



13

Animating

Key Event Animation

In Ray Dream 3D, you create an animation by moving to different points in time and making changes in the scene to define the state of the action at that moment. These changes are called *key events*.

Ray Dream 3D automatically fills in the *transitions* between key events to create the illusion of motion.

Most features in a Ray Dream 3D scene can be animated in this way:

- The motion of objects, lights, and the camera
- Object size, shape, and shading attributes
- Object behavior settings
- Camera and light parameters

- Ambient lighting, background, backdrop, and atmospheric effects

Time-Based Animation

In Ray Dream 3D, key events are tied to real-world time increments—minutes and seconds—rather than to individual animation frames. This means you can create key events at specific points in time without worrying about the number of frames in your final rendered animation.

You might work at a low *frame rate* (6 frames per second is the default) to preview your animation on screen. Then increase the frame rate to render your final animation.

Once you have defined a key event, you can remove it, copy it, or move it along the time line to fine-tune the timing of your animation.

Animatable Properties

Each characteristic of an object or effect that can be animated is called a *property*. A typical object or effect has many animatable properties. Some properties, like those that define position and orientation, are common to all objects. Other properties are specific to certain types of objects.

Lights have special properties like brightness, fall off and sometimes gels.

Rendering Effects like backgrounds, backdrops and atmospheres have their own special properties.

The properties of an individual object depend on several factors, including what type of object it is, and what types of components are used in its shader.

The Fixed Animation Hierarchy

Ray Dream 3D uses the hierarchy to manage an animation internally. For this reason, the hierarchy is fixed—it *cannot change during the course of an animation*. You cannot add or remove objects at specific points in time. Nor can you change groups or links.

You can Cloak (hide) or Uncloak (show) an object at any point during the animation. This allows an object to “exit” or “enter” during the course of the animation without changing the hierarchy. For more information, refer to “[Cloaking an Object](#)” on [page 244](#).

The values of the properties may change over time, but *the properties themselves must be constant*. For example, a spot light cannot become a distant light over time; a bitmap background cannot become a bi-gradient.

Most of the effects you might hope to achieve by changing the hierarchy over time can be achieved using other techniques. See “[Animating Techniques](#)” on [page 241](#) for some examples.

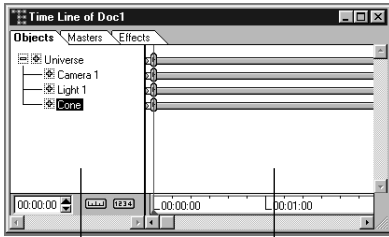
The Time Line Window

This section describes the **Time Line** window, the heart of the animation interface. The window provides tools for several basic tasks:

- Viewing the animation hierarchy
- Changing the current time
- Setting the frame rate
- Specifying the render range (the start and end times of your animation)

The **Time Line** window provides a visual representation of the key events that make up an animation. It allows you to manipulate key events and move them to different points in time. The **Time Line** window consists of three areas:

- The **Hierarchy area** located on the left side of the window displays the scene’s hierarchical structure.



Hierarchy Area

Time Line Area

The Time Line window allows you to control your animations.

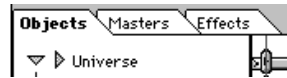
- The **Time Line** area to the right of the hierarchy area displays a *time track* for each item (object or effect) currently shown in the hierarchy area. *Key event markers* on these tracks represent key events in the animation.
- The **Time Axis** extending across the bottom of the window acts as a time ruler, with marks indicating time increments (minutes, seconds, and frames).

Hierarchy Area

All of the grouping, linking and organization tools of the Hierarchy are the same for producing a 3D illustration or an animation. Refer to [“Building a Hierarchical Structure” on page 187](#) for more information on these features of the Hierarchy area.

Objects, Masters, and Effects Tabs

The contents of the hierarchy area (and therefore the tracks shown in the time line area) change depending on which tab is displayed.



The three tabs in the hierarchy area of the Time Line window store hierarchies of the objects, master objects and render effects used in your scene.

- Click the **Objects** tab to show a hierarchical outline representation of all of the objects, lights, and cameras in the scene, with the Universe at the root.

For a discussion of organizing objects hierarchically, refer to [Chapter 11, “Building a Scene.”](#)

- Click the **Masters** tab to show a list of the scene’s master objects. Refer to [“Working with Master Objects” on page 193](#) for information on working with master objects.

Because the modelers operate on master objects, key events modifying an object’s shape appear on the time track of the corresponding master object. The Masters tab is useful for viewing these key events.

- Click the **Effects** tab to show a hierarchical representation of the scene’s render effects. The general category **Render Effects** is at the root.

Hierarchy Area

When you expand the hierarchy to show several levels, there may not be enough space horizontally to display all of the names. You can either scroll the view or widen the hierarchy portion of the window.

To scroll the hierarchy area:

- 1 Click the **Time Line** window.
- 2 Use the horizontal scroll bar to scroll the view of the hierarchy area.

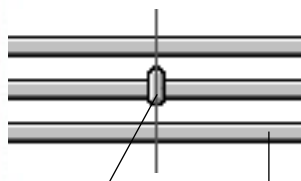
To change the size of the hierarchy area in relation to the time line area:

- 1 Position the cursor over the dividing line between the hierarchy area and the time line area. The cursor changes to indicate that you are over the divider.
- 2 Drag the divider to widen or shrink the hierarchy area. Release the mouse button when the size is right.

