the Project window.

2. Open the Group Deformation Window. There are three ways you can do this:

- Select it from the Tools menu
- Click the small Deformations icon in the top row of the Project window.
- Click the Deformations icon in the Tool bar.

The Group Deformation window opens:

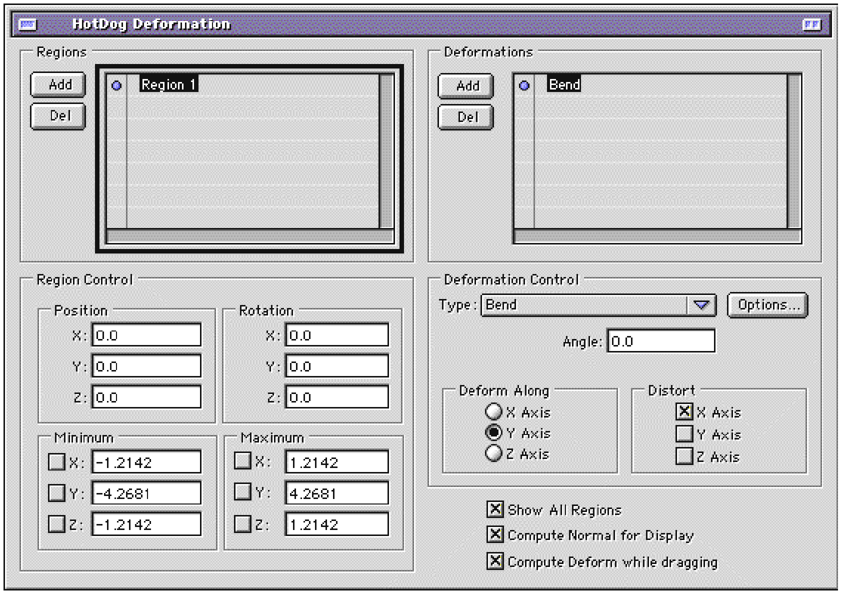


Figure 24.2 — **Deformation window for the Hot Dog group**

Now we will take a look at this dialog and break down its individual parts:

- Deformation Control Section
- Region/Deformation Section
- Region Control Section
- Show Region Buttons

Deformation Control Section

The deformation section consists of the type menu, the options button, the Angle/Amount/Strength edit box, Along Axis and Deform Axis check boxes. This section is where you choose and control the deformation.

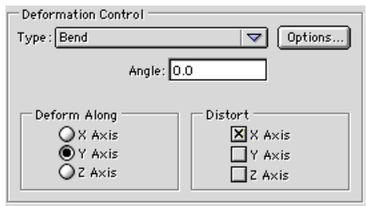


Figure 24.3 — **Deformation control section of the Deformation Window**

Type

This pop-up menu contains all the different types of deformations available to you. This is where you select what kind of deformation you'd like to use. We'll discuss the different kinds of deformations later in the chapter.

Options

Clicking this button brings up options specific to the type of deformation selected. Each deformation type has different options available to it, so depending on what type of deformation you've chosen with the Type pop-up, you will get a different dialog each time you select the Options button. We'll discuss the options for each type of deformation individually when we discuss each later in the chapter.

Strength% (or Scale or Angle)

This is where you enter the amount of deformation to be applied to the group. To animate a deformation, you simply change the value in this box over time, by either directly entering a number or by adjusting it via the rocker buttons to the right of the window. Another way to change this value is by directly manipulating the deformation region in the World views by clicking and dragging on the selected group. You will see the group update in the world view windows as you drag. Just about any deformation available may be interactively set this way.

One thing to note about this box is that its label will change, depending upon which type of deformation you chose. For Twist, Shear and Bend, it will change to Angle; for Scale, Taper or Bulge deformations, it will read Percentage; and for Stretch and Bezier deformations it will read Strength.

Direction

These three radial buttons determine what axis or axes the deformation is calculated along.

Deform

These check boxes determine what direction the deformation will occur towards. These check boxes are dependent upon what axis you chose to deform along in the Along Axis setting.

Using a bend deformation on the Hot Dog as an example, let’s look at how these two settings work together.

24.2 Deformation Examples

Deform X along Y

If you choose to bend the hot dog along its Y axis (Direction setting is Y), you can deform the object on it's X and/or Z axes.

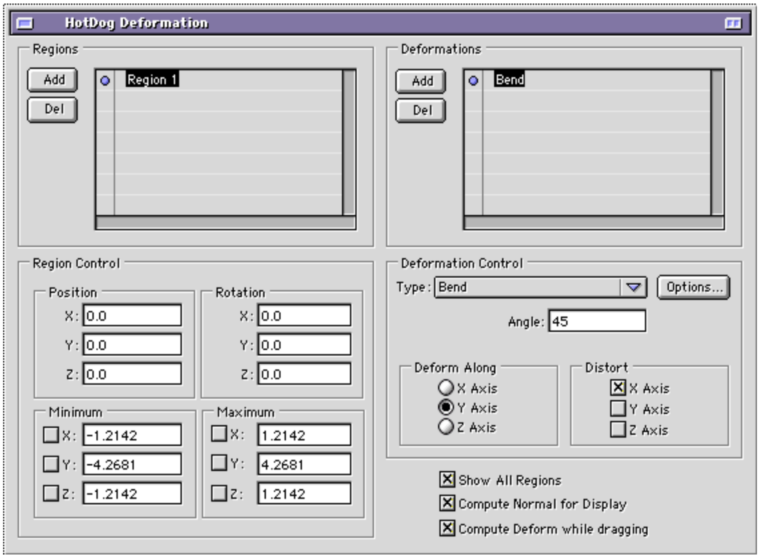


Figure 24.4 — **Y direction deformation along the X axis**

Keeping the direction along which the deformation takes place set to Y, a deform along the X axis will make the object bend to the left or to the right, depending on the value assigned to Angle. Looking at the front view window, positive X is to the right, and negative X is to the left. Because we have a bend angle of 45 degrees (positive,) the object bends to the right.

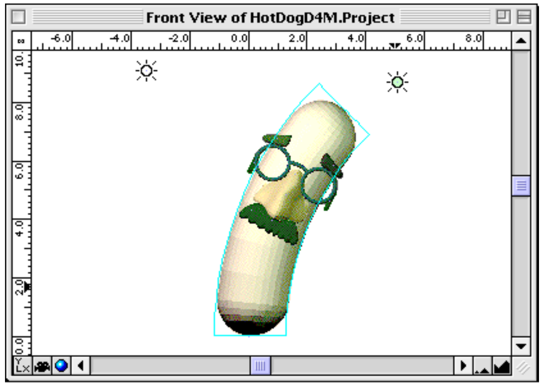


Figure 24.5 — **45˚ X Axis Bend Along Y**

Deform Z along Y

If you choose to deform only the Z axis, you'll see that when you bend your hot dog it will bow forward or arc its back.

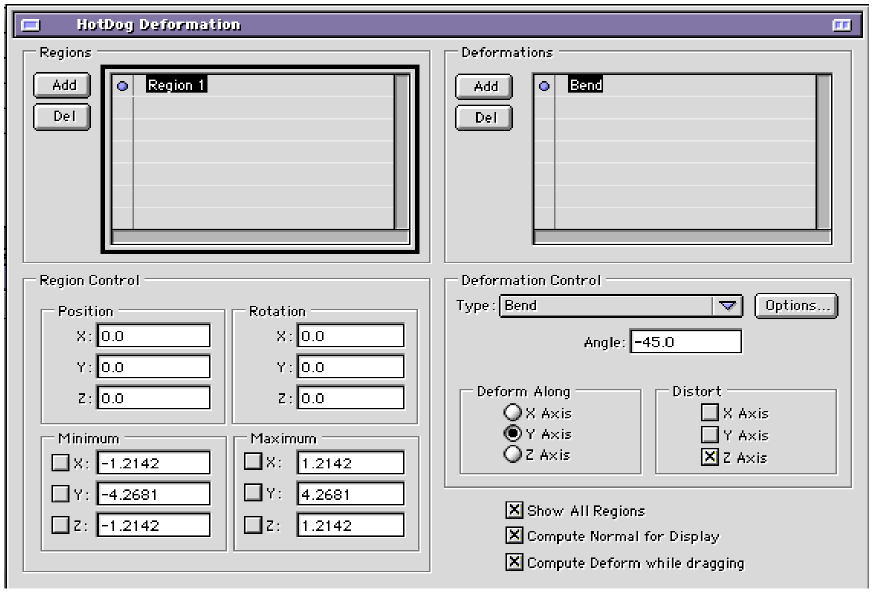


Figure 24.6 — **Y direction deformation along the Z axis**

This is because the deformation is moving the polygons toward either the positive or negative Z along the Z axis. Because we have a negative value for our Angle, the Hot Dog will bend towards negative Z, which is to the left when looking at the side view window.

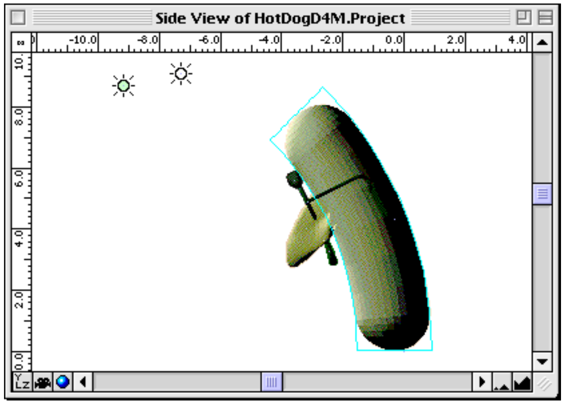


Figure 24.7 — **-45˚ Z Axis Bend Along Y**

Deform X and Z along Y

If you choose to deform in both X and Z axes (both check boxes selected,) then the hot dog will appear to bend in all directions, like forward to the right, backward to the left, etc.

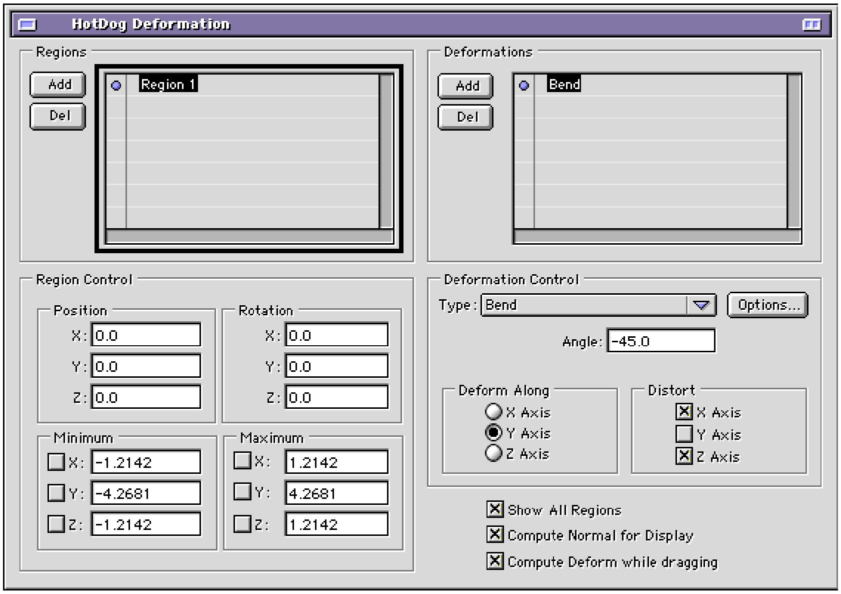


Figure 24.8 — **Y direction deformation along the X and Z axes**

The illustration entitled "-45° X and Z Axis Bend Along Y" show the Hot Dog bending to the forward left. This is because our X deformation is causing it to bend to the left along the positive X axis, and our Z deformation is causing it to bend forward along the negative Z axis.

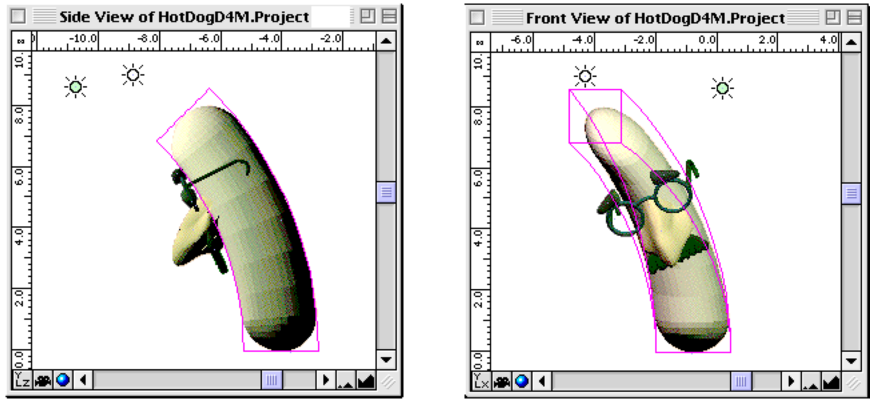


Figure 24.9 — **-45° X and Z Axis Bend Along Y**

Show Regions

As mentioned previously, regions are the extents within which actual deformations are applied to the group.

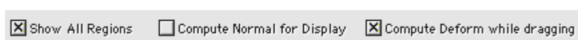


Figure 24.10 — **The Show Regions check boxes**

Show All Regions

By checking the All Regions box you can show every region not currently selected in the Region list (located in the upper right of the Group Deformation Window) as a cyan colored line. The difference with this cyan line vs. the faded purple line of the Ghost Region is that the cyan line of All

Regions actually deforms the extent box of the region to show just how much that region has deformed.

Comparing the Ghost region to All Regions gives you an idea of how complex things are, and is a good way of finding problems and solving them. If you have 3 or 4 deformations and want to know how deformed any of the other regions are, simply check the All Regions box and every deformation region will show up as a cyan line, with any deformation effects applied to the cyan extents box. This is also extremely helpful when you have different regions in different parts of a group and don't want your regions to overlap. By checking All Regions you can be sure that your new regions don't overlap and accidentally interfere with any previously placed regions.

Ghost Regions are shown as a faded purple box delineating the original extents of the deformation region. No matter how much you deform an object, the Ghost Region will always retain the original shape of the deformation region to show you the original position of the region.

Compute Normal for Display

This option causes the deformation engine to compute accurate normals for display in the World View windows. The overall effect is an improvement in the drawing quality. The cost is a performance penalty of three to one.

Compute Deformation while dragging

This option causes the deformation engine to calculate while you are dragging object in the scene. In highly complex scenes, you may wish to disable this feature to improve drawing performance and interactivity.

Region/Deformation Section

This section contains tools and lists for creating and managing regions and deformations. As mentioned previously, deformations are contained within a region that is assigned to a group. You can have as many regions as you like, and as many deformations within a region as you like.

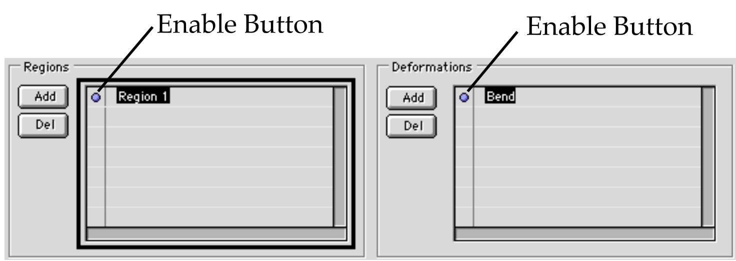


Figure 24.11 — **The Region/Deformation lists of the Deformation Window**

This section covers the following items:

- Region List
- Deformation List
- The Del Buttons
- The Add Buttons
- The Enable Buttons

The Region List

This is the area in which all your deformation regions are listed. They are order dependent, processing from top to bottom. You may drag any region up or down in this list to change the sequence in which a deformation is applied. It is sometimes necessary to adjust the order of regions (and/or their deformations) for very complex multi-deformation effects.

The Deformation List

This section lists all the different deformation types associated with a particular Region. You may change this setting via the Type pop-up menu. The currently selected deformation type for TheBend is Bend.

To Change the Deformation Type

Click on the Type pull-down menu (in the Deformation control section) and change the deformation type from Bend to Scale.

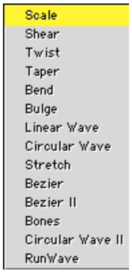


Figure 24.12 — **The Deformation Type popup menu**

Notice that the Deformation list has updated to show that you have changed the deformation type to Scale. You'll also note that the Angle box has changed its name to Scale%, which is the animateable value for a scale deformation.

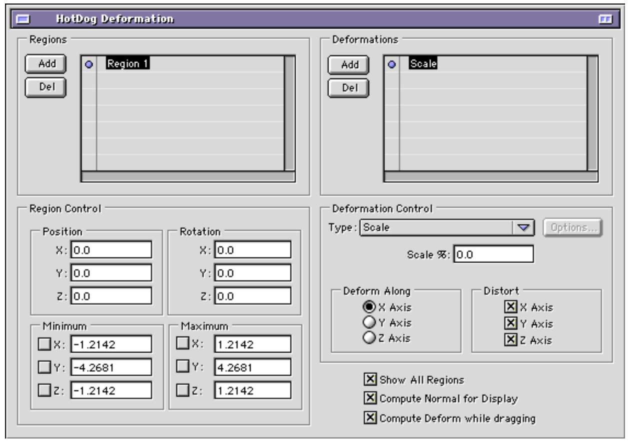


Figure 24.13 — **The Deformation window with the region set to Scale**

The Del Button

You can delete a region or deformation by highlighting it and pressing the Del button. Once something is deleted in this fashion, the information applied to the disposed region is lost. Immediately invoking the Undo command will restore the region/deformation and its information.

The New Buttons

Under both the Region list and the Deformation list you will see a button labelled New. Clicking this button will create a new region or deform, depending on which button is clicked. All new regions are created with Bulge deformations by default.

The Enable Buttons

The small blue buttons to the left of the Region and Deformation names can be used to turn off individual Regions or Deformations. This feature can be very useful as you build up complex deforms. Often it is easier to layer in a new deform with the existing deforms disabled.

To Rename a Region or Deformation

Regions or Deformations can be easily renamed. Both are renamed in exactly the same manner. To illustrate this we will now rename “Region 1” to something else.

1. Double-click on “Region 1” in the Region list box.

2. Type in “Hot Dog Bend” as a new name for the region.

The Deform Region is now renamed.

To Add a Region or Deformation

1. Click the New button under the Region list and name the new region Twister.

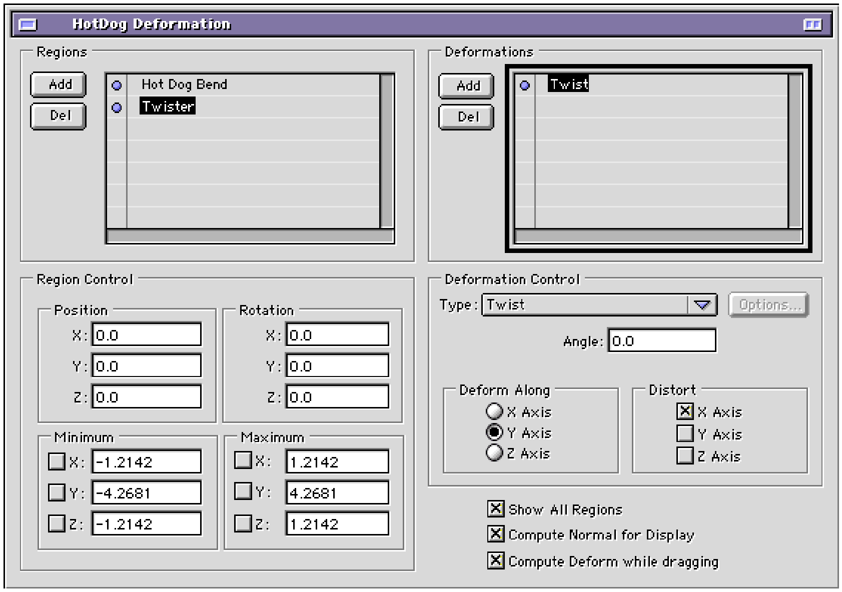


Figure 24.14 — **The Twister group is created**

Note that the default deformation type for the new Region is Bulge. Since we already have a Bend, let's make this a Twist deformation.

2. Make sure that the Twister region is highlighted in the Region list. Change the deformation region to Twist

The Region Section

This section gives you precise numerical control over regions, and the space that they occupy. You can use the edit boxes to adjust the area of the region, or to limit the effectiveness of a region.

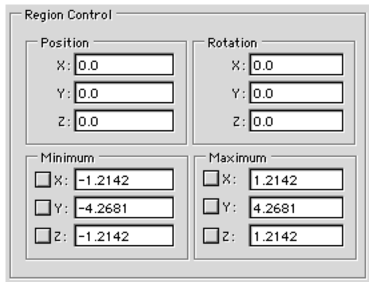


Figure 24.15 — **The Region section of the Deformation window**

The Region Section contains four separate items, each containing a space for X, Y, and Z values:

- Position
- Rotation
- Minimum
- Maximum

Position

These edit boxes allow you to set the position of the deformation region relative to the group it is applied to. This setting may be adjusted by any of three methods:

- Direct entering of numeric values
- Direct manipulation in the world view windows

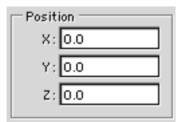


Figure 24.16 — **The Position edit boxes**

This setting is animateable over time. Each of the three coordinates is available, so the deformation region may be anywhere in world space. The default 0,0,0 positions the deformation region at the center point of the group it is applied to. All measurements are in world units, and are measured from the center point of the group being deformed.

Animating the Position of a Deformation Region

The ability to animate the position of the region is useful if you need a deformation to shift from one part of the group to another. Lets make our hot dog pass through a “distortion field.”

1. In the Region list, select the Twister region. In the Y Position box, type in a value of -10 (please note that the capsule created for this demonstration was 9 units long).

The Twist deformation has now shifted directly below the Hot Dog group.

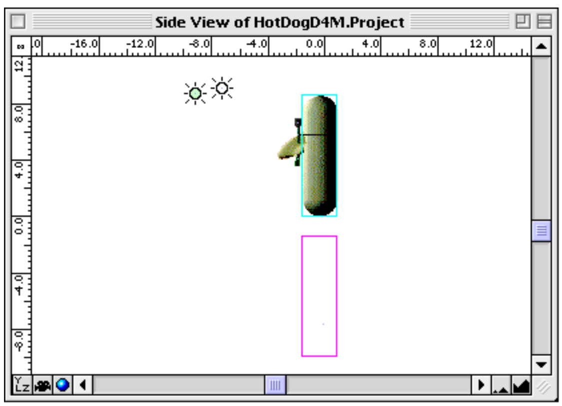


Figure 24.17 — **The Twister region directly below the Hot Dog**

2. Now we will create our “Distortion Field. Give the Twist deformation an angle of 90˚ along the Y axis. This will give the Twister region a 90˚ twist along the Y axis.

Keep an eye on the Hot Dog as you make your change. While there is no change in the shape of the Hot Dog itself, notice that it has turned to its left.

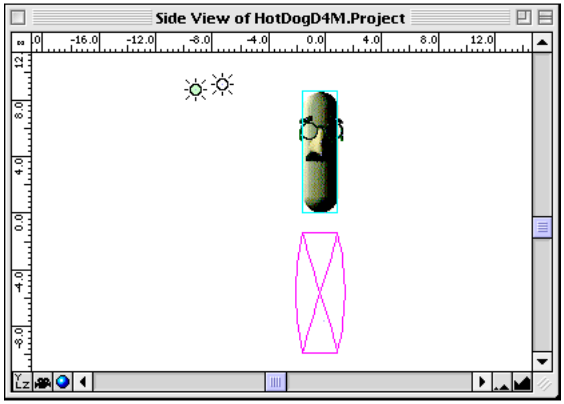


Figure 24.18 — **The Twister region at 90˚, with the Hot Dog turned to the left**

3. In the areas titled Minimum and Maximum, click and activate the check boxes next to the Y value. The Hot Dog group is now oriented correctly. (Why this worked will be explained in detail later in the chapter.)

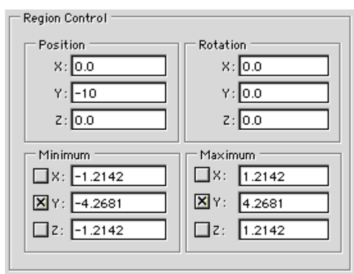


Figure 24.19 — **The Region section with the Y values checked**

Your Side View window should look like the following:

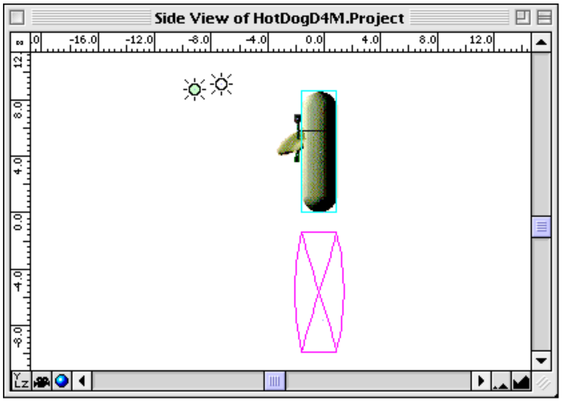


Figure 24.20 — **The correct Side view window**

4. Open your Project window, and move the time thumb to 1 second.

5. In the Deformation window, enter a value of 10 into the Y Position field for the Twister region. A keyframe is created in the Project window for the Hot Dog group.

The region is now directly above the Hot Dog group.

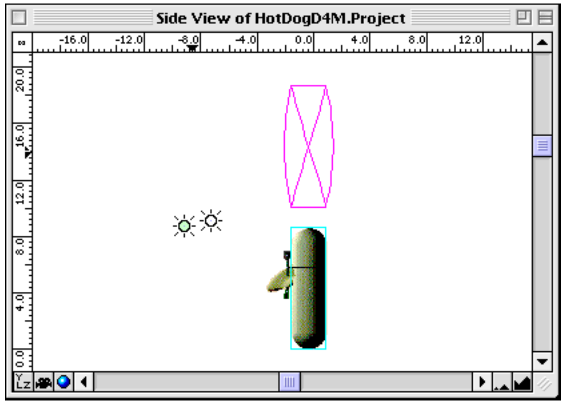


Figure 24.21 — **The deform region above the Hot Dog Group**

6. Again, it looks like nothing has happened to the Hot Dog. To see the effect of the steps we just performed, click the preview icon in the bottom left of the Camera View window to preview the animation.

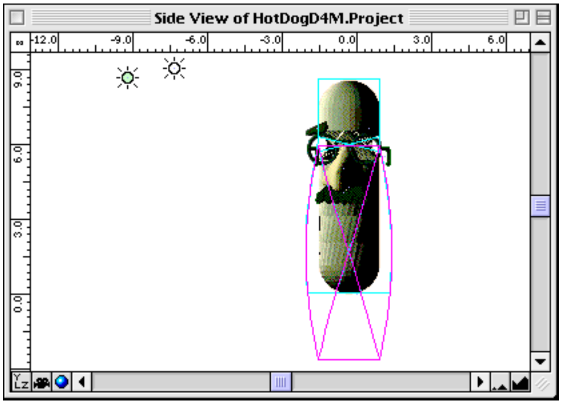


Figure 24.22 — **The group is deformed as the region passes through it**

As the deformation region changes it's position up the Y axis it applies its deformation to the Hot Dog group.

Rotation

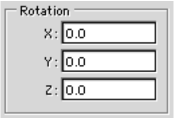


Figure 24.23 — **The Rotation boxes**

The Rotation section enables you to set the rotation value of a deformation region relative to the group to which it is applied to. This setting may be adjusted by any of three methods:

- Direct entering of numeric values
- Direct manipulation in the world view windows

Like Position, this setting is animateable over time. Each of the three rotation axes is available, so the deformation region may be rotated at any angle. All rotations are measured in degrees. Rotating the group to which a deformation region is applied does not affect these rotation values; they are only affected by direct rotation of the region itself.

Animating a Region's Rotation

The following exercise will show you how to animate the rotation values of a deformation region:

- Clear Rotation Values to 0.0
- Deform the X axis of TheBend along the Y axis using a value of 45˚
- Move the time thumb in the Project Window to 1 second
- In the Deformation Window, and enter the value 360 in the Y Rotation field.
- Preview your animation

Watch the Bend deformation rotate over time to produce a twirling effect, making our Hot Dog look like he's doing stretching exercises.

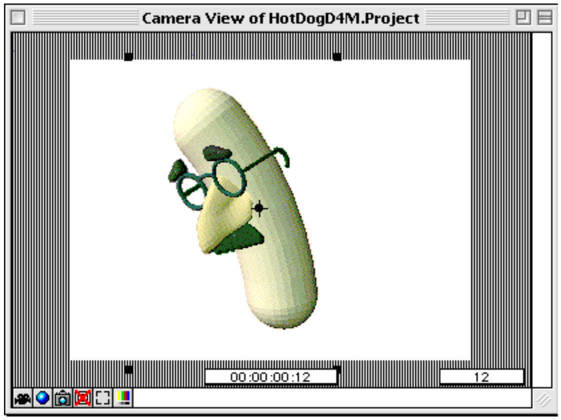


Figure 24.24 — **The Hot Dog is animated**

Rotation of regions also comes in handy when you want to bend an object in one direction, but when you apply the deformation it's bending from the other direction.

Let's say you wanted to bend our hot dog so that his bottom end moved instead of his top end, making him look like he's kicking instead of bowing. The following steps will demonstrate this technique to you:

- Clear Rotation Values to 0.0
- Rotate TheBend deformation region 180 degrees on the Z or X axis at time 0 (essentially flipping it upside-down)
- Deform the X axis of TheBend along the Y axis using a value of 45˚ (as before)
- Preview your animation

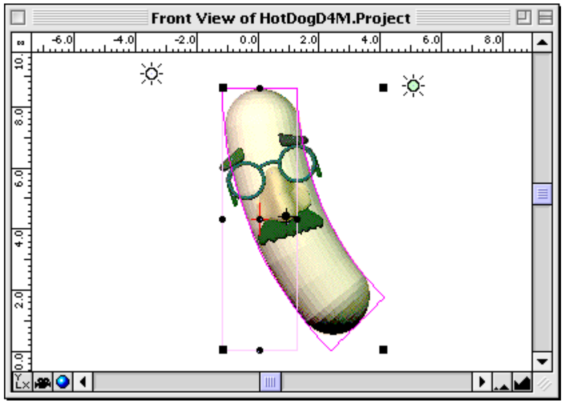


Figure 24.25 — **The deformation region rotated 180˚ on the X axis**

The deformation is now applied to the opposite end of the group. The bottom of the Hot Dog now flips around in a circle, like it's dancing.

Minimum & Maximum

Each region can have a limited range of effectiveness. The edit boxes in this section (along with their associated check boxes) will enable this control.

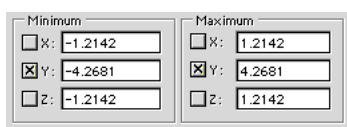


Figure 24.26 — **The Minimum and Maximum boxes**

The Minimum and Maximum boxes are for setting the size of the deformation region relative to the group they are applied to. The numbers that initially appear in these fields represent the extents size of the group the region is applied to. These setting may be adjusted by the following methods:

- Direct entering of numeric values
- By the up and down buttons located next to each value.

If you like, refer back to the exercise on Animating the Position of a Deformation Region. Remember when we put the 90˚ rotation on the deform region and the Hot Dog group rotated 90˚ to the left, even though it wasn't actually within the deform region? When we enabled the check-boxes next to the Y Minimum and Y Maximum fields, we limited the effect that the Deformation Region had on the geometry to the values contained in the check-boxes. In this instance, these values represented the Y extents of the Hot Dog group. As such, the deformation did not take place until the deform region actually entered the space occupied by the extents of the group.

Adjusting the Minimum and Maximum

The following exercise will demonstrate further the use of the Minimum and Maximum values.

- Activate the ghost region
- Set all region position and rotation values to 0.0
- Deform TheBend with an X axis Angle value of 0˚, along Y.
- Enter the value -1.4 in all the Minimum boxes and 1.9 in all the Maximum boxes

The region box changes size to reflect the new values entered.

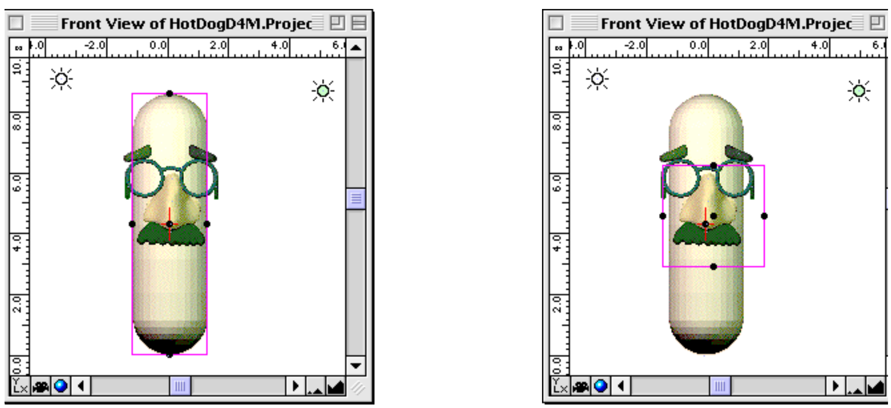


Figure 24.27 — **Before and After the Minimum and Maximum values are applied**

Bend the group to see the effects of limiting the effective range of the region:

- Select Bend in The Bend Region
- Enter an Angle value of 90˚

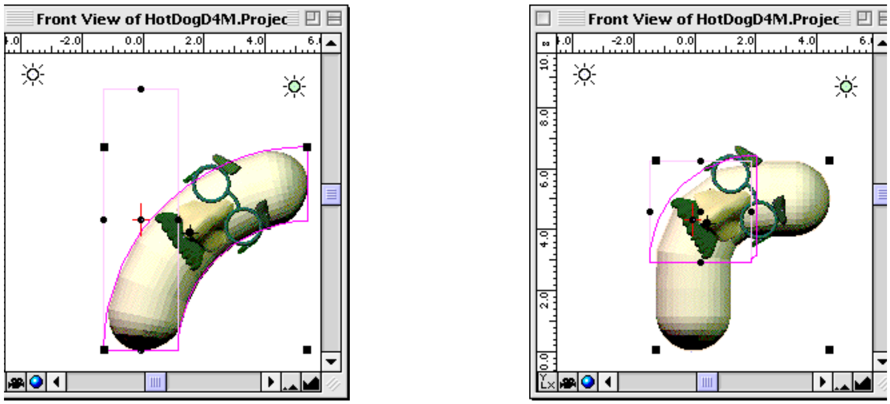


Figure 24.28 — **The 90˚bend with the full region and the newly defined region**

See how the Hot Dog now has a tighter bend with a smaller arc? Before we were calculating the bend along the whole length of the hot dog; now the bend only occurs within the area defined by the region.

Let's change the height of the Region along the Y axis:

- Increase the Y Maximum to 10

The deformation itself is still 90, but the range of the bend is expanding along the Y axis as the region itself expands along the Y axis.

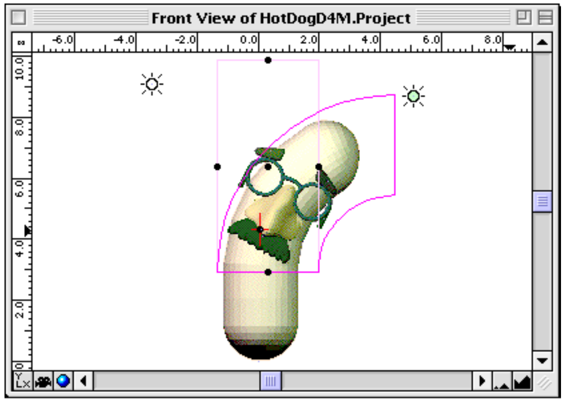


Figure 24.29 — **The 90˚bend expands as the Y deform area increases**

Let's see what happens when we reset the limits on the region:

- Set your Y Maximum back to 1.9
- Enable the check boxes next to Y Minimum and Y Maximum.

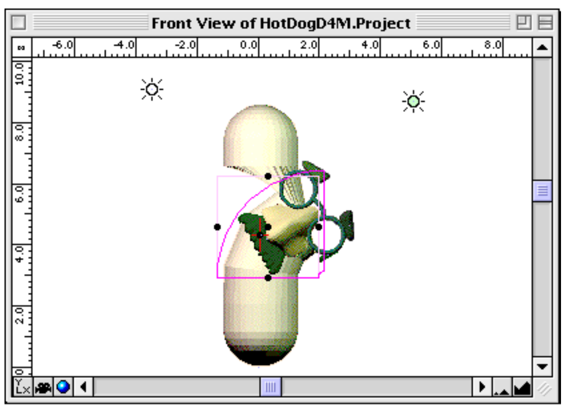


Figure 24.30 — **The 90˚bend with Y Minimum and Maximum off and on**

The hot dog is standing straight up except that the area directly within the bend region is all bent out of shape. What the check boxes did was tell the program not to include any polygons outside of the box to receive the effects of the bend. While this doesn't look so great in this example, you can easily see the difference that the Minimum and Maximum check-boxes make.

This feature is very useful if you need to have something deform in only in one part of a group while not affecting anything else in the group. This is extremely helpful for keeping different deformation regions from interfering with each other.

24.3 Types of Deformations

There are 14 different types of deformations in Animator. They are:

- Scale
- Shear
- Twist
- Taper
- Bend
- Bulge
- Linear Wave
- Circular Wave
- Stretch
- Bezier
- Bezier II
- Bones
- Circular Wave II
- Runwave

Below you will find a description of each type of deformation and an example illustrating its use. To duplicate these examples make your Deform Window settings the same as those provided in the example, creating and deleting Deformation Regions as necessary.

Scale

This type of deformation affects the scale of the group. The amount of scaling applied is measure in percentage. You do not need to determine what axis the deform is along in the Along Axis area since Scale affects all axes selected in the Deform Axis check boxes. To designate the axis or axes along which the Scale will occur, click the appropriate check box in the Deform Axis area.

There are no options available for the Scale deformation type.

Below is an example of a scale deformation applied to the X and Z axes of the hot dog and limited with the Minimum and Maximum settings.

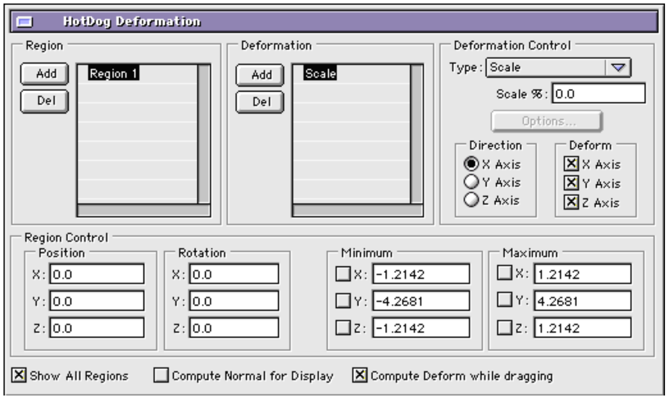


Figure 24.31 — **The Scale deformation**

Shear

This deformation will Shear (or offset) a group along an the axis defined in the Deform Axis check boxes. You may choose to shear a group along any axis by selecting that axis in the Along Axis area.

Shearing can best be described as slanting an object in a particular direction. This slanting is more defined and uniform than the Bend deformation, resulting in a harsher effect than bending gives.

There are no options for the Shear deformation that can be accessed via the Options button.

Here is an example of a Shear deformation applied to the Hot Dog.

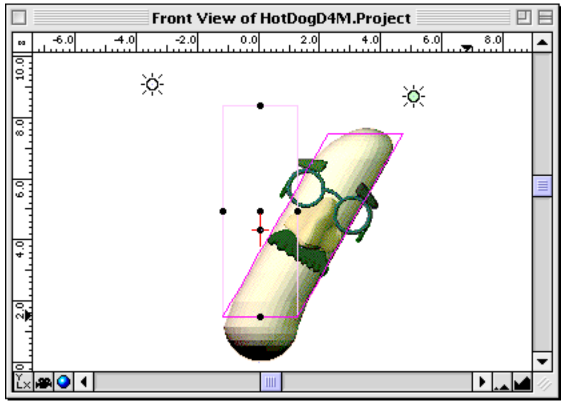


Figure 24.32 — **The Shear deformation set to 30˚**

Twist

The Twist deformation allows, as its name would suggest, for the twisting of a group. Twisting can best be defined as rotation along a defined axis where one end of the deformation region rotates clockwise and the opposite end rotates counterclockwise. The amount of deformation is determined by the degree value in the Angle box.

There are no option available for twist deformations.

Twists are generally set up to affect both axes that are not used to calculate the deformation. For example, if you calculate a twist along the Y axis, it can be used to deform either the X, the Z or both the X & Z axes. Experiment with setting Deform Axis to either one or the other remaining axes of a deformation to see the varying possible results.

Note: Since our Hot Dog group is essentially a long, skinny, Y-oriented object, we will use another object to better illustrate the Twist deformation. Simply turn off visibility for the Hot Dog group and enable visibility for the Box group.

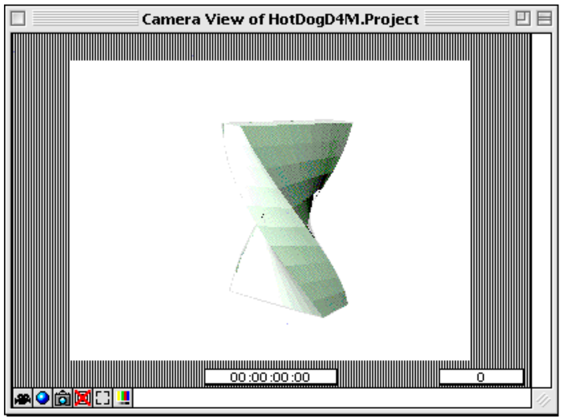


Figure 24.33 — **The Twist deformation**

Taper

The Taper deformation allows a group to be tapered. Tapering can be described as reducing or increasing the dimensions of an object on one end of the deformation region. This dimension change can occur along one or two axes. The amount of tapering is determined by the value in the Percentage field.

If the value in the Percentage field is -100%, the group will Taper to a flat edge along whichever Deform Axis is not selected. The group will taper to a point if the Deform Axis check boxes indicate that two axes are selected.

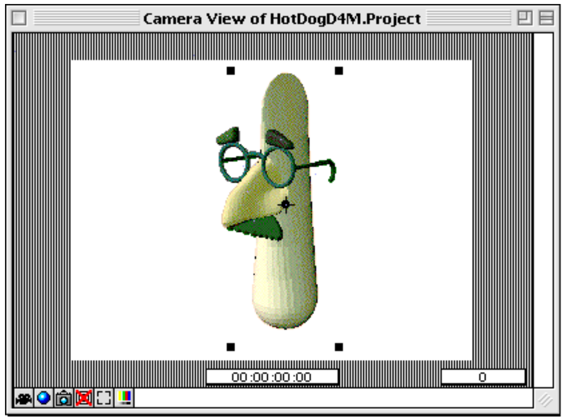


Figure 24.34 — **-100% X axis Taper deformation**

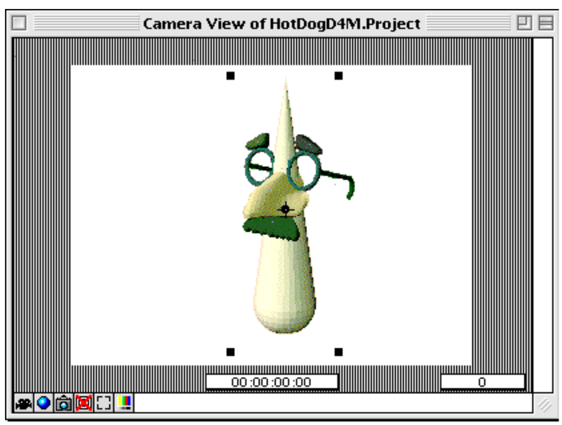


Figure 24.35 — **-100% X and Y axis Taper deformation**

If the value in the Percentage field is 100%, the group will double in size on the end of the deformation region effected.

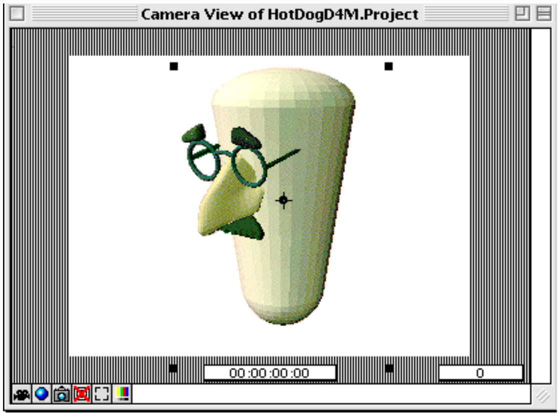


Figure 24.36 — **100% X and Y axis Taper deformation**

Taper Options

The Taper deformation has a Fillet Taper option, which is accessible through the Options button in the Group Deformation window. The Fillet Taper option may be applied to either the beginning, the end or both ends of the region.

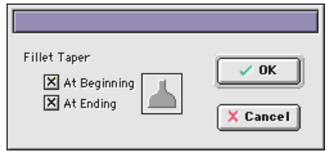


Figure 24.37 — **The Taper options window**

Filleting a taper causes a smooth transition between the taper deformation and the unaffected polygons. This can be seen if the deformation region is reduced to be smaller than the size of the group as a whole. Without Fillet Taper enabled, the edges of the deformation region (where the deformation begins to effect the group,) will appear to have hard, clean edge. With Fillet Taper enabled this edge is rounded and has a softer transition from the area not deformed into the area being deformed.

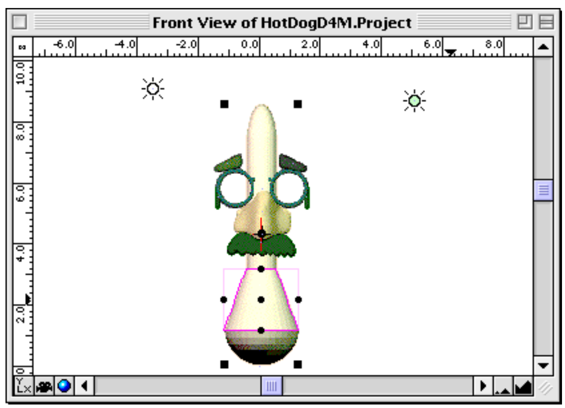


Figure 24.38 — **Front view of a Taper with no Fillet options selected**

Note the hard edges at the boundaries of the taper region. If this is objectionable, activating the “At Beginning” option can remedy this.

