

The ElectricImage™ Version 2.5 *Supplement*

A guide to the new features of the
ElectricImage™ Animation System
Version 2.5

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Chapter 1 Introduction

This supplement to the ElectricImage™ Animation System program documentation covers the enhanced and new features of Version 2.5.

These features include:

- Inverse Kinematics

ElectricImage Version 2.5 offers selectable application of inverse kinematics in animating hierarchically linked groups. With inverse kinematics, life-like movement can be achieved more easily—as a group's position and orientation change, the other groups in the model move as they would in real life. This feature is especially useful for animating human figures. This feature is discussed in *Chapter 2: Inverse Kinematics*.

- Effectors

An effector is an invisible object to which other objects can be linked. Operations given the effector will then be performed on the linked objects. This feature is useful for creating shortcuts in imparting certain types of motion to objects without having to directly animate the objects. This feature is discussed in *Chapter 3: Effectors*.

- New lighting effects:
 - *Shadow Darkness* provides control over the darkness or density of shadows cast by lights—from opaque (full shadow) to transparent (no shadow).
 - *Light Rays* (volume shadows) create natural shafts of light when applied to a glow or fog effect on a spotlight.
 - *Smoke* adds noise patterns to light rays, simulating smoke within the cone of the spotlight.
 - *Lens Flare Obscuration* renders more realistic flare transitions as an object moves to obscure the lightsource.

These features are discussed in *Chapter 4: Lighting Effects*.

- Enhanced anti-aliasing:

Separate controls have been added for Anti-Alias Level and Sampling Level.

- Anti-Alias Level can be set in the range of 4 x 4 to 64 x 64.
- Sampling Level can be set in the range of 1 x 1 to 64 x 64.

You can also specify an independent Sampling Level for each group. These features are discussed in *Chapter 5: Anti-Aliasing*.

- New Image file rendering and display options:
 - Image files can now be displayed within ElectricImage by using the File menu's Display command.
 - The view in the Camera View window can now be previewed fully rendered, within ElectricImage.
 - The location in which images are displayed, after being rendered by the Camera application, can now be selected and set as a preference.

These features are discussed in *Chapter 6: Image Display Features*.

- New data cell fill techniques, collectively known as "Vibe:"
 - *Randomize* adds random numbers to selected data cells.
 - *Spring* impresses a complex waveform on selected data cells.
 - *Jolt* impresses an impulse across a range of selected data cells.

These features are discussed in *Chapter 7: Vibe*.

- Two new plug-ins:
 - *Dicer* divides groups into smaller polygons to produce better results when applying deformations.
 - *Mr. Blobby* forms spheres, or blobs, out of the groups that are linked to it.

These features are discussed in *Chapter 8: Plug-Ins*.

- Control of input and output gamma.

This feature is discussed in *Chapter 9: Gamma Control*.

- A new Select menu replacing the Model List menu.

The commands in the Select menu allow you to select objects in the World View and Project windows. They include:

- The previous Model List menu commands
- The *All*, *Find*, and *Find Again* commands that were previously under the Edit menu
- Several new commands

These features are discussed in *Chapter 10: The Select Menu*.

- A new value modification system:

A simple system has been implemented in ElectricImage Version 2.5 to allow relative and percentage changes to be entered into the Project window cells, and into the edit boxes of most modal and non-modal windows. This feature is discussed in *Chapter 6: Value Modification System*.

- Multi-frame model export:

This feature works in the same manner as the File menu's *Save Model* command, except that a range of frames can be specified, producing multiple versions of the model, with each version identified by the frame number from which it was exported. This feature is discussed in *Chapter 12: Multi-Frame Model Export*.

- Image file to OMFI format conversion

This standalone application converts Image stills and animations into Avid Technology's Open Media Framework Interchange format. This feature is discussed in *Chapter 13: ImageOMFI*.

- **Renderama™**

Renderama™ is a rendering distribution application that can be used to schedule batch rendering on a single computer, as well as to distribute rendering jobs among many networked computers. Jobs can be distributed across AppleTalk and TCP/IP local area networks as well as across TCP/IP wide area networks such as the global Internet. Additionally, Renderama can distribute rendering jobs transparently among multiple computer platforms including Macintosh and UNIX-based computers. This feature is discussed in *Chapter 14: Renderama™*.

Chapter 2 Inverse Kinematics

ElectricImage offers selectable application of inverse kinematics in animating hierarchically linked groups. With inverse kinematics, life-like movement can be achieved more easily—as a group’s position and orientation change, the other groups in the model move as they would in real life. This feature is especially useful for animating human figures.

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Using Inverse Kinematics in ElectricImage

In ElectricImage, using Inverse Kinematics (or IK) is basically a three-step process:

1. Setting up the hierarchy of parents and children.

This is done using the basic Link and Unlink tools to create the parent/child hierarchy. IK works on “chains” of linked groups.

IK works with any kind of hierarchy you assign. You are not restricted to working with a single linear chain—you can manipulate branches and multiple chains as well.

2. Configuring joint types, centers of rotation and movement constraints for objects in the chain.

This is done using the Group Link window, which has been expanded to accommodate additional controls for IK.

3. Dragging the chain into poses.

This is done with the IK tool, which is accessible from both the Tool palette and the Tools menu.

There are also preferences for controlling how ElectricImage applies IK. These preferences can be permanently set from the Edit menu and also be changed “on the fly” from the Kinematics palette.

Linking Groups for Inverse Kinematics

The first step in using IK involves linking the groups within a model into a hierarchy. Groups are linked and unlinked with the Link and Unlink tools, respectively, which are discussed in *Chapter 8: The Project Window* and in *Chapter 15: The Group Link Window*.

A model's hierarchy can contain multiple “chains” and “branches,” as shown in Figure 2.1. In this example there are five chains and two branches. A branch is a group that has more than one child.

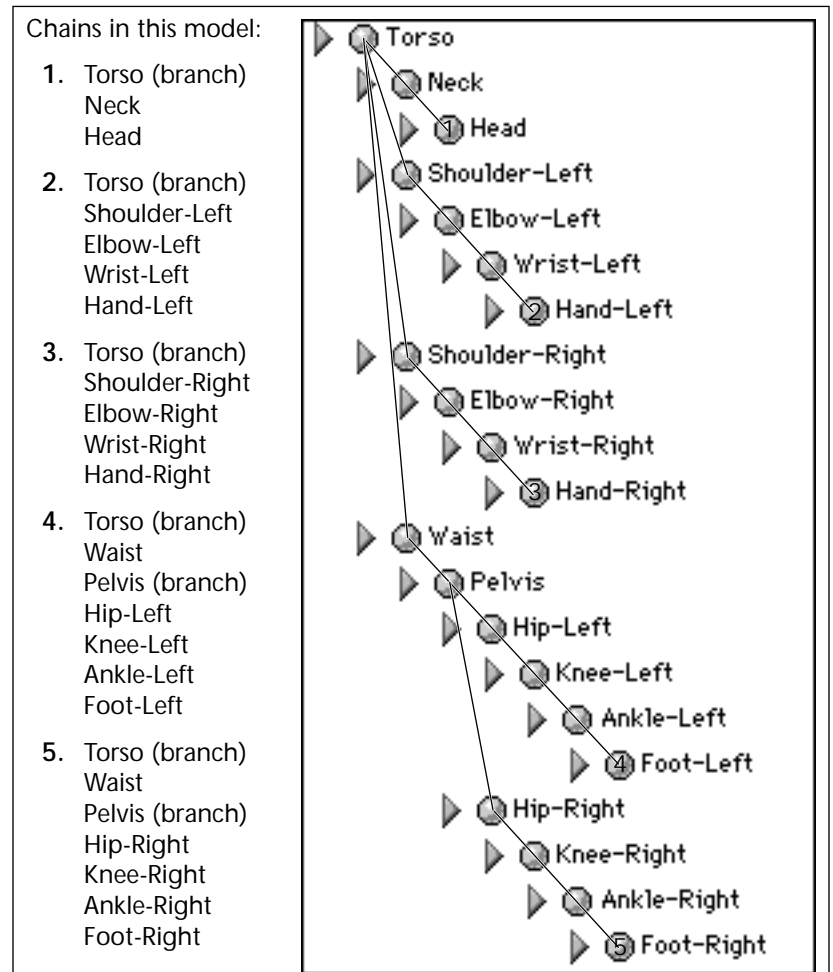


Figure 2.1 Example of chains and branches in a hierarchy

Configuring Groups for Inverse Kinematics

In order to control how IK moves an individual group within a chain, you need to establish the group's joint position (or pivot point), link type and movement constraints (if any). This is done in the Group Link window.

The Group Link window, as shown in Figure 2.2, has been expanded to contain controls for IK (on the right side of the window).

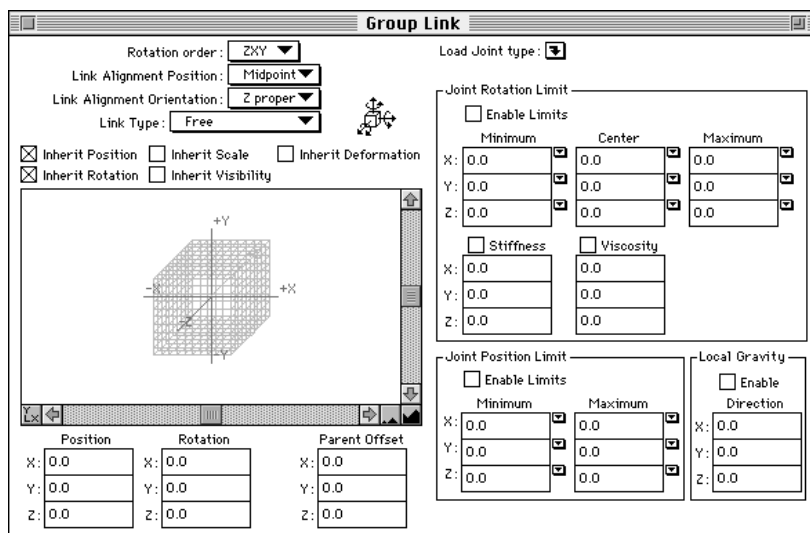


Figure 2.2 Group Link window

You can collapse the window to hide the controls on the right side by clicking the zoom box in the top right corner of the window.

Setting the Joint Position

In order for IK to be correctly applied, the joint position (or pivot point) of each group must be set correctly. The joint position is set by using either the Link Alignment Position pop-up menu or by interactively dragging the gnome, both of which are discussed in *Chapter 15: The Group Link Window*.

In Figure 2.3, a simplified leg model is shown before and after each group's joint position is correctly set.

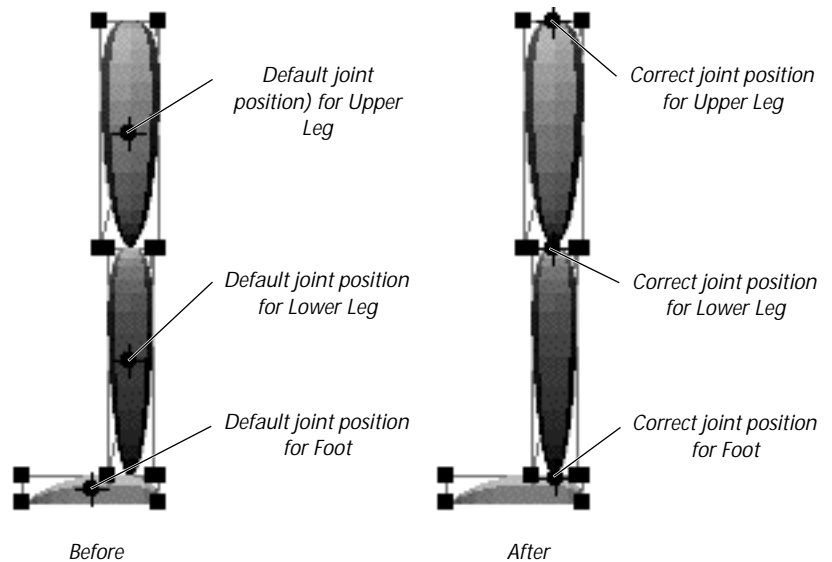


Figure 2.3 Before and after views of joint positions

In this example, the upper leg will pivot at its top, where it would be attached to the pelvis; the lower leg will pivot at its top, which functions as the knee joint; and the foot will pivot at a point where the ankle joint would be.



After setting the position of the joint for a group, check in the Group Info window to make sure that the X, Y and Z values for the group's center are 0, 0, and 0.



Setting the Link Type

After setting the position of the group's pivot point, you'll need to set the link type and any limits on its movement. There are two ways to assign a link type:

- Choose a link type from the Link Type pop-up menu in the left side of the Group Link window. Link Types are discussed in *Chapter 15: The Group Link Window*.
- Choose a pre-configured joint type from the Load Joint Type pop-up menu in the right side of the Group Link window.



ElectricImage supplies a library of pre-configured joint types for joints in the human body, complete with limit values. You can create your own joint types and libraries of joint types by saving the values you enter (an option in the Load Joint Type pop-up menu).

The Load Joint Type pop-up menu is described in the section “Using Joint Libraries” (page 2-12).



Setting Joint Limits

More precise control of the joint is handled by the controls in the right side of the Group Link window, as shown in Figure 2.4.

Load Joint type:

Joint Rotation Limit

☐ Enable Limits

	Minimum	Center	Maximum
X:	0.0	0.0	0.0
Y:	0.0	0.0	0.0
Z:	0.0	0.0	0.0

☐ Stiffness ☐ Viscosity

X:	0.0	0.0
Y:	0.0	0.0
Z:	0.0	0.0

Joint Position Limit

☐ Enable Limits

	Minimum	Maximum
X:	0.0	0.0
Y:	0.0	0.0
Z:	0.0	0.0

Gravity

☐ Enable Direction

X:	0.0
Y:	0.0
Z:	0.0

Figure 2.4 Right side of Group Link window

Joint Rotation Limit

These controls are used to apply constraints or limits on the group's ability to rotate. The pop-up menu next to each edit box can be used to load the current value rather than enter a number.

Enable Limits

This check box option, when enabled, places limits on the group's rotation as specified in the edit boxes below. To allow unrestricted rotation, disable this check box.

Minimum

These edit boxes contain values in degrees for the minimum angle of rotation allowed for the joint.

Center

These edit boxes contain values in degrees for the angles at which the joint wants to be naturally positioned (at rest).

Maximum

These edit boxes contain values in degrees for the maximum angles of rotation allowed for the joint.

Stiffness

These edit boxes contain values that modify the strength of the pull to maintain the angles specified in the Center edit boxes. The higher the value, the more difficult it is to rotate the joint. Stiffness is enabled by checking the Stiffness check box.

Viscosity

These edit boxes contain values that affect the joint's ease or fluidity of rotation. The higher the value, the more viscous-like the joint's movement. Viscosity is enabled by checking the Viscosity check box.

Joint Position Limit

These controls are used to apply constraints or limits on the group's ability to move relative to its parent. The pop-up menu next to each edit box can be used to load the current value rather than enter a number.

Enable Limits

This check box option, when enabled, places limits on the joint's movement as specified in the edit boxes below. To allow unrestricted movement, disable this check box.

Minimum

These edit boxes contain values that indicate the minimum distance the joint can move relative to the group's parent.

Maximum

These edit boxes contain values that indicate the maximum distance the joint can move relative to the group's parent.

Local Gravity

These controls are used to override the global gravity setting found in the IK Preferences dialog box, discussed in the section "Setting Kinematics Preferences" (page 2-26).

Enable

This check box option, when enabled, causes the values in the Direction edit boxes to override the global gravity settings.

Direction

These edit boxes contain values that give direction to the group's local gravity. A positive value causes gravity to effect the group in the positive direction along the specific axis. A negative value causes gravity to effect the group in the negative direction. The higher the value (positive or negative), the stronger the gravitation.



Gravity only affects how the group moves while the model is being dragged in IK mode, which is discussed in the section "Applying Inverse Kinematics" (page 2-15).



Using Joint Libraries

Joint libraries provide a means of organizing and using pre-configured joint types. Joint libraries are accessed and used with the Load Joint Type pop-up menu, as shown in Figure 2.5.

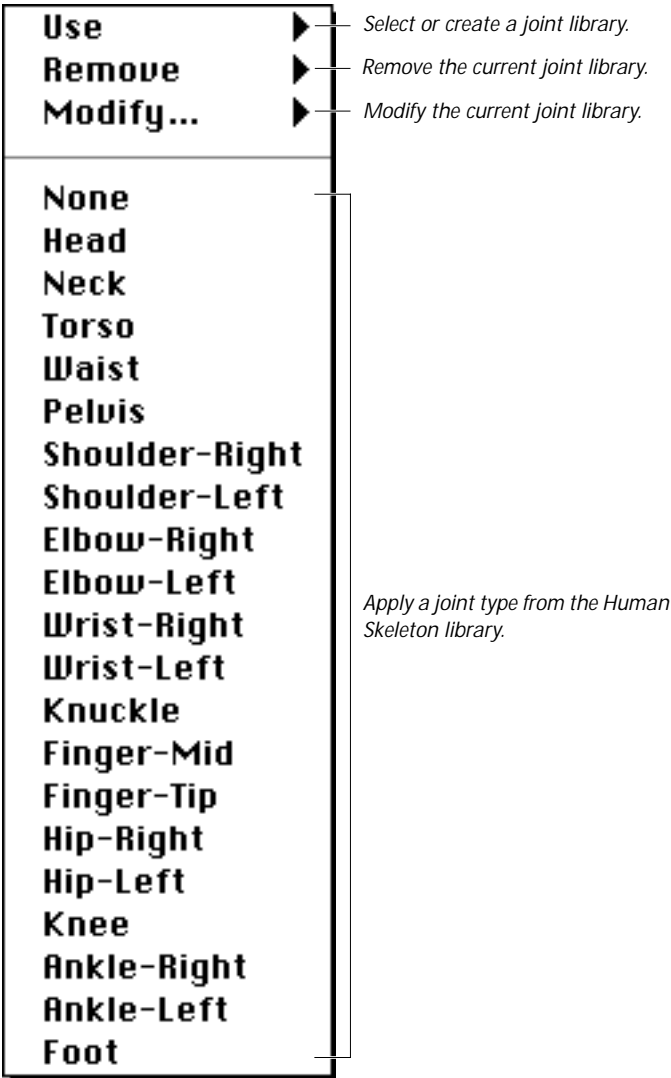


Figure 2.5 Load Joint Type pop-up menu

Libraries of joint types can be created, saved and modified using the Load Joint Type pop-up menu. The menu's commands are:

- Use This command allows you to select a pre-configured library of joint types or create a new library for the program. Choosing this command expands the menu to display a list of existing libraries, along with an option to create a new library.

If you choose New, a dialog box as shown in Figure 2.6 opens for you to name the new library.