Time Line Area

The time Line area of the **Time Line** window displays a *time track* for each element (group, object, or effect) currently shown in the hierarchy.

An animation's key events are represented by *key event markers* on the tracks of the time line. A *marker* may represent a single key event or several coincident key events, each relating to different properties of the same object.



Key Event Marker
Track

The Key Event marker in the Time Line Area indicates the position of a key frame in the animation time line.

The key event marker appears on the track for the object or effect it relates to. The location of a key event marker along its track indicates the time at which the key event occurs.

Step-by-step instructions for editing key events appear in “[Editing the Time Line](#)” on [page 229](#).

Overlapping Key Event Markers

Sometimes two or more key event markers appear on the same time track at nearly, but not exactly the same time (they may represent key events modifying the same property, or key events modifying different properties of the same object or effect).

Depending on the current *time scale* (how closely you have zoomed in on the view of the time line area), these markers may overlap. In this case, the tiny vertical mark on the top key event changes to a plus sign, indicating that there are two or more closely spaced key event markers present.

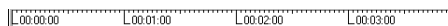


This is what two overlapping key event markers look like on the time line.

Zooming in usually makes it easier to distinguish between overlapping key events. You can zoom in with the **Magnifying Glass** tool, or click the **Time Scale** button and change the settings in the **Set Time Axis** dialog. For instructions, refer to “[Time Scale and Frame Rate](#)” on [page 224](#).

Time Axis

The **Time Axis** extends across the bottom of the **Time Line** window. It serves as a time ruler, with marks indicating time increments (minutes, seconds and frames).



The Time Axis shows the time increments used to measure your animation.

The **Time Axis** and its related interface items—the **Current Time Bar**, **Time Edit Controller**, **Render Range**, and **Time Scale** button—serve several important purposes:

- **Time Axis** provides a temporal reference for the key event markers in the time line area.
- **Render Range** (the white area of the Time Axis) indicates the beginning and end of the animation for the purposes of previewing and rendering.
- **Time Scale** button allows you to change an animation's frame rate and the size of the time increments on the Time Axis.
- **Current Time Bar** and the **Time Edit Controller** indicate the *current time*—the point in the animation currently displayed and edited in the **Perspective** window.

Time Scale and Frame Rate

The time scale describes the amount of time between each mark on the Time Axis. You can change the scale of the axis to see more time in a shorter distance, or less time in a longer distance.

The frame rate describes the number of frames displayed in each second. This applies to previews and renderings.

Note: The frame rate also determines the number of tics between major time divisions on the Time Axis.

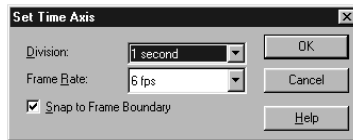
You can set both these options in the **Set Time Axis** dialog.

To change the time unit divisions (scale) on the Time Axis:

- 1 Click the **Time Scale** button at the bottom of the **Time Line** window.



The **Set Time Axis** dialog appears.



Use the **Set Time Axis** dialog to change the unit divisions on the Time Axis in the Time Line window.

- 2 Choose a time scale from the **Division** pop-up.

Time scales range from 1/3 second to 2 minutes.

To set the Frame Rate for the animation (using the Set Time Axis dialog):

- 1 Click the **Time Scale** button at the bottom of the **Time Line** window.
- 2 Choose one of the frame rates from the **Frame Rate** pop-up.

The options range between 1 and 60 frames per second (fps). Typical frame rates are 15 or 18 fps for multimedia (CD-ROM), 24 fps for film, and 30 fps for NTSC video. You'll probably want to use a lower frame rate for previewing, then increase the rate for final rendering.

Note: The **Frame Rate** pop-up in the **Set Axis** dialog is synchronized with the frame rate menus in the **Time Controller** toolbar and the **Render Settings** dialog.

With snapping is turned on, the Current Time bar and key event markers will snap to individual frame boundaries when you drag them.

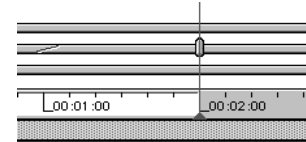
To control snapping to frame boundaries:

- 1 Click the **Time Scale** button at the bottom of the **Time Line** window.
- 2 Enable the **Snap** option.

The Current Time Bar

The **Current Time** bar is a vertical red slider with an arrow that points to the *current time* on the Time Axis.

The content of the **Perspective** window reflects the state of the scene at the current time. The title bar of the **Perspective** window also indicates the current time.



The **Current Time Bar** in the Time Line window indicates the current time in the Time Axis.

By default, when you drag the Current Time Bar it snaps to each tick (frame boundary) along the Time Axis. This allows you to set the current time precisely. You can turn snapping off by clicking the **Time Scale** button and disabling the **Snap** option in the **Set Time Axis** dialog. Refer to “**Time Scale and Frame Rate**” on page 224.

To change the current time with the time bar:

- 1 In the Time Line window, drag the **Current Time** bar to a different point along the **Time Axis**.

You can also click a point on the **Time Axis**.

If you drag the **Current Time** bar slowly, the contents of the **Perspective** Window updates interactively as you drag.