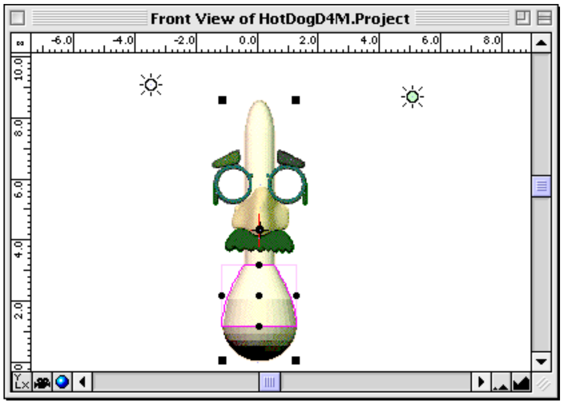


Figure 24.39 — **Front view of a Taper with beginning Fillet options selected**

At Beginning causes the deformation to be blended into the surrounding polygons, changing the shape dramatically.

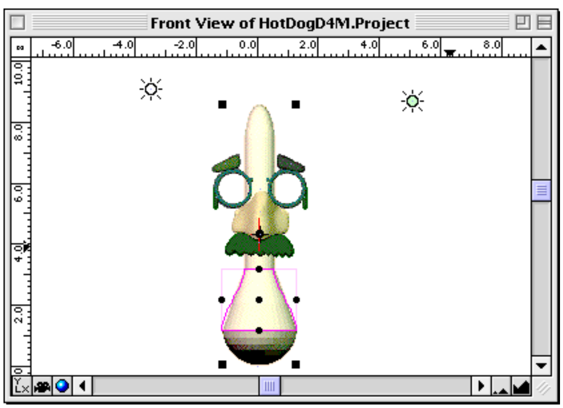


Figure 24.40 — **Front view of a Taper with beginning and ending Fillet options**

With both the At Beginning and At End options selected, we see a smooth transition into the deformation at both ends.

Bend

The bend deformation is used to bend a group. The bend occurs along the axis set in the Along Axis check boxes and deforms in the direction as determined in the Deform Axis check boxes. The deformation amount corresponds with the value in the Angle field.

The bend deformation has a Bend from Center option available via the Options button.

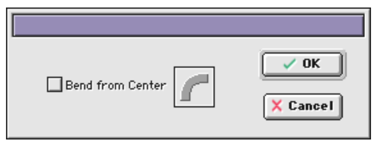


Figure 24.41 — **The Bend Options dialog**

Selecting this option changes the center radii of the bend arc from the edge of the deformation group and places it at the midpoint of the deformation region.

If you apply the Bend from Center option to a Y axis bend deformation, both ends of the hot dog will bend away from center, rather than having one end “locked down” while the other bends away.

Front View of a 90 degree Bend deformation with Bend from Center disabled.

Note how only one end bends away from the group's center line...

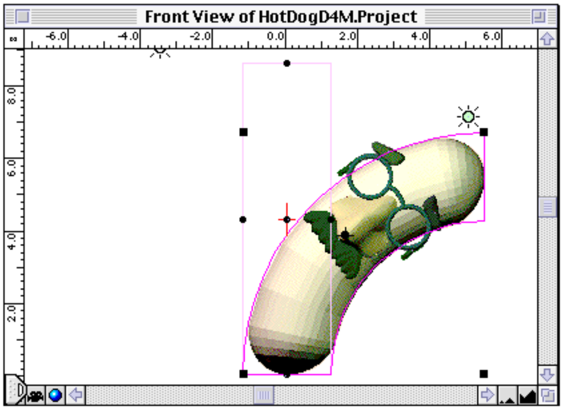


Figure 24.42 — **Bend from Center Disabled (default setting)**

Front View of a 90 degree Bend deformation with Bend from Center enabled. Note how both ends bend away from the group's center line...

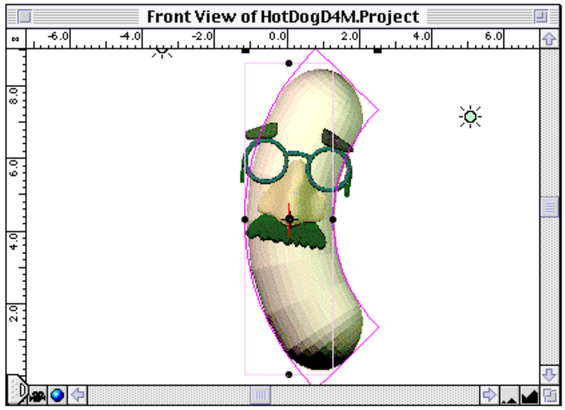


Figure 24.43 — **Bend from Center Enabled**

If a Bend deformation is used in tandem with other types of deformations, and these different deformation regions overlap, it is best to place the bend deformation region last in the Region list, so as to apply the Bend deformation to the other deformations in the list. this will help to avoid some unwanted or unpredictable results that may occur if vertices that are to be deformed by another region if they are bent first.

Bulge

The bulge deformation allows a group to have it's dimensions increased or decreased on two axes from the center of the Bulge deformation region. The amount of dimension deformation is correspondent to the Bulge% value. A positive Bulge% value will expand the groups dimensions away from the center of the bulge region, whereas a negative Bulge% value will draw the dimensions of the group inward toward the center of the bulge region.

If you set the Bulge% value to 75, our hot dog will look like a fat knock-wurst. If you set the Bulge% value to -75, the hot dog will look more like a smoothly rounded hourglass. Bulge deformation with a Bulge% value of 75. Notice how the vertices are “pushed out” from the center of the region.

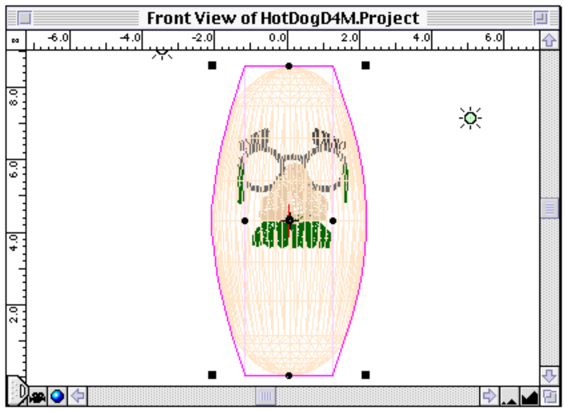


Figure 24.44 — **Bulge Out 75%**

Bulge deformation with a Bulge% value of -75. See how the vertices are “pulled in” toward the center of the region.

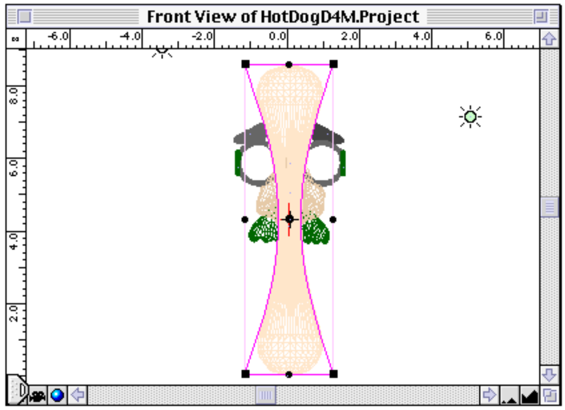


Figure 24.45 — **Bulge in, -75%**

The bulge deformation has a Filleted Bulge option available via the Options button. Similar to the Fillet Taper, the Filleted Bulge allows the edges of the deformation region to be made rounded, rather than the default hard edge when this option is disabled. Unlike the Fillet Taper, however, the Filleted Bulge has no setting for filleting the beginning or end of the region. this is because the Bulge deformation has no beginning nor end, but effects the group from the center of the region.

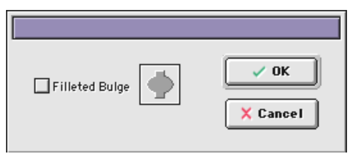


Figure 24.46 — **Bulge Option Dialog**

A Bulge region with Filleted Bulge option enabled. Note how the deformation eases in and is rounded.

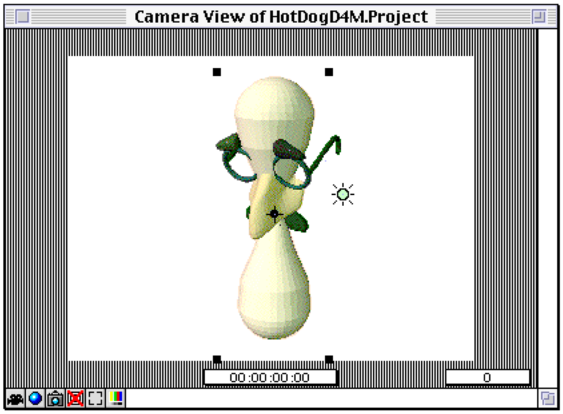


Figure 24.47 — **Filleted Bulge Option Enabled**

Linear Wave

The Linear Wave deformation deforms the vertices of the group along a sine wave that passes along the axis delineated in the Along Axis radial button settings. The crest and trough of the Linear Wave are deformed in the direction delineated in the Deform Axis check boxes. The degree of deformation corresponds to the setting in the Amplitude field. The higher the Amplitude, the more “wavy” the deformation. The lower the Amplitude, the less “wavy” the deformation. The Amplitude is a measurement of world units. If the Amplitude value is set to 1, then the linear wave crest deformation will offset the centerline of the Along Axis by 1 unit in the direction of the Deform Axis setting. The example below is of a Linear Wave deformation calculated along the Y axis and deforming the X axis, to an amplitude value of 1. Note how the center point of the along axis (in this case, the Y axis) is offset by 1 unit, as shown in the ruler ticks.

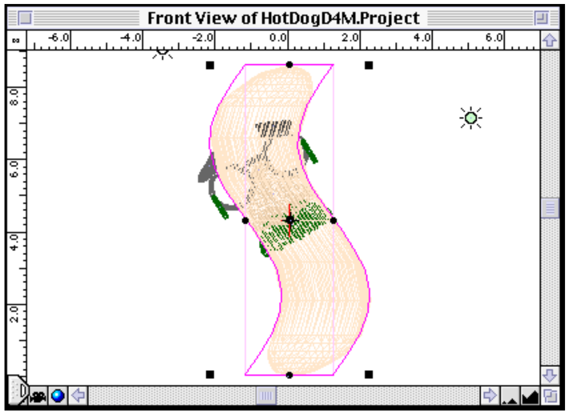


Figure 24.48 — **Linear Wave Deformation**

If you're having difficulty understanding the Linear Wave, think of an ocean. The waves of an ocean are traveling along an axis. If the ocean is like any other body of water, the waves travel in a horizontal direction. This would mean they are Along the X axis (the horizontal axis). Now, the high part of an ocean wave is called it's crest. The low part of a wave is called it's trough. The waves of an ocean go up and down as they travel horizontally. This would mean that the ocean waves are deforming the water's Y axis (hence the up and down of the wave). If the waves of an ocean traveled horizontally (along the X axis) but deformed side to side (deforming the Z axis instead of the Y axis,) then the waves of the ocean would wiggle like a snake instead of going up and down. If you want higher wave crests and lower wave troughs, you need to increase the Amplitude.

The Linear Wave deformation has a Phase and a sin curve selector option available via the Options button. To choose a simple sine wave, select the radial button next to Sin. This is the default. To select a Cosine wave, select the radial button next to the 1- Cos. A cosine wave will have two crests to the sine wave's one.

The Phase option allows you to choose where along the sine wave you wish the deformation to start. Every sine wave has a phase value. The default value for the beginning of a wave is 0. As you travel along the length of the wave, the phase value increases or decreases, depending on the direction you travel. If you travel along a sine wave to the right, the phase value increases. If you travel along a sine wave to the left, the phase value decreases. Phase is the measurement of where you are along the length of the wave. If you need your Linear Wave deformation to begin it's deformation at some point other than the 0 point of the wave, you can change the value in the Phase field of the Options dialog. The line drawing of the curve will update to reflect the value you have entered. Look at the examples below to see the differences that can be achieved via a change in the Phase value. Note the curve feedback in the Options dialog, and how that variance affects the group deformation. This area is one where exploration and experimentation is best tried.

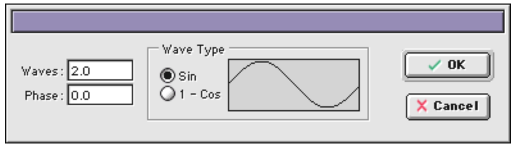


Figure 24.49 — **Linear Wave Option Dialog**

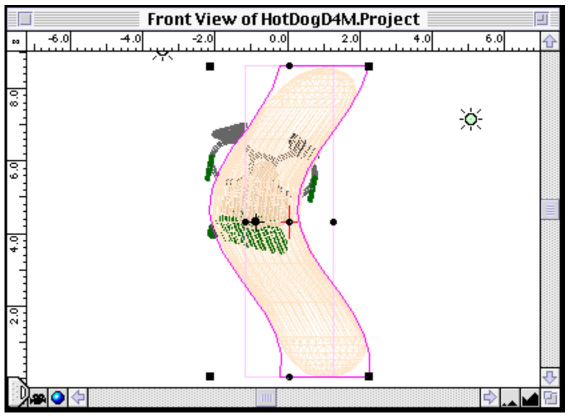


Figure 24.50 — **Phase set to 75**

By animating the Phase value over time you can achieve interesting results, and with some work can animate convincing seaweed flowing in ocean currents, by adjusting nothing more than the Phase value over time.

If you want more than the 2 waves given by the sin or cosine wave, you can adjust the Waves field value in the Options dialog to suit your tastes.

Circular Wave

This deformation type allows you to create waves or ripples similar to those found when a stone is thrown into a pond. The waves move outward from the center of the region in a circular pattern. The amplitude (e.g.: crest and trough) of the wave move along the Deform Axis, as set in the Deform Axis check boxes. The height of the wave, or intensity of amplitude, are determined by the actual height of the circular wave deformation region in the axis determined as the Along Axis. Below is an example of how the region height affects the wave height...

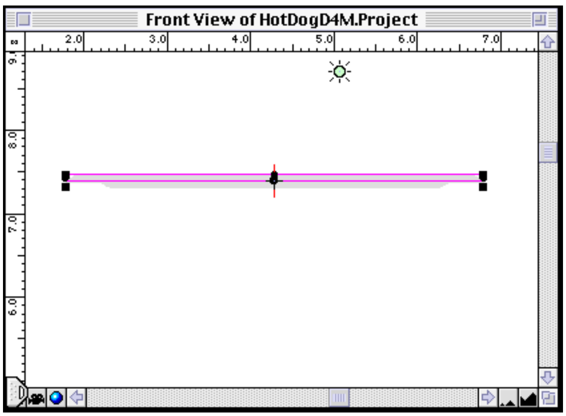


Figure 24.51 — **Wave Height is Dependent upon Height of Deformation Region**

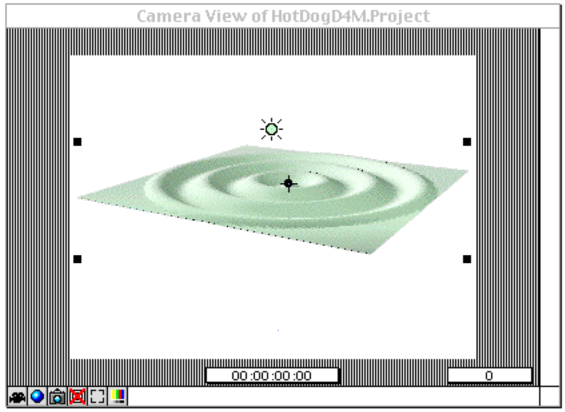


Figure 24.52 — **Camera View with same settings as previous figure**

In other words, if your Deform Axis is X, the waves will move outward horizontally. If the Deform Axis is set to Z, the same will occur, since these waves are circular and move in all directions on these two axes. If your Along Axis is Y, the waves will act like ocean waves/pond ripples and will have the appearance of having height. To adjust this height, adjust the actual height of the deformation region.

Here is a close up of the deformation region. Note the relation between wave height and the height of the deformation region....

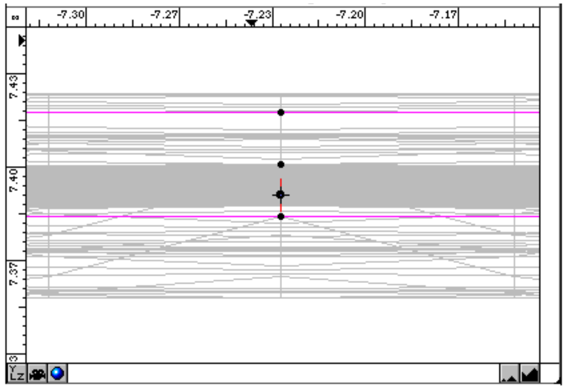


Figure 24.53 — **Close-up of Circular Wave Region**

To determine how much of the group is influenced by the circular wave's deformation region, you may change the value in the Outer Radius field. The Outer Radius is a measurement of percentage of coverage. A setting of 100 will allow 100% of the region to influence the group. A setting of 50 will only allow half of the region to influence the groups deformation. This setting may be animateable over time to produce a rippling effect. An object may start with an Outer Radius of 0, which will not allow any of the region to deform the group. By setting the Outer Radius to 100 at a later time, the impression of a stone being thrown into a still pond may be achieved, with expanding concentric waves resulting.

The circular wave deformation has a number of Rings option available via the Options button. To increase the number of waves, simply change the value in this dialog. This value may be animated over time to produce expanding rings effects.

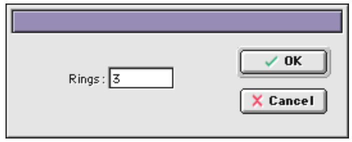


Figure 24.54 — **Circular Wave Options Dialog**

You may also combine several Circular Wave deformation regions to achieve even more interesting wave effects. For the random wave pattern found in a pool on a breezy day, you may add a number of regions of varying size, outer diameter and wave height settings. Also, rain drops falling onto a puddle may be achieved by adding many smaller regions to the puddle group, and animating the regions outer diameter, as well as it's wave height to give the impression of small, short rippling effects common to rain drops. Combined with proper water material properties, this effect can be stunning. Here is an example of how combining several Circular Wave deformation groups can be applied...

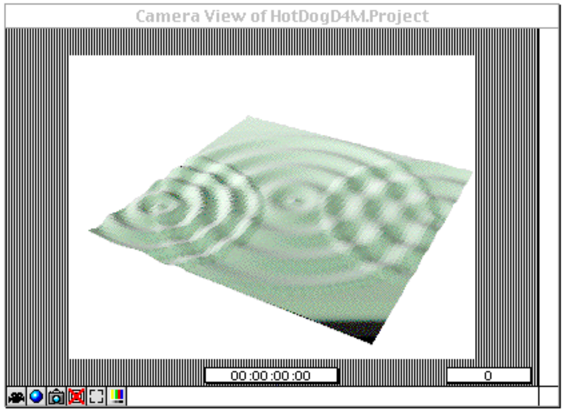


Figure 24.55 — **Multiple Circular Wave Deforms**

Stretch

The stretch deformation allows you to grab a region of vertices and pull, move, rotate or scale them in any direction while remaining attached to the remaining unselected vertices of the group outside of the stretch region. The Stretch deformation is best used when the deformation region is smaller than the entire group. If the entire group lies within the region of the Stretch deformation, nothing will appear to happen when the Stretch region is moved, rotated, etc. except that the whole group moves. To grab this section of vertices, you must “capture” them. To capture the vertices for deformation, you must access the Capture Vertexes button via the Options button. When your region of desired deformation is set, you must click the Capture Vertexes button to enable deforming the object.

Think of your group as a piece of taffy. Now, holding this taffy in your hand, grab one end of it with your fingers. Now, pull that section away from the rest of the taffy glob. It remains attached, but deformed. It is stretched. This is basically how the stretch deformation works. You define how much “taffy” (e.g.: vertices) your grab by the size of the deformation region. You close your fingers around the taffy you wish to pull by capturing the vertices (e.g.: Capture Vertexes) and you pull by moving the deformation region with your mouse, or by entering values in the position or rotation fields.

The best way to understand the Stretch deformation is to see it in action. Follow this example:

- Add a new region to the list
- Choose the Stretch Deformation type
- Activate the Ghost Region
- Adjust the deformation region at the bottom of the group only
- Choose the Options button
- Select the Capture Vertexes button (this tells the computer that you ware ready to start pulling this group into or out of shape.)
- Grab the region with your mouse and pull it as you see fit.

You may also rotate the region via the Rotation values for the region as found in the Group Deformation window

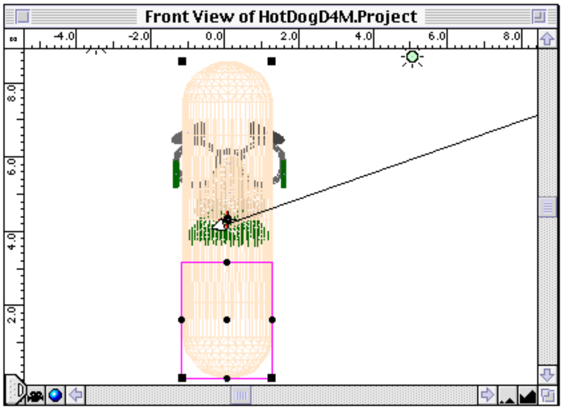
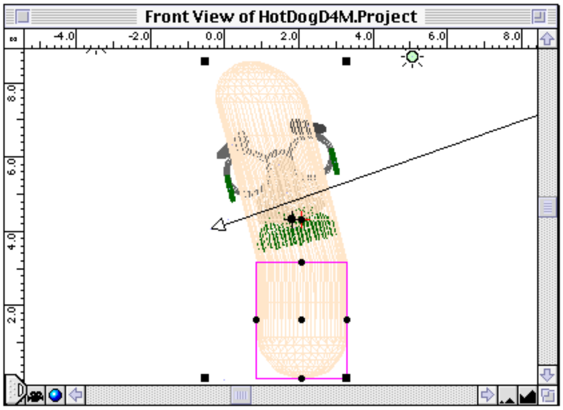


Figure 24.56 — **Stretch Deformation**

If the stretching seems too harsh or edgy, you may adjust the Blend Factor in the Options dialog. Increasing the Blend Factor reduces the harshness of the stretching. A higher Blend Factor will allow the stretch region to affect a wider area of vertices outside of the actual stretch deformation region.



Stretch with Blend Factor at 5

You may limit the stretching to affect only vertices along the X, Y or Z axes. This means that if you only enable the X axis, that no matter how hard you try to move the region on the Y axis, the region will not be allowed to move in that direction until you enable the Y axis in the Deform Axis check boxes. You'll also note that the Along Axis radial buttons are disabled. This is because the Stretch deformation doesn't calculate along an axis, but is determined by the size of the region of captured vertices, as well as the Blend Factor, regardless of axis. You may also pre-define your stretch region's position and animate it's Strength% over time to slowly deform your group without having to set keyframes for the position or rotation of the stretch region. Only adjust the Strength% over time. The result is similar to that of a magnet pulling the vertices out of shape over time.

Bezier

One of the most powerful tools for character animation within Animator is the Bezier deformation. A Bezier deformation allows for a very fluid deformation of the group by it's Along Axis and in the direction as determined by the Deform Axis check boxes. The main controls for the bezier deformation are its control arms and anchor points. The control arms behave in a manner very similar to bones, but have some pronounced differences from bones. Think of the control arms as puppeteering rods built inside of the group. By moving the puppeteering rods, you change the shape of the group. The control arms appear as indigo colored lines that run along the length of the Bezier region as defined in the Along Axis radial buttons. The control arms may be animated to produce the effect of bending, twisting, stretching, squashing and arcing the group as influenced by the control arm. The deformation occurs along the axis that the control arms are parallel to. To define which axis the control arms are parallel to, set this axis in the Along Axis radial buttons.

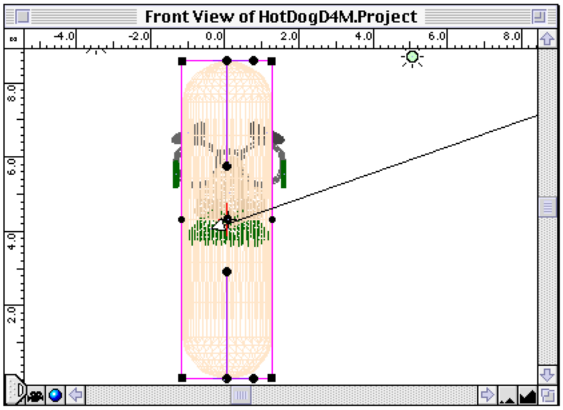


Figure 24.57 — **Along Axis set to Y**

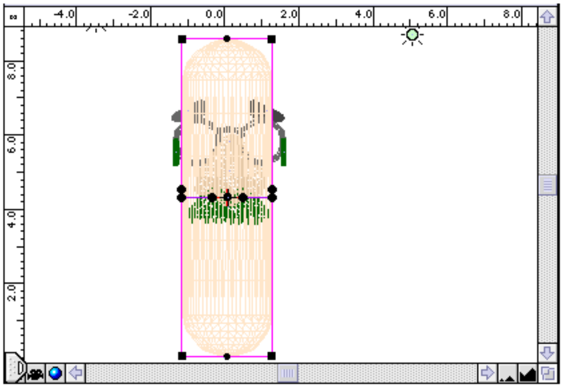


Figure 24.58 — **Along Axis set to the X**

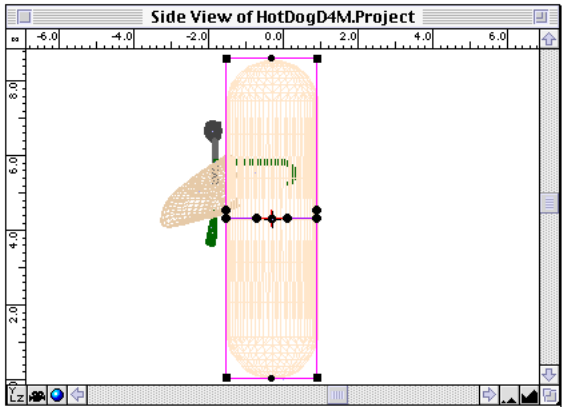


Figure 24.59 — **Along Axis set to the Z**

Each control arm has three controlling points on it. The Anchor point, the Control point and the Spin point. All three points may be animated separately by grabbing them and moving them with the mouse, or they may be moved as a group by grabbing the control arm itself and moving it. Grabbing the control arm itself and moving the Anchor, Control and Spin points all at once produces a result similar to that of the Stretch deformation.

The Anchor point is the black dot at the base of a control arm that is closest to the center of the deformation region. This is the center of rotation for the entire control arm. When the control arm is moved, it seems to pivot and rotate around this point.

The Control point is the black dot at the very end of the control arm and is located at the boundary of the Bezier region. To move the control arm but not affect the Anchor point, grab and move the Control point. This will deform the vertices as influenced within the region.

The Spin point is the point attached to a small spur control arm that emerges from the Control point and is perpendicular to the Control arm. The Spin point allows you to spin the top of the Bezier region for twisting the group. The center of rotation for the Spin point is the Control point, where the center of rotation for the Control point is the Anchor point. The Anchor point has no center of rotation and cannot be rotated. The Anchor point may be moved. Moving the Anchor point effects the rest of the control arm's effects of deformation.

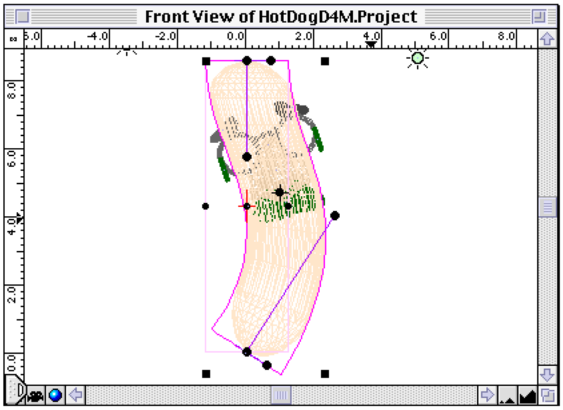


Figure 24.60 — **Moving the Control Point**

Moving the Control point only causes the group to deform along the curve produced between the two points. (Note that the curve is not actually drawn.) You can drag the control point to any position, as with any bezier spline.

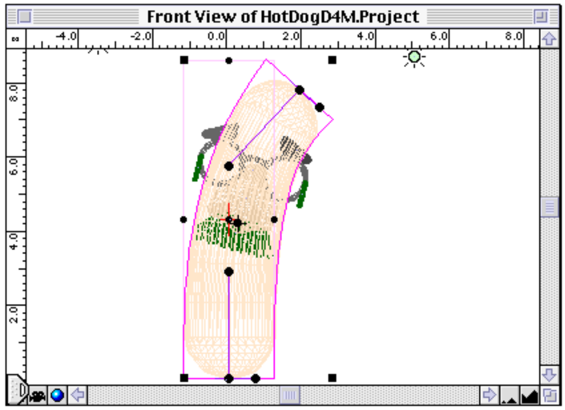


Figure 24.61 — **Moving the Anchor Point**

Moving the Anchor point is equivalent to changing the endpoints of the bezier spline. This is useful for making a character lead or "telegraph" the intended direction of travel (or perhaps for making a great Axl Rose impersonation!)

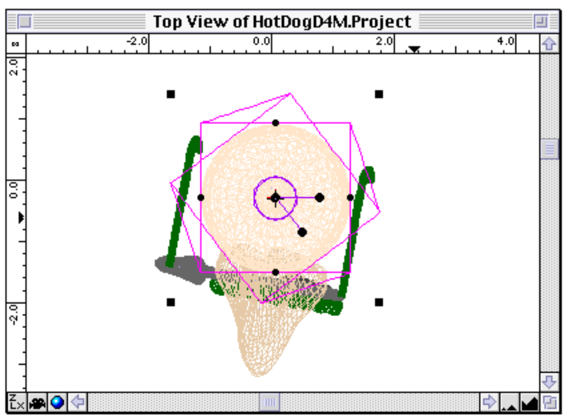


Figure 24.62 — **Moving the Spin Point**

Moving the spin point will twist the group along the spline direction, with the majority of the twist occurring at the location of the spin point.

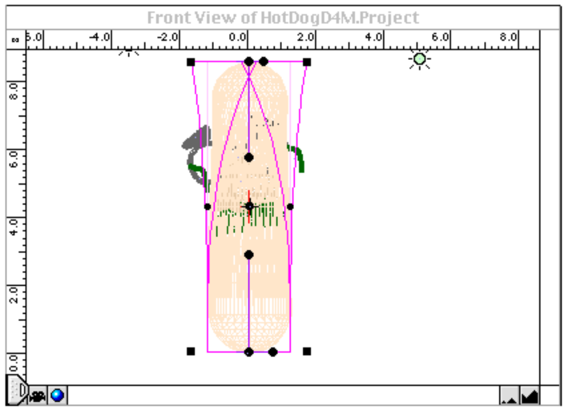


Figure 24.63 — **Spin Rotation from the Side**

The figure above shows the spin from another direction. Again, notice how the twist effect is more pronounced around the spin control point.

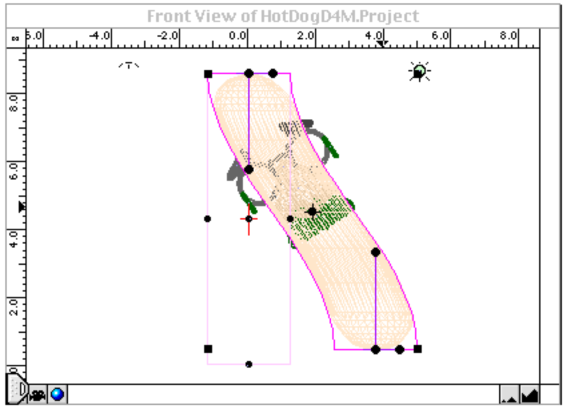


Figure 24.64 — **Dragging the Control Arm**

You can also just drag the entire control arm, which will offset the end-point, keeping the trajectory of the control arm intact. In the example above, the shape is starting to deform back to it's original orientation.

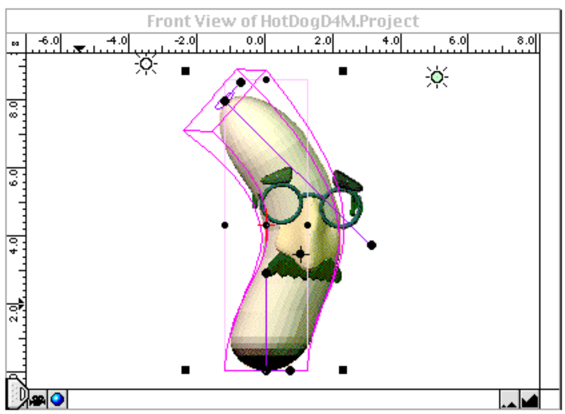


Figure 24.65 — **Bending and Twisting a Bezier**

Bezier deformations, used in tandem with each other, can produce powerfully flexible deformations. One can animate the fingers of a hand with a combination of Bezier deformation regions. One important tip to keep in mind when combining more than one Bezier region on a group is to limit the influence of the region's deformation. This is done via the check boxes next to the Maximum and Minimum fields in the lower right of the Group Deformation window.

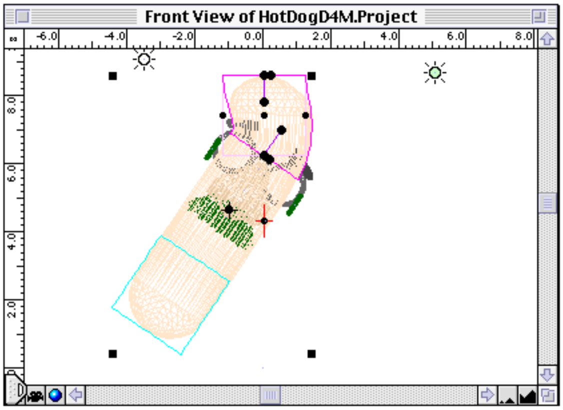


Figure 24.66 — **Limited Bezier Region and it's effects**

Like any deformation, you can have multiple bezier deformations on a group. When doing so, it is best to assign a new region, so you can change the focus area of the bezier effect, as shown in the illustration, "Limited Bezier Region and it's effects" on page 663.

The hot dog has two bezier regions on it. You'll note that when the lower-most Control point of the upper region is moved, it moves the whole bottom of the group. This may or may not be desirable.

You can limit the influence of that region by checking it's Y Minimum limit box, and thus limit the influence of this region to only those vertices with a Y position value greater than the Minimum Y as set in the field.

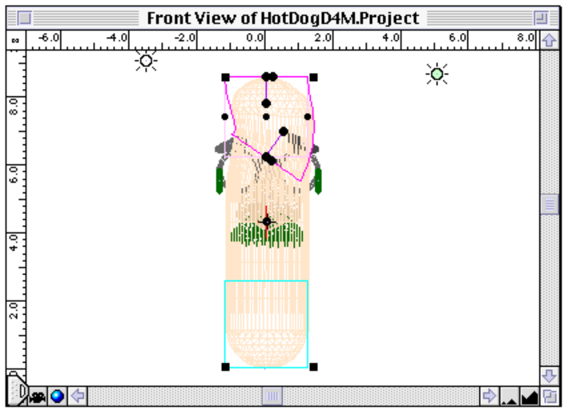


Figure 24.67 — **Limited Region Bezier Deformations**

Now the lower bezier region's upper Control point is moved. Note the very unpleasant deformation results (illustration on page 665). This looks pretty ugly. That's because the upper deformation region has already had it's deforming effects applied. By deforming the lower region, we magnify, or multiply in combination that effect, so that what we see is the result of the two regions affecting the same vertices twice.

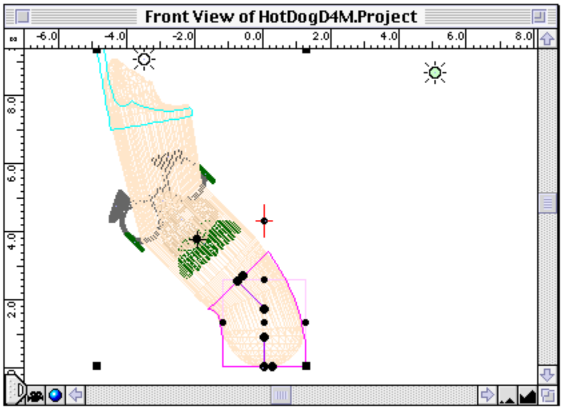


Figure 24.68 — **Problem associated with limiting Y Minimum**

This can be corrected by limiting this region's Y Maximum influence. Do this by checking the check box next to the Y Maximum field in the Group Deformation window.

Observe how the deformations Maximum Y influence is constrained to those vertices within the actual Bezier region itself in the following illustration. The undesirable kink can be removed by insuring the regions are close but not overlapping.

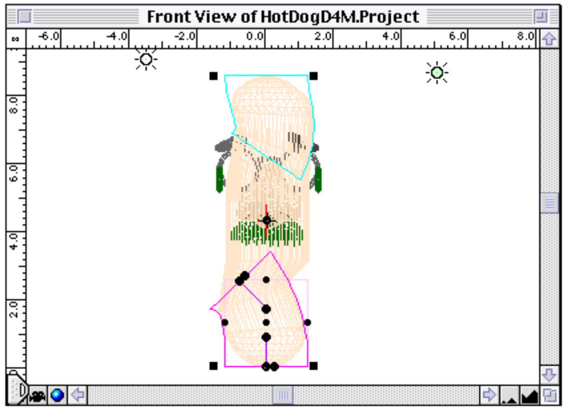


Figure 24.69 — **Not Perfect, but Getting There (Min and Max limited)**

If you need to have greater control over the location of your Anchor, Control or Spin points, you may obtain their location, relative to the group's object space, by clicking the Options button. In the dialog you will see fields for entering numeric values to adjust the positions of these points. This dialog is especially helpful for duplicating point positions. If you need to return an Anchor, Control or Spin point to a previously keyframed position, you can obtain that location information in this Options window for later reference. Also in the Options dialog you will note a Reset Points button. Clicking this button will reset all the Anchor, Control and Spin points to their default position relative to the deformation region. This is helpful if your deformation gets out of hand or you need to return to the default position after animating a deformation.

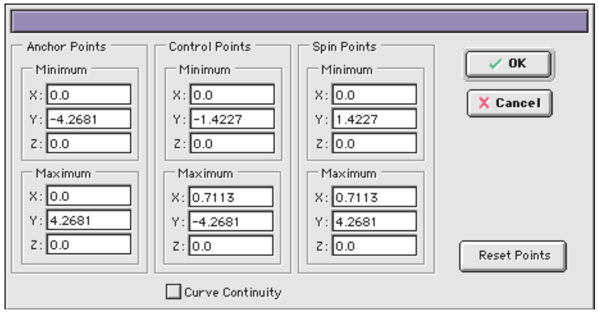


Figure 24.70 — **Bezier Options Dialog**

Also within the Options dialog you will see a check box marked Curve Continuity. This is useful for overriding the default results of the Bezier deformation. By default, when a group is deformed using a Bezier deformation, pinching is minimized. However, you may have undesired results because the continuity, or the continuing, of the curve of the group's vertices as they cross the bezier region boundaries may not be smooth.

The illustration "Bezier example without continuity applied"is an indication that the Curve Continuity option for a Bezier region is necessary.

The hot dog is not maintaining it's volume as it deforms, violating one of the primary laws of squash and stretch, a common cartoon technique. To remedy this, activate the Curve Continuity option in the dialog.

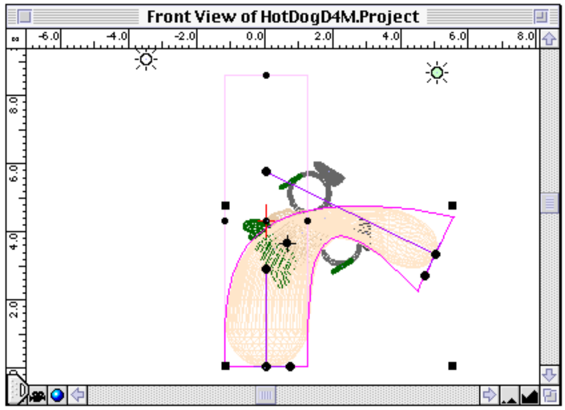


Figure 24.71 — **Bezier example without continuity applied**

Similar to the Stretch deformation, you may preset the amount of bezier deformation and simply animate it's Strength% over time to give a very complex magnet effect.

Bezier II

Bezier II behaves in every way similar to the Bezier deformation, but allows greater flexibility in the ability to add extra control arms on the interior of the deformation region. Up to four control arms may be had with a Bezier II deformation type. The Bezier II deformation deforms exactly the way a Bezier deformation does relative to the Deform Axis and Along Axis settings.

In the following illustration, note how the control arms are arranged within the boundaries of the Bezier II region.

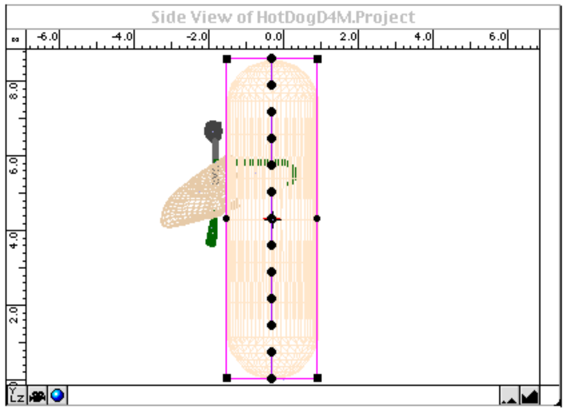


Figure 24.72 — **Bezier II default condition**

To determine the number of control arms a Bezier II deformation may have, you must access the control arm dialog via the Options button. You may also turn off the visibility of the Anchor, Control and Spin points of each of the control arms. In the Options dialog you may also select what type of curve you wish to use. By clicking the left curve type, it is similar to selecting a non-continuous curve. By selecting the right curve type it is similar to selecting a Continuous curve in bezier deformations. The text below the curve types will update to give information about the choice of curve you have made. Also, the Bezier II Options dialog has a Reset Curve button. This behaves in a similar way to the Reset Points button in the Bezier deformation options dialog. This will set all the Anchor, Control & Spin points for all control arms to their default position.

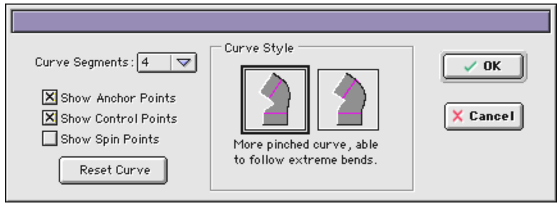


Figure 24.73 — **Bezier II Options Dialog**

Like the Bezier deformation you may move any or all of the Anchor, Control or Spin points of each control arm. Again, either by individually selecting and moving each point or by grabbing the control arm as a whole. Since we covered how the end control arms work within the section discussing the Bezier deformation, let us take a closer look at the interior control arms of the Bezier II deformation.

The interior control arms acts more as "rockers", while the end most control arms behave like puppeteering rods similar to the way they behave in the Bezier deformation type. The interior control arms each have two Control points to their one Anchor point. This allows them to "rock" back and forth, with their center of rotation being the center Anchor point of the control arm.

Note in this illustration how this combination of "rocking" the interior control arms can produce a complex "wavy effect."

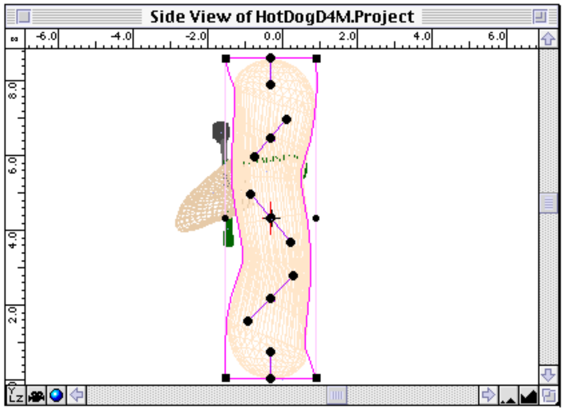


Figure 24.74 — **Tilted Control Arms**

In the following illustration, observe how you can move the Anchor and Control points for each interior control arm by dragging the Anchor points. The relation of the Control and Anchor points to one another remains the same, however the relation of the interior control arms to the group changes. This technique is very powerful for complex muscle movements and internal shape distortions commonly found in character animation.

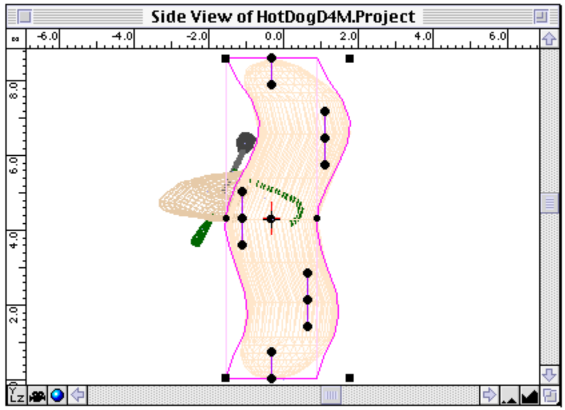


Figure 24.75 — **Offset Control Arms**

By combining moving the Anchor points and adjusting the Control points for each interior control arm, you can achieve very complex deformation effects.

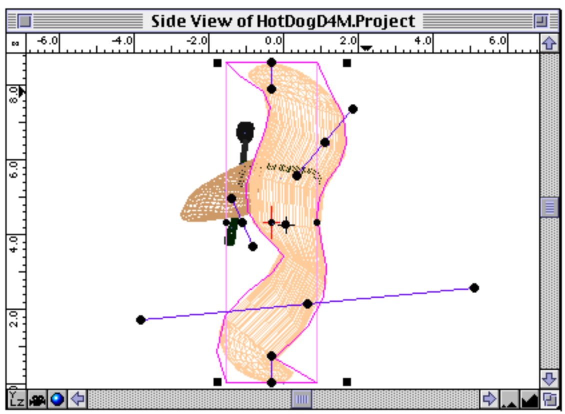


Figure 24.76 — **Hoo, Baby, I Like it Like That!**

Again, as with regular Bezier deformations, you may use a series of Bezier II deformations in tandem on a single group to achieve even more complex deformations. Remember to use the limit influence check boxes next to the Minimum and Maximum fields to keep these multiple regions under control. However, there comes a point of diminishing control with multiple Bezier II deformation regions.