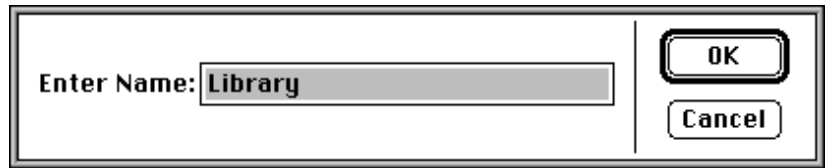


Figure 2.6 Dialog box used to create a new library

You can then add joint types to the library by using the Modify command, as discussed in the section “Modify” (page 2-14).

- Remove This command allows you to remove a library of pre-configured joint types from the program. Choosing this command expands the menu to display a list of existing libraries.



Once you remove a library with this command, it is permanently removed (erased from the disk) and cannot be used again. If the Human Skeleton library supplied with ElectricImage is removed and you wish to use it again, you must reinstall it from the ElectricImage installation diskettes.



Modify This command allows you to modify a joint type library by adding joint types, removing joint types, and updating joint types to the current settings. Choosing this command expands the menu to display a list of existing libraries.

When you choose a library from the list, a dialog box, similar to that shown in Figure 2.7, opens for you to select a joint type from the library to modify.

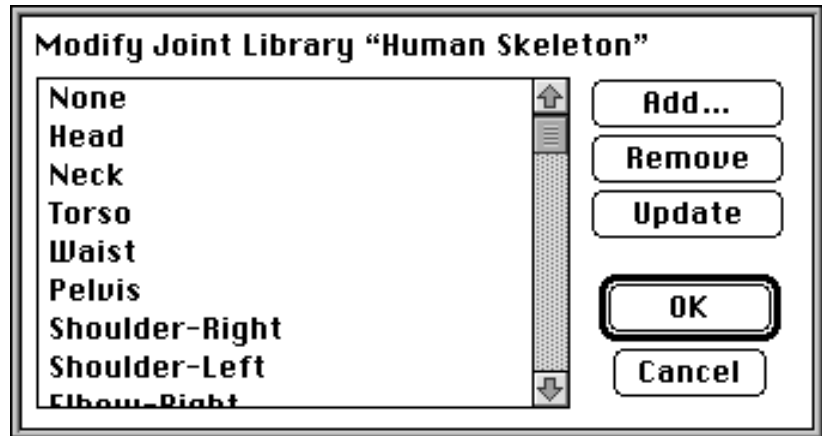


Figure 2.7 Dialog box used to modify a joint type

- To add a new joint type to the library using the current settings, click the **Add...** button. A dialog box opens for you to name the joint type.
- To remove a joint type from the library, click on the name of the joint type and then click the **Remove** button.
- To update a joint type in the library using the current settings, click on the name of the joint type and then click the **Update** button.

Applying Inverse Kinematics

IK is applied interactively—that is, by clicking and dragging. When used this way, the program is said to be in “IK mode.” To work in IK mode, you must choose the Inverse Kinematics tool and use it instead of the default Move tool.

Choosing the Inverse Kinematics Tool

The Inverse Kinematics tool is available from either the Tool Palette or the Tools menu. The Tool Palette button is shown in Figure 2.8.



Figure 2.8 Default Inverse Kinematics tool

When the Inverse Kinematics tool is selected, the cursor changes from the standard arrow icon to the one shown in Figure 2.9.



Figure 2.9 Cursor icon in IK mode

Movement with the Inverse Kinematics tool can be in all directions, or constrained vertically, horizontally or diagonally. Clicking on the Inverse Kinematics tool in the Tool Palette and pressing the Tab key cycles through these options, changing the appearance of the tool as shown in Figure 2.10.



*Move in all
directions*



*Move
horizontally*



*Move
vertically*



*Move
diagonally*

Figure 2.10 IK tool options

Using the Inverse Kinematics Tool to Pose a Model

When the IK tool is highlighted in the Tool palette, you are in IK mode and inverse kinematics will be applied when you drag a group that is hierarchically linked to other groups. What happens when you drag the group is determined by:

- Which groups, if any, are selected when the IK tool is applied.
- The number of chains and branches in the model's hierarchy.
- The dragged group's position in the chain's hierarchy.
- The link and joint types of all groups in the hierarchy.
- The limits, if any, on the joints of each group in the hierarchy.
- The IK preference settings.

IK preferences are set by either an Edit menu command or the Kinematics palette, which contains a subset of the options available in the Edit menu command. Preferences are discussed in the section “Setting Kinematics Preferences” (page 2-26).

Figure 2.12, starting on the next page, shows examples of how IK mode selection works in various situations. Figure 2.11, below, contains a key to the elements in Figure 2.12.

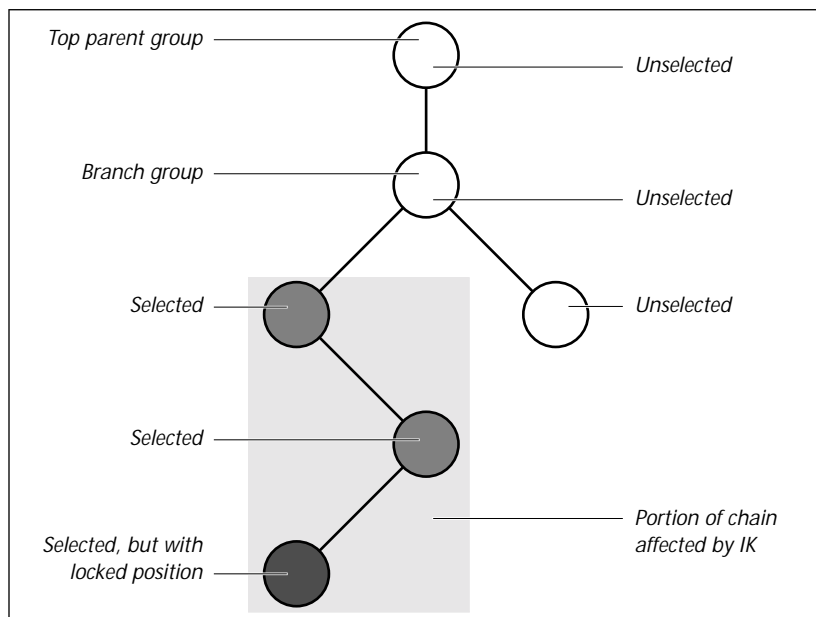


Figure 2.11 Key to elements used in Figure 2.12

Figure 2.12 How IK mode selection works

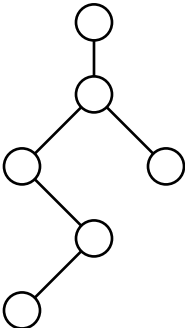
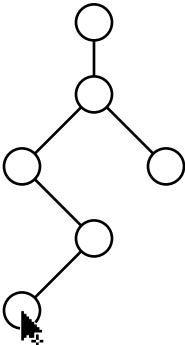
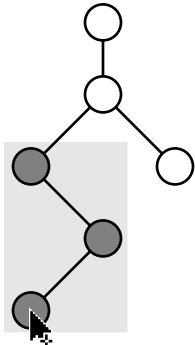
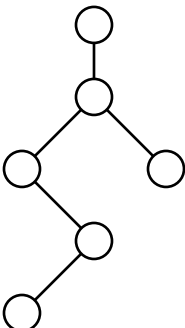
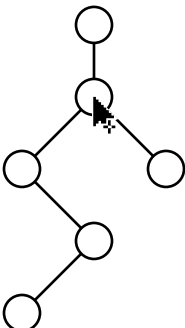
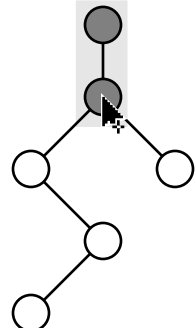
Condition	Action	Result
When no groups are pre-selected...		
<p data-bbox="201 331 479 386">If you start with no groups pre-selected...</p> 	<p data-bbox="562 331 909 386">And you click and drag the group shown below with the IK tool...</p> 	<p data-bbox="972 331 1293 444">IK mode will select the groups as shown below and affect the selected groups in the highlighted chain.</p> 
<p data-bbox="201 855 479 911">If you start with no groups pre-selected...</p> 	<p data-bbox="562 855 909 911">And you click and drag the group shown below with the IK tool...</p> 	<p data-bbox="972 855 1293 969">IK mode will select the groups as shown below and affect the selected groups in the highlighted chain.</p> 

Figure 2.12 How IK mode selection works (continued)

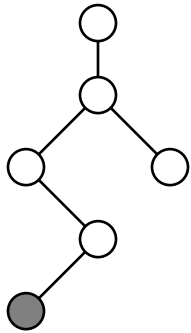
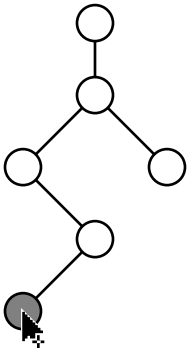
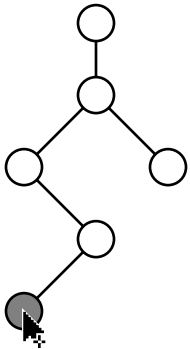
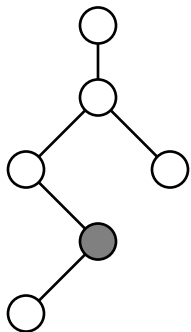
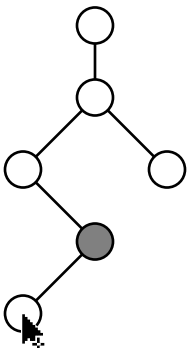
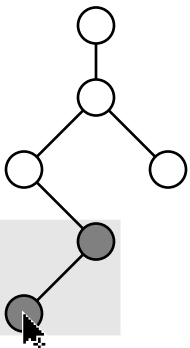
Condition	Action	Result
When groups in a single chain are pre-selected...		
<p>If you start with the group shown below pre-selected...</p> 	<p>And you click and drag the group shown below with the IK tool...</p> 	<p>IK mode will affect the selected group only (with default setting of phantom joint enabled).</p> 
<p>If you start with the group shown below pre-selected...</p> 	<p>And you click and drag the group shown below with the IK tool...</p> 	<p>IK mode will select the groups as shown below and affect the selected groups in the highlighted chain.</p> 

Figure 2.12 How IK mode selection works (continued)

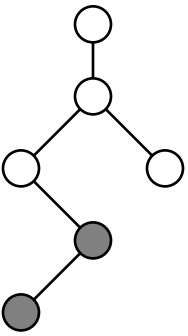
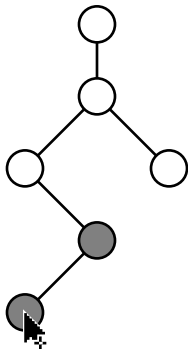
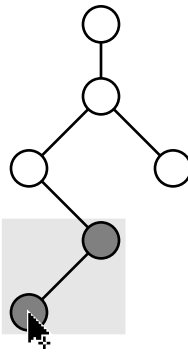
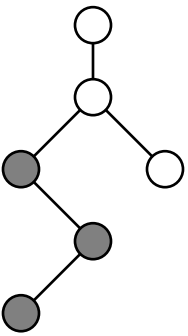
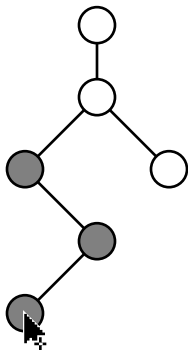
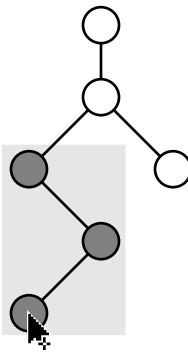
Condition	Action	Result
<p>If you start with the groups shown below pre-selected...</p> 	<p>And you click and drag the group shown below with the IK tool...</p> 	<p>IK mode will affect the selected groups in the highlighted chain.</p> 
<p>If you start with the groups shown below pre-selected...</p> 	<p>And you click and drag the group shown below with the IK tool...</p> 	<p>IK mode will affect the selected groups in the highlighted chain.</p> 

Figure 2.12 How IK mode selection works (continued)

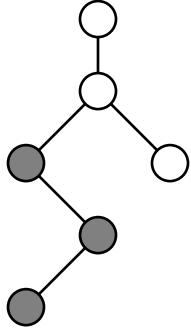
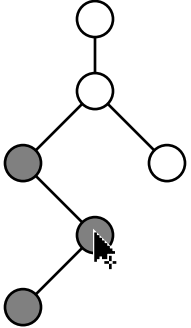
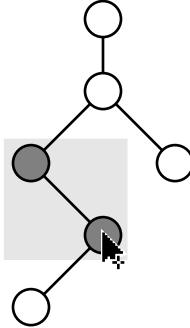
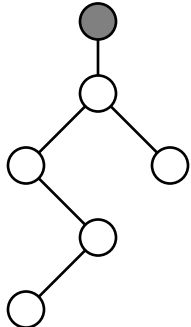
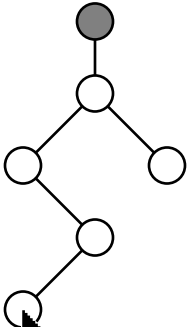
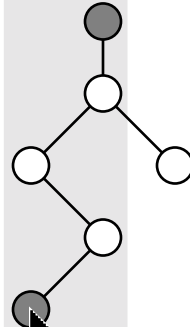
Condition	Action	Result
<p>If you start with the groups shown below pre-selected...</p> 	<p>And you click and drag the group shown below with the IK tool...</p> 	<p>IK mode will deselect the group as shown below and affect the selected groups in the highlighted chain.</p> 
<p>If you start with the group shown below pre-selected...</p> 	<p>And you click and drag the group shown below with the IK tool...</p> 	<p>IK mode will select the groups as shown below and affect the selected groups in the highlighted chain.</p> 

Figure 2.12 How IK mode selection works (continued)

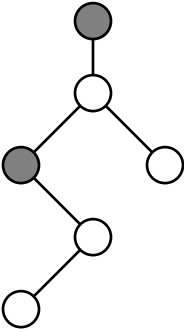
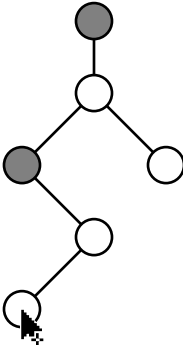
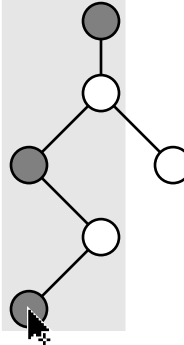
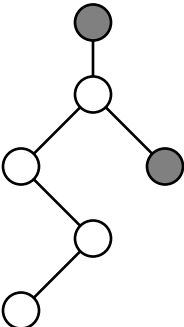
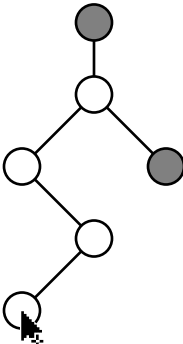
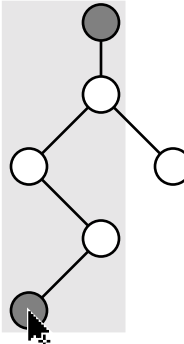
Condition	Action	Result
<p>If you start with the groups shown below pre-selected...</p> 	<p>And you click and drag the group shown below with the IK tool...</p> 	<p>IK mode will select the groups as shown below and affect the selected groups in the highlighted chain.</p> 
<p>If you start with the groups shown below pre-selected...</p> 	<p>And you click and drag the group shown below with the IK tool...</p> 	<p>IK mode will select and deselect the groups as shown below and affect the selected groups in the highlighted chain.</p> 

Figure 2.12 How IK mode selection works (continued)

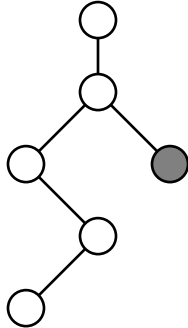
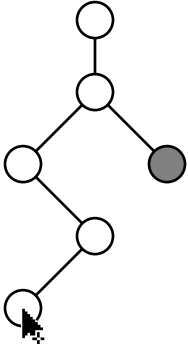
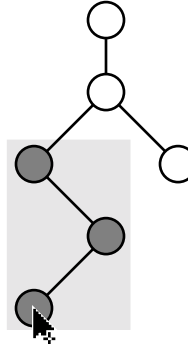
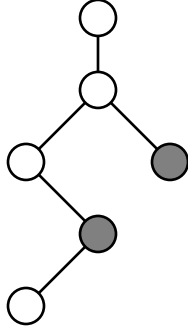
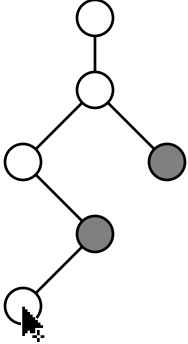
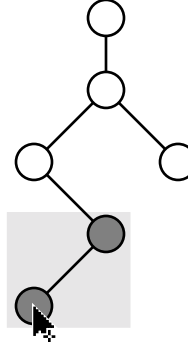
Condition	Action	Result
<p>If you start with the group shown below pre-selected...</p> 	<p>And you click and drag the group shown below with the IK tool...</p> 	<p>IK mode will select and deselect the groups as shown below and affect the selected groups in the highlighted chain.</p> 
When groups in multiple chains are pre-selected...		
<p>If you start with the groups shown below pre-selected...</p> 	<p>And you click and drag the group shown below with the IK tool...</p> 	<p>IK mode will select and deselect the groups as shown below and affect the selected groups in the highlighted chain.</p> 

Figure 2.12 How IK mode selection works (continued)

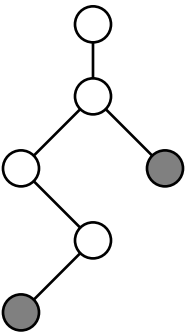
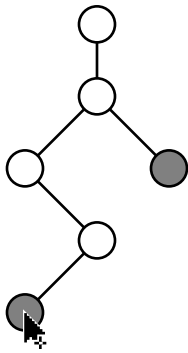
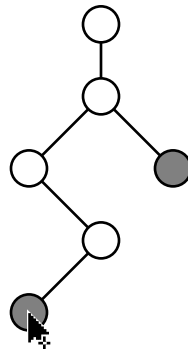
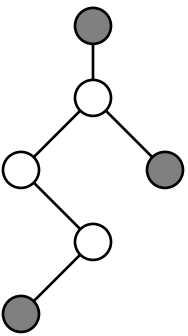
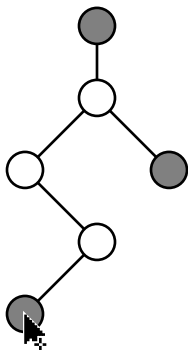
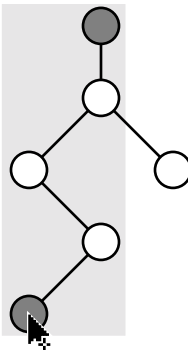
Condition	Action	Result
<p>If you start with the groups shown below pre-selected...</p> 	<p>And you click and drag the group shown below with the IK tool...</p> 	<p>IK mode will not be implemented.</p> 
<p>If you start with the groups shown below pre-selected...</p> 	<p>And you click and drag the group shown below with the IK tool...</p> 	<p>IK mode will deselect the group as shown below and affect the selected groups in the highlighted chain.</p> 