The Time Edit Controller

The **Time Edit Controller**, located to the left of the Time Axis and beneath the hierarchy area, displays the current time numerically in minutes, seconds, and frames (mm:ss:ff). For example, a reading of 00:08:23 refers to the moment that is eight seconds, 23 frames into the animation.

Note: The **Time Edit Controller** is synchronized with the Current Time Bar and the **Time Controller** toolbar described in “[The Time Controller Toolbar](#)” on page 226.

To change the current time (using the Time Controller toolbar):

- 1 Make sure the Time Controller toolbar is displayed.
- 2 Type a new value, or use the arrows to scroll buttons to change the current time value.

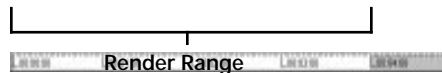


Use the current time fields in the Time Controller toolbar to adjust the position of the Current Time Bar.

The Render Range

The **Render Range** describes which time segment will be previewed or rendered. The **Render Range** is shown in white on the Time Axis.

Note: The **Render Range** is synchronized with the **Scene Settings** window: **Output tab: File Format: Movie controls**. For more information, refer to “[File Format](#)” on page 261.



Render Range on the Time Axis indicates the length of your animation.

The **Render Range** must extend past all key events if you want to preview or render the entire animation. The animation stops at the right boundary of the render range. If your animation does not preview or render to the end, verify that the render range extends beyond the last key event.

In theory, the maximum render range is one hour (the entire length of the Time Axis). In practice, an animation that long would exceed the capacity of most hardware configurations. Lengthy animations should be produced in several short clips, which can then be edited together in a video-editing application.



To change the Render Range start and end times:

- 1 Click the **Time Line** window.
- 2 Drag the right edge of the Render Range to set the end time.
- 3 Drag the left edge of the render range to set the start time of the animation.

The Time Controller Toolbar

The **Time Controller** toolbar contains VCR-like buttons for previewing and moving through your animation within the **Perspective** window, moving forward or back one frame, and moving to the beginning or end of the render range.

The render range is the white area of the Time Axis, which determines the starting and ending points for previewing or rendering an animation. Instructions for setting the render range appear in “[The Time Line Window](#)” on page 222.



Use the Time Controller toolbar to preview your animation.

To display the Time Controller toolbar:

- 1 Choose **View** menu ► **Toolbars**. The **Toolbars** dialog appears.
- 2 Click the **Time Controller** item to enable its display.

When the item has a check beside it, Ray Dream 3D displays that toolbar.

Note: Like all of Ray Dream 3D's toolbars, you can use the **Time Controller** as a floating palette or dock it on any side of the screen.









Previewing an Animation

You can use the **Time Controller** toolbar to preview your animation at any time. The animation will play in the **Perspective** window at the current display quality. Better Preview quality is not recommended for previewing animations.

When you preview an animation in a **Perspective** window, Ray Dream 3D won't skip any frames. If it can't draw frames fast enough to maintain the current frame rate, the preview will take longer to play.

Reducing the frame rate will produce choppy motion, but the preview will play closer to "real time." Lowering the current display quality to wireframe or box will speed up the preview without sacrificing smoothness of motion.

The **Time Controller** can also be used to change the current time. You can advance or back up one frame, or move to the beginning or end of the render range. You can also change the frame rate.

	Play	Click to preview the animation forward from the current time.
	Reverse Play	Click to preview the animation backward from the current time.
	Stop	Click to halt play.
	Loop	Click to loop when you play. Click again to disable looping.
	Rewind	Click to jump directly to the first frame of the render range.
	Fast Forward	Click to jump directly to the last frame of the render range.
	Previous Frame	Click to step back one frame.
	Next Frame	Click to advance one frame.

In some cases, you may want to render a low-resolution animation for preview purposes, rather than preview the animation in the **Perspective** window. For more information, refer to "**Renderers**" on page 252.

To change the frame rate using the Time Controller:

- 1 Make sure the **Time Controller** toolbar is displayed. If it's not choose **View** menu ► **Toolbars** and enable **Time Controller**.
- 2 Choose a frame rate from the **Frame Rate** pop-up. Values range from 1 to 60 frames per second.

Note: You can also set the frame rate using the Set Time Axis dialog or the **Scene Settings** window: **Output** tab: **File Format** controls.

If you are working with limited screen space, you can close the **Time Line** window and use the **Time Controller** toolbar to change the current time as you define key events. However, you won't be able to see the list of animatable properties, manipulate key event markers, or apply tweeners with the **Time Line** window closed.

Interactive Mode

Ray Dream 3D's Interactive Mode lets you see the objects move when you preview animations using Shaded or Better preview. When Interactive Mode is off, only projections (and bounding boxes for selected objects) move when you preview animations in **Preview**, **Shaded Preview** or **Better Preview Quality**.

To enable or disable Interactive Mode:

- 1 If necessary, display the **Rendering** toolbar, by choosing **View** menu ► **Toolbars** and enabling the **Rendering** option.
- 2 In the **Rendering** toolbar, click the **Interactive Mode** button.

Interactive Mode is on when the button is darkened.

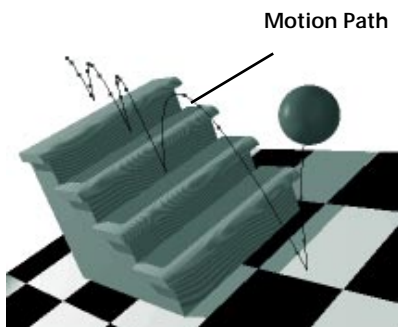


Enable the Interactive Mode button if you want to see your objects move in the Perspective window when you play an animation.