Example of a multiple Bezier II deformation region combo. The more you add, the more difficult it becomes to get predictable results using Bezier II deformations.

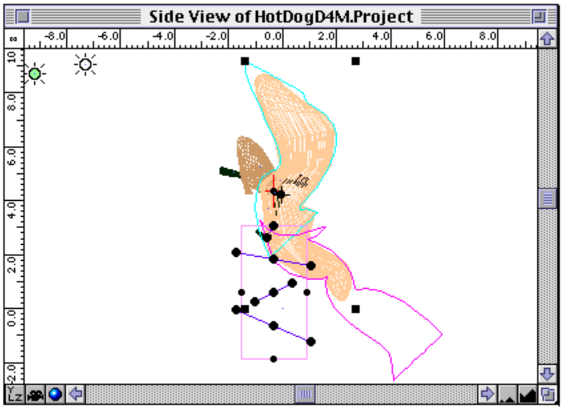


Figure 24.77 — **Now things are getting a little out of hand**

Bones

Bones are used to perform “free-form” deformations, with fewer limitations than the other deformation types. Bones can be linked together to form a deformation chain, imparting an incredible amount of control over a group. With bones, you can deform “single skin” objects such as characters or animals as if there were being moved by their own skeletal system (in fact, they are!) You can even use bones to create “morph targets” for facial expression morphing. In all, bones are quite handy.

Bones can also be a bit picky. Bones act like little magnets, pushing and pulling on groups, sometimes destroying them if used with wild abandon. Deforming a group with bones almost always means there will be more than one bone parented to a group. That means that they will compete with each other, unless you limit their ranges of influence.

Prepping the Model

Like any other deformation, bones require a model that is properly meshed in order to provide the best results. You can use the Dicer plug-in to mesh the model if necessary.

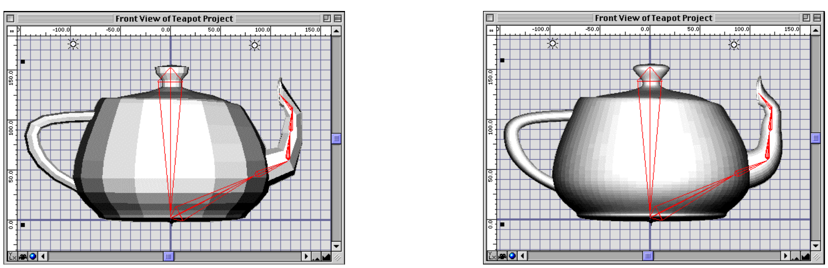


Figure 24.78 — **Low Resolution and high Resolution Models with Bones**

The Dicer plug-in will regenerate the model quite often. Since it is unlikely that you will want to change the resolution of the model over time (the reason why Dicer regenerates) it is best to save the model as a new file once you have the proper resolution.

You can use low resolution proxies to speed up the interaction process when working with bones. Just make sure that the low resolution model is volumetrically similar to the final target model. You can parent both models to a null effector, with the same cubic extent as the models, and then make the working model or final model visible.

Adding Bones

There are two ways to add bones to your project:

- From the File Menu (File>Add>Type>Bones)
- From the Object Palette (Bones Icon)

Bones are added as a chain until you stop the process by choosing *command-period.* The length of the bone is dictated by the distance between each mouse click. In effect, you can actually draw the skeleton on top of the desired model in the world views.

A typical skeleton is comprised of several link chains. The main chain would be the body, including the spine and neck. The extremities would each be a separate chain. When reproducing a bones chain, it is best to create each extremity as a separate chain, and then create the final hierarchy with the parenting tools available in the Project Window. This will enable you to maximize bone usage with inverse kinematics.

Associating Bones to a Group

In order for bones to affect the shape of a group, three steps must first be undertaken. Like other types of deformations in this chapter, bones must be attached to a deformation region. See the section “Creating Deformation Regions.” It is a good idea to create a unique deformation region for bones, to separate them from other deformations. This is necessary because bones can exist in only one region per group, and that region needs to cover the entire extent of the group in a default position.

Remember that regions are order sensitive, and you might want to have the Region containing the bones deformation be at the top of the list. Either before or after you create a deformation region for the bones chain

Before you parent a bones chain to a group, you must first set up the chain so that the linkages of each bone provide the appropriate type of constrained motion. *(See the chapter entitled “Group Linkage Window” for more information on configuring and constraining joints.)*

To associate bones with a group:

- Make sure that the previous recommendations have been followed
- Select the first bone in the chain from the project window
- Click on the Parent tool icon in the project window
- Select the group name in the project window that you want to deform with bones

Assuming that all of the steps have been followed, the bone chain is now attached to the desired group.

Moving the Bones Around

Now that you have created a bones chain, deformation region, set up the joint constraints, and parented the bones to a group, you are ready to test your work. You can use either forward or inverse kinematics to move a bone chain. Each produces a different result. *(For more information on Forward and Inverse Kinematics, see the chapter entitled, "Using Effectors.")*

As you move the bones chain and interact with it, you will likely decide to adjust the values and parameters of the bones for the effect that you want to achieve. To do this, you must configure each bone separately through the Bone Info Window.

To access the Bone Info Window:

- Select the bone
- Double click or choose **File>Get Info…**

The Bone Info Window will appear.

Bone Info Window

The Bone Info Window contains a series of buttons and tabs for configuring the bone, and animating it. As a bone is an effector in Animator, in addition to a deformation type, we will only cover the controls which are related to bones deformations in this chapter. *For an explanation of the other controls, see the chapter "Using Effectors*."

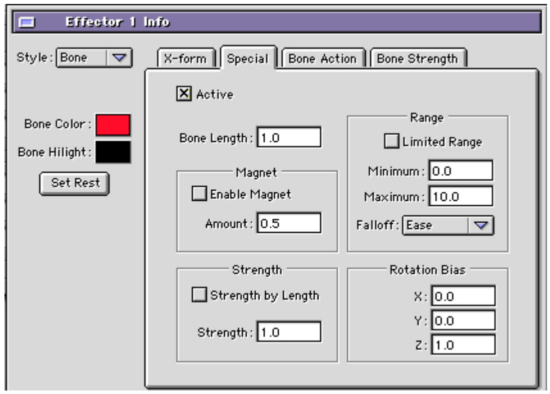


Figure 24.79 — **Bone Info Window**

This chapter will cover the controls in the two tabbed sections: For more information see **"Skin and Bones" on page 563.**

- Bones X-Form Tab
- Bones Special Tab

Bones X-Form Tab

This tab contains the transformation information for a bone. The information in this tab is equivalent for the other effector types, and is covered in detail in the Using Effector chapter.

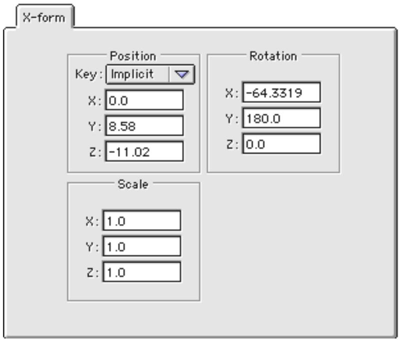


Figure 24.80 — **Bones X-Form Tab**

Bones Special Tab

This tab contains controls for adjusting and setting bones characteristics.

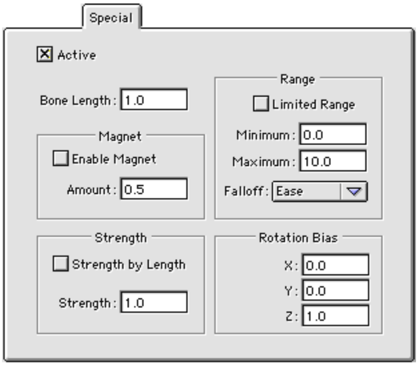


Figure 24.81 — **Bones Special Tab**

The tab is divided into five sections:

- General Section
- Range Section
- Rotation Bias Section
- Strength Section
- Magnet Section

General Section

This section contains the active check box, which determines whether or not the bones effects will be applied to the group, and the bone length edit box. Bone length is set at the time that you create the bone, but you are free to edit the length of the bone at any time with this control. Bone length is a factor in the strength of the bone.

Range Section

The range section contains four items which control the effective range of the bone, and how its energy will be applied to the group through the bone:

- Limited Range Check Box
- Minimum Range Edit Box
- Maximum Range Edit Box
- Fall Off Popup Menu

Limited Range Check Box

This check box activates the bone's ability to limit its influence. The numbers in the Minimum and Maximum range edit boxes are used when this feature is active. If this feature is not active, the bone's effective influence will apply throughout the deformation region for the bone, on the group to which the bone is attached.

When this option is active, the actual range of the bone will be drawn in the world view windows around the bone itself. The minimum value will not be drawn if it's value is 0.0, otherwise it will be drawn in dashed lines. The maximum value will be drawn (if it's value is not 0.0) in unbroken lines.

Minimum Range Edit Box

This edit box specifies the minimum area of effectiveness for the bone. A value of 0.0 (the default value) will begin to dissipate the energy of the bone immediately, until the maximum range value is encountered, using the method specified in the Falloff menu.

Minimum values can be greater than zero. In this instance, the strength of the effect is applied from the center of the bone until it encounters this boundary, at which point the energy will begin to fall off as specified in the Falloff menu.

If you encounter a severe amount of distortion on your model, try setting the minimum value to be larger than 0.0. Combined with the Maximum range value, you can get very precise control over the deformation area.

Maximum Range Edit Box

The edit box specifies the maximum are of influence for the bone. Any part of the group which falls outside of this area will not be directly effected by the bone. This option is valid only when the limited strength check box for the bone is active.

Falloff Menu

The falloff menu determines the energy transition from the Minimum to the Maximum range of the bone. The following methods are available:

- Ease
- Linear
- Power (of) 2
- Power (of) 4
- Power (of) 8
- Power (of) 16

Each of these methods affect the visual quality of the transition. Ease is typically the best method, and the default. You may wish to experiment with the other methods as well to suit your taste.

Rotation Bias Section

Bones have a default direction of influence, which can cause problems for certain types of data, such as motion capture data. This type of data is typically not "indexed" with any accuracy. That is to say, there is no rational frame of reference to begin mapping the motion capture data, as it is typically stored as a series of offset values. This section enables you to "reconfigure" the bone to more closely match the first frame of data in the capture file.

The edit boxes are used to "zero out" the bone. Position the bone to the desired beginning position and click the Set Bias button to do so.

Strength Section

Bones have the strongest effect on points closest to them, or those within the bones limited range (assuming that option is active.) You may wish to add bones which counteract the effect of other bones for more precise mesh control. Typically, these bones would not be independently animated, as their intended function would be to suppress unwanted distortions from becoming pronounced.

Overlapping areas of bone influence can produce points which are under the control of more than one bone. When that occurs, the strength of each bone will have an effect as well. Sometimes this will be of use to you, such as the case mentioned in the paragraph above. At other times, it might be a hindrance. This can be avoided to a degree by limiting the bones area of influence.

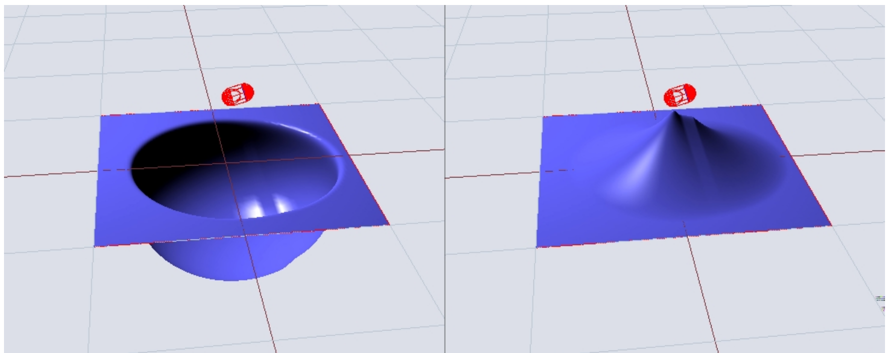
As bones can be set to different strengths, the bone with the higher strength value will exert more influence over points than bones with lower values. All of the bones affecting the points will exert some influence, however. Bones with equal strengths will tend to cancel each other out if pulling in opposing directions.

The Strength by Length check box will use the length of the bone to calculate its influence over the group. The strength edit box is used to set a direct amount of strength for the bone, taking all of the bones contained within the chain into consideration for the overall effect on a group. Bones with strengths that are greater than their neighbors will exert more influence, however the neighbors will still have some “pull,” so to speak.

Magnet Section

By default, bones grab the objects they are assigned to and hang on to them. If you drag the bone, the geometry will move with it. Magnets do not grab the geometry. As you move a magnet, the geometry stays fixed. This feature can be used to create a variety of distinct effects including rippling muscles and cloth. Magnets can be used as attractors or repulsors of geometry.

The Magnet checkbox enables this alternate bone behavior. The Amount edit box allows you to directly control the strength of the magnet. Both positive and negative numbers are allowed so you can push or pull.



a b

Figure 24.82 — **Single Magnet Above a Plane a) Positive Amount b) Negative**

Just as with all other bones, the object being deformed must have a deformation region and the bones must be linked to that object.

Circular Wave II

This deformation type is much like the original Circular Wave deformation discussed on page 649, but it has many more options. This section will cover the options unique to the Circular Wave II deformation.

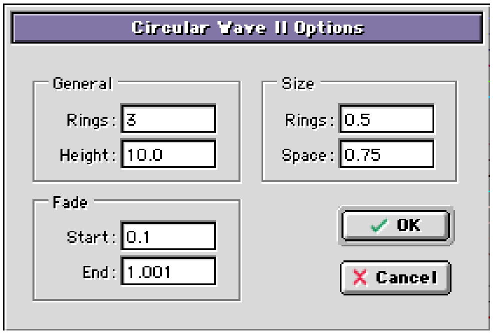


Figure 24.83 — **Circular Wave II Options**

Just as with the original Circular Wave deformation, Rings controls the number of rings generated. Height can be used to override the region setting. If this number is zero, the setting in the region section of the Deformation Control window will be used instead.

Size and Space control the relative width of the rings and the spaces between them. The units of Size and Rings are in radii of the deformation. Therefore a value of 1 represents half the width of the entire deformation.

Fade Start and End allow you create waves that fade with distance from the center of the deformation. The units of Start and End are in radii of the deformation. Therefore a value of 1 represents half the width of the entire deformation.

Runwave

This deformation type is designed to generate simple ocean water effects using a simple noise generator. The noise is used to deform the polygons of your group.When used in close up views, Runwave can do a pretty good job simulating the surface of the ocean.

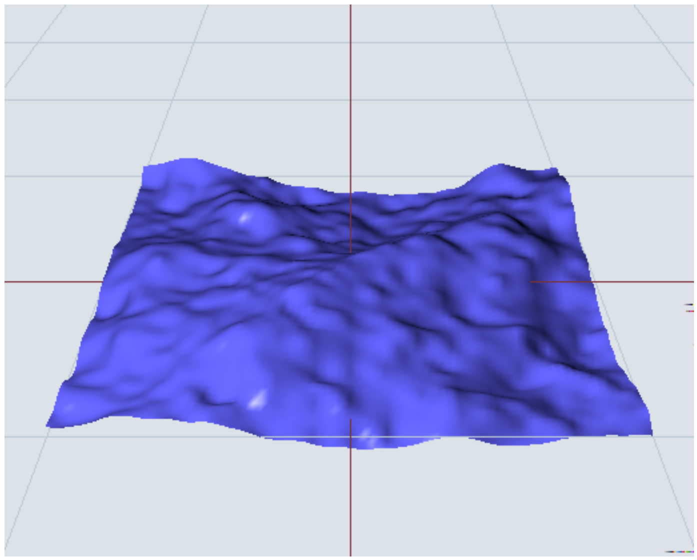


Figure 24.84 — **Runwave Applied to a Plane. Amplitude 100**

A sample project has been provided with EIAS to illustrate the capabilities of the Runwave deformation.

Runwave has a series of options that can be used to vary the noise parameters.

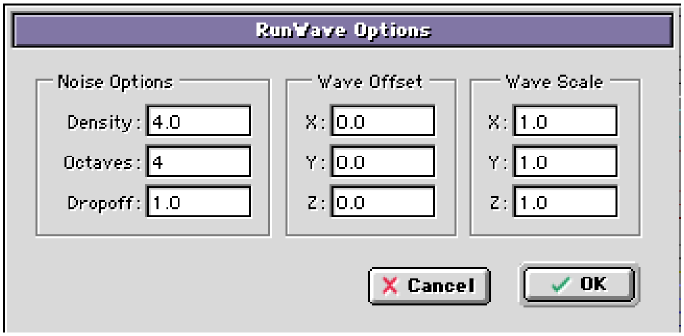


Figure 24.85 — **Runwave Options**

Density is the approximate number of waves in the deformation region. Octaves sets the amount of noise detail created. Higher values for Octaves will create sharper, steeper wavelets.Dropoff can be used to dramatically increase the height of the wavelets. Larger numbers create smaller waves. Smaller numbers (numbers between 0 and 1) create larger waves.

Wave Offset moves the wave a set distance in scene units. Movements along the deformation axis cause 'boiling' effects.

Wave Scale can be used to shape the wave using uniform or non-uniform scaling. Keep in mind that scaling the waves up in size can actually smooth out the deform. Since the individual wavelets get larger, the overall effect is to smooth out the surface leaving larger, undulating waves.

24.4 Tips On Using Deformations

Use Deformation Scale only if Deforming a Group

Do not scale the group or it's children via the Group Info window. Scaling groups before applying deformations is just asking for trouble, especially if your are deforming a group and it's linked children. The greater the variance from the default scale of the parent (e.g.: x1.0, y1.0, z1.0), the greater the distortion of deformed linked children. If you need to scale a parent and children group before adding a deformation, then use a Scale deformation. Make sure the Scale deformation is the first region listed in the Region list in the Group Deformation window. This will allow Animator to apply the Scale deformation first to the group and it's children, followed by any other deformations. One drawback to this is that if you need to Scale deform your group and children by a large amount, it becomes difficult to see the actual Scale region in the world views. The Scale region remains the size of the group before it was scaled, while as the group is scaled, it becomes larger or smaller. Note in the example below how the Ghost Region of the Scale deformation stays the same size, while the group itself, scaled by 100%, grows larger. In this example, this is fine, but try scaling a group by 1000% and you can see why you may not want this.

Turn Off inherit Deformation or Child Groups will Deform too

If you want to deform an object, but simply want it's linked children to move along with the faces, not actually be distorted themselves, then make sure the linked children have Inherit Deformation disabled in their Group Link window. This is the best setting for having hands follow a body, or in the case of our hot dog, having the glasses follow the deforming hot dog without getting all twisted up themselves.

On the Other Hand, That May Be What You Want

If you desire the children of a group to deform in a similar manner as its parent, then make sure the Inherit Deformations option is enabled in the children's Group Link window. This is most useful for eyelids that deform along the eye as they blink, or for clothes that you wish to squash and stretch with a character as they bend or move. This way the children objects will not intersect with the parent as it deforms.

Make Sure Your Models Are Meshed

Groups that don't seem to deform very well may need to have their mesh density increased. Deformations will only move polygons as a whole. Deformations cannot bend a polygon itself. So if your deformation seems "choppy" or doesn't seem to bend smoothly, try increasing the polygon density of the deforming group. You can either do this by adjusting this in your modeler, or by parenting the group to be deformed to a Dicer! object. The best way to handle parenting to a Dicer! is to add the Dicer! object (File>Add>Socket>Dicer!), to the project, then link the group to it. Then export the Dicer! object with the group linked to it as a fact. Re-import the Dicer! object into the project. Discard the linked group and rename the Dicer! in the Project window to the name of the group. What this does is force Animator to recognize the Dicer! group as having more polygons.

This is helpful when it comes time to render because at render time all Dicer! objects need to be recalculated for each frame. But a high density mesh is just read like any other model.

Rotations Can Get Tricky

If you need a group to rotate, but don’t want the deformation to rotate with it, then counter rotate the deformation. Look at the SewerSnake.Project on the EIAS CD-ROM. Note how the bend deformation region doesn't go twirling around at the bottom of the sewer snake as it rotates? This is because the rotation of the sewer snake is offset by a similar counter rotation of the deformation region. This gives the appearance of the deformation region not moving, when in fact it is actually rotating -1 degree for every degree of rotation of the group it deforms.

Camera View of SewerSnake.Project illustrating counter rotation of deformation regions. The head of the sewer snake rotates along with the other parts of the sewer snake as it rotates on its Y axis.

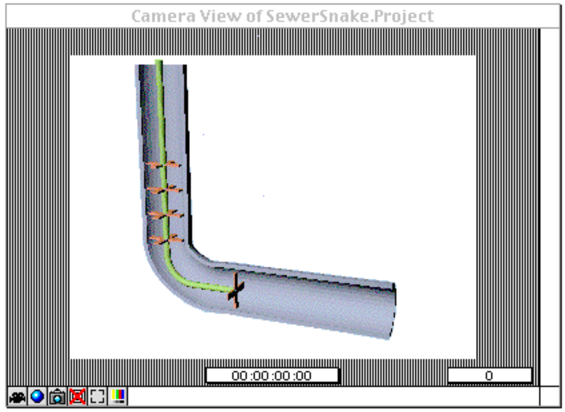


Figure 24.86 — **Counter Rotation of Regions will Compensate Strange Results**

Multiple Groups can give More Control

You can use a combination of groups to achieve even more complex animated deformation effects by applying the deformation of one group to another as it passes through the first group. Look at the SewerSnake-2.Project on the EIAS CD-ROM. The parent Standard Shape, a cylinder, has a 90 degree Bend deformation applied to it. The child, the sewer snake, has Inherit Deformation enabled in its Group Link window. As the sewer snake is animated to intersect with the parent cylinder, it inherits the 90 degree bend that its parent has. This technique is very useful for showing complex organic mechanisms in action.

Camera View of SewerSnake-2.Project illustrating inherited deformations to achieve complex animated deformation effects.

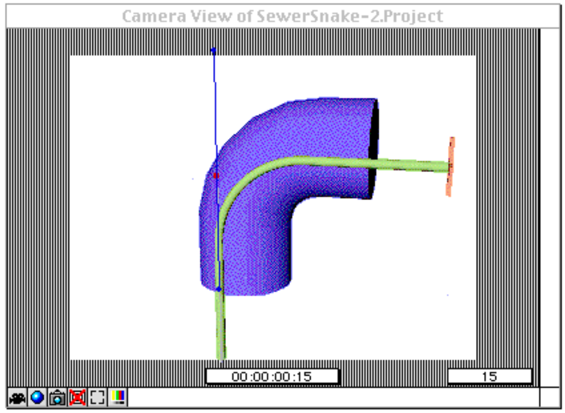


Figure 24.87 — **Child Group Passes through Parent Region**

Copy and Paste

You can copy and paste deformations between objects. Select the deformation in the deformation list and choose Copy under the Edit menu. Go to another object, make sure it has a deformation region, and paste the deformation using Paste under the Edit menu.

Shockwave (.w3d) Export

25.0 Introduction

You can now export your scene to the Macromedia Shockwave (.w3d) file format. This is an authoring format designed to be used by Shockwave applications such as Macromedia Director. It is not a web-ready file format. You cannot take these files and add them directly to a web page.

25.1 Exporting

The Shockwave exporter is invoked by pulling down the Render menu and selecting “Shockwave Settings...”. The Shockwave Information dialog box will pop up. This dialog box allows you to change compression factors and naming conventions for geometry and textures. The Go button writes the Shockwave file to disk.

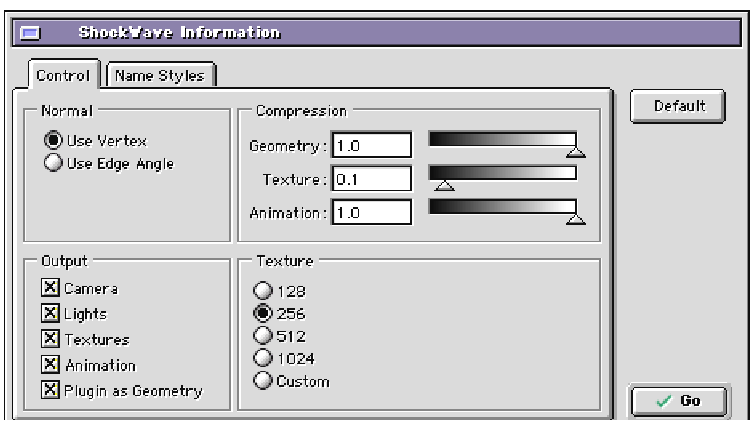


Figure 25.0 — **Shockwave Information**

Control Tab

The Control tab contains options that allow you to optimize the export process for speed and file size.

Normal. This option allows you to specify whether to use the vertex normals, already present in the models, or have the exporter calculate normals based on an angle you specify.

If you select “Use Vertex”, the vertex normals are used. This results in a faster export and a more accurate representation of the models in your scene.

The “Use Edge Angle” option allows you to select the breaking angle (angle at which to break the polygon and create a hard edge) manually. This will create a more efficient, but less accurate, model. This option greatly increases the time it takes to export the file.

Compression. The Compression section allows you to tell the exporter how to compress the data to achieve a more space-efficient and bandwidth-efficient representation. A value of 0.0 is the highest compression achievable, while a value of 1.0 is the lowest.

High compression ratios may be more efficient, but if too high, may introduce artifacts. For geometry compression, this means dropped polygon faces, and for animation, this means non-smooth motion (pronounced jitter). It is up to you to find the best trade-off between accuracy and efficiency in selecting these values.

We have found that the best results are obtained when building a scene with relatively large scene units. That is, don’t expect models with very small extents to export efficiently. Try and maintain overall scene dimensions in the hundreds or thousands.

Output. This section enables you to restrict the kind of objects that are included in the output file. By default, the correct camera, all lights, all models, the first diffuse texture for each group are exported along with their animation data. Bones are exported as an attribute of the groups and are not controlled separately.

Plugin As Geometry will cause plugins that generate polygons to be written out as geometry. If this check-box is off, the plug-ins will be written out as nulls. Plug-ins that modify their polygons over time (particle systems, blobby generators, etc.) will have the geometry at the current time written out for all frames of the .W3D file.

Texture. This section allows you to specify the maximum resolution (in pixels) for the textures being exported. If you select a custom size, please make sure you enter a power of 2 (16, 32, 64, 128, 256, etc.).

Name Styles Tab

This tab gives you control over the naming conventions of the various nodes in the Shockwave scene file. You will most likely use the Lingo language to add your own touches to the finished presentation, so the naming options give you an opportunity to define your own style of naming the nodes.

Shockwave requires that each node has a unique name. EIAS will enforce this by adding a "_#", where # is a number, to the object's name if that name has already been used. In addition, each type of node (view, light, group, etc.) is specifically named using the name styles, where "*" denotes the unique object name that this node belongs to. For example, if you export a group called "Sphere", its Motion name ("*_motion") will be "Sphere_motion", while its Material name ("*_material") will be "Sphere_material".

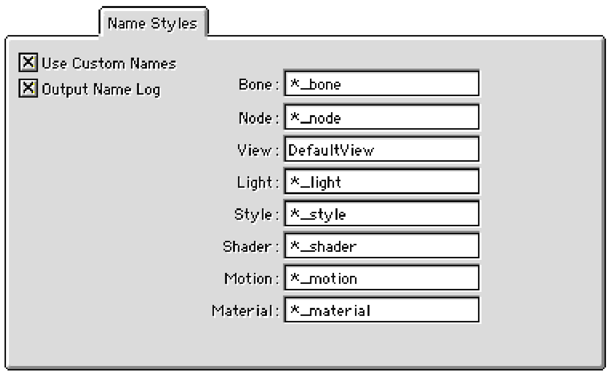


Figure 25.1 — **Name Styles Tab**

The exported camera will be written using a view node and the name defaults to "DefaultView". This allows you to immediately see the view when you import the Shockwave scene into your favorite Shockwave authoring application. If you change the name, you will have to write a Lingo script in your authoring application to view it.

Output Name Log. Causes a text file to be written out that contains the names of all the objects exported to .w3d. The file name will be the same as the name you chose for the .w3d file with the .txt extension added.

25.2 Export Restrictions

The.w3d is a compact, web format. As such, it has a series of restrictions on material complexity, object size., and animation parameters. Please read the following sections carefully before using the exporter.

Animation

The following animation attributes cannot be exported: Morphing, Deformation, Visibility, Material. In addition, the only light parameters that can be written are translation, rotation and scale. Light intensity and color cannot be animated.

Geometry

Points, lines and color vertices will not be exported. Shockwave is a compact representation of a 3D scene that is meant to be transmitted using low-bandwidth internet connections. Any attempt to use large polygon-count models (>10000) will slow down or break the exporter. We suggest keeping your objects under 1000 polygons.

Note Amorphium Pro has some very nice tools for reducing the polygon count of models. Check out our web site for more information.

Materials

The following material attributes will be exported: Diffuse color, Specular color, Specular size, Luminance. In addition, the “Use Polygon Color” button in the Diffuse tab is supported if textures are not in use.

Textures

Only one texture per group will be exported. The texture to be exported will be the texture at the top of the diffuse texture list. Or rather, the first texture in the list with its enable button turned on.

All mapping modes are supported (flat, cylindrical, spherical, cubic). The texture's RGB and Alpha channels are supported. The inverse RGB button setting will be exported. The normal blend mode will always be used. Other blend modes will be ignored.

The Repeat and None texture tiling modes are supported, but the X direction value will be used for Y. Shockwave does not allow separate control of each tiling axis.

When choosing the none tiling setting, the geometry not covered by the texture will be colored according to the diffuse color. The "Use Polygon Color" (in the diffuse tab) button will have no effect.

Camera

Only the current camera will be written out. The current Camera is the one selected for viewing in the Camera View window.

GlobeCaster and GrangerFX

26.0 Introduction

The GlobeCaster is a hardware video production tool originally made by Play, Inc. and now made by GlobalStreams. The GlobeCaster is famous for its real time video effects. Until today, however, much of the power of the GlobeCaster was inaccessible to video designers. Many of the effects which made the GlobeCaster famous could not be produced with the tools that shipped with the system. EIAS can render to the file format supported by the GlobeCaster hardware effects engine (.tfx) and to a format supported by the GrangerFX plug-ins (.vfx) for Adobe After Effects and Premiere Pro.

The GrangerFX plug-ins are included with Electric Image EIAS so everyone can take advantage of them by rendering to the .vfx file format. The GlobeCaster output format (.tfx) is reserved for those users who own the GlobeCaster hardware.

Using EIAS and either the GlobeCaster or the GrangerFX plug-ins, designers can now create packages of effects that create a consistent look for television shows, DVDs, and other broadcast quality video production projects.

26.1 GrangerFX Plug-Ins

The GrangerFX plug-ins were created to allow Trinity/GlobeCaster effects to be used with other products such as Adobe After Effects and Premiere Pro. The plug-ins still use some of the terminology from the Trinity. The plug-ins can use up to three input video streams. These video streams are named **Program**, **Preview** and **Aux**. When switching live video, a producer is looking at a row of monitors, one for each camera or graphics input. The Program monitor displays the video that is currently being seen by the viewers. The Preview monitor shows the video that the producer is about to switch to. The Aux monitor may contain graphics or another video source that the producer wishes to use for a transition, a video inset or some other purpose. The producer can choose a transition to use when switching from Program to Preview. The producer can also load an effect to use over the Program video such as a lower third title or an over the shoulder graphic.

The original Trinity hardware was a large box that contained slots for optional cards. A special card named the Warp Engine was used to warp a live video channel. Up to three Warp Engines could be loaded into a single Trinity. The Trinity's ability to play an effect depended upon whether it had sufficient hardware resources.

The GrangerFX plug-ins have no special hardware requirements but still describe effect files by the elements they contain. For example, if an effect has two video panes flying around the screen over a graphic background, it is described as a "Dual Source Warp with Graphics".

26.2 Rendering an Effect

The GlobeCaster and GrangerFX output formats are selected in the Render tab of the Render Information window. You can open the Render Information window by choosing Render Settings… from the Render menu at the top of the screen. Click on the Format: pop-up menu and choose either GlobeCaster... or GrangerFX... as your output file format.

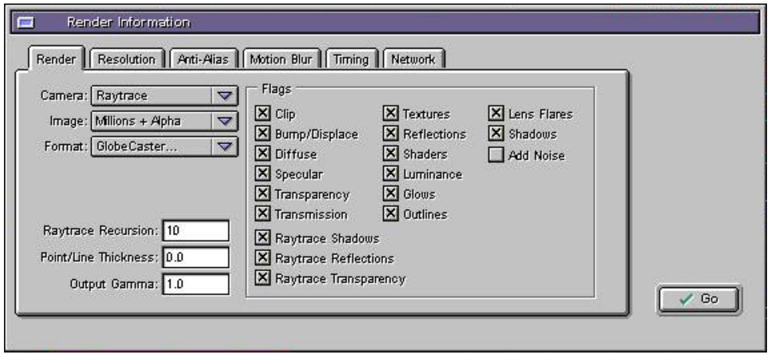


Figure 26.0 — **Render Information Window – Render Tab**

When you choose the GlobeCaster or GrangerFX format, a dialog box will open containing all of the effect options.

Note *You can not use Renderama to render out .vfx or .tfx file. Renderama can not stitch together these files formats.*

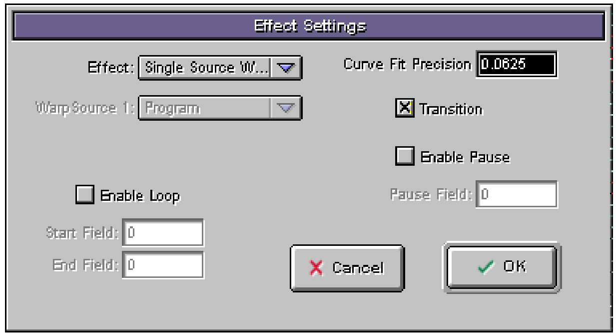


Figure 26.1 — **Effects Options Dialog**

The Effect: pop-up menu selects the among the eleven possible effect modes. These are described in “Effect Modes” on page 706.

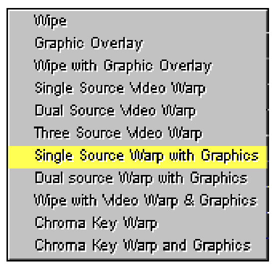


Figure 26.2 — **Effect Pop-Up Menu**

The Warp Source 1: pop-up menu chooses between Program or Preview as the source video to apply to the warp. This is available so that either the program or the preview video can be warped during the effect. The other channel is placed in the background behind the warp. Normally the preview stream is warped as it flies onto the screen to cover the program video. Sometimes it is necessary to swap the video streams at the beginning of an effect. The Mr. Nitro explosion effect, for example, must shatter the program video stream to reveal the preview video stream in the background.

The option to pick between program and preview warp video sources is only available for the following effect modes: Single Source Video Warp, Wipe with Video Warp & Graphics, Chroma Key Warp, Chroma Key Warp and Graphics.

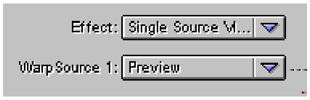


Figure 26.3 — **Warp Source 1 Pop-Up Menu**

The Curve Fit Precision value sets the precision of the curve fit algorithm used to generate the effect file. It is a floating point value in fractions of a pixel. The default is 0.0625 or 1/16th of a pixel. If your effect files are too large or play back too slowly, you could try increasing this precision value. Values greater than 0.5 are not recommended because they could create visible artifacts in the animation.

Figure 26.4 — **Curve Fit Edit Box**

The Transition box, when checked, tells the GlobeCaster or GrangerFX plug-ins to swap the program and preview video sources after the effect has been played. Most effects are transitions. They allow a video producer creative choices other than a simple cut to get from one stream of video to another. Other types of effects do not switch video, lower thirds for example. A lower third is typically a title that appears in the lower third portion of the video.

Figure 26.5 — **Transition Check Box**

The Enable Pause option (used only by the GlobeCaster) will pause on a selected Pause Field, part way through the effect. An example of this feature is an “over-the-shoulder” video inset. The first part of the effect would fly the video inset into the top-left corner of the frame and stop on the pause field. The second part of the effect would fly the video inset out of frame again. During production, the producer could begin playing a clip in the preview channel and then trigger the over-the-shoulder effect. The effect will pause with the video inset in frame. Before the clip ends, the producer would continue the effect so that the video inset would fly off the screen again.

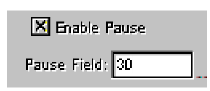


Figure 26.6 — **Enable Pause Check Box**

The Enable Loop option (used only by the GlobeCaster) is used to mark a portion of the effect for looping. The Start Field: and End Field: values specify the range of fields that will be looped. An example of this feature is an animated “lower third” graphic. An effect could be created that would fly the lower third onto the screen, animate a spinning globe within the lower third graphic and then fly the lower third back off the screen again. During production, the lower third effect would continue to loop until the producer decides to continue the effect to completion.

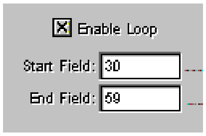


Figure 26.7 — **Enable Pause Check Box**

26.3 Applying Video To Your Models

You will be adding stand-in textures (proxies) to your models in EIAS Animator. These proxies represent the video channels of the GlobeCaster. The GlobeCaster or GrangerFX plug-ins will replacing these textures with actual video. This section covers the different texture proxies and how they are used in EIAS Animator.

Textures

In order to create video warp effects, the animator must specify where and how the live video streams are to be projected onto model surfaces. This is done by applying one of the video source stand-in image files as a texture map or a camera projection map. These stand-in image files are named $Program$, $Preview$ and $Aux1$. They are applied like any other texture or projection map and support all projection features including cropping and tiling. They must only be applied to the Diffuse material channel. Applying the video streams to other channels will not work correctly. When rendering the effect, the surfaces mapped with video will appear to be black in Camera's preview window. The GlobeCaster or GrangerFX plug-ins will replace these black areas with live video.

It is important that the correct stand-in be used for the selected effect mode. If you are rendering a Single Source Video Warp and have selected Program as your video source, you must apply $Program$ as the map. If you select Preview as your video source, you must apply $Preview$ as the texture map.

Wipe with Graphic Overlay effect projects must use the stand-in image file $MainAlpha$ to specify which portions of the video frame will display the preview video stream.

When creating PAL GlobeCaster or GrangerFX effects, you should use the PAL resolution stand-in files. These are named $Program$ PAL, $Preview$ PAL, $Aux1$ PAL and $MainAlpha$ PAL respectively.

26.4 Effect Modes

There are eleven effect modes:

- Wipe
- Graphic Overlay
- Wipe with Graphic Overlay
- Single Source Video Warp
- Dual Source Video Warp
- Three Source Video Warp
- Single Source Warp with Graphics
- Dual Source Warp with Graphics
- Wipe with Video Warp & Graphics
- Chroma Key Warp

- Chroma Key Warp and Graphics

Wipe

Wipes are used to create custom dissolve style transitions. A classic dissolve transition simply fades out the program video stream while fading in the preview video stream. A wipe is an animated alpha mask. When the effect is played, areas of the screen where the mask is black will display the program video stream. Areas of the screen where the mask is white will display the preview video stream. Areas where the mask is some gray value will contain a mix of program and preview video. On the first frame of a wipe transition, all of the pixels of the mask are black. On the last frame, all of the pixels are white.

A simple dissolve would be produced by filling the entire mask with a constant value for each frame. The value would increase linearly from black to white in every frame of the transition.

An example of a more interesting wipe is demonstrated by the Clock Wipe demonstration project. The Clock Wipe effect is an animated pie wedge. The pie wedge gets wider every frame as if the hand of a clock were sweeping the preview video into the frame.

The Wipe mode wipes preview over program. The area where the alpha is white will be preview, the area where the alpha is black will be program. These video channels are added in by the GlobeCaster and GrangerFX plugins. No video stand-ins ($Program$, etc.) are used in Wipe projects.

Graphic Overlay

Graphic overlays are used to place static or animated graphics over the program video. Overlays are not typically used for transitions. Overlays can be animated and may contain pause frames or loops.

One common type of graphic overlay is the lower third title. Another would be a credit roll at the end of a television program. Many cable TV networks also use animated "bugs". A bug is a small logo that will appear in the corner of the video for a short period of time to remind the viewer which channel they are watching and to discourage content from being copied by video pirates.

No video stand-ins ($Program$, etc.) are used in Graphic Overlay projects.

Wipe with Graphic Overlay

This mode combines the Wipe and Graphic Overlay modes together. A wipe controls how much of the program or preview video is seen at each pixel while animated graphics are overlaid on top. This mode can be used to spice up wipes with graphic content. One of the famous GlobeCaster effects is a band of fire that burns up the program video leaving preview video in its wake.

The $MainAlpha$ stand-in file needs to be used with this mode. An object must be added that has $MainAlpha$ as a texture. Wherever that object is visible, the Preview channel will be seen. Wherever it is not visible, program is visible. Over the top of the whole thing, the graphic content is displayed.

Single Source Video Warp

Single source video warps are used to create a wide variety of flying video effects. These effects can be as simple as sliding preview onto the screen or as complex as a Mr. Nitro explosion that shatters the program video into hundreds of shards that reveal preview video as they fall away. Either program or preview can be used for the warped video. The other video source will appear in the background.

You apply either $Preview$ or $Program$ based on the selection you make in the Effect Settings dialog box, WarpSource 1 pull down menu. The channel you didn't select will be put in the background by the GlobeCaster or GrangerFX plug-ins.

Dual Source Video Warp

It may be necessary to make a transition appear during an effect or to move both program and preview video during an effect. Dual source video warps are used to perform complex transition animations. An example is the Infinite Zoom effect in which program is zoomed up towards the viewer, a dissolve occurs in the middle of the animation to reveal the preview video falling away from the viewer and back into place again.

If you are using a GlobeCaster, you must have two warp engines installed to use this effect.

For this effect, you never apply $Program$ because the GlobeCaster and the GrangerFX plug-ins will always place the program channel in the background. But you will be applying the $Preview$ and $Aux1$ stand-ins. These are the two warp channels that will be used by the GlobeCaster and GrangerFX plug-ins.

Three Source Video Warp

The GlobeCaster can support more than just two video inputs. In some rare occasions, a third video source may be needed for a video effect. An example would be two small inset video streams overlaid on top of a third larger video stream. This would allow a "head to head" debate between two people while a third person moderates. For this mode, it is important that no piece of background be left unfilled by video because garbage could appear in the undefined background areas and aliasing (stair-stepping) could occur along the edges.

If you are using a GlobeCaster, you must have two warp engines installed to use this effect.

For this mode, you will apply the $Program$, $Preview$, and $Aux1$ video stand-ins. You should set up the effect so the background is not visible at all.

Single Source Warp with Graphics

This mode allows the full power of EIAS to be harnessed to create fantastic looking effects. In a simplistic sense, this is just a single source video warp combined with a graphic overlay. However, EIAS is able seamlessly to combine the video warp and graphics to produce an effect with real-time ray-tracing, detailed models and realistic lighting.

Single source Warp with Graphics is only used for non-transitional effects. The Preview video channel will NOT appear in the empty areas. Only a black screen will appear in those areas.

An example of this effect mode is the Pile of Spheres demonstration effect. In this effect, a pile of glass spheres rotates in front of the program video.

The live video appears to be refracting realistically through the glass spheres. Highlights are visible on the surface of the glass spheres. The project has a series of transparent spheres in front of a single plane acting as a video stand in that has $Program$ mapped to it.

This mode always uses $Program$ as the video stand-in.

Dual Source Warp with Graphics

This mode can produce fully rendered effects with two video sources. An example is the Sports Night effect in which alternating bands of program and preview video swirl around a gold football trophy and the words Sports Night appear. Both video sources can be seen reflecting in the surfaces of the trophy.

If you are using a GlobeCaster, you must have two warp engines installed to use this effect.

The Preview video channel will NOT appear in the empty areas. Only a black screen will appear in those areas.

This mode always uses $Program$ and $Preview$ as the video stand-ins.

Wipe with Video Warp & Graphics

This mode allows a fully rendered wipe effect to be created. Program or preview video can be selected for the video warp. The background is filled with the other channel just like the Single Source Video Warp mode.

This mode supports 3D graphic elements in the scene and warping of objects that have $Program$ or $Preview$ applied to them.

Chroma Key Warp

This mode works like the Single Source Video Warp mode except that chroma key is enabled for the warped video source. The background will be visible through areas of the warped video that are keyed out. The chroma key values are setup by the producer at the time of production. The warp can be used to scale, rotate, position or fly the chroma keyed video source over the background video. This effect mode can be used to create virtual sets. The animator can create masking objects that remove portions of the chroma key video to create the illusion that the talent is standing behind an object in the background video.

You apply either $Preview$ or $Program$ based on the selection you make in the Effect Settings dialog box, WarpSource 1 pull down menu. The channel you didn't select will be put in the background by the GlobeCaster or GrangerFX plug-ins.

Chroma Key Warp and Graphics

This mode combines the Chroma Key Warp mode above with fully rendered foreground elements. This can be used to create reflective objects that reflect the talent in the chroma key video or transparent objects that refract the talent. For a complete animated virtual set, the animator must also create a perfectly matched background animation. When combined, with the foreground effect, this allows the animator to create virtual camera moves on the virtual set and the chroma keyed talent standing within it.

You apply either $Preview$ or $Program$ based on the selection you make in the Effect Settings dialog box, WarpSource 1 pull down menu. The channel you didn't select will be put in the background by the GlobeCaster or GrangerFX plug-ins.

26.5 Render Settings

The GrangerFX files are very flexible. Interlacing and a broadcast industry standard resolution and frame rate are not required.

The GlobeCaster effect files must be created at the resolution and frame rate that is supported by the GlobeCaster hardware as follows.

In the Resolution tab of the Render Information window, select either GlobeCaster-NTSC 720 x 486 or GlobeCaster-PAL 720 x 576 from the Resolution: pop-up menu; depending on whether you are creating an effect for a NTSC or PAL GlobeCaster.

In the Timing tab of the Render Information panel, select NTSC: 30i from the FPS: pop-up menu for NTSC rendering or PAL: 25i for PAL.

In the Resolution tab of the Render Information panel, set the Pixel Ratio value to 0.9 for NTSC or 1.1 for PAL. This will prevent rendered objects appearing stretched or squeezed when the effect is played.