Figure 2.12 How IK mode selection works (continued)

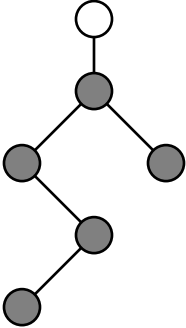
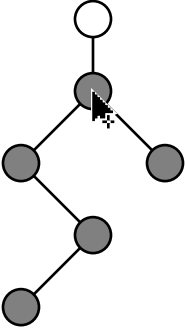
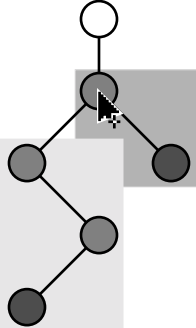
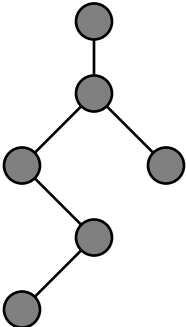
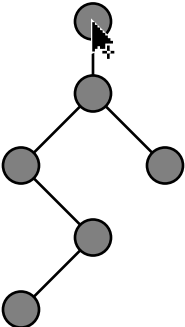
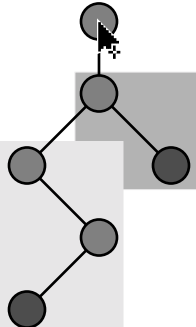
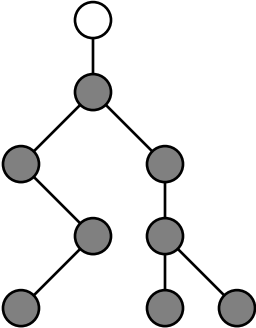
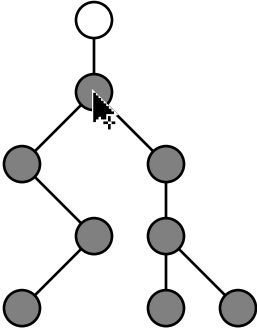
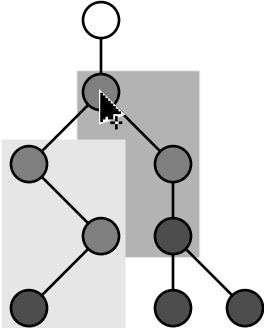
Condition	Action	Result
<p>If you start with the groups shown below pre-selected...</p> 	<p>And you click and drag the group shown below with the IK tool...</p> 	<p>IK mode will affect the selected groups in the highlighted chains (except that the lowest group in each chain is locked in position).</p> 
<p>If you start with the groups shown below pre-selected...</p> 	<p>And you click and drag the group shown below with the IK tool...</p> 	<p>IK mode will affect the selected groups in the highlighted chains (except that the lowest group in each chain is locked in position).</p> 

Figure 2.12 How IK mode selection works (continued)

Condition	Action	Result
<p>If you start with the groups shown below pre-selected...</p> 	<p>And you click and drag the group shown below with the IK tool...</p> 	<p>IK mode will affect the selected groups in the highlighted chains (except that the lowest group in each chain is locked in position).</p> 

Accepting a Solution

While holding down the mouse button and dragging a group, the program will compute solutions for the position and rotation of all affected groups in the chain. IK preference settings, discussed in the section “Setting Kinematics Preferences” (page 2-26), can instruct the program to find an exact solution and also specify the maximum amount of time the program can take to find the exact position. If an exact solution cannot be determined in that amount of time, whatever solution has been derived at that point will be used.

While the program is processing, the cursor icon changes to the one shown in Figure 2.13.



Figure 2.13 Cursor icon in IK mode during processing

You can release the mouse button while the program is processing to accept the current solution, or wait until a more exact solution is presented.

Setting Kinematics Preferences

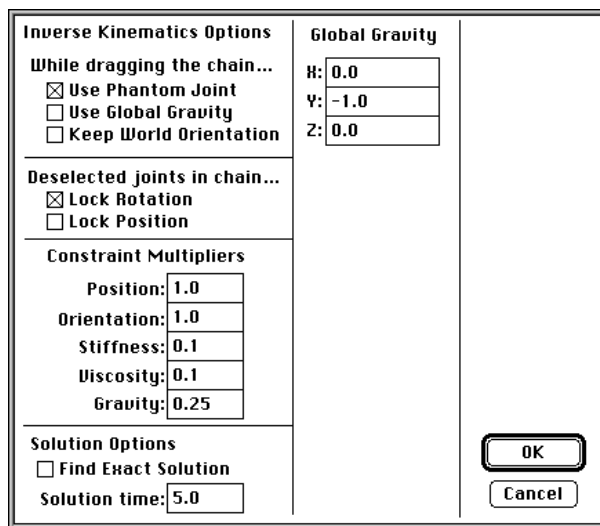
Preferences for how Inverse Kinematics is applied can either be set as defaults for continuous usage or “on the fly” through the use of the Kinematics palette (page 2-29).

The Kinematics... Command

To set default preferences for Inverse Kinematics:

1. Choose **Kinematics...** from the Edit menu.

A dialog box, as shown in Figure 2.14 below, opens.



The dialog box is titled "Kinematics Preferences" and is divided into several sections. On the left, under "Inverse Kinematics Options", there are three checkboxes: "While dragging the chain..." (checked), "Use Phantom Joint" (checked), "Use Global Gravity" (unchecked), and "Keep World Orientation" (unchecked). Below this is "Deselected joints in chain..." with "Lock Rotation" (checked) and "Lock Position" (unchecked). The "Constraint Multipliers" section has five input fields: Position (1.0), Orientation (1.0), Stiffness (0.1), Viscosity (0.1), and Gravity (0.25). The "Solution Options" section has "Find Exact Solution" (unchecked) and "Solution time:" (5.0). On the right, under "Global Gravity", there are three input fields: H (0.0), Y (-1.0), and Z (0.0). At the bottom right are "OK" and "Cancel" buttons.

Figure 2.14 Kinematics Preferences dialog box

2. Use the controls to set your preferences. For an explanation of these controls, see the section “Kinematics Preferences” (page 2-27).
3. To save the preferences, click **OK** or press **Return**.

To reset the system's default preferences at any time, choose Default Preferences from the Edit menu.

Kinematics Preferences

Inverse Kinematics Options

While dragging the chain...

The following three check box options control what happens to groups being dragged when a chain of groups is dragged. These check boxes are duplicated on the Kinematics palette for setting preferences “on the fly.”

- **Use Phantom Joint**

This check box option, when enabled, allows rotation of a child relative to its parent. If disabled, the child will not rotate.

- **Use Global Gravity**

This check box option, when enabled, turns on global gravity, the values for which are set in the Global Gravity edit boxes (page 2-28).

- **Keep World Orientation**

This check box option, when enabled, locks the rotation of groups in the chain in global space.

Deselected joints in chain...

The following two check box options control the movement of groups in a chain that have been deselected (while the remaining groups in the chain remain selected). These check boxes are duplicated on the Kinematics palette for setting “on the fly.”

- **Lock Rotation**

This check box option, when enabled, causes stiffness by preventing the deselected group(s) from rotating.

- **Lock Position**

This check box option, when enabled, attempts to prevent a change of position of the deselected group(s). At a certain point, however, pulling on the chain will yank the group free because the group may have to change its position in order to maintain its place in the chain.

Solution Options

These controls affect how the program determines a solution for the position and rotation of all elements in a chain. For information on how the cursor is affected during processing, see the section “Accepting a Solution” (page 2-25).

Find Exact Solution

This check box option, if enabled, requires the program to find the exact solution. If disabled, the temporary solution used at the point when you release the mouse button is applied.

Solution time

This edit box contains a value in seconds that sets a limit on the amount of time the program can use to arrive at a solution.

Constraint Multipliers

These edit boxes contain values that establish the relative importance of Position, Orientation, Stiffness, Viscosity and Gravity when applying IK. The higher the value for an attribute, the greater importance is placed on that attribute.

The best way to use these controls is to observe their effects. If, for example, you want more viscosity in a group’s movement, increase the value for viscosity.

Global Gravity

These edit boxes contain values for the X, Y and Z direction of gravity to be applied to groups in a chain. Normal earth gravity would be zero for the X and Z axes and a negative value for the Y axis.



Gravity only affects how the group moves while the model is being dragged in IK mode, which is discussed in the section “Applying Inverse Kinematics” (page 2-15).



The Kinematics Palette

The Kinematics Palette, shown in Figure 2.15, is a floating palette that contains a subset of the controls from the Edit menu's **Kinematics...** command. It is used to change some of the IK preferences “on the fly.”



Figure 2.15 Kinematics Palette

The Kinematics palette is opened from the Windows menu.

While dragging
the chain...

The following three check box options control what happens when a chain of objects is dragged. These check boxes are duplicated on the Kinematics palette for setting preferences “on the fly.”

Use Phantom Joint

This check box option, when enabled, allows rotation of a child relative to its parent. If disabled, the child will not rotate.

Use Global Gravity

This check box option, when enabled, turns on global gravity, the values for which are set in the Global Gravity edit boxes.

Keep World Orientation

This check box option, when enabled, locks the rotation of objects in the chain in global space.

Deselected joints
in chain...

The following two check box options control the movement of objects in a chain that have been deselected (while the remaining objects in the chain remain selected). These check boxes are duplicated on the Kinematics palette for setting “on the fly.”

Lock Rotation

This check box option, when enabled, causes stiffness by attempting to prevent the deselected object(s) from rotating.

Lock Position

This check box option, when enabled, attempts to prevent a change of position of the deselected object(s). At a certain point, however, pulling on the chain will yank the object free because the object may have to change its position in order to maintain its place in the chain.

Chapter 3 Effectors

ElectricImage offers a special object class, called Effectors.

An effector is an invisible object to which other objects can be linked. Operations given the effector will then be performed on the linked objects.

This feature is useful for creating shortcuts in imparting certain types of motion to objects without having to directly animate the objects.

Contents

Adding Effectors.....	3-4
The Effector Info Window	3-5

Adding Effectors

To add an effector to a project:



1. Either choose **Add>** then **Effector...** from the File menu or click the Effector icon in the Object palette (as shown at left).

The cursor will change, as shown in Figure 3.1.



Figure 3.1 Cursor for adding an effector

2. Place the cursor in a World View window where you want to add the effector, and click.

The effector appears in the World View windows with an icon as shown in Figure 3.2.



Figure 3.2 Icon for an effector in the World View windows

The first effector added to a project is called “Effector 1.” Each successive effector is numbered in sequence.

3. When you are done adding effectors, select the **Move** tool from either the Tool palette or the Tools Menu.



Once an effector is added to a project, its position and rotation can be animated. You can also rename effectors in the same manner as renaming other objects (in the Project window).



The Effector Info Window

The Effector Info Window, as shown in Figure 3.3, is similar in use to the Group Info window.

Figure 3.3 Effector Info window

Style This pop-up menu offers a choice for how the effector is displayed in the World View windows. The choices are:

- **Cross** (the default)

This option causes the effector to be displayed as shown in Step 2 (page 3-4).

- **Box**

This option causes the effector to be displayed as a group would be displayed—that is, with a bounding box.

Show Bounding Box This check box option toggles the display of the bounding box around the effector (if **Box** is chosen from the **Style** pop-up menu and extent sizes are specified in the **Extent Size** edit boxes).

Extent Size These edit boxes contain values that control the size of the effector's bounding box (if **Box** is chosen from the **Style** pop-up menu). If **Box** is chosen and the extent size values are left at zero, the effector will be visible in the World View windows by only a small point.

Chapter 4 Lighting Effects

There are several new lighting effects available in ElectricImage Version 2.5:

- **Shadow Darkness** provides control over the darkness or density of shadows cast by lights—from opaque (full shadow) to transparent (no shadow).
- **Light Rays** (volume shadows) create natural shafts of light when applied to a glow or fog effect on a spotlight.
- **Smoke** adds noise patterns to light rays, simulating smoke within the cone of the spotlight.
- **Lens Flare Obscuration** renders more realistic flare transitions as an object moves to obscure the lightsource.

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Light Rays	4-3
Smoke	4-5
Lens Flare Obscuration.....	4-10

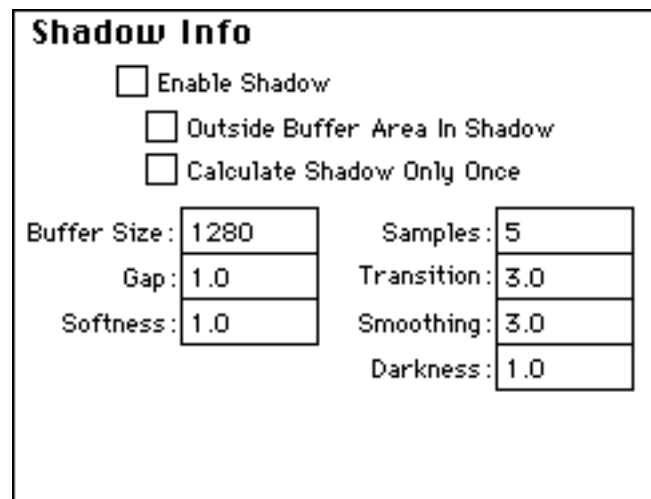
Shadow Darkness

Shadow Darkness provides control over the darkness or density of shadows cast by lights—from opaque (full shadow) to transparent (no shadow).

To control the darkness of shadows cast by a light:

1. Select the light and open the Light Info window.

The Darkness edit box is found in the Shadow Info section of the Light Info window, as shown below.



Shadow Info	
<input type="checkbox"/>	Enable Shadow
<input type="checkbox"/>	Outside Buffer Area In Shadow
<input type="checkbox"/>	Calculate Shadow Only Once
Buffer Size:	1280
Gap:	1.0
Softness:	1.0
Samples:	5
Transition:	3.0
Smoothing:	3.0
Darkness:	1.0

Figure 4.1 Shadow Info section of Light Info window

The shadow's Darkness value defaults to 1.0, which produces a dark (fully opaque) shadow.

2. To decrease the darkness of the shadow, enter a value between 0 and 1 in the **Darkness** edit box—the smaller the number, the lighter (or less dense) the shadow.

Light Rays

Light Rays (volume shadows) can be used to create natural shafts of light when applied to a glow or fog effect on a spotlight. They cause the cone of the spotlight to behave as a realistic light source.

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.

W

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 light rays:

1. Select the light and open the Light Info window.
2. Choose **Spot** from the **Light Modes** pop-up menu.

This sets the light type to spotlight.

W

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. Click the **Enable Shadow** check box to enable shadows.
The Light Rays controls are found in the Special Effects section of the Light Info window, as shown in Figure 4.2 (page 4-4).
4. Click the **Enable Glow** check box to enable the glow effect (or click the Enable Fog check box to enable a fog effect), and configure the glow/fog for color, radii, factor, intensity.
5. Click the **Enable Ray** check box (beneath the appropriate glow/fog section) to enable the light rays effect.

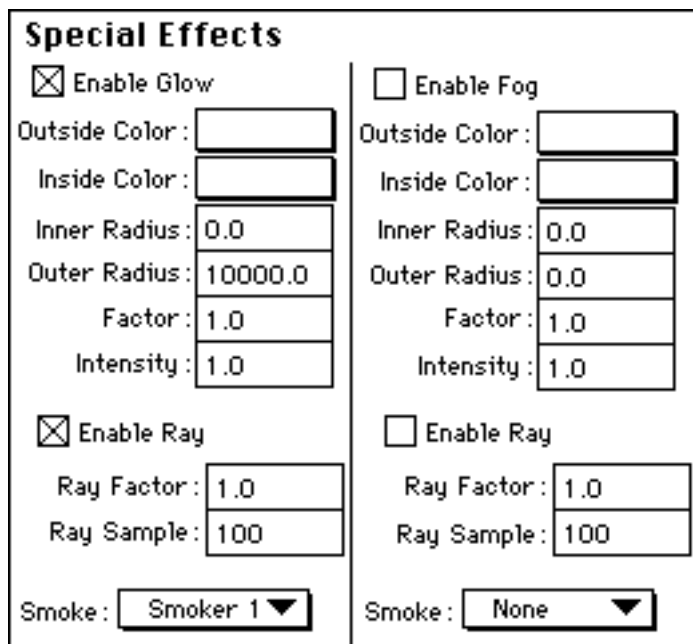


Figure 4.2 Special Effects section of Light Info window

The Ray Factor value defaults to 1.0, which produces very dark (high contrast) rays.

6. 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.
7. To control grain 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).

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The Smoke pop-up menu is used to assign a smoke object to the light for creating smoke within the cone of the spotlight. This feature is discussed in the section “Smoke” (page 4-5).

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 section “Light Rays” (page 4-3), and a smoke object must be added to the project and assigned to the light.

To create smoke:

1. Add a smoke object to the project.

This can be done in either of the following ways:

- Choose **Add>** then **Smoke...** from the File menu.
- Click on the smoke object icon in the Object Palette, as shown above left.

The cursor icon changes, as shown in Figure 4.3.



Figure 4.3 Cursor icon when adding a smoke object

2. Click and drag in the World View windows to place the smoke object.

The smoke object appears as a box within your project. 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.

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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 drift.

3. Select the light to be configured for the smoke effect and open the Light Info window.

4. Configure the light for light rays.
 - Choose **Spot** from **Light Modes** pop-up menu.
 - Click **Enable Shadow**.
 - Click **Enable Glow** (or **Enable Fog**) and configure the glow/fog for color, radii, factor, intensity.
 - Click **Enable Streak**.

Refer to the section “Light Rays” (page 4-3) for more information, if necessary.

5. Choose the smoke object from the **Smoke** pop-up menu, located under the glow or fog effect controls.

The Smoke Info window, as shown in Figure 4.4, opens.

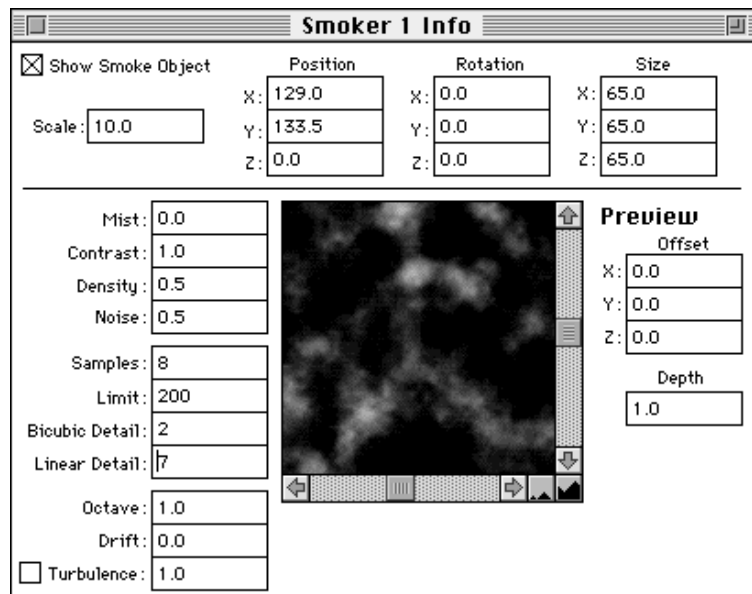


Figure 4.4 Smoke Info window

6. Use the controls of the window to configure the smoke to your preferences. For an explanation of these controls, refer to the section “Smoke Controls” (page 4-7).