Viewing Motion Paths

To help you visualize the movements of your animated objects, Ray Dream 3D can display motion paths. A motion path is a line curving through space that describes

where an object is located throughout the animation. Motion paths are 3D and cast projections.



Motion path let you see the path of your object in an animation.

The marks on the path describe the speed of the object through the animation. Where the marks are closer together, the object moves more slowly.

Note: The motion path is a visualization tool. You cannot change an object's trajectory by editing the path directly.

Motion paths apply to objects individually, so you can show or hide them for any particular object. The control for viewing motion paths is on the **Time Controller** toolbar.



Use the View Motion Path button to see the motion paths of your objects in the Perspective window.

To show or hide an object's motion path:

- 1 Select the object whose path you want to show or hide.
- 2 Click the **View Motion Path** icon on the **Time Controller** toolbar.
- 3 Ray Dream 3D toggles display of the object's motion path.

Note: Remember that motion paths are available for objects individually. You must select an object before clicking the icon to change its motion path display state.

To set Motion Path preferences:

- 1 Choose **File** menu ► **Preferences**.
- 2 Choose **Motion Paths** from the pop-up.
- 3 Enable the **Display Frames** option if you want the path to show marks that indicate the object's position along the animation.

Note: These marks are meant only as guides and do not directly correspond to rendered frames.

- 4 Choose a **Fidelity** level (Low, Medium or High) to set how precisely Ray Dream 3D should calculate and display the paths.

Defining Key Events

Key events are changes to the properties of objects and effects in your scene at specific points in time. You'll define *key events* to set the changes that create your animation. Ray Dream 3D automatically calculates the transitional states between key events.

After creating key events, you may want to modify the rule (tweener) Ray Dream 3D uses to calculate the transitional states between keys. For more information, see [“Applying the Tweener” on page 232](#).

Typically, you'll create a key event at the beginning and end of a particular action.

To define key events:

- 1 Click the **Time Line** window.
- 2 Set the current time to a time where you want to add one or more key events.

You can drag the **Current Time Bar**, click a point on the **Time Axis**, or enter a time in the **Time Edit Controller** to set the time.

- 3 Use the standard Ray Dream 3D tools, editors, palettes, and dialogs to modify the properties of any object or effect you want animated.

Ray Dream 3D places a key event marker on the appropriate track in the time line.

- 4 Continue creating key events for the several elements at various points along the **Time Axis**.

You can also add a key event directly to a time track in the **Time Line** window, using the Add Key Event tool. This doesn't change the existing action. It adds a key event at that point which you can then edit to change the timing of the animation. See [Editing the Time Line](#), below.

Note: Notice that every element has a key event in frame zero, or the first frame. That's because everything must have an initial state.

Editing the Time Line

After you've created several key events, you may want to change the timing of your entire animation, or synchronize individual events within the animation.

You can edit the time line to adjust the timing and content of your animation. You can add key event markers, delete them, or move them along the Time Axis. You can also copy and paste events between time tracks.

Selecting Key Event Markers

To select a key event marker:

- 1 Choose the **Selection** tool.
- 2 Click on the key event marker you want to select.
 - Hold down the **Shift** key and click additional markers you want to select.
 - You may also drag a marquee around one or several markers to select them.

Adding Key Events

To add a key event:

- 1 Click the **Time Line** window.
- 2 Choose the **Add Key Event** tool from the toolbar.



- 3 In the **Time Line** window, click on the time track at the point where you want to add the event.

You can select the new key event marker and move it to change the timing.

Note: The transitions before and after the new key event use the tweener options for the previous key event.

Removing Key Events

To remove key events:

- 1 Click the **Time Line** window.
- 2 Select one or more key event markers.
- 3 Press the **Delete/Backspace** key.

You may also choose **Edit** menu ▶ **Delete**.

Changing the Timing of Key Events

To change the timing of key events, you simply move key event markers horizontally along the time tracks to different points along the Time Axis.

To move one or more selected key events:

- 1 Drag the key event marker along the Time Axis to the point where you want it.

If you've selected several markers, drag one of them and they all will move. The time intervals between the selected key events remain the same.

Ray Dream 3D lets you to move a key event marker past neighboring key event markers on the same time track. If you want to restrict a key event marker to stay between the previous and next key event markers, hold down the Shift key as you drag the key event marker.

Duplicating Key Events while Dragging

You can duplicate a key event to another location on the same time track by holding down a modifier key while you drag a key event marker. This is useful when you want to return an object or effect to the same state at several points during an animation.

To duplicate key events while dragging:

- 1 Click **Time Line** window.
- 2 Hold down the **Option/Alt** key, and drag one or more key event markers along their time track(s).

To nudge selected key event markers:

- 1 Click the **Time Line** window.
- 2 Select one or more key event markers on the time line.

- 3 Press the left or right arrow key to move the marker one screen pixel to the left or right.

Hold the **Shift** key down and press the arrow keys to move one frame at a time.

When you duplicate an object (**Command-D/Ctrl+D**), or Copy and Paste an object, you duplicate all of its animatable properties. Likewise, when you copy and paste objects into other scenes, they carry their key events.