The pixel aspect ratio is set automatically by EIAS when the GlobeCaster NTSC or PAL resolutions are selected.

The GrangerFX files are much more flexible. Interlacing and a fixed resolution are not required.

Pinned Video

It is important that the first and/or last frame of a transition effect match the program and/or preview video precisely. If you wish to create an effect in which the program video appears to fly off the screen, the video mapped to the polygon in the first frame must exactly match the position and scale of the program video stream so that no undesirable shift is perceived by the viewer when the effect begins to play. Each corner of the mapped polygon must be pinned to the corners of the video frame. The stand-in texture must also be scaled to fit the polygon perfectly. This is referred to as Pinned Video.

There are two ways to perfectly create perfectly pinned video. The first way is to texture map a single polygon that fits perfectly inside the camera view. The second way is to use a camera projection map. The later method is documented in the Camera Map Tutorial. Most effects using video warps can be produced with the texture map approach. The camera projection map approach is more difficult to set up but can be used to project pinned video onto curved surfaces or portions of larger models.

26.6 Tutorial: Creating a Pinned Video Plane – NTSC

These are the steps required to create a pinned video polygon for an NTSC GlobeCaster or GrangerFX plug-in effect.

1. Create a new project. Set the render settings as described in"Render Settings" on page 713 (NTSC Settings).

2. Use the UberShape plug-in to create a single polygon Plane 720x486 in the XY Plane. If you plan to deform the video plane, increase the EI Divisions and Camera Divisions to a larger number like 40. Click the OK button to create the plane

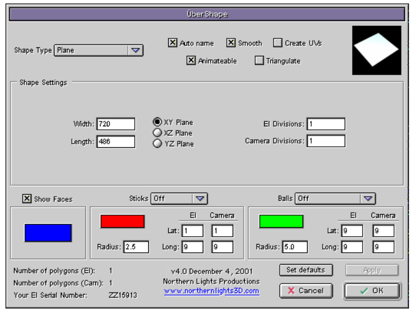


Figure 26.8 — **Creating a Video Plane with the UberShape Plug-in**

3. Double-click on the new group in the Project window to open the Group Info window and set the group's X Scale to 0.9. This is done to compensate for the 0.9 pixel aspect ratio of NTSC GlobeCaster and GrangerFX effects.

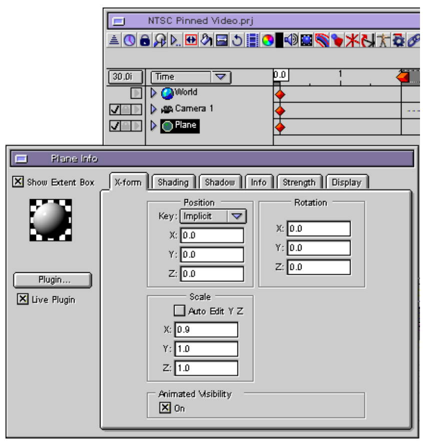


Figure 26.9 — **Scaling The Plane**

4. Click on the material ball in the Group Info window to display the group's Material window. Click on the color chip (rectangle) to open the color picker and change the Diffuse color to black.

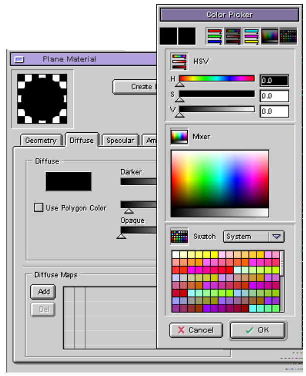


Figure 26.10 — **Set the Diffuse Color to Black**

5. Click on the Luminance tab in the Material window and set the mode to Shade and the amount to 100%. This will prevent the polygons that receive the video from being illuminated or shaded

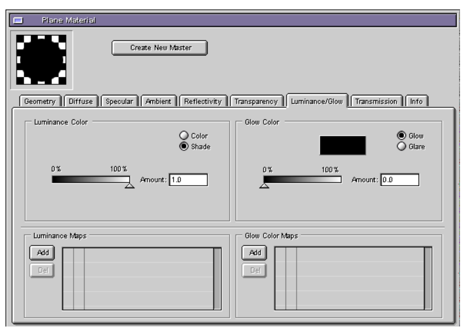


Figure 26.11 — **Luminance Tab**

Steps 6-9 replace with UberShape plug-in with a FACT model. Using a FACT model reduces rendering time as the plug-in must be generated algorithmically every frame of the effect.

6. Select the group in the Project window and rename it to:NTSC Video Plane.

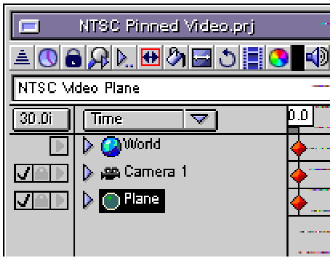


Figure 26.12 — **Rename the Plane**

7. With the plane still highlighted in the Project window, select the Export… command from the Object menu at the top of the screen and choose the Native FACT format from the sub-menu. Name the new model file NTSC Video Plane.

8. Clear the plug-in group from the project file by selecting it and using the Clear command in the Edit menu.

9. Use the Import Object... command in the Object menu to add the NTSC Video Plane model to the project. Click the cancel button to exit the file picker.

10. Double-click on the NTSC Video Plane group in the Project window to open its Group Info window. Click on the material ball to open the group's Material window. Click on the Add button under Diffuse Maps. Select the $Program$ image file. This is just an all white 720x486 24 bit single frame

image file named $Program$. This file acts as the stand-in for the program video channel.

By default, texture maps are automatically fit to the groups they are applied to.

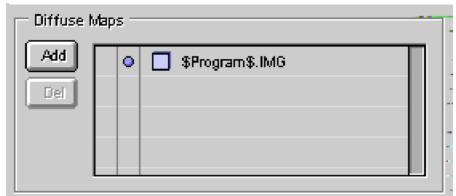


Figure 26.13 — **Adding the Program Video Stand-In**

11. Close the Material panel and Object Info window. Double-click on Camera 1 in the Project Window. Set the Camera Z position to -972. 972 is two times the height of the group (486).

The default focal length of the camera is 2.0 and the field of view is calculated vertically.

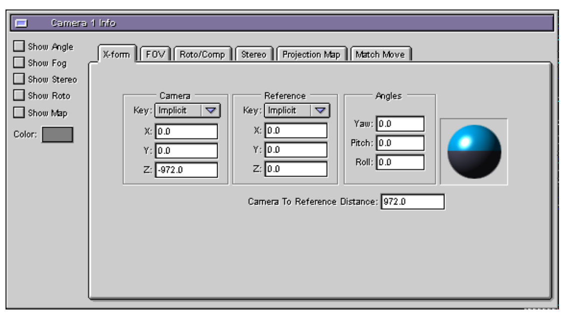


Figure 26.14 — **Setting the Camera's Z-Position**

12. The Camera View should now show the video plane perfectly fitting to the window. If you were to render and play the effect, you should not see any shift in the program video when it starts.

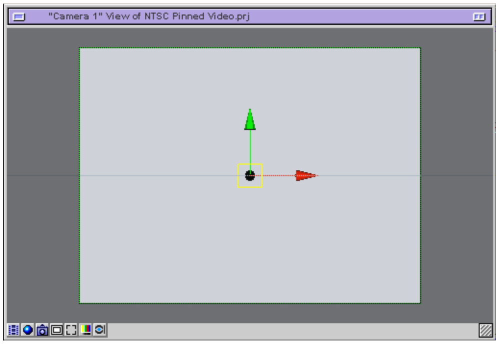


Figure 26.15 — **Camera View Window**

26.7 Tutorial: Creating a Pinned Video Plane – PAL

These are the steps required to create a pinned video polygon for a PAL-GlobeCaster or GrangerFX effect.

1. Create a new project. Set the render settings as described in “Render Settings” on page 713 (PAL Settings).

2. Use the UberShape plug-in to create a single polygon Plane 720x576 in the XY Plane. If you plan to deform the video plane, increase the EI Divisions and Camera Divisions to a larger number like 40. Click the OK button to create the plane.

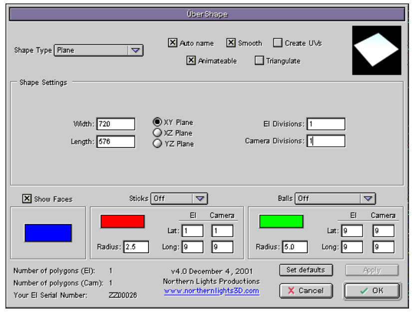


Figure 26.16 — **Creating a Video Plane with the UberShape Plug-in**

3. Double-click on the new group in the Project window to open the Group Info window and set the group's X Scale to 1.0667. This is done to compensate for the 1.0667 pixel aspect ratio of PAL GlobeCaster and GrangerFX effects.

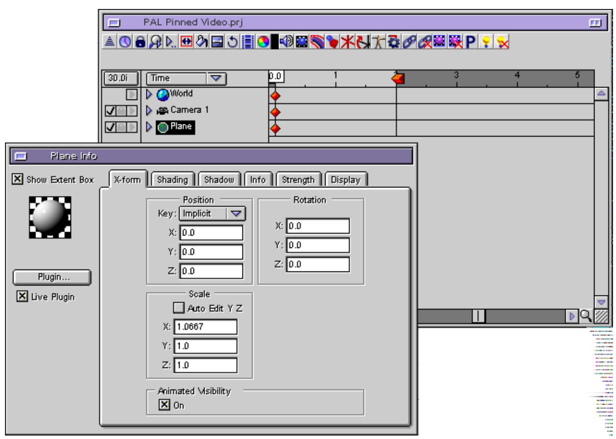


Figure 26.17 — **Scaling the Plane**

4. Click on the material ball in the Group Info window to display the group's Material window. Click on the color chip (rectangle) to open the color picker and change the Diffuse color to black.

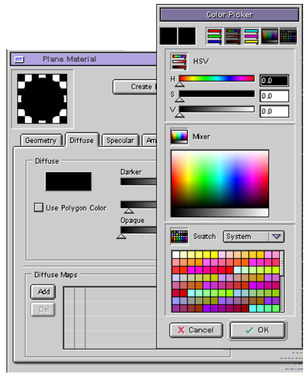


Figure 26.18 — **Set the Diffuse Color to Black**

5. Click on the Luminance tab in the Material window and set the mode to Shade and the amount to 100%. This will prevent the polygons that receive the video from being illuminated or shaded,

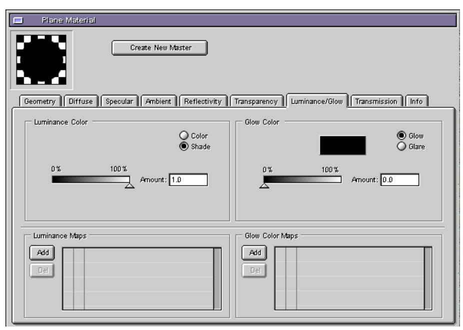


Figure 26.19 — **Luminance Tab**

Steps 6-9 replace with UberShape plug-in with a FACT model. Using a FACT model reduces rendering time as the plug-in must be generated algorithmically every frame of the effect.

6. Select the group in the Project window and rename it to: PAL Video Plane.

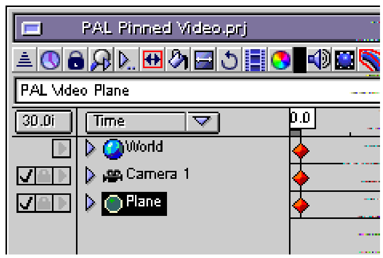


Figure 26.20 — **Rename the Plane**

7. With the plane still highlighted in the Project window, select the Export… command from the Object menu at the top of the screen and choose the Native FACT format from the sub-menu. Name the new model file PAL Video Plane.

8. Clear the plug-in group from the project file by selecting it and using the Clear command in the Edit menu.

9. Use the Import Object... command in the Object menu to add the PAL Video Plane model to the project. Click the cancel button to exit the file picker.

10. Double-click on the PAL Video Plane group in the Project window to open its Group Info window. Click on the material ball to open the group’s Material window. Click on the Add button under Diffuse Maps. Select the “$Program$ PAL.img” file. This is just an all white 720x576 24-bit single

frame image file named $Program$ PAL. This file acts as the stand-in for the program video channel.

By default, texture maps are automatically fit to the groups they are applied to.

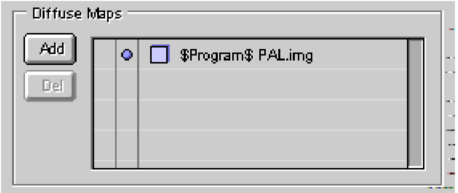


Figure 26.21 — **Adding the Program Video Stand-In**

11. Close the Material panel and Object Info window. Double-click on Camera 1 in the Project Window. Set the Camera Z position to -1152. 1152 is two times the height of the group (576).

The default focal length of the camera is 2.0 and the field of view is calculated vertically.

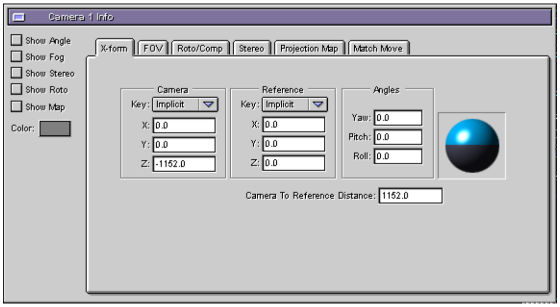


Figure 26.22 — **Setting the Camera's Z-Position**

12. The Camera View window should now show the video plane perfectly fitting to the window. If you were to render and play the effect, you should not see any shift in the program video when it starts.

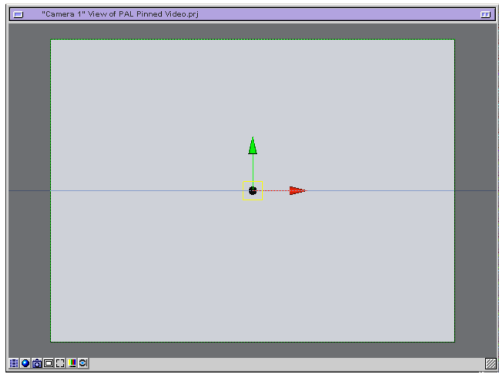


Figure 26.23 — **Camera View Window**

26.8 Cropping Video

The GlobeCaster and GrangerFX plug-ins digitize the entire video frame. Many video sources, such as analog video cameras, have some amount of garbage around the edge of the video frame. This garbage is not seen on television because the edges of the video are hidden beneath the bezel around the edge of the glass tube. Unfortunately, the garbage around the edge of the video frame will become visible if your video warp shrinks as it flies on or off the screen. To compensate for this problem, you must crop the edges of your video map.

There are several ways to crop the video stand-in while keeping it pinned. The most obvious way is to use the Cropping settings in the Image tab of the stand-in Texture Info window. This will cause the cropped edges of the video to be mirrored.

A better method is to create a soft edged cropping mask in Photoshop. This mask image is then applied to the video plane's Clipping Maps under the Geometry tab of the group's Material window.

Perhaps the easiest approach is to adjust the size of the video plane itself in Step 2 of the Pinned Video Plane Tutorial. You can reduce the size of the video plane by 12 pixels in both X and Y so that it is 708x468 (for NTSC) or 708 x 564(for PAL). This will crop into each edge of the video plane by ten pixels. After you apply the $Program$ stand-in texture map in Step 10 (see page 22 NTSC or page 27 PAL), double click the map in the Diffuse maps list to open its Texture Info window. Set the X Scale, Y Scale and Z Scale to 1.0. This will cause the video to go off the edges of the video plane but remain pinned to the screen. The rest of the steps in the tutorial should be followed exactly including setting the camera's Z position to -972 in Step 11.

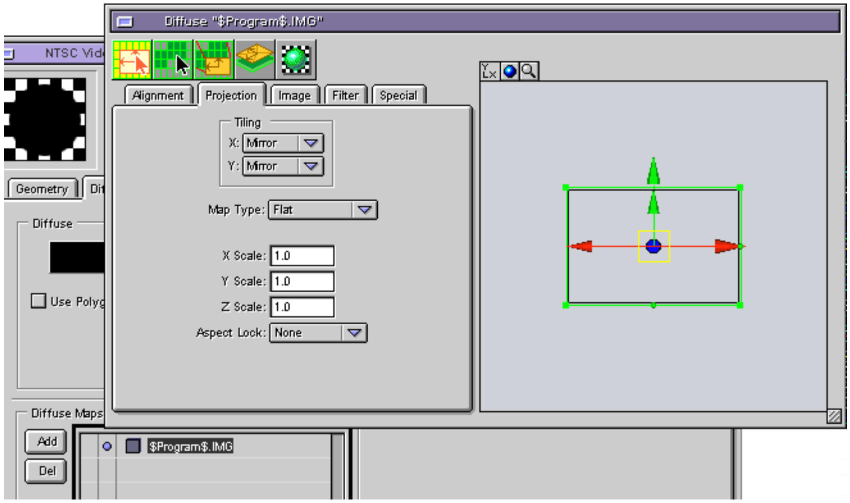


Figure 26.24 — **Setting the Scale of the Map**

It is recommended that cropping not be performed on effect frames in which the video must pinned. This is usually at the first and/or last frame of a transition. You can accomplish this by having an un-cropped video plane object that is only visible when the effect is pinned. The cropped video plane object would be visible on all other frames. You can use EIAS Animator's animated visibility feature to do this.

26.9 16:9 Effects

The GlobeCaster is capable of producing video in the wide screen 16:9 aspect ratio and the GrangerFX plug-ins can also process 16:9 video. This aspect ratio is currently used to produce DVD content as well as some high definition video production. The GlobeCaster still produces video at the standard NTSC resolution of 720x486 or the PAL resolution of 720x576 but when played back, it is stretched to fill a 16:9 aspect ratio monitor.

All that is required to generate a NTSC 16:9 effect in EIAS is that the Pixel Ratio value in the Resolution tab of the Render Information window must be set to 1.2. This will have the effect of squeezing all of the objects in the camera view to simulate a wide angle camera. If you wish to create a pinned video plane, change the X Scale of the video plane to 1.2 in Step 3 of the tutorial (see page 19) to match the rendered pixel aspect ratio.

PAL 16:9 effects can be generated by setting the Pixel Ratio value to 1.4222. For a pinned video plane, you would also need to change the X Scale of the video plane to 1.4222 in Step 3 of the tutorial.

26.10 Limitations of Rendered Effects

In a perfect world, every feature of EIAS could be used without any sort of restriction to create GlobeCaster and GrangerFX effects. Unfortunately, there are a few restrictions and limitations you need to be aware of.

One Warp at a Time

A single warp effect can only modify the refraction or reflection of a pixel, not both. If you want to combine reflection and refraction, you must use a dual source warp.

For example, to create a 'bug' in the lower right hand corner of the video that refracts the video and is partially reflective, you would use two planes. One would be placed in front of the camera (with $Preview$ as its texture) and would be placed behind the camera (with $Aux1$ as its texture). A small 3D object (the bug) would be placed between the camera and the front plane. The bug's material properties would include both ray traced reflection (it would reflect the plane behind the camera) and ray traced transparency (the camera will see through the bug to the front video plane). The output render mode will be Dual Source Video Warp. In the GlobeCaster or GrangerFX plugins, set up the video sources so that Preview and Aux are coming from the same source.

Overly Complex Effects

EIAS can produce some pretty amazing GlobeCaster effects in which live video is refracted through transparent objects or reflected off mirrored objects. When a bump map is applied to these surfaces, the refracted or reflected video will become scattered. This will make the video warp very large and exceed the ability of the GlobeCaster’s effect engine and the GrangerFX plug-ins to process the effect in real time. This will prevent the effect from playing back correctly. You may see tearing in the effect or it could freeze part way through with garbage on the screen. It is recommended that you use smooth surfaces for ray traced video effects and try to limit the number of ray bounces in the scene. If you are in doubt that the effect will work correctly, try rendering a short test to see if it will play back correctly on the GlobeCaster or in the GrangerFX plug-ins. Simple ray traced video effects tend to look better. The Pile of Spheres effect is an excellent example of a simple ray traced video effect with smooth surfaced objects.

It is also possible to exceed the processing power of the GlobeCaster’s effect engine by tiling a video source onto a plane so that hundreds of copies of the video are visible in the frame.

If you think you are close to the limit, you can try reducing the Curve Fit Precision in the Effect Settings panel. This will cut down on the size of the effect.

YUV, Highlights, Transparencies and Lens Flares

One of the big limitations of GlobeCaster and GrangerFX effects is that only white highlights and lens flares can be rendered correctly. This is due to the fact that the GlobeCaster works in a YUV color space instead of the RGB color space that Camera works in. Two YUV colors cannot be added together the way two RGB colors can be. This means that colored highlights or lens flares look awful when they appear over a video surface.

In addition, one YUV color cannot be used to filter another YUV color. This means that a transparent object cannot be used to tint a live video surface behind it. You also should not try to illuminate your video surface with a colored light source.

The good news is that white highlights (specular), lens flares and glowing lights should work fine and add greatly to the production value of an effect. The Page Peel Tutorial demonstrates great looking white highlights on a video surface.

Motion Blur, Object Glow, Mirror and Environment Maps

GlobeCaster and GrangerFX video warps can only be processed during the main rendering pass. Any video sources that appear in pre-processed mirror and environment maps will not work correctly. For this reason, the use of mirror and environment maps should be avoided in GlobeCaster and GrangerFX effect projects. Ray traced reflection works great and looks fantastic so this is the right way to go if you want reflective objects. You can use static reflection maps; however it is not recommend that colored reflection maps be used with video surfaces for the reasons mentioned in the section above.

The Motion Blur and Object Glow features require post processing. These features cannot know what colors will be present in the live video stream when the effect is rendered so they are not compatible with GlobeCaster and GrangerFX effects. Do not enable these features.

Picons

Automatic picon creation is not currently supported by EIAS. The picons for the rendered effects will appear as random noise when accessed by the GlobeCaster or GrangerFX plug ins. You can create your own picon for the effect by following these steps (Windows only):

1.Load your effect into the GlobeCaster by double-clicking its picon.

2.Position the T-Bar on the frame of the effect you wish to use as the picon.

3.Right click on the FX Picon just above and to the right of the T-Bar.

4.Select Properties. The property panel will open for the loaded effect.

5.Click the Set Picon button. The FX Picon will update to the current frame.

6.Click the Save Over Original File button. Your new picon will appear in the bin.

26.11 Loading and Playing Effects

The GlobeCaster organizes all of its files into bins. Each bin is just a folder on your hard drive. The root bins folder is inside your main GlobeCaster folder on your hard drive. It is recommended that you create your own bin within the FX bin to contain the effects you render. You can then either render your effect directly into this bin or copy and paste it into the bin when it is complete. When your effect has finished rendering, you can run the GlobeCaster Switcher, open your bin and double-click the effect to load it. Hit the spacebar or drag the T-Bar control to play your effect. Remember to unload your effects periodically or you will run out of memory. To do this, right-click on the FX pane and select Unload All effects.

The GrangerFX plug-ins use a series of folders to organize all effect files. For more information see the GrangerFX manual.

Transporter

27.0 Introduction

Transporter is a standalone application that is designed to translate 3D geometry from one file format to another. Transporter runs on Mac OS 9, OS X and under Windows.

27.1 Import Model Settings

After launching Transporter, the Import Model Settings dialog will open. This is where you make decisions about how Transporter will process the imported model file.

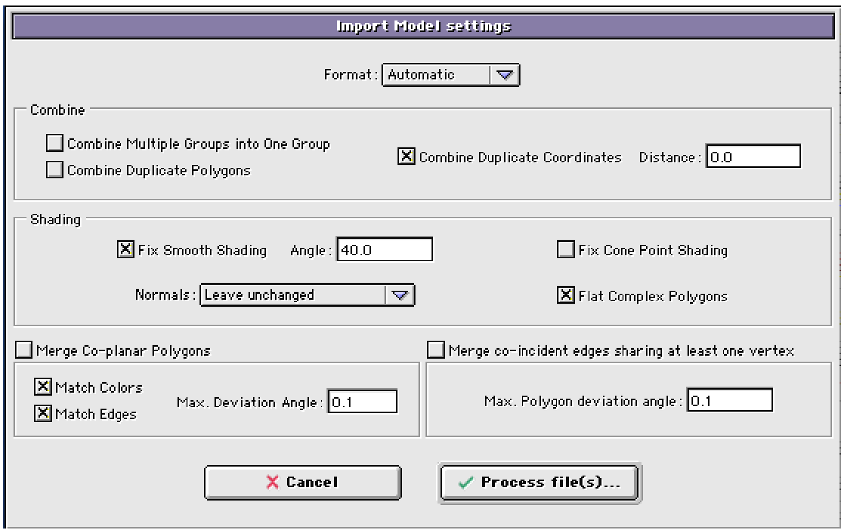


Figure 27.0 — **Transporter Import Model Settings**

Format: Transporter can import models in 29 different file formats.

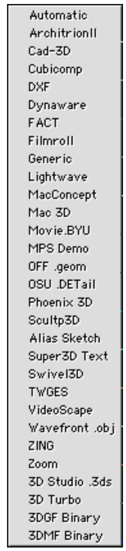


Figure 27.1 — **Import File Formats**

Set the format pull down menu before bringing in the file or leave it set to Automatic if you want Transporter to look inside the file and determine its format.

Combine Multiple Groups Into One Group: Turn on this check box to merge all the groups in the file into a single group.

Combine Duplicate Polygons: When this check box is on during import, the file is searched for polygons that occupy the exact same space. This can be a useful feature if the model is exhibiting rendering anomalies.

Combine Coordinates: This feature is used to ensure that polygons which share edges also share vertices. You can also use this feature to seal vertices, that is, to weld points together that fall within the tolerance shown in the Distance edit box to the right of the check box.

Fix Smooth Shading: This determines the angle at which a hard edge appears between polygons. This feature is often called the “Shading Angle”. If the angle is greater than the value in the Angle edit box, the polygon will shade as a hard edge. If the angle is less than the value in the Angle edit box, the edge will smooth shade.

Fix Cone Point Shading: When turned on, the apex of cones is adjusted so that cones and cone-like shapes will shade correctly (if not enabled, seams can appear). If your data contains one or more cone-like entities, you may wish to turn this option on. Most models do not need this option so it defaults off.

Flat Complex Polygons: This can prevent shading artifacts from appearing in models that have more than for vertices per polygon.

Normals: You can use the normals that are in the file (Leave Unchanged) or ask Transporter to recompute all normals (Force Normal Recalculation).

Merge Co-Planar Polygons: This causes Transporter to sort through the polygons in the file, locating all co-planar polygons (polygons which lie on the same plane) and fuse them together, forming one complex polygon. The Max. Deviation Angle edit box will tell Transporter what tolerance to use when determining whether or not polygons are co-planar.

Match Colors: When on, polygons with different colors will not be merged when using the Merge Co-Planar Polygons option.

Match Edges: When on, both ends of an edge must share points before the two polygons will be merged. When off, two polygons will be merged if they share only one point and part of one edge.

Merge Co-Incident Edges: This forces edges which fall into the tolerance indicated in the Max. Polygon deviation angle edit box to merge. For example, a polygon with three points in a row on a straight edge would lose the middle point.

Process File(s): Click on this button to display a file dialog box. You can choose one or more files to import.

27.2 Export Settings

After the model is imported, the Export Model Settings dialog box opens. This window displays the model in 3D, has statistics about the model and has a variety of options you can use when exporting the model file.

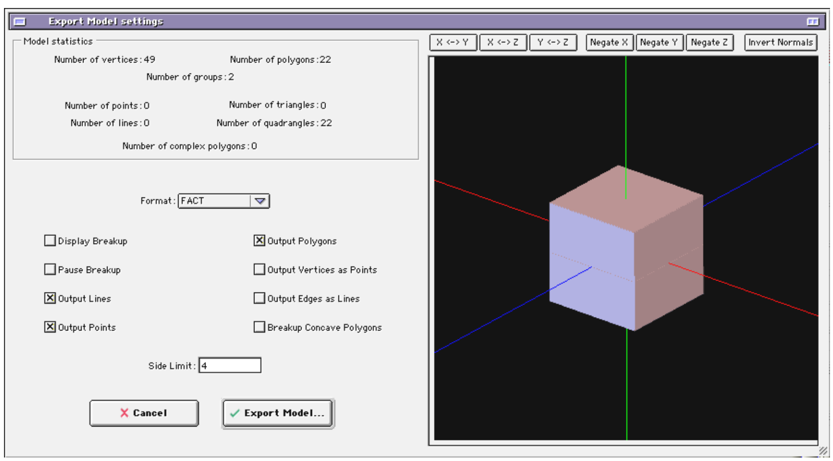


Figure 27.2 — **Transporter Export Model Settings**

3D View: This part of the Export Dialog displays the model using OpenGL. The same shortcuts that work in Animator's Camera View window for orbiting, panning and zooming work in the 3D View. In addition to these, there are some shortcuts specific to Transporter.

Press the **W** key to alternate the display between Gouraud, Flat and Wireframe shading. Press the **N** key to alternate between display of Vertex Normals, Polygon Normals and no normal display.

Model Statistics: This area of the dialog displays basic information about the model after it has been processed using the import settings.

Modify Coordinates (X<->Y, etc.): These options will re-orient the model data. Not by changing the view window's orientation but by changing the model data. X<->Y stands for "Exchange the X and Y axis".

AutoCAD DXF data often comes in to Transporter with the rear of the model pointing forwards, and the right and left sides swapped. to correct this, you click on the Negate X and Negate Z buttons.

Invert Normals: Clicking this button will reverse the direction of the model's normals. This is useful if the model appears backwards or "inside out" in the display window

Format: This sets the file format that will be used when the model is exported. There are 14 different file formats to choose from.

Figure 27.3 — **Transporter Export Formats**

Display Breakup: This shows the process used to break up complex polygons as the file is exported. Transporter will stop and beep if it runs into any problems breaking up complex polygons. It will then wait for you to hit the spacebar before continuing

Note: This is a legacy feature and is not recommended.

Display Breakup: Transporter will wait for a mouse click to advance the breakup process on a polygon-by-polygon basis. This feature is only active if the Display Breakup check box is on.

Note: This is a legacy feature and is not recommended.

Output Points: Allows the saved model file to contain points not associated with polygons. When off, point data is not exported. Turn this feature on if you are trying to process particle data or any other form of point cloud.

Output Lines: Allows the saved model file to contain lines. When off, lines are not exported.

Output Polygons: Allows polygons to be exported. This is rarely turned off, but you might wish to if you need to filter polygons out of a model file containing a point cloud.

Output Vertices as Points: Generates points at every vertex contained within the model file. This can be used to turn a polygon model into a point cloud.

Output Edges as Lines: This adds lines to the model file at the edges of all of the polygons. It could be used to simulate grill work around transparent objects. Also, if you were to turn off all other output options but this one, the result would be a true wireframe representation of the model. Since two lines will be generated whenever two polygons share an edge, the wireframe can be simplified by re-importing the model with the Combine Polygons option turned on.

Breakup Concave Polygons: This option forces polygons that are concave to be broken into a series of smaller, convex polygons. Since Camera can only render convex polygons, this feature can be used to fix polygons that don't seem to render correctly.

Side Limit: Sets the maximum number of edges or sides of the exported polygons. If you enter 0, the maximum number of sides supported by the export format chosen will be used.

Export Model: Opens the save file dialog box which begins the model export process.

27.3 Transporter Preferences

Transporter's preferences can be opened by choosing Preferences... from the main menu.

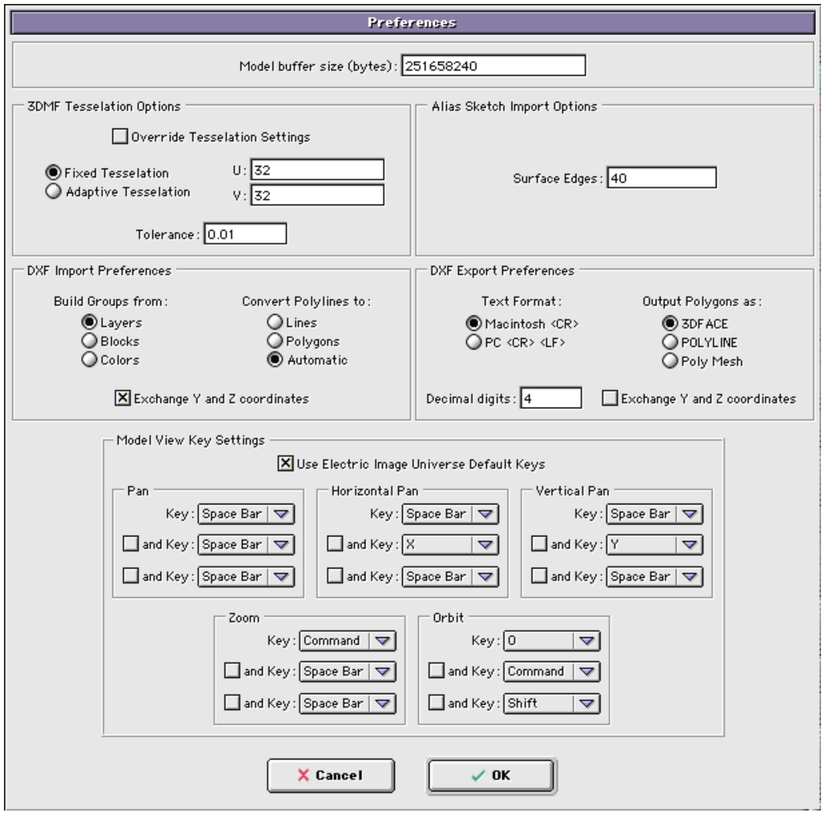


Figure 27.4 — **Transporter Preferences**

Model Buffer Size (bytes): This controls how much memory that Transporter will allocate under OS X and Windows. Valid numbers are between 10000000 (10MB) and 2000000000 (2GB).

3DMF Tessellation Options

Override Tessellation Settings: 3DMF models can contain information describing how they should be tessellated (broken up into polygons). Enabling this feature causes Transporter to replace these built-in settings with either the Fixed or Adaptive settings below.

Fixed Tessellation: This option breaks up the surfaces evenly by the number of steps show in the U and V edit boxes. If the model does not seem to have enough polygons when you export it, you can increase the mesh density by increasing the value of U and V.

Adaptive Tessellation: This option breaks up the surfaces according to their curvature, providing more polygons in the curved portions of the surface and less in the flat portions. If the breakup seems to be creating too few polygons or if the object's curvature does not seem to be preserved, make the value in the Tolerance edit box smaller.

Alias Sketch Import Option

Surface Edges: This edit box contains the number of edges to use when breaking up splines and patches imported from an Alias Sketch file.

DXF Import Options

Build Groups From Layers: AutoCAD organizes drawings in layers. Each layer has a separate color assigned to it. Elements in layers can also have different colors other than the layer color. Layers can also contain blocks. Blocks are user-defined containers which hold any element type that can be created in AutoCAD. Since Transporter follows the Autodesk guidelines for DXF, the default settings function as if the DXF file to be imported was created by AutoCAD. Therefore, since the comparable EIAS FACT file structure for an AutoCAD layer is the group, Build Groups From Layers is the default setting.

Build Groups From Blocks: AutoCAD allows you to create block structures in a drawing file. Normally, when Transporter reads the DXF file and creates the FACT file, blocks are added to the layers in which they were inserted when the drawing was created within the AutoCAD program. However, some programs do not follow the Autodesk convention when it comes to assigning blocks and layers. Instead, these programs create the group structure out of blocks rather than layers. Choose this option if you wish to create FACT file groups from blocks instead of layers.

Note that any layer information will be discarded if this option is selected, and any unblocked entities in the DXF file will be added to a single group.

Build Groups From Colors: Any entity in AutoCAD can have a unique color. AutoCAD supports 256 different entity colors. You can use these colors to create separate groups within the exported file. Since AutoCAD itself provides enough versatility for object grouping and creation, you would probably not wish to use this option when importing DXF file that were created with AutoCAD itself. However, some programs which output DXF files may have a limited group capability, but allow many colors. This option lets you take advantage of this situation and will treat entities with separate colors as separate groups.

Note that no layer or block information will be considered if this option is selected.

Convert Polylines to Lines: All polylines in the DXF file will be converted to lines.

Convert Polylines to Polygons: Converts any polylines in the DXF file into polygons. In AutoCAD, polylines are not used to describe actual surfaces. Instead, they may be used as boundaries from which surfaces can be created using any number of surface entities. Older versions of AutoCAD couldn't support polygons with more than four sides. Some programs wrote out more complex polygons as a series of polylines as a way of overcoming this limitation.

Convert Polylines to Automatic: When this is selected, Transporter will automatically decide convert polylines to either lines or polygons based on compatibility with the output format you have chosen.

Exchange Y and Z Coordinates: This corrects for the difference in the coordinate space between AutoCAD and EIAS.

DXF Export Options

Text Format: DXF is a text file format. Each line can be terminated with either a Carriage Return (CR) or and Carriage Return (CR) and a Line Feed (LF). Most applications can handle either termination, but some do not and the Text Format options can be used to choose a specific termination technique.

Output Polygons as 3DFACE: Polygons will be written to the DXF file using the 3DFACE entity type.

Output Polygons as POLYLINE: Polygons will be written to the DXF file using muti-sided POLYLINE entities. Although this is not strictly "legal" in AutoCAD, many other 3D programs use this technique to store complex polygons.

Output Polygons as Poly Mesh: Polygons will be written to the DXF file using the Poly Mesh entity type.

Decimal Digits: This edit box controls how many digits to the right of the decimal place are written into the output file.

Exchange Y and Z Coordinates: This corrects for the difference in the coordinate space between AutoCAD and EIAS.

Model View Key Settings

If you are not satisfied with the shortcut keys used in the 3D View window, you can change them here. Use the check boxes and pull down menus to set any key combinations you desire.

Shaders

28.0 Introduction

Procedural shaders are little “C” or “C++” language programs which EIAS Camera can use to shaded pixels with a variety of effects. Well written shaders are typically very fast and efficient.

Shaders can be added to any material channel you choose (diffuse, specular, etc.) they will affect this channel and may optionally affect several others as well (shaders do not perform displacements at this time.) Most often, you will add the shader to the diffuse channel. Shaders are located in the EI Shaders folder, in the same directory that EIAS Animator is installed.

The shaders have animation parameters. The numeric entry boxes and the colors can be animated to create some very striking effects. (As an example, add the Cammo shader to a teapot and animate the Density value over time). *Note — Changes you make in these interfaces are made at the current project time. To prevent unwanted texture animation, disable the animation flag for the texture map item for the group in the Project Window.*

A shader is added to a material channel using the add button in the Material Info Window. Once added, you can double-click on the shader to bring up its Texture Info Window. Under the Special Tab you will find two new buttons: Procedural... and Save Procedural as... The Procedural button brings up the interfaces shown in the rest of this chapter. The Save Procedural As button saves a copy of the procedural with the current settings as default. This means you can create a shader with unique set of parameters that you like and save it out with those parameters imbedded in it.

Some procedural shaders are designed to work as 2D projections, others as 3D projections. Those that work in 2D will appear to stretch along the depth of the projection. Also, some shaders are not anti-aliased within the shader. You can increase the group sampling to 2x2 to compensate.

Working with Procedural Shaders

All of the interfaces presented for each shader are simple dialog boxes, listing parameters and values, plus a shader preview area. The preview area fits within the face of the cubic projection that EIAS Animator supplies for procedural shaders. Whatever you see in your preview, will be what you see in the area occupied by the face of the cube, with one caveat: the cubic projection must be equilateral, that is, the scales of the X, Y, and Z axes must be the same. If not, the procedural will appear distorted by the amount of the scale values. The position of the shader is also influenced by the position of the cubic projection icon. You can use this to fine tune procedural placement if necessary.

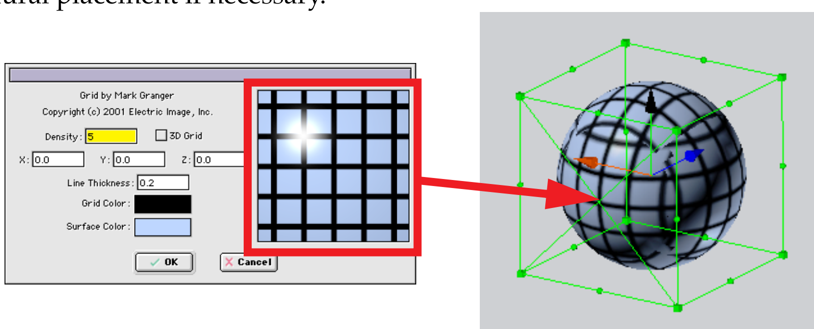


Figure 28.0 — **Relationship of Preview Area to Cubic Projection Icon**

You can also adjust the “lighting” in the shader preview area by clicking the location in the preview area that you would like to see the light shine on the preview (it defaults to the top right of the preview area.) This can help you to get a better feel for the look of the shader before you render. Some shaders can generate holes in surfaces. The preview area will show a non-rendering checkerboard in that case.

You can set color values to alpha 0.0 to use the diffuse color of the group for that component, instead of the color swatch. Some shaders, such as Random Dots, do this automatically.

In addition to the procedural shaders that come with EIAS, our web site has a comprehensive list of shaders available from 3rd parties.

Anisotropic

This shader allows you to specify a non-circular shaped highlight. It will even let you define different layers of highlights, so that you can easily simulate things such as a car paint finish, which is actually a color coat of paint (which has a grain, and therefore a highlight direction and shape that is not circular) underneath a clear coat (which has a more conventional highlight.) In addition to multiple layers, you can also choose preset patterns which mimic that way that bare metal is finished with machine tooling. The results of this shader are quite stunning, and fast, too.

This shader affects only the Specular channel regardless of which channel it is placed into.

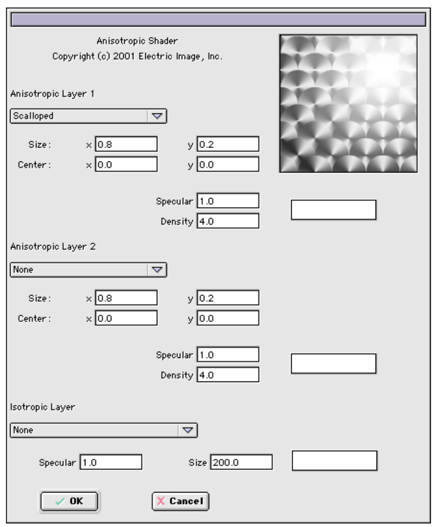


Figure 28.1 — **Anisotropic Shader Interface**

First and Second Anisotropic Layer Options

Pattern. There are several anisotropic patterns to choose from: None, Linear, Radial, Square, Scalloped, and Braided. Each of these options will show in the preview window of the shader interface.

Size. This is the size of the pattern. You may want to make the square, scalloped or braided patterns different sizes depending on the size of your objects.

Center. This is the center of the pattern, which can be moved to a different location.

Color Each layer has a separate color option. They are for the color of the anisotropic pattern or separate specular highlight.

Isotropic Layer

In this layer, you can choose the color of an extra specular highlights, as well as what kind.

Blinn. A blinn highlight is similar, except that the shape of the highlights take into account the light hitting the surface more accurately.

Phong. A phong highlight will look round and bright like those you might see on a billiard ball.

Bricks

This 2D shader creates a brick pattern on any group it is added to.

Apply only to the Diffuse Channel. Will affect the Diffuse, Bump, and Specular Channels.

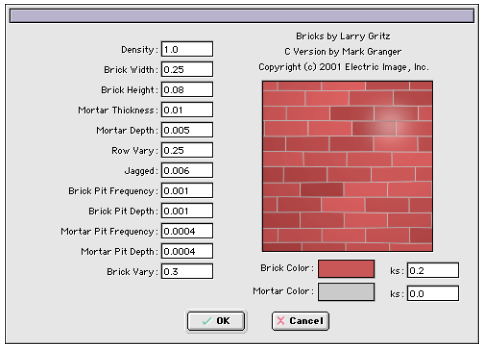


Figure 28.2 — **Bricks Shader Interface**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Brick Width. The width of each brick. A value of 1.0 will yield bricks as wide as preview window.

Brick Height . The height of each brick. A value of 1.0 will yield bricks as high as preview window.

Mortar Thickness . The width and height of the mortar that separates the brick.

Mortar Depth. The mortar is an inset procedural bump. This controls how deep it is.

Row Vary. Controls brick alignment. If set to 0.0, the alignment between alternate rows of bricks will be perfect.

Jagged. Larger numbers than the default will cause extreme variation of the height and length of the bricks in a wave like fashion.

Brick Pit Frequency. The bricks themselves have a rough surface due to a procedural bump. This value controls the number of pits on each brick surface. Useful values are between.001 and.009.

Brick Pit Depth. Controls the depth of the pits on the surface of the bricks. Useful values are between.01 and.0001.

Mortar Pit Frequency. The mortar also has a rough surface due to a procedural bump. Useful values are between.0001 and.0009.

Mortar Pit Depth. Controls the depth of the pits in the mortar. Useful values are between.0001 and.0009.

Brick Vary . This controls the color variation of the bricks. Useful values are between 0 and 1.

Brick Color. The RGB color of the bricks.

Mortar Color. The RGB color of the mortar.

Ks. The Specular value for the Bricks and Mortar. 0 is no specular, 1 is maximum specular.

Bump Array

This 3D shader creates an array of dimples. Could be used for the surface of a golf ball or for metal floor plating. It is also useful for creating a pattern of round holes in an object, like the lid of the original Star Trek communicator. Apply the shader to the Transparency Channel with a Density of 10.0 and the Bump Color set to black.

Will affect the channel in which it is applied and the Bump/Diffuse Channel.

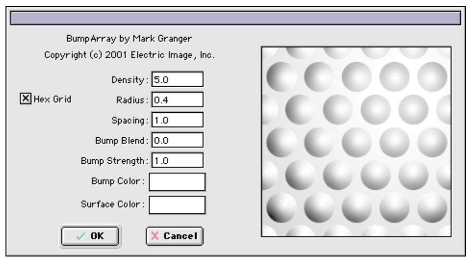


Figure 28.3 — **Bump Array Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Hex Grid. Realigns the bumps in a hexagonal pattern. It defaults to on.

Radius. Controls the radius of the bumps.

Spacing. Controls the distance between each bump. This number can be set small to cause the bumps to overlap.