Smoke Controls

Show Smoke Object	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 “globbs” of smoke.
Position, Rotation and Size	These edit boxes contain values that define the smoke object’s position, rotation (orientation) and size in global space.
Mist	This edit box contains a value from 0 to 1 that sets the ambient smoke level of the scene. A value of 0 is no ambient (rays will not show). A value of 1 is a completely white smoke volume.
Contrast	This edit box contains a value that controls the contrast between the light and dark sections 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 from 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 seem 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 render time.

Bicubic Detail	This edit box contains a value that controls how many fractal levels are computed 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 in combination.
Linear Detail	This edit box contains a value that controls how many fractal levels are computed using linear computation. Linear computation produces ridge-like, horizontal and vertical areas of smoke, less “realistic” than bicubic detail (above) but faster to render. The higher the value, the greater the detail in the smoke. Both linear and bicubic computation can be used in combination.
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 to 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 control. 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 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.

W

The preview window offers only an approximation of the smoke effect. You must render the image to see exactly what the smoke will look like.

Preview 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 Offset edit boxes. Offsetting the Z value changes the depth at which the viewing slice is taken.
Preview 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.

Lens Flare Obscuration

In previous versions of ElectricImage, lens flare obscuration was a binary function—that is, either the lens flare and light source were visible or invisible.

Version 2.5 has more realistic obscuration effects. As the source of light is obscured by a group, it begins to dim naturally, fading to zero intensity when the light is totally obscured.

The size of the light source is defined in world units and is controlled by the **Size:** edit box within the Light Info window.

The **Show Size** check box can be used to display the size of the light in the World View windows.

W

For obscuration to work, you must check the Enable Obscuration check box in the Light Info window for the configured light.

Chapter 5 Anti-Aliasing

ElectricImage Version 2.5 has a much improved anti-aliasing system.

- Separate controls have been added for Anti-Alias Level and Sampling Level.
 - Anti-Alias Level can be set in the range of 4 x 4 to 64 x 64.
 - Sampling Level can be set in the range of 1 x 1 to 64 x 64.
- You can now specify an independent Sampling Level for each group.

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Anti-Aliasing and Sampling Levels

In previous versions of ElectricImage, the Oversample method of anti-aliasing was equivalent to an Anti-Alias Level of 4 x 4 and a Sampling Level of 1 x 1 (these are the default settings in Version 2.5). The Supersampling check box in previous versions changed the Sampling Level to 2 x 2.

Figure 5.1 shows the new anti-aliasing controls in the Render Control window.

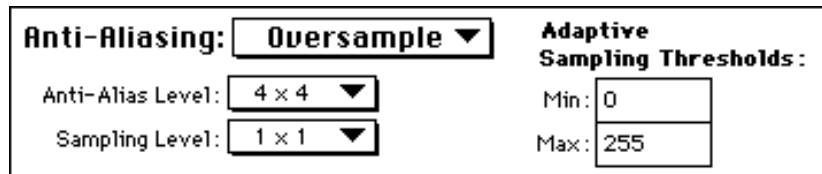


Figure 5.1 Anti-aliasing controls in the Render Control window

Anti-Alias Level

This pop-up menu offers the following options for setting global anti-aliasing levels:

- 4 x 4 (the default)
- 8 x 8
- 16 x 16
- 32 x 32
- 64 x 64

Sampling Level

This pop-up menu offers the following options for setting global sampling levels:

- 1 x 1 (the default)
- 2 x 2
- 4 x 4
- 8 x 8
- 16 x 16
- 32 x 32
- 64 x 64

The sampling level can be set at the individual group level by using the **Sampling Level** pop-up menu in the Group Info window, as shown in Figure 5.2.

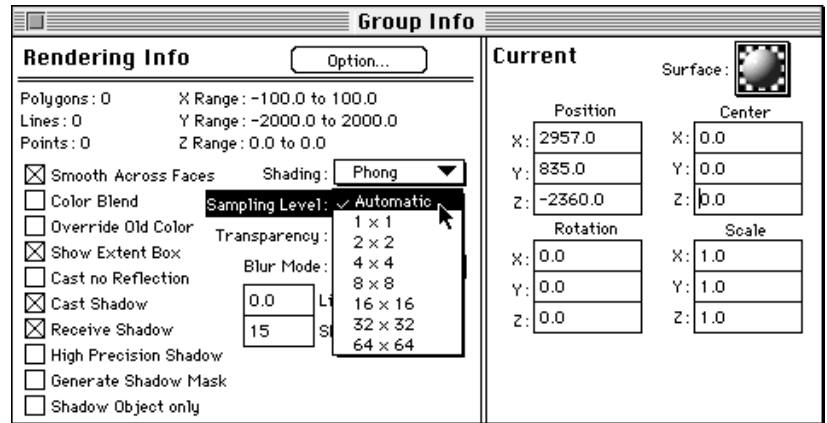


Figure 5.2 Group Info window

The options in the pop-up menu allow you to specify a specific sampling level for the group (which will be overridden by the global setting in the Render Control window if the global level is lower).

The **Automatic** option causes the group's sampling level to be controlled by the Sampling Level pop-up menu in the Render Control window.

Usage Tips

High contrast vertical edges next to horizontal edges can cause aliasing artifacts at 4 x 4 anti-aliasing. Higher anti-aliasing levels should be used to reduce moire patterns that can appear in your renderings (with only a moderate impact on rendering times).

On occasion, high-frequency details, such as an edge with a highlight or the highlights that appear on bump maps, will have a stair-step pattern or will flash off and on during animations. Higher sampling levels will reduce this high-frequency 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 in 2 x 2 sampling instead of 1 x 1 can quadruple rendering time. That is why we have provided the ability to set the sampling level independently for each group in your project. This control has been added to the Group Info Window.

W

As a general rule, make the Anti-Alias Level four times the Sampling Level. This tends to yield the highest quality images. If you need to increase the Sampling Level to 2 x 2 for even one of your groups, increase your Anti-Alias Level to 8 x 8.

Setting the Sampling Level higher than the Anti-Alias Level will not improve image quality and slows down rendering.

The sampling level set in the Render Control window acts as a global limit. In other words, it sets the maximum sampling level for all objects in the scene. If you set some of your groups to a sampling level of 4 x 4, but the level in the Render Control window is set to 1 x 1, all groups will render at 1 x 1.

Chapter 6 Image Display Features

ElectricImage Version 2.5 has several new features related to the rendering and display of Image files:

- Image files can now be displayed within ElectricImage by using the File menu's Display command.
- The view in the Camera View window can now be previewed fully rendered, within ElectricImage.
- The location in which images are displayed, after being rendered by the Camera application, can now be selected and set as a preference.

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The Display Command

The File menu's Display command now displays Image files as well as QuickTime movies. By default, the selected Image file appears in a floating window, as shown in Figure 6.1. You can, however, set preferences for the Display command, as discussed on the next page.

The display window is added to the list of windows in the **Windows** menu so that you can choose it and bring it to the front once it has been covered by other project windows.

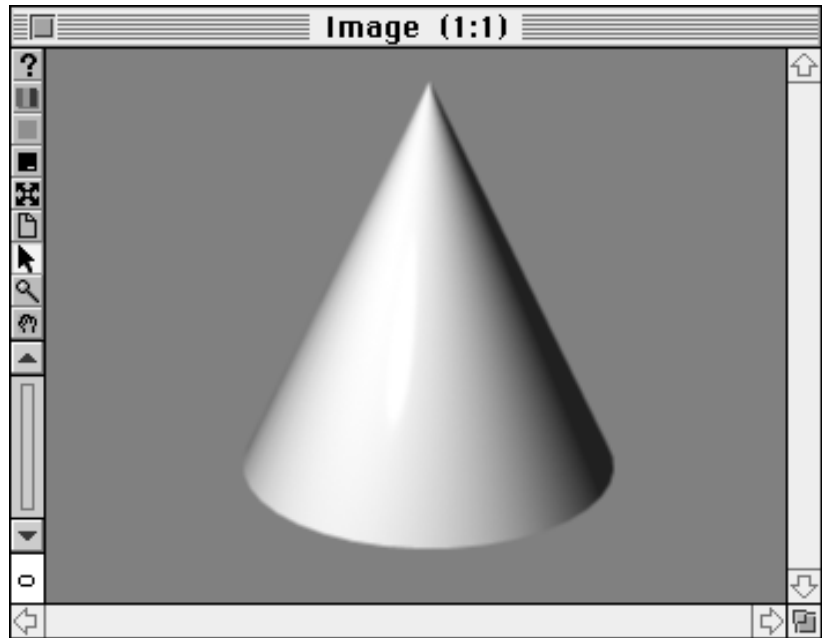


Figure 6.1 Image Display window

The vertical slider bar adjusts which frame of the Image file is being displayed (for animations). The frame number is shown just below.

The left side of the window contains the following controls:



This button pops up a small window containing basic data about the Image file being displayed.



This button allows the Image file's color and alpha channels to be turned off and on.



This button allows the background color of the Image file to be changed or overridden.



This button enables you to select the frame number of the Image animation to be displayed (as an alternative to the vertical slider bar).



This button switches to full screen display. Any mouse click will switch back. While in full screen display, the following keystroke actions are available:

- Up and Right arrow keys advance animations a frame at a time.
- Down and left arrow keys step back animations a frame at a time.
- Space bar selects the scroll tool.
- Command-space bar selects the zoom-out tool.
- Command-Option-space bar selects the zoom-in tool.
- The following command key combinations switch the color display mode:
 - Command-0: RGB
 - Command-1: Grayscale
 - Command-2: Red only
 - Command-3: Green only
 - Command-4: Blue only
 - Command-5: Alpha only



This button opens a standard Save dialog box that enables you to save the displayed Image file to disk.



This button selects the standard move tool. It is pre-selected by default when the window opens.



This button selects the zoom-in tool. It can also be selected by pressing Command-Option-space bar. Pressing the Option key while the zoom-in tool is selected changes the tool to the zoom-out tool, which can also be selected by pressing Command-space bar.



This button selects the scroll tool, which is used to scroll an image that is larger than the display window. It can also be selected for temporary use by pressing the space bar.

To set preferences for the Display command:

1. Choose **Display...** from the Edit menu.

A dialog box, as shown in Figure 6.2 below, opens.

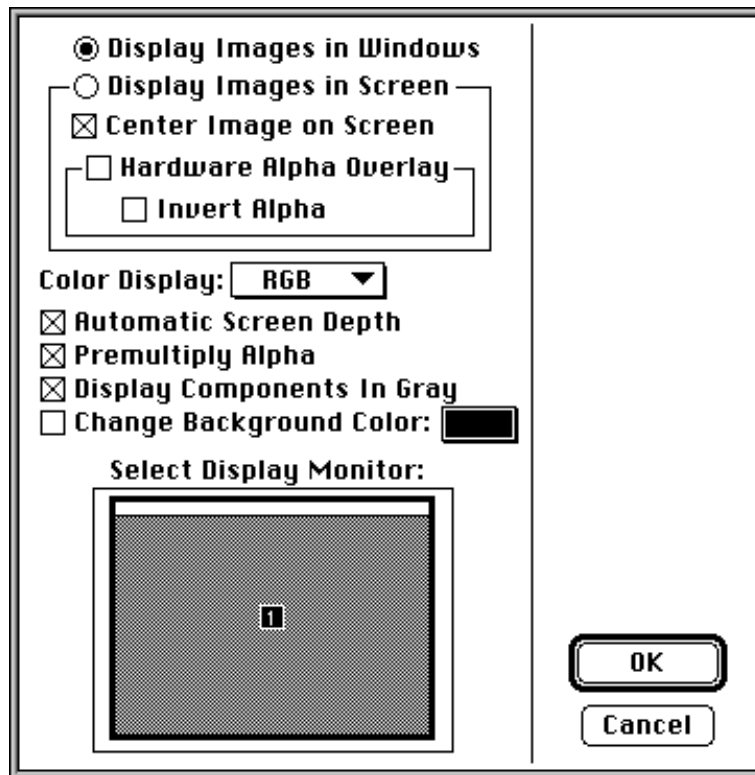


Figure 6.2 Display preferences dialog box

2. Use the controls to set your preferences. For an explanation of these controls, see the section “Display Preferences” (page 6-5).
3. To save the preferences, click **OK** or press **Return**.

W

To reset the system’s default preferences at any time, choose Default Preferences from the Edit menu.

Display Preferences

Display Images in Windows	This radio button, the default, displays Image files in a window.
Display Images in Screen	This radio button, when selected, displays Image files on the screen rather than using a window.
Center Image on Screen	This check box (for screen display only) centers the image on the screen.
Hardware Alpha Overlay	This check box (for screen display only) is used with a video card that supports blending graphics on top of video.
Invert Alpha	This check box (for Hardware Alpha Overlay only), when enabled, inverts the alpha channel to achieve the correct overlay of graphics on video.
Color Display	This pop-up menu sets the color channel to be displayed. Choices are RGB, Red, Green, Blue, and Alpha.
Automatic Screen Depth	This check box sets the color bit depth of the monitor to that of the Image file being displayed.
Premultiply Alpha	This option, when enabled, multiplies the alpha channel into the RGB channel. If, for example, the alpha channel value is 128 (50%), then 50% of the color will display.
Display Components in Gray	This check box option, when enabled, 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 you to select a color with which to override the background color of the Image file.
Select Display Monitor	This control selects the monitor for displaying the Image file (in a multi-monitor set-up).

Previewing the Camera View

The current image in the Camera View window can now be previewed fully rendered (i.e., with lighting, textures, reflections, etc.). You can choose to preview the entire image or select an area of the image to be previewed. Rendering occurs in the background, enabling you to continue project set-up and editing.

W

To use this feature, your system must have enough memory (RAM) to allow both the ElectricImage and Camera applications to run simultaneously.

W

This feature can cut a huge amount of time from the animation set-up process. Scene lighting can be quickly evaluated, modified, and evaluated again. Complex material and mapping attributes can also benefit from quick and accurate previews.

To preview the Camera view:



1. Click on the icon shown at left (located at the bottom of the Camera View window), hold down the mouse button and choose one of the four options from the menu that pops up.
 - To preview the Camera view at the current size of the window in the Camera View window, choose **Window Size**.
 - To preview the Camera view at the project's resolution (as set in the Render Control window), choose **Full Size**.
 - To select an area to be previewed at the size of the standard Camera View window, choose **Selected Window Size**.
 - To select an area to be previewed at the project's resolution setting, choose **Selected Full Size**.

If you choose to select a portion of the Camera view, an instruction appears in the menu bar, as shown in Figure 6.3. Otherwise, no further action is required (see the paragraph following Figure 6.5).



Figure 6.3 Instruction in menu bar

2. To complete the operation, drag a rectangle around the area of the Camera view you want to preview, as shown in Figure 6.4.

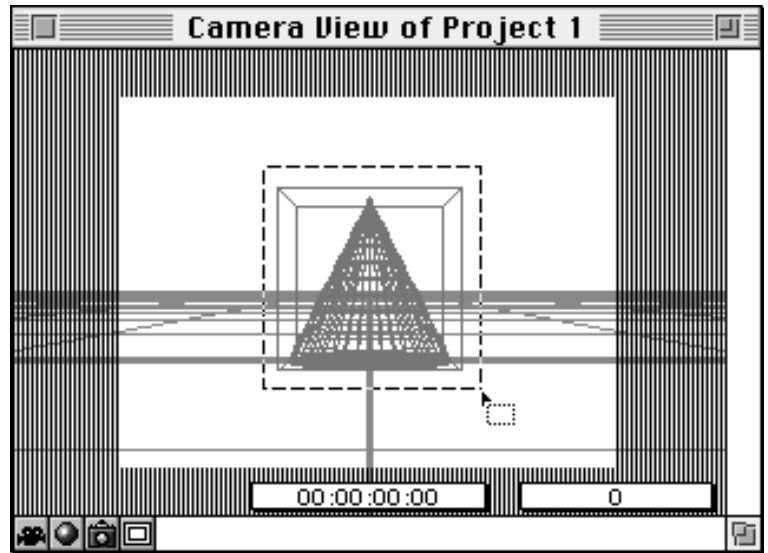


Figure 6.4 Camera View window with preview frame selection

To cancel the operation, use the menu bar instruction as you would a menu and choose Terminate Operation, as shown in Figure 6.5.

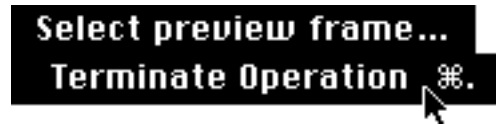


Figure 6.5 Canceling the operation

While the image is rendering, the Camera icon will flash in yellow. Then, when the rendering is completed, the image will be displayed in a floating window within ElectricImage.

W

This preview window is the same window described in the section “The Display Command” (page 6-2).

Display Location

It is now possible to set a preference for where ElectricImage will display an image after it is rendered by the Camera application.

To set your display location preferences:

1. Choose **Preview/Render...** from the Edit menu.

A dialog box, as shown in Figure 6.6, opens.

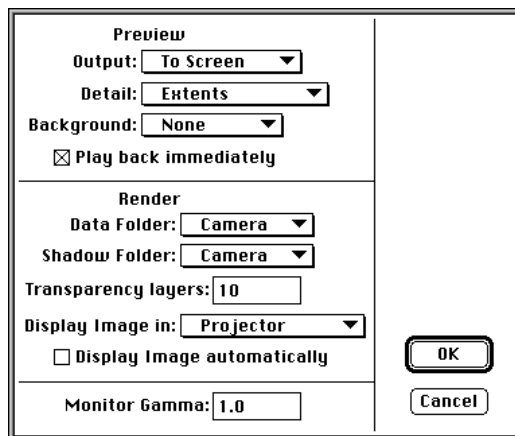


Figure 6.6 Preview/Render Preferences dialog box

2. Choose an option from the **Display Image in** pop-up menu:
 - **Projector** (the default) launches Projector after Camera renders the image.
 - **ElectricImage** quits the program after Camera renders the image.
 - **None** returns to ElectricImage after Camera renders the image. You can then use the Display command (page 6-2).
3. To display an image immediately after it is rendered, enable the **Display Image automatically** check box.
4. To save the preferences, click **OK** or press **Return**.

W

To reset the system's default preferences at any time, choose Default Preferences from the Edit menu.

Chapter 7 Vibe

For ElectricImage Scholastic Version, three options have been added to the Fill pop-up menu in the Project window toolbar:

- **Randomize** adds random numbers to selected data cells.
- **Spring** impresses a complex waveform on selected data cells.
- **Jolt** impresses an impulse across a range of selected data cells.