Stretching a Series of Key Events over Time

You can stretch a series of key events over time, while maintaining the proportional timing between the events. This is useful when you're satisfied with the relative animation of a particular sequence, but you want the entire sequence to be sped up or slowed down.

To compress or expand the timing between a series of key events:

- 1 Click the **Time Line** window.
- 2 Select three or more key event markers.
- 3 Hold down the **Command/Ctrl** key and drag one of the selected key event markers.

The entire series of key events will be stretched or compressed, retaining the proportional timing between the key events.

Copying and Pasting Key Events

You can copy key events from one time track to another. The key events you are copying must modify properties that pertain to the destination track. For example, you can paste key events modifying an object's position to another object's track, but not to a render effect's track—render effects don't have positions.

When you paste key events, they keep both the timing and the property state.

To copy key events:

- 1 Click the **Time Line** window.
- 2 Select one or more key event markers.
- 3 Choose **Edit menu ▶ Copy**.

To paste key events:

- 1 In the Hierarchy area of the **Time Line** window, select the name of the object, group, effect, or property whose time track you want to paste onto.
- 2 Choose **Edit menu ▶ Paste**.

The key events (from the clipboard) are added to the destination track. If some of the key events copied do not pertain to the destination track, they cannot be pasted.

Key Event Actions

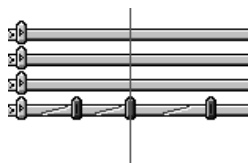
Ray Dream 3D provides some special features for duplicating and modifying a series of key events. You can reverse, repeat or mirror a key event sequence. You can also adjust the positioning of the events so that they coincide with the start of the next frame.

To use a Key Event Action:

- 1 Choose the **Selection** tool.
- 2 In the **Time Line** window, adjust the display to show the sequence of key events you want to work with.

You may need to change the time scale or expand the properties of an object.

- 3 Select each marker in the sequence. You may drag a marquee or **Shift-click**.



Select a sequence of key events.

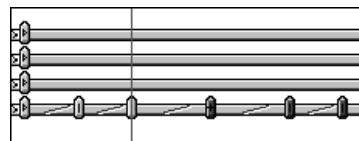
- 4 Choose **Arrange menu ▶ Key Event Action ▶** and select the action you want:

Reverse flips the order of the events so that the last becomes first and vice versa.

Repeat Sequence duplicates the sequence and places the duplicate immediately after the selected sequence.

Mirror Sequence duplicates the sequence, reverses the duplicate, and places it immediately after the selected sequence.

Snap to time adjusts the positioning of the selected events so that they coincide with the start of the next frame



This sequence was mirrored.

Using Tweeners

Tweeners make it easy to create more interesting and subtle changes in the transitions between key events. Tweeners will save you time by automatically creating movements and changes that would be extremely difficult with key

events alone. Tweeners make your animation motions and other changes more natural and sophisticated.

About Tweeners

The time period between any two key events is considered a transition. In the Time Line, you'll see the transition as the "gap" between key event markers. Ray Dream 3D uses a formula (the "tweener") to create the transitional states so that the object or effect changes smoothly between the two key events.

You won't always want a smooth, linear transition. Sometimes you'll want an abrupt change of state. Other times you'll want a transition that starts slowly and accelerates to finish in a rush. You might even want a transition that quickly alternates between the before and after states, like a florescent light flickering on.

All of these transitions are possible by setting your options for the tweener used between each pair of key frames.

A tweener requires a beginning and an ending key event, although you can place the ending key event far out in time.

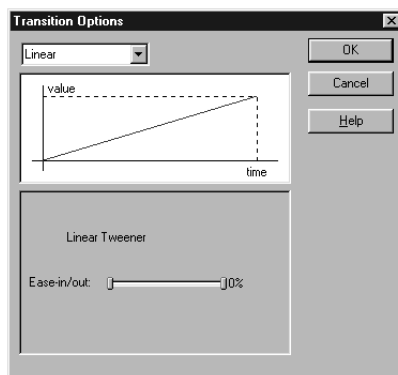
The term tweener is derived from "in-between," a term used in traditional drawn animation.

Applying the Tweener

Every "gap" between key events on the time track must have a tweener. The default tweener is **Linear**, which produces an even rate of change between the two states. You can achieve a different sort of transition by applying a different tweener.

To apply a Tweener:

- 1 Click the **Time Line** window.
- 2 Set up beginning and ending key events.
- 3 Double-click the time track segment between the two key event markers. The **Transition Options** dialog appears.



Use the Transition Options dialog to select a type of tweener to apply to your animation.

- 4 Select a tweener type from the pop-up.

- 5 Set the appropriate controls for the tweener. The controls for each type of tweener are described in the sections that follow.

As you move the handles on a slider, the graph reflects the new settings.

- 6 Click **OK** to close the dialog.

Note: Notice the small graphic on each segment of the time track. This graphic indicates the kind of tweener that is applied.



The indicator shows the type of tweener.