Bump Blend. Distance over which the bumps blend together. Smoothes over transitions when the bumps overlap.

Bump Strength. Controls the magnitude of the bump, how deep or high it is. Can be positive or negative.

Bump Color. The RGB color of the bumped area.

Surface Color. Sets the RGB value of the surface. You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead.

Bumpy Noise

This 3D shader creates a bumpy, noisy pattern. Could be used for alien flesh.

Will affect the channel it is applied to and Bump Channels.

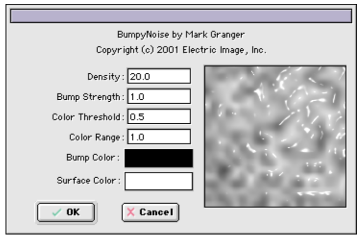


Figure 28.4 — **Bump Noise Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Bump Strength. Controls the magnitude of the bumps on the surface. Useful range is -5.0 to 5.0

Color Threshold. Changes where the color blend begins between Bump Color and Surface Color. 0.5 is right in the middle of the bump, 1.0 is right at the top of bump.

Color Range. Controls the variation in color between the lowest and highest points on the surface. Useful range is between 0 and 10.

Bump Color. The RGB color of the bumped area.

Surface Color. Sets the RGB value of the surface. You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead.

Cammo

This is a camouflage 3D shader and is loosely patterned after the standard US "Woodland" pattern.

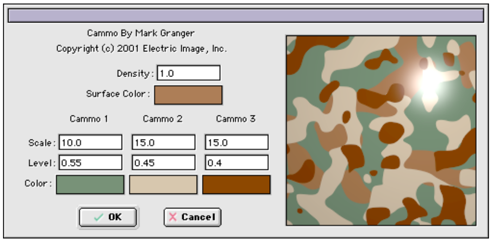


Figure 28.5 — **Cammo Shader**

Will affect only the channel in which it is applied. Will not work if placed in the bump channel.

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Surface Color. Sets the RGB value of the underlying surface. The three Cammo regions are applied on to of this surface. You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead. There are three different regions added on top of the surface color. They each have the following controls.

Scale. Controls the size of the pieces that make up the region.

Level. Controls how much of the Surface color shows through the region. 0.0 allows all of the surface color to show through. 1.0 allows none at all.

Color. RGB color of the region.

Cel Look

This shader is neither a 2D or 3D shader, but rather an illumination shader which gives a cartoon-like appearance to the groups it is applied to. The defaults have been picked to work well. You may wish to try it, as is, before changing any of the values in the interface. The shader will automatically pick up the diffuse color of the object. Therefore, you don’t have to change the color values in the shader for each object you use it with.

Apply to the Diffuse Channel, will affect Diffuse and Specular.

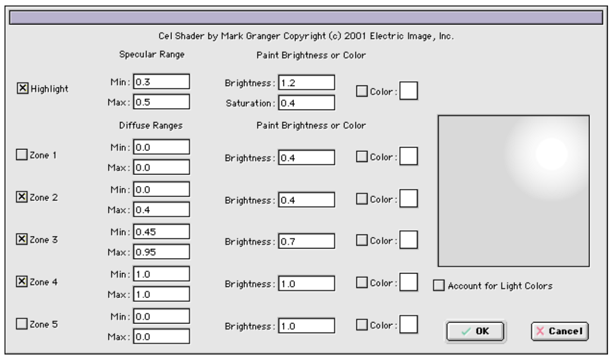


Figure 28.6 — **Cel Shader**

Highlight. If this option is on, the highlight (specular) is operated on by the shader.

Specular Range Min/Max. Specular is always in the range of 0 to 1. 0 is no specular, 1 is 100% specular. As the object is shaded, pixels with a specular value below the Min get no specular highlight at all. Pixels greater than the Max get the color in the specular channel of the group after being processed by the Brightness and Saturation values. Between the Min and Max, the color is ramped.

Brightness. Varies the brightness of the computed highlight.

Saturation. Varies the saturation of the computed highlight.

Color. When on, the color chosen using the swatch is used instead of the group's specular color.

Zones. Sets the number of different colors that will be used to shade the group.

Diffuse Range Min/Max. If the brightness of the pixel being shaded falls into this range, the objects diffuse color is multiplied by the Brightness value and applied. If the brightness falls in between ranges (as in the case of 0.42, using the numbers in the illustration), the color is ramped.

Brightness. The factor by which the diffuse color is multiplied to yield the final pixel color.

Color. If the brightness of the pixel being shaded falls into Min/Max range for this Zone, the object's diffuse color is replaced by this color.

Account for Light Colors. If this option is on, the highlight and the diffuse colors of the shader are effected by scene lighting, otherwise the colors of the group will match the swatches in the shader.

Checker Board

This shader can be either 2D or 3D, and places a checkerboard pattern on the surface of the group.

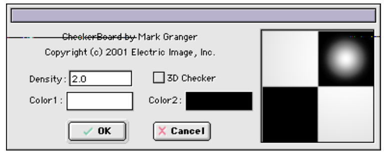


Figure 28.7 — **Checker Board Shader**

Will affect only the channel in which it is applied. Will not work if placed in the bump channel.

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Color1&2. RGB color of the alternating squares.

3D Checker. Makes the procedural act as a solid shader. The checkerboard pattern will repeat throughout the group.

Clouds

This 3D shader creates a cloud-like fractal pattern.

Will affect only the channel in which it is applied. Will not work if placed in the bump channel.

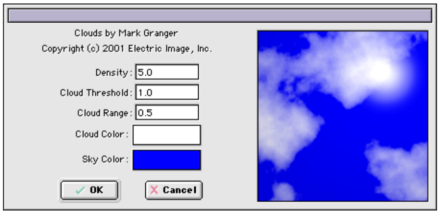


Figure 28.8 — **Clouds Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Cloud Threshold. Controls how many cloud puffs are present. Useful range is 2.0 to 0.0.

Cloud Range . Controls the density of the clouds. Useful range is 10.0 to 0.0

Cloud Color. RGB color of the clouds.

Sky Color. RGB color of the area not covered by clouds.

Color Noise

This 3D shader creates a psychedelic color pattern, similar to tye-dye.

Will affect only the channel in which it is applied. Will not work if placed in the bump channel.

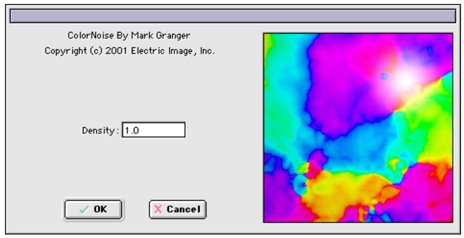


Figure 28.9 — **Color Noise Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Contour

This shader creates a grid pattern on the object. The grid lines themselves have explicit control for visibility.

Will affect only the channel in which it is applied. Will not work if placed in the bump channel.

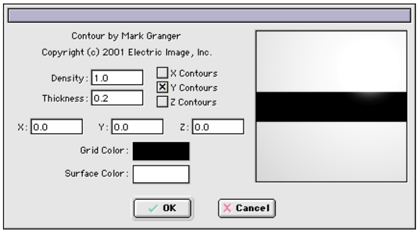


Figure 28.10 — **Contour Shader Interface**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out (seeing more of the grid), smaller to zooming in (seeing less of the grid). The default is 1.0.

Line Thickness. Sets the thickness of the grid lines. The default is 0.2 Smaller numbers produce thinner lines.

X,Y,Z Contours. These check boxes give you explicit controls over the visibility of each of the axis lines.

X,Y,Z. Offsets the grid pattern in the direction specified. Very useful when the 3D Grid check box is on as you might find the Z position of the grid leaves you right in the middle of a line.

Grid Color. Sets the RGB color of the lines.

Surface Color. Sets the RGB value of the underlying surface. You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead.

Crumple

This 3D shader creates a bumpy pattern on an object very similar to crumpled aluminum foil.

Will affect the channel in which it is applied and Bump channels.*This shader is not anti-aliased, so use additional group sampling as needed.*

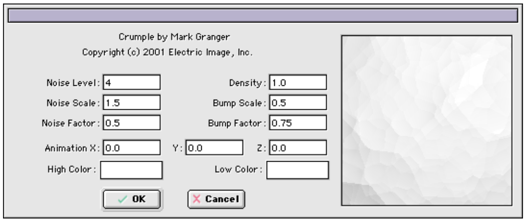


Figure 28.11 — **Crumple Shader**

Noise Level. Controls how many iterations of noise are computed for the shader. Each successive iteration is half the size of the previous one. More Levels require more rendering time.

Noise Scale. Sets the height at which the High Color is drawn.

Noise Factor. Each successive level of noise gets smaller by this amount.

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Bump Scale. Sets the magnitude of the bump. Can be negated to invert the crumple effect.

Bump Factor. At each successive level of noise is computed the bumps get smaller by this amount.

Animation. Animates the noise pattern over time. A value of 1.0 moves the noise 1 unit of the preview square per second. This can be used to create animated water effects. Try doing this by animating the Z value for the shader applied to a flat plane.

High Color. Sets the RGB value of the surface at the top of the bumps. You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead.

Low Color. Sets the RGB value of the surface at the bottom of the bumps. You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead.

Crust

This 3D shader creates a series of high, flat ledges.

Will affect the channel in which it is applied and Bump channels.

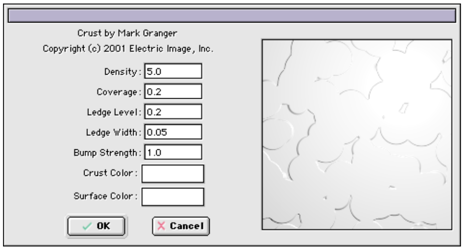


Figure 28.12 — **Crust Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Coverage. Controls the region that the Crust Color covers. 0.0 yields no Crust Color. 1.0 will cause the Crust Color to cover the entire procedural.

Ledge Level. Controls how far the ledges spread out across the surface of the crust.

Ledge Width. Sets the widths of the ledges.

Bump Strength. Sets the magnitude of the bump for the ledges. Values can be either positive or negative.

Crust Color. Sets the RGB value of the ledges.

Surface Color. Sets the RGB value of the surface. You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead.

Cyclone

This 3D shader creates a vortex pattern. The effect is quite startling when applied to the Transparency Channel.

Will affect only the channel in which it is applied. Will not work if placed in the bump channel.

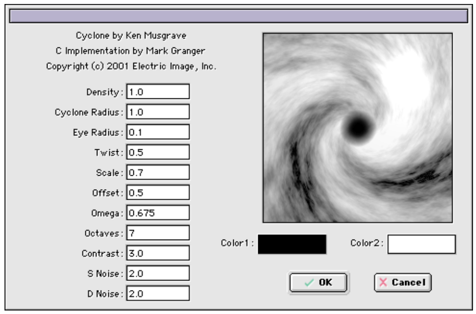


Figure 28.13 — **Cyclone Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Cyclone Radius. The radius of the main body of the swirling vortex. This value manages the apparent "strength" of the vortex. The default value of is 1.0, giving a decent looking vortex. Smaller numbers will impart less energy to the vortex, effectively weakening it. A value of 0.0 will look like smoke, rather than a cyclone. Likewise, values of over 5.0 will have a similar effect.

Eye Radius. The radius of the eye at the center of the vortex. 0.5 corresponds to the width of the preview window.

Twist. Sets the number of revolutions the vortex makes within the width of the preview window

Scale. Sets the magnitude of the amount of clouds created in the vortex. Small changes in this value can vary the look of the effect significantly.

Offset. Can be used to make the overall effect more misty.

Omega. Increases the choppiness of the clouds. Useful range is between 0.0 to 1.0, with 1.0 being more choppy than 0.0.

Octaves. Controls the detail of the noise function. Useful range is 1 to 8.

Contrast. Lower numbers decrease the contrast between Color1 and Color2.

S Noise. A noise seed. Can be used to vary the look of the cyclone.

D Noise. A noise seed. Can be used to vary the look of the cyclone.

Color1. Sets the RGB value of the region not part of the swirling vortex.

Color2. Sets the RGB value of the clouds in the vortex.

Dots

This 3D shader makes a grid of dots on the surface of the object.

Will affect only the channel in which it is applied. Will not work if placed in the bump channel.

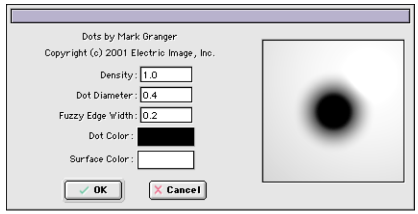


Figure 28.14 — **Dots Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, adding more dots, smaller to zooming in, removing dots. The default is 1.0.

Dot Diameter. Diameter of the dots. A diameter of 1.0 fills the preview window at a density of 1.0.

Fuzzy Edge Width. Sets a region around the dot to blur slightly. Makes a nicer transition from the surface to the dots.

Dot Color. The RGB color of the dots.

Surface Color. Sets the RGB value of the surface. You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead.

Eroded

This 3D shader puts dents and holes in the surface of an object. (The shader uses a black and white checker pattern in the preview area to denote actual holes that will be visible through the material — the pattern does not render.)

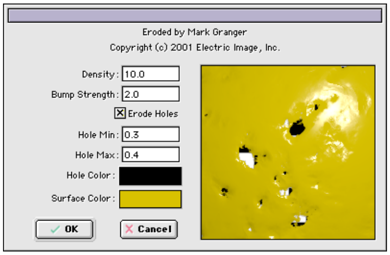


Figure 28.15 — **Eroded Shader**

Will affect the channel in which it is applied and the Bump channels.

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Bump Strength. The magnitude of the bump applied to the dented portions of the surface. Can be a negative number.

Erode Holes. When on, holes are actually cut through the surface. When off, areas that represent holes are shaded with the Hole Color.

Hole Min. The surface of the object is represented by a value of 0 to 1. Where 0 is the bottom of the deepest hole. Hole min sets the range over which holes occur on the object. In the default case, holes appear between 0.3 and 0.4

Hole Max. The surface of the object is represented by a value of 0 to 1. Where 1 is the top of the surface. Hole max sets the range over which holes occur on the object. In the default case, holes won't appear between 0.4 and 1.0. Between 0.3 and 0.4 there is a ramp wherein the surface transitions nicely into the hole.

Hole Color. RGB value of the color applied to the holes when the Erode Holes flag is off.

Surface Color. Sets the RGB value of the surface. You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead.

Flame

This 3D shader creates a fire-like color pattern. You may want to re-align the cubic projection icon to bottom or top, as the preview shader is presenting the flames to you in that orientation. (This shader does not animate the flame effect.)

Will affect only the channel in which it is applied. Will not work if placed in the bump channel.

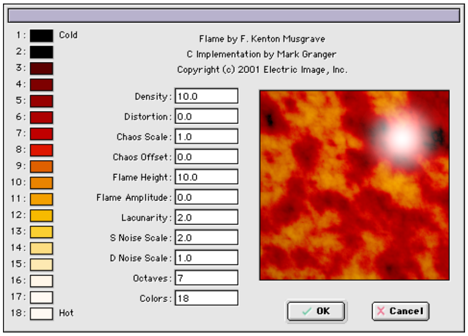


Figure 28.16 — **Flame Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Distortion. Scales the combination of all noise functions. Larger numbers will yield many smaller regions of flame. Useful values are in the range of 0 to 1.

Chaos Scale. Scales the color temperature of the shader. Larger numbers are hotter.

Chaos Offset. Increases the color temperature of the shader (default is 0.0.) Larger numbers are hotter. Numbers over 1.5 tend to “burn out” the shader and are not very useful.

Flame Height. If set to 0.0 (the default), this shader behaves as a 2D shader. If a height is provided, the colors will vary as the height of the object changes. Apply to the top of a cube and enter in a height value. When you render the side of the cube, you will see the colors creeping up.

Flame Amplitude. Scales the flame temperature based on the height.

Lacunarity. Sets the gaps (dark areas) between the regions of flame in the preview window. By setting the colors of the coolest regions to Alpha 0.0 in the color picker, you can see the group’s diffuse color through the gaps.

S Noise Scale. Acts as a noise seed to vary the look of the flame.

D Noise Scale. Acts as a noise seed to vary the look of the flame.

Octaves. Sets the fractal complexity of the shader. Useful values range between 1 and 7.

Colors. Sets the number of colors, from the list of colors on the left, to use when creating the procedural effect.

Fractal Noise

This 3D shader creates a fractal-based noise pattern.

Will affect the channel in which it is applied and the Bump channels.

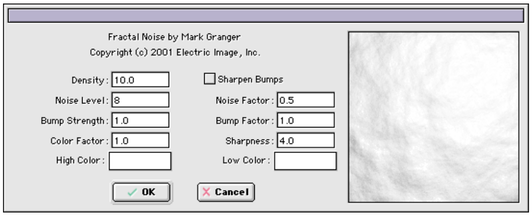


Figure 28.17 — **Fractal Noise Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Noise Level. Controls the complexity of the noise. Useful range is 0 to 8

Noise Factor. Higher numbers produce a rougher surface, smaller number a smoother surface.

Bump Strength. Sets the magnitude of the bump. Can be negated.

Bump Factor. With each successive noise level calculation, bumps get smaller by this factor.

Sharpen Bumps. Takes the highest point and makes it rougher, takes the lowest point and makes it softer. Good for making the bumps nice and craggy.

Color Factor. Sets the point where the shader switches from the High Color to the Low Color. Higher numbers will completely eliminate the Low Color.

Sharpness. Larger numbers increase the contrast between the High and Low Colors

High Color. Sets the RGB value of the surface at the top of the bumps. You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead.

Low Color. Sets the RGB value of the surface at the bottom of the bumps. You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead.

Gooch

This shader renders an object with a hue and value shift rather than traditional phong shading. This produces a more "illustration" style of shading. This look is very useful for technical illustrations and produces an artistic, rather than photo-realistic, representation of the object. The user can control the cool and warm colors of the shading, as well as how the shading threshold will behave.

This shader affects the Diffuse, Specular and Reflectivity channels. Apply is to the Diffuse channel.

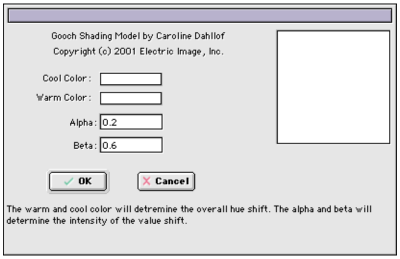


Figure 28.18 — **Gooch Shader**

Cool Color. The cool color of a gooch shaded model, is a color that is not highlighted with a specular hit or is in shadow.

Warm Color. The warm color of a gooch shaded model, is a color that is highlighted with a specular hit, or with bright lighting.

Alpha. Alpha is the prominence of the object color and Beta is the strength of the color shift.

Beta. Beta is the strength of the color shift.

Granite

This 3D shader creates a granite rock appearance.

Apply this shader only to the Diffuse Channel. Will affect the Diffuse and Specular Channels.

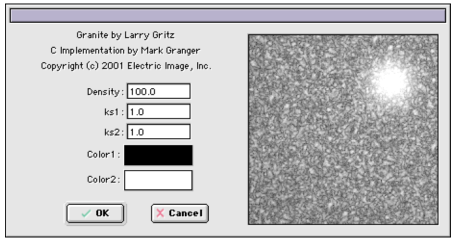


Figure 28.19 — **Granite Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.\

ks1. The Specular value for the region colored by Color1. 1.0 is max, 0.0 is no specular

ks2. The Specular value for the region colored by Color2. 1.0 is max, 0.0 is no specular

Color1. The RGB value for the underlying color of the granite rock.

Color2. The RGB value for the colored pieces that mix in with the granite rock.

Grid

This shader creates a 2D or 3D grid of lines.

Will affect only the channel in which it is applied. Will not work if placed in the bump channel.

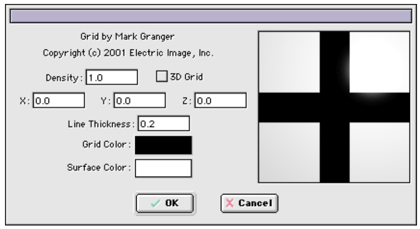


Figure 28.20 — **Grid Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out (seeing more of the grid), smaller to zooming in (seeing less of the grid). The default is 1.0.

3D Grid. Makes the shader work in 3D space.

X,Y,Z. Offsets the grid pattern in the direction specified. Very useful when the 3D Grid check box is on as you might find the Z position of the grid leaves you right in the middle of a line.

Line Thickness. Sets the thickness of the grid lines. The default is.2 Smaller numbers produce thinner lines.

Grid Color. Sets the RGB color of the lines.

Surface Color. Sets the RGB value of the underlying surface. You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead.

Hex Tile

This 2D shader creates a hexagonal pattern of terra cotta tiles. Perfect for your patio or mud room.

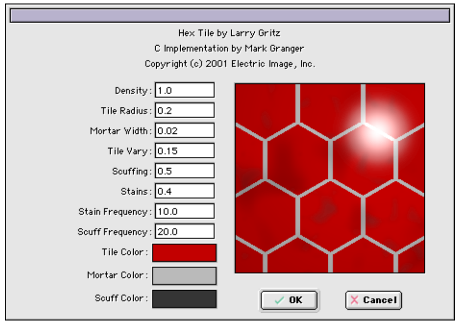


Figure 28.21 — **Hex Tile Shader**

Will affect only the channel in which it is applied. Will not work if placed in the bump channel.

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Tile Radius. Sets the size of the tiles. 1.0 represents one full tile in the preview window.

Mortar Width. Sets the width of the mortar between the tiles. Useful range is 0.0 to 0.3

Tile Vary. Allows subtle variations in the color of the tiles. Useful range is 0.0 to 1.0

Scuffing. Sets the darkness of the scuff marks on the surface of the tiles. Useful range is 0.0 to 5.0

Stains. Creates separate stained areas using the Scuff color. Useful range is 0.0 to 5.0

Stain Frequency. Controls the size of the stained areas. Larger numbers create smaller stains.

Scuff Frequency. Controls the size of the scuff marks. Larger numbers create smaller marks.

Tile Color. Sets the RGB value of the tiles

Mortar Color. Sets the RGB value of the mortar between the tiles.

Scuff Color. Sets the RGB value of the scuff marks on top of the tile.

Marble

This 3D shader creates a marble-line surface for rocks, pillars, temples, etc. Will affect only the channel in which it is applied. Will not work if placed in the bump channel.

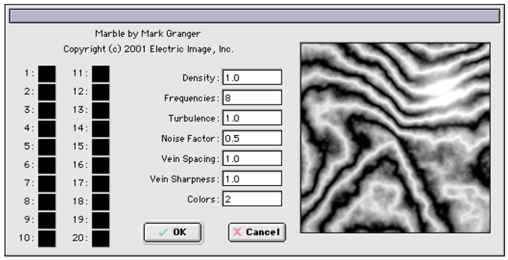


Figure 28.22 — **Marble Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Frequencies. Controls the number of separate veins that appear in the marble. The default is 8 and you can see 8 distinct black veins running through the marble in the preview window.

Turbulence. Sets the waviness of the veins. Larger numbers yield more waviness.

Noise Factor. Affects the variation of the veins along their length. Useful values are in the range of 0.0 to 1.0

Vein Spacing. Controls the distance from one vein to the next.

Vein Sharpness. Controls the sharpness and apparent width of the veins.

Colors. Controls how many of the colors on the left side of the interface are used to shade the marble. *(Color number 1 defaults to alpha 0.0, allowing the diffuse color of the group to show through.)*

Oren-Nayer

The Oren-Nayer shader is rough surface BRDF shader which more accurately shades surfaces which scatter a lot of light, such as unglazed ceramics fabric, terra-cotta, suede, clay, human skin and so on. It can add a softness and richness that typical phong shading lacks.

This shader affects the Diffuse, Specular, and Reflection Channels only.

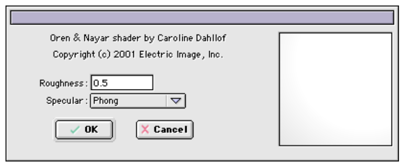


Figure 28.23 — **Oren-Nayer Shader**

Apply only to the diffuse channel.

Roughness. This option basically sets how bumpy or porous an object is. For example skin, is a smooth surface but close inspection shows microscopic ridges all over the surface, so it's roughness is fairly high. On the other hand, a glass object, or glossy painted surface is extremely smooth, so it's roughness is very low.

Specular. Like the specular section for the anisotropic shader the option for a Phong or Blinn type highlight can be chosen.

Pearl

This shader produces a "pearlescent" sheen on an object. Simulating effects like mother of pearl or pearl coats of paint are accomplished with this shader. It works by allowing the user to adjust the reflected red, green and blue wavelengths of light coming from an illuminated object with this shader applied. A noise factor can also be applied.

This shader affects Diffuse, Specular and Reflection channels only. Apply only to the Diffuse channel.

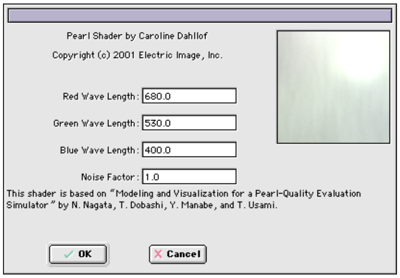


Figure 28.24 — **Pearl Shader**

Wavelength. This shader allows you to assign Red, Green and Blue wavelengths to apply to the object. A very small margin of color from each of these wavelengths is then applied to the model.

Noise Factor. This is a control for the amount of deviation from the wavelengths assigned. A higher number will have a greater variety of colors.

Plank

This 3D shader creates a nice parquet-style wood pattern. Can be used to great effect on the floors of entry halls or on dance floors. Biases the specular highlight with the parquet pattern as well. Can also be used to simulate hardwood flooring.

Apply only to the Diffuse Channel. Will affect the Diffuse, Bump, and Specular channels.

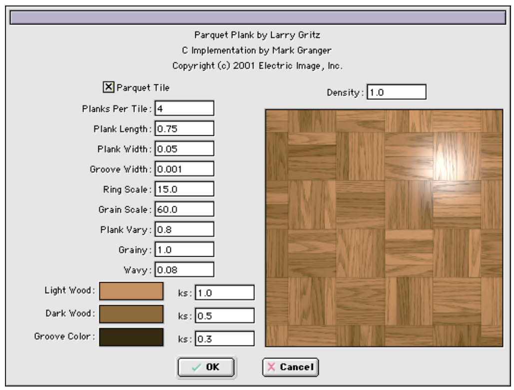


Figure 28.25 — **Plank Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Parquet Tile. Creates the parquet pattern of tiled wood. If off, long planks are created instead; perfect for hardwood floors.

Planks Per Tile. Number of individual wood slats that make up each tile.

Plank Length. Sets the length of the planks when the Parquet Tile flag is turned off.

Plank Width. Sets the width of the tiles when the Parquet Tile flag is on. If the flag is off, it sets the width of the individual planks.

Groove Width. Sets the width of the grooves that separate the tiles from one another and the grooves that separate the planks within the tiles from one another.

Ring Scale. Larger number create more, tighter grain patterns in the planks.

Grain Scale. Larger number cause the grain patters to be thicker.

Plank Vary. Cause color variation in the individual planks. Useful range of values is 0.0 to 2.0.

Grainy. Sets the amount of grain in each plank. Larger numbers give you smaller grain.

Wavy. Larger numbers make the grain more wavy.

Light Wood. Sets The RGB color of the lightly colored planks.

Dark Wood. Sets The RGB color of the darkly colored planks.

Groove Color. Sets The RGB color of the grooves between the planks and tiles.

ks. Sets the specular for each of the areas. 0.0 is no specular. 1.0 is maximum specular.

Random Dots

This 3D shader creates a pattern of randomly colored dots. Perfect for that summer dress.

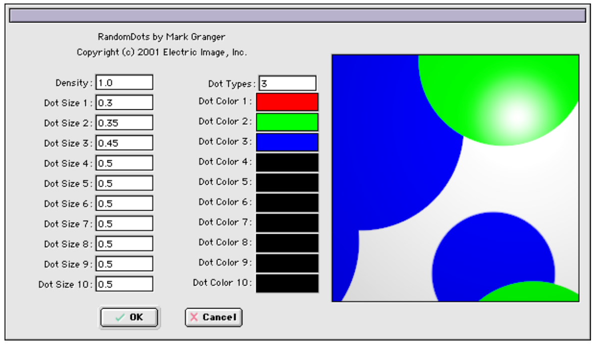


Figure 28.26 — **Random Dots**

Will affect only the channel in which it is applied. Will not work if placed in the bump channel.

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in. Defaults to 1.0.

Dot Types. This value controls which of the 10 different dots are supported will be used by the shader, from top to bottom of the list as presented in the window.

Dot Color. Sets the color of each dot

Dot Size. Sets the maximum size of each dot. There is random variation in the size from the maximum down.

Rust

This 3D shader creates a rusted surface pattern. The surface appears thick with areas eroded down to holes.

Apply only to the Diffuse Channel. Will affect the Diffuse and Bump channels.

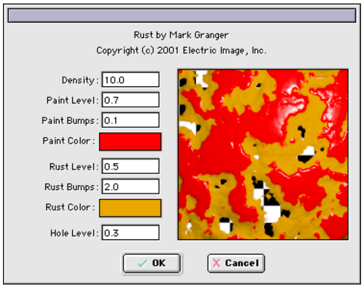


Figure 28.27 — **Rust Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Paint Level. Controls how deep into the surface the paint reaches.

Paint Bump. Sets the magnitude of the bumps on the painted surface.

Paint Color. Sets the RGB value of the surface. You can set the alpha to 0.0 to allow the underlying color or map to come through instead.

Rust Level. Sets the amount of the surface affected by the rust. 1.0 is all rusty, 0.0 is no rust at all.

Rust Bumps. Sets the magnitude of the bumps on the rusty surface.

Rust Color. Sets the RGB value of the rusted area.

Hole Level. Sets the amount of the surface that becomes holes. 1.0 is all hole, 0.0 is no holes.

Stucco

This 3D shader creates a stucco pattern using bumps. Great for adding a slight variation to interior and exterior walls.

Will affect the channel in which it is applied and Bump channels.

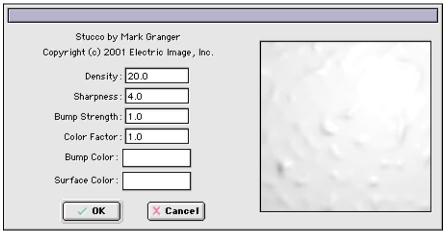


Figure 28.28 — **Stucco Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Sharpness. Controls the smoothness of the bumps. Smaller numbers are smoother, larger numbers sharper. Useful range is 0 to 10.0

Bump Strength. Sets the magnitude of the Bump. Can be positive or negative.

Color Factor. Controls the blend, and therefore the spread, of the Bump Color into the Surface Color. Larger numbers correspond to a larger spread.

Bump Color. Sets the RGB value of the bumps.

Surface Color. Sets the RGB value of the surface You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead.

Thin Film

The Thin Film Shader is designed to provide the effects of a film-like coating above a surface. The most obvious examples would be the soap bubble, or oily puddle, however some new sunglass lenses also exhibit this same effect.

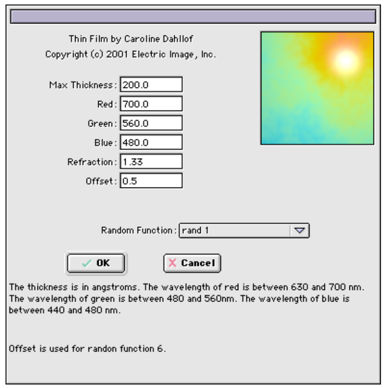


Figure 28.29 — **Thin Film Shader**

This shader effects Diffuse and Reflection channels only. Apply it to the Diffuse channel.

Max Thickness. This option sets the thickness of the 'film' simulated by the shader. It is measured in angstroms, which is a very small unit of measure, one hundred millionth of a centimeter.

Wavelengths. The options for wavelengths are Red, Green and Blue settings. A small band of color will then be used from each setting of the wavelengths.

Refraction. This setting will allow the shader to have refraction inside its small space. This is different than refraction on of the object itself, as it is only affecting the thickness assigned to the shader.

Offset. The Offset option moves the shader through 3D space. Can offset the pattern on the model.

Random. The Random function sets the random variable seed that controls the look of the pattern

Veins

This 3D shader creates a series of polygonal shapes separated by grooves. Could be used for alien skin or even the surface of a cobblestone walkway. Will affect the Channel in which it is applied and Bump channels.

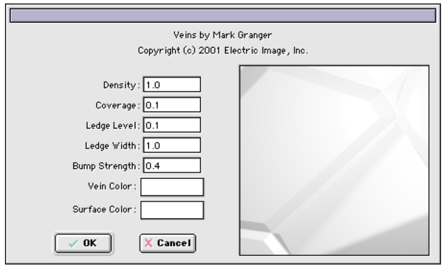


Figure 28.30 — **Veins**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Coverage. Controls the region that the Vein colors covers. 0.0 yields no Vein Color. 1.0 will cause the Vein Color to cover the entire procedural.

Ledge Level. Controls the height that the shapes rise above the veins

Ledge Width. Controls the width of the shapes

Bump Strength. The magnitude of the bump. Can be negative to cause the veins to rise above the shapes.

Vein Color. Sets the RGB value of the veins.

Surface Color. Sets the RGB value of the surface You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead.

Waves

This 2D shader creates a pattern that can be used to simulate ripple effects. You can animate the waves, flowing outward at a rate controlled by the Wave Frequency.

Affects the channel it is applied to and Bump channels.

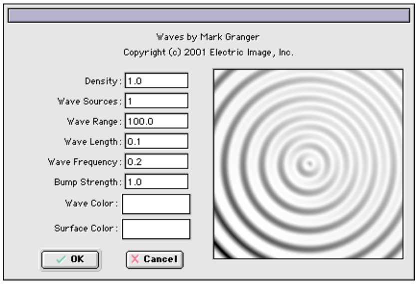


Figure 28.31 — **Waves Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Wave Source. Sets the number of sources that generate the waves. More sources give rise to complex interference patterns

Wave Range. Sets the distance between Wave Sources.

Wave Length. Distance between the wave crests.

Wave Frequency. Number of units the rings move outward per second.

Bump Strength. The magnitude of the bump. Can be negative invert the wave.

Wave color. Sets the RGB value of the wave crests.

Surface Color. Sets the RGB value of the surface You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead.

Wisp

This 3D shader creates a series of lightly drawn lines, as if a calligraphy pen had been used to draw on the surface.

Will affect only the channel in which it is applied. Will not work if placed in the bump channel.

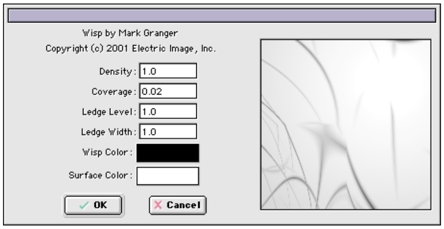


Figure 28.32 — **Wisp Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Coverage. Sets the region that the Wisp Color covers. 0.0 yields no Wisp Color. 1.0 will cause the Wisp Color to cover the entire procedural.

Ledge Level. Larger numbers increase the number of lines that are drawn

Ledge Width. Smaller numbers increase the thickness of each line.

Wave Color. Sets the RGB value of the lines.

Surface Color. Sets the RGB value of the surface You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead.

Wood

This 3D shader creates a basic wood-like appearance.

Will affect only the channel in which it is applied. Will not work if placed in the bump channel.

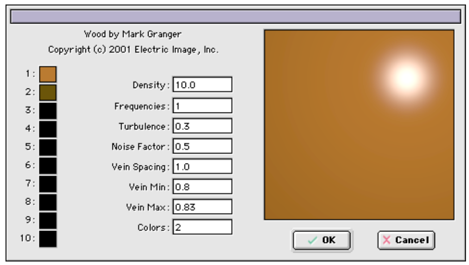


Figure 28.33 — **Wood Shader**

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Frequencies. Controls the number of separate grains that appear in the wood.

Turbulence. Sets the waviness of the grain. Larger numbers yield more waviness.

Noise Factor. Affects the variation of the grain along their length. Useful values are in the range of 0.0 to 1.0

Vein Spacing. Controls the distance from one vein to the next.

Vein Min. Controls the minimum width of the veins.

Vein Max. Controls the maximum width of the veins.

Colors. Controls how many of the colors on the left side of the interface are used to shade the wood.

NPR Shader Lite

This is a shader for Non-Photorealistic Rendering (NPR). It can be applied object by object or scene-wide using a camera map.

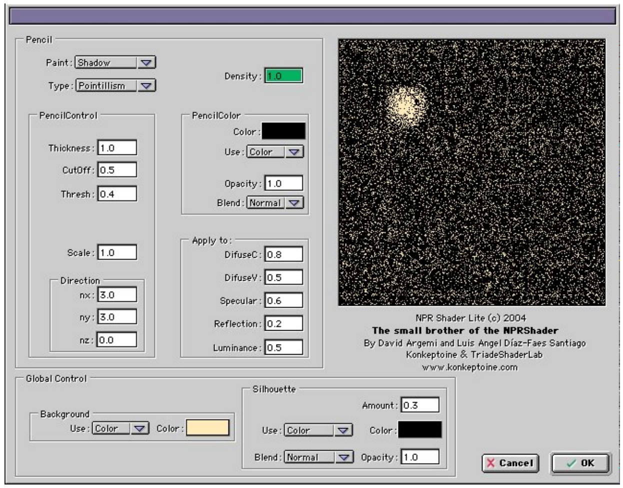


Figure 28.34 — **NPR Shader Lite**

Paint. Use this menu to choose where the shader adds color.

Shadow: Shader adds to the shadowed areas of objects.

Light: Shader adds color to the lit areas of objects.

None: Shader adds no color.

Figure 28.35 — **Shadow (L) and Light(R) Settings**

Type. Use this pull down menu to change the paint mode.

3Dlines: The shader will use lines to define the objects. These 3D lines, as opposed to the 2Dlines, will change their orientation based on the object's shape. The line's inclination can be controlled using the Direction parameters "nx", "ny" and "nz". The line size will change according to the shadow-light gradient.

2Dlines: The shader will use lines to define the objects. The lines will not adapt to the object's shape. The lines inclination can be controlled using the Direction parameters "nx", "ny" and "nz". The line size will change according to the shadow-light gradient.

Figure 28.36 — **3DLines(L) and 2DLines(R) Types**

Plain: The shader will place a plain color over the area to colorize. This mode is similar to a cartoon style.

Ink: The shader will place a plain color, but using a noise as an opacity modifier. This gives the illusion of wet zones on the canvas. The main "density" of this noise is also controlled by the Density parameter.

Figure 28.37 — **Plain (L) and Ink(R) Types**

Pointillism: The shader will paint small dots. The dot's density can be controlled using the Thickness parameter. Greater values create a denser dotted pattern and lower values a less dense pattern. The pattern will also change based on the shadow-light gradient.

Charcoal Strokes: This paint type will simulate charcoal strokes. The charcoal lines will adapt to the object's shape.

Figure 28.38 — **Pointillism (L) and Charcoalt(R) Types**

Density: Use this parameter to scale the whole shader at once.

Pencil Control

Thickness: The size of the stroke

CutOff: How the pencil acts over the shadow-light area gradient. When using it with Shadow Mode, lower values will tend to paint less on light areas, while higher values will tend to invade light zones and paint on them. The reverse effect will take place when using Light Mode.

Threshold: The threshold of the strokes changing along the shadow-light gradient areas.

Scale: Used to scale the whole effect. It will change the way the CutOff and the Threshold look.

Direction: Use these three parameters to change the direction of 3Dlines, 2Dlines and Charcoal Strokes. You can think of nx, ny and nz as vector directions in 3D space to change the direction of the strokes.

Pencil Color

Use: This pull down menu presents different options to colorize the strokes:

> **Color:** The Color Picker will be used to colorize the strokes.
>
> **Texture:** The object's texture colors will be used to colorize the strokes
>
> **Hue Agent:** This mode will take the Hue of the Color Picker, while applying the Saturation and Value of the underlying object's texture.

This mode allows you to use the Saturation and Value of a texture while painting with a plain color. It creates wonderful effects.

SV Agent: This mode will take the Saturation and Value of the Color Picker, while the Hue will be taken from the underlying object's texture.

Light's Color: This mode will use the color of the light sources used in the scene to paint.

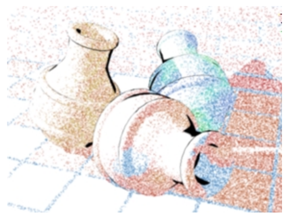


Figure 28.39 — **Color Using SV Agent**

Opacity: The opacity of the stroke. Use this control to simulate the "pressure" of a pencil on a canvas.

Blend: Choose a blend mode for the whole shader effect.

Apply To

Use these controls to choose which render features you want to be used for the NPR rendering.

Diffuse C: Choose the amount of Diffuse Color used in the rendering. From 0 to 1.0

Diffuse V: Choose the amount of Diffuse Value used in the rendering. From 0 to 1.0

Specular: Choose the amount of Specular used in the rendering. From 0 to 1.0

Reflection: Choose the amount of Reflection used in the rendering. From 0 to 1.0

Luminance: Choose the amount of Luminance used in the rendering. From 0 to 1.0

Background Controls

Use: This pull down menu will let you choose how the background is colorized. You have two options, Color and Texture. Color will use the selected color in the Color Picker, while Texture will use the underlying object's texture.

Silhouette controls

Use this group of controls to create a silhouette outline for the objects.

A Note about the silhouette: Use this feature with caution. The silhouette generated by the NPR shader will not look good on flat objects, like flat planes or cubes. However, it can look very good on curved objects.

Amount: The amount of silhouette to draw. Note that the size will change depending on the object's position and orientation; what could be good for some effects, may not suitable for others.

Use Menu: This menu will let you choose how the silhouette is colorized. You have two options. Color and Texture. Color will use the selected color in the Color Picker, while Texture will use the underlying object's texture.

Blend: Choose a blend mode for the silhouette.

Opacity: The opacity of the silhouette.

SpKiller

This shader is used to control the size and amount of the specular highlights that appear on the back side of ray traced transparent objects.

Without it, a simple solid glass sphere, for example, will look like a shell or a skin made of glass because there will be a specular highlight created on the inside back face giving a hollow appearance.

Apply this shader to the diffuse channel.

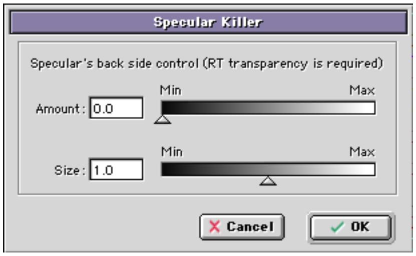


Figure 28.40 — **SpKiller Interface**

Amount. Controls the intensity of the specular that appears on the back side of ray traced transparent objects.

Size. Controls the size of the specular that appears on the back side of ray traced transparent objects.

This shader modifies the behavior of ray traced transparencies. Phong transparencies will not be affected.

If multiple ray traced transparencies are in your scene, then please specify a refraction index greater 1.0 for all groups where SpKiller is applied. Otherwise the front side will be affected in areas where transparent objects overlap.

Gradient

This shader is used to create colored gradients. The gradient can vary between two to twelve colors. This shader can be applied to any material channel and will affect only the channel it is applied to.

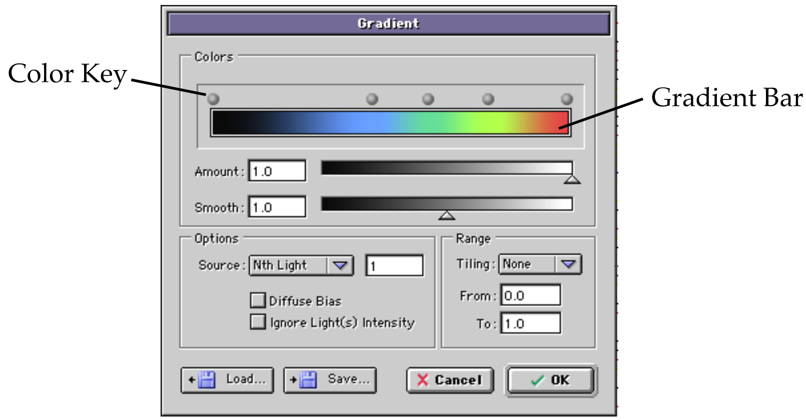


Figure 28.41 — **Gradient Interface**

Gradient Bar and Color Keys. The Gradient Bar displays the ramping colors. The individual Color Keys can be dragged back and forth to adjust the ramp. Add a new Color Key by clicking in the Gradient Bar. Delete a Color Key by dragging it outside the bar (the last two keys cannot be deleted). Double click on the Color Key or just under it to open the color picker and edit the color assigned to the Key.

Amount. Acts as a multiplier to control the intensity of the gradient.

Smooth. Controls the smoothness of the color ramp.

Source. This pull down menu controls the orientation of the shader on the surface of the object.

Texture X, Y, Z. The selected texture axis is used.

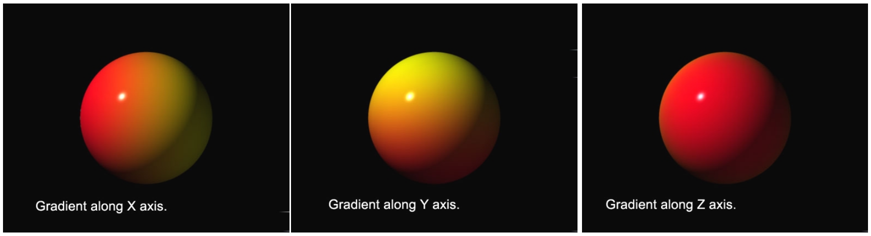


Figure 28.42 — **Gradient Source—X, Y, Z**

View Edge. The direction perpendicular to the camera plane is used.

All Lights. An average of all lights is used.

Nth Light. The direction of the specified light is used. The Nth value of 1 corresponds to the first light in the project.

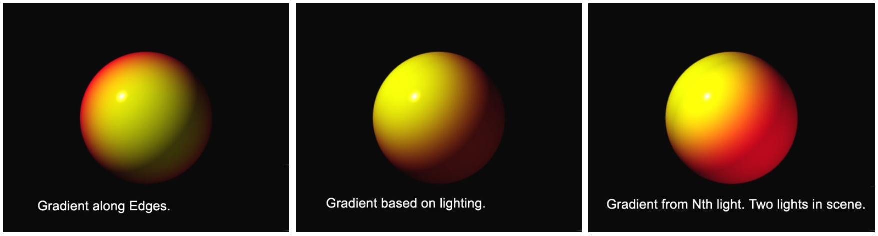


Figure 28.43 — **Gradient Source—View Edge, All Lights, Nth Light**

Diffuse Bias. Multiplies the final color by the diffuse color. If the shader has been applied to the diffuse channel and another texture is below it in the texture list, then the color of that texture is used.