Collectively these three features are known as “Vibe.”

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Randomize

To add random numbers to selected data cells:



Choose **Randomize** from the Fill pop-up menu in the Project window's tool bar.

A dialog box, as shown in Figure 7.1, opens.

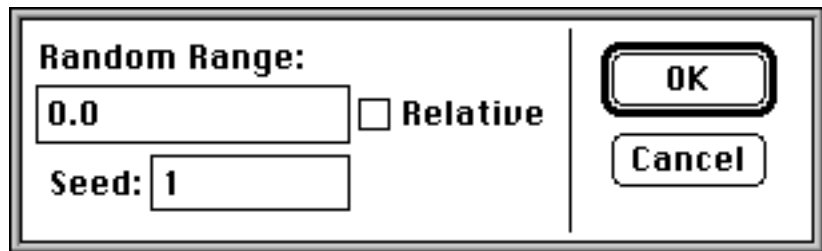


Figure 7.1 Randomize dialog box

Random Range

This 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.

Seed

This 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.

Relative

This 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.

Spring

To impress a complex waveform on selected data cells:

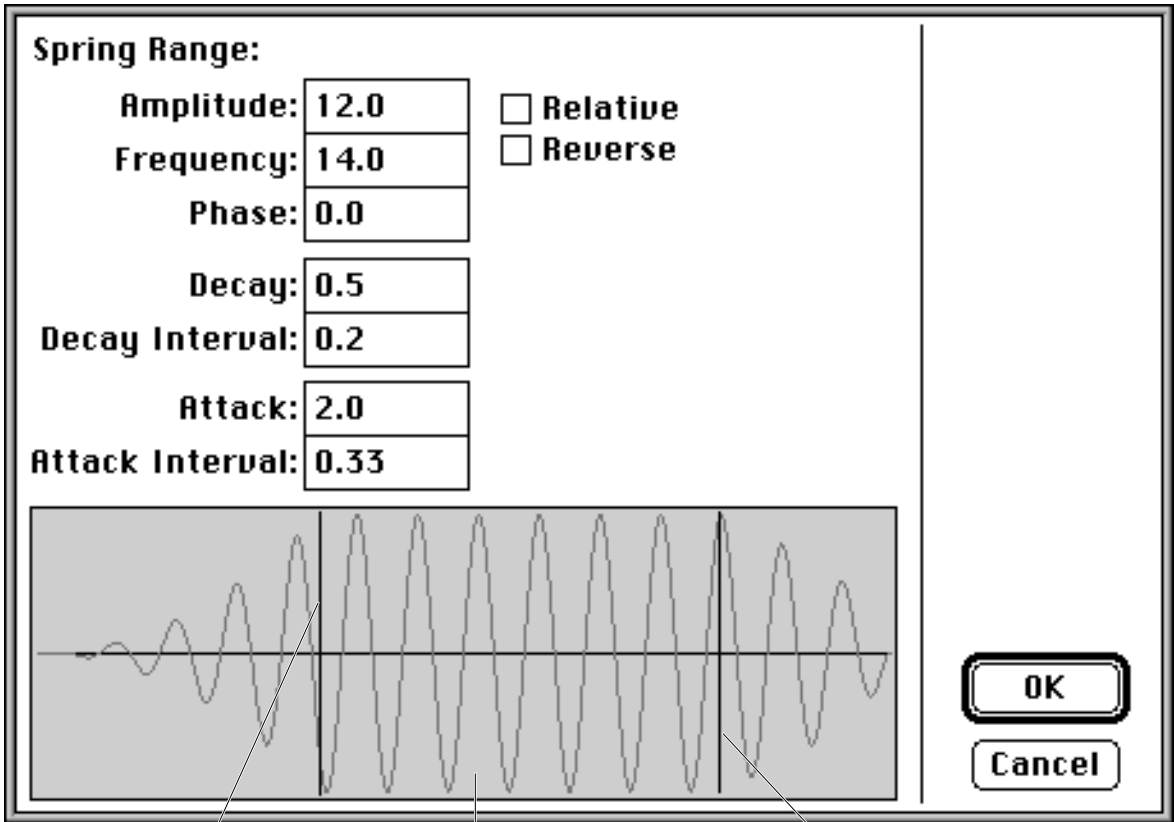


Choose **Spring** from the Fill pop-up menu in the Project window's tool bar.

A dialog box, as shown in Figure 7.2, opens.



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.”



Attack Interval Bar

Curve Window

Decay Interval Bar

Figure 7.2 Spring dialog box

Amplitude	This edit box contains a value that controls the maximum and minimum points on the waveform.
Frequency	This edit box contains a value that controls the number of complete cycles in the entire waveform.
Phase	This 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.
Relative	This 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.
Reverse	This check box, when enabled, inverts the entire waveform.
Decay	This edit box contains a value that controls the slope of the waveform from the Decay Interval Bar to the end of the curve.
Decay Interval	This 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.
Attack	This edit box contains a value that controls the slope of the waveform from its beginning to the Attack Interval Bar .
Attack Interval	This 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.

Jolt

To impress an impulse across a selected range of data cells:



Choose **Jolt** from the Fill pop-up menu in the Project window's tool bar.

A dialog box, as shown in Figure 7.3, opens.



This command could be used to simulate a camera hitting a small bump as it rolls along a track.

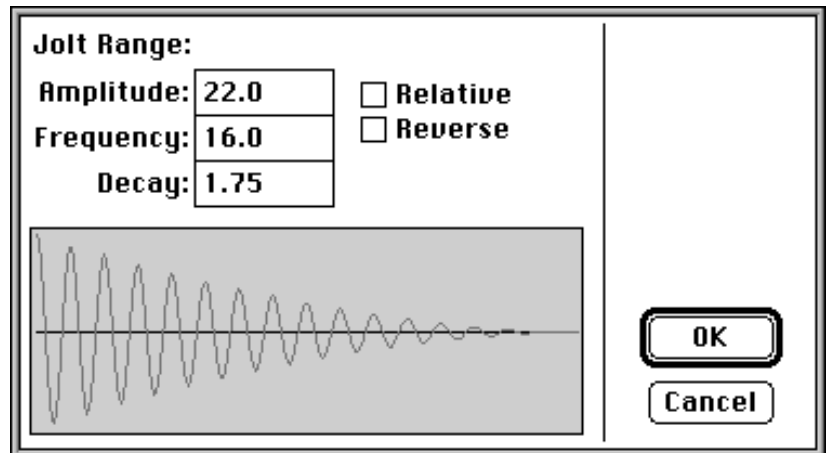


Figure 7.3 The Jolt Dialog Box

- Amplitude This edit box contains a value that controls the maximum and minimum points on the waveform.
- Frequency This edit box contains a value that controls the number of complete cycles in the entire waveform.
- Decay This edit box contains a value that controls the slope of the entire waveform.

- | | |
|----------|---|
| Relative | This 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. |
| Reverse | The check box, when enabled, inverts the entire waveform. |

Chapter 8 Plug-Ins

There are two new plug-ins for ElectricImage Version 2.5, available from either the Object palette or the File menu:

- **Dicer** divides groups into smaller polygons to produce better results when applying deformations.
- **Mr. Blobby** forms spheres, or blobs, out of the groups that are linked to it.

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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.

To use the Dicer plug-in:

1. Click the Dicer icon in the Object Palette, or choose **Add>** then **Dicer...** from the File menu.

A dialog box, as shown in Figure 8.1, opens.

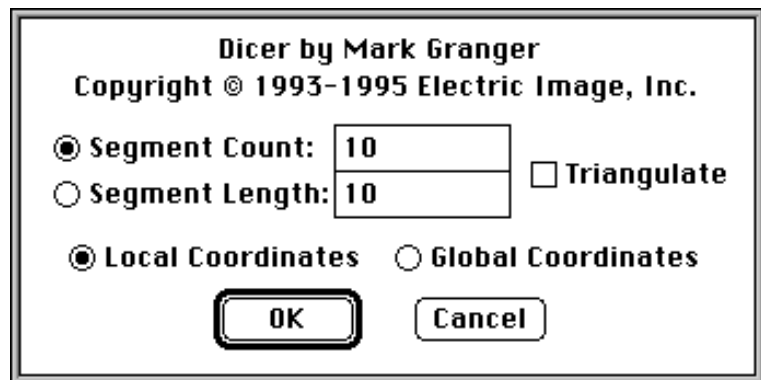


Figure 8.1 Dicer dialog box

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 “Dicer Controls” (page 8-3).
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	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.

Mr. Blobby



This tool takes groups that are linked to it and forms spheres (or blobs). As multiple blobs get close together, they blend into a single blob.

To use the Mr. Blobby plug-in:

1. Click the **Mr. Blobby** icon in the Object Palette, or choose **Add>** then **Mr. Blobby...** from the File menu.

A dialog box, as shown in Figure 8.2, opens.

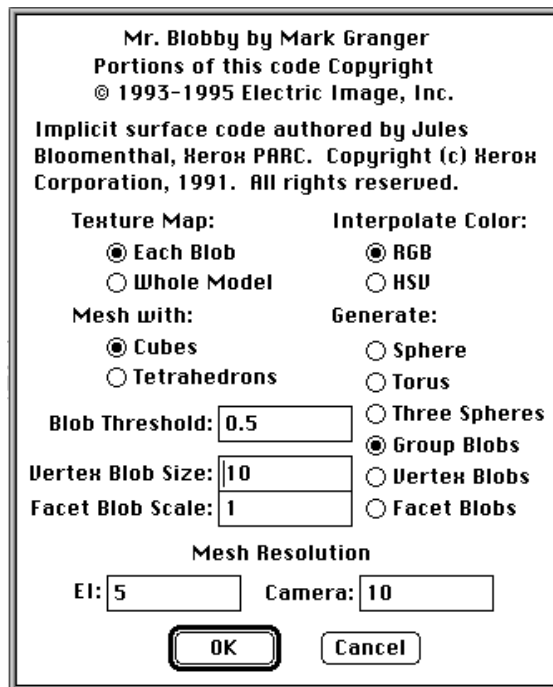


Figure 8.2 Mr. Blobby dialog box

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" (page 8-5).

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	<p>This is a primitive to be used to set up a texture map.</p> <p>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.</p>
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: El	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 keyframes.
- 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.

Chapter 9 Gamma Control

Gamma is a technical term used to describe the intensity of different levels of gray as they appear on a computer monitor or on a video screen.

ElectricImage provides control over Input Gamma and Output Gamma.

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Overview

Computers typically use values from 0 to 255 to represent gray values from black to white. You may expect that a value of 128 would be displayed as a 50% gray value precisely between black and white. Because of the way electrons illuminate the phosphors on a computer screen, however, this is not the case.

The actual pixel intensity value is calculated with the formula:

$$x^g$$

where x is the gray value divided by 255 and g is the monitor's gamma value.

A typical monitor has a gamma value of between 1.4 and 1.6. Standard NTSC video gamma is 2.2. For a pixel with a value of 128, the intensity would be:

$$(128/255)^{2.2}, \text{ or about } 20\% \text{ illumination}$$

Setting Gamma

ElectricImage's default settings for Input and Output Gamma are identical. Changing the Input Gamma to a new value will cause the Output Gamma to be set to the new value as well.



It is to your advantage to keep the Input and Output Gamma settings equal. If you use one value for Input Gamma and a different value for Output Gamma, ElectricImage will remap RGB and alpha channels from the Input to the Output gamma settings. Since there are only 255 values for each channel, some colors may be lost. This may be noticeable in areas of smooth gradation of color.



Ideally, your texture and other maps should be created at the same gamma setting as that required for your output medium. For video the setting is 2.2, for multimedia 1.4, and for film it will depend on the input gamma of your film recorder.

You should begin by setting your computer monitor's gamma to the gamma of your target medium. The Macintosh provides some control over gamma, as follows:

1. Open the **Monitors** control panel.
2. Hold down the Option key while clicking the **Options...** button.
3. Choose either:

Mac Std Gamma (1.4)

or

Uncorrected Gamma (2.2).



If you need a different value (for a film recorder or other custom output device), you will need to purchase a separate application to set your gamma.



Gamma Controls in ElectricImage

To set Input Gamma:

1. Choose Preview/Render... from the Edit menu.

The Preview/Render dialog box, as shown in Figure 9.1, opens.

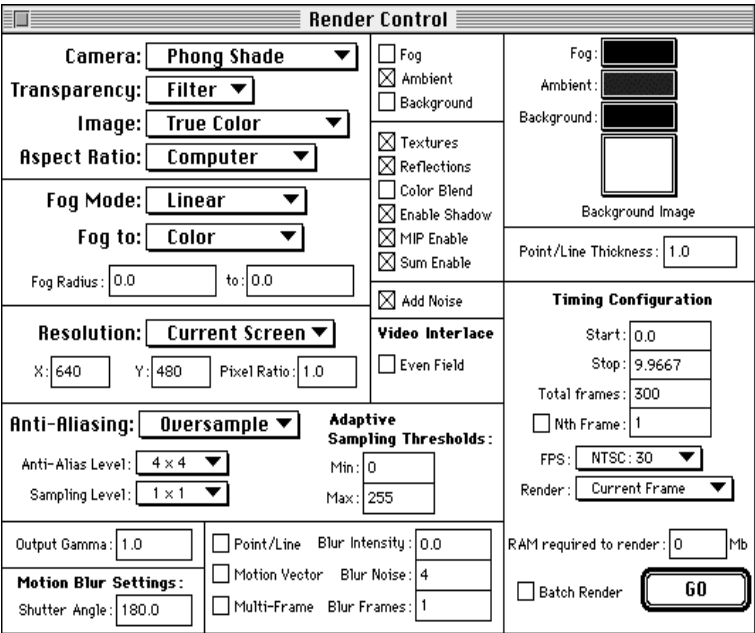


Figure 9.1 Preview/Render Preferences dialog box

2. Use the **Input Gamma** edit box (at the bottom) to set the Input Gamma value (which defaults to 1.0).

The Input Gamma is a preference, and as such is stored in the ElectricImage preferences file. To reset the system's default preferences at any time, choose Default Preferences from the Edit menu.

To set Output Gamma:

1. Choose Render from the File menu.

The Render Control window, as shown in Figure 9.2, opens.

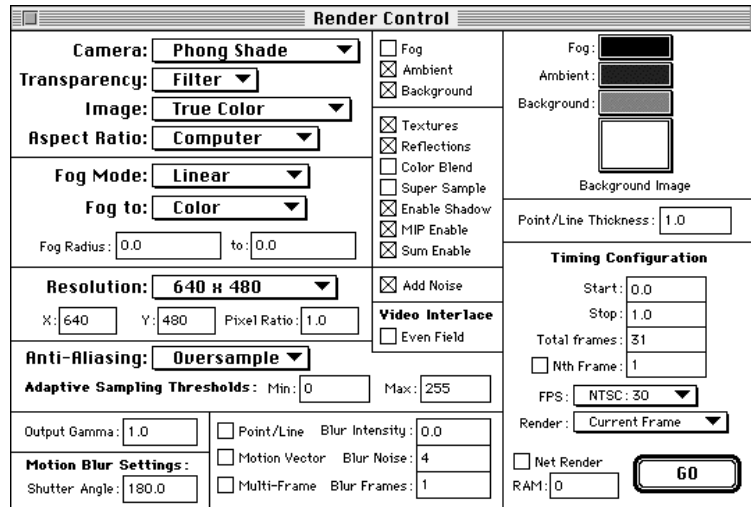


Figure 9.2 Render Control window

2. Use the **Output Gamma** edit box (at lower left) to set the Output Gamma value (which defaults to 1.0).

Chapter 10 The Select Menu

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The Select Menu Commands..... 10-7

The commands in the Select menu allow you to select (that is, highlight) objects in the World View and Project windows. They include:

- The **All**, **Find**, and **Find Again** commands.
- Alternate commands are also available when the **Option** key is held down. All of the commands are described on the following pages.

Overview

Select		Select	
All	⌘A	All + Locked	⌘A
None		None	
Inverse		Inverse	
Find...	⌘F	Find...	⌘F
Find Again	⌘G	Find Again	⌘G
Find All...		Find All...	
Disible		Disible	
Locked		Locked	
Hidden		Hidden	
Cameras		Cameras	
Lights		Lights	
Groups		Groups	
Effectors		Effectors	
Model	▶	Model	▶
Parent of Selected		Ancestors of Selected	
Children of Selected		Offspring of Selected	

Figure 10.1 The Select Menu (at left) and Select Menu with Option Key (at right)

•

All

This command selects all cameras, lights and model groups in the current project.



Objects that are locked cannot be selected with this command. Objects are locked (or unlocked) in the Project window, as discussed in the section “The Object Status Panel” (page 8-17) in Chapter 8: The Project Window



Find...

This command is used to locate and select objects in the project.

To find an object:

1. Choose **Find...** from the Edit menu.

A dialog box, as shown in Figure 10.2, opens.

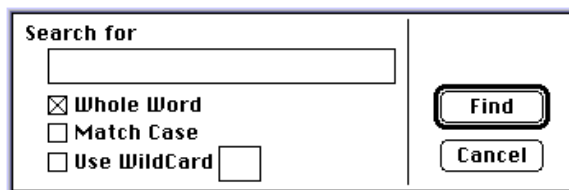


Figure 10.2 Dialog box used to find an object

2. Type the name of the object or a search string.
3. Specify whether or not the search string is a whole word (the default) and whether or not to match the case of the letters.
4. Specify a wildcard character and click **Use Wildcard**
5. Either click **Find** or press **Return**.

The Select Menu Commands

The table below lists the commands available from the **Select** menu.

Command	Description
All	Selects all unlocked objects (same as previous Edit menu command).
None	Deselects all selected objects.
Inverse	Deselects all selected objects while selecting all other objects that are not locked.
Find	Opens a dialog box to enter a search string (same as previous Edit menu command). Wildcards may now be used to control the search. Selects the first object that matches the search string.
Find Again	Selects next object matching the search string previously entered with the Find command (same as previous Edit menu command).
Find All...	Similar to the Find command except that all objects matching the search string are selected.
Visible	Selects all objects with visibility check boxes <i>on</i> .
Locked	Selects all objects with lock check boxes <i>on</i> .
Hidden	Selects all objects hidden in the Project window.
Camera	Selects the Camera.
Lights	Selects all lights.
Groups	Selects all groups.
Effectors	Selects all effectors. For a description of effectors, refer to <i>Chapter 3: Effectors</i> .
Model	Opens a submenu to select a model (same as previous Model List menu).
Parent of Selected	Selects the immediate parent of the currently selected object.
Children of Selected	Selects the immediate children of the currently selected object.

Choosing the **Select** menu while the **Option** key is held down reveals several alternate commands, listed in the table below.

Command	Description
All + Locked	Selects every object in the project.
Ancestors of Selected	Selects all parents up the hierarchy.
Offspring of Selected	Selects all children down the hierarchy.