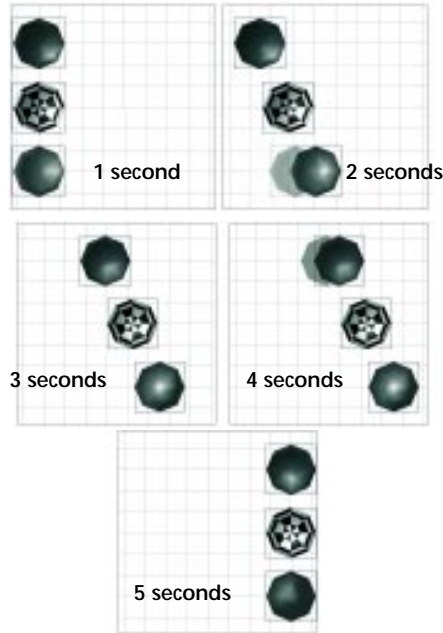
Linear Tweener

The **Linear** tweener creates gradual, direct transitions between actions.

When the graph line is straight, from the bottom left to the top right corner, the transition proceeds at an even rate from start to finish. This is the default, but you can change it.

To set Linear tweener options:

- 1 Click the **Time Line** window.
- 2 Double-click the time track segment between the two key event markers. The **Transition Options** dialog appears.
- 3 Select a **Linear** from the pop-up.
- 4 Adjust the two handles on the **Ease-In/Ease-Out** slider on the **Linear** tweener to modify the rate of change at the beginning and end of the transition.
 - Drag the left handle to the right to start slowly.
 - Drag the right handle to the left to finish slowly.



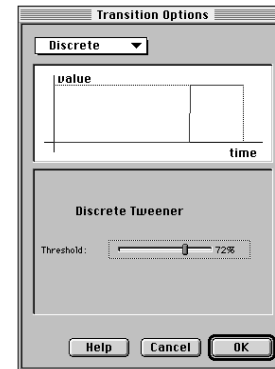
You can see how different Ease-In and Ease-Out settings affect your animation. Some objects move faster at the beginning of the animation while others move faster at the end of the animation.

Discrete Tweener

The **Discrete** tweener maintains the values from the key event that begins the transition until a specific time in the transition is reached. Then the values abruptly change to those of the key event that ends the transition. Use the **Discrete** tweener when you want a property to change immediately, like switching on a light.

To set discrete tweener options:

- 1 Click the **Time Line** window.
- 2 Double-click the time track segment between the two key event markers. The **Transition Options** dialog appears.
- 3 Select a **Discrete** from the pop-up.



Use the Discrete Tweener options dialog to set the tweeners options.

- Adjust the **Threshold** slider to specify the exact point during the transition where you want the change to occur.

The threshold value is a percentage of the transition's entire duration. For example, if you want the discrete change to occur halfway between the key events, set the threshold to 50%. If you want the change to occur at the time of the first or last key event, set the threshold to 0% or 100%, respectively.

Bézier Tweener

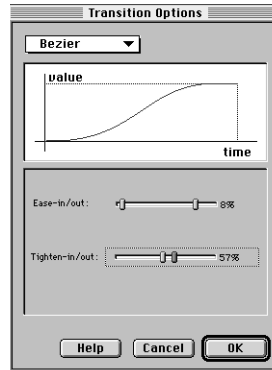
The **Bézier** tweener is designed especially for creating smooth motion paths. For best results, use it on an object's transformation track.

The **Bézier** tweener has two controls that you can adjust—**Ease-In/Out** and **Tighten-In/Out**.

To set Bézier tweener options:

- Click the **Time Line** window.
- Double-click the time track segment between the two key event markers. The **Transition Options** dialog appears.
- Select a **Bezier** from the pop-up.

The Bezier tweener controls appear. The two handles on the **Ease-In/Ease-Out** slider on the **Linear** tweener to modify the rate of change at the beginning and end of the transition.



Use the Bezier Tweener options dialog to adjust the curve of the tweener.

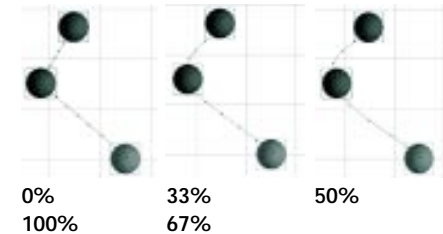
- Drag the left handle to the right to start slowly.
- Drag the right handle to the left to finish slowly.

The **Tighten In/Out** slider allows you to adjust the trajectory of the transition—the “path” the values take as they change from one key event to the next.

- Drag the left handle to change the initial trajectory.

- Drag the right handle to change the finishing trajectory.

Values near the extremes (0% and 100%) result in tighter trajectories (closer to linear). Values near 50% result in looser (less direct) trajectories. The default settings (33% in and 67% out) are optimized for natural, smooth motion.



Extreme Tighten In/Out settings result in tighter trajectories. Values closer to 50% result in smoother trajectories.

Oscillate Tweener

The **Oscillate** tweener switches back and forth between the start and end values several times during the transition. You can choose between several wave forms to describe the alternation.

To set Oscillate tweener options:

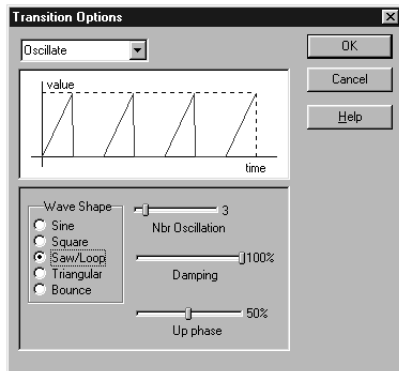
- Click the **Time Line** window.
- Double-click the time track segment between the two key event markers. The **Transition Options** dialog appears.