Ignore Light(s) Intensity. This feature is useful when the shader is applied to the luminance channel. It causes the shader to use only the lights direction as an input. The lights' intensities and colors are ignored.

Range Options. Simple control for the way the shader tiles over the surface of the object it is applied to.

Load and Save. You can save and load settings for the Gradient shader to disk.

SimpleWave

SimpleWave is an auto-animated shader that produces an attenuated finite continuous wave. The wave continues flowing endlessly, attenuating until it reaches the maximum attenuation distance. It is also a reactive shader that outputs color, bump and displacement. Why a shader version of the Wave Deformation? Beyond personal tastes or the reactive ability that is more related to the shading realm, the shader version provides one simple advantage over the Deformations: Depending on the situation, it does not need displacement and can work only with bump, thus saving lots of geometry and rendering time. There is also a second reason: one can use a single-poly plane generated by Ubershape in Animator, and the same plane can be high-resolution in Camera.

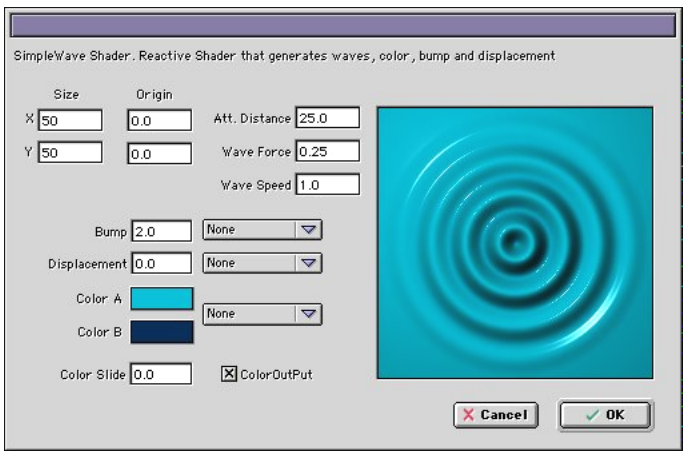


Figure 28.44 — **Simple Wave Interface**

Size and Origin. These edit boxes set the size of the wave and its starting point in scene units. By making X and Y different, you can create ellipsoidal waves.

These two parameters are closely related. Changing the Size of the Wave will affect also where the center is, because the shader changes the global density to allow the wave to be deformed. Even though this is not a big deal, take it into account when planning your animations.

Note that you can set the origin of the wave "outside" the object on which the SimpleWave is applied. In this case, you will not see the waves origin, but get waves only. This is good when you want to place a bit of movement on your liquid, but you do not want a visible wave.

In the same way, if you make an ellipsoidal wave outside of the object, you will have the feeling of a more planar than circular wave.

Att. distance. The distance at which the waves will completely disappear.

Wave Force. The Force of the wave. It is a multiplier that will affect the wave's color and bump.

Wave Speed. The speed of the wave. The default value is 1.0. Higher values will make the wave move faster, while lower values will make the wave move slower. A value of 0 will "freeze" the wave.

Bump. The amount of bump the wave generates.

Displacement. The amount of displacement of the wave: Use it with caution. Usually low values like 0.1 or similar are enough to get a good effect. Also, remember to have a high enough tessellation in order to get a good smooth displacement.

Colors. Clicking here opens the color picker. You can choose two different colors that will alternate on the surface of the wave.

Color Slide. Use this parameter to “slide” the color mix across the wave. This is very useful when you use the SimpleWave shader with other reactive shaders and you intend to exactly place the colors.

Color Output. This is a way to have the shader in the Diffuse channel to make reactive bumping without adding colors.

Reactive Controls

Bump. Choose what value of the underlying colors will be used to change bump

Displacement. This feature has not been implemented yet.

Colors. Choose what value of the underlying colors will be used to place colors.

Tips

You can layer as many SimpleWave shaders with different settings as you want. The colors, bumps and displacements will mix (Set up a alpha 0 value for the color you want to make disappear, or just use a Blend Mode).

If you own 3rd party reactive shaders you can create amazing effects.

By changing X and Y Size, and the wave’s origin, one can get lots of different wave effects.

Animate the Attenuation Distance to get even more special effects.

Try to apply the shader to a 3d object with some added displacement.

LonelyWave

The LonelyWave Shader creates a finite non-continuous looping wave. As opposed to the SimpleWave shader, in LonelyWave you can decide when the wave starts, and also the exact number of ripples that the entire effect will have. When the wave is completed it will start again. The shader is also reactive, and produces color, bump and displacement.

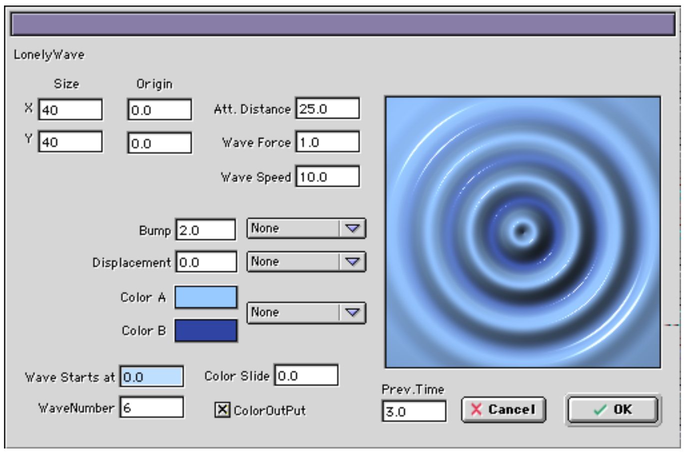


Figure 28.45 — **LonelyWave Interface**

Size and Origin. These edit boxes set the size of the wave and its starting point in scene units. By making X and Y different, you can create ellipsoidal waves.

These two parameters are closely related. Changing the Size of the Wave will affect also where the center is, because the shader changes the global density to allow the wave to be deformed. Even though this is not a big deal, take it into account when planning your animations.

Note that you can set the origin of the wave “outside” the object on which the SimpleWave is applied. In this case, you will not see the waves origin, but get waves only. This is good when you want to place a bit of movement on your liquid, but you do not want a visible wave.

In the same way, if you make an ellipsoidal wave outside of the object, you will have the feeling of a more planar than circular wave.

Att. distance. The distance at which the waves will completely disappear.

Wave Force. The Force of the wave. It is a multiplier that will affect the wave’s color and bump.

Wave Speed. The speed of the wave. The default value is 1.0. Higher values will make the wave move faster, while lower values will make the wave move slower. A value of 0 will “freeze” the wave.

Bump. The amount of bump the wave generates.

Displacement. The amount of displacement of the wave: Use it with caution. Usually low values like 0.1 or similar are enough to get a good effect. Also, remember to have a high enough tessellation in order to get a good smooth displacement.

Colors. Clicking here opens the color picker. You can choose two different colors that will alternate on the surface of the wave.

Color Slide. Use this parameter to “slide” the color mix across the wave. This is very useful when you use the SimpleWave shader with other reactive shaders and you intend to exactly place the colors.

Color Output. This is a way to have the shader in the Diffuse channel to make reactive bumping without adding colors.

Wave Starts at. Choose the time when the first wave will be generated.

Number of Waves. The number of ripples generated per wave.

Preview Time. Set the desired time to see how the wave has evolved at that time. This control has no effect on the render, but only acts inside the shader interface.

Reactive Controls

Bump. Choose what value of the underlying colors will be used to change bump

Displacement. This feature has not been implemented yet.

Colors. Choose what value of the underlying colors will be used to place colors.

Cammo2

This is a advanced version of the original Cammo shader. It can create a larger variety of camouflage patterns.

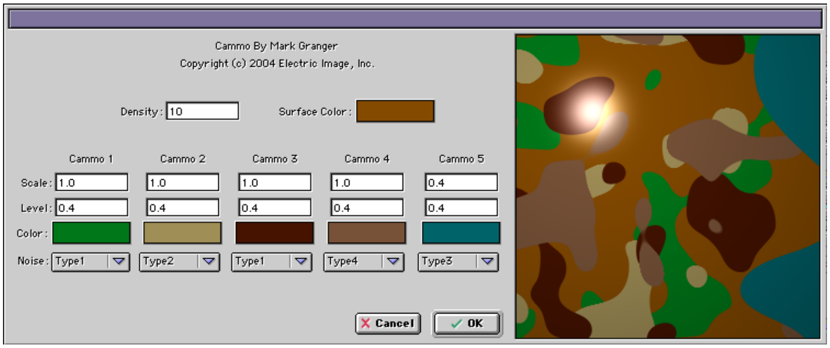


Figure 28.46 — **Cammo2 Shader**

Will affect only the channel in which it is applied. Will not work if placed in the bump channel.

Density. Sets the Scale of the shader on the group. Larger numbers are equivalent to zooming out, smaller to zooming in.

Surface Color. Sets the RGB value of the underlying surface. The three Cammo regions are applied on to of this surface. You can set the alpha to 0.0 to let the object's diffuse color, or the next texture map in the diffuse list, come through instead. There are three different regions added on top of the surface color. They each have the following controls.

Scale. Controls the size of the pieces that make up the region.

Level. Controls how much of the Surface color shows through the region. 0.0 allows all of the surface color to show through. 1.0 allows none at all.

Color. RGB color of the region.

Noise. You can select from four different noise algorithms to vary the pattern.

Reactive Shaders

Reactive shaders have parameters that are driven externally, usually from another shader or a texture. The driver will usually be color, but it can be any other kind of information, such as bump or light. Reactive controls allow for endless possibilities and for a greater flexibility, and once mastered, you will be able to do a wide range of new things with Animator and Camera.

Universe includes the BumpyNoiseR, CrumpleR, ErodedR, FractalNoiseR and RustR reactive shaders.

Let's see a simple example of a reactive shader usage. Take a look at the following rendering.

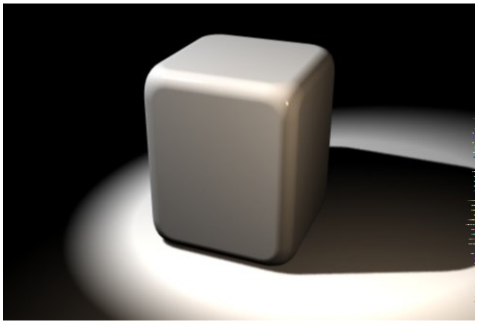


Figure 28.47 — **Cuboid - No Shaders Applied**

We are about to do a short tutorial before entering into deeper explanation about reactive shaders.

First, we will prepare the "hot zones". In other words, the areas that will "drive" the shader. To do so, we will add the Clouds shader using black and 100% red color, as it is shown in the dialog box that follows.

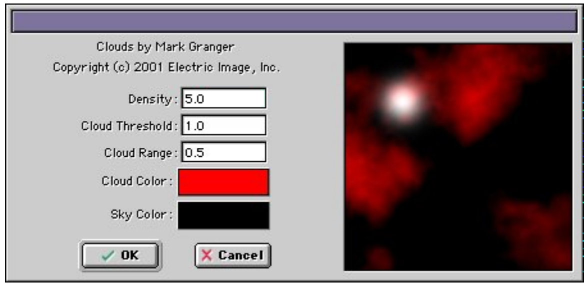


Figure 28.48 — **Cloud Shader**

Rendering the cuboid with the Cloud shader will yield:

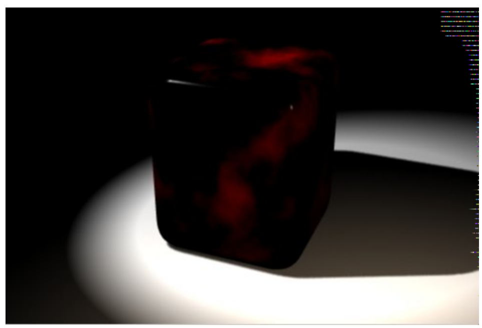


Figure 28.50 — **Cuboid with Cloud Shader**

By now, we have mapped the cuboid using a single shader and we have already set up the reactive zones. The red areas will drive the reactive shader giving us the effect we are after. So now, we will apply the Fractal-NoiseR reactive shader on top of the Clouds shader, as shown in the following Figure.

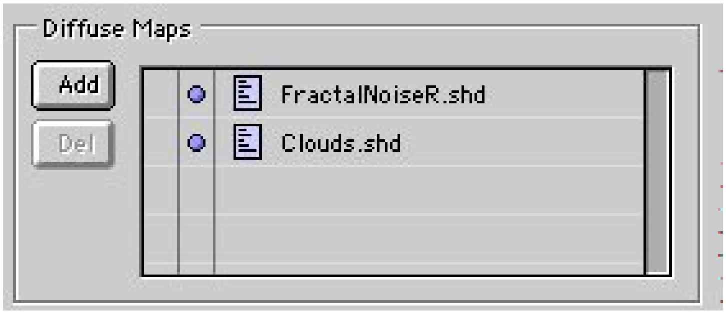


Figure 28.52 — **Diffuse Texture List**

In this way, the FractalNoiseR reactive shader will be able to read the colors beneath it, and act accordingly. The reactive controls are off by default. Let’s begin by setting up the FractalNoiseR shader without reactive controls so you can compare how the cuboid looks with and without reactive controls. Set it up roughly as is shown in the next image:

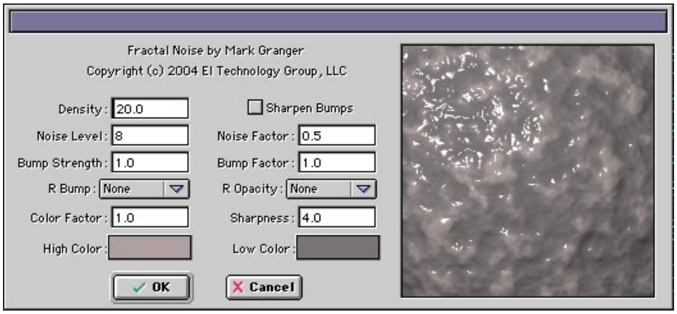


Figure 28.54 — **FractalNoiseR Shader**

A quick test rendering will yield the following image.

Figure 28.56 — **FractalNoiseR - No Reactive Parameters**

Now we open the FractalNoiseR shader again and activate the Reactive Bump menu. Choose "Red" from the "R. Bump" pop-up menu.

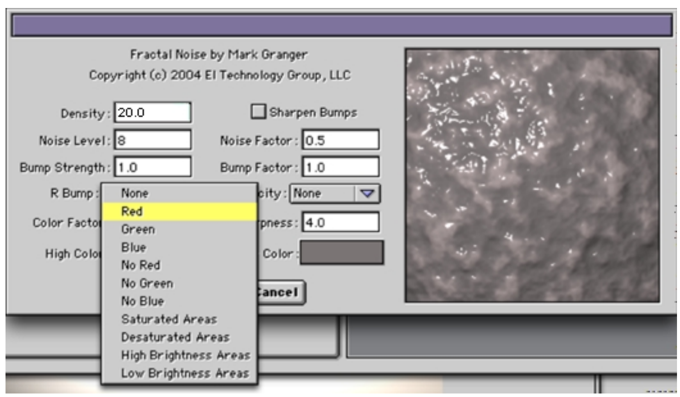


Figure 28.58 — **Enable the Reactive Parameter**

This will cause the shader to place the maximum bump value (what you've set up in the Bump Strength parameter) ONLY in the areas that are 100%

red, and progressively decrease the Bump Strength value as the red channel goes towards zero. Render again we get the following image.

Figure 28.60 — **FractalNoiseR - With Reactive Parameters**

See how the fractal bump generated by FractaNoiseR appears only over the underlying 100% red areas.

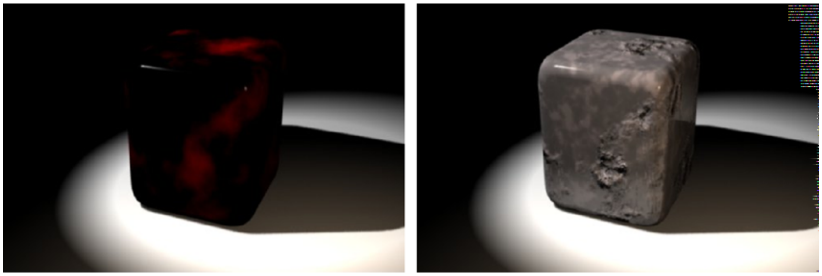


Figure 28.62 — **Side-By-Side Comparison**

Note that you can “choose” where your procedural bumps will appear by using another shader, a bitmap texture, or by painting the object with Amorphium. Using Amorphium™ to paint your objects with reactive shaders in mind will allow you to precisely “paint” the bumps.

Texture RGB and HSV

There are shaders that have unique reactive controls for each parameter, and shaders that have global controls. Values can also be subtracted for each of the reactive modes. One group of modes works through reading RGB channel values of the underlying colors of the object, these are the R, G, B , No Red, No Green, and No Blue modes. The other four modes work by reading the HSV values of the underlying colors applied to the object. These modes are called “Saturated Areas”, “Desaturated Areas”, “High Brightness Areas” and “Low Brightness Areas”.

The RGB group of modes work better when you paint the object with software such as Amorphium (or other software that supports the painting of the object’s vertices directly), or by painting a texture map in Photoshop™. This is because the RGB values can be painted directly and then used to drive the reactive shader.

HSV modes can be used the same way (Just paint black and white), but they were designed with scanned texture maps in mind. With texture maps, the RGB values of every pixel can have a lot of variation through the map, and it is easier to see the visual differences of the texture using other methods, such as brightness changes or saturation changes. The HSV reactive modes will read the S and V values and react accordingly. One thing to always keep in mind is the nature of texture maps in general. You need to understanding how RGB and HSV work. Some texture maps can have a type of S or V value through the pixel-map that, combined with any of the reactive modes, will not work as expected. A color could be 100% saturated but with a very low V value, so visually, you will see a dark color or a completely black color. If you look at the map you don’t have any way to see whether the darker areas have high or low saturation values. Use the HSV modes carefully and experiment a little to achieve the best results.

Here is an example using a texture map of wood grain.

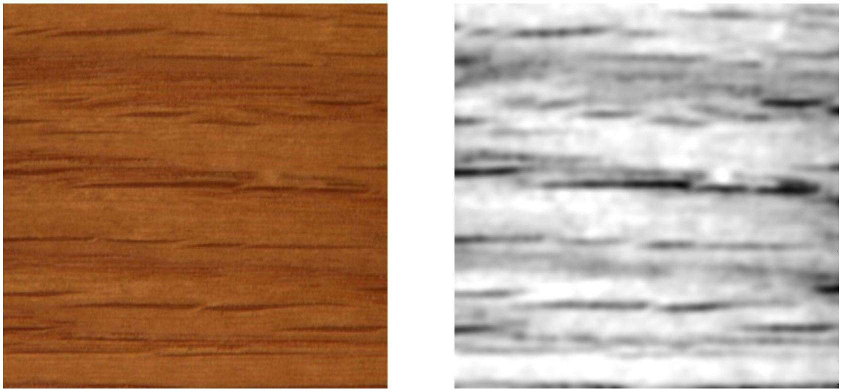


Figure 28.64 — **RGB Wood Texture (left) and Grey Scale (right)**

Apply this wood texture to the diffuse channel. Then make a grayscale version of the wood and place it below the color one. We then apply it to the cuboid used in the earlier example

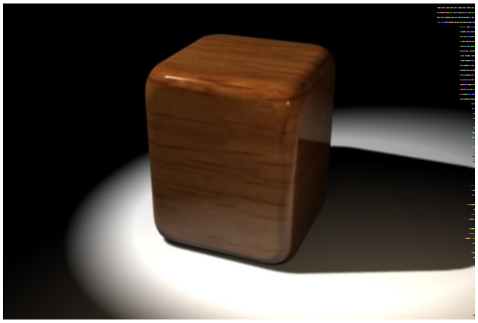


Figure 28.66 — **Wood Texture on Cuboid**

However, if now you add a reactive shader (Let's use FractalNoiseR again) above the grayscale image and activate the reactive bump with "Low

Brightness Areas", the bump will be placed only over the darker veins of the bump.

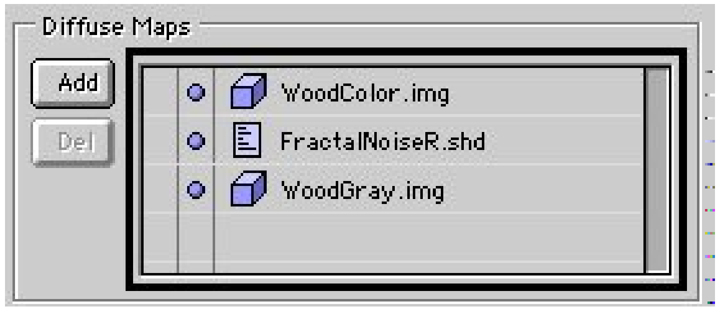


Figure 28.68 — **Diffuse Texture List**

Rendering the cuboid now yields the following image.

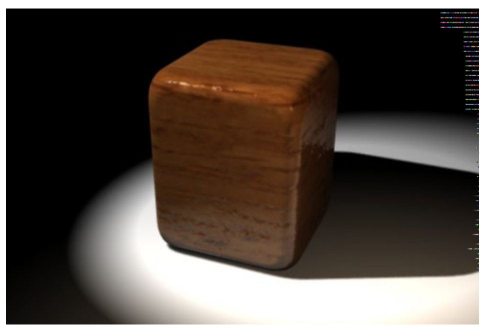


Figure 28.70 — **Reactive Texture on Cuboid**

Note how the bump is distributed over the lowest brightness values given by the grayscale image. The effect is much more subtle and rich than using a mere copy of the wood image placed in the bump channel.

You can place the reactive shaders in any of the material channels. Note that if you place the shader in the specular channel, for example, shader will not read any specular information from the object's surface, but instead, the shader is reacting by placing bumps (or colors, luminance, or whatever it makes) in the same place where Camera places the specular brightness.

Reactive Controls

Following is a brief description of each reactive mode.

None. No reactive effect for the parameter or the shader.

Red. The user-value is applied where red (RGB) areas are. When the red value decreases, the user-value decreases. A red value of 0 means a 0% user-value for that parameter.

Green. The user-value is applied where green (RGB) areas are. When the green value decreases, the user-value decreases. A green value of 0 means a 0% user-value for that parameter.

Blue. The user-value is applied where blue (RGB) areas are. When the blue value decreases, the user-value decreases. A blue value of 0 means a 0% user-value for that parameter.

No Red. The user-value is applied where non-red (RGB) areas are. When the red value decreases, the user-value increases. A red value of 0 means a 100% user-value for that parameter.

No Green. The user-value is applied where non-green (RGB) areas are. When the green value decreases, the user-value increases. A green value of 0 means a 100% user-value for that parameter.

No Blue. The user-value is applied where non-blue (RGB) areas are. When the blue value decreases, the user-value increases. A blue value of 0 means a 100% user-value for that parameter.

Saturated Areas. The user-value is applied where high saturation (HSV) areas are. When the S value decreases, the user-value decreases. A S value of 0 means a 0% user-value for that parameter.

Desaturated Areas. The user-value is applied where low saturation (HSV) areas are. When the S value increases, the user-value decreases. A S value of 0 means a 100% user-value for that parameter.

High Brightness Areas. The user-value is applied where high brightness (HSV) areas are. When the V value decreases, the user-value decreases. A V value of 0 means a 0% user-value for that parameter.

Low Brightness Areas. The user-value is applied where low brightness (HSV) areas are. When the V value increases, the user-value decreases. A V value of 0 means a 100% user-value for that parameter.

Amorphium™ Example

As seen in the previous sections, reactive shaders are driven by external information. We have already seen how they are driven by textures and shaders, but there is yet another powerful way to use these shaders. The shaders can be driven using vertex colors painted on the model by a program such as Amorphium.

Start with a well tessellated object. Open your object in Amorphium and paint it as desired. For our sample we've used a simple box with a cylinder embedded in it. Take a look at the Amorphium screenshot.

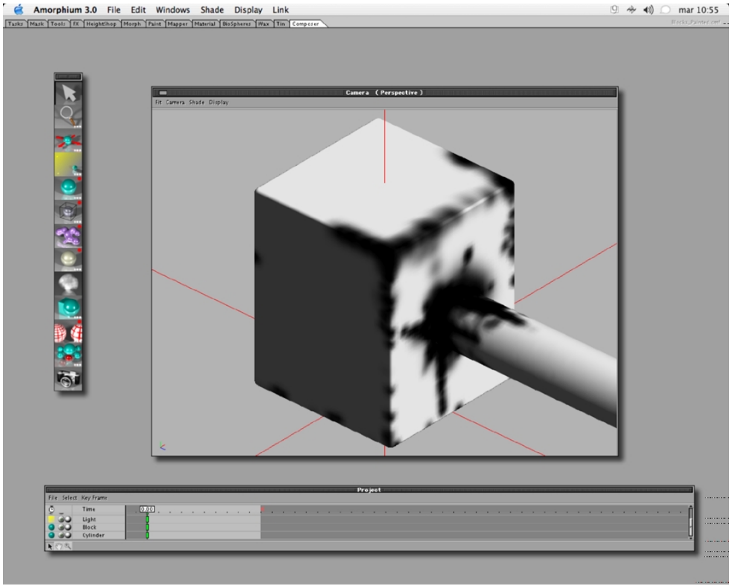


Figure 28.72 — **Amorphium Project**

The model is white with black painted on it in various places, notably at the intersection of the cube and cylinder.

Next, the model is exported from Amorphium and brought into Animator. When rendered, it appears as expected.

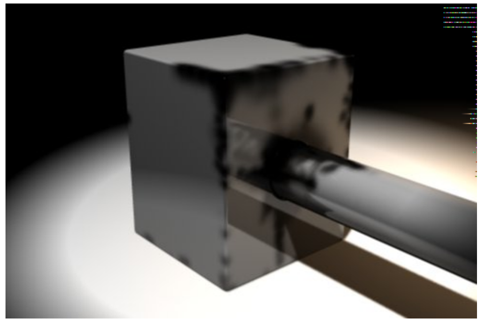


Figure 28.74 — **Initial Rendering of Painted Object**

We will follow the same procedure as in the previous examples, but using what we painted in Amorphium as the reactive driver. First we will set up a nice metallic texture using the Clouds shader (You can use any other shader present in Universe Animator or any other 3rd party shader that you have). This is how our scene looks using the Clouds shader.

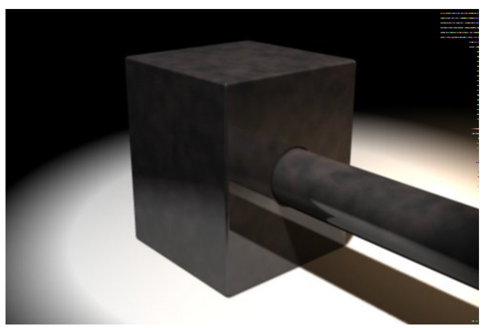


Figure 28.76 — **Painted with Clouds Shader**

Important Note: When using a model with painted vertices, remember to enable the "Use Polygon Color" check box in the Material Info window - Diffuse tab.

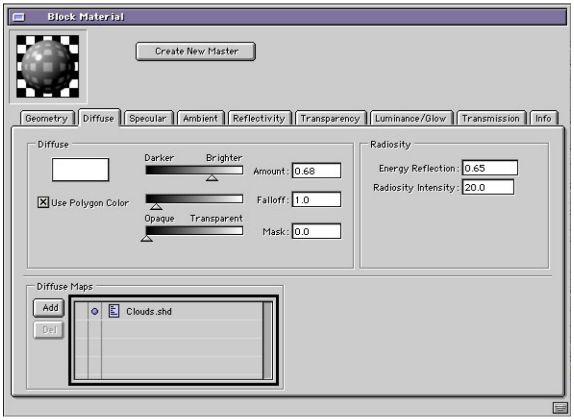


Figure 28.78 — **Material Info Window - Diffuse Tab**

Now is time to add the reactive shader. We will continue using Fractal-NoiseR, so please add the FractalNoiseR shader to your scene and drag it BELOW the Clouds shader (or below the shader or bitmap you used to texture your object).

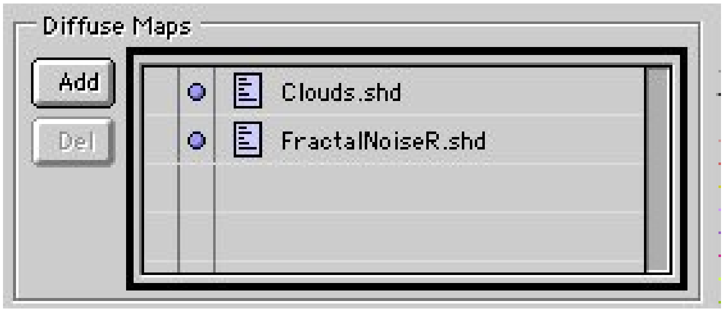


Figure 28.80 — **FractalNoiseR Added**

Set up its parameters similar to the ones found in the next image, and be ready to select a reactive parameter for the bump.

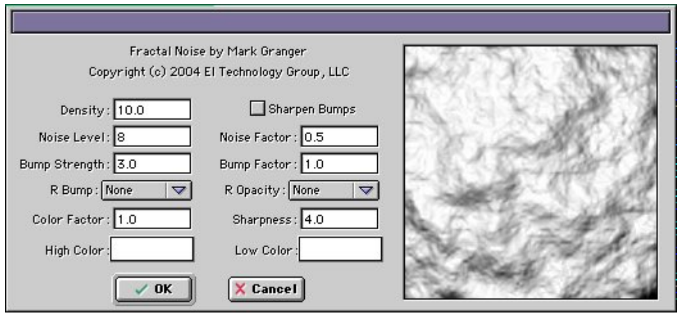


Figure 28.82 — **FractalNoiseR Shader for Cube and Cylinder**

For this sample, we will use the “Low Brightness Areas” mode. Note how we have painted the object using black and white.

The white color is composed of:

- Red Channel: 100%
- Green Channel: 100%
- Blue Channel: 100%
- Hue value: (non applicable-all)
- Saturation Value: 100%
- Value value: 100%

The black color is composed of:

- Red Channel: 0%
- Green Channel: 0%
- Blue Channel: 0%
- Hue value: (non applicable-all)
- Saturation Value: from 0% to 100%
- Value value: 0%

The main areas of the object are painted white, while the areas that we have painted are black. The black color can be thought of as “the absence of Red, Green and Blue, or as a Value (or Brightness) of 0. So, we can use either Non Red, Non Green, Non Blue, or the lowest brightness values in the reactive shader. For simplicity we have chosen “Low Brightness Areas”.

When you set “Low Brightness Values”, note how now the bump in the shader interface suddenly disappears. This is because the shader interface uses always pure white as a reactive color, and therefore, when Low Brightness Areas is chosen, the bump actually reacts and disappears. Hit OK, and the shader interface will close.

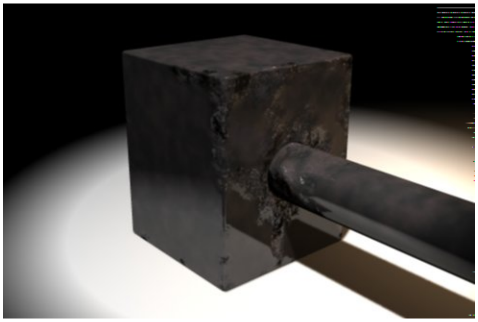


Figure 28.84 — **Final Rendered Image**

Plug-ins

29.0 Introduction

Plug-ins are external modules that extend the capabilities of EIAS Animator and Camera. They create and modify geometry and often have a sophisticated array of animateable parameters. They are stored in the EI Sockets folder which is in the same folder as animator.

You can create subfolders inside the EI Sockets folders to organize your plugins. Remember to copy both the plugin and it's resource file.

Note *Slaves do not support subfolders inside the EI Sockets folder.*

The following plug-ins ship with EIAS:

- Dicer
- Mr. Blobby
- Mesh Generator
- Mr. Nitro
- Power Particles Basic
- Pixel Grains
- Flag
- UberShape
- LensFlare
- LightFlare
- Mr. Nitro2

In addition to the plug-ins that come with EIAS, our web site has a comprehensive list of plug-ins available from 3rd parties.

Dicer

This plug-in increases the polygon density of any group or groups attached to it. That is, the number of polygons in the group is increased by dividing (or dicing) the group into small polygons. Dicer is therefore very useful when combined with Deformations, because groups that contain few polygons and vertices cannot be deformed.

1. Choose **Plugin>Dicer!.plm…** from the main menu bar.

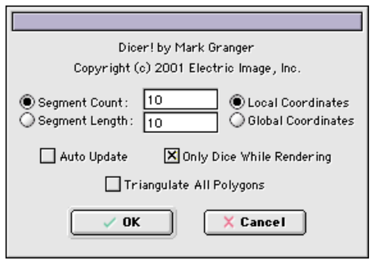


Figure 29.0 — **Dicer! dialog**

2. Use the controls of the dialog box to configure the operation to your preferences.
3. Either click **OK** or press **Return**. The Dicer effect is added to the project as a group.
4. Link the group(s) to be diced to the Dicer group.
5. To deform the group(s), apply the deformation to the Dicer group.

Dicer Controls

Segment Count. This radio button option, the default setting, divides a group into equal length segments. The length of each segment is determined by taking the longest extent dimension (x, y or z) of the group and dividing it by the value in the Segment Count edit box.

Segment Length. This radio button option, when selected, divides a group into segments whose length is determined by the value in the Segment Length edit box.

Triangulate All Polygons. This check box option, when enabled, uses triangles only (no quadrangles). Use this option if you notice flashing polygons in objects linked to Dicer.

Local Coordinates. This radio button option, the default setting, determines the length of each segment by the local coordinates of the group as displayed in the Group Info window.

Global Coordinates. This radio button option, when selected, determines the length of each segment by the global coordinates of the group. These can be seen by turning on the rulers in the Top, Front, or Side View windows.

Dice Only While Rendering. This check box prevents dicing from occurring while the object is displayed within EIAS Animator. This improves the speed of screen redraw and display.

Auto Update. This check box sets the plugin to update all linked groups without having to take any other steps. (?)

Mr. Blobby

This plug-in takes groups that are linked to it and forms spheres (or blobs). As multiple blobs get close together, they blend into a single blob.

1. Choose **Plugin>Mr. Blobby.plm…** from the main menu bar.

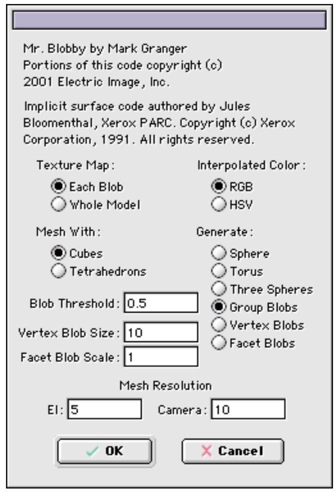


Figure 29.1 — **Mr. Blobby dialog**

2. Use the controls of the dialog box to configure the operation to your preferences. For an explanation of these controls, refer to the section "Mr. Blobby Controls" (below).
3. Either click **OK** or press **Return**.
   The Mr. Blobby effect is added to the project as a group.
4. Link the group(s) to be affected to the Mr. Blobby group.

Mr. Blobby Controls

Texture Map Each Blob. Allows a single texture map to be applied to every blob. Every blob will receive the same map.

Texture Map Whole Model. Allows a single texture map to be applied to the extent of the entire Mr. Blobby group.

Mesh With Cubes. Creates 4 sided polygons.

Mesh With Tetrahedrons. Creates 3 sided triangles.

Interpolate Color: RGB. When working with blobs of different colors this setting will blend the colors based on the RGB color model. There is a direct blend from one color to the next with no transitional hues. A blend from Red to Blue would look like mixed paint creating a smooth gradation between the two colors.

Interpolate Color: HSV. When working with blobs of different colors this setting will blend the colors based on the HSV color model. This causes a blend from one color to the next with extra transitional hues appearing. The extra hues are created by interpolating through the Hue color spectrum when blending between a start and finish color. A blend from Red to Blue would look like a rainbow of Red, Orange, Yellow, Green, Cyan and Blue.

Generate: Sphere. This is a primitive to be used to set up a texture map.

Select this option, then use the texture window to map the Mr. Blobby group. Only a spherical map will work. The map can be RGBA for bump mapping or transparency mapping. When done setting the map change Generate: Sphere to Generate: Groups Blobs, or Generate: Facet Blobs. When rendered each blob will appear with the texture map applied.

Generate: Torus. This setting puts Mr. Blobby into a special mode in which only a torus will be created. No other Mr. Blobby functions will work.

Generate: Three Spheres. This setting puts Mr. Blobby into a special mode in which only three spheres will be created. No other Mr. Blobby functions will work.

Generate: Group Blobs. This setting will take each group linked to the Mr. Blobby plug-in and make it a blob. It uses the bounding box size to determine blob size. This option allows you to control the movement of each individual blob by first animating a set of placeholder groups and then linking them to the Mr. Blobby group. This option also allows you to control the size of individual blobs by letting you animate the Scale of each placeholder group. This option also allows you to control the color of individual blobs by letting you animate the Color of each placeholder group.

Generate: Vertex Blobs. This setting will take each vertex of a group linked to the Mr. Blobby plug-in and make it a blob. If you use a model, it will place a blob at each vertex of the model.If you use a particle generator, it will place a blob at each vertex emitted by the generator.The size of each vertex blob is set with the Vertex Blob Size entry box.The color of the vertex blobs are set with the surface color settings for the particle system group. If you want to use the color boxes inside the particle system plug-in to change blob colors over time, you must use the Generate: Facet Blobs option.

Generate: Facet Blobs. This setting will take each polygon of a group linked to the Mr. Blobby plug-in and make it a blob. If you use a model, it will substitute a blob for each polygon of the model.If you use a particle generator, it will place a blob at each vertex emitted by the generator. If you use Mr. Nitro, it will substitute a blob for each fragment generated by Mr. Nitro. The size of each facet blob is based on a combination of the size of the facets in the model, and the setting in the Facet Blob Scale entry box.The color of the facet blobs are based on the original model, or set with the surface color settings in the group info window, or based on colors set in the Mr. Nitro or Particle plug-ins, or based on a texture map applied to the Mr. Blobby group.

Blob Threshold. Affects how attractive the blobs are to each other. A higher value will cause multiple blobs to join.

Vertex Blob Size. This sets the size of the blobs using World Coordinate units. All vertex blobs are the same size.

Facet Blob Scale. This sets the size of the blob as a percentage of the size of the polygon the blob is based on. A setting of 1 will create a blob that will totally encompass the bounding area of the polygon. (1 is equal to 100% of bounding area.) A setting of.5 will create a blob half the size of the total bounding region. A model with facets of differing sizes will produce blobs of differing sizes.

Mesh Resolution: EI. This sets the resolution of the surface mesh for display within EI. A setting of 3 to 5 will create a usable mesh for setting up animation.Be careful to test the effects of a higher Mesh Resolution. If you are working to get a specific look, be aware that the shape of the surface will change when you render at higher resolution.

Mesh Resolution: Camera. This sets the resolution of the surface mesh for rendering within Camera. A setting of 15 to 20 will create a fairly tight surface.

Usage Notes

- All blobs are spherical. You cannot make them ellipsoidal, and you cannot change their region of influence on an individual basis.
- In order for blobs to react to each other they must be generated by the same Mr. Blobby group.

- Mr. Blobby settings do not animate and do not set key frames.
- Blobs do not understand rotation, as such it does no good to animate the rotation of Group Blobs because the blob won't pick up the rotation angles.
- Blob size is based on the bounding box size. If you rotate a group it's bounding box is likely to change size resulting in a blob that grows and shrinks.
- Plug-ins pass their data down the project hierarchy. Try linking a standard shape to a Mr. Nitro and then link that Mr. Nitro to a Mr. Blobby (in Generate: Facet Blobs mode). As the standard shape explodes, Mr. Blobby will convert the fragments into blobs.
- The blobs are recreated at every frame. Large numbers of blobs (such as those created by Mr. Nitro or a Particle system) may add huge numbers of polygons to your project. Remember, a single facet created in a Mr. Nitro explosion might be turned into 200 polygons by Mr. Blobby.

Mesh Generator

This tool adds the Mesh Generator to the project. The Mesh Generator is used to animate various shape transformations, primarily a plane into a sphere (or vice versa).

1. Choose **Plugin>Mesh.plm…** from the main menu bar.

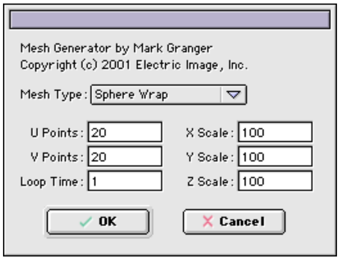


Figure 29.2 — **Mesh dialog**

2. Use the controls of the dialog box to configure the mesh to your preferences. For an explanation of these controls, refer to the section “Mesh Generator Controls (see below).

3. Either click **OK** or press **Return**.

Mesh Generator Controls

Mesh Type. This pop-up menu provides a choice of five different animated mesh objects. The menu choices are:

- Flat
- Sine Wave
- Breathing Cylinder
- Screw Thread
- Sphere Wrap

Flat. This option creates a flat, two-dimensional mesh grid.

Sine Wave. This option creates a mesh object containing animated circular waves.

Breathing Cylinder. This option creates a cylinder that expands and contracts as if breathing.

Screw Thread. This option creates an object that simulates a screw thread which reverses its threads inwards and outwards over time.

Sphere Wrap. This option (the default) creates an object that transforms itself from a plane into a sphere (and back again).

U Points. This edit box contains a value for the number of horizontal grid segments.

V Points. This edit box contains a value for the number of vertical grid segments.

Loop Time. This edit box contains a value in seconds for the amount of time it will take for one complete transformation. In the case of a Sphere Wrap, for example, the loop time would be the amount of time it will take for the plane to transform into a sphere (before transforming back into a plane).

X, Y and Z Scale. These edit boxes contain values for the scale of the object along the X, Y and Z axes. For a Sine Wave object, you can use the Y Scale value to control the height of the waves.

Once the object is added to the project, this dialog box can be reopened to modify your preferences. To do so, open the Group Info window for the object and click the Plugin… button.

Mr. Nitro

This tool adds the Mr. Nitro special effect to the project. Mr. Nitro is used to animate realistic explosions of models.

1. Choose **Plugin>Mr. Nitro.plm…** from the main menu bar.

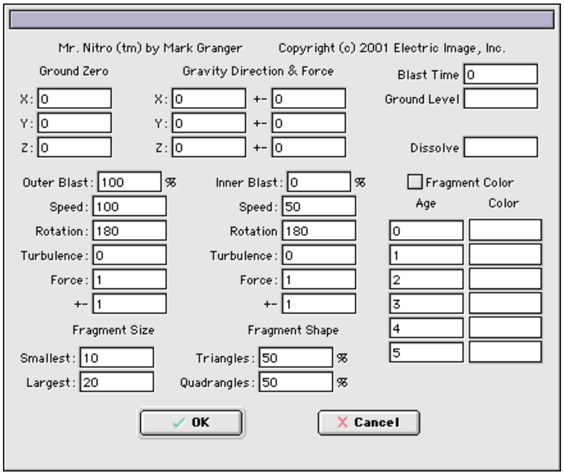


Figure 29.3 — **Mr. Nitro dialog**

2. Use the controls of the dialog box to configure the blast to your preferences. For an explanation of these controls, refer to the section "Mr. Nitro Controls (see below).
3. Either click **OK** or press **Return**.
4. Parent the group(s) to be exploded to the Mr. Nitro object.

Mr. Nitro Controls

Ground Zero. These edit boxes contain values for the X, Y and Z coordinates of the blast's origin, or "ground zero." This is the point from which the shock wave of the blast originates, emanating in all directions. By positioning ground zero farther away from the group(s) to be exploded, you can create more of a "wall-shaped" shockwave.

To position and configure the blast to your requirements, you should first check the coordinates and size of the group(s) to be blasted in their respective Group Info windows. You can then set Mr. Nitro's values accordingly.

Gravity Direction & Force. These edit boxes contain values for the direction and force of gravity which will affect the manner and speed in which the blast fragments fall. The ± edit boxes enable you to impart a variability to each value so that some fragments are more affected by gravity than others.

Blast Time. This edit box contains a value for the time in the project at which the shock wave will commence. A negative value will result in the shock wave originating prior to the start of the animation.

You will need to use a negative blast time value when ground zero is far away from the group(s) to be exploded—otherwise the moment of impact will occur long into the animation. For the blast to occur in the first frame of the animation, blast time should be set according to the following formula:

Blast Time = - distance from Ground Zero to group ÷ Speed

For example, if ground zero is a distance of 1000 from the group and the blast speed (see **Speed** edit box, below) is 10, blast time would be -1000 ÷ 10, or -100 seconds.

Air Resistance. This edit box contains a value for the amount of air resistance which will affect the manner in which the blast fragments fall. The higher the value, the more air resistance slowing the fragments.

Dissolve. This edit box contains a value for the amount of time in seconds for blast fragments to dissolve after being hit by the shockwave. A value of 0 (the default) prevents fragments from dissolving.

Outer Blast. These edit boxes control the speed, rotation, turbulence and force of the initial shockwave of the blast. An explosion can have two shockwaves, the outer blast (first) and the inner blast (second).

%. This edit box contains the percentage value for the outer blast (initial shockwave). It defaults to 100, so that there is only the outer blast. To create two shockwaves, assign a value less than 100% to the outer blast and the Inner Blast% edit box will be adjusted accordingly (so that they add up to 100%).

Speed. This edit box contains a value for the speed (distance per second) of the shockwave. When used in conjunction with the Blast Time value (see above), this value can control the moment when the shockwave hits the group(s).

Rotation. This edit box contains a value in degrees for the maximum amount of rotation of the flying blast fragments. Fragments rotate around random axes.

Turbulence. This edit box contains a value for the amount of air turbulence which will affect the manner in which the blast fragments rotate. With a value of zero, fragments rotate around their centers. A value other than zero will cause fragments to rotate off-axis.