Chapter 11 Value Modification System

A simple system has been implemented in ElectricImage to allow relative and percentage changes to be entered into the Project window cells, and into the edit boxes of most modal and non-modal windows.

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Implementing Value Changes

There are two types of 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 regardless of what it is.
- **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, and a percentage change of 75% would make the value 3/4 of its current value.

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

@ symbol amount

where @ means the current value of the cell, *symbol* indicates an operation to be performed, and *amount* is the numeric offset or percentage. Therefore, @*7.6 means: take the cell's "current value" and multiply it by seven-point-six.



Cells and edit boxes do not remember the formulas. The new value will be computed and immediately written into memory over the old value.



Table 11.1 shows the symbols that are supported:

Table 11.1 Supported symbols

Symbol	Action
+	add
-	subtract
*	multiply
/	divide
^	exponential
%	percentage

Table 11.2 provides examples of formulas for relative offset changes.

Figure 11.2 Examples of formulas for offset changes

Formula	Result
@+2.7	Adds 2.7 to the channel.
@-2.7	Subtracts 2.7 from the channel.
@*2.7	Multiplies the channel by 2.7.
@2.7	Also multiplies the channel by 2.7.
@/2.7	Divides the channel by 2.7.
@^2.7	Takes the channel to the power of 2.7.

Table 11.3 provides examples of formulas for percentage changes.

Figure 11.3 Examples of formulas for percentage changes

Formula	Result
@2.7%	Makes the channel 2.7 percent of its current value.
@*2.7%	Also makes the channel 2.7 percent of its current value.
@/2.7%	Divides the channel by 0.027.
@+2.7%	Adds 2.7 percent to the channel.
@-2.7%	Subtracts 2.7 percent from channel.
@^2.7%	Undefined. Gets treated as @*2.7

Usage Tip

Assume that you have a whole series of custom frames that control the intensity of a light. You have used custom frames because you wanted the light to flicker over time. How do you increase the intensity by 20% over the duration of the animation without changing the value in every cell by hand?

Follow this procedure:

1. Set the Project window to Keyframe mode.
2. Highlight the range of intensity cells that you wish to change.
3. Choose the **Fill Constant...** command from the Project window's toolbar.
4. Type @+20% into the dialog box that appears.
5. Click **OK**.

The value of every selected cell has just been increased by 20%.

Chapter 12 Multi-Frame Model Export

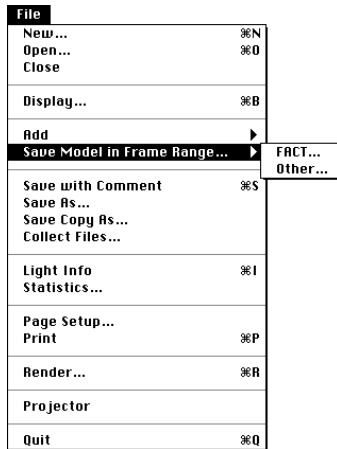
ElectricImage Version 2.5 features a multi-frame model export feature, for exporting models in a variety of file formats.

This feature works in the same manner as the File menu’s **Save Model** command, except that a range of frames can be specified, producing multiple versions of the model, with each version identified by the frame number from which it was exported.

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Exporting Models



To export multiple copies of a model over a range of frames:

1. Hold down the Option key and choose **Save Model in Frame Range...** then **FACT...** (or **Other...**) from the File menu.

The dialog box used to set the model's hierarchy opens (as happens with the basic Save Model command).

2. Specify whether or not you want to preserve the model's hierarchical structure by clicking the appropriate radio button.

Another dialog box, as shown in Figure 12.1, opens.

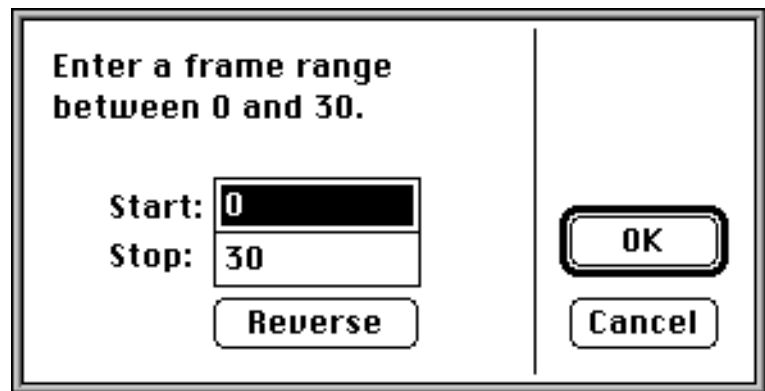


Figure 12.1 Dialog box used to enter a frame range

3. Enter the starting and ending numbers for the frame range in the **Start** and **Stop** edit boxes.

Note: The Reverse button will have no effect.

4. Click **OK** or press **Return**.

Another dialog box opens for naming and placing the copies of the models.

5. Name the model (and set other options as appropriate), then click **Save** or press **Return**.

The model(s) are saved in separate files with filenames that add the frame number to the end of the given name.

Chapter 13 ImageOMFI

This standalone application converts Image stills and animations into Avid Technology's Open Media Framework Interchange format.

W

The current version of the OMFI specification is 1.5. Version 1.5 does not support an alpha channel—therefore, ImageOMFI premultiplies the alpha channel before converting each frame.

Use of ImageOMFI is similar to that of the ImageQT application that was included in Version 2.0.

Chapter 14 Renderama™

Renderama™ is an application program designed to maximize the rendering utilization of your computer hardware. Renderama can be used to schedule batch rendering on a single computer, as well as to distribute rendering jobs among many networked computers. Jobs can be distributed across AppleTalk and TCP/IP local area networks as well as across TCP/IP wide area networks such as the global Internet. Additionally, Renderama can distribute rendering jobs transparently among multiple computer platforms including Macintosh and UNIX-based computers.

Renderama acts as a middle-man in-between ElectricImage and one or more Camera rendering engines. It coordinates all rendering activity, automatically distributing jobs across the network, or, in the case of a single machine configuration, queuing several jobs for subsequent batch rendering.

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Installing Renderama

Renderama is a small (500 KB) application. We recommend installing it in the Startup Items folder (in the System folder) of all Macintosh computers that will be using ElectricImage or Camera.

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It is to your advantage to launch Renderama before ElectricImage. Otherwise, there may not be enough contiguous memory to launch Camera with its maximum memory setting.

Configuring Renderama

Before Renderama can be used for distributed or batch rendering, it must be configured correctly. Configuring Renderama is simply a matter of setting a few options in the Preferences window. However, since there are seven different modes in which Renderama can be configured, some explanation is necessary.

Modes of Operation

Renderama can be configured to run in several different modes. This allows a single application to meet many different needs. There are four distinct Renderama modes:

- User
- Server
- Slave
- Standalone

Additionally, Renderama can run in any combination of User, Server, and Slave modes, giving a total of seven unique modes in which Renderama can be configured. The table on the next page summarizes each possible configuration.

Mode	User	Server	Slave	Standalone
User Mode <ul style="list-style-type: none"> • initiate rendering jobs • display finished jobs 				
Server Mode <ul style="list-style-type: none"> • maintain job queue, distribute files • monitor slaves, assemble frames 				
Slave Mode <ul style="list-style-type: none"> • perform rendering • retrieve needed files for Camera 				
Standalone Mode <ul style="list-style-type: none"> • maintain local job queue to allow batch rendering. 				
User + Server Mode <ul style="list-style-type: none"> • initiate jobs, maintain job queue • distribute files, assemble frames 				
Server + Slave Mode <ul style="list-style-type: none"> • maintain job queue, distribute files • perform rendering, assemble frames 				
User + Server + Slave Mode <ul style="list-style-type: none"> • initiate jobs, maintain queue • perform rendering, assemble frames 				
User + Slave Mode <ul style="list-style-type: none"> • initiate rendering jobs • perform rendering 				

The current mode is configured using the Preferences window. Renderama's Preferences window is described in the section "The Preferences Window" (page 14-10).

User Mode This mode includes the features needed by animators using ElectricImage to take advantage of distributed network rendering. User mode requires the animator to choose a network render server in the Renderama Preferences window. If Renderama is configured in Server mode in addition to User mode, then the local machine can act as its own render server.

When the user initiates a rendering job within ElectricImage, an animation control file will be created by ElectricImage, then sent by Renderama to the currently chosen render server. The render server will determine if it has up-to-date copies of the model, texture map, and plug-in files needed to render the job. If any of the server's files are out-of-date, the render server will immediately collect the needed files from the animation machine.

Once the render server has up-to-date versions of the job's model, map, and plug-in files, the job will be entered into the server's job queue and will be distributed to slave rendering machines as they become available. At this point, the animation machine that submitted the job may be shut down or disconnected from the network without affecting the rendering job's progress (unless the machine is acting as its own render server). This allows animators who submit rendering jobs over a dial-up connection such as Apple Remote Access, SLIP, or PPP to disconnect once the render server has finished collecting the job's associated files.

Server Mode This mode takes care of several tasks involved in distributed network rendering. A computer configured to be a render server maintains a local job queue. As new rendering jobs are accepted by the server they are added to the end of the queue. It is the render server's responsibility to collect up-to-date copies of all model, texture map, and plug-in files when it accepts a new job from a user. Only files that have been modified since the last rendering job are collected.

Additionally, the render server keeps track of all slave machines on the network. It divides up rendering jobs beginning with those at the head of its queue, and distributes rendering tasks to each available slave renderer. Slaves request model, map, and plug-in files from the render server as they need them. The render server responds to the slave's requests by forwarding files to the slave machines as needed.

As slave machines complete their rendering tasks, the render server retrieves the finished frames from the slave machines and assembles them into a complete animation for each job. Finally, once a rendering job has been completed, the render server checks to see if the user machine that submitted the job is still connected to the network, and if so sends the finished animation file to the user machine.

Slave Mode This mode handles the tasks necessary to perform unattended rendering on a dedicated network rendering machine. When a render slave becomes available to perform network rendering, it notifies all render servers on the network that it is currently idle and ready for a new task. As a render slave receives rendering tasks from a server, it launches the ElectricImage Camera rendering engine to render each incoming task. Renderama takes care of retrieving the files needed by Camera to render the task. Finally, Renderama sends finished frames back across the network when requested to do so by a render server.

Standalone Mode This mode is designed specifically for single-machine batch rendering. When operating in Standalone mode, Renderama ignores all other Renderama nodes on the network. In fact, no network is necessary to use Renderama in Standalone mode.

Standalone mode allows an animator to submit several rendering jobs to be rendered at a later time. As jobs are submitted, Renderama adds them to its local job queue in a suspended state. Once the animator has batched up the jobs they want to render, they can use Renderama to release the jobs in the queue for local rendering by ElectricImage Camera.

Typical Configurations

Along with the flexibility provided by Renderama's different modes of operation comes a fair degree of complexity. Typically the most difficult decision to be made when using Renderama is determining which of the seven possible configuration modes to use. To help you make this decision, here are some of the more common configurations.

Renderama Solo For animators with access to a single machine, this mode (Figure 14.1) allows rendering of multiple jobs overnight.



Figure 14.1 Standalone mode

Animators with access to a network rendering system may wish to submit several jobs to be rendered over the network using Renderama in User mode, then switch Renderama into Standalone mode and submit several more jobs for local rendering before going home for the evening. Switching Renderama's modes is as simple as clicking a check box in the Renderama Preferences window.

The Small Render Farm When the number of slave rendering machines is small (Figure 14.2), the need for a dedicated render server is low, so animators can configure their machines to act as both users and render servers.

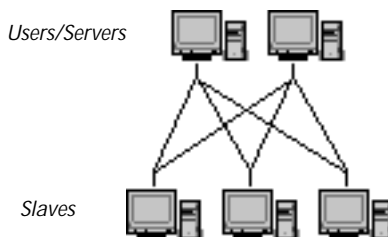


Figure 14.2 Small User + Server mode network

Each animator's machine maintains its own job queue and takes care of distributing model, texture map, and plug-in files to each slave

machine. Slaves accept tasks from animation machines on a round-robin basis.

The Growing Farm

As the number of slave rendering machines increases (Figure 14.3), the file transferring load on each animation machine increases. This is because it is necessary for the animation machines to send model, texture map, and plug-in files to each slave machine that is rendering one of its jobs.

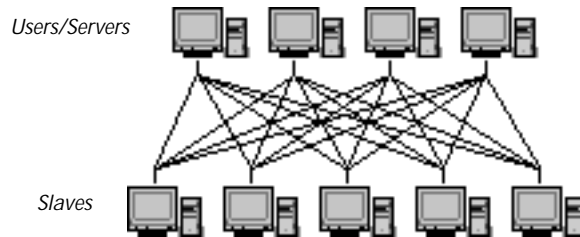


Figure 14.3 Large User + Server mode network

Additionally, the animation machines are responsible for collecting the finished frames from the slaves and assembling them into a finished animation for each job. This added load can make it difficult for an animator to continue to work interactively with their computer. This is when a dedicated render server becomes a valuable addition to the network.

A Dedicated Server

Adding a dedicated render server to the network (Figure 14.4) reduces the load on each animation machine.

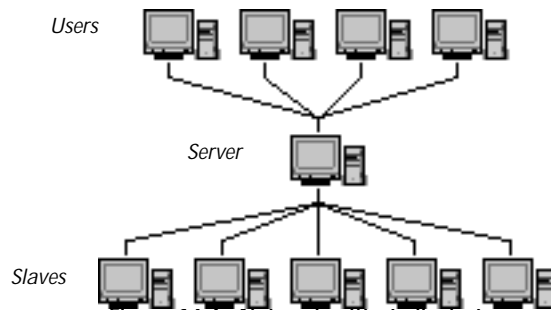


Figure 14.4 Network with dedicated server

Animation machines no longer need to send model, map, and plug-in files to each slave, instead they send the files once to the render server. Additionally, the render server takes care of maintaining the queue of jobs to be rendered over the network and also collects and assembles finished frames into complete animations before sending them to the animation machines. Unlike animation and slave machines, dedicated render servers typically do not need powerful CPUs or floating-point processors. A fast hard-disk and network connection are generally more beneficial to a dedicated render server than a powerful CPU.

An Overloaded Server

As a distributed rendering network grows, it is possible to overload a dedicated render server with too many animation and slave machines (Figure 14.5). When this occurs it is time to add another dedicated render server.

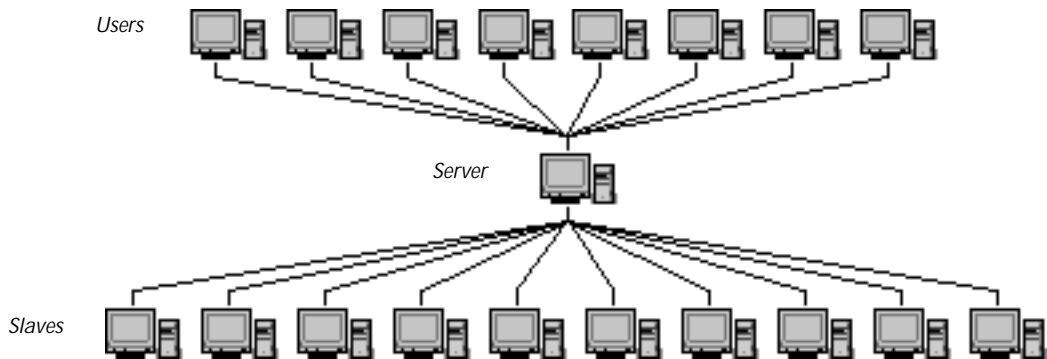


Figure 14.5 Overloaded server

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The diagram in Figure 14.5 is not meant to suggest the exact size of a network that can overload a dedicated server. This will depend on the speed of the server and network as well as the demand placed on the server by the animation machines.

Multiple Dedicated Servers

In this scenario, the load supplied by the animation machines is divided among two render servers (Figure 14.6).

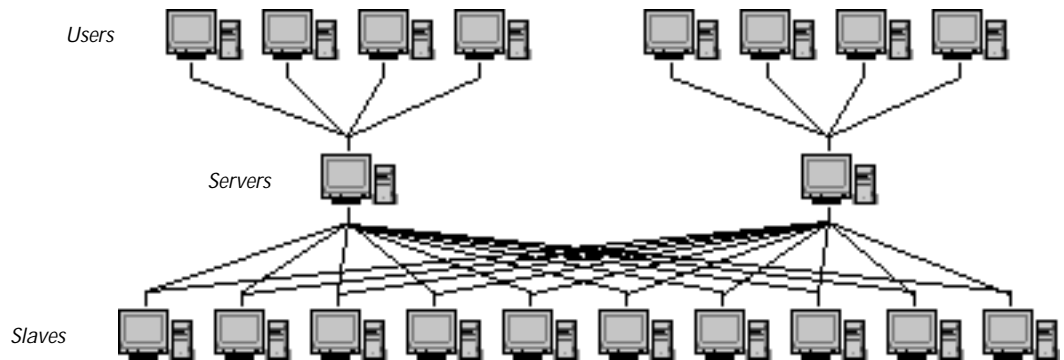


Figure 14.6 Multiple dedicated servers

Notice however that each render server can still have access to all of the available slave machines. This allows maximum utilization of the slave machines, even when one of the render server's job queue becomes empty.

The Preferences Window

Renderama is configured through its Preferences window (Figure 14.7), which is accessible from the File menu.

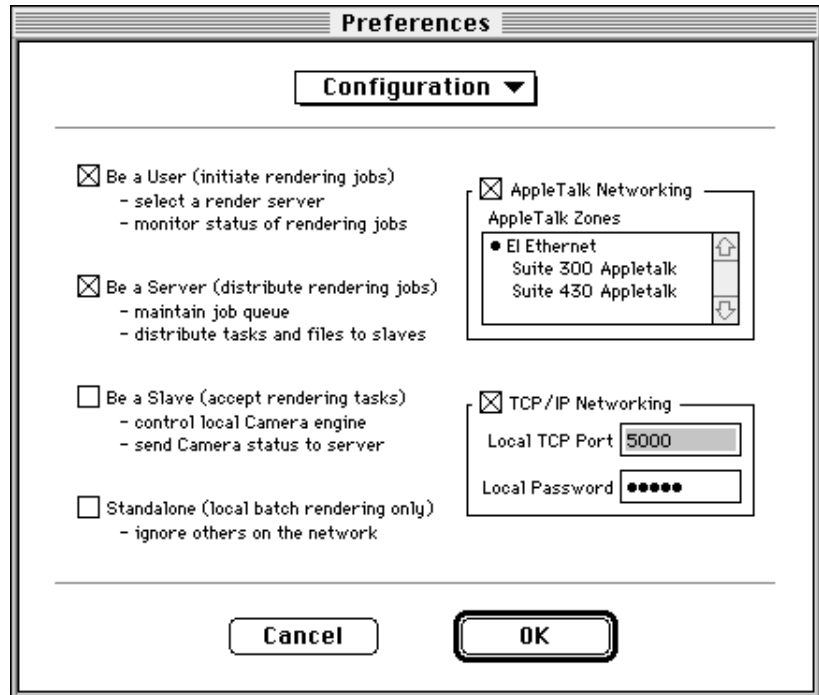


Figure 14.7 Preferences window with Configuration options

The Preferences window is used to specify in which of the seven possible modes Renderama will operate. Additionally, the Preferences window is used to specify options that apply specifically to User and Server mode.