3 Select a **Oscillate** from the pop-up.

4 Click one of the **Wave Shape** radio buttons to choose the wave shape you want.

The graph of the wave shape shows how the switch occurs between up and down phases.

- The **Sine** wave uses a sine curve to alternate the before and after values.
- The **Square** wave alternates back and forth between the first and last key events with no interpolation.



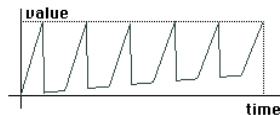
Use the *Oscillate Tweener options dialog* to set the shape of the oscillate wave and other attributes.

One way to make a light blink at one second intervals is to turn the light on and off by setting key events every second on the light's time track. A more efficient way is to turn a light on at Event A and then turn it off, perhaps ten seconds later, at Event B. Afterwards, apply the **Oscillate** tweener, and specify ten oscillations (using the Square wave so that the switches are abrupt). The **Oscillate** tweener switches the light on and off ten times during the ten-second interval, using only two key events and a single tweener.



- The **Saw/Loop** wave interpolates linearly from its beginning value to its ending value, then snaps back abruptly to the beginning value in each oscillation.

You can use this option to replicate an action, such as hitting a gong. The character's arm is first placed in a drawn back position, moves to strike the gong, and then snaps back. You can also use Saw/Loop to play a movie from start to end in a loop.



This is what the Saw/Loop Wave Shape looks like when you apply Damping

- The **Triangular** wave shape causes the transition to alternate back and forth abruptly.
- The **Bounce** wave shape causes the transition to alternate, with abrupt change in and out of the second position and gradual change in and out of the first position. This works well when the first position is a ball at height, and the second position is the ball on the floor.

- 5 Adjust the **Nbr Oscillation** slider to set the number of times the values should alternate.
- 6 Adjust the **Damping** slider to progressively diminish the amplitude of the oscillations.

After each oscillation, the amplitude diminishes by the damping factor percentage.

- 7 Adjust the **Up Phase** slider to control how much of each oscillation is dedicated to the "up phase."

For example, if you set the Up Phase value to 90%, the object spends 90% of the oscillation changing from A to B and only 10% changing from B to A.

Behaviors

Behaviors allow you to give objects sets of instructions that give them an “activity” during the animation. Behaviors reduce the number of key events you need to create and allow you to create actions that are not otherwise possible.

Some behaviors, such as Bounce and Spin, automatically assign complex actions to an object. Others, such as Point At and Track, define or modify the motion of one object based on the location or motion of another object.

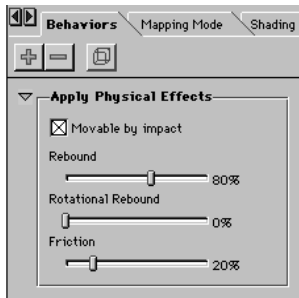
Applying Behaviors

You can apply multiple behaviors to an object or group; however, some may override the others.

For example, you can apply both a bounce and a spin to an object. However, some behaviors are exclusive—they cannot be used together. It wouldn't make sense to assign the **Point At** behavior to an object and also give the object Spin—these behaviors would produce contradictory results.

When you apply a behavior, it remains in the object's behavior list for the duration of the animation.

However, most behaviors can be turned on or off at different points along the time line.



Use the Behaviors tab in Properties palette to add or delete behaviors from an object.

To apply a behavior:

- 1 Select an object.
- 2 Display the **Properties** palette: **Behaviors** tab.
- 3 Click the **Plus** icon. A dialog appears with a list of the available behaviors.
- 4 Choose the behavior you want to apply. Click **OK**.
- 5 Set other options for the behavior.

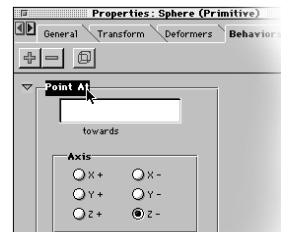
The options for **Spin**, **Bounce**, **Point At**, **Track** and **Inverse Kinematics** are described below.

- 6 Click **Apply** to send your changes to the object.

Behaviors are applied in the order that they appear in the list. Where two or more applied behaviors conflict, those further down the list override those above. After you add behaviors, you can drag them up or down to change the order.

To remove a behavior from the list:

- 1 Select the object or group that carries the behavior.
- 2 Display the **Properties** palette: **Behaviors** tab.
- 3 On the tab, click the title of the behavior you want to remove to select it.



Click the Behavior's name on the Behavior's tab to select it.

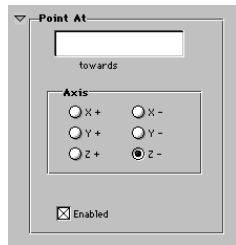
- 4 Click the **Minus** icon in the **Behaviors** tab.

Point At

The Point At behavior instructs an object to orient itself “toward” another object (hot point) through all or part of the animation.

You can use the Point At behavior to get a camera or light to follow a particular object or group. You can also use it to animate an object that always faces or points at another, such as a satellite dish as it tracks a satellite, or a sunflower as it follows the path of the sun.

Arrange menu ▶ Point At differs from the **Point At** behavior in two respects. First, **Arrange menu ▶ Point At** only operates on cameras and lights. Second, it only makes the change “right now,” so it’s not an animation tool.