Force. This edit box contains a value for the force of the shockwave. The greater the force, the faster the fragment will move in the direction of the shockwave. A force of 1.0 will cause fragments to move at the same speed as the shockwave. The ± edit boxes enable you to impart a variability to the value so that some fragments fly faster than others.

Fragment Size. These edit boxes contain size values for the smallest and largest blast fragments, relative to the size of the exploding group. To have all fragments of approximately the same size, enter the same value in both the Smallest and Largest edit boxes.

Setting a minimum size value that is too small will generate a very large number of fragments, which will take too long to generate and may also cause you to run out of memory. As a starting point for the minimum size, try using a value that is 1/10 the longest dimension of the group; for the maximum size, use a value that is twice the minimum size.

Fragment Shape. These edit boxes contain values for the percentage of fragments that are to be triangles versus quadrangles. The default is 50% for each. Changing one value will adjust the other value accordingly (to add up to 100%).

Fragment Color. This check box, when enabled, allows you to assign a color to the blast fragments, overriding the surface color setting of the group. The color of the blast fragments can be animated over time through the use of the Age Color buttons, discussed below.

Age Color. These buttons invoke the Color Picker to enable you to set different colors for the blast fragments at different stages of the blast. The age values are all in seconds and can be edited.You can change the color of the fragments before they are hit by the shockwave by setting the first age value to less than zero.

Once the Mr. Nitro object is added to the project, this dialog box can be reopened to modify your preferences. To do so, open the Group Info window for the Mr. Nitro object and click the ***Plugin****… button.*

Power Particles Basic

This tool adds the Particle Generator to the project. The Particle Generator is used to animate special effects such as sparks, jets of fire, and fountains or streams of water.

1. Choose **Plugin>PowerParticlesBasic.plm…** from the main menu bar.

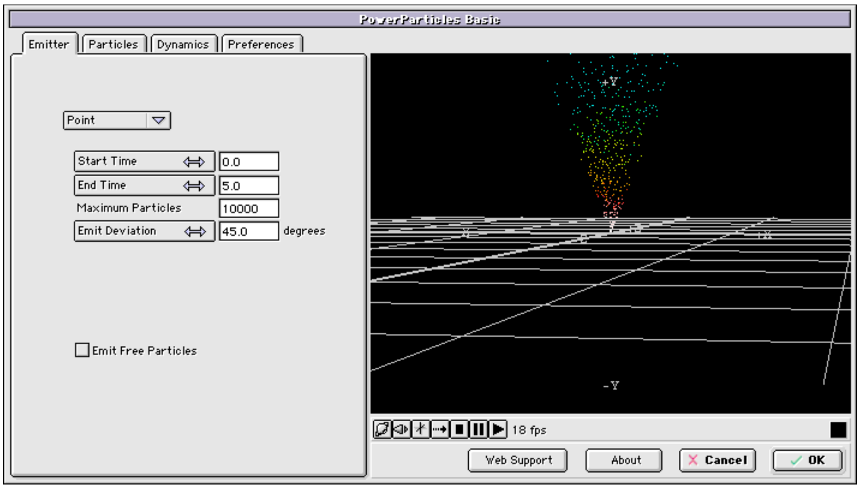


Figure 29.4 — **Power Particle Basic dialog**

2. Use the controls of the dialog box to configure the particle stream to your preferences. For an explanation of these controls, refer to the section "Power Particles Basic Controls (see below).
3. Either click **OK** or press **Return**.

This plugin offers previews so that you can predict how the particles will behave over time without having to render. Previews are in OpenGL for maximum speed.

EIAS Animator Preview

Previews in EIAS Animator can be viewed either as emitted particles or as a direction arrow. Particle previews can also be set to display a percentage of particles you want to see. For fast Previews in EIAS Animator, we recommend running with 1/10th or less particles than you want to see in the renderings.

Interface Controls

Power Particles introduces some new and unique controls that are discussed in this section.

OpenGL Preview Buttons

Figure 29.5 — **OpenGL Preview Buttons**

Orbit. This button allows you to move the view point around the particle stream. Changing the view in Power Particles does not affect the camera position in EIAS Animator.

Dolly. This lets you slide the view point closer or farther away from the particle system.

Orientation. This allows you to choose between Top, Side, Front or Perspective views.

Note Orbit only applies to the Perspective view.

Continuous/Loop. The loop button allows you to see the system from its start frame to its end frame. Then it starts over. (Animation of the plug-in is not shown). Continuous shows the system emitting its particles with no reference to start and end time. In other words, it just keeps going and going forever or until you close the interface.

Stop, Pause and Play. These work just like standard CD type controls to control the plug-in preview of the particle system.

Background color . The last item is the background color setup icon. Click the color swatch to change the background color.

Shortcuts

- Tab/Shift-Tab: Move between virtual sliders within a tab.
- Cntrl-Z, Cntrl-X: to change the increment of a virtual slider.
- Cntrl-Q, Cntrl-W: to move to another tab.

Slider Buttons

Figure 29.6 — **An Interactive Slider Button**

Notice the arrows on the button. This icon indicates that the button is a new "Virtual Slider". To use this function, press the button (the arrow changes to yellow to indicate it's active), then click and hold the mouse button in the OpenGL screen and slide it right and left. Notice the values in that parameter change. Also note: Under the OpenGL Screen are Min, Max, and Inc. Min and Max show the minimum and maximum values allowed for a given "slideable" parameter. Inc. shows the increment used when changing the slider. The increment can be changed by using cntrl-Z and cntrl-X. Slider increments will increase or decrease by a factor of ten.

Emitter Tab

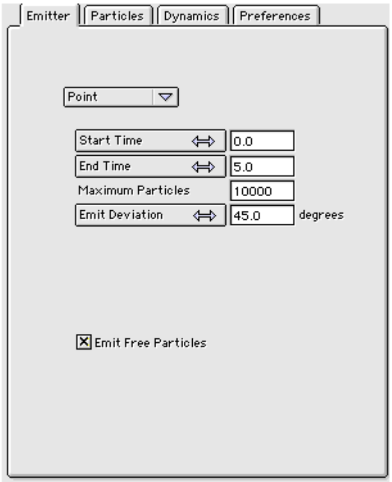


Figure 29.7 — **Emitter Tab**

This tab allows you to select between Point, Line, and Volume type emitters.

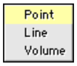


Figure 29.8 — **Emitter Pull-down**

Point. Select this option if you want objects to be emitted from a point.

Line. Select this option if you want objects to be emitted from a line. Set Line Length to the length in EIAS Animator world units of the emission line. Any number greater than or equal to 0 can be entered. A line length of 0 has the same function as emitting from a point.

Volume. Select this option if you want objects to be emitted from a volumetric region. Set the X, Y and Z values to determine the volume in which the particles will be emitted. Volume emission is always centered around the Power Particles center point locator in EIAS Animator.

Start Time. Set this parameter to the time in seconds from the beginning of the animation that you want particles to start emitting. The frame that corresponds to this time will be the first frame in the animation in which particles are emitted.

End Time. Set this parameter to the time in seconds from the beginning of the animation that you want particles to stop emitting. This parameter only controls the time at which particles stop emitting; emitted particles will still be present in the animation until they either reach the end of their life span or the end of the animation, whichever occurs first. The frame that corresponds to this time will be the last frame in which particles are emitted. When Start Time is set to the same time as End Time, particles will be emitted on the one frame that corresponds to this time.

Maximum Particles. Set this parameter to the maximum number of particles you want to exist at any particular time during the animation. Power Particles will continue to emit the specified Rate Per Second until the maximum number of particles is reached. After this threshold is reached, new particles will be emitted only to replace particles whose lifetime has expired. The maximum number of particles also greatly influences the amount of memory used by the plug-in. Previews and rendering run most efficiently if you set Maximum Particles very close to the desired maximum number of particles you want in the animation.

Emission Deviation. Set this parameter to the angle in degrees that you want particles to deviate from their initial direction vector. Valid values are from 0.0 to 360.0. At 0.0, particles will all be emitted in the direction that the emitter arrow points in the EIAS Animator user interface. At 360.0, particles will be emitted in all directions from the direction of the emitter. Values between 0.0 and 360.0 deviate the emission direction accordingly.

Particles Tab

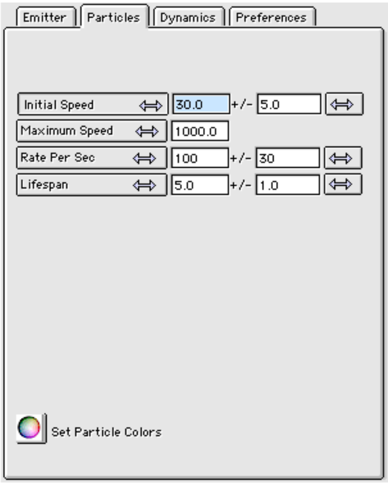


Figure 29.9 — **Particles Tab**

Initial Speed. Set this parameter to the initial speed of an emitted particle. If you want to vary the initial speed of emitted particles, enter a number in the ± edit box (or use the virtual slider).

Maximum Speed. Set this parameter to the maximum speed for all emitted particles. This function is used to constrain the speed of the particles. If no constraint is needed the default setting will normally not interfere with particle speed.

Rate Per Second. Set this parameter to the number of particles you want created during each second of the animation. If you want to vary the number of particles created per second, enter a number in the ± edit box.

Lifespan. Set this parameter to the length of time in seconds you want emitted particles to appear in the animation. If you want to vary the lifetime of emitted particles, enter a number in the ± edit box.

Set Particle Colors. Click this button to change the colors of emitted particles.

Particle Colors

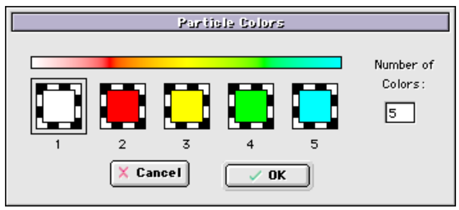


Figure 29.10 — **Color Bar**

Color Bar. The color bar at the very top of the screen shows the selected colors as they will appear over the lifetime of the particle. It displays from left to right the starting color through the ending color, in sequence. The two down arrows indicate which of the colors are displayed in the five color display icons below the color bar.

Color display icons. The color display icons below the color bar show the five colors available. The selection indicator around a color icon indicates which one of the five color settings is currently selected. You modify a color's settings by first selecting its color display icon and then select the color using the color picker. On the screen shown, color 1 is selected.

Number of colors. You are allowed between 1 and 5 colors.

Dynamics Tab

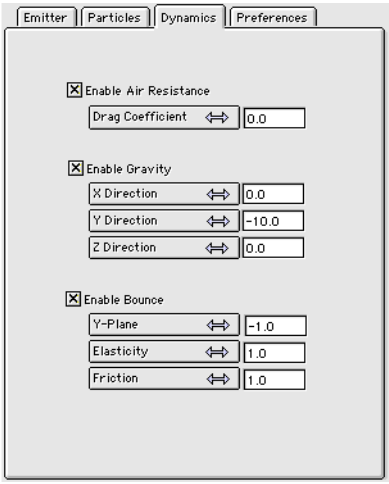


Figure 29.11 — **Dynamics Tab**

Enable Air Resistance

Check this box if you want the emitted particles to react to air resistance.

Drag Coefficient. Air resistance corresponds to the drag coefficient of the particle. Since the air resistance force depends on the velocity of the particles, this parameter needs to be adjusted to match the scale of any particular animation. The faster the particles move (large Initial Speed), the smaller the number you want for this parameter. Numbers between 0.0 and 1.0 are not uncommon; it all depends on the scale of the animation in EIAS Animator.

Enable Gravity

Set this parameter to the acceleration due to gravity you want applied to emitted particles. Gravity is an acceleration which is applied to particles in the X, Y, or Z direction. Positive values result in accelerating particles in a positive X, Y, or Z direction.

X Direction. Set this parameter to the acceleration due to gravity you want applied to emitted particles in the X direction. Positive values result in accelerating particles in a positive X direction.

Y Direction. Set this parameter to the acceleration due to gravity you want applied to emitted particles in the Y direction. Positive values result in accelerating particles in a positive Y direction.

Z Direction. Set this parameter to the acceleration due to gravity you want applied to emitted particles in the Z direction. Positive values result in accelerating particles in a positive Z direction.

Enable Bounce

Check this box if you want emitted particles to bounce off the Y-Plane.

Y-Plane. Power Particles Basic offers collision with a designated altitude only. This is set by entering a Y value where you want the invisible Y-Plane to intersect the Y axis.

Elasticity. Set this parameter to the amount of bounce you want to give to emitted particles. Use the following values as a guide to specify bounce behaviors:

Value	Behavior
0	Emitted particles stick to the Y-Plane, no bounce
<1	Emitted particles lose speed with each bounce
=1	Emitted particles maintain the same speed with each bounce
>1	Emitted particles gain speed with each successive bounce

Friction. Like elasticity this setting changes how the particles bounce. This setting alters the horizontal distance a particle travels after a bounce. A setting of zero will give the particle no horizontal distance. A setting of one will give the particle its normal calculated horizontal bounce distance based upon the elasticity and the velocity.

Preferences Tab

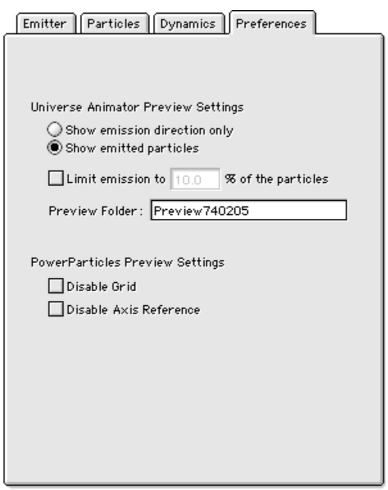


Figure 29.12 — **Preferences Tab**

Show Emission Direction Only. Check this button to show the initial speed and direction of emission. This is shown graphically with the use of an arrow. The length of the arrow denotes the initial velocity value and the direction of the arrow shows the direction the emitter is pointing.

Show Emitted Particles. Check this button to display emitted particles. This is the default setting.

Limit Emission to _____% of the object. Allows you to set the percentage of emitted particles to be seen in the EIAS Animator Interface. Camera will render 100% of the emitted particles.

Preview Folder. Specifies the name of the folder in which the preview files are stored. The preview folder is placed in the folder where EIAS Animator is located. This folder must be available to Camera during rendering of stills. If this folder is available to Camera during rendering, the Camera temp file needed by Power Particles will be stored here also. Power Particles does not delete these folders. These folders can be deleted at any time from the EIAS Animator directory.

Disable Grid. Check this box to hide the grid from the preview screen.

Disable Axis References. Check this box to hide the Axis reference letters from the preview screen.

Pixel Grains

“X-Men”, the movie, Inspired the creation of this plugin. An effect involved the characters of the movie planning their attack strategy and they create a 3D grain like replica of NY City region consisting of millions of little tiny primitives that are rearranged based on animated height maps. The effect was originally created on a high end workstation. We developed the same sort of power available for a desktop computer.

This model plugin uses EIAS IMAGE (format) files, single or multi-frame to generate models inside of EIAS. Each pixel with non-zero gray level will make a primitive be created. A variety of built-in primitives are offered. The shape is scaled according to the gray level value of the pixel. Animated gray maps create animated grains of pixels, hence the name Pixel Grains.

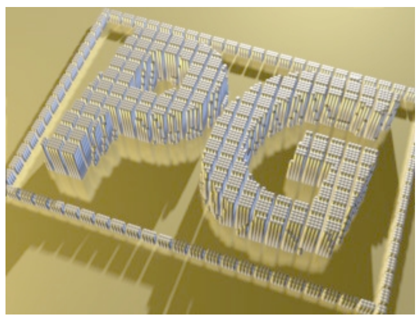


Figure 29.13 — **Pixel Grains Sample, image courtesy of Wombat Interactive**

Memory Allocation

This plugin can require a lot of memory. It can handle images of size 2K by 2K and so needs at least 60 MB (this is in addition to what EIAS and Camera are using) just to allocate buffers. Also, depending on the number of actual non-zero gray pixels, and the type of primitive, more memory may be needed. Typically 150MB for a 256*256 map is not unusual. Both EI and camera will need to have additional RAM.

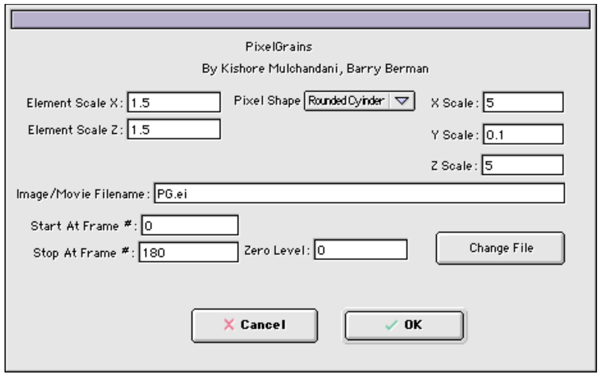


Figure 29.14 — **Pixel Grains Interface**

Pixel Element Shapes

Choose the shape of the primitive you want to be created for each pixel from this menu.

Plane. A flat rectangle

Cube. A 5-sided primitive (no base)

Rounded Cube. A cube with rounded edges (9 quads)

Cylinder. 6 sided cylinder with a covered top. (8 quads)

Rounded Cylinder. A cylinder with rounded top (14 quads)

Cone. A 6 sided cone

Custom. A group that is child of the plugin, modeled with Y-up and unit size in X and Z with base center at the origin. Keep in mind, the included primitives are severely optimized, custom objects might not be, so more RAM would be needed.

Scaling Factor

Each primitive is a unit size in x and z. Scaling factors in X and Z can be used to make the elements larger or smaller than the pixel square. This allows for creating overlapping or non-overlapping elements.

The above two will let you change the size of the pixel primitive itself, without scaling the spacing between them.

Element Scale X. Scale factor in X

Element Scale Z. Scale factor in Z

Mesh Scale X. Scale of the entire model in X

Mesh Scale Y. Scale of the entire model in Y

Mesh Scale Z. Scale of the entire model in Z

Mesh Scale is just the same as if you scaled the Pixel Grains plugin in the Group Info Window.

Image/Movie Filename. Name of the image/ movie file to be used. This file must be EIAS IMAGE format file and MUST be in the EI Sockets folder. The Change File button lets you select a new file, and will let you change the folder, BUT, you must only select files from the EI Sockets folder. This is being done to allow for files to be found if Renderama is being used to render on the slave machines.

Start At frame #. The frame index of animation at which Pixel Grains start to generate geometry.

Stop At Frame #. The frame index of the animation at which Pixel Grains stops generating geometry.

Zero Value. Typically a zero gray value is taken to be the zero height field. If you want to take some other gray level as the virtual zero, that gray level value is entered here.

Flag

Flag is a small plug-in that generates a rectangular flag, and deforms (makes it look like it's waving) it using dynamics. This will mimic a flag in a windy area. There are separate controls for amount of wind, direction, locks.

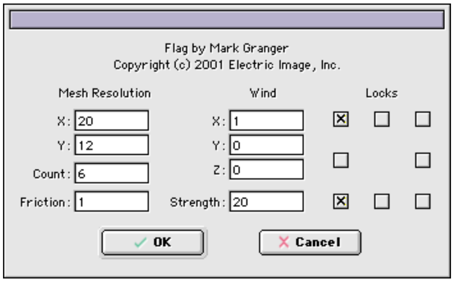


Figure 29.15 — **Flag Interface**

Mesh Resolution. This determines how many polygons the constructed Flag geometry will have.

Count. Count controls how fast time is running in the simulation. A higher number means faster flag movement. If you would like the simulation to begin before the animation in your scene, drag Flag's initial keyframe before 0.

Friction. Friction is how stiff the fabric of the flag is. A higher number would make it appear that the flag is made of a thicker material.

Wind X/Y/Z. This is the direction of the wind.

Strength. Strength measure the speed of the wind. Higher numbers will make it appear that the wind is blowing harder.

Locks. The locks check boxes are basically where the flag would be tied down. By default the top and bottom left boxes are checking, making it appear that the flag is attached to a pole (pole would be separate geometry) at the top and bottom left of the flag.

UberShape

UberShape is a plugin that creates an enormous variety of objects. These objects can be used for animation, texturing, and rendering. There are many custom controls used for each type of shape too.

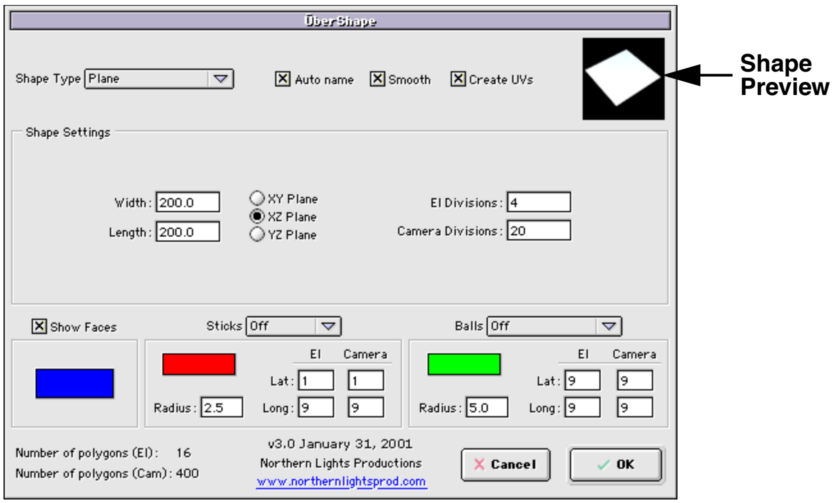


Figure 29.16 — **UberShape Interface with Plane Selected**

Shape Type. This pull down menu allow to choose between the different types of shapes each with it's own options. The shape settings area is where the options for each object is selected, the shapes include:

- Plane
- Cube
- Cylinder/Disc
- Cone, Sphere
- Torus
- Tube Ring

- Capsule
- Teapot
- Rock
- Geodesic
- Uniform Polyhedron

Auto Name. When this option is checked, a Plane will be named “Plane” in the project window. Similarly, a teapot will be named “Teapot” and so on. If you would like to instead name the objects yourself, uncheck the Auto name option.

Smooth. The smooth option will look smooth when rendered as Phong or higher. Sometimes you might want more of a faceted look, if so, uncheck this option.

Create UVs. UV coordinates aid in texturing. This plugin will make UV coordinates for the group if wanted. This can aid in texturing when applying UV maps.

Shape Preview. This box will show an example of what the object selected may look like when generated. This is especially useful when choosing a polyhedron shape.

Show Faces. The show faces check box is there primarily to uncheck if rendering for only Sticks and Balls.

Sticks. Sticks colors the edges of each polygon a separate color. It can be set to Lines which is a separate color, or to Cylinders, which will create cylinders as the polygonal edges. There is also options for divisions for EIAS and Camera. This is for a lower resolution in the view screens than while rendering. The sticks option can also be turned off as it is by default.

Balls. Balls will put a point, line or sphere at each of the vertices of the object created. There are several orientation options for the spheres also. The balls have options for divisions in both EIAS and Camera.

Shape Settings

Each different type of object that UberShape has its own options. In general though many are used in common.

Dimension. These include, Length, Width, Height, and Radius. Each of these affect the dimensions of the standard shape.

Orientation. These are X, Y, and Z rotational values. These can be set here at the initial creation of the object, or later in the group info window's rotational values.

Divisions/Subdivisions. The density of the mesh created is controlled by setting the EI and Camera divisions settings. If you plan on deforming an object, sometimes a higher division setting is needed for a smooth result.

Cap Ends. Some of the shapes (Cylinder/Disc, Cone, Capsule) have this option to have its ends covered or open, or to have just one side covered.

Detail Level. Some shapes (Rock, Teapot) use detail level to affect how dense the mesh is created.

Random Seed. Rocks use a random seed to allow the rock to look more natural. If adding several rocks, changing the random seed in each, will make the rocks look more unique.

Buckyball. Buckyball is a geodesic made up of pentagons and hexagons. It was named after Buckminster Fuller who did most of the early research on geodesic structures. Since Buckyballs don't have triangles, you can't generate faces. This feature is only available as part of a Geodesic.

Class 1/Class 2 Geodesic. These are slightly different variations of the polygon layouts. Class 2 is a denser mesh and is a little bit smoother.

LensFlare

The LensFlare plugin is a post-processing plugin that adds a lens flare effect over the top of the rendered image. Flares are assigned to individual lights using the Flare tab of the Light Info window.

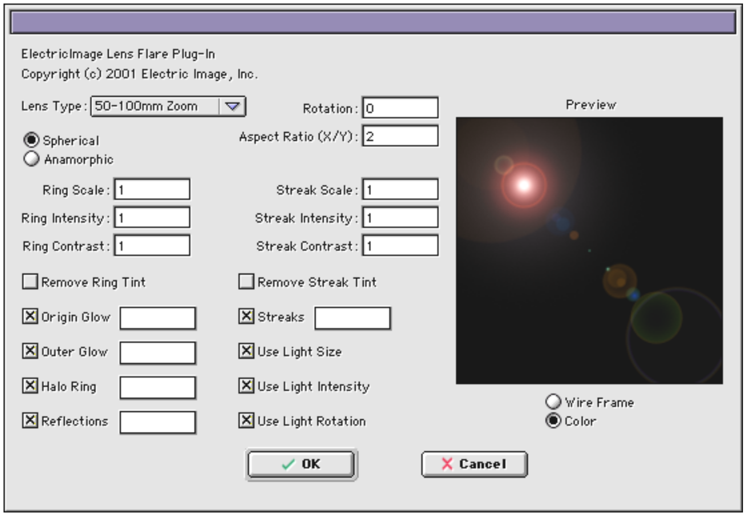


Figure 29.17 — **LensFlare Interface**

Lens Type. This pop-up menu provides a choice of two types of lenses: 50-100mm and 35mm Prime. Each produces a different type of flare with different sets of ring and streak elements.

Spherical/Anamorphic. These radio buttons provide a choice between circular and oval rings.

Rotation. This edit box contains a value in degrees for the angle of rotation of the streaks. This control can be used to simulate the spinning of a lens.

Aspect Ratio. This edit box is used in conjunction with Anamorphic lenses. It alters the oblateness of the flare.

Ring Scale. This edit box contains a value for the overall scale of the flare's ring elements. It defaults to 1 for standard-size rings. The higher the value, the larger the rings.

Ring Intensity. This edit box contains a value for the overall brightness of the flare's ring elements. It defaults to 1. the higher the value, the brighter the rings.

Ring Contrast. This edit box contains a value for the contrast in the flare's ring elements. It defaults to 1. The higher the value, the higher the contrast.

Remove Ring Tint. This check-box, when enabled, changes all of the flare's ring elements to gray scale. This option makes them easier to color with the **Origin Glow**, **Outer Glow**, **Halo**, and **Lens Reflections** color buttons. This options defaults off.

Origin Glow. This check box, when enabled, creates a glowing ball at the flare's origin. It defaults on. The adjacent color button opens the color picker to adjust the color of this element. The color defaults to white.

Outer Glow. This check box, when enabled, creates a glowing ring around the flare's Origin Glow. It defaults on. The adjacent color button opens the color picker to adjust the color of this element. The color defaults to white.

Halo Ring. This check box, when enabled, creates a halo around the flare's Origin Glow. It defaults on. The adjacent color button opens the color picker to adjust the color of this element. The color defaults to white.

Reflections. This check box, when enabled, creates lens reflections. It defaults on. The adjacent color button opens the color picker to adjust the color of this element. The color defaults to white.

Streak Scale. This edit box contains a value for the scale of the flare's streak elements. It defaults to 1. The higher the value, the longer the streaks.

Streak Intensity. This edit box contains a value for the overall brightness of the flare's streak elements. It defaults to 1. The higher the value, the brighter the streaks.

Streak Contrast. This edit box contains a value for the contrast in the flare's streak elements. It defaults to 1. The higher the value, the higher the contrast.

Remove Streak Tint. This check-box, when enabled, changes all of the flare's streak elements to gray scale. This option makes them easier to color with the **Streaks** color button. It defaults off.

Streaks. This check-box, when enabled, creates the flare's streaks. It defaults on. The adjacent color button opens the color picker to adjust the color of this element. The color defaults to white.

Use Light Size. This check-box, when enabled, causes the Light Size in the Light Info window, Properties tab to be used for both the lens flare obscuration size and the lens flare's glow radius.

Use Light Intensity. This check-box, when enabled, causes the intensity of value set in the Light Info window, Properties tab to determine the overall brightness of the flare.

Use Light Rotation. This check-box, when enabled, rotates the lens flare rings and streaks in 2D to match the light source rotation as shown in the Light Info window, X-form tab. When the light is linked to another object, the lens flare will be rotated by the combination of the light and the object. In addition, the Camera's roll value will affect the light rotation angle.

LightFlare

The LightFlare plugin is a post-processing plugin that adds a lens flare effect over the top of the rendered image. Flares are assigned to individual lights using the Flare tab of the Light Info window.

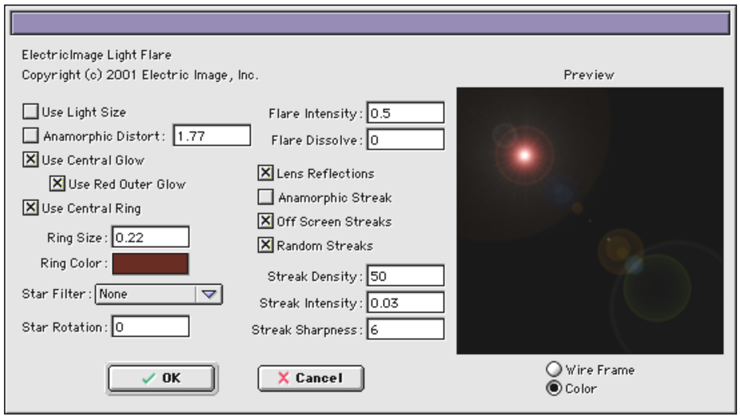


Figure 29.18 — **LightFlare Interface**

Use Light Size. This check-box, when enabled, causes the Light Size in the Light Info window, Properties tab to be used for both the lens flare obscuration size and the lens flare's glow radius.

Anamorphic Distort. This check-box, when enabled, causes a flattening of the flare. The edit box controls how flat the flare becomes.

Flare Intensity. This Edit box controls the overall brightness of the entire flare.

Flare Dissolve. Causes the flare to become transparent. The higher the value, the more transparent.

Use Central Glow. This check box, when enabled, creates a glowing ball at the flare's origin.

Use Red Outer Glow. This creates a soft, red glow around the Central Glow. It is only available if Central Glow is enabled.

Use Central Ring. This check box, when enabled, creates a halo around the flare's Central Glow.

Ring Size. Controls the size of the Central Ring.

Ring Color. Brings up a color picker that changes the color of the Central Ring.

Star Filter. This pop-up menu enables streak patterns that emanate from the center of the flare. The filter supports both major and minor streaks. e.g. "6+6 Point" means six major streaks and six minor streaks.

Star Rotation. This edit box controls the rotation of the streaks. Only the streaks are rotated with this option.

Lens Reflection. This check box, when enabled, creates lens reflections.

Anamorphic Streak. This check-box, when enabled, creates a flat, blue streak that runs horizontally through the center of the lens flare.

Off Screen Streaks. This check-box, when enabled, allows the lens flare to be seen even when it moves outside the field-of-view of the camera. The Enable Offscreen check-box must be turned on in the Flare tab of the Light Info window as well.

Random Streaks. This check-box, when enabled, creates a large number of small streaks that center on the flare's origin.

Streak Density. This edit box controls the number of Random Streaks created when the Random Streaks check-box is on.

Streak Intensity. This edit box controls the brightness of the Random Streaks.

Streak Sharpness. This edit box controls the contrast of the Random Streaks. Lower values blur the streaks.

Mr. Nitro2

This tool adds the Mr. Nitro2 special effect to the project. Mr. Nitro2 is used to animate realistic explosions of models. Mr. Nitro2 is an enhanced version of Mr. Nitro. It includes support for strength maps, polygon extrusion, and a separate simulation timing system.

1. Choose **Plugin>Mr. Nitro2.plm…** from the main menu bar.

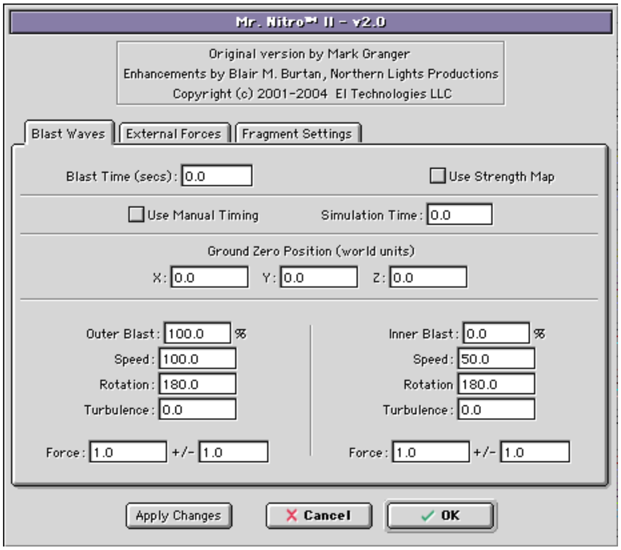


Figure 29.19 — **Mr. Nitro2 Interface**

2. Use the controls of the dialog box to configure the blast to your preferences. For an explanation of these controls, refer to the section “Mr. Nitro Controls (see below).
3. Either click **OK** or press **Return**.
4. Parent the group(s) to be exploded to the Mr. Nitro2 object.

Mr. Nitro2 Blast Waves Controls

Blast Time. This edit box contains a value for the time in the project at which the shock wave will commence. A negative value will result in the shock wave originating prior to the start of the animation.

You will need to use a negative blast time value when ground zero is far away from the group(s) to be exploded—otherwise the moment of impact will occur long into the animation. For the blast to occur in the first frame of the animation, blast time should be set according to the following formula:

Blast Time = - distance from Ground Zero to group ÷ Speed

For example, if ground zero is a distance of 1000 from the group and the blast speed (see **Speed** edit box, below) is 10, blast time would be -1000 ÷ 10, or -100 seconds.

Use Strength Map. Turning on this check box makes use of the first Strength Map of each group to apply a mass factor to the exploded polygons. Where the strength map is 100%, the polygons receive the full force of the blast wave. Where the strength map is 0%, the polygons are frozen and unaffected by the blast wave. Sub-polygons created by the plugin receive an interpolated strength from the initial polygon.

This feature allows you to create interesting effects such as blowing holes in a model without having to create a separate model for the region to be exploded.

Use Manual Timing. When this is turned on, the absolute simulation time as specified by the Simulation Time animation channel is used instead of the project's animation timing. This mode allows you to speed up or slow down or even freeze the explosion.

Simulation Time. Used with the Use Manual Timing check box. This is the absolute simulation time at the current frame of the animation. You can use this setting to set keyframes for the Simulation Time animation channel in the Project window. This means you can run the simulation backwards while the animation runs forwards. Or you can run the simulation at a varying rate of speed. For instance, at scene time 0.0, you could set the simulation time to 0.50. At scene time 1.0, you could set it to -0.50. The explosion would begin normally but would start running backwards at scene time 1.0.

Ground Zero Position. These edit boxes contain values for the X, Y and Z coordinates of the blast's origin, or "ground zero." This is the point from which the shock wave of the blast originates, emanating in all directions. By positioning ground zero farther away from the group(s) to be exploded, you can create more of a "wall-shaped" shockwave.

To position and configure the blast to your requirements, you should first check the coordinates and size of the group(s) to be blasted in their respective Group Info windows. You can then set Mr. Nitro2's values accordingly.

Outer Blast and Inner Blast. These edit boxes control the speed, rotation, turbulence and force of the initial shockwave of the blast. An explosion can have two shockwaves, the outer blast (first) and the inner blast (second).

%. This edit box contains the percentage value for the outer blast (initial shockwave). It defaults to 100, so that there is only the outer blast. To create two shockwaves, assign a value less than 100% to the outer blast and the Inner Blast% edit box will be adjusted accordingly (so that they add up to 100%).

Speed. This edit box contains a value for the speed (distance per second) of the shockwave. When used in conjunction with the Blast Time value (see above), this value can control the moment when the shockwave hits the group(s).

Rotation. This edit box contains a value in degrees for the maximum amount of rotation of the flying blast fragments. Fragments rotate around random axes.

Turbulence. This edit box contains a value for the amount of air turbulence which will affect the manner in which the blast fragments rotate. With a value of zero, fragments rotate around their centers. A value other than zero will cause fragments to rotate off-axis.

Force. This edit box contains a value for the force of the shockwave. The greater the force, the faster the fragment will move in the direction of the shockwave. A force of 1.0 will cause fragments to move at the same speed as the shockwave. The ± edit boxes enable you to impart a variability to the value so that some fragments fly faster than others.

Mr. Nitro2 External Forces Controls

Gravity Direction & Force. These edit boxes contain values for the direction and force of gravity which will affect the manner and speed in which the blast fragments fall. The ± edit boxes enable you to impart a variability to each value so that some fragments are more affected by gravity than others.

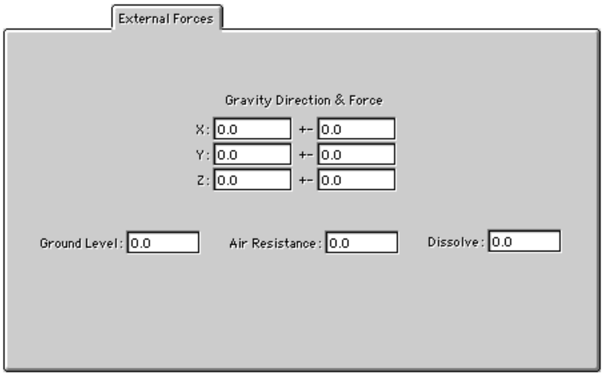


Figure 29.20 — **Mr. Nitro2 – External Forces**

Ground Level. A value for the Y axis coordinate of an invisible ground plane below which blast fragments disappear as they fall

Air Resistance. This edit box contains a value for the amount of air resistance which will affect the manner in which the blast fragments fall. The higher the value, the more air resistance slowing the fragments.

Dissolve: This edit box contains a value for the amount of time in seconds for blast fragments to dissolve after being hit by the shockwave. A value of 0 (the default) prevents fragments from dissolving.

Mr. Nitro2 Fragment Settings Controls

Fragment Size. these edit boxes contain size values for the smallest and largest blast fragments, relative to the size of the exploding group. To have all fragments of approximately the same size, enter the same value in both the Smallest and Largest edit boxes.

Setting a minimum size value that is too small will generate a very large number of fragments, which will take too long to generate and may also cause you to run out of memory. As a starting point for the minimum size, try using a value that is 1/10 the longest dimension of the group; for the maximum size, use a value that is twice the minimum size.

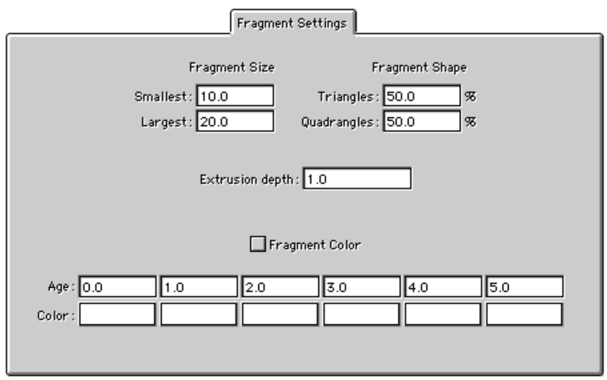


Figure 29.21 — **Mr. Nitro2 – Fragment Settings**

Fragment Shape. These edit boxes contain values for the percentage of fragments that are to be triangles versus quadrangles. The default is 50%

for each. Changing one value will adjust the other value accordingly (to add up to 100%).

Extrusion Depth. This setting applies an extrusion to each of the exploded fragments. The size or depth of the extrusion is in world units. When set to 0.0, no extrusion is applied.

Fragment Color. This check box, when enabled, allows you to assign a color to the blast fragments, overriding the surface color setting of the group. The color of the blast fragments can be animated over time through the use of the Age Color buttons, discussed below.

Age Color. These buttons invoke the Color Picker to enable you to set different colors for the blast fragments at different stages of the blast. The age values are all in seconds and can be edited.You can change the color of the fragments before they are hit by the shockwave by setting the first age value to less than zero.

Preferences

30.0 Introduction

To bring up the Animator preferences dialog box, from the system menu, choose **Edit>Preferences...** While running OS X, choose **EIAS Animator>Preferences...**

The OK button closes the preferences dialog box accepting any changes you might have made. The Cancel button closes the preferences dialog box without making any changes. Reset changes all preference items back to their default (factory) values.

30.1 Keyframe Tab

The Keyframe tab contains settings that control the way that channel animation is handled for new and existing objects.

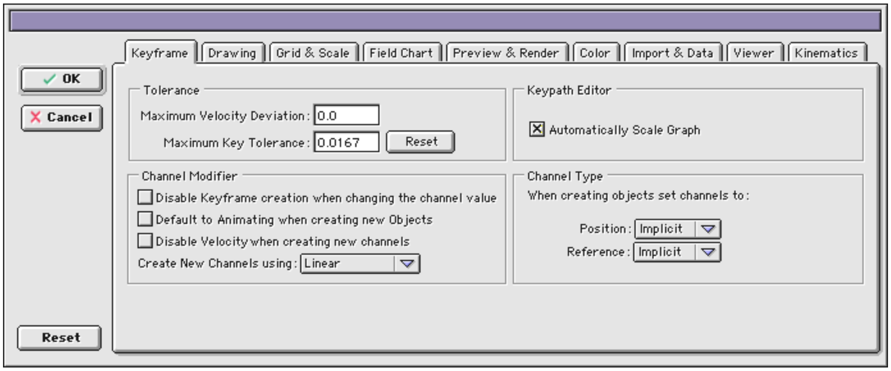


Figure 30.0 — **Preference Window-Keyframe Tab**

Maximum Velocity Deviation. This is a control for the velocity calculation. The higher the deviation the less accurate it becomes, but gets computed faster. The lower value produces a more accurate velocity, but computes slower.

Maximum Key Tolerance. This value allows control over how close the global time can be to a keyframe to consider the keyframe highlighted for modification.

Automatically Scale Graph. This option causes the F-Curve editor to automatically scale to the selected curve.

Disable Keyframe creation when changing the channel value. A rendered sequence, like a scene in a movie.

Default to Animating when creating new Objects. Causes the green, enable-animation arrow to default to the on position in the Project window for all objects added to the scene.

Disable Velocity when creating new channels. Prevents velocity channels from being created for objects added to the scene.

Create New Channels using: Sets the default interpolation type for animation channels. Choices are Linear, Natural Cubic, Hermite, and F-Curve.

When creating Objects set channels to: Allows control over the default key type that is set in the Group Info window, X-form tab for both the object and its reference. The choices are Implicit and Explicit.

30.2 Drawing Tab

The Drawing tab contains settings that control OpenGL, software drawing, and mouse interaction.

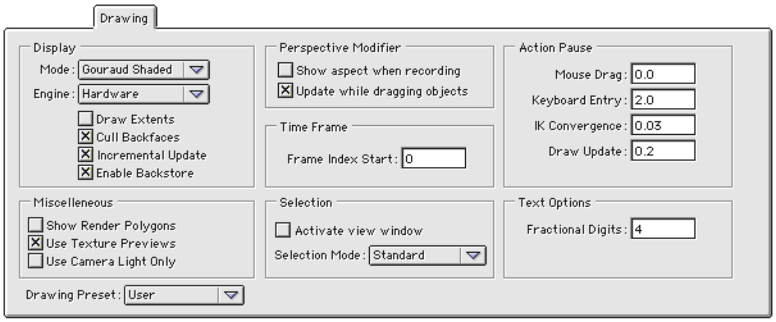


Figure 30.1 — **Preference Window-Drawing Tab**

Mode. Sets the default drawing level for the View windows. Choices are None, Point, Outline, Wireframe, Point Shaded, Outline Shaded, Wireframe Shaded, Gouraud Shaded, and Phong Shaded.

Note *Phong shading is only available when the Software Engine is enabled. Gouraud is the highest shading level available when using the Hardware Engine.*

Engine. Sets the default drawing engine for the View windows. Choices are Hardware (OpenGL) or Software (Animator's internal drawing engine).

Draw Extents. Causes extent boxes to be drawn around all objects in the scene. Extents are cubes that surround groups and show the maximum dimension of the object in X, Y, and Z.

Cull Backfaces. Polygons that are not facing the view are removed before the View window is drawn. This will improve drawing speed.

The four settings above may be overridden for each individual window using the blue, Shader Mode, ball in the lower right-hand corner of the World View windows.

Incremental Update. Allows a subset of the polygons to be drawn window by window until all windows are updated. This feature dramatically improves interactive drawing performance by allowing you to interrupt a window refresh by selecting or dragging an object.

Enable Backstore. Under Mac OS 9, this feature keeps a copy of the drawing windows stored in memory. This removes the need to rerender the drawing windows when they are covered/uncovered by a dialog box.

Show Render Polygons. Displays subpolygons in the view windows.

Use Texture Previews. Enables the display of textures on objects in the View windows.

Use Camera Light Only. Prevents scene lights from being used to render the View windows except a single, imaginary light placed at the camera position. This feature is useful if you have more than 8 lights being used in the scene. OpenGL can only render with 8 lights per pass. If you have more than 8 lights, each view window must be rendered more than once for final display.

Drawing Preset. Handy presets for items in the Drawing tab. As your project gets larger and more complex, drawing interactivity will be improved by moving from the settings in Small Project to Large Project.

Show aspect when recording. Shows the proper picture you would get while rendering when a pixel aspect ratio other than 1 is set in the Render Control window.

Update while dragging objects. When off the Camera View window won't interactively update when you drag objects in the other View windows. Since only one window has to be drawn interactively, this greatly speeds up drawing performance.

Frame Index Start. Sets the frame number that is used to begin a new animation. Common settings are 0 and 1.

Activate view window. Causes World View windows to be activated when they are clicked in.

Selection Mode. When set to Toggle, objects are unselected when they are clicked on a second time. When set to Standard, objects already selected stay selected when clicked on a second time.

Mouse Drag. A time in seconds for the time interval between the moment when camera dragging stops and the window is redrawn. This allows the extent boxes displayed to remain for the time specified before full drawing begins.

Keyboard Entry. Time in seconds for the time interval between the moment when key entry stops and the image is redrawn in the View windows.