When the Preferences window is opened, it initially displays Renderama's current configuration. A pop-up menu at the top of the dialog allows you to switch between the Configuration, User, and Server Options areas of the Preferences dialog.

Configuration Options

Renderama's Configuration Options specify how Renderama will operate on the local machine and how it will connect with other machines over the network. In Figure 1.7 (page 14-10), Renderama is configured to operate in User and Server modes. Additionally it is configured to connect with all Renderama nodes in the "EI Ethernet" zone via AppleTalk. For incoming connections to computers using the TCP/IP network protocol, Renderama is configured to listen for connections on the local TCP port 5000. A password has been specified to prevent unauthorized access to Renderama over TCP/IP wide-area networks.

The most important step in configuring Renderama is choosing the appropriate configuration mode for the local machine. For more information on choosing the local configuration mode, read the section "Modes of Operation" (page 14-2). The four check boxes along the left side of the dialog box determine Renderama's current configuration.

AppleTalk Networking

This check box in the upper right allows you to determine whether Renderama will attempt to automatically connect to other Renderama nodes using AppleTalk networking.

AppleTalk Zones

This list in the upper right corner of the Preferences dialog allows you to select one or more AppleTalk zones to be automatically searched for active Renderama nodes. This list will contain all zones in your AppleTalk local area network. By clicking once on a zone in the list you can enable or disable it for use by Renderama. Initially only the zone to which your Macintosh belongs will be enabled. The zones that are enabled for use by Renderama are preceded by a bullet (•).

TCP/IP Networking

This check box allows you to connect to remote TCP/IP hosts running Renderama. Unlike AppleTalk networking, Renderama can not automatically detect other Renderama nodes running on a TCP/IP network. Therefore it is necessary for you to explicitly enter the network identity of each remote TCP/IP machine you wish your local Renderama to connect with. Likewise, remote Renderama's

must be told your local TCP/IP identity to initiate a connection with your machine. See the section “Networking Options” (page 14-17) for more information on how to enter the TCP/IP identity of a remote machine.

Local TCP Port

This edit box allows you to specify which TCP port to use locally to listen for incoming TCP/IP connections. This value must be an integer number between 0 and 65,535. It must be chosen to avoid a collision with other TCP/IP-based programs running locally that might be using the same port number.

Generally it is preferable to choose a higher number since port numbers in the lower range are reserved for standard TCP/IP programs such as Telnet, FTP, etc. The number 5000 was chosen as an arbitrary default port number. Unless you are aware of another program on your local Macintosh that uses TCP port 5000, you are probably safe with this default value.

Local Password

This edit box allows you to specify a password that remote TCP/IP nodes must provide in order to establish a connection with your local machine. In order to establish a TCP/IP connection with a remote machine running Renderama, you must know three pieces of information: 1. the remote machine’s Internet address, 2. the TCP port number Renderama is using on the remote machine, and 3. the password specified in the remote machine’s “Local Password”.

User Options The User Options area of the Preferences window (Figure 14.8) allows you to control how rendering jobs initiated from ElectricImage on the local machine are handled.

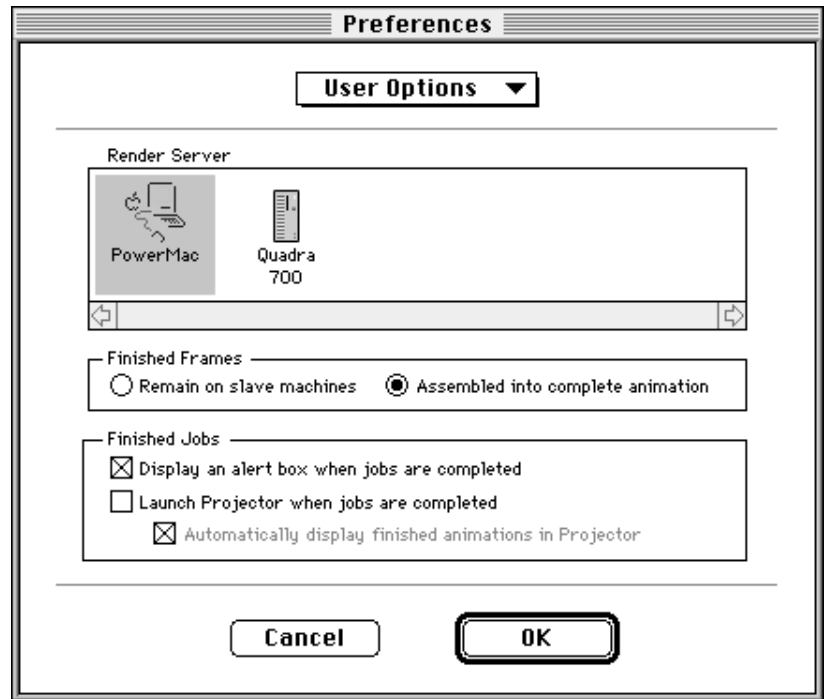


Figure 14.8 Preferences window with User options

Render Server

This list toward the top of the dialog box allows you choose which render server will receive the jobs you submit. A render server is any machine currently running Renderama in Server mode. If you are running Renderama locally in Server mode, then typically you will choose your own local machine as your server. However, to reduce the demands placed on your local machine you may instead want to choose a remote render server. Click once on the icon of your desired render server. Clicking twice on a render server icon will choose the server and dismiss the Preferences dialog as if you clicked the “OK” button.

Finished Frames

This radio button group allows you to determine how rendered frames will be handled once they are completed by a slave renderer.

- If the **Remain on Slave Machines** button is selected, then the Image files for the pieces of your animation will not be collected and assembled into a complete animation. Instead they will be left in a special work folder created for you on the slave machine on which they were rendered.

A textual report will be created and sent to you when the job has finished rendering listing the name and location of each Image file that was created to render your job.

This option is useful when a finished animation is so large that it is impractical to send it across the network.

- In most cases you will want to select the **Assembled into Complete Animation** radio button instead.

With this option, the finished frames are transferred from the slave machines on which they were rendered to the render server. The render server takes care of assembling the separate Image files into a single animation file, and then sends the final animation to the machine that originated the job.

Display an alert box when jobs are completed

This check box allows you to specify whether or not Renderama should notify you when finished render jobs arrive.

Launch Projector when jobs are completed

This check box allows you to specify whether Projector should be automatically launched when a finished job is received locally. If the check box is unchecked, then Projector will not be launched.

Automatically open finished animation

This check box allows you to specify whether Projector should automatically open completed animations when it is auto-launched by Renderama. Generally you will want this box to be checked. However, if you typically use Projector to send animations out to tape instead of creating FastLoad files, then you may want to leave this box unchecked.

Server Options

The Server Options area of the Preferences window allows you to specify how Renderama behaves as a render server.

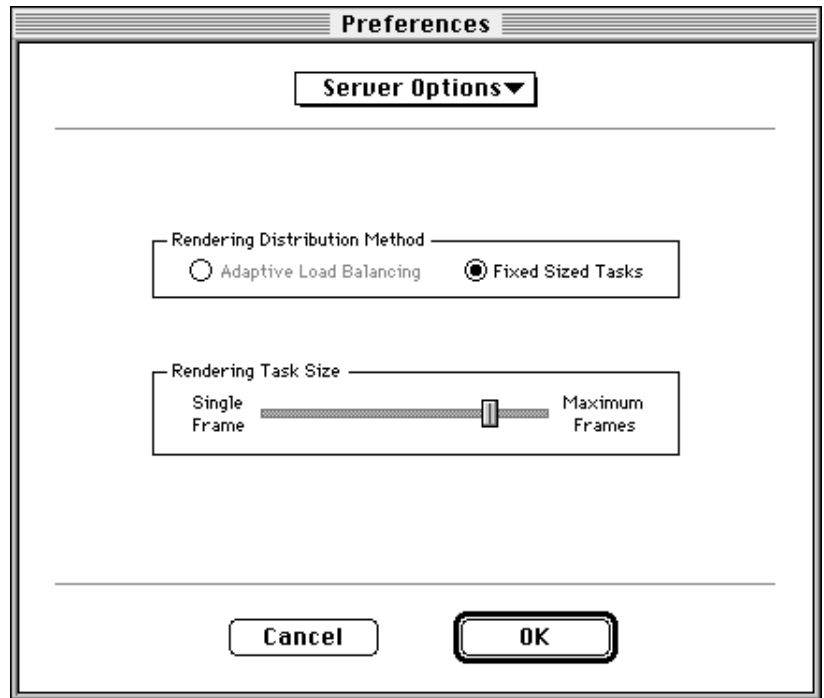


Figure 14.9 Preferences window with Server options

Rendering Distribution Method

This radio button group determines how rendering jobs are divided and distributed to the slave rendering machines.

- If the **Adaptive Load Balancing** radio button is selected, then the render server automatically divides jobs into tasks to match the abilities of each slave machine.

In other words, a more powerful slave rendering machine will be given a proportionally larger rendering task than a less powerful slave. The “power” of a slave machine is based on the average time it takes the slave to render a single frame of animation. This average time per frame is maintained by Renderama for each slave machine. Over time, as the machine is used to render many different jobs, this average becomes a reasonable indicator of the

machine's overall rendering power. However, when Renderama is first installed on a network, it has no way to calculate a reasonable estimate of each slave machine's rendering power. To handle this, there is an alternative distribution method that divides each job into fixed size tasks.

- If the **Fixed Size Tasks** radio button is selected, then rendering jobs are broken up into fixed size tasks. The number of frames in each task is determined by the number of active slave machines at the moment and the setting of the **Rendering Task Size** slider. If the slider is all the way to the right (**Maximum Frames**), then the size of each rendering task will be determined by dividing the size of the rendering job by the number of currently active slave machines.

In other words, if there are four slave machines, then each rendering jobs will be divided into four quarters. Setting the slider to **Maximum Frames** guarantees the least amount of division of jobs and therefore the least amount of overhead. However, if the all of the slave machines are not equal in rendering power, then rendering jobs may take longer to complete because weaker slave machines are given the same size tasks as the stronger slaves.

Rendering Task Size

To prevent a slow slave machine from stretching out the overall rendering time of each job, drag this slider toward the left. This will cause the render server to divide each render job into smaller tasks. If the slider is moved all the way to the left (**Single Frame**), then jobs are divided into the smallest possible tasks, currently one frame per task.

If your slave rendering machines are all of the same configuration (i.e. all PowerMac 8100/110s with 256 Mb of RAM), then you will want to keep the slider all the way to the right for the least possible overhead. On the other hand, if you have slave rendering machines of all different types, then you will have to experiment by moving the slider to the left until you find you are no longer routinely waiting on the slowest slave machine for your rendering jobs to complete.

Networking Options

The Networking Options area of the Preferences window (Figure 14.10) allows you to specify networking parameters for Renderama. Additionally you may create a list of remote TCP/IP host machines for Renderama to automatically initiate connections with when it starts running.

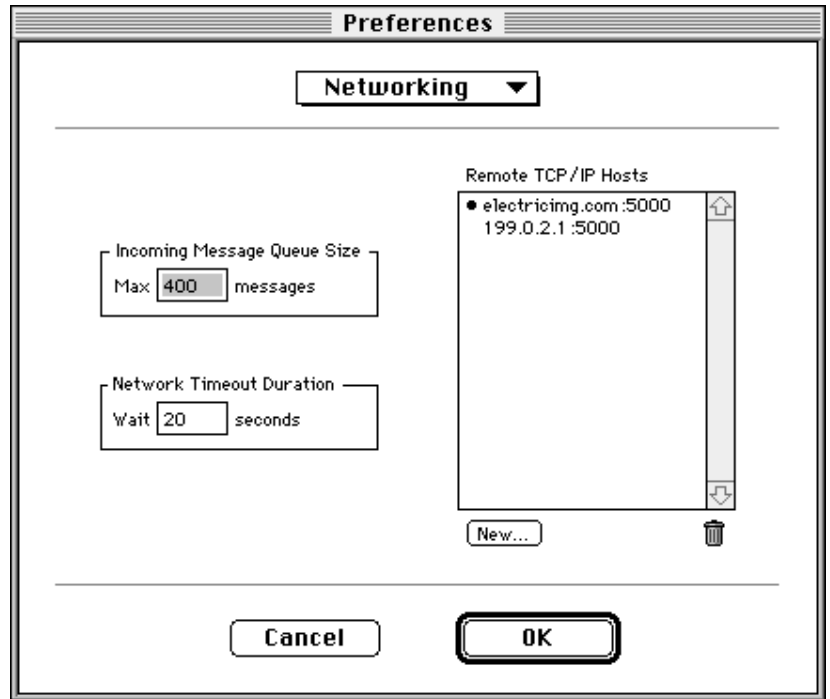


Figure 14.10 Preferences window with Networking options

Incoming Message Queue Size

This edit box can be used to increase the number of incoming network messages Renderama can handle at once.

Typically you will not need to change this number from its default value of 400. However, for render servers that are connected to more than 10 slave machines it is a good idea to increase this value by 40 for each additional slave machine.

In other words, if a render server is making connections to 12 slave renderers, then set this value to 480 messages. If a server typically connects to 20 slave machines, then set this value to 800 messages.

Increasing the incoming message queue size reserves extra space in memory for messages from remote machines. Each increment of 100 messages requires approximately 3 Kb of memory. By allowing the user to set this value, Renderama is able to keep a small memory footprint on machines with lower network traffic, and scale up accordingly in situations where the network traffic is greater.

Network Timeout Duration

This edit box can be used to change the amount of time that Renderama will wait for a response from a remote machine.

If a remote machine is not responding promptly, there are typically three explanations:

- The remote machine is too busy to respond promptly.
- The network connection is slow.
- The remote machine has crashed without closing the connection.

In the first two situations, it is desirable to have a longer network timeout period to give responses from the remote machine time to arrive. However, if the remote machine has crashed, then you do not want to wait all day for a response that is never going to come. If you typically connect to a remote machine that has trouble responding promptly either because it is overloaded or the connection is slow, then you may want to increase Renderama's network timeout duration.

Renderama will display the spinning watch cursor whenever it must wait more than 1 second for a response from a remote node. The cursor will spin until the response arrives or the network timeout duration expires. Additionally, you can type Command-period to immediately force Renderama to stop waiting for a response whenever you see the spinning watch cursor. However if Renderama fails to receive a response that is vital to the success of the job being processed, then the job may not complete successfully.

Remote TCP/IP Hosts

This list on the right side of the Preferences window allows you to specify TCP host machines to which Renderama will attempt to initiate a connection each time it starts up. Renderama can not automatically detect remote Renderama nodes across a TCP/IP network as it can across an AppleTalk network due to differences in the way the networking protocols are implemented. Additionally, since the global Internet includes millions of computers around the world, it is not feasible to automatically search for remote nodes running Renderama. For these reasons you must explicitly enter the address and port number of each remote TCP/IP Renderama node.

To add a new TCP/IP host to the list, click the **New...** button just below the list. A window will open, as shown in Figure 14.11, allowing you to enter the address, port number, and password of a remote Renderama node.

The figure shows a window titled "Remote TCP/IP Host". It contains three text input fields. The first field is labeled "Remote Address" and has a hint "Domain name (host.sub.domain) or IP address (128.1.2.3)". It contains the text "electricimg.com". The second field is labeled "Remote TCP Port" and has a hint "TCP port used by Renderama on the remote host". It contains the number "5000". The third field is labeled "Remote Password" and has a hint "Renderama TCP/IP password on the remote host". It contains seven dots. Below these fields is a checkbox labeled "Enabled" which is checked. At the bottom right are two buttons: "Cancel" and "OK".

Figure 14.11 Remote TCP/IP Host window

- **Remote Address**

You may enter either a valid domain name or IP address in dot notation into this edit box.

- **Remote TCP Port**

In this edit box you must enter the TCP port number used by Renderama on the remote machine to listen for incoming connections.

- **Remote Password**

If a TCP/IP password has been entered in the Configuration Options area of the Preferences window of the remote host then you must enter the same password in this edit box. If you are unsure of these values, check with the user or system administrator of the remote host.

- **Enabled**

This check box specifies whether or not a connection will actually be initiated with the remote host.

In the list of remote TCP/IP hosts, enabled hosts will have a bullet (•) to the left of the host's address and port number. To prevent Renderama from connecting to a TCP/IP node without actually removing the node from the list, click once on the node to disable it. A second click will enable it again. To permanently remove a node from the list, drag its entry into the small trash icon below the list. To change a node's address, port number, or password, double-click on the node in the list.

Using Renderama

In general, Renderama is designed to require as little user interaction as possible. Once configured, Renderama attempts to go about its business of performing distributed or batch rendering with little or no user intervention. However, Renderama provides feedback to the user indicating the progress of rendering jobs and allows you to abort, suspend, resume, or postpone rendering jobs on demand.

Figure 14.12 shows what a machine using Renderama in User and Server mode to render three jobs using three slave rendering machines might look like.

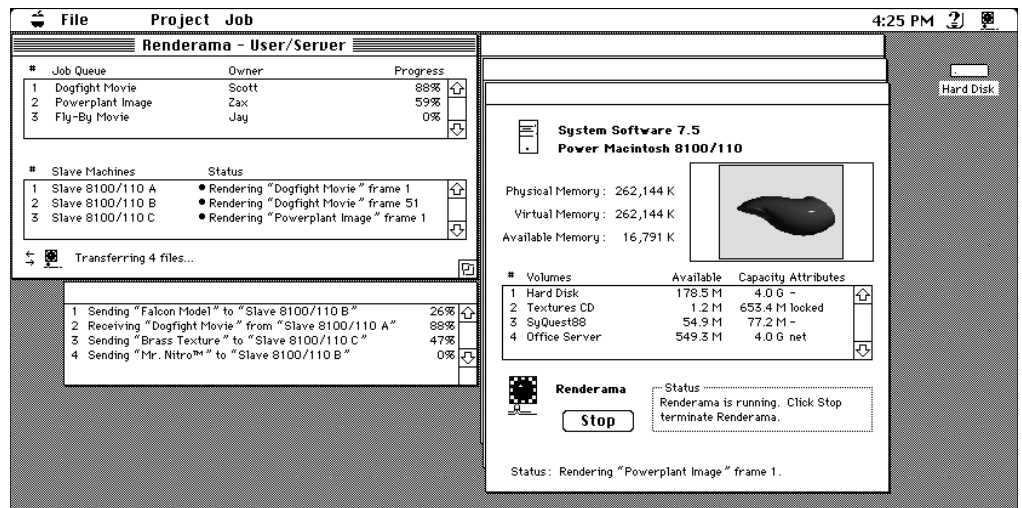


Figure 14.12 Renderama in use

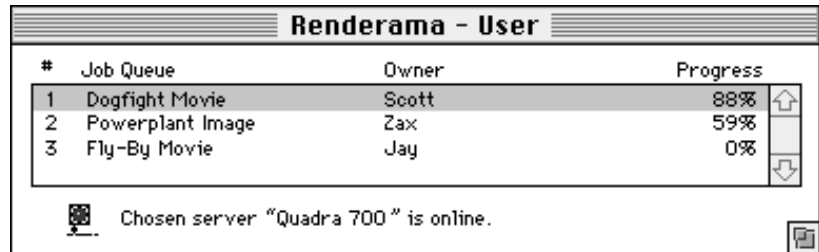
There are three types of Renderama windows: the Main window, the Machine Info windows, and the File Transfers window. All three types of windows are shown in Figure 14.12.