Use the **Point At** Tab to select an object to point at.

To set point at options:

- 1 Apply the **Point At** behavior to an object. The **Point At** controls appear on the **Properties palette: Behaviors tab**.

See “**To apply a behavior:**” on page 236 for instructions on applying behaviors.

- 2 Type the name of the object to be pointed at in the text box. Type the name exactly as it appears in the Hierarchy area. (The text box is case sensitive).
- 3 Use the radio buttons in the Axis area to select which face of the object should point at the target object.

For objects other than camera or light, you’ll need to specify which face of the object should be oriented toward the target. For example, if you’re working with a “pointing finger” object, select the axis that describes the direction the finger points.

This step is not necessary with a camera or light. By default, the face with the light beam or the camera lens is selected. Any other setting would point the light beam or camera lens at 90° or 180° to the target.

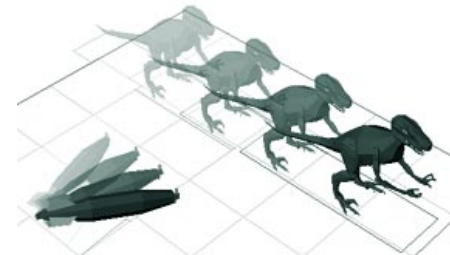
You can display the **Properties palette: Transform tab: Position controls** to show the axes. For a reference on the object itself, enable the **File menu: Preferences dialog: Perspective: Hot Point: Show Axis Information** option.



- 4 You can use the Enable checkbox to turn the behavior on and off at specific points in the animation.

A key event is created each time you turn the behavior on or off.

- 5 Remember to click **Apply** to update your changes to the object.



The **Point At** behavior was applied to the rocket so that it continues to point at the dinosaur no matter where it moves.

Bounce

The Bounce behavior instructs an object to bounce up and down along the global z-axis. You can set the upper and lower limits for the bounce, and specify the number of bounces per second.

Note: The bounce behavior does not control an object's lateral movement (along the x and y planes).

To set bounce options:

- 1 Apply the **Bounce** behavior to an object. The **Bounce** controls appear on the **Properties palette: Behaviors tab**.

See “[To apply a behavior:](#)” on page 236 for instructions on applying behaviors.
- 2 In the **Floor** entry box, enter the lower limit of the bounce. The value describes the distance from the global universe Z=0 plane that is the lower limit of bouncing.
- 3 In the **Height** entry box, enter the height of the bounce. The value describes the distance above the floor level that is the upper limit of bouncing.
- 4 In the **Bounces per Second** entry box, enter the number of bounces per second.

- 5 Enter values in the **Start Time** and **End Time** entry box to limit the bounce to a particular range in time.
- 6 Remember to click **Apply** to update your changes to the object.

Spin

The **Spin** behavior instructs an object to rotate on one of its axes. You can set the number of cycles of the spin per second.

To set spin options:

- 1 Apply the **Spin** behavior to an object. The **Spin** controls appear on the **Properties palette: Behaviors tab**.

See “[To apply a behavior:](#)” on page 236 for instructions on applying behaviors.
- 2 Select the axis of rotation.
- 3 In the **Cycles per second** entry box, enter the number of cycles per second for the spin. (A cycle is one complete 360° rotation.)
- 4 Enter values in the **Start Time** and **End Time** entry boxes to limit the spin to a particular range in time.
- 5 Remember to click **Apply** to update your changes to the object.

Track

The **Track** behavior instructs an object to “shadow” another as its moves through the universe.

To set track options:

- 1 Apply the **Track** behavior to an object. The **Track** controls appear on the **Properties palette: Behaviors tab**.

See “[To apply a behavior:](#)” on page 236 for instructions on applying behaviors.
- 2 Type the name of the object to be tracked in the text box. Type the name exactly as it appears in the Hierarchy area. (The text box is case sensitive.)
- 3 Enable the checkboxes for each axis you want to track in.
- 4 Enable Track Rotation if you want the object to track the rotation as well as position.
- 5 Use the Enable checkbox to toggle the behavior on and off at specific points in the animation.
- 6 A key event is created each time you turn the behavior on or off.
- 7 Remember to click **Apply** to update your changes to the object.

Record Behaviors

When you apply a behavior, Ray Dream 3D automatically calculates the position and orientation of objects over the course of the animation. The objects move to positions and orientations not explicitly defined by key events.

You might decide that you want to control the position or orientation that's determined by a behavior. Ray Dream 3D lets you do this by converting the behavior action to a series of key events. After creating the key events, you can adjust them individually.

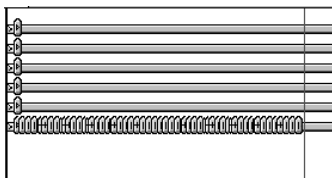
To convert behaviors to key events:

- 1 Set up the behavior to animate the object.
- 2 Choose the frame rate you want for this project.

Ray Dream 3D creates a key event marker for each frame, so it's important to set the frame rate first.
- 3 Set the render range to extend as far as necessary for this segment.

Ray Dream 3D creates key event markers through the end of the render range, so it's important that the range extend to the end of this object's behavior.

- 4 Select the object whose behavior you want to convert.
- 5 Choose **Arrange menu ▶ Record Behavior**.



This is what a behavior looks like when it's converted to key frames.