IK Convergence. Time in seconds to wait for an IK solver to converge on a solution. Higher numbers will make for a more accurate solution but at reduced interactive performance.

Draw Update. Fine tunes the Incremental Update system. Smaller values cause the drawing interrupts to occur more frequently while dragging.

Fractional Digits. Number of digits to the right of the decimal that are shown in edit boxes.

Point Size. Windows only. Sets the font point size of the text in Animator dialog boxes.

Note For large projects, in the Preferences, Drawing tab, use “Large “Project” mode, set “Mouse Drag” to 0.1 and “Draw Update” to 0.5. All drawing is interruptible when “Incremental Update” is turned on. *Incremental Update is recommended when working on large projects.*

30.3 Grid & Scale Tab

The Grid & Scale tab contains settings that control the snapping parameters, grid color, grid density, ruler bars, and scene size.

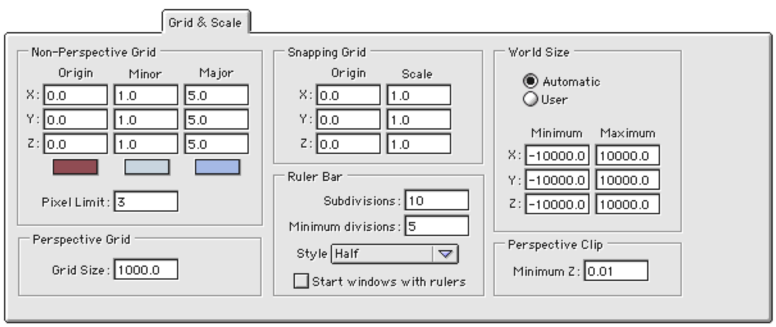


Figure 30.2 — **Preference Window-Grid & Scale Tab**

Non-Perspective Grid. Sets the origin in world space, the scale of the Major and Minor grid lines, and the colors of the Origin axis, Major grid lines and Minor grid lines.

Pixel Limit. Value that specifies, in pixels, how close two parallel grid lines can be drawn in the World View windows. This feature can help avoid the situation where all grid lines touch each other or are being drawn on top of each other, resulting in a solid background. More dense or sparse grid spacing can therefore be set by changing the pixel limit. A larger pixel limit also means faster grid updates because there are fewer lines to draw. Pixel Limit does not apply to the Camera View window because there are no two projected lines that are parallel in perspective space.

Prospective Grid. Size of the grid shown in the Camera View window.

Snapping Grid. The origin and scale of the invisible grid to which objects are snapped to when snapping is enabled.

Ruler Bar Subdivisions and Minimum Divisions. Sets the number of Subdivisions (number of minor lines between major lines) and the Minimum Divisions (major lines shown in the View windows).

Ruler Bar Style. Sets the ruler bar style. Choices are None (suppresses subdivision lines), Flat (shows major lines and subdivision lies at the same height), Half (raised subdivision line half-way between major lines), Quarter (three raised subdivision lines between major lines), Two's (every other subdivision line is raised).

Start windows with rulers. Sets automatic display of rulers in the World View windows when a new project is started.

Minimum Z. Sets the distance out from the camera for which information in the Camera View window is clipped away (also known as the "hither clipping plane").

World Size Automatic and User. These values are used to precompute the hither and yon values for OpenGL display. In the automatic case, all objects including extents, key paths and handles, and other displayable attributes are used to compute the global extent of a scene. In the user case, the values are keyed into the edit boxes are used.

30.4 Field Chart Tab

The Field Chart tab contains settings that control the use of line aids in the Camera View. You can control the display of particular elements when a new project is created and the color that those elements are drawn with (in new or existing projects).

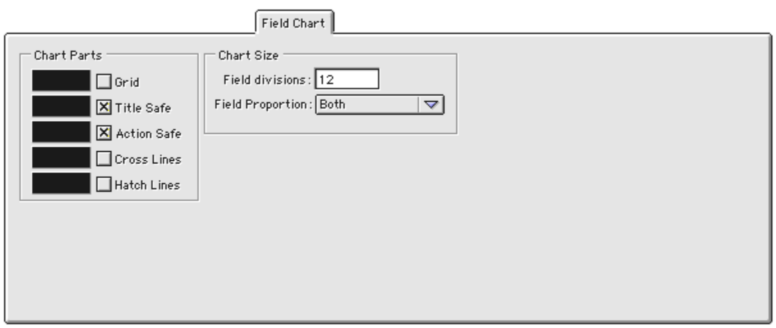


Figure 30.3 — **Preference Window-Field Chart Tab**

Grid. This check box turns on the field grid which appears in the Camera View window.

Title Safe. This check box turns on a frame within which is considered to be the safe area to display titles (with no risk of cropping).

Action Safe. This check box turns on a frame within which is considered to be the safe are to display action (with no risk of cropping).

Cross Lines. This check box turns on a pair of crossed lines in the center of the Camera View window.

Hatch Lines. This check box turns on a pair of diagonal crossed lines in the center of the Camera View window.

Field divisions. This edit box contains the number of divisions in the field. The default is 12 (for a standard 12 field chart).

Field Proportion. Controls the proportional spacing of the grid lines. The default is Both which yields spacing proportional to the X/Y aspect ratio. Horizontal and Vertical create even grid lines regardless of the X/Y aspect ratio. The Field Division value is enforced on the selected direction and the other direction is best-fit.

Color Buttons. The color buttons to the left of each check box are used to select a color for that element of the chart. Setting a different color for each element provides added clarity when multiple elements are enabled.

30.5 Preview & Render Tab

The Preview & Render tab contains settings that control the way the live previews work in the Camera View window and offers several choices for altering the behavior of the Camera rendering application.

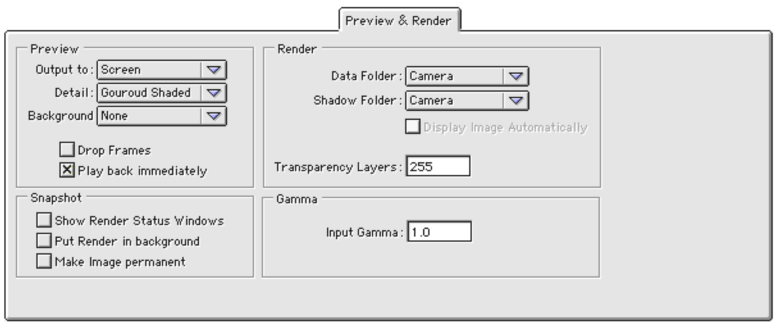


Figure 30.4 — **Preference Window-Preview & Render**

Output to. Changes the where previews are written for the current project and all new projects that are created subsequently. Choices are Screen (preview in the Camera View window), Image (write the preview out to an Image file), and QuickTime (write the preview out to a QuickTime movie).

Detail. Changes the rendering level for previews for the current project and all new projects that are created subsequently. The Choices are the same as for **Mode** on page 885.

Background. Controls how background images are treated during previews for the current project and all new projects. Choices are None (do not display background images during previews), Still (show the first frame of the background throughout the preview), and Increment (show the proper background frame for each frame of the preview).

Drop Frames. When on, frames may be skipped during preview to maintain the project frame rate.

Play Back Immediately. When on, previews that were written to disk are immediately played back upon completion.

Show Render Status Windows. When a snapshot rendering is taking place, this option tells Camera to display its status windows.

Put Render in background. Animator will launch Camera but put it into the background so it isn't visible.

Make Image permanent. When this option is on, Animator saves all of the snapshot images in the EI Snapshots folder. When off, Animator deletes all files in the folder when it is quit.

Data Folder. Tells Camera where to store its temporary files during rendering. Camera creates a variety of temporary folders for motion blur, glow, procedural reflections, etc.

Choices are:

- Image - Store the data in the folder where the rendered image file is being rendered
- Camera - Store the data in the same folder where the Camera application resides.
- Project - This option stores the data in the folder where the project file resides.
- Custom - Opens a directory dialog box in which a a folder on a local hard drive may be specified.

Shadow Folder. Tells Camera where to store Z-Buffer shadow files during rendering. The choices are the same as those for Data Folder above.

Transparency Layers. Sets the maximum number of transparency levels used by Camera during Phong rendering. This value does not affect ray traced transparency.

Input Gamma. Sets the gamma value that Camera uses when processing texture maps.

30.6 Color Tab

The Color tab contains settings that control the color of a variety of elements in the work environment (Project window, World and Camera View windows, etc.).

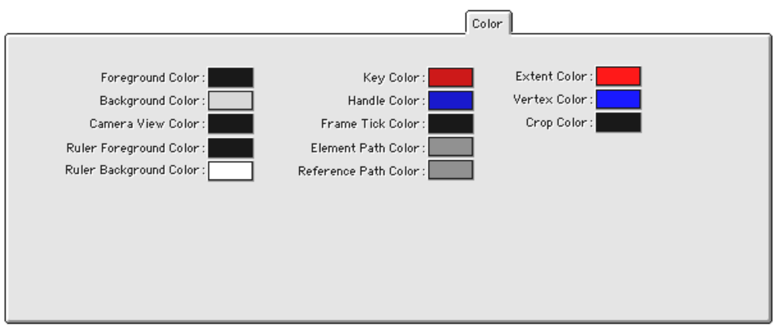


Figure 30.5 — **Preference Window-Field Chart Tab**

Foreground. Sets the color for the extra widgets available to the Camera and Light icons (FOV, Spotlight radius, etc.).

Background. Sets the color for the background in the World View and Camera View windows.

Camera View. Sets the color for the holdout region. The region outside the rendered area but still visible semi-transparently in the Camera View window.

Ruler Foreground. Sets the color of the numbers and hatch marks on the rulers.

Ruler Background. Sets the color of the semi-transparent background behind the rulers.

Key. Sets the color of the keyframe markers in the World View and Camera View windows.

Handle. Sets the color of the handles on the Bezier spline motion controls in the World View and Camera View windows.

Frame Tick. Sets the color of frame indicators on the motion paths as drawn in the World View and Camera View windows.

Element Path. Sets the color of the group's motion path as shown in the World View and Camera View windows.

Reference Path. Sets the color of the group's reference path as shown in the World View and Camera View windows.

Extent. Sets the color of the extent boxes drawn in the World View and Camera View windows.

Vertex. Sets the color of vertices (groups that consist of separate point) drawn in the World View and Camera View windows.

Crop. Sets the color of the cropping region drawn in the Camera View window.

30.7 Import & Data Tab

The Import & Data tab contains settings that affect the settings on objects and scenes when they are first brought into Animator.

Object Tab

The items in the Object tab control the inherit settings for groups that are brought into the project. These items are found in the Joint/Link window for each group.

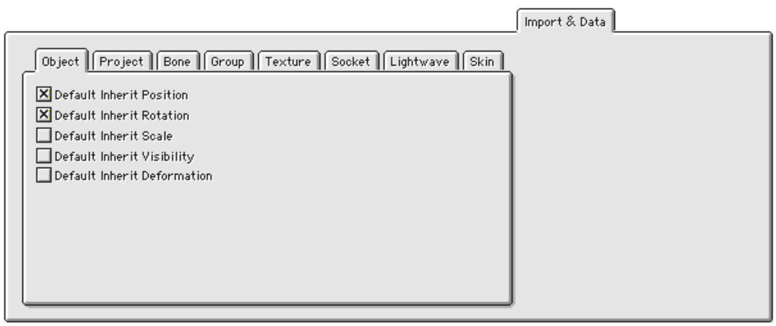


Figure 30.6 — **Import & Data - Object Tab**

Inherit Position. Causes a parent group's position values to be passed on to its children.

Inherit Rotation. Causes a parent group's rotation values to be passed on to its children.

Inherit Scale. Causes a parent group's scale values to be passed on to its children.

Inherit Visibility. Causes a parent group's visibility status to pass to its children.

Inherit Deformation. Causes deformations performed on a parent group to affect its children.

Project Tab

The items in the Project tab control options for reading and writing of the project file.

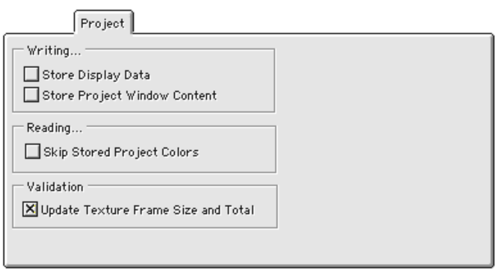


Figure 30.7 — **Import & Data - Project Tab**

Store Display Data. The contents and status of the View windows are stored in the project file.

Store Project Window Content. The contents and status of the Project window is stored in the project file.

Skip Stored Project Colors. Keeps the colors (foreground, background, keypath, etc.) stored in a project file from overriding the colors set in the Color preferences.

Update Texture Frame Size and Total. When a project is read in, the parameters of animated texture maps and backgrounds are verified.

Bone Tab

These two parameters set the defaults for the bone color as shown in the Bone Info window.

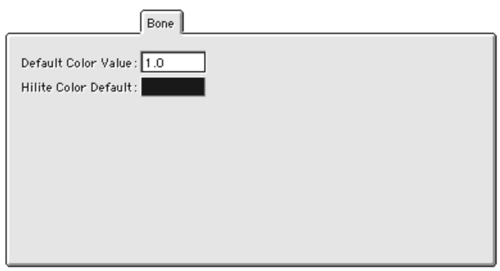


Figure 30.8 — **Import & Data - Bone Tab**

Default Color Value. A multiplier that is used to brighten or darken the overall color of the bones.

Highlight Color Default. Sets the default color for bones as shown when they are selected.

Group Tab

These three parameters set the defaults for the group's display and texture settings as shown in the Group Info window.

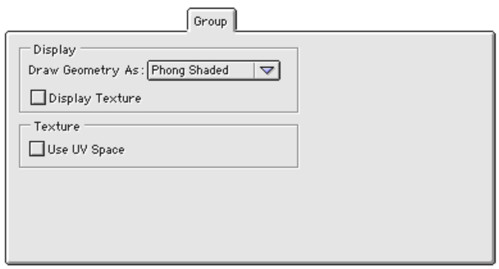


Figure 30.9 — **Import & Data - Group Tab**

Draw Geometry as. Sets the default shading level for groups as displayed in the World View and Camera View windows.

Display Texture. Controls whether or not groups display their texture in the World View and Camera View windows.

Use UV Space. Sets new groups to use their UV space for texture mapping. The Choices are the same as for **Mode** on page 885.

Texture Tab

This parameter set the tiling default for the group's texture as shown in the Texture Info window.

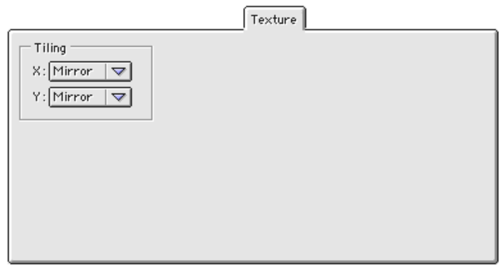


Figure 30.10 — **Import & Data - Texture Tab**

Tiling. Sets the default tiling method for new texture maps added to the project. Choices are None, Hold, Repeat, and Mirror. See "Map Projection Tab" on page 490 for more information.

Socket Tab

A single parameter is provided to control the management of memory usage by plug-ins.

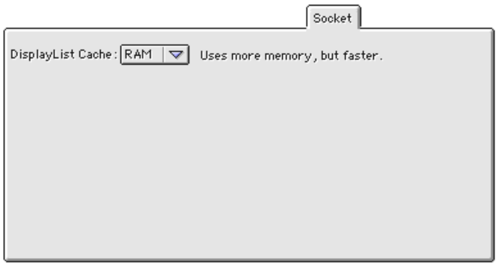


Figure 30.11 — **Import & Data - Socket Tab**

Display List Cache. The Animator can store the information generated by plug-ins in RAM (faster), or it continually read and write it from Disk (slower but uses less memory). This is a global setting affecting all plug-ins in the project.

Lightwave Tab

These three parameters set the defaults for the group's display and texture settings as shown in the Group Info window.

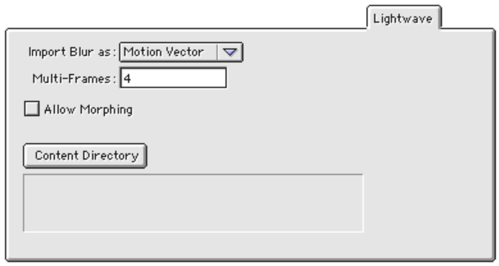


Figure 30.12 — **Import & Data - LightWave Tab**

Import Blur as. Converts Lightwave's blur settings to either Motion Vector Blur or Multi-Frame blur.

Multi-Frames. Sets the number of blur frames if the Multi-Frame blur setting above has been chosen.

Allow Morphing. Enables the importation of morph data from Lightwave projects.

Content Directory. Allows Animator to use the same directory structure as Lightwave when importing lightwave project files. Usually this is the directory entitled "Newtek".

Skin Tab

These three parameters set the defaults for skin behavior on newly skinned objects as shown in the Skin editor.

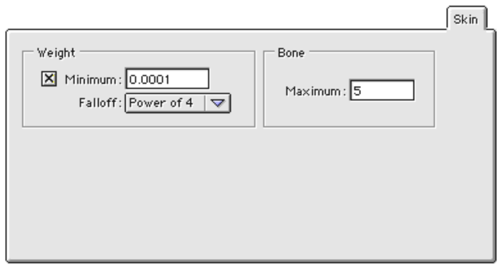


Figure 30.13 — **Import & Data - Skin Tab**

Weight Minimum. Sets the minimum influence a bone has on a vertex. If the computed weight falls below this threshold, the bone will not influence the vertex. The checkbox enables/disables the minimum weight computation.

Weight Falloff. Sets the falloff distance that is used to “tighten” or “loosen” the influence of the bones based on the distance between the skin’s vertices and the bones.

Bone Maximum. Sets the maximum number of bones that can influence each vertex in the skin.

30.8 Viewer Tab

These preference settings control the default behavior of the View Image command (available under the File Menu).

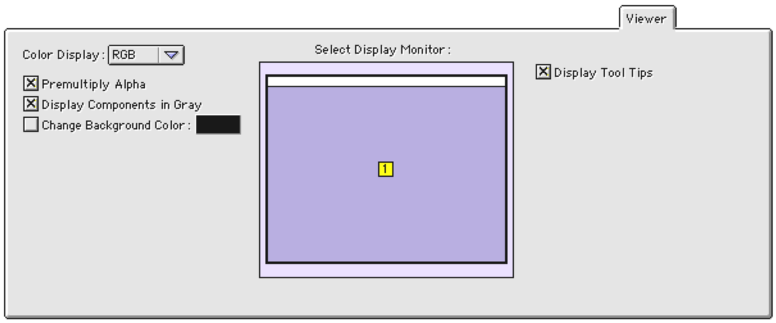


Figure 30.14 — **Preference Window-Viewer**

Color Display. This pop-up menu sets the color channel of the image to be displayed. Choices are RGB, Red, Green, Blue, and Alpha.

Premultiply Alpha. This option, when enabled, multiplies the alpha channel into the RGB channel.

Display Components in Gray. Causes a grayscale display when the Red, Green, or Blue color channels are selected from the **Color Display** pop-up menu.

Change Background Color. This option, along with the color button to its right, allows the selection of a color that will be used to override the background color of the image.

Select Display Monitor. Selects the monitor for displaying the image file (in multi-monitor configurations).

Display Tool Tips. Enables the display of help text that pops-up over icons in the Animator.

30.9 Kinematics Tab

The Kinematics tab contains parameters that control the overall behavior of the IK system.

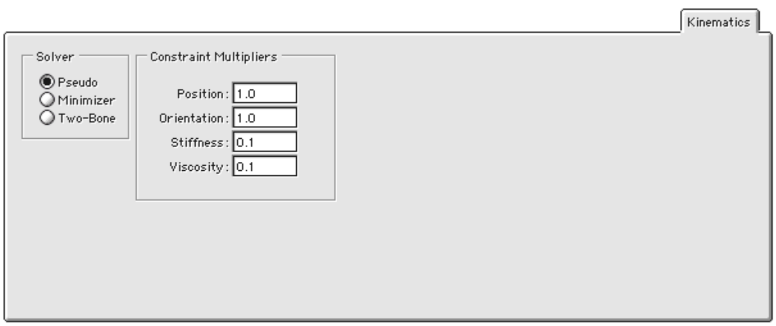


Figure 30.15 — **Preference Window-Kinematics**

Solver. Sets the default solver type for new IK chains as shown in the IK Handle Info window, Properties tab. Choices are Pseudo, Minimizer, and 2-bone.

Constraint Multipliers. These edit boxes contain values that establish the relative importance of Position, Orientation, Stiffness, Viscosity, and Gravity when computing the IK solution. The higher the value for an attribute, the greater importance is placed on it.

Macintosh Shortcut Keys

World View Window Shortcuts

Press Key	Mouse Action	Result
R	None	Switches tool to rotate
S	None	Switches tool to scale
T	None	Switches tool to Translate
]	None	Zoom out front window
[	None	Zoom in front window
=	Click in View window	Fit window to world
F	Click in View window	Fit window to world
Shift-F	Click in View window	Fit selected objects to world
Option	Drag rectangle in View window	Fit window to selected region
Cmd-Spacebar	Click and drag in View window	Zoom window interactively
Spacebar	Click and drag in View window	Pan window
Spacebar-X	Click and drag in View window	Pan window horizontally
Spacebar-Y	Click and drag in View window	Pan window vertically
Ctrl	Click and drag an object	Rotate object freely
0-9 keys	None	Change time to Time Marker
Option-1-6 keys	None	Switch window view

World View Window Shortcuts

Press Key	Mouse Action	Result
Arrow Keys	None	Moves selected objects one pixel
Shift-Arrow Keys	None	Moves selected objects ten pixels
Ctrl	Click and drag camera	Vector-constrained translation
Ctrl	Click on Preview button	Bring up options for Preview
Ctrl	Click on Shade Mode button	Shade window at highest level
Cmd	Double click on group	Open Material Info window
Cmd-Option	Double click on group	Open Link/Joint Info window
Cmd-Ctrl	Double click on group	Open Deformation window
Ctrl-Option	Double click on plug-in	Open plug-in options dialog box
Cmd	Double click on light	Select light color
Ctrl	Click and drag Bezier handle	Move handle along its vector
Cmd-Option	Click and drag Bezier handle	Break Bezier handle
Cmd	Click and drag Bezier handle	Realign Bezier Handle

Camera View Window Shortcuts

Press Key	Mouse Action	Result
Ctrl	Click on Rotoscope button	Bring up Rotoscope options
Ctrl	Click on Preview button	Bring up Preview options
Ctrl	Click on Fieldchart button	Bring up Fieldchart options
Spacebar	Click and drag in window	Track the camera or light
Spacebar-X	Click and drag in window	Track the camera or light horizontally
Spacebar-Y	Click and drag in window	Track the camera or light vertically
Cmd-Spacebar	Click and drag in window	Orbit the camera or light
O	Click and drag in window	Orbit the camera or light
Opt-Spacebar	Click and drag in window	Pan the camera or light
Ctrl-Spacebar	Click and drag in window	Dolly the camera or light
Shift-Spacebar	Click and drag in window	Zoom the camera (FOV)
V	Click and drag in window	Change rise/fall/shift
Cmd	Double Click on group	Open Material Info window
Cmd-Option	Double Click on group	Open Link/Joint window
Cmd-Ctrl	Double Click on group	Open Deformation window
Ctrl-Option	Double Click on plug-in	Open plug-in options dialog
Cmd	Double Click on light	Select light color
Ctrl	Click and drag Bezier handle	Move handle along its vector
Cmd-Option	Click and drag Bezier handle	Break Bezier handle
Cmd	Click and drag Bezier handle	Realign Bezier Handle

Project Window Shortcuts

Press Key	Mouse Action	Result
Option	Click on Zoom button	Fit time line to window
Option	Click on Flags (visibility, lock and animation)	Toggle elements from click position to bottom
Cmd-Option	Click on Flags (visibility, lock and animation)	Toggle object and its children
Cmd	Double click on group	Open Material Info window
Cmd-Option	Double click on group	Open Link/Joint Info window
Cmd-Ctrl	Double click on group	Open Deformation window
Ctrl-Option	Double click on plug-in	Open plug-in options dialog
Cmd	Double click on light	Select light color
Cmd	Double click on sound icon	Play/Stop selected sound
Cmd	Click in data cell	Select all data cells in row
Shift	Click in data cell	Select row and columns from last selection to new
Cmd-Shift	Click in data cell	Include/Exclude whole row(s) in selection
Shift-Up-Arrow	Click in data cell	Include/Exclude row above
Shift-Down-Arrow	Click in data cell	Include/Exclude row below
Shift-Left-Arrow	Click in data cell	Include/Exclude row to left

Project Window Shortcuts

Press Key	Mouse Action	Result
Shift-Right-Arrow	Click in data cell	Include/Exclude row to right
Cmd	Click and drag time line	Select keyframe scale region
Ctrl	Drag selected keyframes	Interactive keyframe scaling
Option	Drag selected keyframes	Duplicate keyframes
Shift	Click individual keyframes	Select multiple keyframes
Shift	Click and drag soundtrack	Include/Exclude cue time
Option	Drag Time Thumb	Scrub (preview animation)
Shift-Option	Drag Time Thumb	Scrub Camera View only
Ctrl	Click on Time Thumb	Time Thumb options menu
Cmd-Left-Arrow	None	Move Time Thumb one frame back
Cmd-Right-Arrow	None	Move Time Thumb one frame forward
Shift-Cmd-Left-Arrow	None	Move Time Thumb ten frames back
Shift-Cmd-Right-Arrow	None	Move Time Thumb ten frames forward
0-9 keys	None	Change time to Time Marker
+/- keys	None	Increment/decrement time to Time Marker

Info Windows (Group, Light, Camera, Texture, Joint, Bone)

Press Key	Mouse Action	Result
Ctrl	Click on any check-box	Pull-down menu that copies settings to other objects
None	Click and drag color chips	Copy color to other objects

Material Info Window Shortcuts

Press Key	Mouse Action	Result
None	Click on Material Ball	Highlight material for copy and pasting
None	Click and drag color chips	Copy color to other objects
Cmd	Click on Material Ball	Change background pattern
Ctrl	Click on Falloff Sliders	Change slider range

Texture Info Window Shortcuts

Press Key	Mouse Action	Result
R	None	Switch tool to rotate
T	None	Switch tool to translate
F	Click in window	Fit window to world
Spacebar	Click and drag in window	Pan window
Spacebar-X	Click and drag in window	Pan window horizontally
Spacebar-Y	Click and drag in window	Pan window vertically
Opt	Drag rectangle in window	Fit window to selected region
Cmd-Spacebar	Click and drag in window	Zoom window interactively
O	Click and drag in window	Orbit the view
Cmd-Shift-Spacebar	Click and drag in window	Orbit the view
Opt	Click on object	Highlight one polygon
Shift-Opt	Click on object	Add/Remove polygon to/from list
Cmd	Drag texture	Drag texture orthogonal to surface

Texture Info Window Shortcuts

Press Key	Mouse Action	Result
None	Click and drag on green dots at texture proxy outer edge	Scale the texture
Opt	Click on Source Editor button	Open Material Info window

Joint/Link Window Shortcuts

Press Key	Mouse Action	Result
R	None	Switch tool to rotate
T	None	Switch tool to translate
F	Click in window	Fit window to world
Spacebar	Click and drag in window	Pan window
Spacebar-X	Click and drag in window	Pan window horizontally
Spacebar-Y	Click and drag in window	Pan window vertically
Opt	Drag rectangle in window	Fit window to selected region
Cmd-Spacebar	Click and drag in window	Zoom window interactively
O	Click and drag in window	Orbit the view
Cmd-Shift-Spacebar	Click and drag in window	Orbit the view

Miscellaneous Shortcuts

Press Key	Mouse Action	Result
Caps Lock	None	Toggles Grid Locking
Home	None	Fit window to world

F-Curve Editor Shortcuts

Press Key	Mouse Action	Result
Option	Drag region	Zoom to region
Option	Click zoom button	Fit selected curve to window
Spacebar	Drag in window	Pan window
Shift	Drag region	Add keyframes within region to selection
Tab	None	Toggles keyframe drag constraint direction
Option	Click on selected curve	Add keyframe to curve
Cmd	Click on Bezier handle	Toggle break/mend Bezier
Ctrl	Drag keyframe(s)	Scale keyframes in region
Cmd-Ctrl	Click on keyframe	Toggle linear on or off

Object Menu (Hold down Ctrl key while selecting)

Mouse Action	Result
Range Export Option	Export multiple FACT's, one per frame. Useful for exporting deformations

Plug-in Menu (Hold down Ctrl key while selecting)

Mouse Action	Result
Choose About Plug-in	Open plug-in's "About Box"

Animation Menu (Hold down Ctrl key while selecting)

Mouse Action	Result
Choose Reset F-Curve Editor	Resets position and size of F-Curve Editor

Select Menu (Hold down Ctrl key while selecting)

Mouse Action	Result
Choose All + Locked	Selects all objects, even if locked
Choose Select by Hierarchy>Parent	Selects all ancestors
Choose Select by Hierarchy>Children	Selects all offspring

Windows Shortcut Keys

World View Window Shortcuts

Press Key	Mouse Action	Result
R	None	Switches tool to rotate
S	None	Switches tool to scale
T	None	Switches tool to Translate
]	None	Zoom out front window
[	None	Zoom in front window
=	Click in View window	Fit window to world
F	Click in View window	Fit window to world
Shift-F	Click in View window	Fit selected objects to world
Alt	Drag rectangle in View window	Fit window to selected region
Ctrl-Spacebar	Click and drag in View window	Zoom window interactively
Spacebar	Click and drag in View window	Pan window
Spacebar-X	Click and drag in View window	Pan window horizontally
Spacebar-Y	Click and drag in View window	Pan window vertically
0-9 keys	None	Change time to Time Marker
Alt-1-6 keys	None	Switch window view

World View Window Shortcuts

Press Key	Mouse Action	Result
Arrow Keys	None	Moves selected objects one pixel
Shift-Arrow Keys	None	Moves selected objects ten pixels
None	Right-Click and drag camera	Vector-constrained translation
None	Right-Click on Preview button	Bring up options for Preview
None	Right-Click on Shade Mode button	Shade window at highest level
Ctrl	Double click on group	Open Material Info window
Ctrl-Alt	Double click on group	Open Link/Joint Info window
Ctrl	Double click on light	Select light color
None	Right-Click and drag Bezier handle	Move handle along its vector
Ctrl-Alt	Click and drag Bezier handle	Break Bezier handle
Ctrl	Click and drag Bezier handle	Realign Bezier Handle

Camera View Window Shortcuts

Press Key	Mouse Action	Result
None	Right-Click on Rotoscope button	Bring up Rotoscope options
None	Right-Click on Preview button	Bring up Preview options
None	Right-Click on Fieldchart button	Bring up Fieldchart options
Spacebar	Click and drag in window	Track the camera or light
Spacebar-X	Click and drag in window	Track the camera or light horizontally
Spacebar-Y	Click and drag in window	Track the camera or light vertically
Ctrl-Spacebar	Click and drag in window	Orbit the camera or light
O	Click and drag in window	Orbit the camera or light
Alt-Spacebar	Click and drag in window	Pan the camera or light
Shift-Spacebar	Click and drag in window	Zoom the camera (FOV)
V	Click and drag in window	Change rise/fall/shift
Ctrl	Double Click on group	Open Material Info window
Ctrl-Alt	Double Click on group	Open Link/Joint window
Ctrl	Double Click on light	Select light color
Ctrl	Click and drag Bezier handle	Move handle along its vector
Ctrl-Alt	Click and drag Bezier handle	Break Bezier handle
Ctrl	Click and drag Bezier handle	Realign Bezier Handle

Project Window Shortcuts

Press Key	Mouse Action	Result
Alt	Click on Zoom button	Fit time line to window
Alt	Click on Flags (visibility, lock and animation)	Toggle elements from click position to bottom
Ctrl-Alt	Click on Flags (visibility, lock and animation)	Toggle object and its children
Ctrl	Double click on group	Open Material Info window
Ctrl-Alt	Double click on group	Open Link/Joint Info window
Ctrl	Double click on light	Select light color
Ctrl	Double click on sound icon	Play/Stop selected sound
Ctrl	Click in data cell	Select all data cells in row
Shift	Click in data cell	Select row and columns from last selection to new
Ctrl-Shift	Click in data cell	Include/Exclude whole row(s) in selection
Shift-Up-Arrow	Click in data cell	Include/Exclude row above
Shift-Down-Arrow	Click in data cell	Include/Exclude row below
Shift-Left-Arrow	Click in data cell	Include/Exclude row to left
Shift-Right-Arrow	Click in data cell	Include/Exclude row to right
Ctrl	Click and drag time line	Select keyframe scale region

Project Window Shortcuts

Press Key	Mouse Action	Result
None	Right mouse-Drag selected keyframes	Interactive keyframe scaling
Alt	Drag selected keyframes	Duplicate keyframes
Shift	Click individual keyframes	Select multiple keyframes
Shift	Click and drag soundtrack	Include/Exclude cue time
Alt	Drag Time Thumb	Scrub (preview animation)
Shift-Alt	Drag Time Thumb	Scrub Camera View only
None	Right-Click on Time Thumb	Time Thumb options menu
Ctrl-Left-Arrow	None	Move Time Thumb one frame back
Ctrl-Right-Arrow	None	Move Time Thumb one frame forward
Shift-Ctrl-Left-Arrow	None	Move Time Thumb ten frames back
Shift-Ctrl-Right-Arrow	None	Move Time Thumb ten frames forward
0-9 keys	None	Change time to Time Marker
+/- keys	None	Increment/decrement time to Time Marker

Info Windows (Group, Light, Camera, Texture, Joint, Bone)

Press Key	Mouse Action	Result
None	Right-Click on any check-box	Pull-down menu that copies settings to other objects
None	Click and drag color chips	Copy color to other objects

Material Info Window Shortcuts

Press Key	Mouse Action	Result
None	Click on Material Ball	Highlight material for copy and pasting
None	Click and drag color chips	Copy color to other objects
Ctrl	Click on Material Ball	Change background pattern
None	Click on Falloff Sliders	Change slider range

Texture Info Window Shortcuts

Press Key	Mouse Action	Result
R	None	Switch tool to rotate
T	None	Switch tool to translate
F	Click in window	Fit window to world
Spacebar	Click and drag in window	Pan window
Spacebar-X	Click and drag in window	Pan window horizontally
Spacebar-Y	Click and drag in window	Pan window vertically
Alt	Drag rectangle in window	Fit window to selected region
Ctrl-Spacebar	Click and drag in window	Zoom window interactively
O	Click and drag in window	Orbit the view
Ctrl-Shift-Spacebar	Click and drag in window	Orbit the view
Alt	Click on object	Highlight one polygon
Shift-alt	Click on object	Add/Remove polygon to/from list
Ctrl	Drag texture	Drag texture orthogonal to surface

Texture Info Window Shortcuts

Press Key	Mouse Action	Result
None	Click and drag on green dots at texture proxy outer edge	Scale the texture
Alt	Click on Source Editor button	Open Material Info window

Joint/Link Window Shortcuts

Press Key	Mouse Action	Result
R	None	Switch tool to rotate
T	None	Switch tool to translate
F	Click in window	Fit window to world
Spacebar	Click and drag in window	Pan window
Spacebar-X	Click and drag in window	Pan window horizontally
Spacebar-Y	Click and drag in window	Pan window vertically
Alt	Drag rectangle in window	Fit window to selected region
Ctrl-Spacebar	Click and drag in window	Zoom window interactively
O	Click and drag in window	Orbit the view
Ctrl-Shift-Spacebar	Click and drag in window	Orbit the view

Miscellaneous Shortcuts

Press Key	Mouse Action	Result
Caps Lock	None	Toggles Grid Locking
Home	None	Fit window to world

F-Curve Editor Shortcuts

Press Key	Mouse Action	Result
Alt	Drag region	Zoom to region
Alt	Click zoom button	Fit selected curve to window
Spacebar	Drag in window	Pan window
Shift	Drag region	Add keyframes within region to selection
Tab	None	Toggles keyframe drag constraint direction
Alt	Click on selected curve	Add keyframe to curve
Ctrl	Click on Bezier handle	Toggle break/mend Bezier
None	Right Mouse Drag keyframe(s)	Scale keyframes in region

Object Menu (Hold down Alt key while selecting)

Mouse Action	Result
Range Export Option	Export multiple FACT's, one per frame. Useful for exporting deformations

Plug-in Menu (Hold down Alt key while selecting)

Mouse Action	Result
Choose About Plug-in	Open plug-in's "About Box"

Animation Menu (Hold down Alt key while selecting)

Mouse Action	Result
Choose Reset F-Curve Editor	Resets position and size of F-Curve Editor

Select Menu (Hold down Alt key while selecting)

Mouse Action	Result
Choose All + Locked	Selects all objects, even if locked
Choose Select by Hierarchy>Parent	Selects all ancestors
Choose Select by Hierarchy>Children	Selects all offspring

Appendix A: Before Calling Tech Support

A.0 Introduction

We receive many, many calls during the course of the day. Some people have questions about making EIAS work. But many of the calls we receive deal with customers' ability to diagnose system problems. Often, the only thing Technical Support can do is walk you through some basic Trouble-shooting methods. This is the process of elimination that you should learn if you are going to have any success using a computer loaded with the power of 3D software. (You could also call it the “scientific method”.) This information is vital to successfully use EIAS.

Do Not Wait Until the Last Minute

This is a very common scenario: A customer is on a deadline. He or she has a problem using the product, and spends hours upon hours of valuable (billable) time trying to figure what's wrong. Then, at the last minute, the customer calls us with this problem that needs to be solved because the deadline is fast approaching.

This is a case where Tech Support personnel would rather have you call them earlier than later. Many times the problem can be resolved quicker because we tend to know where the problems already are located and might be able to point you at a solution that you may have missed or a work around that we may have already posted.

Unexpected Behavior: Bug or Feature?

Have you ever attempted to use a feature you were unfamiliar with and didn't know how to use? Perhaps you had an opinion about how a feature should operate? But for some reason, this feature doesn't work like you envisioned? In this case, it's probably best to just call us and we'll do our best to tell you if what you are experiencing is a bug or a feature.

A.1 Crashing, Freezing, and/or Error Messages?

The information in this section applies to the Macintosh version of ElectricImage EIAS only.

If you experience any crashing, freezes or error messages which prevent program operation, we need *you* to help us to help you, and take steps to find out what the problem is before you call Tech Support. Please follow the suggestions outlined in the following sections, and call us with your results.

Zap P-RAM

Zapping the P-RAM clears system parameter memory. System parameter memory is used by the Macintosh to set overall operational parameters. Zapping P-RAM will cause you to reset certain system settings, such as mouse speed.

How do I do this properly? Just restart your computer, and immediately hold down the following keys: Command - Option - P - R. Keep holding until the machine makes the restart noise another 3 times.)

Rebuild the Desktop

Rebuilding the desktop cleans up the Finder directory of files and Icons (similar to the Windows Registry.) Sometimes, newer versions of the operating system will do this automatically.

How do I do this properly? Just restart your computer, and immediately hold down the following keys: Command - Option. Keep holding until the machine asks you if you want to rebuild the desktop for your Hard Drive. At this time you can release the keys, and click OK in the dialog window.

Note Often, this process is best done directly after zapping P-RAM. When finished zapping P-RAM, just hold down the Command - Option keys as normal.

Run Norton Utilities Disk Doctor

Norton Utilities Disk Doctor is a utility program offered by Symantec that cleans up disk errors and miscellaneous b-tree errors. See the documentation that comes with Norton. Use the latest version please.

Restart with Minimal Extensions

Extensions are small utility programs which add functionality to the operating system. Extensions can from Apple, or third parties. Sometimes, these extensions can interfere with the normal operation of the EIAS applications. If you are running into difficulty operating the software, it is a good idea to reduce the amount of extensions that you are running to an absolute minimum.

The Extension Manager will let you create different sets of extensions to use for just this purpose. When reducing your extensions, make sure that you include the following extensions, as the EIAS applications require these extensions to operate properly:

- Carbon Lib 1.1.1 or greater
- Open GL 1.1 or greater
- Quickdraw 3D extensions (all)
- QuickTime 3.0 or greater
- QuickTime PowerPlug
- USB extension (if your Mac has a USB port)

Hardware Keys

ElectricImage EIAS supports two different types of hardware keys on the Macintosh: one for the older ADB bus, and one for the newer USB bus. EIAS prefers the newer USB bus, as it is more reliable and faster than the older ABD bus. If you decide to upgrade to a newer Macintosh that uses the USB bus, call the sales department to order an upgrade key.

Many customers end up collecting a rather large amount of hardware keys. This can sometimes cause problems with program operation. When this occurs, run only with the ElectricImage EIAS hardware key.

If you think you may have a malfunctioning hardware key, here is a test to determine if that is indeed the case. Before we begin the test, run through the procedures listed in section the section entitled “Crashing, Freezing, and/or Error Messages?” on page 932. You may find that one of those procedures may work for you. If that is not the case, proceed with the following:

- Make an alias of EIAS Animator and put it in the “Startup Items” folder in your “System” folder.
- Shutdown your computer.

- Remove everything from your USB bus except for the EIAS hardware key.
- Boot up your computer

If EIAS Animator launches, then the hardware key is not the problem. You should try some of the other isolation techniques listed in these pages. If EIAS Animator does NOT launch, you likely have a dead hardware key and should contact us immediately.

A.2 Hard Disk Drivers

ElectricImage EIAS makes extensive use of disk drives, especially for long animations. EIAS can create and copy very large files, which can sometimes cause difficulties when the disk drives are in less than top form. It is imperative that your disk drives are functioning normally.

The primary issue for disk drives is to make certain that the drivers you are using are compatible with your system software. To determine this, find the program “Drive Setup” on your System Disk, and update Drivers just to make certain. Be sure to read any warnings regarding drivers vs. operating system compatibility before changing any drivers. Normally, current drivers are available from the manufacturers’ websites.

A.3 Viruses

Viruses are programs designed to invade and attack your computer. Viruses can sometimes be benign, more of a prank than anything, but often they are malicious, and designed to destroy. If you notice that EIAS or other programs that you are using are not working properly, check your system for viruses, trojan horses, etc. Most commercial virus checking programs should handle this just fine. Make sure you have the latest version of the program, and that it is compatible with your operating system version.

A.4 Corrupted Project Files

If you think that a feature is not working correctly, it's time to create a New file and try the feature with the barest of circumstances. Let’s look at the following example to see how to do that:

Let’s say that you have just added a new object file to that project that you have been working on for the past three days. Suddenly, the program will not let you add a texture map to that object. Instead of panicking, attempt to determine why you are having the problem.

Create a new project with an Uber Shape and apply your texture there. If the texture can be added to the uberShape object, then chances are you may just be experiencing user error. In this case, you should go back to the Materials and Textures section in the EIAS Animator documentation, and review the process of adding a texture map to an object. If that doesn’t work, here are a few more things to think about:

- Check to see that something else is not setup properly and is perhaps affecting this feature
- Be sure that you are accurately mimicking the setup that your problem project has.
- Your project may have become corrupted

This is over-simplifying the case, but the point is to make your new project as simple as possible and isolate the feature from all the other things going on in your real work project. This will help you (and us) to determine where the problem actually lies.

Corrupt projects don't happen often, but they can happen. There are too many outside factors on modern computers to completely guard against such hazards. Here are some suggestions to help prevent projects from becoming corrupted.

- Save project files frequently
- Backup model files and texture maps
- Backup project files at least once a day (or more, if your system seems unstable)
- Make sure that your disk drives are in good working order
- Make sure that you operating system is stable
- Don't use extensions that you don't need

If a project ever becomes corrupted, there is little that can be done to restore it. Therefore, it is imperative that you follow the guidelines set forth in this document, and keep your computer in good working order.

A.5 Missing "Resources"?

EIAS applications use resources which enable the program to function. These resources are kept in folders called "EI Resources" for EIAS Animator. Inside, there will be files called "EIASKey" which is required, and should remain inside those folders. The "EI Resources" folder should reside inside the same folder that contains the "EIAS Animator" application.

A.6 When All Else Fails

Should all of the previous actions fail to return your program to normal operation, try these last few recommendations (in order!):

- Delete the preference files for EIAS Animator. This file is located in System: Preferences.
- Re-install EIAS
- Install EIAS on a different computer

Create a Minimized Project

One of the best ways to diagnose a problem is to create a minimized project that exhibits the problem behavior. There are two good ways to create a minimized project:

- Create a duplicate of the problem project, and remove items one at a time until you have isolated the offending element
- Create a duplicate project and turn off items one at a time, and note any differences in the results that you are getting

Once you have isolated the element which causes the problem, send us your project. We can go over it with you to determine a work around, or to log the problem as a bug so that it can be fixed in a follow-up version.

Some Tips on Creating that Minimized Project

Once you have created a duplicate of the project, remove any items that don't have any bearing on your problem. Turn off that big model with the 100MB texture map. Does the problem occur? If **yes**, then you can delete that model from your project. If **no**, then leave it in. Repeat this process until you get your project down to the barest of circumstances that make the problem occur. Continue with the following procedure:

1. Once you have the problem isolated, Save the project.
2. Choose **File>Collect Files** from the main menu bar and save your project, support models and textures to a unique folder location sepa-

rate from the project files you have in progress.

This is the best way of placing your support files with the project and quickly sending them to us. Now you are ready to compress the files to e-mail.

A.7 Send Us Your Project When We Request It

Be prepared to send us a project which exhibits the problem that you are experiencing. if you are involved in a production and cannot send us work product, make sure to send us a duplicate project which does not fall under that restriction. If you cannot, we can sign the appropriate NDAs to protect your work. Regardless, we cannot fix what we cannot see, so please, when we request you to send in your project, please do so promptly. We can only help you if you let us do so.

Prepping Your Files

Whatever you use for file compression, please make it a self-extracting archive, if possible. We may not have the application that will read your compressed file. And even if we do, we may not have the latest version.

After making the self extracting archive, you should also BinHex your file, which is a process that converts your file to a binary file. This makes your file much less susceptible to corruption as it travels across the internet via e-mail. BinHex utilities (shareware and freeware) are available at many sites on the internet. Also, popular products like “Stuffit Deluxe” come with binhex translators.

Now, attach the compressed, and BinHexed file to your e-mail and send it to us at: Support@ElectricImage.com or the e-mail address we give to you on the phone.

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