The Main Window

Renderama's Main window is always open while Renderama is running. It includes information that pertains to the mode in which Renderama is configured, therefore the appearance of the Renderama Main window changes depending on the current mode.

User Mode

In this mode, the Renderama Main window (Figure 14.13) displays the job queue of the currently chosen render server.



The screenshot shows a window titled "Renderama - User". It contains a table with the following data:

#	Job Queue	Owner	Progress
1	Dogfight Movie	Scott	88%
2	Powerplant Image	Zax	59%
3	Fly-By Movie	Jay	0%

Below the table, there is a status bar with a small icon and the text: "Chosen server 'Quadra 700' is online." There are also up and down arrow buttons on the right side of the table.

Figure 14.13 Main window in User Mode

Jobs in the queue are processed from top to bottom, therefore the job at the top is the first candidate for rendering by available slave machines. In User mode, you can select any of the jobs that you submitted and have the render server abort, suspend, or resume the job by using the Job menu.

The small icon and message at the bottom of the window indicate whether the currently chosen render server is on-line or off-line. Additionally this area of the window is used to temporarily indicate file transferring activity.

Server Mode

In this mode, the Main window (Figure 14.14) displays the server's local job queue as well as a list of the slave machines available for rendering.

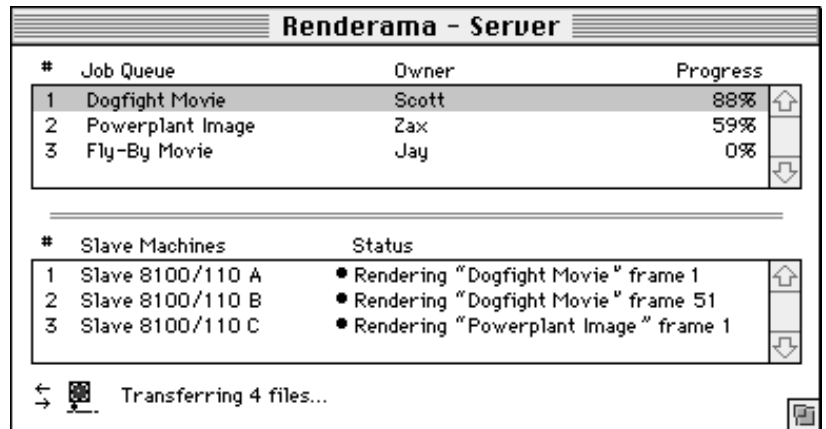


Figure 14.14 Main window in Server Mode

Any of the jobs in the job queue may be selected and acted upon by the Job menu. Additionally, the order of the jobs in the job queue may be changed by dragging selected jobs up or down in the queue.

The list of slave machines in the bottom half of the window shows the status of each slave renderer currently connected to the local server. A bullet (●) to the right of the slave's status message indicates that Renderama is currently running on the slave machine. If no bullet appears, then the machine is configured to be a slave renderer, but Renderama is not currently running on the machine, therefore it is not currently available for slave rendering. To obtain more information about a slave machine, double-click on it to open the slave's Machine Info window.

If Renderama is running in both User and Server modes, and the currently chosen render server is a remote machine, then a situation arises in which there are two possible job queues to display in the Main window:

- The local server's job queue
- The chosen server's job queue

In this case, a pop-up menu appears above the job queue allowing you to switch between displaying the local job queue and the remote server's job queue (Figure 14.15).

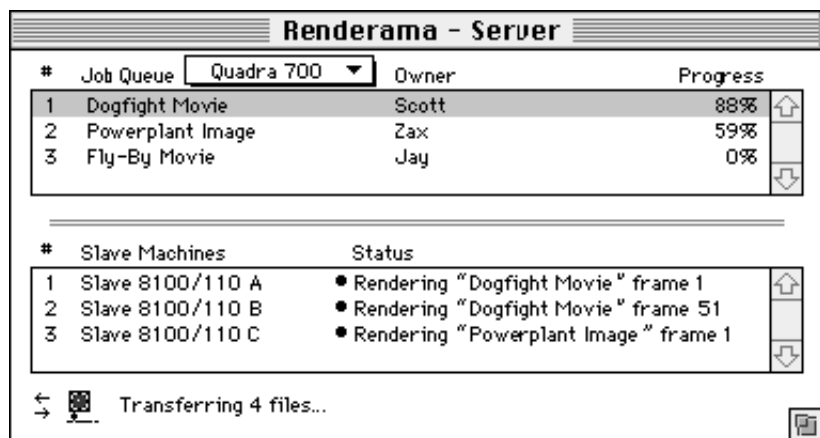


Figure 14.15 Main window in User + Server mode

In practice this situation is quite common. Animators find that it is nice to see the status of the slave machines as they are rendering, so they frequently run Renderama in both User and Server mode. However they still wish to off load the file transferring responsibilities to a remote server, so they choose a remote render server instead of acting as their own server. One thing to keep in mind however is that running Renderama in Server mode increases the amount of network traffic that your machine will handle significantly. This is primarily due to status messages that slave machines send to all connected render servers. In addition, Server mode uses more RAM than User, Slave, or Standalone modes.

Slave Mode

In this mode, the Main window (Figure 14.16) displays a message describing the task currently being rendered by the local slave. If Camera terminated abnormally the last time it was executed, the Main window's message indicates why Camera terminated.

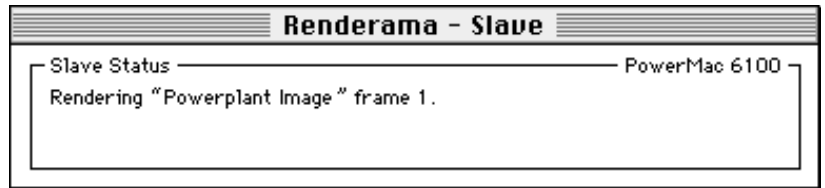


Figure 14.16 Main window in Slave Mode

Standalone Mode

In this mode, the Main window (Figure 14.17) displays the local job queue. Standalone mode is designed to provide local batch rendering for single-machine configurations. When running Renderama in Standalone mode, jobs are added to the job queue in a suspended state. This allows you to queue up several jobs locally before rendering actually begins. To begin rendering the jobs in the queue, select the jobs and choose "Resume" from the Job menu (page 14-31).

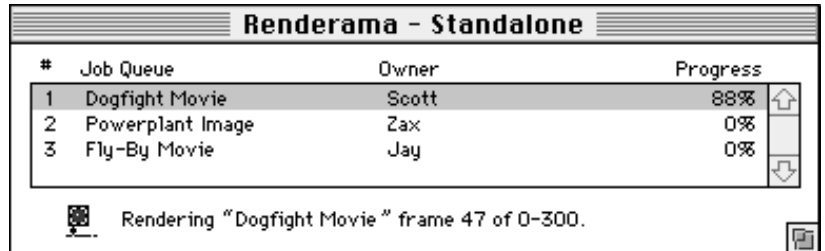


Figure 14.17 Main window in Standalone Mode

As with User and Server mode, jobs in the queue are processed from top to bottom. However, in Standalone mode the network is ignored and all rendering is performed by the local machine. You can select any of the jobs in the queue and abort, suspend, or resume them using the Job menu commands. Additionally, the order of the jobs in the job queue may be changed by dragging selected jobs up or down in the queue.

The message at the bottom of the window describes the task currently being rendered by the local slave.

The Machine Info Window

Double-clicking a slave machine in the Renderama Main window will open a Machine Info window, as shown in Figure 14.18, for that slave.

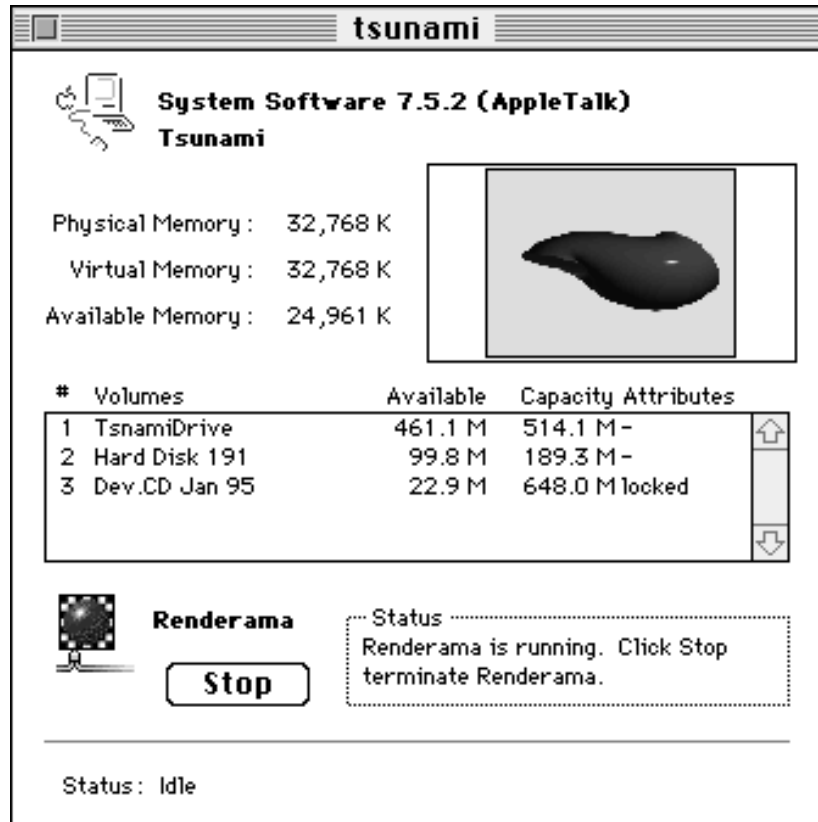


Figure 14.18 Machine Info window

The Machine Info window displays information about the slave machine such as the available RAM and the currently mounted disk volumes. It also shows a preview of the last image to be rendered. Additionally, a button at the bottom of the Machine Info window allows you to remotely stop Renderama on the slave machine.

The File Transfers Window

Renderama's File Transfers window (Figure 14.19) displays a list of all files currently being transferred over the network.



File Transfers			
1	Sending "Falcon Model" to "Slave 8100/110 B"	26%	↑
2	Receiving "Dogfight Movie" from "Slave 8100/110 A"	88%	↓
3	Sending "Brass Texture" to "Slave 8100/110 C"	47%	↕
4	Sending "Mr. Nitro™" to "Slave 8100/110 B"	0%	↕

Figure 14.19 File Transfers window

Renderama is capable of sending several files concurrently in the background. This allows processing by Renderama and other applications on the local machine to continue while Renderama is transferring files across the network.

Renderama's Menus

The File Menu This menu has five commands.

- **Preferences...**

This command allows you to open Renderama's Preferences window through which you can configure Renderama, as discussed in the section "Configuring Renderama" (page 14-2).

- **Show File Transfers**

This command opens and closes the File Transfers window.

- **Rebuild Network Connections**

This command causes Renderama to regenerate all of its network connections. All currently open connections are closed, and Renderama attempts to connect to remote nodes in the same fashion as when it starts up. This command can be used if you are having difficulty connecting to a particular remote machine.

- **Remote Launcher...**

This command opens a dialog box, as shown in Figure 14.20, that can be used to launch Renderama on remote machines.

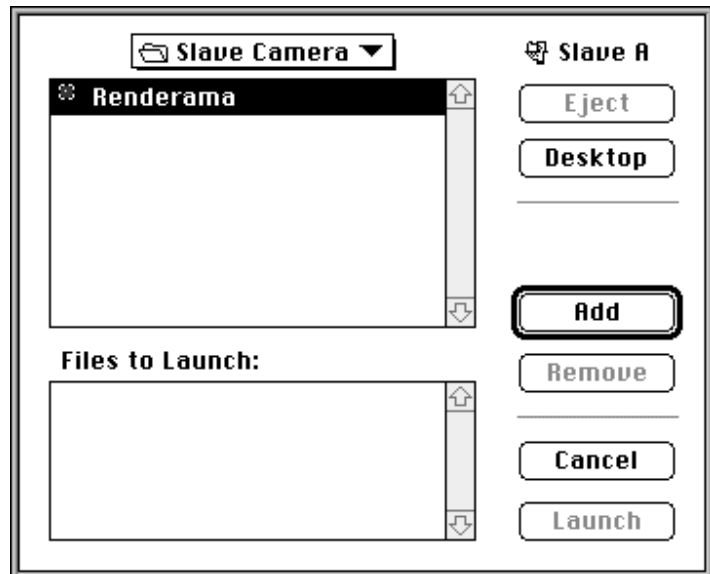


Figure 14.20 Remote Launcher dialog box

In order to use the remote launcher, you must have Application Linking privileges on each remote machine, and you must have the remote machines' volumes containing Renderama mounted as icons on your desktop.

Using the remote launcher's Open File window, navigate to Renderama on each of the remote machines, and click **Add** to add Renderama to the **Files to Launch:** list at the bottom of the window.

When you have selected all of the remote Renderama's to be launched, click **Launch** to launch them on the remote machines.

If a password has been set up for your Application Linking privileges in the Users & Groups Control Panel, then you will be prompted to enter that password the first time you try to launch to each remote machine.

- **Quit**

This command shuts down Renderama.

The Edit Menu

This menu offers the standard editing actions: **Undo**, **Cut**, **Copy**, **Paste**, and **Clear**. These commands can be applied to any edit box in Renderama's windows or dialog boxes.

The Project Menu

This menu is used to install or remove all files related to an ElectricImage project across the network. Its commands are:

- **Install...**

This command is enabled when Renderama is in either User or Server mode. It allows you to transfer a project's texture map, model and plug-in files across the network before actually submitting a rendering job. Installing a project's related files in advance is not required, however, since the files will be transferred automatically if necessary when you submit a rendering job. This feature is provided mainly as a convenience.

Upon selecting **Install...** in the Project menu, you will be prompted with a dialog box to select an ElectricImage project file. If you choose a project file and then click **Install** in the

dialog box, the selected project file will be searched to determine the project's related texture maps, models, and plug-in files.

If you are in User mode and you have chosen a remote render server, then you are also given the option to **Propagate Files to Connected Slaves** when you select a project to install. The default setting copies the project's maps, models and plug-ins to the remote server which in turn propagates the files to all slave machines connected to the server. If you deselect the "Propagate Files" check box, then the files are only copied to the remote server and no further.

If you are in Server mode, then installing a project's files automatically copies the files to each connected slave machine.

- **Remove...**

This command is enabled when Renderama is in either User or Server mode. This command allows you to delete all texture maps, models, and plug-ins relating to one or more projects that you have rendered over the network. This feature is useful for cleaning old files from the disk drives of networked server and slave machines.

Upon selecting "Remove..." in the Project menu, you will be prompted with a dialog box to select one or more projects to remove. If you are in User mode then the dialog will simply list all projects that you have rendered using the currently chosen render server.

When you click the "Remove" button in the dialog box, the selected project's texture maps, models, and plug-ins will be deleted from the chosen render server's disk as well as from the disk's of all slave machines currently connected to the render server. Note that the original project file, its texture map, model, plug-in files will never be deleted, only the copies of these files that were transferred across the network are deleted.

If you are in Server mode, you will be prompted with a slightly different dialog box that displays a list of each user that has rendered or installed projects on the local server.

The Job Menu

This menu is used to change the state of rendering jobs in either a local or remote render server's job queue.

The Job menu is disabled until one or more jobs are selected in the Main window's job queue. All commands in the Job menu are applied to the currently selected jobs in Renderama's Main window.

- **Abort**

This command removes all selected jobs from the server's job queue, and terminates all current rendering of the selected jobs.

- **Suspend**

This command puts the selected jobs into a suspended state. Any current rendering tasks for the selected jobs are allowed to complete, but no new processing is performed for a job in a suspended state. If there are other jobs in the server's queue that are not currently suspended, they will be processed as usual.

- **Resume**

This command puts any selected jobs that are currently suspended back into an active state. Partially rendered jobs will continue from the point where they were last suspended. When Renderama is used in Standalone mode to perform batch rendering, jobs are automatically added to Renderama's job queue in a suspended state. For local rendering of queued jobs to begin, the user must select the jobs in the queue and choose the "Resume" command in the Job menu.

Renderama Glossary

Term	Definition
Job	A request by a user to have a specified range of frames from one of the user's projects rendered into an animation.
Project	A discrete animation project by a single animator. In a production environment a project is also referred to as a "shot." To confuse things a bit, the term project is also used as an abbreviation for "Project File".
Project File	The file that ElectricImage uses to store all the information an animator needs to compose an animation. This information includes references to the project's model, map, sound, and plug-in files as well as information about the project's camera, lights, motion paths, deformations, and so on.
Project-related files (the project's files)	Any files that might be required to compose and render an animation. These files may include: <ol style="list-style-type: none"> 1. The project's model files 2. The project's assorted map files 3. The project's sound files 4. The plug-ins used in the project.
Server	A computer that is primarily dedicated to running Renderama in Server mode.
Server Mode	One of the modes in which Renderama can be configured to execute. Server mode exists primarily to reduce the amount of file transferring load an animation machine must incur. Once a project's files have been transferred from an animation machine to a server, the animation machine is free from any further rendering demands. Additionally, server mode maintains a queue of rendering jobs, and takes care of dividing jobs into tasks, distributing tasks to the available slave machines, retrieving the finished frames from the slaves, and assembling them into a complete animation.
Slave	A computer that is primarily dedicated to rendering animations.
Slave Mode	One of the modes in which Renderama can be configured to execute. Slave mode launches Camera on the local machine in order to complete rendering tasks that are sent from a server.
Standalone Mode	One of the modes in which Renderama can be configured to execute. Standalone mode allows the user to queue multiple jobs for batch rendering on the local machine.

Term	Definition
Task	A request by a server to have a specified range of frames from a job rendered by a slave machine.
User	Synonymous with “animator.” An individual who spends a lot of time using ElectricImage, and wishes to spend less time watching Camera’s status windows.
User Mode	One of the modes in which Renderama can be configured to execute. User mode is designed to meet the needs of animators who wish to take advantage of network rendering with as little effort as possible.

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